PHLD79
April 14th, 2024
Thomas Ridout

The 'Many Mes' Problem for Theories of Persistence Through Change

Intuitively objects persist through change, object *x* can, at different times, be sitting at t_1 and standing at t_2 and still be the same object at both times. Generally, two commonly held theories explain how objects can persist through change. Endurance which states that objects persist by being wholly present at every time they exist, and perdurance where objects persist by having different temporal parts at every time they exist. The purpose of this paper will be to explain how applying implications of special relativity to these two theories of persistence through change leads to the 'Many Mes' problem. Namely due to the simultaneity of relativity, there are an infinite number of versions of an object relative to the motion of reference frames existing all at the same time. In this paper, I will also discuss how the Endurantist and Perdurantist might respond to such a problem.

The sections of the paper will be as follows; in section 1 I will discuss the motivations for persistence through change and traditional challenges against endurance and perdurance, not relating to the Many Mes problem which only arises when special relativity is assumed. In section 2 I will analyze certain implications of special relativity such as the relativity of simultaneity and explain how applying this theory to endurance and perdurance leads to two respective Many Mes problems. In Section 3 I will review potential options the Endurantist and Perdurantist could offer as responses to the Many Mes problem. Also in this section, I will assess each potential response individually and compare them to reveal which theory of persistence through change poses a preferable solution to the Many Mes problem.

1. The Two Accounts of Persistence Through Change

"No man ever steps in the same river twice, for it is not the same river and he is not the same man." While it may be denied that objects survive change such as Heraclitus once famously did, it is still commonly assumed that an object persists if that object exists at various times (Lewis, 1986, p.204). For example, a piece of paper persists as it exists at one time and will continue to do so even after it is changed by being crumpled up into a ball. However, the question then becomes if this new form of the persisting piece of paper is identical to the one which existed before the change (before it was crumpled). It could be claimed that because this paper now takes a different shape, it is no longer the same paper; Heraclitus might approve of an argument like this. To respond to this claim we must introduce two distinct types of identity, numerical and qualitative.

Numerical identity refers to any object's relationship to itself as a singular entity. If one object is numerically identical to another, it is the same one entity not two or more. For example, Mark Twain is a writer and numerically identical to Samuel Clemens because they are the same person. Qualitative identity refers to how objects may relate based on properties or qualities. Objects must completely share all their properties to be considered qualitatively identical. For example one could claim an object at a time is qualitatively identical only to itself at that same time; a perfect similarity. This distinction allows us to answer that the paper which has been crumpled is no longer qualitatively identical to the paper before this change; however as it is still the same entity, it is numerically identical. Therefore when discussing persistence through change, this persistence relates to numerical not qualitative identity. An object can persist by

being numerically identical and existing at different times. How these objects persist is the problem endurance and perdurance seek to explain.

1.1 Endurantism

The two theories of persistence can be compared to how one might imagine the distinction between objects (such as a ball, whole presence at a time) and events (such as a baseball game, partial presence at a time) existing in time. Endurantism explains that when objects persist, they do so by being wholly present every time they exist (Lewis, 1986, p.204). Endurance assumes whole existence similar to how Presentists assume an object is wholly in the present. An object every time it exists, does so all at once not spread throughout the various times of its existence into different parts. Endurantism is usually held as the theory of persistence majorly motivated by human intuition, relating to how we perceive the flow of time or even the common sense view. It is natural to perceive objects as only having spatial parts which all exist at once. However, endurantism and whole persistence must consider their fair share of challenges; I will consider these traditional challenges as they do not relate to implications of special relativity or the Many Mes.

One of the commonly induced objections to endurantism comes as a result of change known as the problem of Temporary Intrinsics. Endurantism requires an object to wholly persist, numerically identical through whatever change it may undergo. However, if this is the case then how can an object contain two contradicting properties? It can be argued that change necessitates some property of an object becoming incompatible with its previous state. For instance, a man is sitting, then a change occurs and now he is standing. The properties of standing and sitting are

contradicting, however, a numerically wholly persisting object will change to have both the properties of sitting and standing. If the object is numerically identical, change then seems to be incompatible with Leibniz's law which states that numerically identical entities, *x* and *y*, must share all their properties *P* to be considered such. This law can be written in the following formula:

$(\forall x)\,(\forall y)\,(x = y \rightarrow (\forall \mathrm{P})\mathrm{P}x \equiv \mathrm{P}y)$ (Goswick, 2013, p.365)

A numerically same entity must share all its properties to be identical but if a change requires a numerically identical object to have incompatible properties with itself, according to Leibniz's law it is no longer the same entity from before; therefore persistence through change is impossible. The Endurantist response to this problem of change is to include time into the picture, relativizing the properties an object has to the times at which the object exists. This seems like a promising solution as it would allow the Endurantist to claim that violating Leibniz's law would require an object to have incompatible properties at the same time. Instead, an object can have incompatible properties at different times. There is no matter of fact regarding the property of sitting or standing to the object, rather the object has the relationship to sitting at t_1 or standing at t_2. Certain Perdurantists such as David Lewis claim this response makes properties something not intrinsic to the object but rather only relational. Solving the problem of temporary intrinsics by arguing there are no intrinsic properties at all only relations, a solution he finds counter-intuitive (Lewis, 1986, p.205). He proposed Perdurantism as a better option to account for change without making properties relational.

1.2 Perdurantism

As previously mentioned, endurance relates to how one intuitively expects a 3-D object like a ball to persist, all at once. Perdurance then can be compared to how an event such as a baseball game might exist in time (4-D objects), not all at once but with different parts at different times referred to as temporal parts. Perdurantism states that an object persists by having different temporal parts every time it exists (Lewis, 1986, p.206). What exists of an object at every moment is nothing more than an instantaneous temporal part contained within the greater object which is extended, like a spacetime worm, through four dimensions. Each temporal part is but a slice of this greater 4-dimensional object only existing momentarily and because each part has different properties, is unidentical from other parts. The whole 4-dimensional object exists as many temporal parts in the sense that at each place and time the object exists, there is a part of that object always existing there at that time. The object existing at different places at different times make up the greater extended 4-D object implying persistence.

One of the popular traditional objections to the perdurantist view of persistence also comes in the form of change. Change requires an object x to undergo some kind of difference in properties $Px \rightarrow Fx$ making them incompatible, but still numerically identical. For example, a man is sitting, a change occurs, and now the man is standing; numerical identity and incompatible properties imply change. One would not consider it change when two numerically unidentical objects x and y have different properties Fx and Py or a man is sitting, and a woman is standing. However, it seems that in perdurantism, the notion of different temporal parts making up an object invokes this very reasoning. The objection follows that perdurance implies no change occurs in a single entity as each temporal part is numerically unidentical with

incompatible properties (Hawley, 2023, p.11). Each temporal part is unique and change does not occur between unidentical entities. To say a man has parts of him which sit and parts which stand does not imply that the man, at any moment, changes between sitting or standing as none of these individual temporal parts have incompatible properties. The man simply is sitting or standing if he has the temporal part of sitting and standing.

The way the Perdurantist could respond to this particular objection could be to accept the objection that there is no change intrinsic change in objects and relativize properties similar to the Endurantist. Except in this case to temporal parts instead of times. The 4-dimensional object of the man is neither sitting nor standing, but rather each temporal part defines which appropriate properties of the man are relevant. The object can change in relation to its different temporal parts. There is no matter of fact that the man is sitting at one time then standing at another but rather he at that time exists in relation to the temporal part of him which is sitting then changes to exist in relation to the temporal part of him which is standing. Although this is a promising solution, perdurantism would then also become a victim to making properties of objects relational, claiming they are not intrinsic but relativized to other things. Also, any change of these properties is not intrinsic to the object but instead a product of the parts which define the object at any moment. Ironically this was one of the major motivations for Lewis to criticize endurantism and promote perdurantism but it seems this view has similar problems.

2. Special Relativity and The Relativity of Simultaneity

Having discussed theories of persistence, their motivations and challenges, we can now turn our attention to special relativity. Like many metaphysical theories, endurantism and

perdurantism are theories of persistence which assume absolute space and time. Absolute space and time derive from Newtonian physics or the 3 laws of motion. These physical laws imply that both space and time exist unrelated to each other and the motion of objects. Newtonian physics proves effective when explaining how objects move at ordinary constant speeds (low velocity) but begins to unravel as objects, such as electromagnetic particles, approach the speed of light (Hawley, 2009, p.507). Einstein's theory of Special relativity presented in 1905 attempted to explain the physical phenomena which occur when objects approach velocities near the speed of light. The theory has two main postulates; the laws of physics are identical for all inertial (constant velocity) frames of reference (point of observation), and the speed of light is the same for all observers regardless of motion.

These two postulates combined have been proven to be the most accurate model of motion absent of gravitational and quantum effects. They have also created a variety of certain physical implications. If the the laws of physics must remain the same in every frame of reference no matter the constant speed at which it is travelling, then certain factors like space and time once thought absolute must become relative. These factors are relative to the different constant velocities of reference frames, when there are huge contrasts in velocity (such as between a still frame and one going near the speed of light) time and dimensions of space behave differently to account for this. In special relativity, space and time are no longer two distinct things but rather exist as one continuum known as spacetime. Physical laws such as velocity and time equalling distance must remain the same between every inertial reference frame. As light has a constant speed, time and distance must become the variables which can be altered to account for this. Time dilation occurs when time slows down for inertial reference frames

relative to still reference frames. This is because, from the perspective of the still reference frame R_1, light relative to the inertial frame travelling at a high-velocity R_2 (say half the speed of light) will have to travel a longer distance at the same speed. The same light will travel a smaller distance relative to R_2 from the perspective of R_2 than the distance that light will travel relative to R_2 from the perspective of R_1. If the distance is different over the same measured time but the speed of light is a constant (and physical laws must remain the same between inertial reference frames) then time must become relative to each frame. From the perspective of the still frame, time has slowed down for the high-velocity frame as light seems to travel a longer distance at the same speed.

Another implication, the relativity of simultaneity, explains that there is no absolute state of rest or fact about the simultaneity of events. This instead is all a matter of the observers' reference frame. If two events take place simultaneously e_1 and e_2, with an observer in the middle, if the observer is moving towards e_1 at a constant velocity near the speed of light, because light also travels at a constant, the observer travelling towards the light emitted from e_1 is shortening the distance that light has to travel to reach him. In this case, the observer will see e_1 which he is travelling towards take place first. As the observer is travelling away from e_2 and away from the light emitted by it thereby increasing the distance it has to travel to reach the observer, he will then see e_2 after e_1 which he is travelling towards. Even though an outside observer, not moving towards or away from the events at high velocity, will still see the two simultaneously take place. Therefore it is impossible to say for an absolute matter of fact that two events take place at the same time if those events are separated in space. Certain variables related to distance, speed, and time of objects and events are no longer absolute but instead

relative to frames of reference. In spacetime, there is no absolute matter of fact regarding temporal duration, simultaneity, or spatial distance (Gilmore, 2008, p.1226). These are all relativized to the motion of a frame of reference and as there is no one privileged frame of reference there is no absolute time and space.

2.1 The Many Mes Problem For Endurantism

As special relativity implies, there are no absolute matters of fact about space or time but rather these are relative to reference frames. But how exactly does this new understanding of physics apply to theories of persistence through change? If special relativity is assumed and no two points separated in space are simultaneous in time rather this is dependent on reference frames, then both endurantism and perdurantism run into trouble but for slightly different reasons. Matters of fact being relative to reference frames means there is no such thing as an object absolutely existing at a time but rather many different versions existing at once depending on the motion of reference frames. The many reference frames now define the physical and temporal dimensions of objects and events. However, each reference frame may have different physical interpretations of that object than other frame-dependent interpretations. This is based on their motion and as every object is always in motion all exist at the same time, there are countless frames of reference. Different frames of reference now create many different versions of the same object or event. The endurantist must explain how given the relativity of simultaneity, space, and time, there does not exist one version of ‘me’ but rather ‘many mes’ all wholly present and relative to the motion of different frames of reference.

Endurantism proposes that objects exist wholly present at every time. The Endurantist would support an object existing wholly present at two different times, but the relativity of simultaneity implies that for any time there will be multiple versions of that object existing at the same time dependent on reference frames. When relativity is applied to endurantism, it seems the Endurantist would have to admit that there can be multiple versions of the same wholly present object existing at one time. As there are infinite reference frames based on motion and according to relativity no one reference frame is privileged, there are then in fact an infinite number of wholly present mes existing at one time. This seems implausible if intuitively wholly present objects just exist as one numerically identical entity. For instance when looking at an object such as a cup intuitively we do not assume the cup to exist in multiple different whole forms all at once, but rather only one whole version. However, if both endurantism and special relativity are assumed, then simultaneously this cup exists wholly but also as many different relative versions based on the motion of reference frames.

2.2 The Many Mes Problem For Perdurantism

Although there is a Many Mes problem present for perdurantism as well, this problem takes a different nature as perdurance does not imply whole presence as existence but rather a chain of different temporal parts in different spaces. First, the Perdurantist needs to consider that the relativity of simultaneity undermines how perdurantism views time and space as two distinct things, there are no longer temporal parts but rather spatiotemporal parts. Relational issues like what is considered a spatiotemporal part of an object or what property is defining the object at that moment, are no longer absolute or intrinsic to the object but instead dependent on the motion of frames of reference. Assuming special relativity would force the Perdurantist to admit the

existence of multiple spatiotemporal parts of an object existing at one time. While the version of each spatiotemporal part of the greater 4-dimensional object is now multiplied by the number of frames of reference (Hawley, 2009, 512).

Perdurance with special relativity applied claims that for every object, whenever it exists it does so as a different spatiotemporal part as defined by the frames of reference for a greater region which the object occupies. As each spatiotemporal part of the object exists dependent on the motion of reference frames, then there can be a number of differently defined spatiotemporal parts of an object existing at once. Each reference frame essentially changes how the entire 4-dimensional object is defined. Imagine a spacetime object existing like a cake with each reference frame essentially cutting a different pattern into the cake determining the greater 4-dimensional object. One reference frame takes the whole cake and cuts it entirely horizontally while another frame takes the whole cake and does so vertically. The different spatiotemporal makeups all result in different versions of the same cake or spacetime object. As there are an infinite number of reference frames, how this object is constructed (like how the cake is cut) in spacetime infinitely varies. Although perdurantism allows for many different temporal parts to represent the existence of an object like a chain, before assuming special relativity, the state of these temporal parts was absolute. Now with relativity applied, assuming that this causes space and time to be dependent on the motion of objects, the absoluteness of these parts which define the greater object is no longer the case. It is hard for the Perdurantist to associate any kind of independent identity to each part or that each part relates to the object as properties become not intrinsic but the product of reference frames which may, at the same time, vary in their interpretation.

3. Comparing Potential Responses to the Many Mes Problem

In this section, I will review possible responses which endurantists and perdurantists could use to make their views of persistence through change more compatible with special relativity. The Endurantist could first either accept that the principles of relativity are incompatible with whole existence and pose a solution which would then explain whole existence implying absoluteness in a relativized world; the privileged reference frame. The other solution for the Endurantist would be to argue that principles of relativity actually are compatible with whole existence and that identity is not unified but rather comes in many forms. In this case, how objects wholly persist is in as many versions as there are interpretations of that object existing all at once. On the other hand, the Perdurantist would need to explain how there can be many different spatiotemporal parts dependent on the motion of reference frames which still make up the same 4-dimensional object. If there are many different interpreted parts, the whole 4-dimensional definition of the object will be completely different according to each frame of reference. The Perdurantist would need to associate identity first with the object and secondly with the spatiotemporal parts that make up the object. At any moment, various reference frames could be differently interpreting the same object, but these frames and how they interpret the object are ontologically dependent on that object. We will then assess which of these responses is preferable given how attuned each response is to the underlying assumptions of special relativity while remaining similar to their original claims of persistence.

3.1 Posing and Assessing Potential Endurantist Responses

3.1(a) Endurantist Response and Assessment #1

Say the Endurantist allows the assumption that according to the notion of whole presence, it is unintuitive for objects (when special relativity is applied) to exist in many forms relative to reference frames; existing wholly and relativity are intuitively incompatible. They would then have to pose a response which in nature relativizes the properties of the whole object to one frame. This solution would essentially be privileging one of the frames by which the object is referred to, and therefore one of the whole versions of the object. This might be a plausible solution as it would make whole existence no longer something of many versions all existing at once dependent on the motion of all reference frames. Instead, if one of these frames is privileged, one of these versions exists as the real version of the whole object. However, when one frame of reference is privileged time, motion, and space, become dependent on the observation of this frame of reference. There is an assumption of absoluteness. It seems that this response may run into trouble as it contradicts the already-existent principles of relativity.

This response may be promising as it allows the Endurantist to hold onto their notion of a singular whole existence despite the implications of the underlying theory of relativity. However, this particular response seems to conflict with what we know about special relativity. More specifically this solution is incompatible with the principle of relativity which explains that no one frame of reference is privileged over others. To privilege one frame over others would be to assume the absoluteness of spacetime based on that frame which may seem like a plausible assumption at normal velocities but as special relativity argues is not the case when objects move at higher velocities such as the speed of light. The principle of relativity requires physical laws to

be the same for every inertial object moving at a constant velocity, as they are for a non-moving object. However, when objects move at a high velocity, for their physical laws to remain the same as non-moving objects while accommodating the constant speed of light, things once thought absolute such as space and time have to bend, effectively becoming relative. This is seen in the principles of time dilation which explains that time lapse between events is dependent on the relative speeds of the observers (relativity of simultaneity); and length contraction which explains that the dimensions of an object may be measured differently based on the observer with objects of motion looking smaller from the perspective of still frames. It is impossible to refer to one of these frames as the privileged one unless it exists independent of the laws of physics. Due to its incompatibility with special relativity which needs to be assumed so that the Many Mes problem can occur, this response by the Endurantist is not as preferable.

3.1(b)Endurantist Response and Assessment #2 (as proposed by colleague Ethan Yao)

What were to happen if instead, the Endurantist promoted the notion that whole existence does not necessarily have to be as one unitary object at a time? This would deny that it is unintuitive for existence to be multiple whole different versions all at once, claiming there is nothing wrong with many whole mes existing at the same time. In this response, the Endurantist admits that special relativity causes multiple whole versions of an object to exist at once dependent on the many velocities in which reference frames move, but that this principle of relativity does not conflict with the notion of whole existence. Perhaps, in this case, existence and identity are mere products of the many relations that an object has. Consider how the endurantist and perdurantist had to relativize their properties to times and temporal parts to account for change. In the same sense, the Endurantist can claim the whole object is now

relativized to every reference frame (as only relativizing to one would privilege said frame) and every interpretation possible.

In terms of responses to the Many Mes problems, this may be the Endurantists' best bet. Claiming that the identity of an object is relational and therefore comes in many different versions would make the object relative to the observer and compatible with special relativity. However is this a problematic way of conceptualizing whole identity? If the Endurantist is to accommodate whole existence, they must explain how an object can persist unitarily. To claim that whole existence is not an object persisting as one but instead many things seems to conflict with the notion of unity. Also when comparing multiple whole existences as an object persisting to unitary whole existence, the latter of these views would be the more ontologically parsimonious claim. That is, claiming whole existence takes not one but many versions makes unnecessary assumptions using more resources to explain the same phenomenon. Ontological parsimony favours simplicity, and increasing the number of whole versions of an object all existing at once would multiply entities required for this theory of persistence beyond necessity. It seems that if the relativity of identity is assumed, the Endurantists' claim about whole persistence becomes less parsimonious than their original claim without special relativity applied. However, this may be the preferable option in the case of enduring relativity from the two proposed.

3.2 Posing and Assessing Potential Perdurantist Responses

Even though the Many Mes problem applies to perdurantism, it does so in a very different way than to endurantism. Perdurantism is slightly more compatible with relativity as it

does not assume whole existence. Still, this theory of persistence assumes absolute space and time and therefore absolute versions of objects and events, which according to relativity is instead a matter determined by motion. Unlike how endurantism sees 3-dimensional objects (not accounting for time), the perdurantist stretches objects across a 4-dimensional plane accounting for the different temporal parts of the object (parts of the object existing at each moment). As perdurantism already supports the notion of objects existing as multiple parts over time, the real threat of relativity has to do with what defines each spatiotemporal part and therefore the whole object. If the motion of each reference frame defines these as relativity assumes, this causes there to be different interpretations of the entire 4-dimensional object based on these frames of reference. The Perdurantist would have to focus their solution on making an ontological claim essentially arguing that the spatiotemporal object exists first and independently, then the different reference frames relativize this into different versions which are still all contained within the greater 4-dimensional object. This response would be claiming that the reference frames are essentially ontologically dependent on the ontologically independent object so that these frames cannot exist without the object existing first. The object exists before the reference frames of the object which define the parts, and each method of slicing up the cake existing dependent on the many forms of motion at once is still all contained within the greater 4-dimensional wormlike object which is the cake. As the slices of the cake cannot exist without the cake, the slices, like the frames of reference depend on the cake, or whichever object in spacetime, existing first and independently.

When comparing this response to that of the Endurantist, it seems that the Perdurantist has a more preferable solution. If we are to assume that the object has to exist first before the

frames of reference of that object, then perhaps the Perdurantist must defend the position of absolute identity in a relativized world. Still, their accommodations do not have to admit the privilege of one reference frame over others thereby conflicting with special relativity. Also, they do not have to make their explanation of persistence any less parsimonious than it already was. The Endurantist has to make their notion of whole existence diversely constructed rather than unitarily. As the Perdurantist already assumes there are many different temporal parts which make up objects to begin with, relativity and the existence of many reference frames can be accommodated better. Although there is no absolute winner between the theories of persistence in the case of the problem of Many Mes as these theories are based in absolute space and time while the Many Mes problems assumes relativity, it seems the Perdurantist and their notion of persistence through many parts is better suited to deal with relativity than Endurantism and whole persistence.

Word Count: 5094

References

Gilmore, Cody (2008). 'Persistence and Location in Relativistic Spacetime'. *Philosophy Compass.* 3/6 University of California: Blackwell Publishing p.1224-1254

Goswick, Dana Lynne (2013). 'Change and Identity Over Time'. In Heater Dyke and Adrian Bardon (eds.), *A Companion to the Philosophy of Time.* John Wiley & Sons, Inc. p. 365-384

Hawley, Katherine (2023). 'Temporal Parts'. *Stanford Encyclopedia of Philosophy*

Hawley, Katherine (2009). 'Metaphysics and Relativity'. In Robin Le Poidevin, Peter Simons, Ross Cameron & Andrew McGonigal (eds.), *The Routledge Companion to Metaphysics*. Routledge p. 507-515

Lewis, David (1986). *On the Plurality of Worlds*. Oxford: Blackwell Press