The Justified Ontology of Time

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Abstract

What are we justified in asserting when constructing an ontology of time? I believe a version of Presentism to be the only justified theory. 'Justified' here refers exclusively to a basis of empirical and epistemological evidence. What can we assert about the metaphysics of time when we start from a justificationist epistemology? Putnam and Rietdijk argue that the relativity of simultaneity supports Eternalism. My investigation examines the strength of justification Eternalism attains from the special theory of relativity (STR) and will argue that Eternalism is not justified by STR. I will also suggest that an alternative metaphysical theory of time, Point Presentism, attains justification from STR.

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1.0 Introduction

1.1 Grounding Question

The question that grounds this investigation concerns what we are justified in asserting when constructing an ontology of time. I believe a version of Presentism to be the only justified theory. 'Justified' here refers exclusively to a basis of empirical and epistemological evidence. What can we assert about the metaphysics of time when justifying from epistemology? Putnam and Rietdijk argue that the relativity of simultaneity supports Eternalism. My investigation will examine the strength of justification Eternalism attains from the special theory of relativity (STR). I will also suggest that an alternative metaphysical theory of time, Point Presentism, is justified by STR. The same line of reasoning employed by those who endorse Eternalism is shown to actually provided justification for Point presentism.

1.2 Ontologies of Time

The two theories of time that concern this investigation are Presentism and Eternalism. Presentism is the metaphysical position asserting everything actual that exists is located at the present. Nothing actual is located at a different point in actual time. The past and future do not contain entities that exist. If you were to assemble everything that actually exists then you would have a collection of present events, objects and properties. Eternalism, in contrast to Presentism, asserts that there is more than one actual temporal location. The different temporal locations are those which are earlier and later than the present. Nothing is entailed from the object's existence to its temporal location. If the object in question exists then it has a temporal location that is not necessarily present; that which has been and that which will be is the same as that which is, insofar as existence goes. Objective becoming and dynamism are rejected by the eternalist but essential to the presentist position. Objective becoming is the creation of the actual existence. The reality of objects is attained at the present. Prior to this, there is no such object. The manifestation of actual objects is a feature of the world; objects exist depending on temporal location. Dynamism is the flow that time has which for the presentist is an objective feature of time.

Although Presentism and Eternalism hold true to the descriptions expressed above it would be wrong to assert that there is consensus concerning every feature of the theories. There are many different versions of both Presentism and Eternalism. Eternalism is best categorised as four dimensional space-time. The universe is a static four-dimensional block lacking a shifting present with all times and events located at each time being equally real. (Dainton, 2001, p. 27) This is the

standard understanding of Eternalism. All dynamic and flowing aspects to time are rejected. The impression of time's flow is not of an objective feature of the universe. What is called 'present' is simply a single static temporal location determined by an observer; each observer is capable of determining what is present for them. What we perceive as a flowing present is a mentally constructed phenomenon; the experience of a single static time as a part of a series one after the other creating some illusion of dynamism. This is similar to the way a flip book appears to portray motion whereas in fact it is simply a number of static images stacked one after the other. Observing one static image followed by another static image can create the illusion of dynamism. Additionally, ideas of becoming are also rejected. No events come into existence as everything that will exist does exist. This is to assert that the future does not become real at the present. The realisation of things cannot occur as everything is already real.

An individual who wants to maintain that time flows and that the notion of becoming is an objective matter is not necessarily excluded from the eternalist camp. The fundamental requirement is an objective attribute associated with the passage of time. The 'moving spotlight theory' is a hybrid theory that permits this. The dynamic flow of time is akin to a light shining on events as they are 'present'. It was first expressed by Broad (Broad, 1923),

> 'We are naturally tempted to regard the history of the world as existing eternally in a certain order of events. Along this, and in a fixed direction, we imagine the characteristic of presentness as moving, somewhat like the spot of light from a policeman's bull's-eye traversing the fronts of the houses in a street. What is illuminated is the present, what has been illuminated is the past, and what has not yet been illuminated is the future' (Broad, 1923, pp. 59-60)

In contrast to this particular eternalist matter, Presentism in all forms is committed to objective becoming and dynamism. Events that come into the present were previously non-existent. This becoming, regardless of the extent that events and objects remain in existence, is sufficient to constitute objective becoming. Most Presentists do not find issue with objective becoming or dynamism in time but instead assert this as a positive feature of their doctrine. The internal conflict between presentists when concerned with the implications of STR arises from what constitutes the present. Varying versions of Presentism construe the present in different forms. The nature of these variations is usually the result of attempting to offer a version of Presentism that is compatible with STR. To explain them here before explaining STR would be unhelpful. Some of the different varieties of Presentism will appear later in the investigation and will be given attention at that point.

STR is the driving factor in much of the discussion concerning theories of time. The general theme follows the following dialectic: a position will be presented that incorporates some desirable aspects, such as becoming or dynamic time and then receive opposition on the grounds that it is not compatible with STR. Presentism is often subject to this dialectic as it preserves both of these aspects. It is not restricted to Presentism either. The moving spotlight theory faces opposition on the grounds that it is incompatible with STR. Skow (Skow, 2009) defends the moving spotlight theory in the same way many presentists have done when defending Presentism. This highlights how the debate, when concerned with justification from physics, is not exclusively between Presentism and Eternalism but is between Eternalism and all other theories. This is because Eternalism is argued to be the result of justifying from STR and is repeatedly claimed to be the only theory compatible with STR. Most importantly for this investigation, it is often claimed to be the only justified theory. Putnam (Putnam, Time and Physical Geometry, 1967) comes to one of the most sweeping conclusions when arguing for the block universe and against Presentism,

> 'I conclude that the problem of the reality and the determinateness of future events is now solved. Moreover, it is solved by physics and not by philosophy. We have learned that we live in a four-dimensional and not a three-dimensional world, and that space and time or, better, space-like separations and time-like separations are just two aspects of a single four-dimensional continuum with a peculiar metric which sometimes permits distance (y, x) = 0 even when $x \neq y$. Indeed, I do not believe that there are any longer any philosophical problems about Time' (Putnam, Time and Physical Geometry, 1967, p. 247)

Putnam's conclusion not only strongly endorses the block universe theory but effectively decides that the discussion concerning time is concluded. He rejects that philosophical discourse was the driving factor in reaching such a conclusion, instead declaring that physics has given us a justified theory of time. Putnam's rejection of philosophical discourse is contradictory. His paper is one of philosophy and not physics. He suggests through logical argument that Eternalism is the correct theory. Even if it is accepted that physics provides justification for a theory of time it can only be shown through philosophical discourse. Rejecting the part that philosophy has to play would result in no ontological position of time being justified. Rejecting philosophy would involve rejecting the reasoning used by Putnam to endorse Eternalism. Putnam's work will become clearer as the investigation progresses but first more groundwork is required. Notably, expressing how Justificationism fits into the picture and giving a comprehensive explanation of the relevant aspects of physics.

1.3 Justificationism

Justificationism is the philosophical doctrine asserting that one should believe only what one could have justification for. A belief should be adopted only if there is sufficient justification for its adoption or if it is possible for this to be the case. An example of this can be found in Dummett (Dummett, 2004). Dummett's discussion concerns a range of statements and involves a substantial semantical element that is not necessary for adopting justificationism but his version is provided to give an example of how justificationism can be employed. In the statement, 'The chair exists', the speaker is referring to an objective object. The term 'chair' refers to the object denoted as 'chair'. The reality of an object is determined by the truth value assigned to a corresponding statement about its existence. Dummett maintains that a statement has meaning only if a truth value can be assigned to it. If it is not possible to make such a truth evaluation then the statement is meaningless. Statements where it is possible to assign a truth value are the only ones that have meaning. Those statements that have meaning connect to ontology.

If there is sufficient justification for holding the belief, '*x* exists' then the statement, 'x exists' is true. As this statement is true it follows that the object that *x* refers to exists. If there is not sufficient justification for holding the belief then the statement, '*x* exists' is not true and therefore it cannot be that *x* exists. If it is possible to assign a truth value to the statement, '*x* is bright' then it follows that *x* must exist; being able to assign a truth value to this statement entails that *x* must exist. The justificationist doctrine places an empirical requirement on the metaphysical outcomes; an inability to justify results in something that should not be believed which is not to say whether it should be disbelieved. As our justification is one that starts from empirical evidence, something should be accepted as true only if it is justified on this basis. Relevant to our discussion of time are the results from modern physics. Physics is based in empirical verification and testing.

It should be noted that the version of justificationism outlined above holds a strong connection with semantics. Dummett or any other semantical considerations are in no way entailed along with the adoption of justificationism and he is included here to give and example of a justificationist approach. Justificationism should be understood in the sense of holding a belief because there is evidence for holding that belief. Most importantly for this investigation is the notion that beliefs that are impossible to justify should not be held. In addition, it is not the case that all Eternalists are motived by justificationist reasons.

Holding a particular belief is justified when there is evidence that supports holding such a belief. Evidence can be found from empirical data. The belief concerning the existence of a certain object is

justified because there is empirical information that provides justification for holding said belief. More exposition of the relevant aspects of justificationism employed in this thesis can be found in later in the paper (Sections 3.0 and 3.1). It is important to note here that I in no way am endorsing the adoption of justificationism. Justificationism is held independently of the argument that I am putting forward. It is an assumption that I do not justify but I am assuming results from the debate. The individual who is sympathetic to justificationism should also take the considerations resultant from STR found in this paper (such as those later proposed in the Putnam-Stein debate) to also support the conclusions.

The lines between what is the exclusive domain of physics and philosophy are blurred. This philosophical investigation is concerned with the conclusions that have been drawn from physics and used to express STR; the extent to which this is the concern of philosophers or physicists in unclear. To offer a distinctive and clear boundary between what is physics and what is philosophy would be difficult. Both parties would disagree on where to draw the line. This is clearly illustrated in this investigation; work from both philosophers and physicists are relevant here. Putnam rejected philosophy in his argument and essentially deemed the ontological construction of time as an issue for physics. As was shown previously, he was clearly overstepping himself. Instead of drawing such strict boundaries, an interwoven and overlapping interpretation will suffice. It makes no difference to this investigation if it is the concern of philosopher or physicist. If logic and reasoning are implemented to arrive at a conclusion then a philosopher can intervene; much of what is said concerning the justification of time is built on logical and rational discourse leaving much room for a philosopher to get involved.

1.4 Time and Physics

1.4.1 Absolute and Relative Time

To give a sufficiently detailed account it is instructive to start from Newton's (Newton, 1687) position concerning time, absolutism. Absolutism entails that events which are taken to be simultaneous from one frame of reference are to be taken as simultaneous in all frames of reference. A frame of reference is a four dimensional coordinate system centred on a particular location from which spatial and temporal judgments can be made. According to absolutism, the temporal relations between events from one frame of reference will be in agreement with all other frames of reference:

> ‘All motions may be accelerated and retarded; but the true, or equable, progress of absolute time is liable to no change. The duration or perseverance of the existence of things remains the same, whether the motions are swift or slow, or none at all’ (Newton, 1687, pp. 78-79)

Absolutism is in contention with Einstein’s (Einstein, 1916) work advocating relative temporal relations. Relativism is the view that events that are taken to be simultaneous from one frame of reference do not have to be taken as simultaneous in all frames of reference. Different frames of reference can produce conflicting but equally valid judgments on the simultaneity of events. Einstein bases his argument on physics, notably the consequences of the special theory of relativity. STR, as defined by him, is the theory that logically results from holding the *principle of relativity* and the *principle of the constancy of light*, as the following sections explain.

1.4.2 Principle of Relativity

The principle of relativity states that all equations describing the laws of physics have the same form regardless of the frame of reference they are applied from. Every accurate measurement from every frame of reference is equally valid. No one particular perspective on temporal aspects of the world is privileged. There can be no particular point in space or time that has precedence over another. (Einstein, The Foundation of the General Theory of Relativity, 1914-1917, p. 111)

1.4.3 The Constancy of Light

When measuring the speed of light in a vacuum, it always travels at the same speed. This is regardless of the relative motion between the frame of reference and the location of light. If a car is stationary relative to your frame of reference and turns on its headlights, the speed of light coming from the headlights will be the same as when the car is moving relative to your frame of reference. If the car travels at half the speed of light (relative to your frame of reference) and switches on its headlights, the speed of light remains constant.

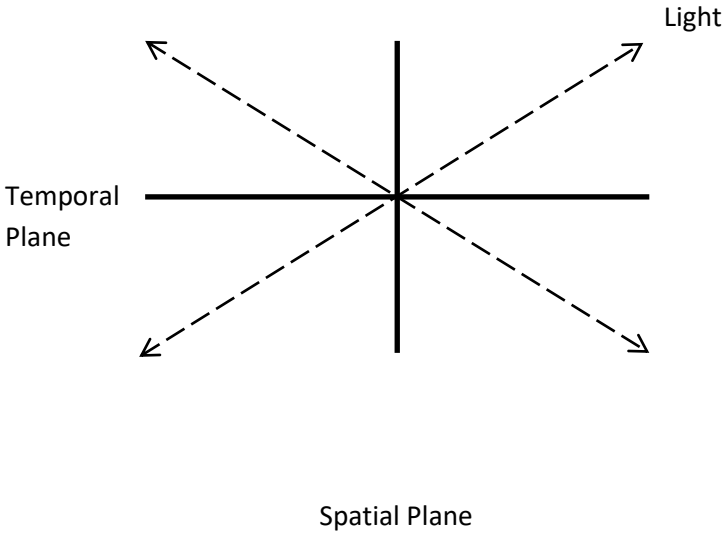
A consequence of this is that the speed of light sets an upper limit for the speed that objects with mass can travel. No matter how fast an object is travelling, it can never surpass the speed of light. Light will always be travelling away from the object at the same speed; so no matter the speed of the object, it is impossible to overtake light.

1.4.4 Minkowski Space-Time Diagrams

The Minkowski space-time diagram (Figure 1.0) can express the spatio-temporal positions of objects and events from a particular frame of reference. The observer is located at the centre point. The rest of the picture expresses the spatio-temporal locations of other objects within that frame of reference. The vertical axis represents temporal position and the horizontal axis represents spatial position along a given dimension. If we take an absolute view of time, then the horizontal line along the centre of the diagram can represent the present, the upper half of the diagram its future and the lower half its past. This encompasses the extent of spatio-temporal relations in an absolute way. Absolutism can be expressed in this way. The present is a single horizontal line that extends uniformly across the spatial plane. For two events to be simultaneous with each other, they simply need to be located on the same horizontal line. The temporal relations between any two objects are absolute.

The implications of relativity come into the diagram with the inclusion of two light cones. The diagonal lines are paths along which light would travel. They extend from the present and create two light cones, one into the past and the other into the future. As light sets the cosmic speed limit and because the photons of light are in the spatio-temporal locations they are, we can assert that only information from within the light cones is able to reach and be reached by the centre point. Nothing beyond the lower light cone is observable from the origin of the frame of reference depicted. The light cone signifies the limitations of possible perception. Nothing outside the light cone is able to reach the observer at that point. This creates two ‘dark zones’. These are areas where it is impossible for light to reach the observer.

Figure 1.0 –



1.5 Einstein and Simultaneity

1.5.1 Einstein's Definition of Simultaneity

According to Einstein (Einstein, 1916), a definition of simultaneity must allow us in the present case to decide empirically whether two spatially separated events occurred simultaneously. Any attempts to attaching meaning to the term 'simultaneity' will be unsuccessful if this requirement is not satisfied. He proposes the following,

> 'Lightning has struck the rails on our railway embankment at two places A and B far distant from each other. I make the additional assertion that these two lightning flashes occurred simultaneously. If I ask you whether there is sense in this statement, you will answer my question with a decided "Yes." […] I cannot be satisfied with this answer for the following reason. Supposing that as a result of ingenious considerations an able meteorologist were to discover that the lightning must always strike the places A and B simultaneously, then we should be faced with the task of testing whether or not this theoretical result is in accordance with the reality. We encounter the same difficulty with all physical statements in which the conception "simultaneous" plays a part.' (Einstein, 1916, p. 22)

Einstein places only one requirement on a definition of simultaneity: in every actual case the definition must provide an empirical verdict on whether or not the concept which we are asking to be defined is satisfied. Under the right conditions two things are simultaneous when an observer asserts that they are, based on the direct evidence they have access to. Einstein continues,

> ‘The concept does not exist for the physicist until he has the possibility of discovering whether or not it is fulfilled in an actual case. We thus require a definition of simultaneity such that this definition supplies us with the method by means of which, in the present case, he can decide by experiment whether or not both the lightning strokes occurred simultaneously. As long as this requirement is not satisfied, I allow myself to be deceived as a physicist (and of course the same applies if I am not a physicist), when I imagine that I am able to attach a meaning to the statement of simultaneity’ (Einstein, 1916, p. 22)

After making this point clear, Einstein suggests a method of testing simultaneity. We find the midpoint between the two positions of A and B by measuring along the track and then proceed to set up two mirrors at 90 degrees. Each mirror permits the direct observation of A and B at the same time. If the observer perceives both of the flashes of light at the same time it should be concluded that they are simultaneous. For this situation to result in simultaneity, the nature of light’s constancy must be knowable. To do this would require that we measure it but this could only be done if we already had a means of measuring time,

> ‘Your definition would certainly be right, if only I knew that the light by means of which the observer at M perceives the lightning flashes travels along the length A M with the same velocity as along the length B M. But an examination of this supposition would only be possible if we already had at our disposal the means of measuring time. It would thus appear as though we were moving here in a logical circle.’ (Einstein, 1916, p. 23)

This objection is rejected by Einstein because the nature of light is of no concern when defining simultaneity. Only one requirement needs to be met; that in every actual situation we must be able to come to an empirical decision as to whether or not the two events were simultaneous or not:

> ‘That light requires the same time to traverse the path A M as for the path B M is in reality neither a supposition nor a hypothesis about the physical nature of light, but a stipulation which I can make of my own freewill in order to arrive at a definition of simultaneity.’ (Einstein, 1916, p. 23)

By adopting this definition of simultaneity, it is possible to give precise meaning to the temporal location of as many events as desired. This, for Einstein, is a definition of time provided by physics. In this definition, he supposes that three clocks of identical construction are placed along the railway line at three points, *A*, *B*, and *C*. Each of the clocks is set in such a way that the positions of the hands are simultaneously identical. The time of an event is to be understood as the time presented by observation of one of the clocks in the same spatial location as the event. This results in a time value

capable of being observed in association with every event. Further, this definition results in the following: If two events belong to the same reference body then time ticks off at the same rate for each of these events:

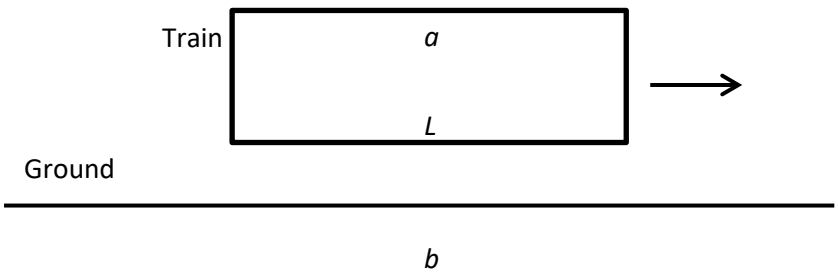
> 'This stipulation contains a further physical hypothesis, the validity of which will hardly be doubted without empirical evidence to the contrary. It has been assumed that all these clocks go at the same rate if they are of identical construction. Stated more exactly: When two clocks arranged at rest in different places of a reference-body are set in such a manner that a particular position of the pointers of the one clock is simultaneous (in the above sense) with the same position, of the pointers of the other clock, then identical "settings" are always simultaneous (in the sense of the above definition).'

Einstein's makes verificationist assumptions in his definition of simultaneity. The central requirement is direct observation. This condition alone is sufficient for an accurate assertion of simultaneity. An observation of any event confers the status of present to the entity. Additionally, two spatially separated events which are perceived at the same time are also simultaneous.

1.5.2 Relativity of Simultaneity

In taking the previous definition of simultaneity, Einstein arrives at the consequence that simultaneity must also be relative. Take the following similar example. Suppose that you, *a* are travelling on a train in motion (relative to the ground). You are standing at the centre of the train (stationary relative to the train). I, *b* am standing on the side of the tracks (stationary relative to the ground). As you are travelling past me, I am in motion relative to the train. Now, suppose that you, at the centre point of the train, arrive aligned with me. It is at this point that a light, *L* is switched on at the centre of the train. (Figure 1.1)

Figure 1.1 -



We are both asked to judge which end of the train the light reaches first. As you are stationary relative to the train and because the speed of light is constant, you correctly assert that the light reaches each end of the train at the same time. However, as I am in motion relative to the train and because the speed of light is constant, I also correctly assert that the light reaches the back of the train first and then reaches the front. Relative motion between bodies of reference will produce different but equally valid claims on the simultaneity of events. The light reaching the back and front of the train is simultaneous from a frame of reference on the train and not simultaneous from a frame of reference off the train. Each frame of reference with a different relative motion has its own perspective on the temporal ordering of spatially separated events. If the location of the frame of reference is unspecified, then statements about when an event occurred are meaningless. (Einstein, 1916, p. 26)

Relative simultaneity leads to a rejection of absolute notions of time. It is no longer true that the state of motion that a 'reference-body' is in has no effect on the temporal location of an event. The notion of absolute time is incompatible with Einstein's definition of simultaneity. Rejecting the assumption of absolute time allows for harmony between the constancy of light and the principle of relativity; hence relative time is adopted to produce a coherent theory.

Einstein's definition of simultaneity entails the relativity of simultaneity. From this, a new theory of time, Eternalism, has been argued to be the resultant theory. Putnam, Rietdijk and Penrose all offer endorsements of Eternalism based in the consequences of relative simultaneity. These endorsements are built upon physics and should be treated as justification from empirical evidence.

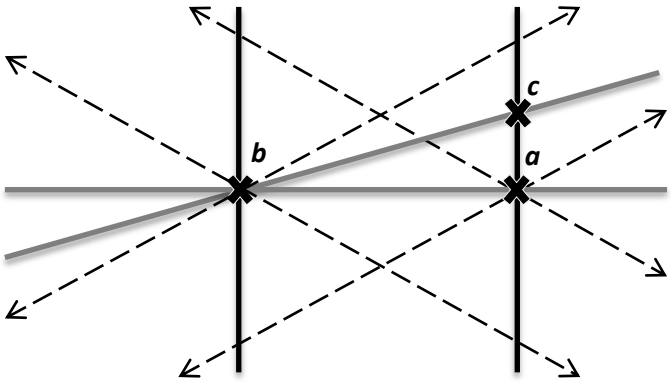
1.6 Justified Eternalism

1.6.1 Rietdijk and Eternalism

Rietdijk provides a proof that everything called 'present' from one frame of reference has the possibility of being in the past in another frame of reference belonging to some distant observer. Take two observers perceiving from differing frames of reference. One of the observers is moving towards the other. Due to the relative motion between the two observers, their planes of simultaneity do not align (Figure 1.3). *a, b, c,* represent events located at the spatio-temporal locations depicted. Event *a* is simultaneous with *b*. Event *b* is simultaneous with event *c*. Event *c* is in the future of event *a*. *c* from the frame of reference *b* is as real as *b* is from frame of reference *a*. In virtue of the simultaneity between *a b* and *b c*, *c* is as real to *a* as *b* is for *a*. Every event has the possibility of being past to some distant observer. There can always be an observer sufficiently

spatially distant and travelling with sufficient relative motion that results with all events that you call 'present' being past to another observer. (Rietdijk, 1966, p. 341)

Figure 1.3 - Simultaneity =



1.6.2 Penrose and Eternalism

Penrose offers a similar line of reasoning. He proposes a paradox. Suppose two individuals walking past each other in the street on earth. Just outside of the Milky Way exists the Andromeda galaxy. Of our two walkers, one is walking towards the distant galaxy and the other away from it. Due to the vast distance between the observer and the event, the relatively small difference in relative motion greatly distorts what events are simultaneous according to each observer's frame of reference. The individual's walking away is simultaneous with a meeting of aliens debating whether or not to invade earth. The individual's walking towards is simultaneous with the Andromedan invasion force already en route. Penrose questions how it can be possible for there to be uncertainty concerning this event and how two observers located at the same place offer such drastically differing accounts of what is occurring now. If the aliens have already decided to invade then how can there be any uncertainty over this? The event is concurrently in the determined past of one observer and in the uncertain future of the other. He writes:

> 'In fact neither of the people can yet know of the launching of the space fleet. They can know only later, when telescopic observations from earth reveal that the fleet is indeed on its way. Then they can hark back to that chance encounter, and come to the conclusion that at that time, according to one of them, the decision lay in the uncertain future, while to the

other, it lay in the certain past. Was there then any uncertainty about that future? Or was the future of both people already "fixed"?' (Penrose, 1989, pp. 392–393)

The presentist has the problem of two observers disagreeing over what is present. The relativity of simultaneity results in the existence of contrasting presents. For a presentist to resolve this consequence, substantial revisions are required. Eternalism resolves this paradox because all temporal events, regardless of location, are equally real. For the observer walking towards Andromeda the invasion is present and exists along with the preceding events existing. For the observer walking away from Andromeda the invasion still exists but is not yet present.

1.6.3 Putnam and Eternalism

Putnam argues that events located in the future from one frame of reference must already exist. He makes four assumptions. The first three of which are the following,

> 'I. I-now am real. (Of course, this assumption changes each time I announce that I am making it, since 'I-now' refers to a different instantaneous "me.")
>
> II. At least one other observer is real, and it is possible for this other observer to be in motion relative to me.
>
> III. If it is the case that all and only the things that stand in a certain relation R to me-now are real, and you-now are also real, then it is also the case that all and only the things that stand in the relation R to you-now are real.' (Putnam, Time and Physical Geometry, 1967, pp. 240-241)

The fourth assumption is the truth of STR, including the definition of simultaneity as presented by Einstein. Without assuming STR, a presentist account of time is clearly compatible with the other three assumptions. If the present is to constitute the relation of real things to me now exclusively, then it follows that everything simultaneous with me at the present is real and only those things. The same is true from your frame of reference. An absolute account of the simultaneity leaves everything, simultaneous with me, aligned with everything simultaneous with you. As everything and only those things that are simultaneous with me and you are found at the present, everything actual that exists is located at the present.

Once STR is assumed, Putnam argues that events located in the future are real:

> ‘We now discover something really remarkable. Namely, on every natural choice of the relation R, it turns out that future things (or events) are already real’ (Putnam, Time and Physical Geometry, 1967, p. 242)

He uses the following example to express this point. Both you and I are located in the same place but moving exceptionally fast relative to each other. Our world lines and planes of simultaneity are different because of the relative motion between us. To ensure that there are no privileged observers:

> ‘We cannot take the relation of simultaneity-in-my-coordinate-system to be R without violating the way in which the principle that There Are No Privileged Observers is intended to be understood. Rather, we have to take R to be the relation of simultaneity-in-the-observer's-coordinate-system’ (Putnam, Time and Physical Geometry, 1967, p. 242)

Then assuming that at my now, every event and only those events are simultaneous with me are real, it follows that you at present are also real. All and only those events, in relation your plane of simultaneity, are also real. (Putnam, Time and Physical Geometry, 1967, p. 242) However, an accepted consequence of STR is that there are events located in the future from my frame of reference and these same events are located in the present from your frame of reference. The events I call future are simultaneous with you. You are simultaneous with me. Everything simultaneous with me at the present is real and only these events are real. As you are simultaneous with me, everything simultaneous with you is real. Therefore, reality has to be granted to those events that I call future. (Putnam, Time and Physical Geometry, 1967, p. 242)

Additionally, if the present is defined outside a frame of reference, it is subject to Putnam’s objection places the present as privileged. STR designates no absolute simultaneity between events that belong to different reference bodies. Absolute simultaneity constitutes assigning the status of present to a set of events independent of any frame of reference. According to STR, no two spatially separate events can be simultaneous with each other independent of their frame of reference. The present can be constructed only from a frame of reference. Each plane of simultaneity is relative to its frame of reference. Presentists assign the present to a group of events that are not frame dependent. According to Putnam, the presentist’s understanding of the present gives it a privileged ontological status that is incompatible with STR. This part of Putnam’s argument poses STR as incompatible with Presentism and then concludes: when being forced to choose between Presentism and STR, we should side with STR, as it is a much more successful theory in physics and has empirical backing. (Bourne, 2006, p. 162)

1.7 Consequences for Presentism

Presentism appears to have arrived in a particular predicament. STR, Einstein's definition of simultaneity and the relativity of simultaneity together offer strong opposition to Presentism. A presentist in this context has options. The presentists fall into two broad camps when responding. The first group responds by rejecting one or more of the premises that lead to conclusion; such as rejecting some aspect of STR or Einstein's definition of simultaneity. Examples of this can be found in Bourne (Bourne, 2006) who rejects the verificationist assumptions made by Einstein, allowing for a rejection of his definition of simultaneity. A reformulated version of simultaneity is also offered on presentist terms. Alternatively, Tooley (Tooley, 1997) accepts Einstein's definition of simultaneity but rejects the constancy of light as defined in STR. Instead, light has differing speeds in different inertial frames of reference. What remains constant is the round-trip speed of light. As a result, the arguments for Eternalism are lacking a necessary premise. It should be noted that Tooley is not arguing in defence of Presentism but his defence could be adopted by Presentism. The other approach accepts the consequences presented by Putnam, Rietdijk and Penrose and attempts to construe a compatible presentist position. Examples of this can be found in Sklar (Sklar, 1977) who questions the transitive nature of simultaneity. As such, simultaneity from one frame of reference does not align with what is simultaneous from other frames of reference. This is required for the Eternalist endorsement. Additionally, Stein (Stein, On Einstein--Minkowski Space--Time, 1968) accepts an absolute nature of becoming and rejects any association concerning simultaneity between events outside the light cones. With this, relative simultaneity is no longer a possibility. Stein argues that the individual at the origin of the frame of reference is only able to determine temporal locations for themselves and their light cones. Nothing can be rightly asserted about temporal relations between spatially separated locations; it is impossible for me to rightly assert anything about the temporal relations between spatially separated events. It should also be noted that, as with Tooley, Stein is not defending Presentism but his defence could be adopted by Presentism. (Dainton, 2001, pp. 272-273)

Those who attempt to produce a presentist theory compatible with STR have to explain the connection between existence and presentness. What is present is different depending on the frame of reference and reality must be explained in this context. The Eternalist is not faced with the same problem. Reality is not dependent on temporal location. Unlike the presentist, if an actual object is real then it does not have to be present. Relative simultaneity is perfectly compatible with their theory of time. Differing times can be present from different frames of reference but each event, regardless of temporal location, exists. There is a connection between existence and temporal

location for presentism. Relative simultaneity means that existence and temporal ordering of events do not align. One possible way to respond is to relativize existence along with the present. Not only is simultaneity relative but so too is existence. What exists from each frame of reference depends on the relative motion between the event and the observer. This appears more like an argument against Presentism from absurdity. Regardless, the relation between present and existence must be adequately explained.

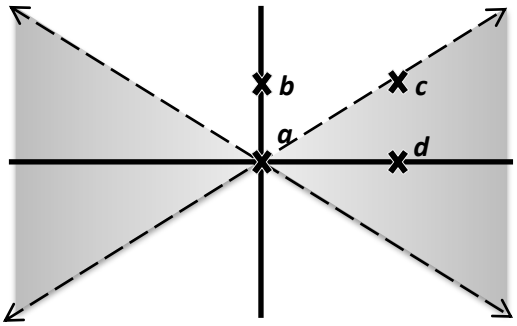
2.0 Anti-Thesis

2.1 Putnam & Stein

2.1.1 Responses to Putnam

I will mention three ways of responding to the Eternalist arguments. Each of these responses accepts that the present cannot be constructed independent of a frame of reference. In the context of the Minkowski space-time diagram, the present has to start from the centre point; from the frame of reference that the diagram represents. The first option is to assert that everything in the 'dark zone' is simultaneous with the centre point (Figure 2.0). Events might not be on the same horizontal axis but if they are located outside the future and past light cones they are also present. Events located at points *c* and *d* are both simultaneous with *a.*

Figure 2.0 –

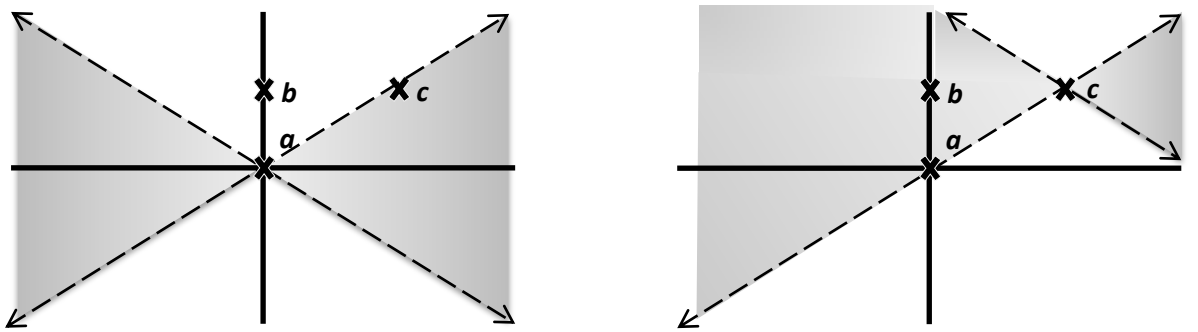


Present =

This leads to a contradiction (Figure 2.1). An event that is not spatially separate from *a* is in the future, namely *b*. *c* is spatially separated. Therefore *c* is simultaneous with *a*. From the perspective of *c*, *b* is spatially separated and so simultaneous with *c*. The following is asserted at the same time: *b* is future and *b* is present. This cannot be allowed unless a relative idea of the present is adopted, which is self-defeating for the presentist doctrine.

Figure 2.1 -

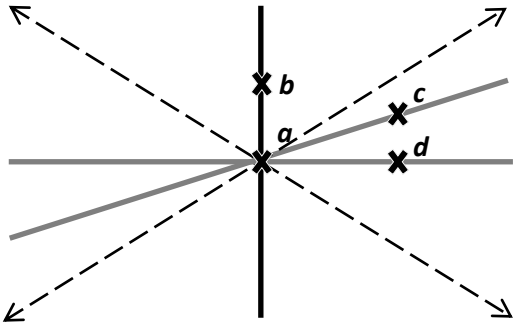
Present =



The second approach is to assert that only some spatially separate events are simultaneous with the centre point. For example, asserting that the horizontal axis is the grounding factor for the present. *a* and *d* are present (Figure 2.2). However, selecting particular set of events to be present creates a conflict; different events are present at the same time. This arises when there is relative motion between the two events that produce differing planes of simultaneity. From one frame of reference *a* and *c* are both present, as shown in the diagram. Having a single absolute present from each frame of reference cannot be the case. These presents must be relative and not absolute. Planes of simultaneity cannot be shown to run along a single universal axis. Both the plane of simultaneity between *a* and *c* is just as valid as between *a* and *d*. The resolution to this would be to assert a relative form of Presentism that, as previously noted, is self-defeating.

Figure 2.2 -

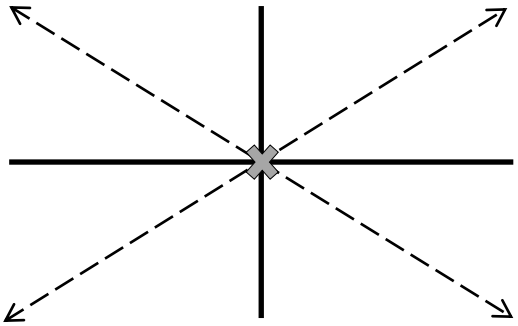
Present =



The final approach is to assert that nothing in the 'dark zone' is simultaneous with the centre point, as is done by Stein. Stein (Stein, On Einstein--Minkowski Space--Time, 1968) rejects that the notion of present can be spatially extended. The issue that Putnam highlights assumes that the present includes spatial extension. For the present to be defined in a relativistic setting it must be restrained to the here-now. (Figure 2.3)

Figure 2.3 –

Present =

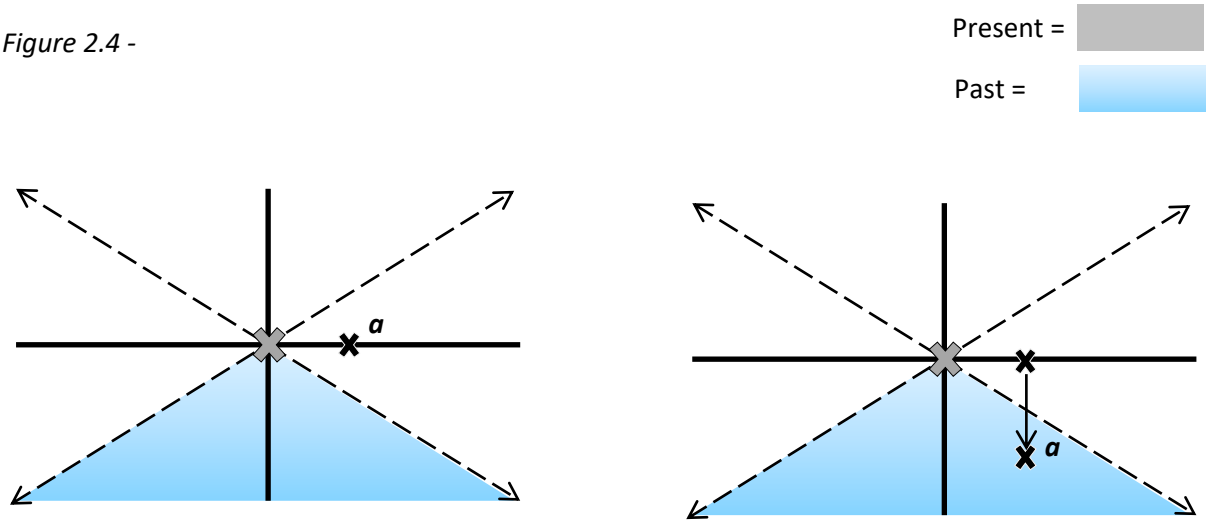


2.1.3 Putnam's Objection to Stein

Putnam articulates an objection to Stein. He states that the following arises from Stein's view: something can come to have existed without ever existing. Take a point that is outside the lower light cone from one frame of reference but at a future time will arrive inside it, *a*. (Figure 2.4) From the first frame of reference depicted, *a* is not present and does not exist. In the second frame of reference, *a* is in the past and existed. An event existed without ever existing. Things that were never real have been real. (Putnam, Time and Physical Geometry, 1967, p. 246)

Putnam asserts that the view offered by Stein conflicts with a conceptual truth about time. The nature of time does not allow something to be past that was never present. The concept of being past is derived from things that were once present.

Figure 2.4 -



2.1.4 Stein's Response

Stein does not think Putnam's objection is valid. Instead Stein argues that all that Putnam has highlighted is the stark differences between pre and post relativistic space-time. If a spatially separate event has already become, then we have assumed a pre relativistic notion; notably that simultaneity extends across spatially separated events. Stein has already rejected this notion of simultaneity:

> 'If "presentness to each other" of events is taken to mean that each has, for the other, already become, then in pre relativistic theory we have the ordinary concept; but in Einstein Minkowski space-time an event's present is constituted by itself alone. In this theory, therefore, the present tense can never be applied correctly to "foreign" objects. This is at bottom a consequence (and a fairly obvious one) of our adopting relativistically invariant language – since, as we know, there is no relativistically invariant notion of simultaneity. The appearance of paradox only confirms that the space-time of Einstein and Minkowski is quite different from pre relativistic space-time.' (Stein, On Einstein--Minkowski Space--Time, 1968, p. 15)

Stein is simply pointing out how Putnam's objection assumes a pre relativistic notion of simultaneity. As Stein does not make such an assumption, Putnam's objection merely highlights how the concept of time must be drastically different post relativity. This kind of response is best articulated in the following:

> ‘Many of the objections and replies we will encounter have this general form. First, the presentist is urged to take relativistic space-time seriously. The presentist then makes a proposal about what his view comes to in a relativistic setting. An objection is then made to the presentist's proposal which is based on some principle from outside relativity theory, such as the principle that what is past was present, which fails to hold in the relativistic setting on the presentist's proposal. The presentist then replies that the principle's not holding is just what we should expect given the relativistic setting.’ (Hinchliff, 1998, p. 580)

Judgments about temporal relations between spatially separated events are not applicable under Stein’s definition, as it is important to note:

> *‘in Einstein Minkowski space-time an event's present is constituted by itself alone. In this theory, therefore, the present tense can never be applied correctly to "foreign" objects’*
> (Stein, On Einstein--Minkowski Space--Time, 1968, p. 15)

In addition, Stein rejects Putnam’s claim concerning an objective connection between an event ‘presently existing’ and it being ‘real’. Recall Putnam’s third condition offered earlier:

> ‘III. If it is the case that all and only the things that stand in a certain relation R to me-now are real, and you-now are also real, then it is also the case that all and only the things that stand in the relation R to you-now are real.’ (Putnam, 1967, pp. 240-241)

A ‘certain relation R’ is the simultaneity between two events. Putnam is claiming (in line with Einstein’s definition of simultaneity) that the observation of another spatially separated event is equal to that event being both present and real; being simultaneous grants objective reality. Stein rejects this claim on the grounds that it is assuming a relativistically invariant notion and that the present can only be constituted by itself alone. He writes:

> ‘In fact, having stated the "man on the street's view" that "real" means "presently existing" and having correctly shown that this is incompatible with special relativity (if one assumes 'real' to have an objective meaning – i.e., to be relativistically invariant), Putnam bases the rest of his discussion upon "our desire to preserve ... one-half" of that view: namely (cf. sec. II above), the principle that all presently existing things are real’ (Stein, On Einstein--Minkowski Space--Time, 1968, p. 15)

He continues,

> ‘It is amusing to ask, Why not try to save the other half? If, indeed, instead of maintaining the implication "present implies real," we were to insist upon the converse – i.e., that only

> things that exist now are real –, we should be led by an argument like Putnam's to conclude that for any event, it and it alone is real; and then, instead of the interesting result that special relativity implies determinism, we should have the interesting result that special relativity implies a peculiarly extreme (but pluralistic!) form of solipsism.' (Stein, On Einstein--Minkowski Space--Time, 1968, p. 18)

These passages from Stein leave us with a degree of uncertainty over what exactly the theory of time he is presenting entails. His remarks about assuming 'real' to have objective meaning leave much for discussion about what exactly he is suggesting in this passage. Additionally, he starts his discussion leading to a solipsistic position with, 'It is amusing to ask'. This leaves the question open as to what exactly he is endorsing. Bourne (Bourne, 2006) offers three possibilities for interpreting Stein's positive thesis.

2.1.5 Minimalist, Relativistic and Solipsistic Interpretations

The minimalist interpretation endorses Eternalism. Stein is offering a minimalistic interpretation of becoming and existence as Eternalists do. This claim is based on the idea that the here-now is the only way of conceiving the present in post-relative space time that makes sense. Bourne writes:

> 'The minimalist interpretation of becoming and existence is based on an argument from meaninglessness: it is based on the claim that the only notion of 'present' that makes sense in the context of Einstein-Minkowski space-time is that of the here-now. The idea then, according to this interpretation, is to say that, of any event, it is present relative to itself and to nothing else: it and it alone is present.' (Bourne, 2006, p. 164)

Stein furthers this interpretation:

> 'Let us turn now to the main arguments of Rietdijk and Putnam. The common fallacy of those arguments is their employment, in the context of the Einstein-Minkowski theory, of notions about time that are illegitimate in that theory… the Einstein Minkowski structure gives us (in a very clear mathematical sense) temporal relations, but no "time" simpliciter. In the context of special relativity, therefore, we cannot think of temporal evolution as the development of the world in time, but have to consider instead (as above) the more complicated structure constituted by, so to speak, the "chronological perspective" of each space-time point. The leading principle that connects this mathematical structure with the notions of "process" and "evolution" (and justifies the use of our notion of "becoming" in relativistic space-time) is this: *At a space-time point a there can be cognizance of-or*

information or influence propagated from-only such events as occur at points in the past of a.'

Stein is presenting a view incompatible with Putnam and Rietdijk but his watered down version of becoming is not sufficient to distinguish it from their endorsements of Eternalism. Nothing of what is said about the present is adequate to make it incompatible with the Eternalist view. In fact, an Eternalist may happily subscribe to the version of becoming offered here. Nothing is distinctive about this version of becoming is incompatible with Eternalism. Stein is principally opposed to Putnam and the Eternalist doctrine but interpreting Stein in this way aligns the two positions. It is unlikely that Stein desired his positive thesis to result in such an association.

The relativistic interpretation accepts reality to be a relativistically variant notion. Post relativistic time results in reality joining simultaneity as a relativistically variant notion. Just as each point in space-time has its own self-contained present; it also has its own self-contained reality. Bourne captures the nuance of this view:

> 'What exists for me is not necessarily what exists for you. What is wrong with that? Well, first, although we may think that existence can be relativized to some things, such as times, it sounds more like a bad joke to think that existence depends on how fast you're going! But, nevertheless, it might well be argued that anyone who accepts STR will accept that simultaneity is frame-relative; so anyone entering into the spirit of special relativity will be happy to accept that existence itself is frame relative.' (Bourne, 2006, p. 168)

However, the support for endorsing this view is lacking. Interpreting Stein in this way leads to a conclusion about reality that he does not argue for. Granted, it might well be the case that reality is relative but this view should not be accepted without sufficient backing. Stein does not offer support for the relative interpretation. It is a difficult to see why these consequences should be accepted simply to make sense of the previous reasoning Stein has used. The Eternalist has no reason to adopt such a view. Equally, Eternalism is perfectly capable of avoiding such a result:

> 'Well, not quite! Tenseless theorists need not accept it. So because there is a theory available that does not lead to the conclusion that we must relativize existence itself, and because there are no other compelling reasons to relativize existence, tense theorists should not happily swallow this conclusion and take it to be a surprising discovery about existence, but should view it as an unwelcome consequence of adopting this solution.' (Bourne, 2006, p. 168)

The solipsistic interpretation is the last understanding of Stein's positive thesis that will be discussed. This view maintains that reality and presentness are interconnected as a proper tensed theorist would maintain. Reality is assumed to be as restricted as the present is; reality is to follow suit in line with Stein's definition of the present. Recall that Stein asserts:

> *'in Einstein Minkowski space-time an event's present is constituted by itself alone. In this theory, therefore, the present tense can never be applied correctly to "foreign" objects'*
> (Stein, On Einstein--Minkowski Space--Time, 1968, p. 15)

The solipsistic view takes the present to be spatially restricted. Granted, we often think of the present in a spatially limitless sense. But there is no reason for this, post relativity. The here-now is all that exists. Each here-now is all that can be granted existence. Stein offers support for this view:

> When a soldier at roll call responds "Present!" upon hearing his name, he is not merely announcing that he still exists; he means that he is on the spot. Now, in the theory of relativity, the only reasonable notion of "present to a space-time point" is that of the mere identity-relation: present to a given point is that point alone-literally "here-now"' (Stein, 1991, p. 159)

Stein's argument is not strong enough to affirm that the only way to conceive of the present as spatially contained. What we can conclude with certainty is that the notion of a here-now present is valid. The reasoning allows for us to understand the present in the here-now sense but doesn't exclude any other expression of the present. Further support is needed for this:

> 'This argument certainly shows that we have a legitimate use for the notion of the here-now. But this argument does not show that the notion of the here-now is primary; less still does it show that we have no conception of the present extending beyond our spatial location.'
> (Bourne, 2006, p. 170)

The solipsistic interpretation, although producing some strange consequences, is how I shall take Stein's positive thesis. It maintains Presentism and can express the ideals that a presentist wants to with ease. Becoming can be explained relative to each frame of reference. Everything which is in the upper light cone is in a state of non-existence and then becomes at the present; only that in your here-now is real and holds true to an objective definition of becoming. Reality is restricted to your frame of reference and only what becomes for you counts. Objectively, a spatially restricted reality becomes at your here-now.

However, this is not without difficulties. Note that the past is that in the lower light cone and Stein maintains that it is as real as the present. Exposition on why Stein holds these views and how they are problematic follows.

2.2 Alternative to Stein

2.2.1 Stein and the Past

Stein makes two notable claims when he defines the past. Firstly, he claims that the past is defined as that which takes place in the lower light cone. What takes place in the observer's lower light cone is said to be in the 'absolute past' of that observer, since those events are in that observer's lower light cone in all frames of reference. Whilst it can be said that everything in another observer's lower light cone is past for them and this is absolute, a judgement about the temporal location of a spatially separated event in another observer's lower light cone relative to that frame of reference cannot be asserted. Secondly, he claims that the absolute past is as real as the present. This means that from each frame of reference everything found in the lower light cone is just as real as that at the present. These claims result from Stein arguing against Putnam and Rietdijk. (Stein, On Einstein--Minkowski Space--Time, 1968, p. 16)

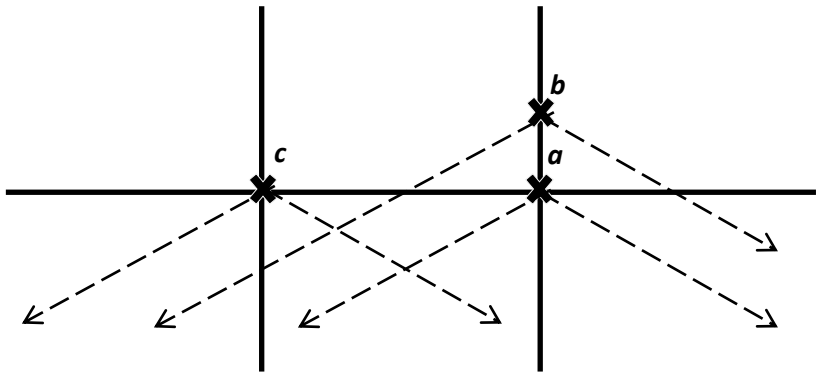
Stein's reasoning for defining the past as that which takes place in the lower light cone appears intuitive. The lower light cone is representative of possible information and knowledge that is accessible at the present. Cognizance of past events allows for temporal ordering. It is possible to assign a chronology to everything in the lower light cone. The lower light cone is the only area of space-time where this is possible. No observer can have perceptual knowledge of anything outside the lower light cone. It is impossible for such an epistemological connection outside the lower light cone and it is also impossible for anything outside of the upper light cone to become at the present. This claim aligns with Stein's rejection of Putnam's spatially extended definition of the present. Stein has already reduced the present to the here-now. Stein expresses this in terms of geometric positions:

> 'In the geometrical situation defined at the beginning of this section,[1] the point c is not in the past of a (nor identical with a), and a is not in the past of c; therefore, no information or influence from or cognizance of either can occur at the other. This provides no warrant at all

[1] 'For any points a and b of Einstein-Minkowski space-time, there is a point c in space like relation to both: i.e., such that c is comparable neither with a nor with b under the chronological ordering.' (Stein, On Einstein--Minkowski Space--Time, 1968, p. 12) See figure 2.5

for the claim that the event at c must be "real" or "determinate" to an observer at a; and the fact that there is a time axis orthogonal to the direction from a to c (or a time-coordinate function having equal values at a and c) adds nothing. The relation of b to c is of course just the same; the existence, adduced by Rietdijk, of a time coordinate whose value is smaller at b than at c, does not put b – in the absolute, or physical, or relativistically invariant sense in the past of c, because "a time coordinate" is not "time." Neither a nor b is, in any physically significant sense, "present" (or past) for any observer at c – regardless of his velocity – for neither has already become for c (nor has c for them); but a has already become for b, and can influence it.' (Stein, On Einstein--Minkowski Space--Time, 1968, p. 16)

Figure 2.5 –



2.2.2 Objection to Stein

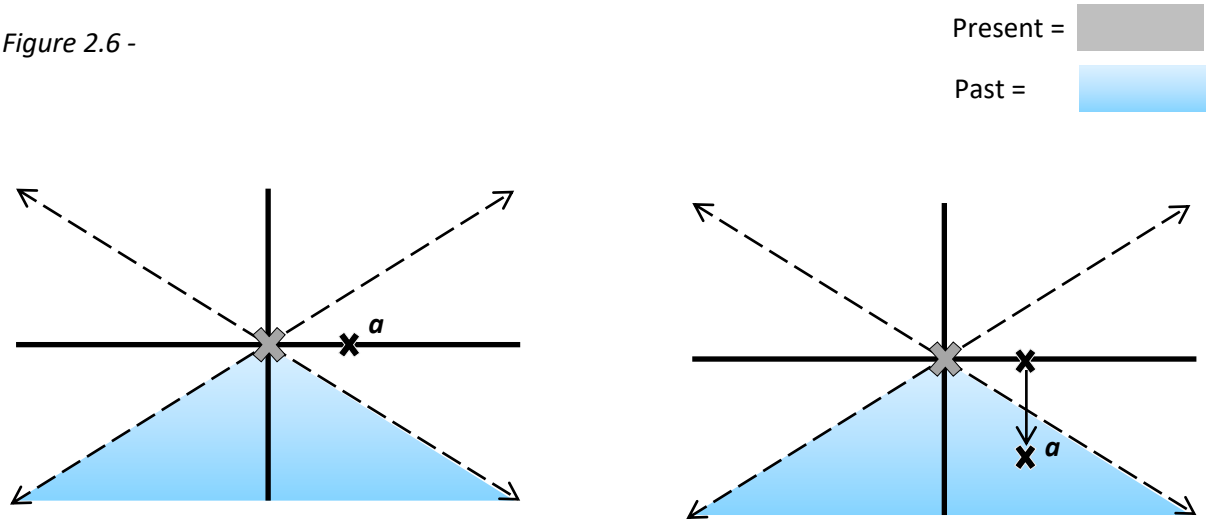
It would be good to recap the structure of the argument at this point. We started with STR endorsing Eternalism, embodied by the arguments of Putnam, Rietdijk and Penrose. Stein responds directly to Putnam and Rietdijk. Stein points out that a spatially extended present is incompatible with post relativistic space-time; consequently pointing out the fallacy of Putnam's argument. Putnam argues that an event can come to have existed without ever existing. This, to Stein, is also a fallible objection, resolved by rejecting the assumption of a present incompatible with post relativistic space-time. However, this is where I take issue. I find Stein's response to be unsatisfactory. He responds to Putnam by expressing the invalidity of his argument. The present in post relativistic space-time is not spatially extended. This is how Stein assumes Putnam to be mistaken. Recall Stein's assertion:

'If "presentness to each other" of events is taken to mean that each has, for the other, already become, then in pre relativistic theory we have the ordinary concept; but in Einstein

> Minkowski space-time an event's present is constituted by itself alone. In this theory, therefore, the present tense can never be applied correctly to "foreign" objects.' (Stein, On Einstein--Minkowski Space--Time, 1968, p. 16)

However, this does not fully encompass the extent that the problem Putnam is raising. Stein believes that simply clarifying what constitutes the present in post relativistic space-time is sufficient for overcoming the objection. But even if the present does not extend to any other point on the Minkowski space-time diagram, it allows for an event never existing but at a future point to have existed (Figure 2.6). A spatially restricted present does not resolve the problem. The past for Stein is that which takes place in the lower light cone. This is something spatially extended and contains events and objects that are as real as the present. His views about the past allows it to contain real entities when, even under exclusive relativistic notions, they never were realised in the present. Making the present contained is irrelevant to resolving this problem. This issue is found in a discrepancy between defining the past as spatially extended and the present as spatially contained.

Figure 2.6 -



The issue is a product of the way Stein has defined the extent of the past and present. In addition, his claims about the past's reality must also be examined. Regardless of whether the past is real or not the issue remains. If the reality of the past is rejected, then the issue concerns how something that did never presently exist can have existed. If the reality of the past is accepted, then the issue concerns how something is real when it never became real at the present. Either way Stein fails to address Putnam's objection.

I shall offer clarity on the reality of the past and then produce a satisfactory response to Putnam's objection. In rejecting Stein a viable presentist position emerges. If the past contains objects that

exist then it is no longer the case that everything that exists is present. The past contains events that are not present but do exist. A response can still be produced that will accommodated a presentist mentality and it is in line with the starting position Stein has presented.

2.2.3 The Reality of the Past

Stein's claims about the reality of the past are not sufficiently supported. An adaptation of his argument against Putnam's spatially extended (and pre relativistic) concept of simultaneity can be applied to the past as well.

If we take apart Stein's argument, we can fully diagnose his mistake. Recall that Stein remarks the following in response Putnam's assumptions about how simultaneity functions post relativity:

> 'The point c is not in the past of a (nor identical with a), and a is not in the past of c; therefore, no information or influence from or cognizance of either can occur at the other.' (Stein, On Einstein--Minkowski Space--Time, 1968, p. 16)

Note that knowledge of events is important. Possessing such information about events allows for an individual to create a temporal structure; to produce a chronology, in an absolute sense, of when an event occurred. Without such cognizance it is impossible to do this. An individual's lower light cone is the only place where it is possible to accurately assign a temporal location for events. This is why the lower light cone is synonymous with the past.

If the event exists outside of the lower light cone, it is impossible to deduce anything about the event's reality or where it is located in time. Being in the lower light cone gives the event an absolute and set location relative to the observer. Stein affirms there to be a significant difference between the relation between events in the 'dark zone' and the relation concerning an event in the absolute past:

> 'Neither a nor b is, in any physically significant sense, "present" (or past) for any observer at c – regardless of his velocity – for neither has already become for c (nor has c for them); but a has already become for b, and can influence it.' (Stein, On Einstein--Minkowski Space--Time, 1968, p. 16)

The important notion to understand is that Stein firmly holds there to be an objective difference between events in the absolute past and events located outside the lower light cone. The past and present are all of which an observer is capable of possessing knowledge and this is what grants reality.

However, this view is not grounded by sufficiently strong support. Stein's requirement is such that the absolute past is somehow under the influence of the present event; cognizance and information being accessible. The ability to create a chronology, assigning a temporal location to an event is the basis of Stein's argument. He shows how the lower light cone is the only place where this is possible. The knowledge an observer possesses permits them the ability to create a temporally ordered structure. It seems that it must also be necessary to show how this form of influence translates into *reality*. Simply possessing knowledge about the past is independent of the issue of whether past events are real. Simply knowing something does not result in the object in question existing. Being able to create a chronology of events is equally irrelevant to those events being real. Actual events are not real merely in virtue of being temporally ordered. Stein would require an additional argument that justifies his claim about the reality of the past. As he does not provide such an argument, there is no need to follow Stein when he subscribes to the reality of past objects and events.

2.2.4 The Extent of the Past

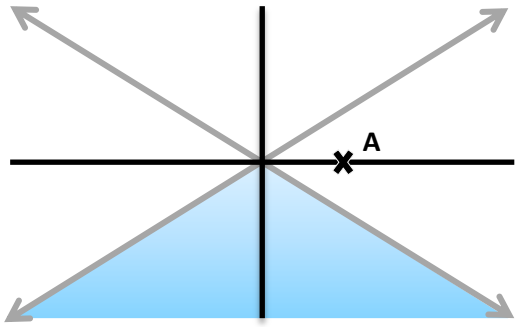
To resolve the problem raised by Putnam, the discrepancy between what constitutes the past and the present must be resolved. The problem arises because the present is reduced to a small point of here-now in the centre of the Minkowski space-time diagram while the past is extended to an entire quadrant of the diagram. An entity can easily avoid passing through the narrow present and enter into the protracted past. Two recognizable solutions are appropriate. We either reduce the past to a smaller entity or extend the present to envelop the past. Both solutions must ensure that any entity located in the future is not capable of being located in the past at a future time without first being located at the present. The present must exist as a border between the future and past ensuring that the migration of entities from future to past goes through the present. Two positions follow which are capable of resolving these problems: Cone Presentism and Point Presentism with a localised past.

Cone Presentism resolves the problem by extending the present beyond a point; namely, along the light cones (Figure 2.7). Two things are simultaneous when one exists on the light cone of another (Godfrey-Smith, 1979). This resolves the problem by increasing the size of the present to encase the past. Everything in the lower light cone has the present at its border. Nothing is capable of moving into the past without first entering the present. Things are no longer able to have existed without ever existing.

Figure 2.7 –

Present =

Past =

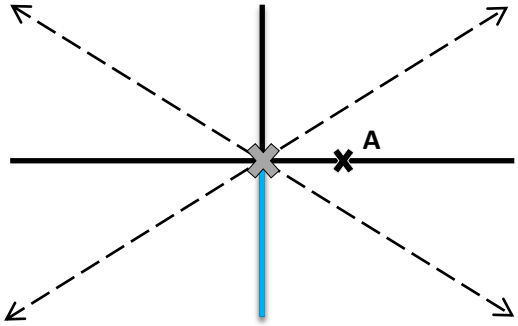


Localising the past with point Presentism reduces the scope of the past. This is done by reducing the past to that which was in the observer's here-now'. (Figure 2.8).This remedies the discrepancy between the past and present by making only that which was realised in the observer's here-now constitute this past. This localised past can always affirm the past to have once been present. Only events and objects that have been realised at the present will have existed. Becoming is contained to the progression of here-now's. Those things which become at present are all that can be claimed to have existed when they are no longer present. As all presentness is contained within the object itself, every object will have its own here-now present and its own pathway through previous here-now's (the object's so-called 'worldline' determines what is and was real for that object).

Figure 2.8 -

Present =

Past =



2.2.5 Point Presentism & the Past

Out of the two possible solutions, I find point Presentism with a localised past to be the preferable option. Cone Presentism is subject to an objection by Savitt. Under the cone presentist model, events that we know to be temporally distant are aligned with the present. Cosmic background radiation exists in the light cone of everyone on earth but its source is the big bang. The big bang is temporally distant from us right now but the cone model makes it simultaneous with us. (Savitt, 2000, p. 6) In addition to wanting to avoid this objection, an argument for accepting the present to be contained is found in empiricism. What we have justification for does not extend beyond a single point. More will be said on this reasoning in the following section.

2.2.6 Point Presentism

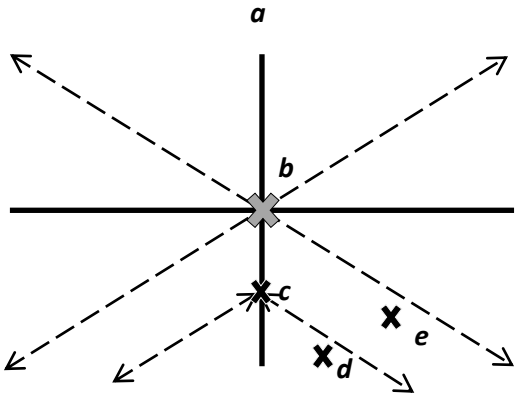
Point Presentism is the resultant theory of adopting this solution to Putnam and interpreting Stein in a solipsistic way. The view I offer is similar to the one Stein offers but is distinct when concerned with the characterisation of the past. The nature of the present is contained simply to the point on which the frame of reference is centred. For us as humans it is entailed by taking a strict justificationist position that the frame of reference is restricted to the mind. Every observation that we call present is the current interpreted mental picture. The past takes the same form as the present; a series of mental phenomena that were previously a part of your present mind-set. Each individual is capable of creating a chronology on past presents. It is beyond the scope of this discussion to state how memories are forms that link current experience to previous experiences in such a way that an ordering of events could be created. However, later in the investigation (See 3.3.4) a brief sketch of an account is given.

Expressing this view on a Minkowski space-time diagram will provide some clarity (Figure 2.9). The line *a*, represents the observer, *b's*, progression through time. Each point on the line from *c* to *b* and towards *a* are progressing points that either were once present or will become present for the observer. Adopting Justificationism in that way I have presented entails the present to be restricted to the mental state of observer *b*. Nothing else is present. When the observer was located at *c* the event located at *d* is within the light cones. A mental representation of *d* can be a part of the present at *c*. The actual event located at *d* is irrelevant to what is present at *c*. Only a phenomenal representation of *d* can be present at *c*. The event *e* is outside of the light cones for *c* and therefore no belief concerning the existence of *e* could be justified. At *b* both *e* and *d* are within the light cones. A belief about their existence can be justified. At *b* a mental representation of events located at both *d* and *e* can be present. Anything actually occurring at any location spatially separated is

neither a part of any present or past for the observer. What is present for *b* is simply a mental representation of events located at *d* and *e*. What is past for *b* is that located at *c*. All that was located at *c* was the mental representations of events within the light cones. A mental representation of *e* is not past for *b* but is a part of the present at *b* as *e* is located on the lower light cone of *b*.

Point presentism is the theory that asserts the present to be that which is here-now. The past is restricted to the same form as the present; a pathway through previous here-nows. All that constitutes the past is that which was present. The present is entirely contained to the mind; all that was present was phenomenal so all that is past is also phenomenal. Whatever the past mental states that can be justified from your here-now are all that constitutes the past.

Figure 2.9 –



This is a strong conclusion to reach and will not stand up to scrutiny unless extensive support is offered. Justificationist ideology provides this support when taken with empiricism. Putnam relies on physics to determine the ontology of time. In assuming justificationism, his argument that empirical methods and constrictions determine the ontology should also lead to the adoption of point presentism.

3.0 Positive Thesis

3.1 Justificationism& Empiricism

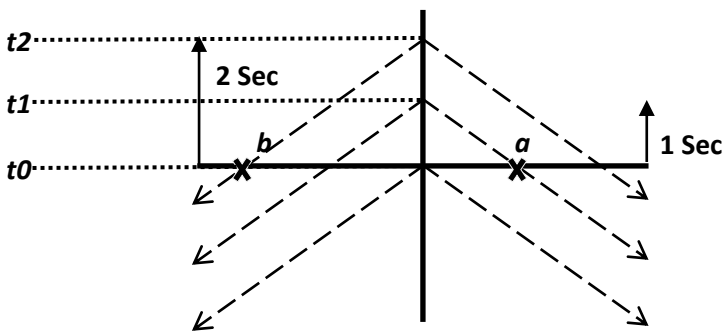
3.1.1 Justification for a Spatially Contained Present

All three endorsements of Eternalism stated in this investigation (in section 1.6) assume that the present is spatially extended beyond events located at the centre of a frame of reference. Stein rejects this notion but as previously noted (section 2.1.5) he has no argument against a Presentist or Eternalist who says it does make sense. Justificationism can be implemented here underpin Stein's position. Remaining true to the aim of this investigation, nothing is to be included in the metaphysical picture of time that is not justified from evidence. Only presently accessible information can be included in a definition of simultaneity. When we take a proper empirical stance on presently accessible information, a spatially contained present is all that we can justify. Einstein defined simultaneity by referencing two spatially separated events. The observations of which provided the total justification for their simultaneity; simultaneous observations equated to the actual simultaneity of those events. In this definition, Einstein asserts that you can determine the simultaneity of two spatially separated events so long as you are in the middle of them.

Our observations of the spatially separate are observations of the object's past state. Our observations are based on the present light we perceive but this does not equate to the present state of the object. The information we decipher from light and interpret is of an object's past state. For us, the actual spatially separated object is not to be equated with the corresponding mental phenomena that represent it. All that is present is a singular event; a temporally and spatially contained conscious experience. The information presently conveyed by light does not entail any other object's present state.

For example, suppose that a table has spontaneously come into existence in a location spatially separate from two observers (Figure 3.0). Light takes one second to travel from the table to the first observer *a* and two seconds to travel to the second observer *b*. The table shall be assigned three temporal states. One for each frame of reference we have taken. At the point of creation, *t0*. After one second, *t1* and after two seconds, *t2.*

Figure 3.0 –



When the table is first comes into existence neither *a* nor *b* can possibly assert anything about it. After one second it becomes possible for *a* to perceive the table. However, the perception will be of the table as it was at *t0* not as it is at *t1*. It is impossible for *a* at *t1* to assert anything about the table as it is at *t1* because the light cannot have reached the spatio-temporal location at *a*. After two seconds it becomes possible for *b* to perceive the table as it was at *t0* and for *a* to perceive the table as it was at *t1*. Asserting that the perception is of the present state of the object (After 2 seconds *b* perceives the state of the table at *t2*) implies an impossible instantaneous connection with the spatially separated object.

A point of present is all that remains after justifying from empirical evidence. The spatio-temporal location of 'now' is confined to the centre of the frame of reference. For us, as humans, this means that the present is restricted to a current mental state. The collection of things to be included as present can only be made up of a single conscious experience. 'Now' refers to what you currently experience; only that which it is possible to justify at your present can be included in any single present moment. Working in line with justificationist ideology, we can conclude that: when it is impossible to justify the actual existence of an event or object we cannot conclude that those events or objects exist. It is impossible to justify present existence beyond each point and so all that we can claim exists is that located at a singular point of present.

3.1.2 Revised Definition of Simultaneity

A revised definition of simultaneity is required in line with the results of this investigation so far. Recall that Einstein has only one requirement for two events to be simultaneous, simultaneous observation. Being able to verify is the central notion that he requires the observer satisfy. When observers produce conflicting accounts of the present, he concludes with the relativity of simultaneity. Einstein's verificationist assumptions are not to be rejected. In fact they are to be fully embraced; not only should we accept them but further them. Einstein's notion, that two observations made at the same time are simultaneous, still holds. What must change is the connection these observations have to the actual world. When a claim is made that two events are simultaneous, all that is being discussed are the cognitive perceptions exclusively. Two mental

phenomena apart of the same conscious experience are simultaneous. The present is not spatially extended and does not include anything beyond a single point; empiricism prevents this.

Take the example previously offered by Einstein concerning two flashes of light on a train (explained in 1.5.1). For one observer the flashes are simultaneous and for the other they are not. In Einstein's account it is important to remedy the conflicting accounts because reference is being made to the actual spatially separated events. However, once you accept that your experience is contained to a point, there is no issue. One experience determining that the light flashes are simultaneous has nothing to do with what any other observer experiences. Experiences do not determine the actual simultaneity between any spatially separated events. An experience is restricted to a single point and says nothing about any event beyond that point. For the observer asserting that the light flashes are simultaneous, the assertion is to be reduced to the following: my experience is of the light flashes being simultaneous. As experience is contained to the mind and nothing is being said concerning the actual events' simultaneity. To conclude that an experience determines the simultaneity of two spatially separated events would be incorrect. Instead, two conflicting accounts cannot say anything about the simultaneity (or lack of) between the light flashes; their experiences do not provide sufficient support for this.

3.1.3 Unjustified Eternalism

The relativity of simultaneity was the driving force behind endorsements of Eternalism based on empirical evidence (section 1.6). With a revised definition of simultaneity, there is no reason to adopt relative simultaneity. This removes a necessary premise from the arguments for Eternalism. Take Putnam's argument, which involved four premises. The last assumes STR, as defined by Einstein, including the way he defined simultaneity. Without this premise, there is no discrepancy between what one observer asserts as past and another as present. The existence of future events from any single frame of reference is no longer presently justified from another frame of reference. A spatially extended present is required along with relative simultaneity to make any claims concerning events in one observer's future already existing. Additionally, Rietdijk's argument no longer follows. He argues that the events I call present can be past to another. When Einstein's simultaneity and a spatially extended present are removed, he offers nothing to endorse Eternalism. This form of response is somewhat anticipated by Rietdijk as he accepts that: 'an extreme positivism: "that which cannot yet be observed does not yet exist", can possibly withstand the conclusion concerned' (Rietdijk, 1966, p. 343) Finally, Penrose suffers the same form of refutation. What is striking about Penrose's argument is how he accepts that at the present spatially separated events are unjustifiable:

> ‘In fact neither of the people can yet know of the launching of the space fleet. They can know only later, when telescopic observations from earth reveal that the fleet is indeed on its way’ (Penrose, 1989, pp. 392–393)

In arguing from a justificationist stance, anything beyond the possibility of justification should be disregarded. It is impossible to observe anything presently occurring in another galaxy, so it does not follow that anything occurring there is presently simultaneous with what is occurring here on earth. It should not be accepted that things exist when they cannot be justified. All we could possibly have justification for is provided by experiences here on earth.

3.1.4 Justified Point Presentism

Empiricism and Justificationism leaves us with simply a point of present as possibly justifiable. This is how we justify Stein’s claims concerning a spatially contained present. Stein offered a definition of the present that restricted it to the present but he has no argument against a presentist or eternalist who says it does make sense (section 2.1.5). Justificationism provides this support. Most importantly, it should be noted that the support for a spatially contained present comes from the same line of reasoning used to endorse Eternalism from empirical grounds in STR. The arguments against Presentism shown in this investigation were based on justifying from evidence; starting from physics and then following what view of time we arrive at. Putnam even went as far as to disregard the philosophical dialogue as being relevant to arriving at that outcome. Physics taken with Justificationism alone provided a definitive answer.

Eternalism seems to overstep what is empirically justifiable and Point Presentism conforms to it. Putnam, Rietdijk, Penrose and any individual who accepted empirical justification to be important will find Point Presentism obeys the consequences of empirical justification and Eternalism does not. I have not altered the method of how these individuals arrived at their conclusions but instead fully endorsed this form of justification. What has changed is the accuracy of what we are able to justify. I have removed things that are impossible to justify but left the full extent of everything that can possibly be presently justified. What we have discovered is that instead of Eternalism being the theory that is fully justified from empirical evidence it is instead Point Presentism. When taking everything that can be possibly justified as being a part of a present we have justification for Point Presentism.

3.2 Beyond Justification

3.2.1 Justificationism and Existence

As present beliefs are all that we are capable of justifying there is much to explain about beliefs concerning things beyond the present. Our experiences provide justification for the truth of a belief. If we have an experience that justifies a belief then we can conclude with the belief being true; where there is not an experience providing justification, the truth of a belief cannot be held. Discussion is required of what can be said about everything beyond our current instant of mental experience. It should be noted here that Justificationism has so far been used exclusively to affirm what exists. A belief, in the existence of an event or object, is only held as true if it is possible to justify the belief. If such justification is impossible then we cannot assert existence. I will detail two options for explaining the unjustifiable. The first I will call the strong interpretation and the latter the weak interpretation.

3.2.2 Strong Justificationism

The stronger view takes our experiences to provide justification for beliefs that encompass the extent of existence. That which cannot be justified cannot be true. If justification cannot be provided for a belief then it cannot be true. Strong justificationism assumes that experience is the basis for existence; if a belief cannot be justified from experience then the belief cannot be true. Epistemology is the only factor driving ontology. Beyond experience there is no possible existence as it cannot be justified. The extent of the world is determined by what can be justified. What we experience encompasses the ontological; those beliefs that are justifiable contain the extent of true beliefs. As these justifiable beliefs are restricted to the present and the present is simply a point, all that exists is the here-now and everything beyond that does not exist.

The ‘dark zones’ and future resemble areas of space-time beyond the outer most limitations of possible justification. The localised past can be justified based on present evidence but this does nothing to justify the actual existence of any event or object located in the past. There is no way of claiming anything in these areas exists from our frame of reference. Therefore, nothing located in those areas presently exists. An observation of an object that is not here-now is explained as present tense mental phenomena. What is justifiable never extends beyond any point. So everything beyond that point is non-existent. You could endorse strong Justificationism and defend the consequences adequately but it is not the only option, the weaker alternative can be just as effective.

3.2.3 Weak Justificationism

The alternative is to adopt a weaker version of Justificationism. When experience is not sufficient to provide justification for the truth of a statement the result is not to assert that the belief cannot be true. We arrive at a weaker view by reducing the connection between epistemology and ontology. Justification provides only part of the picture. Our experiences do no encompass the extent of existence, as much beyond experience might exist. Every belief that is justified is true but not every belief that is true has the possibility of being justified: if it is justifiable then it is true but if it is true then it is not necessarily justifiable.

We are not justified in asserting truth to any belief referring to objects found in the 'dark zones' but that does not mean that we should conclude that they do not exist. It means that we cannot say if those beliefs are justified or not. An agnostic position is required. Beliefs about objects existing in places we can never justify may well be true but we cannot make such assertions. What we can say is that those beliefs for which my experience does not provide justification cannot be determined to be true of false. As our frame of reference will never allow for the justification of certain beliefs, we do not assert that the referent of those beliefs are non-existence but instead remain agnostic. This is distinct from the strong interpretation because our experience does not definitively provided justification for all true beliefs.

Assertions about the existence of events in the lower light cone cannot be true but you say some true things concerning past events. If there is presently accessible evidence justifies a statement about the past then it is true. For example, if you hold an accurate memory that yesterday you were eating a cake. There is present evidence, located in the here-now, that supports assertion that yesterday you was eating cake. So the assertion is true. If you do not possess present evidence to support this assertion that the conclusion is agnosticism; the assertion is not false. You just do not have sufficient justification to hold the statement.

Van Fraassen (van Fraassen, 1998) defines a form of agnosticism that parallels with the weak version of justificationism I am offering here. A distinction is made between scientific gnostic and scientific agonistic positions. A gnostic believes that the scientific beliefs they hold are true. The agonistic believes that the scientific beliefs they hold are empirically adequate but does not believe them to be true nor do they believe them to be false. Van Fraassen suggests in situations where there are unobservable entities that we should remain agonistic concerning a belief about their truth:

> 'The first agnostic I envisage says: 'I accept theory T, I believe it to be empirically adequate, but look – T also postulates some unobservable entities. Their existence is not required for

> T's empirical adequacy, and I have no opinion at all about whether those entities exist.' The second is a slightly more sophisticated colleague, who begins instead with: 'I accept T in a qualified way, I have my subjective probabilities for its empirical adequacy, for the putative empirical evidence, and for certain rivals of T, but look - ...' (ending the same way).' (van Fraassen, 1998, p. 214)

Empirical adequacy does not play a part in position I am articulating. What is to be taken from van Fraassen is the notion of agnosticism. Agnosticism is to be understood as having no opinion concerning the truth of beliefs that are impossible to justify. If there is no way of accurately deciding whether or not a belief is true of false neither is assigned. In contrast to the strong view where if there is no empirical justification then the conclusion is that the belief in question is not true. However, it appears plausible for there to be a dissonance between what our experiences justify and whether or not a belief is true or false. Not having access to the necessary empirical evidence only rules out claims affirming the truth of a belief but does not necessarily affirm falsity. Under this view a truth value is not assigned to unjustifiable beliefs.

To assert that something does not exist has the same requirements as asserting its existence. A suitable associate to evidence is required supporting the claim to non-existence. Suppose that hidden under the earth is the fossilised remains of an undiscovered dinosaur. It is located in such a position that at our current level of technological advancement it is impossible to discover. This does not mean that it does not exist. What it means is that we have no way of justifying the corresponding existence statements. There is the possibility of this entity existing here but no one is making this claim. We should not claim that it does not exist; instead, we should never make claims about it.

3.3 Problems for Point Presentism

3.3.1 Problems with Justificationism

Both the weak and strong interpretations of Justificationism have problems. Adopting a weak version of Justificationism results in an inability to distinguish between futures, pasts and the 'dark zones'; the result of weak Justificationism is agnosticism concerning all spatially and temporally separated events. When adopting this version of Justificationism it applies to everything that cannot be justified. This includes beliefs about events in the future and past. For the presentist, events located in the future and past do not exist. Actual events located at the present are all that exist. Even though beliefs about events in the future and past cannot be justified it is not the case that they are not true. Weak Justificationism means that we can only affirm truth to that which is

justified. It is not the case that an unjustified event does not exist. There is nothing to be said about whether a corresponding object or event of an unjustified belief exists or does not exist. The problem is that events in the future and past could exist even though the corresponding beliefs are unjustified. Just like beliefs concerning the unjustified 'dark zone' those beliefs about the future and past are also granted an agnostic status. Existence simply cannot be defined beyond that which is present. Global agnosticism results; previous events that the presentist would have agreed do not exist have the possibility of existing.

The result of applying Justificationism to the empirical evidence leads us to either of these conclusions. Depending on how strong you want your Justificationism to be, the result is either a point of existence or a global agnosticism. It should be noted that reaching these points is simply the result of applying Justificationism, along with empirical thought, to the scientific evidence. The point being that whatever you say, Eternalism is shown to overstep the mark.

3.3.2 Semantical Issues

Presentism is also quite commonly objected for issues pertaining to semantics. More than what is present can be discussed but if all that exists is what is present, what makes talk about that beyond the present meaningful? The objection is simply: how can expressions have meaning when they refer to something that does not exist:

> 'One problem has to do with what appears to be perfectly meaningful talk about non-present objects, such as Socrates and the year 3000. If there really are no non-present objects, then it is hard to see what we are referring to when we use expressions such as 'Socrates' and 'the year 3000'' (Markosian, 2016)

Point Presentism is capable of resolving this objection. All that exists is that which is present. The same is true for everything that you have the possibility of referencing. It is not the case that when an individual speaks of 'Socrates' they are referring to a non-present entity. They are simply referring to a present mental concept. When we discuss Socrates, reference is only ever made to our present knowledge. It would be impossible for us to include in any discussion, pertaining to Socrates, anything beyond present knowledge. This is far from a fully developed defence of the response but is stated here to give an idea of the way in which I would try to respond. Markosian also objects to Presentism on grounds for making sense of the relations between non-present objects:

> 'Another problem for the Presentist has to do with relations involving non-present objects. It is natural to say, for example, that Abraham Lincoln was taller than Napoleon Bonaparte,

> and that World War II was a cause of the end of The Depression. But how can we make sense of such talk, if there really are no non-present objects?' (Markosian, 2016)

To make sense of such talk we have to first accept that all objects and events referred to are present. When someone produces the claim, 'Abraham Lincoln was taller than Napoleon Bonaparte', a discussion is being held concerning present beliefs exclusively. These present beliefs concern the height of Abraham Lincoln and Napoleon Bonaparte. The speaker has a belief that a certain person was a certain height. The referent of the belief might not be present but the belief about the height of those individuals is.

From here someone assuming a strong justificationist stance can argue the following. These beliefs are true if there is presently accessible information that justifies the belief. There are present mental concepts that justify the height of the two individuals the beliefs concern. The two beliefs held by the individual are the height of Abraham Lincoln and the height of Napoleon Bonaparte. They are true because of the presently accessible information providing justification. From this you can produce a third belief. If the present belief of the height of Abraham Lincoln affirms a greater height than the present belief affirms to the height of Napoleon Bonaparte then it follows that the present belief 'Abraham Lincoln was taller than Napoleon Bonaparte' is also justified and true. This is done without reference to anything beyond presently justified beliefs. The weak justificationist can take the same approach but remains agonistic over what exactly makes a statement true. The beliefs can still be held because there is presently accessible evidence that justifies holding the belief. What actually makes the belief true is irrelevant. The same argument can be made because the beliefs are justified by evidence regardless of whether or not they are true. To parallel van Fraassen, the claim is that you accept that Lincoln is taller than Napoleon but you remain agonistic when concerned with the truth of such a claim.

3.3.3 Truth-makers

To resolve the previous semantical issues for Presentism, clarity was all that we required concerning the referent of an expression; notably that all terms refer to presently existing events and objects. Again I will note that this is far from a fully developed defence of the response but is stated here to give an idea of the way in which I would try to respond. However, there is a more substantial issue when concerned with what makes a statement true:

> 'A third problem for the Presentist has to do with the very plausible principle that for every truth, there is a truth-maker. The problem is that it is hard to see what the truth-makers

> could be for such truths as that there were dinosaurs and that there will be Martian outposts.' (Markosian, 2016)

The response to this issue varies depending on whether or not you follow strong or weak justificationism. The strong justificationism can respond as follows. Right now, the presentist will accept that dinosaurs do not presently exist. What then makes a statement such as 'it is true that dinosaurs existed' true? The claim that a past tense statement is true is so because there is presently accessible information that supports it. Remember, that point presentist here is solipsistic; you are the definitive authority of what is past. Only that which is in your present is all that is present. When talking about the existence of dinosaurs, reference is never made to anything beyond that which is possible to presently access. The information currently accessible to any individual is such that there is sufficient justification for us to produce the claim that dinosaurs existed. If the presently accessible information is sufficient to warrant the possible justification of a statement being true then we can conclude that it is true. There have never been any direct observations of dinosaurs. The reason we accept that they existed is because at the present is it possible for their existence to be justified. Fossils provide part of this justification. Their existence can be a part of our presents. It is possible for you to presently perceive a fossil. In turn, the scientific knowledge that is produced from this presently accessible information allows for us, in accepting the conclusions that scientists reach, to assign a truth value to the past existence of dinosaurs.

The referent of any statement is simply a mental phenomenon. If there is sufficient empirical data available to provide justification then that is all that is required for a truth-maker. Justification based on presently accessible information is able to provide an extensive list of truth-makers for everything that can possibly be a part of any individual's present. When I produce the statement, 'that chair exists', it can be true because there is possible justification for its existence. But as all that can possibly be presently justified is the mental state representing the past state of the object, the truth evaluation can only presently refer to a mental state. So when I produce the statement concerning the present existence of any actual spatially separated object the evaluation can never be true. It is true that I am presently aware of a certain conscious phenomena; it is true that I have a mental representation when I perceive a chair.

The approach of weak justificationism requires less philosophical manoeuvring. The weak justificationist is capable of remaining agnostic concerning what makes a statement true. They do not have to provide a definitive collection of truth makers for every statement. Instead they can continue to assert statements without truth makers because there is presently accessible information that provides justification. The accessible evidence is sufficient to support the holding of

a belief but it does nothing to assert its truth. The objection to the presentist concerned what makes a true statement true when there is no evidence. Unlike the strong justificationist, who holds that only justified beliefs are true, the weak justificationist asserts that the statement does not have to be justified to be held. They do not have to make a claim concerning what makes a statement true. Agnosticism can be held in regard to the truth-makers themselves.

3.3.4 Explaining Instantaneous Change

The point presentist should have a sufficient account that explains how things change. Explaining change is important if the present is to retain its dynamic and flowing element. Point Presentism only sustains an instantaneous point of existence. The general objection is as follows: how can change occur if only one thing exists? The intuitive position is that for something to change we require more than one thing. This is often an objection to Eternalism. As Point Presentism maintains that all that exists is a single point then a similar objection that applies to Eternalism applies to it too:

> 'William James (James, 1890) argued for the specious present on the grounds that a succession of experiences is not sufficient for an experience of succession. The idea, roughly, is that if change involves a succession of states then the perception of it must encompass more than an instant. According to the [Eternalist] change consists merely in there being one state of affairs at one time and a different state of affairs at another time.' (Prosser, 2011, p. 96)

The objection raised here suggests that an Eternalist is not capable of adequately explaining change as all there is to change is being in one state of affairs at one time and then being in a differing state of affairs at another time. Point Presentism is in a remarkably similar situation. Change must be explained within a single point and any given time. Prosser (Prosser, 2011) suggests a solution to this problem that we can apply to Point Presentism. He first offers an account of the phenomenal interaction our minds have with actual objects:

> 'Consider a normally-sighted subject looking at a square object. The subject has a visual experience with a 'square' phenomenal character. Suppose we wish to explain why the subject's experience has that phenomenal character. What we say will depend on the nature of the explanatory project. One may, for example, pose a question like this in the course of developing a full explanation of phenomenal consciousness. But sometimes something far more modest will suffice. Suppose, for example, that we merely wanted to know why the subject was experiencing a 'square' phenomenal character rather than, say, a 'triangular'

> phenomenal character. For some such purposes a sufficient answer might be: 'because the subject's experience represents a square'.' (Prosser, 2011, p. 99)

Each object has its own mental representation. It is so because the experience is representative of the actual object being perceived. This singular mental percept is then combined as a method of efficiencies used by the human mind that produces change:

> 'Imagine first watching a slow sequence of images, slow enough that they are experienced as a series of distinct objects appearing and disappearing, one after the other. There is no persistence, and nothing moves. Imagine now the whole series repeated many times, with each repeated sequence quicker than the last. At some point a threshold is reached at which one's perception switches and one seems instead to perceive a single moving object. At this point there is a clear change in the phenomenology. This, I suggest, is the point at which one's experience represents an enduring object instead of a series of distinct short-lived objects. It is no coincidence that this is also the point at which one starts to experience motion (change of position), as well as other changes in the moving object (if successive still images differ in colour, for example, then one experiences a moving object that changes colour). One's perceptual system is 'lazy' – it no longer 'bothers' to separate the still images as separate identities and instead puts them together as one single moving object, numerically identical throughout.' (Prosser, 2011, pp. 116-117)

Prosser's suggestion here explains how phenomenal experience explains how a single moving object is derived from a number of separate still ones. This offers assistance to the Eternalist as their theory rejects any form a dynamism as an objective part of time. The solution offered explains why we can perceive of change and dynamic motion when time itself is in fact static. The Point Presentist is capable of including dynamic and flowing aspects as an objective part of time. Unlike the Eternalist model, there is only one single point of time. Our perceptions of time is of each single time flowing from one to the next. As Prosser suggested, the mind is producing a phenomenological representation of this flow. But instead of it being produced from a series of static times, one after the other, the mental representation is produced from a single flowing present coupled with the memory of past presents. As the present flows from each point to the next, we hold in recollection the previous points of present that we were in. As the present flows the current present along with the previous remain conscious. This produces a phenomenal representation of the objectively dynamic nature of time. What we perceive as time flowing is an accurate representation of time actually flowing.

Experience is the fundamental basis used to construct the ontological features of time in this investigation. Change is one of these features. What we experience has to be sufficient in justifying a belief concerning the nature of time's flow. An issue would result if our experience of time did not align with the metaphysical consequences from this investigation. Our experience is of time flowing and as such the ontology should reflect that to ensure continuity. Repurposing Prosser's explanation of change for Point presentism allows for this.

4.0 Conclusion

4.1 Summary

Others who offer views counter to Eternalism employ philosophical rebuffs. I have not taken this approach. I have argued that arguments for Eternalism from STR do not follow. Those who have previously argued that STR provides support for Eternalism have not properly employed Justificationism. When amendments are made to the Justificationist doctrine the result is not Eternalism but instead a form of Presentism. I have drawn from the same empirical evidence supplied by STR and drawn a conclusion supporting Point Presentism.

Einstein offers a definition of simultaneity that asks for 'now' to include objects and events that could not possibly be justified. Observations tell us nothing of what is occurring now at any spatially separated location. When Justificationism was properly employed along with empiricism the result is 'now' being restricted to mental phenomena. The argument for adopting relative simultaneity requires 'now' to be spatially extended. A fundamental premise, relative simultaneity, is removed from Putnam's argument. Reformulating simultaneity in this way amounts to different people differing over their experiences of what is simultaneous with what. Someone asserting that a certain set of events are present in contention to the events I call present cannot draw any ontological conclusions from that. People can say different events are present but this has no bearing on the actual ontological state of the event. The argument based on justification from evidence supporting Eternalism now fails.

What is left after the anti-thesis is how to properly articulate the resultant theory. Point Presentism is akin to the positive thesis offered by Stein. Although offering an unambiguous account of such position was demanding and required substantial discussion, a solipsistic interpretation was chosen to be preferable. What was lacking from Stein was sufficient support for the present to be spatially contained. Such support was found in the consequences of justification based on evidence. The metaphysical picture offered by interpreting Stein in this way aligned with the consequences of

properly justifying from evidence. I supported this claim with a discussion concerning employing justificationist ideology. However, Stein's position was not entirely acceptable. He offered a view of the past which conflicted with what is justifiable. So a localised version of the past was given; the past is that which was present and as all that was present is what is here-now, the past can only be what was here-then.

A discussion of Justificationism was then held. Special consideration was given to what to make of that beyond justification. Two options were articulated. We either take justification to be strong and actively reject existence beyond the present or take it to be weak and accept an agnosticism to result. Either way has issues. Weak Justificationism creates dissonance between the epistemological basis and the ontological repercussions. The strong view leaves nothing occurring now beyond the frame of reference as existing. The choice between these holds much greater implications for the entirety of this investigation but they are not the only options. A number of conclusions can be reached.

4.2 Possible Conclusions

The first possible conclusion is to bite the bullet and accept that all that exists is the here-now. If it is truly accepted that the present is simply the here-now, in a solipsistic sense, then there should be no problem with this conclusion. The present is both spatially and temporally contained. Right now, the single point of my mind is all that exists. Existence might be lonely but it's the logical conclusion of adopting strong Justificationism. Objections based on not wanting to be alone have to be disregarded. Hinchliff remarks on this kind of objection:

> 'The common objection to point Presentism is that it is lonely. Only the here-now exists. Though I am moved by this objection, I have often thought I should not be. It is really just a restatement of the view as an objection. It is like objecting to solipsism by saying the problem with solipsism is that there are no other people. Perhaps, though, in cases like these, an objection can be just a restatement of the view.' (Hinchliff, 1998, p. 579)

If someone does find this conclusion to be truly unpalatable, they could object by adopting the second possible conclusion. This is to reject a close association between epistemology and ontology. Weaker Justificationism might seem like it produces less unpalatable consequences. Existence is no longer restricted to a single point of here-now. Not being able to justify certain existence claims doesn't equate to non-existence, so things beyond the here-now may still exist. However, this does mean that we can no longer be sure that the resultant ontology is a form of Presentism. Instead, everything that is located at the present exists along with an agnosticism regarding the existence of

all objects and events beyond the present. Conceding that events located beyond our present might exist means that the events located in the future and past might also exist. Someone who wants to defend Presentism will say something stronger. Additionally, someone who previously accepted a stronger view of Justificationism might be unhappy with this conclusion.

The third possible conclusion is that there isn't enough evidence that allows for a cohesive picture. Epistemological bases that can provide Justificationism might simply be too limited to result in the entire picture of time being expressed. Physics could advance and new evidence might come to light that has implications for the metaphysics of time. As it stands, the justified ontological implications are inconclusive because scientists have not provided a sufficient epistemological basis. However, this raises the question, why was it sufficient before Point Presentism was the outcome? Putnam, Rietdijk, Penrose and others accepted Eternalism on the same grounds. The confidence they held for their conclusion was so great that they gave Eternalism privilege as the only theory compatible with STR. It is acceptable for others to adopt this conclusion but those who previously accepted the consequences of Justificationism based on STR cannot reject it solely on the grounds that do not approve of the new conclusion.

The final possible conclusion is that time is best explained by the philosophers and not the physicists. The notion of justifying time from evidence exclusively gives us a point of present. Point Presentism is an ontologically limited theory. It tells us very little about the ontology of time. An explanation of the concept of time is lacking. By adopting Point Presentism you have gained little further understanding of time beyond that your current mental experience is present. It might be all that we can justify is Point Presentism but if we reject that Justificationism should be that dominant thought when explaining time, the possibilities for offering a truly comprehensive explanation remains open.

Regardless of which position one finds most attractive the important point to take away from this investigation is that Eternalism is not the justified position. Eternalism has held a privileged position; arguments have been made exclusively for Eternalism as justified from STR. In accepting the anti-thesis, I have argued that Eternalism is not justified. What is justified is some form of Point Presentism. The form of which depends on the strength of Justificationism applied.

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