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## *Five New Arguments for The Dynamic Theory of Time*

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### **1 Introduction**

In the ongoing debates about the nature of time, two main theories have recently come into focus. One is *The Static Theory of Time*, according to which time is like space in various ways, and there is no such thing as the passage of time. And the other is *The Dynamic Theory of Time*, according to which time is very different from space, and the passage of time is an all-too-real phenomenon. For various contingent, historical reasons, The Static Theory has been the majority view among scientists and philosophers ever since early in the 20<sup>th</sup> Century. Lots of arguments have been proposed against The Dynamic Theory, and Dynamic Theorists have mainly played defense, attempting to respond to the arguments that have been raised against our view. In this paper, I am going to get offensive: I want to introduce five new arguments for The Dynamic Theory of Time.

But I want to emphasize at the outset that I am going to talk about two views – each one a combination of several different theses – that are among the many views on the table in the metaphysics of time. I will talk about these two because I consider them to be the most plausible and the most interesting. But for each of the two views to be featured here, there are many other possible combinations of theses in the same ballpark, quite a few of which have been defended in the literature. Some of what I say will apply to some of these other combinations, and some of what I say will not. One cannot talk about everything in a single paper. But my main goal is to introduce five new arguments for what I take to be the most plausible and the most interesting version of a dynamic theory of time.

Before I get to those arguments, I will start by characterizing the two theories about the nature of time that I want to focus on. This is important partly in order to clarify what is at issue, and also because, as I see it, the two main sides in the dispute over the nature of time have not been formulated in the most perspicuous ways, and I want to be a part of the solution to that problem.

## 2 Two Theories About the Nature of Time

Let me start with The Static Theory of Time. The guiding thought behind this theory is that time is like space. (This is believed by many people to be one of the main lessons from Special Relativity.<sup>1</sup>) One important way in which time is supposed to be like space, on this theory, is that the universe is spread out in four dimensions – the three dimensions of physical space, along with time – which together make up a unified, four-dimensional manifold,<sup>2</sup> appropriately called *spacetime*.<sup>3</sup>

A second way in which time is supposed to be like space, on The Static Theory, has to do with the way physical objects are extended in time.

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<sup>1</sup> But there are metaphysicians who disagree with this assessment. See for example Emery, “Actualism without Presentism? Not by way of the Relativity Objection;” Emery, Markosian, and Sullivan, “Time,” Section 11; Hinchliff, “A Defense of Presentism in a Relativistic Setting;” Miller, “Enduring Special Relativity;” Markosian, “A Defense of Presentism,” Section 3.9; and Zimmerman, “The Privileged Present: Defending an ‘A-Theory’ of Time,” pp. 218-221. For those of us who think that it is not a consequence of Special Relativity that time is similar to space, the idea that time is like space nevertheless remains an interesting way to think about time.

<sup>2</sup> A unified manifold is an  $n$ -dimensional space in which the dimensions are connected in some significant way. (More on this in Section 4 below.)

<sup>3</sup> David Lewis writes, “The world—the time traveler’s world, or ours—is a four-dimensional manifold of events. Time is one dimension of the four, like the spatial dimensions except that the prevailing laws of nature discriminate between time and the others—or rather, perhaps, between various timelike dimensions and various spacelike dimensions. (Time remains one-dimensional, since no two timelike dimensions are orthogonal.)” [Lewis, “The Paradoxes of Time Travel,” p. 145.]

On The Static Theory, they have *temporal parts*.<sup>4</sup> In order to get a grip on the notion of a temporal part, think of a filmstrip showing you as you walk across a room. It is made up of many frames, and each frame shows you at a moment of time. Imagine cutting the frames and then lining them up, in chronological order, with the two-dimensional images of you all right-side-up. Each one of these frames represents a *temporal part* (or “time slice”) of you, in a specific position, at a particular location in space, at a single moment of time. And what you are, on this view, is the fusion of all these temporal parts. You are a “spacetime worm” that curves through the four-dimensional manifold known as spacetime.<sup>5</sup> Also, on this view, what it is to have a momentary property at a time is to have a temporal part at that time that has the property in question.<sup>6</sup> So you are sitting right now in virtue of the fact that your current temporal part is sitting. And what makes it true now that you were standing before is that you have an earlier temporal part that is standing. (All of this is meant to be a way in which time is similar to the dimensions of space because one way a physical object can be extended in space is by having different spatial parts in different regions of space.)

A third way in which time is supposed to be like space, on The Static Theory, is that no one moment of time is metaphysically special (just as no one location in space is metaphysically special). Here is a way to illustrate the idea. Take the filmstrip for the whole universe, cut the frames, and line them up, in chronological order. Now you have something – a gigantic block of movie frames – that represents the entire history of the universe. Each frame in this block represents the universe at a moment of time (so the

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<sup>4</sup> There are different ways of understanding the notion of a temporal part. (See, for example, Thomson, “Parthood and Identity Across Time.”) My favorite way is a variation on the one offered by Theodore Sider in Chapter 3 of his *Four-Dimensionalism*. But the definition I prefer, unlike Sider’s, requires that a temporal part of an object persists for a shorter span of time than the object itself:  $x$  is a *temporal part* of  $y$  =df (i)  $x$  persists for a shorter span of time than  $y$ , and (ii) throughout the time during which  $x$  persists,  $x$  exactly overlaps  $y$ . (Where to *persist* during a period of time is to be located at every moment during that period, the way you are located at noon today and Marie Curie is not.)

<sup>5</sup> See, for example, Lewis, “The Paradoxes of Time Travel,” p. 145; and Sider, *Four-Dimensionalism*, Ch. 3.

<sup>6</sup> See, for example, Lewis, “The Paradoxes of Time Travel,” pp. 145-146; Lewis, *On the Plurality of Worlds*, pp. 202ff.; and Sider, *Four-Dimensionalism*, pp. 93ff.

universe has temporal parts, too), and we can see by the way the frames are arranged which ones are *earlier than* which other ones. But since, in the scenario we are currently imagining, there is no light shining on any one of the frames, no one of the frames is the objectively present moment. (Just as no single location in space is objectively present.)

Here is some terminology that has proven to be useful in stating our theories.<sup>7</sup>

**A-properties:** putative temporal properties such as *being present, being past, being future, being four days future*, etc.

**B-relations:** temporal relations such as *simultaneous with, earlier than, later than, four days later than*, etc.

On The Static Theory, there are no genuine A-properties, and there are no objective facts about which moments are past, present, or future. (This is why the definition of A-properties contains the word ‘putative’ – because it is controversial whether there even are such things as A-properties. But all parties to the dispute believe in B-relations.) And this is another way in which time is like space, on The Static Theory, since we all agree that there is no monadic property of *hereness* that is instantiated by one metaphysically privileged location in space (and we also agree that there are no objective facts about which spatial location possesses this (nonexistent) property).

Since they maintain that there are no objective A-properties, Static Theorists do not think that we need any linguistic devices for expressing facts about such properties. If someone says today, “I will graduate from college in the future,” then, according to The Static Theory, they express the proposition that their graduation is *later than* the time of their utterance. They are talking about B-relations between events, rather than A-properties of events. Thus there is no need for past- and future-tensed sentences in an

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<sup>7</sup> These definitions of ‘A-properties’ and ‘B-relations’ are from Markosian, “How Fast Does Time Pass?,” but they are based on terminology from McTaggart, *The Nature of Existence*, Volume II, Book V, Chapter 33.

ideal language.<sup>8</sup> And since there is also no need for spatial analogues of temporal tenses in an ideal language, this is yet another way in which time is like space, according to The Static Theory.

A final way in which time is like space, on The Static Theory, has to do with ontology. Everyone agrees that the correct ontology doesn't change from one place to the next. Even here in Western Massachusetts, we need to include spatially distant objects like the Taj Mahal on the list of everything that exists. On The Static Theory, it is the same with time: Even now, in the 21<sup>st</sup> Century, we need to include temporally distant objects like Marie Curie and humans from the year 2525 (if there will be any) in the correct ontology. For the correct ontology, on this view, doesn't change from one time to another.<sup>9</sup>

Here then are six ways in which time is like space, according to The Static Theory of Time.<sup>10</sup>

### *The Static Theory of Time*

1. The universe is spread out in four dimensions (each one orthogonal to each other one), which together make up a unified, four-dimensional manifold (appropriately called *spacetime*) in which physical objects are located and possibly extended.

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<sup>8</sup> For more on the connection between A-properties and tense, see Emery, Markosian, and Sullivan, "Time."

<sup>9</sup> For more on temporal ontology, see Sider, *Four-Dimensionalism*, Ch. 2, and Markosian, "A Defense of Presentism."

<sup>10</sup> Some or all of the following components of The Static Theory can be found in Williams, "The Myth of Passage;" Price, "Identity Through Time;" Smart, "The River of Time;" Lewis, "The Paradoxes of Time Travel;" Sider, *Four-Dimensionalism*; Hawley, *How Things Persist*; Moss, "Four-Dimensionalist Theories of Persistence;" and Skow, *Objective Becoming*. (As well as many other places.) It is important to note that The Static Theory, as formulated here, is a natural and popular combination of related theses. But it is not inevitable. Various hybrid views are possible, and several such views have been endorsed in print. (The following characterization of The Static Theory is borrowed (with minor changes) from Markosian, "The Dynamic Theory of Time and Time Travel to the Past.")

2. Any physical object that persists through time does so in virtue of having a temporal part at each moment at which it is located.
3. There are no genuine and irreducible *A-properties*; all talk that appears to be about *A-properties* can be correctly analyzed in terms of *B-relations*.
4. The temporal facts about the world include facts about *B-relations*, but they do not include any facts about *A-properties*.
5. We do not need to take tense seriously. Propositions have truth values *simpliciter* rather than at times, and so cannot change their truth values over time. Also, we can in principle eliminate verbal tenses like *is*, *was*, and *will be* from an ideal language.
6. The correct ontology does not change over time, and it always includes objects from every region of spacetime.

Of course, Static Theorists admit that time *seems* special to us, and even that time seems to pass. But they insist that this is just a feature of consciousness – of how our brains experience the world – and not a feature of reality that is independent of us.<sup>11</sup>

Turning now to The Dynamic Theory of Time, the guiding thought behind that theory is that time is very different from space. One important difference between time and space, on The Dynamic Theory, is that time cannot be added to the dimensions of space to form a unified manifold. Although talking about “spacetime” is a useful way to encode information about the spread of objects and events in space and time, it does not follow that space and time form a unified manifold in the relevant sense.<sup>12</sup>

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<sup>11</sup> See for example Paul, “Temporal Experience;” and Skow, *Objective Becoming*, especially Chapters 11 and 12.

<sup>12</sup> There are theories in the vicinity of what I am calling The Dynamic Theory according to which spacetime *is* taken to be a unified manifold. (Again, more on the notion of a unified

A closely related difference between time and space, on The Dynamic Theory, is that physical objects are not spacetime worms that are extended in time in virtue of having different temporal parts at different times.<sup>13</sup> Instead, each object is wholly present at each time at which it is located.<sup>14</sup> It's not a mere temporal part of you that is sitting in your chair right now. It's you.

Another important claim of The Dynamic Theory is that the passage of time is a real, objective, and mind-independent feature of the world – one that makes time very different from the dimensions of space. Opponents of The Dynamic Theory (and sometimes proponents as well) like to illustrate the theory using the metaphor of a moving spotlight that slides along the temporal dimension, brightly illuminating just one moment of time, the present, while the future is a kind of foggy region of potential and the past is a shadowy realm of what has been. This is an intuitively appealing way to capture the idea behind The Dynamic Theory, but at the end of the day it is just a metaphor. What the metaphor represents is the essential idea behind The Dynamic Theory, namely, the idea that A-properties like *being future*, *being present*, and *being past* are objective and metaphysically significant properties of times, events, and things.<sup>15</sup> Also, the metaphor of the moving spotlight represents the fact that, according to The Dynamic Theory, each time undergoes an inexorable process, sometimes called *temporal becoming* – it goes from being in the distant future to being in the

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manifold in Section 4 below.) See, for example, the discussion of The Moving Spotlight Theory in Emery, Markosian, and Sullivan, "Time."

<sup>13</sup> See, for example, Prior "Thank Goodness That's Over;" and Thomson, "Parthood and Identity Across Time."

<sup>14</sup> There are many different ways of understanding the notion of being wholly present. Here is my favorite: *x is wholly present at t* =df *x is present at t*, but not in virtue of having a *temporal part* at *t*. (I take it that to be *present* at a time is to be located at that time, the way you are located at the time of your reading this sentence and Marie Curie is not.)

<sup>15</sup> See, for example, Prior, *Past, Present, and Future*; and Markosian, "How Fast Does Time Pass?"

near future, it has a brief moment of glory in the present, and then it recedes forever further and further into the past.<sup>16</sup>

Despite its being intuitively appealing, the moving spotlight metaphor has a major drawback: It encourages us to think of time as a fourth dimension, akin to the dimensions of space. On The Dynamic Theory (as I am conceiving it), this way of thinking – “spatializing time” – is a major no-no. It is not that there are these four connected dimensions, and one of them has some extra bells and whistles added to it. Instead, it is that time is completely different from the dimensions of space. So different, in fact, that it is not even the same kind of dimension – just as neither *the moral dimension* nor *the modal dimension* is the same kind of dimension as space. We cannot meaningfully take the three dimensions of physical space and add the moral dimension to them in order to form a unified, four-dimensional manifold in which physical objects are located and extended. This is because morality is not the same kind of dimension as space. On The Dynamic Theory, it is the same with time.

Because A-properties and the passage of time are objective features of reality, according to The Dynamic Theory, proponents of the theory will have to insist that we “take tense seriously.” For what is true keeps changing, on this view. 2020 was present, and now it is past. (Thank goodness that’s over!) You are sitting, and later you will be lying down. This means that the bearers of the truth-values (which I take to be propositions) must have truth-values at times, and must be capable of changing their truth-values over time. And this in turn means that a language rich enough to capture all of the constantly changing facts about the world will have to allow speakers to say things like, “It was the case that *p*, and it is not now the case that *p*.” Hence verbal tenses like *was* and *will be* are ineliminable from an ideal language, on The Dynamic Theory.<sup>17</sup>

A final difference between time and space, on The Dynamic Theory, has to do with ontology. On this theory, the correct ontology does indeed

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<sup>16</sup> See, for example, Markosian, “How Fast Does Time Pass?” Section 2; and Markosian, “A Defense of Presentism,” Section 3.10.

<sup>17</sup> See in this connection, Prior, “Changes in Events and Changes in Things;” Markosian, “How Fast Does Time Pass?;” and Emery, Markosian, and Sullivan, “Time.”

change over time, and it always includes only objects that are present at a given time, never objects that are merely past (like Marie Curie) or merely future (like my great-great-grandchildren).<sup>18</sup>

Here is the view.<sup>19</sup>

### *The Dynamic Theory of Time*

1. Time cannot be added to the dimensions of space in order to form a unified manifold in which physical objects are located and possibly extended.
2. Any physical object that persists through time does so in virtue of being wholly present at each moment at which it is located.
3. There are genuine and irreducible *A-properties*, which cannot be correctly analyzed in terms of *B-relations*.
4. The temporal facts about the world include ever-changing facts involving *A-properties*, including facts about which times are past, which time is present, and which times are future.

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<sup>18</sup> See, for example, Prior, "The Notion of the Present;" and Markosian, "A Defense of Presentism."

<sup>19</sup> Some or all of the following components of The Dynamic Theory can be found in Prior, *Past, Present and Future*; Thomson, "Parthood and Identity Across Time;" Markosian, "How Fast Does Time Pass?;" Markosian, "A Defense of Presentism;" and Sullivan, "The Minimal A-Theory." (Not to mention many other places.) It is important to note that, like The Static Theory, The Dynamic Theory, as it is formulated here, is a natural and popular combination of related theses. But it is not inevitable. Various hybrid views are possible, and several such views have been endorsed in print. (The following characterization of The Static Theory is borrowed (with minor changes) from Markosian, "The Dynamic Theory of Time and Time Travel to the Past.")

5. We must take tense seriously. Propositions have truth values at times rather than *simpliciter* and can, in principle, change their truth values over time. Also, we cannot eliminate verbal tenses like *is*, *was*, and *will be* from an ideal language.
6. The correct ontology is liable to change over time, and it is always true that only present objects exist.

And here are two better metaphors for our two theories about time.<sup>20</sup> For The Static Theory, the universe is like a movie that is never shown. The frames are all there, but the movie is just sitting on a shelf, in the dark. Also, instead of being attached end to end, in the way of a normal filmstrip, the frames are cut and then stacked against each other. Each frame is a temporal slice of the universe, and if you look closely at the stack of frames, you can see your own spacetime worm curving through it, like a tiny wire in an enormous block of granite. But because the movie is never shown, no part of it is metaphysically privileged. Although the frames are arranged in an order, there is no light shining on any one frame. No frame is special.

For The Dynamic Theory, on the other hand, the universe is like a movie that is being shown in a theater *right now*. But it's not the frames that are the universe. Instead, it is the image on the screen. There is only one image on the screen, and it keeps changing. That's because reality is one thing that keeps changing. It *was* that way, now it *is* this way. Soon it *will be* some other way. The present moment – the image on the screen that we are experiencing – is special because it is the one and only way reality is right now.<sup>21</sup>

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<sup>20</sup> The following metaphors for the two theories are also borrowed from Markosian, "The Dynamic Theory of Time and Time Travel to the Past."

<sup>21</sup> In this metaphor, the frames in the filmstrip up in the projection booth are a useful way to represent the different states of the universe at different times. They are like maximal, consistent, tensed propositions. There is always one of them that is special: the one that corresponds to the image on the screen *right now*. But it is important to understand that which frames are in the filmstrip, and which one has a light shining through it right now, is determined by the universe, and not the other way around. (So this is an important

Now that we have our two theories in front of us, let's turn to the new arguments I want to offer for The Dynamic Theory of Time.

### 3 The Argument from Personal Identity and Moral Responsibility

My most embarrassing moment occurred when I was seven years old. I will spare you the cringeworthy details, but the important thing for our purposes is that when I think back, the memory of that event is accompanied by the unhappy thought, "That was me." To this day the memory still makes me squirm. So the following is a sentence about personal identity that seems true. ("EM" stands for "Embarrassing Moment.")

(EM) I feel embarrassed today about something that happened to me when I was seven years old.

Here is a second example. Let's suppose that you performed a brave deed last year for which you now deserve credit. Then it is an important truth that you are currently morally responsible for performing that brave deed last year. Here is a sentence reporting this truth. ("BD" stands for "Brave Deed.")

(BD) You are now morally responsible for performing that brave deed last year.

The Static Theorist can agree that (EM) and (BD) are both true sentences. For The Static Theory comes with a semantics for such sentences that gives the result that (EM) and (BD) are both true. But the problem is that the Static Theorist must give an account of what makes these sentences true – i.e., an account of the fundamental facts underlying these truths –

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disanalogy between the universe and a movie being shown in a theater right now, on The Dynamic Theory.)

that is deeply unsatisfying. Here is the Static Theorist's account of the truthmaker for (EM).

(TEM<sub>ST</sub>) (EM) is true now because my current temporal part feels embarrassment over something that happened to a distinct temporal counterpart that is seven years removed from a still earlier temporal counterpart that is being born.

And here is why this seems like the wrong account of what makes (EM) true. On this account, the thing that is embarrassed, on a fundamental level, is the current temporal part of me, rather than me (for on the static theory, I am embarrassed now in virtue of having a current temporal part that is embarrassed); and this thing that is embarrassed (the current temporal part of me) is embarrassed because of what happened to a distinct thing (a still earlier temporal part of me). This makes the case similar to a case in which my hand is embarrassed because of what my foot is doing: on the level of fundamental property ascriptions, the thing that feels the embarrassment, according to the Static Theorist, is not identical to the thing that suffered the embarrassing experience. But this strikes me as wrong. After all, in the case of my most embarrassing moment, I wouldn't be cringing so much today if I didn't remember the event from my childhood and think, "That was me." The phenomenology of embarrassment is that of a subject feeling shame for what happened to it, not to some counterpart of it.<sup>22</sup>

So what is the right account of what makes (EM) true? That's easy: (EM) is true now because I am embarrassed about something that happened *to me* some time ago.

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<sup>22</sup> There is an intermediate kind of case, where one feels shame due to the actions of a family member. But it seems to me that the phenomenology in that kind of case is markedly different from the phenomenology in the original case of me and my most embarrassing moment. For in my case it does not feel like embarrassment over the action of a member of my social group; it simply feels like embarrassment over an action that I myself performed.

(TEM<sub>DT</sub>) (EM) is true now because I feel embarrassment over something that happened to me when I was seven years old.

(TEM<sub>DT</sub>) captures a crucial fact about the case, which is that the thing that experienced the embarrassing moment and the thing that is now feeling embarrassment about that moment are numerically the same thing (and not distinct things that are related in some special way).

Meanwhile, here is the Static Theorist's account of the truthmaker for (BD).

(TBD<sub>ST</sub>) (BD) is true now because the current temporal part of you is morally responsible for a brave deed performed by an earlier temporal part of you (in virtue of being a temporal counterpart of that earlier temporal part).

But this strikes me as an incorrect account of what makes (BD) true. For on this account, the thing that is morally responsible, in the first instance, is the current temporal part of you. (It's also true that the spacetime worm that is you is now morally responsible for the brave deed, but the worm has that property derivatively, in virtue of your current temporal part's having the property non-derivatively.) Moreover, the current temporal part of you has this property of being morally responsible because it is a temporal counterpart of an earlier temporal part that performed the brave deed. (It's also true that the spacetime worm that is you has the property of now being responsible for performing the brave deed, but the worm has that property derivatively, in virtue of having an earlier temporal part that has the property of performing the brave deed non-derivatively.) All of this is like saying that you are morally responsible for an action performed by your doppelgänger in another possible world, or like saying that you are morally responsible for an action performed by your cousin. It's a mistaken account of personal responsibility because responsibility in fact attaches to the one who actually performed the action

in question, not to something else that stands in some special relation to the one who performed the action.

What, then, is the right account of what makes (BD) true? That's easy: (BD) is true now because of something that *you* did last year.

(TBD<sub>DT</sub>) (BD) is true now because you performed a brave deed last year.

The difference between the Dynamic Theory's account of the truthmakers for (EM) and (BD), on the one hand, and the Static Theory's account of those truthmakers, on the other hand, has to do with what the underlying, fundamental facts (the truthmaking facts) are said to be in cases of personal identity and moral responsibility. According to The Static Theory, the relevant fundamental facts concern relations between distinct things – different temporal parts of a single, four-dimensional worm. But on The Dynamic Theory, the fundamental facts in these cases concern facts about a single thing (which is embarrassed about something that it did, in the case of (EM), or morally responsible for something that it did, in the case of (BD)). I want to suggest that the latter account – which puts the identity in personal identity, and properly accounts for the responsibility in moral responsibility – is tenable, while the former account – which makes personal identity a matter of standing in a relation that is not identity, and turns moral responsibility into a matter of one thing being accountable for an action performed by a distinct thing – is not tenable.

Here is my argument.

### **The Argument from Personal Identity and Moral Responsibility**

- (1) The Dynamic Theory gives the correct account of the truthmakers for important truths about personal identity and moral responsibility, but The Static Theory does not.
- (2) If (1), then The Dynamic Theory is true.

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- (3) The Dynamic Theory is true.

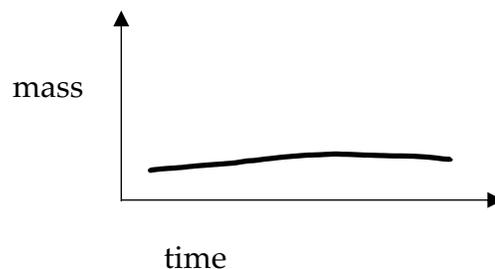
A Static Theorist might be tempted to say that this argument begs the question, because on their view *what it means* to have a property at a time is to have a temporal part that has the property in question. (EM), for example, just means that my current temporal part feels embarrassment about the fact that it has an earlier temporal counterpart that experiences a terrifically embarrassing moment (and that is seven years removed from a still earlier temporal counterpart that is being born). And (BD) just means that there are two suitably related temporal parts of you: one of which is earlier than the other, and performs a brave deed, and the other of which is responsible for that brave deed. If we assume this account of what these sentences mean, then the Static Theory truth conditions described above can be seen to be the right truth conditions for these sentences. And if we assume a different account of what the sentences mean, according to the objection, then we are begging the question against The Static Theory.

Here is my reply. I don't happen to agree with the Static Theory account of what it means to have a property at a time. But the argument does not presuppose that this account is false, nor does it presuppose an alternative account of the meanings of sentences like (EM) and (BD). It is neutral on the question of what such sentences mean. Instead, the argument focuses on the question of what makes sentences like (EM) and (BD) true. And the central claim of the argument is that what makes it true today, for example, that I feel embarrassment over something that happened to me when I was seven years old is not the fact that the thing that feels embarrassed today is related in some special way to a distinct thing that endured the relevant embarrassing experience. Similarly, the claim is that what makes it true that you are now responsible for the brave deed you performed last year is not the fact that the thing that is responsible today is related in some special way to a distinct thing that performed the brave deed. And the further thought is that it is possible to have such firm convictions about the truthmakers for sentences like (EM) and (BD) without presupposing anything controversial about what those sentences mean.

## 4 The Manifold Arguments

My next three arguments concern the notion of a *unified manifold*, so it is time to say more about what I mean by that phrase. Historically, the idea comes from Static Theorists such as Einstein, Minkowski, and many others, who emphasize the importance of the idea that space and time constitute a unified manifold by putting the words ‘space’ and ‘time’ together to form a single word. Although these scientists and philosophers do not say much about how they understand the notion of a unified manifold, the intuitive idea is that such a manifold is an  $n$ -dimensional space in which the different dimensions are relevantly similar, and are connected in some significant way. In what follows I will try to flesh out this intuitive idea.

The paradigm case of a unified manifold is the physical space that we inhabit. Our physical space is an isotropic space that is made up of similar dimensions and that can be represented by a graph with three axes that connect at a single origin point. By contrast, consider the two-dimensional space that we can represent with a graph showing your mass at various times.



Although the two axes in this graph are connected at a single origin point, the two-dimensional space consisting of mass + time is not a unified manifold, for several different reasons. For one thing, the two dimensions that make up this space are quite dissimilar, and in fact have very little in common. Nor is the space consisting of mass + time isotropic – it is not the same in every direction. For one direction corresponds to increase in mass, and another direction corresponds to the *later-than* relation. What’s more, mass + time is not a space in which any object can literally be located.

Information about your mass at various times can be represented by a graph like the one above, but representing that information in this way is not the same thing as actually putting you into the relevant space. For the relevant space is an abstract thing: it is just a collection of ordered pairs – each one consisting of a mass and a time – and a graph like the one above is just a way of encoding some information about these ordered pairs. And a fourth reason mass + time is not a unified manifold is that mass and time are not actually connected in any real way. One way to see that mass and time are not really connected is to appreciate that it is possible to be “located” – to have a value – along one of the dimensions in this two-dimensional space without being located along the other dimension. For an object (like a photon, or an immaterial soul, or the number 2) can exist at a time without having a mass at that time.

This last point suggests that we can capture part of what it means for the different dimensions of a unified manifold to be connected with the following principle, which must be obeyed by any  $n$ -dimensional space in order for that space to count as a unified manifold.

### *Location*

If several dimensions,  $d_1$ - $d_n$ , form a unified manifold, then any object that has a location along one of the dimensions in  $d_1$ - $d_n$  must also have a location along each of the other dimensions in  $d_1$ - $d_n$ .

For example, if a rock has a location along one dimension of our physical space, then it must have a location along each of the other two dimensions. And even a point-sized particle, which has no extension along any spatial dimension, must still have a location along all three of the spatial dimensions, if it has a location along any of them.<sup>23</sup>

A fifth feature of our three-dimensional physical space that seems to me crucial to its being a unified manifold has to do with the way the different dimensions of physical space “flow together” (in much the way the different chambers of an exhaust manifold in an internal combustion

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<sup>23</sup> I am here and elsewhere assuming a substantivalist view of space and time.

engine flow together). One way to see this is to think about the possibility of rotating an object once it has been placed in physical space. When a rock, for example, is placed in our physical space, it can then be rotated around any of the three dimensions without thereby altering any of its intrinsic properties. This suggests that another principle that must be obeyed by any  $n$ -dimensional space in order for that space to count as a unified manifold is the following.

### ***Rotation***

If several dimensions,  $d_1-d_n$ , form a unified manifold, then rotating an object that is located in that manifold, so that its orientation with respect to  $d_1-d_n$  changes, will not result in changing the intrinsic features of that object.

For example, consider the above graph showing your mass at various points in time. If we rotate the line representing you in the graph 90 degrees, the result is a graph representing you as having many different masses at a single time, but only existing for a very short period of time. The two versions of you – represented by the original graph and this new, rotated graph – have very different intrinsic features. One is the kind of thing that has only one mass at any given time, and the other is not; one is very short-lived, and is “spread out” along the dimension of mass, while the other is not; etc. Whereas any object that is contained in our physical space can be rotated around any of the three dimensions of that space without thereby changing any intrinsic feature of that object.

Yet another property of an  $n$ -dimensional space that seems to me essential to being a unified manifold is that the relevant dimensions be in some sense commensurable. We see this kind of commensurability, again, with our own physical space, where distances along the up-down dimension can be compared to distances along the side-to-side and front-to-back dimensions. And we also see this kind of commensurability in the way Static Theorists think of spacetime. For one of the main lessons of Special Relativity is supposed (by Static Theorists) to be that the fundamental unit of measurement for spacetime is *spatiotemporal separation*

rather than less fundamental units like *meters* or *seconds*.<sup>24</sup> This suggests that we can add a third principle to our list of principles that any  $n$ -dimensional space must obey in order to count as a unified manifold.

### *Commensurability*

If several dimensions,  $d_1-d_n$ , form a unified manifold, then those dimensions must be commensurable. That is, for any two dimensions,  $d_i$  and  $d_k$ , among  $d_1-d_n$ , it must be possible to compare distances along  $d_i$  to distances along  $d_k$ .<sup>25</sup>

For example, the three dimensions of physical space are commensurable, because it is possible to compare distances along the up-down, front-to-back, and side-to-side dimensions. (I.e., for any two such distances, either the first is greater than the second, or else the second is greater than the first, or else they are equal.) And this is part of the reason why physical space is a unified manifold. But the two dimensions in the space consisting of mass + time are not commensurable in the same way, because temporal distances are not comparable to differences between masses. (One second is not more than, less than, or equal to one gram.)

So far I have tried flesh out the notion of a unified manifold in two different ways: (a) by offering an example of a paradigm case of an  $n$ -dimensional space that is a unified manifold (our three-dimensional physical space) as well as an example of a paradigm case of an  $n$ -dimensional space that is not a unified manifold (the two-dimensional space consisting of mass + time); and (b) by formulating three different principles that, I have suggested, must be obeyed by any  $n$ -dimensional space that qualifies as a unified manifold: *Location*, *Rotation*, and *Commensurability*. I now want to offer three distinct but closely related arguments that aim to disprove The Static Theory by showing that

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<sup>24</sup> I am grateful to Ted Sider here.

<sup>25</sup> On the most straightforward characterization of commensurability, two dimensions are commensurable – i.e., distances along either one can be compared to distances along the other – iff for any two such distances, either one is greater than the other or else they are equal.

spacetime is not in fact a unified manifold. (In what follows I will use the term ‘spacetime’ to refer to the 4-dimensional space that consists of our three-dimensional physical space plus time, while remaining neutral on whether that 4-dimensional space is a unified manifold, in the sense spelled out above.)

The first of these three arguments (which I will refer to collectively as “the manifold arguments”) is based on the idea that spacetime does not obey the principle *Location*. For I think that there are many objects with a location in time that do not have a location along any of the three dimensions of physical space. I have in mind examples like the following. (Note: I am not committed to the existence of entities of all of the kinds listed below, but I am committed to entities of the first five kinds, and am open to the seventh.<sup>26</sup> Meanwhile, there are plenty of other philosophers who are committed to Thomassonian fictional characters or concrete but non-physical objects.)

- Your singleton set, which exists whenever you do, but not before or after.
- Other sets, including eternal sets containing objects that exist at all times.
- Propositions, including the ones that you are believing right now.
- Universals.
- Numbers.
- Fictional characters, on Amie Thomasson’s view (according to which fictional characters are abstract artifacts that are created by their authors at a certain point in time, and can later go out of existence).<sup>27</sup>

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<sup>26</sup> For the record, I suspect that there is overlap among some of these categories. For example, I am inclined to believe that numbers are a special kind of universal.

<sup>27</sup> See for example Thomasson, *Fiction and Metaphysics*. (I suspect that Thomasson herself views fictional characters as being created in time by their authors, but nevertheless

- Any other abstract objects there may be.
- Any concrete but non-physical objects there may be, such as souls, which plausibly have locations in time but not in space.<sup>28</sup>

All of these examples are controversial to some degree or other. But it is certainly a widely held view (and one that I endorse) that at least some of these examples are indeed objects that have locations in time but not in space. And this means that it is a widely held view (and one I endorse) that *spacetime* violates the principle *Location*.

Here then is the first of my three manifold arguments.

### **The Argument from *LOCATION***

- (1) There are many objects that have a temporal location but lack a location along any of the spatial dimensions.
- (2) If (1), then spacetime does not obey *Location*.
- (3) If spacetime does not obey *Location*, then spacetime is not a unified manifold.
- (4) If spacetime is not a unified manifold, then The Static Theory of Time is false.

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- (5) The Static Theory of Time is false.

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lacking temporal locations. So the view I have in mind here is Thomassonian, but perhaps not Thomasson's.)

<sup>28</sup> There are tricky questions about how to draw the concrete/abstract distinction, and also tricky questions about how to draw the physical/non-physical distinction. For my part, I am inclined to say that abstract objects are repeatable things that are abstractions from other objects (the way wisdom is an abstraction from all the different beings who are wise), while concrete objects are not. And I am also inclined to say that the difference between the physical and the non-physical is that physical objects have spatial locations and non-physical objects do not. (This is why I accept the metaphysical possibility of non-physical, concrete objects, like souls.) For more on the idea that physical objects are objects with spatial locations, see Markosian, "What Are Physical Objects?"

I take it that the most likely objection to this argument will be the following. All abstract objects, it might be claimed, lack both a spatial and a temporal location, while all concrete but non-physical objects (if there are any) likewise lack both a spatial and a temporal location. Whereas all physical objects have locations in both space and time. So each object is either in space and time or in neither space nor time. Which means premise (1) of the argument is false.

My first reply to this objection is that the claim that all non-physical objects, whether concrete or abstract, lack temporal and spatial locations would be a very surprising and substantive commitment of The Static Theory of Time. (It would rule out the Thomassonian view that fictional characters are abstract artifacts with temporal but not spatial locations, for example. And it would also rule out the possibility that numbers and properties and other abstract objects all exist in time.) I would think that some Static Theorists, at least, would like to have the option of maintaining that all objects are in time, while also maintaining that the difference between the physical and the non-physical is the difference between having and lacking a spatial location.

But secondly, and perhaps more importantly, it seems very strange to say that your singleton set, for example, did not come into existence when you came into existence. And, similarly, it seems odd to say that none of the propositions that you happen to believe right now is present at this moment. For if those propositions are not present right now, then how can you presently stand in the belief relation to them?

One possible response to what I have just said is that I am confusing *existing at a time* and *being located at a time*. Recall that Tenet 6 of The Static Theory says that the correct ontology does not change over time. So, on The Static Theory, your singleton set never came into existence – it has always existed, just as you have always existed. But like all abstract objects (and unlike you) your singleton set has no temporal or spatial location. So nothing notable happened to your singleton set when you came to be present (i.e., at the first moment at which you were located in time). It continued to exist, and it continued to be neither spatially nor temporally located. As for the propositions, the fact that they exist right now is enough to make it possible for you to believe them right now (even though they are

not present right now, and in fact lack any temporal or spatial location). Hence, according to this line of thought, premise (1) of the argument is still false.

My reply is that although this is a coherent view, and likely the best thing for the Static Theorist to say in response to my argument, it still seems to me like a surprising commitment, and a significant cost, of the view, insofar as it rules out certain popular positions (like the aforementioned Thomassonian account of fictional characters, according to which authors literally bring their characters into existence, and the thought that numbers and the rest have temporal locations but lack spatial locations). Moreover, it is one thing to claim that objects that are located elsewhere in space or time can be said right here and now to exist, but it is another thing entirely to claim that objects that are not located anywhere in space or time can nevertheless be said right here and right now to exist.

A second possible objection to my argument will also attack premise (1), but for a different reason. According to this objection, all abstract objects (and non-physical, concrete objects, if there are any) have temporal locations, but they also have spatial locations. That is, they all have locations in space *and* time, because they are all ubiquitous, and eternally present. So premise (1) of the argument is false.

My first response to this objection is the obvious one: it is implausible to say that all non-physical objects are located everywhere and at every time. People sometimes object to the notion that God might be omnipresent, because this implies that God is in some surprising (and undignified) locations. But the problem would be much worse if every single non-physical object – including all the properties, propositions, sets, etc., there might be, plus every single soul (if we take them to be non-physical, concrete objects) – was located (always!) at every single location in space. That just seems like too much overcrowding to be believed.

A second, more theoretical response to the objection is just to note that if we say that non-physical objects all have spatial locations, then it is

hard to see how we can draw a distinction between physical and non-physical objects.<sup>29</sup>

There is a third possible objection to my argument from *Location*, and that is to deny premise (3) and the principle itself. One who opts for this objection will maintain that an  $n$ -dimensional space can be a unified manifold without obeying *Location*, so that an object can have a location along one of the dimensions in a unified manifold without having any location along one of the other dimensions.

My reply is that if this is what the Static Theorist says, then I don't know what the Static Theorist means by the phrase 'unified manifold'. At the very least, a Static Theorist who makes this objection to my argument owes us an account of what is meant by 'unified manifold' in the first tenet of their view.

Finally, there is a fourth possible objection that could be raised against The Argument from *Location*, and that is to deny premise (4), and to boldly deny that spacetime is a unified manifold, in any sense. In response to this objection, I would simply point out that if this is the route that the Static Theorist takes, then they have given up Tenet 1 of the view that I have identified as The Static Theory of Time. Moreover, anyone who opts for this response to the argument owes us an account of what spacetime is, on their view, if it is not a unified manifold, and in what ways, if any, space and time are meant to be connected.

The second of my three manifold arguments appeals to the principle *Rotation*. According to that principle, rotating an object in a unified manifold does not change the intrinsic features of that object. The motivation for the principle was that rotating a physical object, such as a rock, in three-dimensional space (which is our paradigm example of a unified manifold) does not affect the size or shape or mass or any other intrinsic feature of that rock. But it is not so clear that the same is true when it comes to rotating a rock in spacetime. Take an ordinary, roughly spherical rock, with a diameter of four centimeters, that persists for, say, 10,000 years.

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<sup>29</sup> I have argued elsewhere that the best way to draw this distinction is by saying that physical objects are objects with spatial locations. See Markosian, "What Are Physical Objects?"

On The Static Theory, of course, this rock is a spacetime worm that is made up of 10,000 years' worth of temporal parts, with each temporal part having a modest extension in each of the three spatial dimensions. Now imagine rotating this spacetime worm around the up-down spatial dimension in such a way that the rock's extension along the temporal dimension (which is orthogonal to each of the spatial dimensions, according to The Static Theory) becomes its extension along the east-west dimension, and its east-west extension likewise becomes its temporal extent.

The result of rotating our rock in this way is an object that used to be fairly small when measured from east to west, and very long-lived, but is now tremendously long when measured from east to west (as in, the equivalent of 10,000 years long, whatever that is in centimeters) but relatively short when measured along the temporal dimension (as in, the equivalent of four centimeters in time, whatever that amounts to). This, it seems to me, is an object whose intrinsic features have been changed dramatically: it used to have a roughly spherical shape at any given moment of time, but now it has the shape of a tremendously long cylinder at each moment of its existence. Thus we have a violation of *Rotation*.

It might be thought that there is an easy way to avoid this consequence. If we stipulate that 10,000 years along the temporal dimension is roughly equivalent to four centimeters along the east-west dimension, then rotating our rock in the way described above will not result in changing its shape at any given time. (For in this case the shape of the rock's spacetime worm itself will be roughly spherical.) So the case will not be a violation of *Rotation* after all.

Unfortunately, this stipulation will not really solve the problem. For if it is stipulated that 10,000 years is the equivalent of four centimeters, then we merely have to change the example to one involving a spherical rock that exists for much shorter, or much longer, than 10,000 years. A rock that exists for merely a year, for example, when rotated in the relevant way, will come to have the shape, at any given time, of a very flat disk (if 10,000 years is equivalent to four centimeters, that is). And a rock that exists for 10 million years, on the current stipulation, will, upon rotation, come to be shaped at each moment of its existence like a tremendously long cylinder. Thus, whatever we stipulate about the relation between 10,000 years and

four centimeters, there will be countless examples in which the relevant kind of rotation will dramatically change the shape of a spherical rock.

The rock example is one kind of case illustrating that spacetime is not governed by the principle *Rotation*, but there are others. Consider a typical human person, with a lifespan of 100 years. At each moment of their existence, this object has such properties as *being a person*, *being conscious*, *believing that  $2 + 2 = 4$* , and *being morally responsible for certain past actions*. But when we rotate this person in spacetime, so that their life lies “thwartwise of the manifold, with its belly plump in time, its birth at the east and its death in the west, and its conscious stream perhaps running alongside somebody’s garden path,” the result is a very strange object indeed.<sup>30</sup> For one thing, this object’s shape at any given moment will no longer be that of a human being. (But this is just the same point as the one made above with the example of the rock.) More importantly, this rotated object will no longer have, at any moment of time, properties like *being a person*, *being conscious*, *believing that  $2 + 2 = 4$* , or *being morally responsible for certain past actions*. Thus our rotated object will have been changed radically.

There is more. If we assume that moral value is a real kind of intrinsic value in the world, and that facts about moral values are objective facts rather than subjective, mind-dependent facts, then it will be easy to construct additional cases in which *Rotation* fails for spacetime. Consider, for example, a series of events that goes from an unjust situation to a just resolution. That series of events, taken as a whole, adds positive intrinsic value to the world. But if we rotate this series of events 180 degrees with respect to the temporal dimension in spacetime, so that the result is a series of events that goes from a just situation to an unjust one, the resulting series of events will lower the intrinsic value of the world. This seems like a striking case of changing the intrinsic features of an object (in this case a series of events) by rotating that object in spacetime.<sup>31</sup>

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<sup>30</sup> The quoted passage is from Donald C. Williams’s description of a rotated person (which he takes to be theoretically possible, and unproblematic, on The Static Theory) on p. 468 of “The Myth of Passage.” Williams remarks in a footnote that such an object’s mental life must be “a dragged-out monstrous delirium.”

<sup>31</sup> I mention this kind of case in “Sideways Music,” and suggest that it can be used in an argument based on a principle like *Rotation* against a theory like The Static Theory.

Similarly, if we assume that intrinsic aesthetic value is a real thing in the world, and an objective, mind-independent feature of the things that instantiate it, then we can construct further cases in which *Rotation* fails for spacetime. One kind of case will be similar to the cases of the rock and the human person: an oak tree, for example, that has great aesthetic value at each moment of its existence due to its tremendous beauty, will lack that aesthetic value when rotated in spacetime in the relevant way. For instead of having the shape of a magnificent oak at any given time, the rotated tree will have, at any given time, the shape of a two-dimensional slice of an oak tree. There may be a kind of beauty in such an oak-tree slice, but it will not be the same beauty as that exhibited by the full, three-dimensional tree. And another kind of case will be similar to our case involving justice: a series of events that consists of a worthy performance of a beautiful piece of music, for example, will have great aesthetic value when it occurs “normally” in spacetime, but when rotated 90 degrees (so that it becomes a case of “sideways music”) it will not have the same aesthetic value (since it will then consist of all the same sounds occurring at once).<sup>32</sup>

Given all of these cases, it seems that we can formulate a powerful argument from *Rotation* against The Static Theory. Here is the argument.

### **The Argument from *ROTATION***

- (1) There are many objects and events such that certain ways of re-orienting those objects and events in spacetime would alter their intrinsic features (including the shapes, mental properties, moral values, and aesthetic values of those objects and events).
- (2) If (1), then spacetime does not obey *Rotation*.
- (3) If spacetime does not obey *Rotation*, then spacetime is not a unified manifold.

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<sup>32</sup> I develop an argument from aesthetic value like the one suggested here, but in much greater detail, in “Sideways Music.”

- (4) If spacetime is not a unified manifold, then The Static Theory of Time is false.

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- (5) The Static Theory of Time is false.

One way Static Theorists are likely to respond to this argument involves rejecting the part of premise (1) that concerns moral and aesthetic value. For many Static Theorists will say that there is no such thing as intrinsic moral or aesthetic value in the world. I have two responses to this objection to the argument. The first is simply that anti-realism about moral and aesthetic value strikes me as so implausible as to be untenable. I am not willing to give up the claim that there is great beauty and terrible injustice in the world (and that the facts about these matters are objective facts about the intrinsic features of various objects, events, and states of affairs). But of course opinions on this issue vary widely, and this is not the place to consider arguments for the kind of moral and aesthetic realism that I find intuitively obvious. My second response to the current objection to The Argument from *Rotation* is merely to point out that the rejection of intrinsic moral and aesthetic value in the world (in the way required by the objection) is a substantive and controversial commitment. So if this is the best objection to the argument available to the Static Theorist, then we have learned something important about The Static Theory.

A second way that Static Theorists could respond to The Argument from *Rotation* is to admit that there is intrinsic moral and aesthetic value in the world, but to maintain that the moral and aesthetic features of objects and events are in fact preserved under rotation. The claim would be that sideways music is just as beautiful as normal music, for example, and likewise that it is only the total amount of justice in the world that matters (rather than how it is distributed across time). A Static Theorist who takes this line will insist that our perceptions of events like sideways music and backward justice are merely subjective matters of taste, perhaps resulting from natural selection and our own confusions about how spacetime works. This position also strikes me as implausible. I cannot believe that my intuitions on these matters – that sideways music and backward justice are less valuable to the world than normal music and ordinary justice – are just

artifacts of the way I perceive the world. But in any case, I note that if this is the best response to the argument available to the Static Theorist, then we have again uncovered an important and surprising commitment of that theory. Several, in fact: that sideways music and backward justice are more valuable than we tend to think, and also that we are very bad at estimating the aesthetic and moral values of a great many events.

It is worth noting that the two objections to The Argument from *Rotation* just considered concern only the cases discussed above involving moral and aesthetic value. But part of the rationale for premise (1) of the argument had to do with the intrinsic shapes of things like rocks and human beings, and another part of the rationale for that premise had to do with such properties as *being a person*, *being conscious*, *believing that  $2 + 2 = 4$* , or *being morally responsible for certain past actions*. The two objections considered above do not seem to give the Static Theorist a way of responding to the challenges posed by those kinds of properties.

In any case, there is a third way that Static Theorists may want to respond to The Argument from *Rotation*, and it is for my money the most promising response. This third way involves rejecting premise (3) of the argument and the principle – *Rotation* – it is based on. The idea would be that spacetime is indeed a unified manifold, but that time is nevertheless different enough from the dimensions of space that spacetime counts as a counterexample to *Rotation*.

One main problem with this response to the argument is that there is a danger of a slippery slope. Part of the intuitive appeal of The Static Theory is the idea that time is just like the dimensions of space. Once we give up that claim, and admit that there are differences between time and space, then it is hard to know where to draw the line. Why not in that case say that time is dramatically different from the dimensions of space? Or at least different enough that time has a direction, and a dynamic aspect, whereas the dimensions of space have neither of those features?

Which brings us to a second main problem with the current response to The Argument from *Rotation*: when you consider the ways in which putative differences between time and space seem to be relevant to the aesthetic value of a musical performance and the moral value of a sequence of events, it is the most dynamic aspects of The Dynamic Theory (the mind-

independence of A-properties, the unreality of the past and the future, and the thought that there is some kind of inexorable flow or passage that characterizes the temporal dimension but not the dimensions of space) that seem crucial. It certainly does not help merely to say that there happens to be an asymmetry to certain time-like dimensions within the manifold, for example, that is a result of some contingent facts about how causation or gravity works in the actual world. Thus, merely saying that time is a little bit different from the dimensions of space, due to relativistic considerations, will be of little help to the Spacetime Theorist in dealing with The Argument from *Rotation*. For whatever small differences are posited between time-like dimensions in the manifold and space-like dimensions will presumably not be enough to account for the great differences in moral and aesthetic value that are relevant here.

Finally, as with The Argument from *Location*, there is a fourth possible objection that could be raised against The Argument from *Rotation*, and that is to reject premise (4), while boldly denying that spacetime is a unified manifold. But of course if this is the route that the Static Theorist takes, then they have given up Tenet 1 of the view that I have identified above as The Static Theory of Time. Also, anyone who opts for this response to The Argument from *Rotation* owes us an account of what spacetime is, on their view, if it is not a unified manifold, and in what ways, if any, space and time are meant to be similar.

The last of my three manifold arguments appeals to the principle *Commensurability*. The reader may recall that in our discussion above we considered the possibility of taking a spherical rock with a diameter of four centimeters and a duration of 10,000 years, and rotating that rock in spacetime so that its temporal extension becomes its length along the east-west dimension and its east-west extension becomes its length in time. It was suggested that this would result in making the rock much longer along the east-west dimension (and much shorter in time) than it had been.

I suspect that at the time of that discussion the reader had some misgivings about the whole idea of a rock's extension in time becoming its extension along one particular spatial dimension. And I suspect that the reader also experienced some cognitive dissonance as a result of the idea that 10,000 years would have some equivalent measure along any

dimension of space. If so, I think the reader was right to have those misgivings, and to experience that cognitive dissonance. For it seems to me nonsensical to ask what the equivalent of 10,000 years is in meters. I think there is no answer to that question, because time and the spatial dimensions are in fact incommensurable. 10,000 years is not less than, greater than, or equal to four centimeters.

This simple thought leads to the following argument.

### **The Argument from *COMMENSURABILITY***

- (1) There are no meaningful comparisons between distances along the temporal dimension and distances along any of the spatial dimensions.
  - (2) If (1), then spacetime does not obey *Commensurability*.
  - (3) If spacetime does not obey *Commensurability*, then spacetime is not a unified manifold.
  - (4) If spacetime is not a unified manifold, then The Static Theory of Time is false.
- 
- (5) The Static Theory of Time is false.

I think the best response a Static Theorist can make to this argument is to reject premise (1). As I mentioned above, when initially introducing the principle *Commensurability*, it is sometimes said by Static Theorists that the basic units of measurement for spacetime are units of spatiotemporal separation, rather than meters or seconds. A Static Theorist who takes this line can thus maintain that there are meaningful comparisons between distances along the temporal dimension and distances along the dimensions of space. For all such distances (regardless of how we might be inclined to describe them) are really just varying amounts of spatiotemporal separation.

I get that this is what Static Theorists will likely say about The Argument from *Commensurability*, but to me, this seems like a large bullet to bite. Consider two events that (relative to your frame of reference) occur

in the same spatial location but are separated by one hour. The claim that there is some particular point,  $P$ , along the east-west dimension at the time of the first event (again, relative to your frame of reference) such that the distance from the first event to  $P$  (a distance that we would measure in meters) is equal to the distance from the first event to the second event (a distance that we would measure in seconds) seems quite implausible to me. For this amounts to saying that (relative to your frame of reference) a certain number of meters is equal to one hour, and that sounds to me like a category mistake.

Of course, your mileage may vary (!), and I admit that what I have just said, like The Argument from *Commensurability* itself, is not likely to convince hardcore Static Theorists. Nevertheless, I find The Argument from *Commensurability* persuasive, and I hope that some fence-sitters might also find it convincing.

I want to end my discussion of the three manifold arguments by saying something about an objection that is likely to be raised against all three of these arguments.<sup>33</sup> The objection is that we can't give up the idea of spacetime as a unified manifold, in the way that accepting these arguments seems to require us to do, since that idea is a consequence of The Special Theory of Relativity (STR). So (according to the objection) there must be something wrong with all three of these arguments.

Here is my reply to this objection. I think that the claim that spacetime is a unified manifold (in the sense spelled out above) is not actually a consequence of STR (even though many people talk as if it is). You might wonder, *What does STR entail about spacetime, if not the claim that it is a unified manifold?* I think the answer to this question is surprisingly simple. STR – and here I mean just the empirical content of STR – entails that spacetime is a useful framework for observations and predictions concerning the physical world. The theory requires us to think of spacetime as a four-dimensional space in which events and objects are spread out, and in which it is not possible to observe a relation of absolute simultaneity among pairs of events. But this requirement is neutral between thinking of that four-dimensional space as a unified manifold, in the sense spelled out

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<sup>33</sup> Here I am indebted to Jill North.

above (like our three-dimensional physical space), or merely as a logical construction (like mass + time). The choice between those two options is a theoretical choice, not a choice that is forced upon us by any empirical theory.

So I think it is not the case that the cost of accepting any of the three manifold arguments is giving up the notion of spacetime and rejecting the empirical content of STR. I think that one can accept the empirical part of STR, reject the extra-empirical baggage that is normally associated with the theory (including the verificationist claim that since we cannot observe absolute simultaneity there is no such thing as absolute simultaneity, as well as the Static Theory claim that spacetime is a unified manifold), accept that spacetime is a useful framework for encoding information about the locations of objects and events, and appeal to the manifold arguments in support of The Dynamic Theory of Time.

## **5 The Sentimental Argument for The Dynamic Theory**

I turn now to my last argument for The Dynamic Theory of Time. I want to begin with an analogy. I know there are people who sincerely claim that there are no genuine moral properties in the world. They are called Moral Nihilists. But I am convinced that they are doing it wrong, in a serious way. There is something about the world that is of the utmost importance, and that is missing from their theory: the moral dimension. (I hasten to add that many of them are perfectly nice people, mainly because they behave as if they are not really Moral Nihilists. In fact, I suspect, because of this behavior, that some of the relevant people may not actually be Moral Nihilists.)

I want to suggest that it is the same with Static Theorists. I think that they are failing to appreciate some important truths – some of them important but poignant truths – about how the world works. Here are a few of the truths I have in mind. (Some of these are merely generically true, which actually makes them even more poignant.)

### *Nostalgia*

Every event that has already happened is irretrievably past. The world will never be like that again.

### *Pre-Nostalgia*

What is happening now will soon be irretrievably past. The world will never be like this again.<sup>34</sup>

### *Time the Healer*

Time heals all wounds.

### *Time the Conqueror*

All things come to an end.

### *Lost and Gone Forever*

What is past is lost and gone forever. Loved ones we once cherished, but who have passed away, no longer exist. This is tragic.

### *Dynamic and Changing*

The world is a dynamic and changing place. It can be hard to keep up.

### *Inexorable Passage*

The passage of time is a strange and inexorable process that we are powerless to stop. We can't even slow it down. Sometimes this is tragic, and sometimes it is a blessing.

### *Better Days*

There will always be better days.

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<sup>34</sup> I am grateful to Hannah Kim for pointing out the importance of *Pre-Nostalgia* on this list.

I think that it is important to have a proper appreciation of truths like these, because if you don't, then you're doing it wrong, the way Moral Nihilists are doing it wrong. You're missing some really important facts about the world and our place in it. You're failing to appreciate the temporal dimension.

Of course, Dynamic Theorists can take these sentences at face value; we can maintain that these sentences are literally true. But Static Theorists cannot, and so if they want to accommodate sentences like *Nostalgia* and the others, they will naturally have to paraphrase. But what will the Static Theory paraphrases of these sentences look like? In what follows I consider what I take to be the best candidates, together with what I think is unsatisfactory about each one of these likely Static Theory paraphrases.

Let's start with a Static Theory paraphrase for *Nostalgia*.

*Nostalgia<sub>ST</sub>*

There are certain events that are earlier than this utterance, and these earlier events are not duplicated at any time later than this utterance.

This paraphrase is inadequate because it doesn't capture the feeling of genuine nostalgia that goes along with the original. Here it is important to note that it is not enough to say that we have certain biases in our attitudes toward earlier and later events. (Compare this to remarking that the situation to the east of here is not duplicated anywhere to the west of here. That might be interesting, if true, but it would not be a cause for tears.)

The situation is even worse when we consider the likely Static Theory paraphrase for *Pre-Nostalgia*.

*Pre-Nostalgia<sub>ST</sub>*

What is happening now will not be duplicated at any time later than this utterance.

After all, the Static Theorist is already well aware that each event happens precisely when and where it in fact happens. So it seems inexplicable that they should lament the specific locations in spacetime of the events that are simultaneous with their current thoughts. Nor would it be satisfying to say that the source of the wistful feeling is the realization that current events are not duplicated at any later time. For the wistfulness is not about a failure of duplication – it is about the feeling that these events, right now, will soon fade into the past. As you watch your young children running through the grass in the fading sunlight, the feeling of pre-nostalgia is not diminished by the thought (if you should be strange enough to have it) that this scene will be duplicated by some look-alikes in the distant future.

Here is the most likely Static Theory paraphrase for *Time the Healer*.

*Time the Healer<sub>ST</sub>*

Spatiotemporal distance alleviates pain.

This paraphrase is inadequate because it's not the *distance* part that is important, it's the *pastness*. If your heart is broken, and you travel to someplace far away, that doesn't help. (I know because I've tried.) You actually need some time to pass, because you need certain events to literally fade into the past.

Here is a likely Static Theory paraphrase for *Time the Conqueror*.

*Time the Conqueror<sub>ST</sub>*

Everything has a latest temporal boundary.

And here is why this paraphrase is inadequate: It doesn't capture what is sad about the relevant fact. For compare the above claim to this claim: Everything has an eastern-most boundary. That's true, too, but no one should think that it is sad. More importantly, the paraphrase doesn't capture the alarming fact that for every present thing (including each one of us), the demise of that thing is fast approaching. The passage of time can be pretty terrifying, and *Time the Conqueror<sub>ST</sub>* fails to capture this fact.

The most likely Static Theory paraphrase for *Lost and Gone Forever* would be something like the following.

*Lost and Gone Forever*<sub>ST</sub>

Earlier things still exist, but they are earlier. This is tragic.

This paraphrase is inadequate, however, because if being earlier than my current utterance is like being east of my current utterance, then it would be silly to call that tragic. Compare this to remarking on how things in Paris are east of here, rather than here, and then claiming that this is tragic. That just seems plainly wrong. You might think, “What is tragic is that no later temporal part of me will meet with that particular loved one.” But suppose your best friend is on a spaceship, traveling away from the Earth at near-light-speed. You realize that you will never be able to meet with your friend again. This might make you sad, but it is not tragic in the same way that learning that your friend has died is tragic. At least in the spaceship scenario your friend still exists!

Finally, here is a likely Static Theory paraphrase for *Inexorable Passage*.

*Inexorable Passage*<sub>ST</sub>

We have a mistaken impression according to which there is such a thing as the passage of time – a strange and inexorable process that we are powerless to stop (or even to slow down). Sometimes this mistaken impression is accompanied by a feeling that something tragic is happening, and sometimes it is accompanied by a feeling that something is happening that is a blessing. But it is always just an illusion, because time does not really pass.

If you have sometimes felt that the inexorable passage of time is tragic, and other times felt that it is a blessing, then I think you will know right away why this paraphrase is inadequate. And if you’ve never felt those things, then I’m afraid I can’t help you. (But I think you do need help.)

The upshot of these considerations, it seems to me, is that The Dynamic Theory of Time is consistent with a proper appreciation of these important truths about the passage of time, but The Static Theory is not. In fact, like the people who say they are Moral Nihilists but whose behavior suggests they might not actually be Moral Nihilists, I am inclined to wonder if the philosophers who say they are Static Theorists really are Static Theorists. For their behavior suggests that they are not: they get nostalgic, they tear up over old photos, they openly lament the passage of time, they sometimes feel its healing power, and they are appropriately alarmed by the fast approach of their own demise.

In any case, here is my argument.

### **The Sentimental Argument for The Dynamic Theory**

- (1) There are certain important yet poignant truths about the passage of time such that The Dynamic Theory is consistent with a proper appreciation of those truths, but The Static Theory is not.
- (2) If (1), then The Dynamic Theory is true.

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- (3) The Dynamic Theory is true.

It might be wondered how this argument differs from The Argument from Personal Identity and Moral Responsibility. The main difference is that The Argument from Personal Identity and Moral Responsibility involves a bunch of sentences that the Static Theorist can say are true. For the Static Theorist says it is literally true that you performed a brave deed last year, and also literally true that my most embarrassing moment occurred when I was 10 years old. The difference between Static Theorists and Dynamic Theorists, when it comes to these sentences about personal identity and moral responsibility, is that they disagree about the underlying facts that make these sentences true. And my argument was that the Static Theorist's account of the truthmakers for these sentences is untenable.

But when it comes to the allegedly important yet poignant truths about the passage of time, the difference between Static Theorists and Dynamic Theorists is that Static Theorists cannot even admit that these sentences are true. At best, according to The Static Theory, these sentences are literally false, but each one can be associated with something “in the ballpark” that is both interesting and true, and that can be captured by a paraphrase like one of the ones considered above. This is why The Sentimental Argument is formulated in terms of a proper appreciation of some allegedly important yet poignant truths, rather than being formulated in terms of truthmakers for sentences that both sides take to be literally true.

There are three possible objections to The Sentimental Argument. The first objection is to reject premise (1) by denying that sentences like *Nostalgia* and the others are actually true, and insisting that there are not even any nearby truths in the ballpark. A Static Theorist who takes this line will maintain that there is nothing even approximately true in the relevant sentences, and will likewise maintain that attitudes like nostalgia for the past and a dread of one’s own fast-approaching demise are always misguided. For my part, it is hard to imagine anyone seriously and sincerely taking this line. If I encountered a philosopher who reported that this was their position on these matters, I would suspect that we were somehow talking past each other.

The second possible objection to The Sentimental Argument – which is also an objection to premise (1) – is to go with the paraphrasing strategy to capture what is quasi-true in sentences like *Nostalgia*, perhaps endorsing the paraphrases considered above, or perhaps offering different paraphrases. I have already registered my dissatisfaction with the above paraphrases, and I suspect that I would be similarly dissatisfied with any alternative paraphrases a Static Theorist might come up with. But I remain open to considering such paraphrases, and encourage Static Theorists to propose their best accounts of what we are talking about when we talk about the passage of time. If someone does manage to come up with satisfying, Static-Theory-friendly paraphrases of the relevant sentences, then I will be impressed, and will retract my argument.

The third possible objection to the argument is an objection to premise (2). According to this objection, there may be some sentimental

value in sentences like *Nostalgia* and the others, and it may be difficult or impossible to capture, in Static-friendly language, what is of value in those sentences, but that somehow says more about our own psychologies than it does about the nature of time. According to this line, the considerations raised by The Sentimental Argument are overly romantic and maudlin sentiments that are not a proper basis for an argument about metaphysics.

I suspect that I have friends in philosophy who would endorse this response to the argument. Even I might have said something similar when I was younger. But I have to say that, the older I get, the more the kinds of considerations raised by The Sentimental Argument seem real to me, and powerful. Indeed, although the first four arguments I have presented here are in some sense more respectable *philosophical* arguments, The Sentimental Argument actually feels more forceful to me. This is because it is based on what are for me powerful intuitions about what I take to be deep truths concerning life, and how the world works, and these are intuitions that I would not want to give up, even if some of my friends sincerely claimed that they do not share them.<sup>35</sup>

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