ABSTRACT

Title of dissertation: B-COMING: TIME'S PASSAGE IN THE B-THEORY BLOCKWORLD

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I defend what is routinely held to be an incompatible combination of views: the idea that time passes and the idea that the universe is a four-dimensional manifold without an objective present. Almost all philosophers of time think that A-theory, in which there is a privileged universe-wide plane of simultaneous events identified as the common "NOW," is the only theory able to preserve our fundamental experience of time's passage. B-theorists hold that the Special Theory of Relativity implies that the universe is a four-dimensional manifold without a NOW, and as a result, passage must be merely an illusion. It seems we have a choice: reject the relativistic universe or accept passage as an illusion. I hold that we do not need to make this choice, and show instead how time *can* pass in this B-theory blockworld. I first argue that the passage of time cannot be understood as the change or shift of the NOW, and then develop and defend an alternative account of the passage of time based on the notion of B-coming, which is a relation between spacetime points defined in terms of the light cone structure of relativistic spacetime. In this way, I make room for passage in the B-theory blockworld.

B-COMING: TIME'S PASSAGE IN THE B-THEORY BLOCKWORLD

by

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Introduction: About Time

How kind time is, altering space
so nothing stays wrong; and light,
more new light, always arrives.[1]

Sometimes time flies, and sometimes it crawls, but time does not stand still. The essential aspect of time is that it passes; this is what gives time its direction, separates it from space, and accounts for the transient nature of our temporal experience. Philosophers mention the ebb and flow of time, the sense that time rushes (or crawls) by, and the experience of the future approaching while the past fades away. What underlies these metaphors is the traditional understanding of time's passage as the commitment to an objectively privileged present moment, identified as a universe-wide plane of simultaneous events and referred to as the NOW, that changes in a certain direction, specifically, from earlier to later. The change in the NOW takes place by way of temporal becoming. By this I mean: one moment becomes present, and then the next moment becomes present, and then the next moment becomes present, and so on. Temporal becoming is the becoming present (however this is to be defined) of a particular moment, while the passage of time is to be found in the successive occurrences of temporal becoming. The passage of time, therefore, is ultimately the process of temporal becoming.

Not all accept that time passes; in fact, the dominant view has been to deny the passage of time. To fully understand why this is the case, it is necessary to take a brief detour to outline important background information. Philosophers of time fall into two

[1] Reese (2009)

main camps: A-theorists and B-theorists.[2] In general, A-theorists can be classified as those who endorse the NOW; according to A-theory, there is an objectively privileged present moment that extends across the spatial dimensions to serve as the common NOW.[3] Because the A-theorist holds that this NOW changes, he can accommodate passage to account for our phenomenal experience of the transience of time. As a result, the A-theory is held to be the commonsense or default view of time. B-theorists deny that there is a NOW. According to the B-theory, the universe is a four-dimensional block in which no moment is objectively privileged. Because B-theory denies the existence of a NOW, and the NOW is (traditionally) required for the passage of time, there can be no passage of time in B-theory. Denying time's passage seems a high price to pay, but B-theorists point to the fact that science is on their side. The Theory of Special Relativity (STR) is formulated in terms of a four-dimensional manifold which rejects the possibility of an objectively privileged present moment in the form of a rejection of a preferred frame of reference. STR requires the very theory of time that B-theory endorses, and as a result, B-theory is favored as the scientifically respectable account of time. Most B-theorists, therefore, uphold the view that the passage of time is an illusion. This means that our experience of what we consider to be the central aspect of time – its passage – must instead be given a psychological account in order to explain away our experience of the transience of time.

We can accept either A-theory or B-theory, but in accepting either one of these, we must give something up. In accepting A-theory, we give up that our best science is

[2] McTaggart coined these uninformative classifications in his famous (1908) article about the unreality of time.
[3] The different varieties of A-theory define what it means to be an "objectively privileged" (present) moment differently. These differences are explicated in the next chapter.

the true description of the world. In accepting B-theory, we give up a fundamental intuitive belief about the world – that time passes. Accepting either theory will cost us something that I hold is unacceptable to give up. So where do we go from here?

My project is to reconcile this conflict between our commonsense intuitions and science. We do not need to give up the passage of time or STR. Ultimately I argue that time can pass in a four-dimensional universe in which there is no objectively privileged present moment. The advantage of this view is that we can have it all – a fundamental experience that we do not have to explain away as an illusion combined with the endorsement of a scientifically respectable view of the world. The ultimate payoff of an account of the passage of time in this B-theory blockworld is the defense of a little explored niche that resolves an important – and seemingly intractable – conflict about the nature of time.

The dissertation proceeds in two parts. In the first part, I argue that the traditional understanding of the passage of time should be rejected. The most common argument against the passage of time is inspired by science; more specifically, STR tells us there cannot be a changing NOW because there cannot be an objectively privileged present moment to begin with. A-theorists have responded by altering, augmenting or rejecting STR and justifying this on the basis of saving passage. I argue that the idea of a changing NOW is subject to metaphysical problems so devastating that there can be no changing NOW. Therefore, there is no justification to reject the standard interpretation of STR. Thus, both our best science and metaphysics show that there cannot be a changing NOW. This means that the idea that the NOW can change must be abandoned. I argue, however, that the passage of time should not be abandoned. Instead, passage can be

understood in a different way. In the second part of the dissertation, I outline and defend a revision to our understanding of the passage of time. Specifically, I argue for a theory of the passage of time based on what I call B-coming – an account of temporal becoming which fits within the B-theory and is scientifically respectable – which can then save the central aspect of time. In sum, I show that there can be passage in B-theory.

I begin in Chapter 1, "On the Nature of Passage and Becoming," by reviewing the background literature on time and detailing a conceptual analysis of notions of the passage of time and temporal becoming. I lay out the different options for an ontology of time as well as the different options for what kinds of temporal characteristics exist in the world. Combinations of the varieties of these two options result in the four main metaphysical positions on time that is the focus of this project: presentism, B-theory blockworld (B-theory eternalism), the growing block theory, and the moving spotlight theory (A-theory eternalism). Next, I offer a conceptual analysis of the passage of time, clarifying that our traditional understanding of the passage of time is one of the change or shift of the privileged present NOW in a certain direction – from earlier to later. This understanding of the passage of time then allows the account to satisfy our central intuitions about time; specifically, this characterization of time fulfills our intuitions that space and time are different, that there is an arrow to time, and that time is transient.

I point out, crucially, that this change or shift in the NOW can only come about by way of temporal becoming. I argue that there are two models of temporal becoming which elucidate the idea of "becoming present" that is associated with temporal becoming. The first model is a reality-acquisition model in which "to become" means

"to come into existence." The second model is a property-acquisition model in which "to become" means "to become present."

These two models can only be accommodated by A-theories of time. I then outline how B-theory is the scientifically respectable model of the world, which means that there is no passage if we are to accept the standard interpretation of STR. I show how this results in the central problem: it seems we must choose between the B-theory's STR and the A-theory's passage. But both options have drawbacks – in choosing either option, we lose something important. In accepting B-theory, we give up passage; in accepting A-theory, we abandon our best scientific theory of the world. This then motivates the possibility of a third option: an account of passage that does not conflict with STR and is thereby compatible with the B-theory blockworld.

To attempt to find a place for time's passage in the B-theory blockworld, the first step is to challenge the status of the shifting NOW. Chapter 2, "The Changing NOW" contains my rejection of traditional accounts of passage. I show that the shifting NOW faces an insurmountable structural problem that cannot be avoided. More specifically, I claim that any theory of the nature of time that endorses the traditional understanding of the passage of time is committed to two theses: the Present Thesis that the present is objectively privileged, and the Change Thesis that what is objectively privileged changes. I argue that these two theses are incompatible regardless of the form in which they are adopted. I do so by outlining how this is the case with respect to the three main A-theories of time: the moving spotlight view, presentism, and the growing block view.

In the moving spotlight view, the incompatibility of the two theses directly manifests as McTaggart's famous Paradox of the contradictory nature of temporal

change. I consider and reject any attempts by the moving spotlight proponent to avoid McTaggart's Paradox by appeal to a hypertime. Presentism avoids McTaggart's Paradox by opting for a radically austere ontology – only present things exist – but in the course of doing so, fails to accommodate the Change Thesis which underpins the passage of time. I review the likely presentist responses to account for change, and argue that all of them fail as an adequate characterization on which to base the passage of time. For the proponent of the growing block theory to establish change, he must show that an event has two positions: in the block and at the edge of the block. It seems, initially, that the only way the proponent of the growing block theory can do this is to appeal to another temporal parameter which sets in motion an infinite regress that is identical to the one that the moving spotlight theory attempts to avoid in the face of McTaggart's Paradox. The growing block proponent can hold, however, that the existence of an event in the block entails its former existence at the edge of the block because the edge of the block is the place at which an event comes into being. Ultimately, the proponent of the growing block theory appeals to temporal becoming in order to avoid the incompatibility of the two theses.

Chapter 3, "Absolute Becoming and the Existence of the Future" therefore contains an examination of the plausibility of the reality-acquisition model of temporal becoming, referred to as "absolute becoming," which is the basis of the growing block proponent's avoidance of the incompatibility of the two theses. In this chapter, I show that the absolute becoming requires commitment to two elements, which I call the Non-Existent Future Element and the Causal Element. The Non-Existent Future Element entails simply that the future does not exist. The Causal Element demands that the

present (and the past) bring about the future (or, bring the future into existence). In a fashion similar to my arguments against the shifting NOW, I argue that these two elements are incompatible. More specifically, I argue that if the present (or past) brings about the future, the present (or past) must cause the future to come into being. But for this to be the case, there must be a casual connection between the present (or past) and the future, which then means that the future must exist.

I explore the options for the proponent of absolute becoming to avoid this incompatibility. The obvious option is to give up one of the two commitments; but giving up either of them is unacceptable to the proponent of absolute becoming. Accepting that that the future exists is to give up absolute becoming. On the other hand, accepting that the past and present do not bring about the past entails a myriad of difficulties: that what we do now has no efficacy to bring anything about, that we are subject to the whim of what is created, and that the orderliness of the world we inhabit is in fact a colossal fluke. Thus, the strategy should be to reconcile the two commitments by reinterpreting the Causal Element so that it is compatible with the non-existence of the future. In this case, the strategy that the proponent of absolute becoming must follow is to accept an account of causation that does not entail the existence of the future. This amounts to accepting one of two options: endorsing a non-relational account of causation or endorsing an account of causation that does not admit of cross-temporal relations.

I canvass the ways in which the proponent of absolute becoming can defend these two options and find them wanting. I argue that any account of causation that the proponent of absolute becoming appeals to will face the same problem as giving up causation in the first place: that the world continues to exist from moment to moment in

exactly the right way to be well-ordered is an "outrageous run of luck"[4] that cannot be tolerated. As a result, any attempt to reconcile the incompatibility of the two elements fails. This means that the proponent of the growing block cannot preserve the changing NOW. Furthermore, the future must exist if we are to accept that the present (and past) bring about the future. I conclude that if there is temporal becoming, it cannot be the form of an event's gaining presentness in any way interpreted by an A-theory.

The conclusion of the first three chapters is that there can be no shifting NOW. There is therefore no justification for rejecting the standard interpretation of STR. Does this mean there is no passage? Chapter 4, "B-coming: A Revisionist's Guide to the Passage of Time," marks the transition to the second part of the project in which I argue to the contrary – there is passage even in the absence of the NOW. I begin by rejecting the popular B-theory response to the difficulties of the shifting NOW: hold that the passage of time is an illusion. Why not just hold that passage is an illusion? I argue that it is distasteful to dismiss the existence of something that is such a fundamental part of our understanding of the world. But – more to the point – if we can have passage within our theory then why not accept it? Most philosophers just assume that they cannot have the passage of time in their theory so they make due with it being an illusion. I argue, in part, that this does not have to be the case. We can have passage in B-theory, and the second half of the project is the exploration of how this is possible.

I propose to follow Williams' (1951) claim that there is nothing more to passage than the presence of events in the manifold. Thus, in dropping the shifting NOW from the picture and revising our understanding of passage, the proponent of passage can avoid the metaphysical problems with passage. In this way, I challenge the fundamental

[4] These are Strawson's (1989) words, p. 140.

assumption that passage must be understood as the change in what is NOW. Thus, I disconnect the link between A-theories being "dynamic" theories which accommodate passage and B-theories being "static" theories which deny passage.[5]

First, what has become is traditionally defined relative to the NOW, which is a plane of simultaneous events. There is a knife-edge of becoming events, so to speak. But in a special relativistic world, this absolute simultaneity cannot be defined. There can be no knife-edge of becoming. Instead of temporal becoming being defined in terms of a universe-wide plane of events, temporal becoming is defined relative to each event. Specifically, I follow Stein (1968), in defining what has become relative to an event as what is in the causal past of the event (which is the past light cone). This is what I refer to as B-coming. What has B-come for one event is defined as what is in that event's past light cone. B-coming is a relational concept between two events; thus, to say that an event, *x*, becomes, it is to say that *x* becomes with respect to another event, *y*. Ultimately, this means that what has B-come with respect to an event are all the events to which is can have a causal connection. Thus, the B-coming relation is one of causal connectability. I argue that understanding temporal becoming as B-coming can satisfy the two intuitions about temporal becoming: that the future is open, and that the present (and past) bring about the future.

I then set out a new understanding of the passage of time based on B-coming. A relational account of becoming entails that no event changes in its B-coming relation to any other events. How is this revised understanding then to capture the change that underlies the jerk and whoosh of time's passage? I point out that the world is composed

[5] Dieks (2006), Maudlin (2007), and Norton (2010) are the only other B-theorists to defend the existence of passage in the blockworld. An examination of their views will be offered in the following chapters.

of temporally extended things and there is change in what B-comes for these temporally extended things. Thus, even though what B-comes with respect to one event cannot change, what B-comes with respect to a temporally extended thing can change. This change is in the form of the difference in what has B-come for different temporal parts of the temporally extended thing. I hold that this change in what has B-come for an object is the passage of time. I argue that this account of the passage of time meets all of our original intuitive requirements of the passage of time: it is a process of temporal becoming, it is the basis of the differentiation between space and time, it provides an arrow of time, and, most, importantly, it can account for our experience of the transience of time.

In Chapter 5, "Defending Revisionism: Objections and Replies" I consider some of the most pressing objections that my revised version of passage encounters. The first problem is that because the B-coming relation is asymmetric, no two events have become as of each other. Opponents claim that this means that no two events share a present. I respond that, due to the implications of STR, we must revise how we understanding sharing a present moment. I argue that if two events share enough events with which they have become in common, then this adequately captures the experience sharing a common NOW. The second problem is that a relational account of temporal becoming is itself not a notion worth wanting because it is not similar to the traditional account of temporal becoming. I respond by pointing out that our understanding of many concepts need to be revised in the face of our best science and that understanding this revised account of becoming (and passage) captures all of the essential elements of our intuitive understanding of becoming and passage to be worth wanting. B-coming, therefore, is not

an empty technical result. The third problem is that there is no change in the B-theory blockworld and so it cannot accommodate the passage of time. I reply that there is change in the blockworld – but it is different than the change endorsed by my opponents. My understanding of change, however, is adequate due to the fact that I can show how change across time is more than the "mere variation" of the change across space.

Overall, this project addresses a central issue in metaphysics: the conflict between what our best science tells us the world is like with respect to time – a four-dimensional manifold without an objectively privileged present moment – and our fundamental understanding of the world as one in which time passes. In the metaphysics of time, those philosophers who want to preserve the existence of the passage of time reject STR. In its stead they offer alternate theories aimed at preserving the existence of time's passage. My dissertation defends a revised account of the passage of time that allows us to save the passage of time without rejecting STR. In this way, we can have it all – preservation of both our intuitive understanding of the world while endorsing what our best science tells us the world is like.

1

On the Nature of Passage and Becoming

The future is yet to be but getting closer, the present is vivid and real, and the past fades away. This coming and going typifies our temporal experience. Time is transient – the future becomes the present, and the present becomes the past. This transience is often taken to be the basis of our experience of the passage of time. In this way, there is a dynamic feature to time; this dynamic feature lends the "whoosh" to time which accounts for the nature of our temporal experience.

Much is said about the passage of time in the manner of the opening paragraph above; it is a concept gestured toward and discussed metaphorically, but relatively rarely analyzed explicitly and in-depth. Matters are further complicated because the passage of time and temporal becoming are often conflated and consequently are used interchangeably. I differentiate the two, and understand the passage of time to be the *process* of temporal becoming. Traditionally, the passage of time is expressed as the change or shift in what is present, due to new moments coming to be. This notion of "coming to be" is temporal becoming, and is responsible for the change in what is present that is commonly understood as the passage of time.

In what follows, I give an analysis of the passage of time, taking my cue from the importance of the idea that time's passage – the transience of the temporal – is ultimately based in time's differentiation from space. I show that the traditional formulation of the passage of time achieves this differentiation through the idea that time is the dimension

through which the NOW changes from earlier to later. Thus, time passes by virtue of a change in what is present; this change is a result of a new present coming to be. This "coming to be," however, can be understood in different ways. I set out the two main ways in which coming to be is normally understood in the form of the two traditional models of temporal becoming. Because these two models of temporal becoming require commitments to different views of spacetime, I begin the chapter by outlining the various ontologies of spacetime as well as the two main theories of the temporal characteristics of the world and then show how the combination of these ontologies and temporal properties result in the different views of the nature of temporal change.

I explicate how on one view of spacetime, the B-theory blockworld, the traditional view of the passage of time is not possible. Unfortunately, the B-theory blockworld is the only metaphysics of time that is compatible with the Special Theory of Relativity (STR). I briefly outline STR and show how STR rules out any metaphysics of time that makes room for a privileged present moment which leads to the overall problem: it seems we have to choose between STR and passage. Neither option comes without its major drawbacks. In pointing out these drawbacks, I motivate my solution: a relativistically-friendly understanding of passage which is based on a model of temporal becoming which I called B-coming.

1.1 The Ontology of Spacetime

The ontology of spacetime concerns the question "What exists?"[6] with respect to past, present, and future things.[7] Specifically, the ontology of spacetime involves

[6] I use the terms "exist" and "real" interchangeably. See McCall (1994) for an example of someone who differentiates the two.

determining the ontological status of non-present things. It is uncontroversial that I exist, but does Socrates exist? Does the outpost on Mars exist? Proponents of different ontologies of spacetime will answer these questions differently. One good way to think about questions concerning the ontology of spacetime is to consider what class of things our most unrestricted quantifiers range over. Do our most unrestricted quantifiers ranger over me? Yes. Do they range over past things, such as dinosaurs, or future things such as the outpost on Mars? These answers depend on what ontology of time one endorses. There are two main views in the ontology of spacetime: presentism and four-dimensionalism. Presentists hold that only present things exist or are real.[8] Four-dimensionalists hold that in addition to present things, there exist past or future things (or both). Four-dimensionalism comes in two varieties: eternalism, in which the past, present, and future are real, and the growing block view, in which the past and present are real but the future is not. I consider each of these three views in turn.

1.1.1 Presentism

"Presentism is the doctrine that only the present is real."[9] That is, according to presentism, only temporally present objects exist.[10] I can say that Socrates did exist and the outpost on Mars will exist, but I cannot say that Socrates and the outpost on Mars do

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[7] I am using "things" in a broad but specific way. I understand "things" to refer to both concrete objects and events, and do not metaphysically prioritize one type of thing over the other. I talk mostly in terms of events, as is standard in the literature, and I assume for present purposes that my discussion in terms of events rather than objects does not impact the plausibility of the arguments I propose.

[8] Here and throughout the project when I use the term "exist" I mean to use it in its tenseless form.

[9] Sider (1999), p. 325

[10] There is debate about whether presentism is a substantive thesis or not. This "triviality debate" concerns the dilemma that the central thesis of presentism (only present things exist) is either trivial or obviously false. Proper consideration of this particular debate is beyond the scope of the current project, so the issue will not be discussed. I merely assume that presentism is neither trivial nor obviously false. For articulation of the debate, see Zimmerman (2006) and (2007), Callender (2000), and Meyer (2005).

exist because they are temporally located in the past or the future. Presentism is widely held to be the commonsense or default ontology of time:

"Presentism is, perhaps, our intuitive view of time."[11]

Presentism…is the 'commonsense' view, i.e., the one that the average person on the street would accept."[12]

"Presentism is a view that, for many of us, has considerable 'intuitive' appeal – by which I mean little more than that, upon reflection, many people find themselves believing it."[13]

"If we attempted to set out the man on the street's view of the nature of time, we would find that the main principle underlying his convictions on this subject might be stated some-what as follows" (1) All (and only) things that exist now are real. Future things (which do not already exist) are not real… similarly, past things (which have ceased to exist) are not real, although they were real in the past."[14]

"Presentism was believed by everyone, both philosophers and the folk, until at least the 19th Century; and it is still assumed in everyday life even by philosophers who officially deny it."[15]

"[Presentism is] arguably the commonsense position."[16]

The unreality of the past reflects the way in which inaccessible formerly existing things are settled and gone, accounts for why the present is so vivid, and ensures that the future is open and brimming with possibility. [17] According to presentism, this is why I am relieved when a headache is over – because it no longer exists – and also why I am dreading the next one – because it will be coming into existence.

[11] Le Poidevin (2003), p. 136
[12] Markosian (2004), p. 48
[13] Zimmerman (2011), p. 226
[14] Putnam (1967), p. 240
[15] Bigelow (1996), p. 35
[16] Rhoda (2009), p. 41
[17] Although it should be noted that presentism is not the dominant view among philosophers of time. Some of the most influential proponents of presentism include: Prior (1967), Smith (1993), Bigelow (1996), Merricks (1999), Craig (2000), Crisp (2003), and Zimmerman (2011).

Thus, presentists are committed to the idea that there is a succession of present times; the present moment changes as presents follow and replace one another.[18] For the presentist, the present time or moment is a universe-wide plane of simultaneous events which serves as the common NOW.[19] This common NOW is traditionally held to be either instantaneous or of a very short (indivisible) duration.[20] Due to these features, presentism is understood to naturally accommodate the commonsense intuition that there is something special about the present moment. It also preserves our experiences of the past being inaccessible because it no longer exists and the future being open because what comes next does not yet exist. But most importantly, presentism seems to naturally accommodate our everyday temporally experiences that time is transient because what is present is fleeting; in presentism, the NOW changes, from one moment to the next.

1.1.2 Eternalism

Eternalism, in contrast, is the view that temporally present objects are not ontologically privileged – that all objects, past, present, and future, are ontologically on par with one another. According to eternalism, both Socrates and the Mars outpost exist – even though they are not currently present. Thus, non-present objects are real; temporal location does not matter at all when it comes to ontology. Temporal location, according to eternalism, is akin to the commonsense view about spatial location. Are the objects

[18] An exception to this is the presentist view that only the present is real, but what is present does not change. This view is referred to as solipsistic presentism or frozen presentism. No one in the literature defends such a view, and it is not hard to understand why. Frozen presentism lacks one of the most attractive features of the traditional presentist view: an account of why time seems to pass. Without this dynamic element, the frozen presentist must explain how this is an illusion – the very aspect of why presentists find eternalist accounts of time deficient. See Dainton (2010) for a discussion of this view.

[19] Note that the postulation of a universe-wide plane of simultaneous events conflicts with the Special Theory of Relativity. See below for an articulation of this problem.

[20] An alternate view, called compound presentism, also referred to as thick presentism and overlapper presentism, holds that the present moment is extended in that it can be divided up into multiple non-simultaneous temporal slices. See Dainton (2010) for a discussion of this type of presentism (although he rightly points out that it is not clear that this view can be labeled as a presentist view). See Tallant (2010a) for an argument against this view.

here in my immediate vicinity more real than distant objects, say, in France? The intuitive reply is of course not; one naturally would want to resist the distinction that objects over there – far way in space – are less real than objects that that are right here. Thus, places in my immediate vicinity may be epistemologically privileged, but they are not metaphysically privileged. The eternalist denies the ontological privilege of the NOW in time just like he denies ontological privilege of the "here" in space. The NOW is instead considered an indexical notion that picks out where one is in time – the temporal location – but does not distinguish something ontologically special about that moment. In summary, the eternalist holds that things are spread out in time just as they are spread out in space – the result is a four-dimensional universe composed of the three dimensions of space and the fourth dimension of time. The universe, in other words, is a four-dimensional "block," which is the basis for the theory's alternate name, the blockworld view.

What is the motivation for the blockworld view? The view seems to violate our most basic intuitions about time; in the blockworld, the future is real, and so it is fixed, and the past is just as real as the present. In addition, the present is not ontologically distinguished in the way that it is in presentism. The blockworld view, however, enjoys vast support among the philosophers of time.[21] This is due to the fact that there are plausible reasons to believe in the existence of both the past and the future. Among the reasons to think the past exists include (i) that the existence of past things is what grounds or makes true our claims about the past, and (ii) the existence of the past allows the

[21] The leading proponents of the blockworld view of time include: Williams (1951), Smart (1963), Lewis (1976), Le Poidevin (1991), Oaklander (1991), Mellor (1998), and Sider (2001).

existence of cross-temporal relations like causation.[22] The most popular reason to endorse the existence of the future is that the Special Theory of Relativity (STR) is traditionally taken to show that any future event is real.[23] Furthermore, STR is formulated in the mathematical setting of Minkowski spacetime, a four-dimensional manifold of spacetime events. Minkowski spacetime, on the orthodox approach, is understood as a representation of spacetime; thus this modeling of the universe as four-dimensional is interpreted as support for the idea that the universe is a four-dimensional object.[24] Defenders of the blockworld view ultimately believe that both the metaphysical advantages and the physics-friendly nature of the blockworld outweigh any of its conflicts with our everyday commonsense understanding of the ontology of time.

1.1.3 The Growing Block

The intermediate view of ontology between presentism and eternalism is called the growing block view. The proponent of the growing block view wants to preserve the important intuition that the future is open because it does not exist. He accepts the reality of the past and the present while denying the reality of the future; according to him, future things do not exist. Thus, Socrates is real, but the outpost on Mars is not. The present, however, is special in that it is the leading edge of a growing block – one to which events are continually being added. Broad (1923), a proponent of the growing block view, describes the theory in the following way:

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[22] These two issues are classic problems for presentism. Most opponents of presentism hold that the presentist has difficulty accounting for the so-called truthmakers for true propositions about the past; this is referred to as the "grounding problem." The second issue for the presentist is that he cannot account for relations across time because only one time – the present – exists; this is referred to as the "problem of cross-temporal relations." Chapter 2 explores the grounding problem in more detail; Chapter 3 explores the problem of cross-temporal relations in more detail.

[23] This claim will be explicated below.

[24] See Crisp (2007a) for further explication as well as a critique of this idea.

> It will be observed that such a theory as this accepts the reality of the present and the past, but holds that the future is simply nothing at all. Nothing has happened to the present by becoming past except that fresh slices of existence have been added to the total history of the world. The past is thus as real as the present. On the other hand, the essence of a present event is, not that it precedes future events, but that there is a quite literally *nothing* to which is has the relation of precedence.[25]

New times are continually being added to the four-dimensional universe; the block, in other words, grows over time.[26] Endorsing the reality of only the past and the present allows the growing block view to preserve the features of temporal experience by accounting for the fixed nature of the past and the openness of the future while avoiding some of the classic pitfalls the presentist faces.[27] But like presentism, the growing block view conflicts with STR. The growing block view proposes a universe-wide plane of simultaneous events as the leading edge of the growing block, but STR makes no room for such a set of absolutely simultaneous events. Both the presentist and the proponent of the growing block view therefore must address the charge that their ontologies of spacetime conflict with a well-confirmed scientific theory.[28]

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[25] Broad (1923), p. 87, emphasis in original. Forrest (2006) and Adams (1986) are also proponents of the growing block view. Tooley (1997) is sometimes considered a proponent of the growing block theory as well, although some (Zimmerman (2005) fn. 10) argue that his view in not a genuine growing block view since he endows the future with actuality *simpliciter*.

[26] A similar view, call the shrinking tree view, is defended by McCall (1976) and (1994). On this view, the universe is the shape of a tree, with every possible future existing in addition to the existence of the actual past and present. The trunk of the tree is a four-dimensional manifold of the past (and the edge of the trunk of the tree being the present), and the branches of the tree are four-dimensional manifolds of the future. As the present passes, possible futures go out of existence, and instead of growing, the tree is instead continually "pruned."

[27] Zeilicovici (1989) seems to propose a growing block-type view. He holds that at each successive moment in time, the entire A-series is replaced, with the increase in the sum total of existence of things. See Oaklander (1992) for a critique of this particular view. Earman (2008) also proposes a similar version of this growing block view.

[28] The growing block view also faces a metaphysical objection known as the "dead past objection." According to the growing block view, both the past and present are real, and the present is only distinguished by being the leading edge of the block. But how can I know right now that I am at the leading edge of the block? Socrates is just as real as I am, and presumably Socrates thinks that he is at the leading edge of the block. How I am to know that I am really in the present rather than in the position of Socrates? See Bourne (2002), Braddon-Mitchell (2004), and Merricks (2006). See Forrest (2004) for a reply to this objection.

1.1.4 The Metaphysical Equivalence Objection

The growing block view has few proponents, and as a result, the central debate in the ontology of spacetime concerns the choice between presentism and eternalism. Some allege that presentism and eternalism are metaphysically equivalent.[29] Callender (1998) asks us to imagine that there is a four-dimensional manifold of events, each carrying a light bulb that can be switched on or off. When an event exists, the light bulb is turned on, and when an event does not exist, the light bulb is turned off. Eternalism is then translated into the view that all of the light bulbs are turned on. The presentist holds that the only light bulbs that are on are those that exist. But the eternalist agrees with this, since all of the light bulbs are turned on. Furthermore, the proponents of both views agree that there are no light bulbs that are turned off. Hence, there seems to be no dispute between the presentist and the eternalism concerning ontological status.

When the issue is formed in terms of the indexical "presently," however, there does seem to be substantive disagreement.[30] The eternalist believes that every light bulb is on – but not every light bulb is presently on. There are some light bulbs are on that are off NOW. The presentist believes that there are no light bulbs are on that are off NOW because every light bulb that is on is presently on. Thus, the presentism and the eternalist will answer the question "Are any light bulbs that are on not presently on?" differently, and consequently, a substantive debate arises. Another way to express this idea is that one can understand the difference in the ontological positions of eternalism and

[29] Proponents of this view include: Lombard (1999), Callender (2000), Meyer (2005), Dorato (2006), and Savitt (2006). For a more in-depth defense against the worry of the metaphysical equivalence of presentism and eternalism, see Sider (1999) and Crisp (2004).
[30] This is Hinchliff's (2000) suggestion, p. S577.

presentism by considering the presentist's set of light bulbs that are on as a subset of the set of eternalist's light bulbs that are on.[31]

1.2 The Temporal Characteristics of the World

In addition to the three main ontologies of spacetime, there are two different frameworks of the temporal characteristics of the world that purport to track our conception of time. In his famous argument for the unreality of time, McTaggart (1908) introduces a distinction between two kinds of ordered series of events which compose these two different frameworks of the temporal characteristics of the world.

1.2.1 The A-series and the B-series

The first framework is composed of what McTaggart identifies as the A-series, which counts as fundamental the "series of positions which runs from the far past through the near past to the present, and then from the present through the near future to the far future"; the second framework is composed of what McTaggart labels the B-series, which counts as fundamental "[t]he series of propositions which runs from earlier to later."[32] The distinctive temporal characteristics of the A-theory are the properties of pastness, presentness, and futurity, commonly referred to as the A-properties. On the other hand, the distinctive characteristics of the B-theory are the relations of earlier than, simultaneous with, and later than, commonly referred to as B-relations. The A-properties

[31] This is merely a quick summary of the debate. A full consideration of this issue is outside the scope of the project, but it is a promising avenue for future research.
[32] McTaggart (1908), p. 457

are the basis of what are called A-theories of time and B-relations are the basis of the B-theory of time.[33]

A-theorists believe that there is an objective distinction between things that are present and things that are past and future. This objective distinction might be made by way of a monadic property of presentness, but not all A-theorists posit a monadic property of presentness; instead, the objective distinction is more often made by way of ontology (such as reducing presentness to existence), or position in the ontology (such as being at the leading edge of a growing block). The present, then, is somehow distinguished from the past and the future "in a way that is not relative to any other temporal thing, such as a conversation, a time, or a frame of reference."[34] B-theorists, in contrast, reject that the present is special in any way, and hold that the temporal locations of the past, present, and future merely describe one's B-relation to the event attributed an A-property. Furthermore, a defender of the A-theory need not be committed to the existence of all three A-properties of pastness, presentness, and futurity; both presentism and the growing block view are considered forms of A-theory, and the presentist denies the existence of the A-properties of pastness and futurity, while the proponent of the growing block denies the existence of the A-property of futurity. Because of these reasons, I identify A-theory as the position that the present is somehow privileged, although not necessarily by way of commitment to three monadic properties of pastness, presentness, and futurity.

[33] More specifically, A-theorists believe that A-theories are fundamental (that is, that B-relations can be reduced to A-properties) and B-theorists believe that B-relations are fundamental (that is, that A-properties are in fact indexical claims to be interpreted in terms of B-relations).
[34] Zimmerman (2005), p. 402

A-properties are always held to be transitory, although they need not be.[35] In contrast, B-relations do no change. McTaggart (1927) describes this difference when he claims that

> Positions in time, as time appears to us *prima facie*, are distinguished in two ways. Each position is Earlier than some and Later than some of the other positions…In the second place, each position is either Past, Present, or Future. The distinctions of the former class are permanent, while those of the latter are not. If M is ever earlier than N, it is always earlier. But an event, which is now present, was future, and will be past.[36]

Because A-properties are transitive, events are constantly changing with respect to these properties. Thus, a future event becomes less and less future, then becomes present, and then fades increasingly into the past. This change in what events are present is, as will be explicated later in the chapter, the basis of the traditional understanding of the passage of time. In B-theory, there is no objective present, and thus no events can change with respect to a privileged moment of the present. Thus, the B-relations of being earlier than, simultaneous with, and later than are permanent and never change. This leads some to refer to the B-theory as a "static" account of time. Ultimately, the important difference between A-theory and B-theory is that the monadic properties of an event change while the B-relations between events do not.

1.2.2 The Debate About Tense

A distinction similar to A-theory and B-theory is the distinction between tensers and detensers, sometimes referred to as the tensed/tenseless debate. The debate concerns how to understand our tensed language. When I claim that "It is NOW raining" how am I to make sense of the predication of presentness? Tensers understand our tensed language in a straightforward way; when I predicate a property of presentness to an event, all I

[35] An A-theory does not necessarily need to posit the A-properties as transitory, but no one in the literature holds such a view, for similar reasons to those identified in fn. 12.
[36] McTaggart (1927), pp. 9-10

mean is that the event is present. On the other hand, a detenser wants to reduce our tensed language to tenseless language. For the A-theorist, the "tensed" way is intuitive; to say that it is NOW raining is to hold that the event of rain is present – that is to attribute the A-property of presentness to the event of rain. The B-theorist denies the existence of A-properties and thus must understand claims of NOWness in a different way. This way is referred to as the tenseless understanding of time. That it is NOW raining must, according to detensers, be reduced to tenseless language. The detenser asserts that tensed sentences (sentences containing A-predicates) can be true even without the existence of A-properties. Detensers reinterpret tensed claims in tenseless terms; thus, NOWness is reinterpreted in terms of simultaneity. In addition, past-tensed propositions are reinterpreted in terms of the earlier than relation while future-tensed propositions are reinterpreted in terms of the later than relation. Thus, according to the tenseless view, "It is NOW raining" is true if the event of rain falling is simultaneous with the utterance that it is NOW raining. In the same way, "The sun will shine later" is true if the event of the sun shining is later than the utterance and "The storm was approaching" is true if the event of the storm approaching is earlier than the utterance.

The detensers therefore think it is a mistake to take our language as indicative of what the world is like; although we talk about the "NOW" there is not in reality a NOW which is identified by our talk. This is reflected in B-theory's rejection of a present moment. According to B-theory, there is no present moment that is privileged; there are only unchanging B-relations. In addition, the NOW is understood to be an indexical, functioning in much the same way as the indexical "here." When I state that it is NOW dinnertime, according to B-theory, what I am claiming is that dinnertime is simultaneous

with my statement. In contrast, the A-theory holds that our tensed language is to be understood in a straightforward way; when I claim that something is happening NOW, I am making a claim about the A-property of an event. According to A-theory, there is a privileged present, and this present is always changing, which is the basis of the passage of time.

1.2.3 The Moving Spotlight

Debate regarding the ontology of spacetime is sometimes conflated with the debate between A-theory and B-theory; this is due to the tendency to equate A-theory with presentism and B-theory with eternalism. But, as is clear above, the growing block view is also an A-theory. Furthermore, although understanding eternalism as a B-theory is natural and intuitive, eternalism need not be considered a B-theory. Instead, one can combine eternalism with A-theory to produce a view that the past, present, and future are real, but present events possess the special monadic temporal property of presentness. Successive events in time possess this property of presentness; there is something special about events that are present in that they are lit up by the spotlight of the NOW, so to speak, but before and after they are illuminated, they dwell in darkness. The combination of eternalism and A-theory is known as the moving spotlight view – we can imagine a spotlight moving through the four-dimensional blockworld. Broad (1923) describes it in the following way:

> 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.[37]

[37] Broad (1923), p. 84

There is one time that is absolutely present, which is highlighted by the spotlight of the NOW. Past and future things lack the property of presentness. A future event is one that has not yet acquired the property of presentness, and a past event is one that has acquired and lost the property of presentness.

1.2.4 The Metaphysics of Time

Combining ontologies of time with the temporal characteristics of the world results in the four main types of views of the metaphysics of time: presentism; the growing block view; the B-theory blockworld view (B-theory eternalism); the moving spotlight view (A-theory eternalism). Presentism is a type of A-theory in which the present is distinct from the past and the future because it is ontologically privileged; the present is different from the past and the future in that it is real. The growing block view differs from presentism in that both past and present events are real. The view, however, is also an A-theory view in that the present is privileged because it is the leading edge of a growing block. The B-theorist eternalist endorses the ontology of the four-dimensional block and denies that the present is in any way distinguished from the past and the future. The A-theory eternalist also endorses the ontology of the four-dimensional block, but also accepts the A-properties of pastness, presentness, and futurity.

1.3 The Concept of Temporal Change

The heart of the differences among the four views of the metaphysics of time lies not only in how the universe looks at one time, but also in how the universe looks over time. Each view's take on change over time can be represented by the pictures of the sum total of reality that the proponent of the respective views draws at different given

times. The proponent of the B-theory blockworld always draws the same picture of the sum total of reality:

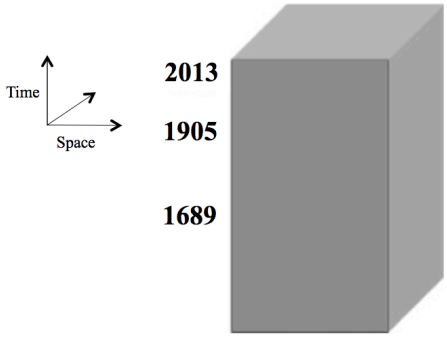

Figure 1.1[38]

For the B-theory blockworld, what is real does not change, nor is there a slice of time that is privileged by being the present moment. The proponents of the three other views, however, all draw different pictures of the sum total of reality at different times. For the proponent of the moving spotlight view, what exists does not change, and so in this respect, the view is the same as the B-theory blockworld. But the moving spotlight view does include a privileged present moment, and this privileged present moment is in a different position at each different moment; thus the proponent of the moving spotlight view draws a different picture of reality at each different time with respect to the NOW being in different positions:

[38] In the diagrams, the three spatial dimensions are represented as two-dimensional, with the third dimension representing the dimension of time.

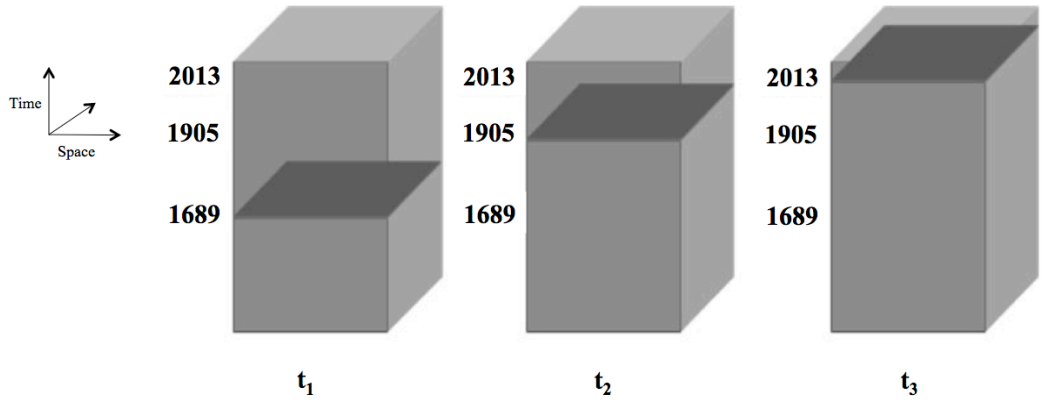

Figure 1.2

The proponent of the growing block view also draws a four-dimensional block, but it is not the entire block drawn by the proponents of the B-theory blockworld or moving spotlight view. Instead, the proponent of the growing block draws his block to include all events up to and including the present moment. An additional slice of reality is added to the block at each successive moment, represented by the block growing in the sum total of reality over time. For the growing block view, then, the later the time, the bigger the block of the sum total of reality:

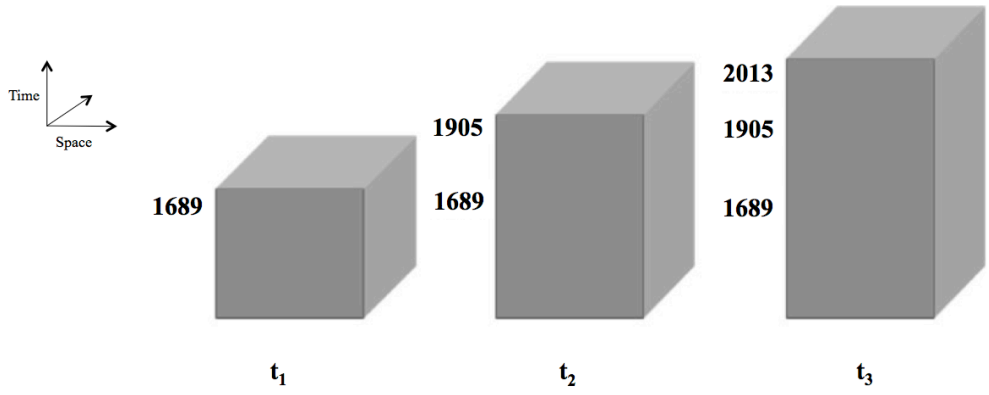

Figure 1.3

The presentist, in contrast to all of the other views, draws only a three-dimensional slice of the four-dimensional block at any given time. But the three-dimensional slice is

different at different times, thereby representing both that only the present is real and that what is present changes over time:

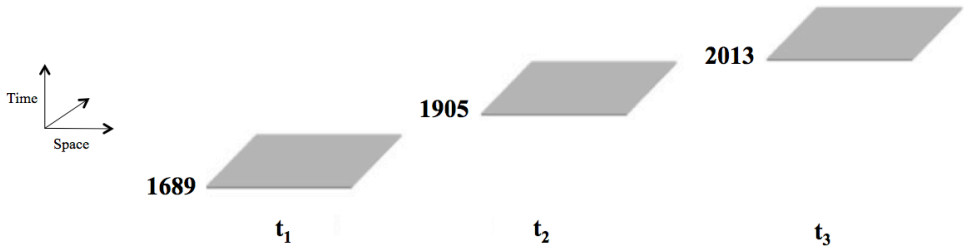

Figure 1.4

Thus, the main views of the metaphysics of time result from a combination of what things exist and the temporal characteristics of the world; in turn, each of these four main views differs in the nature of change over time. According to presentism, temporal change is a change in the existence of the present moment, while temporal change for the growing block view is the change in what events are at the leading edge of the block. In both views, there is a change in the sum total of what exists. For the moving spotlight there is a change in what moment possesses the monadic property of presentness; this temporal change is the change in the sum total of reality in that a different set of events possess the property of presentness from one moment to the next. Lastly, there is no change over time in the B-theory blockworld. This means that the proponent of the B-theory blockworld denies that there is a change in the sum total of reality or existence. This, as is seen in the following sections, results in a problem for the B-theory blockworld's account of the passage of time.

1.4 The Passage of Time

Time is taken to be something that passes. What exactly does this mean? Williams (1951) grandly declares that passage is:

> the jerk and whoosh of process, the felt flow of one moment into the next. Here is the focus of being. Here is the shore whence the youngster watches the golden mornings swing toward him like serried bright beakers from the ocean of the future. Here is the flood on which the oldster wakes in the night to shudder at its swollen black torrent cascading him into the abyss.[39]

Most simply, passage means that there is a transitory aspect to time; that first outpost on Mars is in the distant future, but will be present and then will continue to fade into the past.

1.4.1 The Transitory Nature of Our Temporal Experience

Right NOW, the events of my sitting at a desk and writing are present; these events are vivid and fresh and seemingly privileged in a way that the past event of my eating a donut for breakfast or the future event of my drinking a beer after work are not. But that past event *was* vivid and fresh in the way that this present is, and the future event *will* be vivid and fresh in the same way. Events approach from the future and fade into the past but time itself does not move. This flow of time is merely a metaphor for the idea that what is fresh and vivid to me in the present is transitory. Thus, the first important aspect of the passage of time is that it is responsible for our experience of transience. Importantly, we are involuntarily pulled along through time in a way that we are not pulled along through space.

1.4.2 The Differentiation of Space and Time

This hints that the ontological basis of the transitory nature of our temporal experience is that time is different from space. I can stand still and halt my travel through

[39] Williams (1951), p. 466

space, but time waits for no one. Time passes while space does not; in this way, time's passage distinguishes time from space. *This* is the heart of the essence of time's passage; any theory which holds that time passes is committed to what Markosian (1993) calls the passage thesis:

> Time is unlike the dimensions of space in at least this one respect: there are some properties possessed by time, but not possessed by any dimension of space, in virtue of which it is true to say that time passes.[40]

What then, is special about time that differentiates it from space? The essential difference between time and space is that there is a change over the temporal dimension in a way that is different in kind from change over the spatial dimension. Time, in short, is the dimension of change; there is no process of spatial change that is similar to this unfolding of the universe over time. This change over time is therefore the ontological basis of the passage of time.

1.4.3 More Than Mere Variation

The traditional account of temporal change, as proposed by A-theory, has always been that the difference in space and time is to be found in the appeal to the NOW. More specifically, temporal change is the change in what is present. Furthermore, the temporal dimension is the dimension in which the NOW shifts, and because of this, there is a straightforward differentiation of space and time. The B-theorists, however, hold that they can give their own account of temporal change without the NOW. Supporters of the B-theory blockworld, for example, cite Russell (1903), to show how there can be change in the B-theory blockworld:

> Change is the difference, in respect of truth or falsehood, between a proposition concerning an entity and the time T, and a proposition concerning the same entity and the time T*, provided that these propositions differ only by the fact that T occurs in the one where T* occurs in the other.[41]

[40] Markosian (1993), p. 830
[41] Russell (1903), p. 469

In this way, there can be change if an object has a certain property at one time and then possesses and incompatible property at another time.[42] The A-series, therefore, is not required for change; there can be change in the B-theory.

The B-theory's account of temporal change, however, seems to be nothing more than mere variation. To understand this, consider variation in space, understood as an object possessing different properties at different places. McTaggart's (1908) famous example is of a poker that is hot at one end and cool at the other end. The different (spatial) parts of the poker have different properties; one end is hot and the other is cool. But intuitively, we do not conceive of this mere variation of properties over the spatial extent of the poker to be sufficient to claim that the poker *changes* from hot to cool. In other words, mere variation over space does not suffice for change. Compare mere variation in the spatial dimension to mere variation in the temporal dimension. Consider the poker as having the properties of being hot at t_1 and cool at t_2. This is mere variation over the temporal dimension. An object's possession of different properties at different points in space is insufficient for change; analogously, an object possessing different properties at different point in time also fails to be sufficient for change. McTaggart claims that in this way, there is no essential difference between mere spatial variation of the poker that is hot at one end and cool at the other and the poker that is hot at t_1 and cool at t_2. Both situations are instances of mere variation and so neither suffice for change.

If this is the case, and if temporal change is just mere variation, then B-theory does not seem to account for how temporal change can be the feature that distinguishes

[42] Mellor (1998) describes this B-change as "a thing having incompatible real properties at different times" (89).

time from space. This inability to differentiate space and time thus seems to be an obstacle to preventing B-theory from accommodating a theory of passage.[43] The A-theory account of temporal change, on the other hand, provides a natural way to satisfy Markosian's passage thesis.

1.4.4 The Traditional Understanding of Passage

Temporal change is traditionally held to be a continual change in what is present.[44] That is, the passage of time is explicated in terms of a changing NOW – whether the NOW is identified in terms of a temporal property (such as in the moving spotlight and growing block theories) or in terms of existence (such as in presentist theories). Any theory of the passage of time must be able to distinguish time from space; this shift in the privileged present is the traditional and most straightforward way of accomplishing this task. Furthermore, this shift in the privileged present is what accounts for our temporal experiences of time as moving, thus satisfying our experience of the transience of the passage of time.

The traditional account of the passage of time is a tidy fit into the A-theories of time. The A-theorist holds that the present is an objective feature of reality. What is NOW, according to the A-theory, is privileged. What is NOW changes, and this change in what is present is the passage of time.[45] The passage of time, then, is the change in

[43] Maudlin (2007) and other B-theorists could respond that there *is* something that accounts for this difference: some kind of generation or production that exists in the temporal dimension but not in the spatial dimension. This is a strategy similar to the one I endorse in later chapters.
[44] The idea that the present moment moves in some way brings up the question of how fast time passes. This rate of passage argument (see Smart (1949)) is that if time flows, then one can ask how fast it flows, but this does not seem to be a sensible question. See Price (1996) for explication of the argument, and Maudlin (2007) for an attempted response.
[45] Note that not all A-theorists accept the passage of time. Tallant (2010c) is a notable exception, although he still accepts that things change.

what moment is privileged, or NOW. The traditional account of the passage of time can be described by three claims:

1. There is an objective present – the privileged moment, NOW.
2. This objective present changes or shifts – the privileged moment moves.
3. This objective present changes in a certain direction – from events in the future follow events in the present, and events in the present follow events in the past.[46]

The third element of the passage of time composes the arrow of time. The series of events that make up what we call time run in a certain direction from earlier to later.[47] The shift in the NOW from earlier to later is what gives rise to the "succession of NOWs" that is taken as a popular formulation of the passage of time.[48] The traditional understanding of the passage of time is ontologically based on the change, from earlier to later, of a privileged present moment, the NOW.[49]

1.5 Temporal Becoming

The crucial element of the passage of time is that the present moment changes, and this element provides the differentiation of space and time as well as the transitory

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[46] This closely follows Price's (2011) breakdown of the intuitive elements of time:

1. The view that the *present moment* is objectively distinguished.
2. The view that time has an objective *direction*; that it is an objective matter of which of two non-simultaneous events is the *earlier* and which the *later*.
3. The view that there is something objectively *dynamic,* flux-like, or "flow-like" about time (277, emphasis in original).

My understanding of the requirements of the passage of time are inspired by this list, although I further analyze the "dynamic" aspect of time to be the shift of the NOW.

[47] Can the A-theorist supply a direction of time? It is commonly held that he can; but see Diekemper (2005) for a critique. In the project, I sidestep issues related to this area of the philosophy of time due to the fact that I focus on whether the A-theorist can accommodate change of the present in the first place, so establishing the direction of this change is an additional problem outside the scope of this project.

[48] For explicit formulations of this kind, see Le Poidevin (2003), Dorato (2006), Savitt (2006), and Oaklander and White (2007).

[49] Fitzgerald (1969) presents two different conceptions of the passage of time. The first conception Fitzgerald presents is, in essence, compatible with the traditional notion of the passage of time that I explore here. The second conception of the passage of time seems to be a deflationary notion, which I will explore in Chapter 4.

nature of our temporal experience. But how exactly does this privileged moment change? What lies beneath this shift in what is NOW? The intuitive account is that the NOW shifts by way of different events becoming present. This is usually expressed in terms of events coming into being. A more general way of understanding this is holding that what is privileged changes because different events *become*. Thus, the basis of the passage of time is the process of this temporal becoming. At each time, a different moment becomes, and in the becoming of each new set of events, the privileged present shifts, allowing time to pass. If events cannot become, then the NOW does not change, and according to the traditional view, there can be no passage of time. Note that the passage of time requires multiple sets of events becoming. One set of temporal events becoming present, in other words, does not suffice for the NOW to move, and therefore fails to establish the passage of time.

How is one to understand this seemingly mysterious notion of temporal becoming? There are two traditional models of understanding this concept which reflect the two ways of understanding the change of an event from future to present to past. The first understanding, labeled the reality-acquisition view, involves understanding the claim "coming into being" as a claim concerning existence (or reality).[50] In other words, temporal becoming is analyzed in terms of existence. The second understanding of the concept of temporal becoming is labeled the property-acquisition view. In the property-acquisition view, an (already existing) event comes into being by the acquiring the property of presentness.[51]

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[50] Here I am equating "coming into existence" and "becoming real" – for my purposes, I do not believe this results in any difficulties for the arguments I propose.

[51] Fitzgerald (1972) and (1985) presents four models of temporal becoming. The first and third notions are those of the reality-acquisition and property-acquisition models, while the second notion is Whitehead's

1.5.1 The Reality-Acquisition Model

In the reality-acquisition model, the claim that "event *x* has become" means that "event *x* has come into existence." An event in the future does not exist, but in the present it does exist, so the becoming of an event on this conception is the unreality of a future events coming into reality in the present (or, a non-existent event in the future coming into existence in the present). Unreal (future) events become real (in the present). Becoming thus amounts to coming into existence – an event becomes (temporally) if it comes into existence. The non-existence of future events is required for this conception of temporal becoming and fits well into the commonsense understanding of the ontology of spacetime, presentism. Growing block theorists also endorse this model of temporal becoming; in the growing block view, coming into being is merely the addition of a slice of reality to the block universe.

This is the model of becoming that Broad (1923) endorses as "absolute becoming" and so I use this label to differentiate this kind of temporal becoming from the second model of temporal becoming.[52] This conception of becoming preserves our intuitions about the transitory nature of temporal experience because there is a change in the number of things that exist in a world when an event "comes into being" or "becomes." This change is accounted for, simply put, by the fact that an event exists where it did not before it came into being. Broad's (1923) discussion of becoming is the *locus classicus* of this conception; he characterizes the idea as follows: "[W]hen an event

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(1929) epochal theory of time and the fourth notion is a seemingly subjective model of becoming. I subsume the second model under the reality-acquisition view.

[52] Note that Broad's understanding of temporal becoming changed from (1923) to (1938). In Broad (1923), he seems to hold a view of absolute becoming that requires the unreality of the future. See Oaklander (1976). In Broad (1938), his understanding is similar to a deflationary understanding to temporal becoming that I endorse in Chapter 4. See Savitt (2002) for an analysis of Broad's later views.

becomes, *it comes into existence*; it was not anything at all until it had become."[53] This is the traditional (and perhaps commonsense view) of temporal becoming. In fact, it is near unanimous that the non-existence of future events is required for temporal becoming.[54] Becoming is then regarded as the becoming real (or coming into existence) in the present of an unreal or non-existent future event. Furthermore, absolute becoming itself gives the direction of time – it moves in the direction of adding reality to the universe and thus provides a differentiation of space from time.[55] In this way, change in the temporal dimension is distinguished from the mere variation in the spatial dimension because reality is continually being added to the temporal dimension in a way that reality is not added to the spatial dimension. This additional reality therefore is not only the basis for the direction of time (a later event is one that contains a larger sum total of reality), but also for the differentiation of the temporal dimensions of space and time.

Broad makes it clear that the change associated with absolute becoming is to be contrasted with purely qualitative change. He states

> I think that we must recognise that the world 'change' is used in three distinct senses, of which the third is the most fundamental. These are (i) Change in the attributes of things, as where the signal lamp changes from red to green; (ii) Change in events with respect to pastness, as where a certain event ceases to be present and moves into the more and more remote past; and (iii) Change from present to future.[56]

He goes on to declare that both (i) and (ii) depend on (iii). For Broad, to say that the signal lamp changes from red to green is merely to claim that the lamp's being red precedes the lamp's being green. For the red section of the lamp's history to precede the

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[53] Broad (1923), p. 68, emphasis in original
[54] Dorato (2006), p. 560 points this out.
[55] In the case of the growing block view, this can be taken literally, and it seems to be how Broad (1923) endorses it. The presentist, however, must interpret this "addition of reality" in a more loose manner; perhaps the addition of reality is the addition of tensed properties or tensed facts. I will not expand on this here – the presentist, as I make clear below, has more pressing problems than accounting for the direction of time.
[56] Broad (1923), p. 67

green section of the lamp's history, the red section of the lamp's history must have existed when the green section of the lamp's history did not. Thus, an analysis of the qualitative change of things involves a change in the sum total of existence (absolute becoming). Because qualitative change involves absolute becoming, absolute becoming cannot be analyzed in terms of qualitative change. Broad further highlights this difference when he notes that "We say 'S becomes,' and we say 'S becomes P.' The latter type of judgment expresses qualitative change, the former expresses coming into existence."[57] Thus, the change involved in becoming must be distinguished from qualitative change. Qualitative change depends on absolute becoming, and because of this, absolute becoming cannot be the qualitative change of an event. Instead, absolute becoming is an event's coming in to existence.

1.5.2 The Property-Acquisition Model

The ontologies of presentism and the growing block nicely accommodate the first model of temporal becoming – future things come into existence in the present, and this is it means for something to "become." An eternalist ontology of spacetime, however, does not have the resources to accommodate this conception of becoming. In eternalism, because all events exist, the notion of becoming cannot just be understood as the becoming real or coming into existence of future events. This forces the eternalist to supply a different conception of temporal becoming. Clearly, eternalists do not accept the view that becoming should be analyzed in terms of existence. Instead, temporal becoming must be analyzed in terms of an already-existing event gaining a certain property, namely, presentness. Thus, becoming is to be understood as an event's gain of a certain property instead of an event's coming into existence.

[57] *ibid*, p. 69

The gain (or loss) of an intrinsic property represents the fact that the world has undergone a genuine shift, which then accounts for the change required by the traditional views of the passage of time. Furthermore, the understanding temporal becoming to be the gain of the intrinsic property of presentness allows us to assert that there is an objective sense in which events become. Because this model of temporal becoming is set within an eternalist ontology of spacetime and requires that there be a property of presentness that events gain and lose, the model is a natural fit with the moving spotlight view of time. On the moving spotlight view, one holds that the present possesses the primitive property of presentness – but this property has no bearing on the existence (or non-existence) of events. All events exist, but some of them happen to have this property of presentness. Which events possess this property of presentness changes, and this change is the basis for the passage of time. Thus, the property-acquisition model of the temporal becoming is the model is the model of becoming endorsed by the proponent of the moving spotlight theory.

In this way, becoming, *contra* Broad, is analyzed as a specific type of qualitative change – one involving temporal properties. This more closely matches the definition of temporal becoming as an event changing from future to present to past. Future events already exist – so temporal becoming is not understood in terms of the acquisition of reality or existence – rather, becoming is understood as the acquisition of the property of presentness by already-existing events. On this account, past and future things lack the property of presentness. A future event is one that has not yet acquired the property of presentness, and a past event is one that has acquired and lost the property of presentness. Temporal becoming can then be understood as an event acquiring the primitive property

of presentness. An event in the future has not yet become because it has not yet gained the primitive property of presentness. An event becomes as it gains this property. Thus, events in the future can be said to exist (or be real), but we can still have an account of temporal becoming. The future event becomes when it gains the property of presentness.

1.6 The Special Theory of Relativity

The most infamous difficulty for an A-theory, and therefore any account of the passage of time, is its conflict with the Special Theory of Relativity (STR). According to its standard interpretation, STR entails the rejection of both of the traditional models of temporal becoming. This is a result of the fact that, according to STR, all inertial frames of reference are equivalent together with the constancy of the speed of light in all frames.

1.6.1 The Details

In 1905, Albert Einstein published an article titled, "On the Electrodynamics of Moving Bodies" which sets out the Special Theory of Relativity. The theory is based on two postulates:

> First Postulate (The Principle of Relativity): The laws of physics are the same in all inertial frames of reference.
>
> Second Postulate (Constancy of the Velocity of Light): The velocity of light in a vacuum is constant in all frames of reference.[58]

A frame of reference can be understood as an array of observers with the same three-dimensional coordinate system that moves with the observers. In addition, suppose all of the observers in a frame of reference carried clocks with them – they would find that each clock has the same reading at the same time. A second frame of reference will then

[58] Included in the theory is the assumption that space is homogenous and isotropic – the same in all regions and in all directions.

consist of another collection of observers, all at rest relative to one another, and all moving at the same velocity relative to the first set. They too, have their own synchronized clocks.

The first postulate follows from the fact that the laws of nature are the same in all frames of reference that are in uniform motion relative to each other. This is the principle of relativity, as famously outlined by Galileo (1632):

> *Salviatus*: Shut yourself up with some friend in the main cabin below decks on some large ship and have with you there some flies, butterflies, and other small flying animals. Have a large bowl of water with some fish in it; hang up a bottle which empties drop by drop into a wide vessel beneath it. With the ship standing still, observe carefully how the little animals fly with equal speed to all sides of the cabin. The fish swim indifferently in all directions; the drops fall into the vessel beneath; and, in throwing something toward your friend, you need throw it no more strongly in one direction than another, the distances being equal; jumping with your feet together, you pass equal spaces in every direction. When you have observed all these things carefully…have the ship proceed with any speed you like, so long as the motion is uniform and not fluctuating this way and that. You will discover not the least change in all the effects named, nor could you tell from any of them whether the ship was moving or standing still.[59]

Any experiment performed in one frame of reference in uniform motion will yield the same results when performed in any other uniformly moving frame of reference. This entails that no experiment can determine whether a frame of reference is at rest or moving uniformly. Thus, only the relative velocity between frames of reference can be measured.

The second postulate is based on the result that all observers, regardless of their frame of reference, measure the speed of light to be the same – (approximately) 299,792,458 meters per second (labeled c by scientists). For example, an observer traveling at 200,000,000 meters per second "chasing after" a flash of light will measure the speed to be c.

[59] Galileo (1632), pp. 186-187

STR is formulated in Minkowski spacetime. Briefly, the characteristic feature of Minkowski spacetime is the light cone, a double cone extending in opposite directions, centered at each event in spacetime.

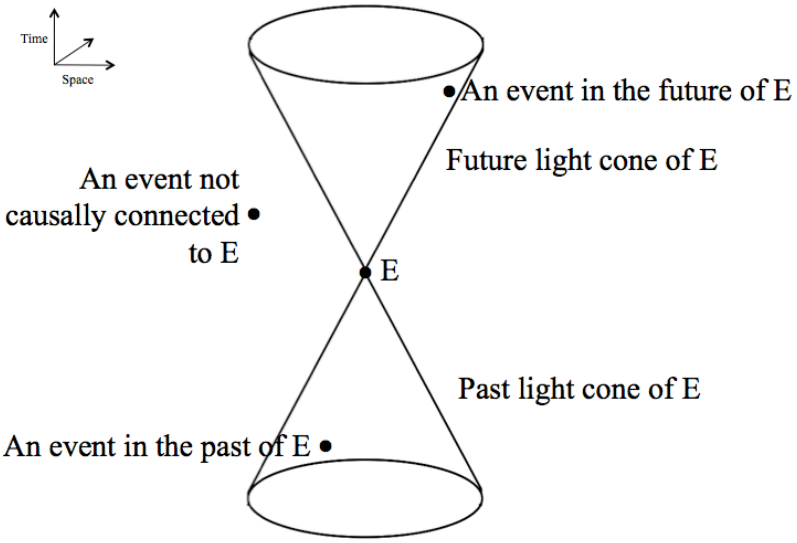

Figure 1.5

The upper light cone is the future light cone, which represents the future history of a light flash emitted at the event. The lower light cone, called the past light cone, represents all directions from which light flashes can be received at the event. Because the speed of light is constant in all frames of reference, all observers will agree on the light cones at each event, regardless of each observer's motion.

Events can be light-like, time-like, or space-like separated according to their positions in another event's light cone. Event *y* is light-like separated from another event, *x*, if *y* lies on the outer edge (separated at a 45 degree angle) of *x*'s light cone. This represents the situation that *x* can only be causally influenced by photons traveling at the speed of light from *y*. In addition, *y* is time-like separated from *x* if *y* is inside *x*'s light cone. If *y* is in *x*'s past light cone, then *y* can have causal influence on *x*. If *y* is in *x*'s future light cone, then *x* can causally influence *y*. Last, *y* is space-like separated from *x* if

y is outside of *x*'s light cone. Events that are space-like separated can never influence each other, since this would imply causal influence at speeds faster than the speed of light.

1.6.2 The Implications of STR

One of the most important implications of STR is the relativity of simultaneity. That is, as a result of the two postulates, two events that are simultaneous in one frame of reference are not simultaneous in another. Furthermore, there is no frame of reference that is the privileged frame of reference. Lee Sartori (1996) notes that "it is fruitless to inquire whether the two events are 'really' simultaneous; there is no operational way to answer the question. We conclude, rather, that simultaneity is not absolute but can hold only in a particular frame of reference."[60]

This relativity of simultaneity ultimately means that no two events are "really" or absolutely simultaneous; two events are only simultaneous with respect to a certain frame of reference. A-theories seem to require a classical spacetime in which there is absolute simultaneity, or a preferred foliation of spacetime. Briefly, A-theories suppose a preferred foliation of spacetime in which spacetime can be sliced up only in one way – which is the global present. Absolute simultaneity holds across each of the sliced up 3-planes (foliations). And thus, what is happening now (what is the present) is the same across the entire 3-plane. STR, however, expressly rejects this type of preferred foliation. It entails that all inertial frames of reference are equal because the laws of nature are the same in all of them. Therefore, there are many ways to "slice up" the spacetime cube – and none of them is preferred over any other. The consequence follows that it is not the

[60] Sartori (1996), p. 59

case that the present (the class of events simultaneous with the present) will be the same for all frames of reference.

1.6.3 The Rejection of Traditional Temporal Becoming

Ultimately, this standard interpretation of STR entails that temporal becoming cannot be understood as a gain in reality or the monadic temporal property of presentness. An argument originally offered by Hilary Putnam in "Time and Physical Geometry" as an attack against tensed theories of time (such as presentism) can be utilized in order to expose the difficulties with accepting the traditional understanding of the conception of becoming.[61] Putnam argues that STR has the consequence that any future event *x* is *already* real.

This problem is highlighted when considering two space-like separated events, O and E in Minkowski spacetime. Sally is the observer at O, and O and E are simultaneous from the point of view of Sally. Thus, E is present for Sally because it is happening simultaneously with her now. Fred is also another observer at O – but he is in a different frame of reference and thus has a different point of view. Fred has not yet observed E and rightly concludes that E is in his future. For Fred, this means that O and E are not simultaneous.

[61] Putnam (1967). Rietdijk (1966) also set out a similar argument against tenses, and Maxwell (1985) sets out a related argument with respect to quantum mechanics.

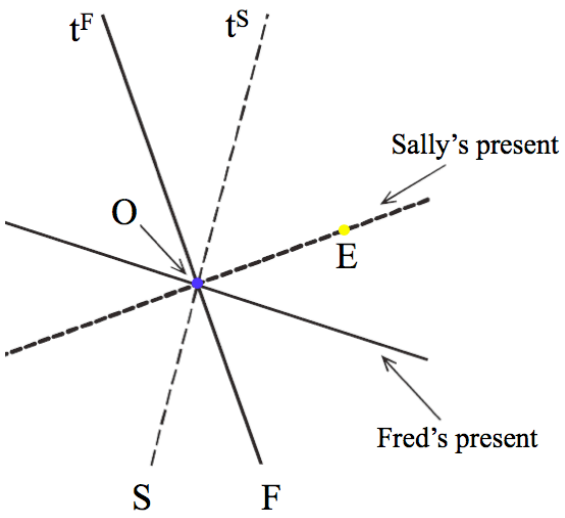

Figure 1.6

Sally is co-present with Fred at O, thus Sally is real or present to Fred, and because E is real or present for Sally (because E is present for Sally), Fred concludes that E must be real or present. But E is in Fred's future from Fred's point of view. If Fred is a presentist or growing block theorist, E cannot be real for him. If Fred is a moving spotlight theorist, E cannot be present for him. In the context of special relativity, it turns out that E is both real and not real, or E is present and not present for Fred.[62] The endorsement of an objective non-relational conception of presentness leads to this contradiction; therefore, opponents of A-theory views argue that A-theory must be rejected.[63]

Although Putnam's argument was originally formulated as an attack against A-theories of time, it has consequences for the plausibility of certain conceptions of temporal becoming. Mauro Dorato (2008) explains, "To the extent that the notion of *temporal becoming* presupposes the unreality of future events as its necessary condition, STR seems to rule out also becoming."[64] More specifically, if temporal

[62] This example (slightly altered by me) is in Hinchliff (1996) and Savitt (2000).
[63] See Petkov (2006) for further elaboration.
[64] Dorato (2008), p. 59, emphasis in original

becoming is analyzed according to the first model of temporal becoming in terms of existence (in which a non-existent future event comes into existence in the future), we are forced into accepting absurd consequences. The traditional conception of temporal becoming requires that events in the future do not exist. They come into existence in the present through the process of temporal becoming. For Fred, E is in his future, and thus has not yet "become" for him. Because temporal becoming is analyzed in terms of coming into existence, the fact that E has not yet become for Fred means that E does not exist for Fred (because it has not yet *come* into existence). But E has "become" for Sally. This is due to the fact that E is in Sally's present and so for Sally, E exists. Thus, because E has not yet become for Fred, it does not exist, and because E has become for Sally, it exists. On this view of temporal becoming, it seems as if E both exists and does not exist.

If we accept the conception of temporal becoming as analyzed in terms of existence, we seem forced to conclude that an event can both exist and not exist. On the other hand, if we endorse the second model of becoming, the future exists and so we might think that it avoids the problems associated with endorsing Minkowski spacetime. But this would be too quick; endorsing Minkowski spacetime while accepting becoming in terms of an event's gain in the temporal monadic property of presentness leads to the conclusion that an event can both possess the monadic property of presentness and fail to possess the monadic property of presentness simultaneously. Thus, the problem resulting from STR applies to the second model of temporal becoming as well as the first model of temporal becoming.

1.6.4 The Rejection of Passage

The standard interpretation of STR entails that the world is a B-theory blockworld. But neither of the traditional model of temporal becoming can be accommodated by the B-theory blockworld. Proponents of traditional passage declare that the B-theory blockworld, the view that the world is a four-dimensional entity without the temporal properties of pastness, presentness, or futurity, cannot account for temporal becoming; these opponents of the B-theory blockworld claim that in a so-called "frozen" universe in which everything already exists, nothing can become, and therefore time cannot pass. Becoming and passage are both conspicuously absent from the world described by the standard interpretation of our leading scientific theory.

1.6.5 The Response

The popular response of those who want to save the passage of time is to reject the standard interpretation of STR. The relativity of simultaneity leads to the contradiction; if the A-theorist can find a place for absolute simultaneity, then the contradiction does not arise. Finding absolute simultaneity takes the form of inserting a preferred foliation of spacetime. In other words, the spacetime manifold – the four-dimensional "cube" – is sliced up in one particular way. This stack of spacelike hypersurfaces is the privileged foliation. The A-theorist could then hold that what is present in this spacetime manifold is just three-dimensional slice (or hypersurface) that is privileged.

There are two main ways to preserve a privileged foliation: alter or augment STR. One way of altering STR is to accept a Lorentzian style interpretation.[65] In this interpretation, the world is not Minkowskian – instead, we return to a Newtonian

[65] Based on the work of Lorentz (1916).

manifold in which space and time are both absolute. For example, in Tooley's (1997) Neo-Lorentzian interpretation, there is privileged frame of reference – the one which is at rest relative to absolute space. This also means that there can be an absolute notion of simultaneity – this is defined as simultaneity relative to the privileged frames of reference that are at rest relative to absolute space. Tooley's interpretation replaces the principle that the speed of light is absolute with the principle that the speed of light is constant in all directions relative to absolute space, and we can derive the Lorentz transformations for the cases of inertial frames in motion relative to absolute space. The Second Postulate of STR states that the speed of light is constant in *all* frames of reference; the strategy to produce a modified theory based upon STR is to give up the Second Postulate of special relativity and replace it with the principle that the speed of light is the same in all directions relative to absolute space.[66]

The second strategy is to augment STR by accepting Minkowski spacetime, but adding structure to it. The addition of a foliation to Minkowski spacetime does not necessarily violate STR. That is, a preferred frame of reference can be consistent with STR. Zimmerman (2011) holds that "A theory can even add a causally-relevant foliation without violating [STR], so long as the laws that make use of the foliation appeal not to intrinsic structure but to a foliation privileged by the metrical contents of the manifold."[67] For example, the dynamics of the universe could pick out a preferred frame of reference, even though the background spacetime is Minkowskian.[68] The distribution of mass could determine an inertial frame, and correspondingly, a set of slices of absolute simultaneity.

[66] Tooley (1997) argues that this replacement is possible and justified. Note that he claims that the round trip speed of light is also constant – this is why we measure the speed of light to be constant in all frames of reference.
[67] Zimmerman (2011), p. 215
[68] This seems to be the view advanced by Peacock (2006).

Thus, there are dynamical facts (about the material contents), apart from concerns about the metric of spacetime, that privilege one foliation of the manifold.[69]

1.7 Passage and Illusion

Those who accept the standard interpretation of STR take passage to be an illusion. This is typically the B-theory response. B-theorists hold that STR should not be altered or augmented and that our experience of the passage of time is best explained as a type of illusion.[70] It is almost universally agreed that there is no becoming or passage in the B-theory blockworld. This is due to the overwhelming endorsement of the traditional models of temporal becoming and the traditional understanding of the passage of time as requiring the shift of the privileged present moment. This leads virtually everyone in the debate about the passage of time to agree that B-theorists deny becoming and passage and hold it to be an illusion. B-theory is thereby commonly taken to be synonymous with denying becoming and passage while A-theory is synonymous with the endorsement of the existence of becoming and passage. B-theorists, therefore, have accepted the label that their theory is one which holds becoming and passage as an illusion to be explained away.

Although this is the typical B-theory response, not much work has been done to explain exactly how time seems to pass even though it in fact does no such thing. There is agreement, however, that these B-theorists must make sense of the features of our

[69] An additional strategy is to argue that a more fundamental theory of physics – that of quantum gravity – will restore a privileged present moment and thus save A-theory from being rejected by physics. Monton (2006) proposes this type of option (and points to a CMC foliation approach to quantum gravity specifically). I put this option to the side because there are no models of this type that are currently being seriously pursued by physicists.

[70] For example, see Russell (1915), Smart (1980), Oaklander (1984), Le Poidevin (1991), Mellor (1998), and Dyke (2002).

temporal experience as something that moves without appealing to the existence of the passage of time.[71] B-theorists are then in the position of attempting to give a reasonable explanation of why we have experiences of passage without the existence of passage. One such explanation is offered by Paul (2010). She claims that cognitive inputs of static events could be interpreted by our minds as transitory in nature in a similar way to the illusions of apparent motion in cognitive science. Insofar as we can experience motion from static inputs, Paul claims, we can explain the experience of passage in the B-theory blockworld.

1.8 The Problem and the Solution

The overall problem, however, is that it seems we must either reject what one of our best scientific theories tells us about the nature of the world or we must accept that something so fundamental and inescapable as the experience of passage is an illusion. On one hand, we must reject what our standard science tells us is the case; on the other hand we must dismiss what so vividly seems to be the case. This is, at the most basic level, a clash between science and commonsense. We then must make a choice: science or commonsense.

Unfortunately, neither choice is acceptable. First, A-theorists alter STR in order to preserve a privileged present moment that, in turn, purportedly allows them to save the passage of time. Thus, the justification for altering what is our standard interpretation of the nature of spacetime is the preservation of passage. I argue, however, that independent of STR, there can be no change or shift of the NOW. The metaphysical problems associated with each A-theory's version of the change in what moment is objectively

[71] See Paul (2010) and Prosser (2012).

privileged are insurmountable. Furthermore, the metaphysical problems with each A-theory are similar in nature, suggesting a structural problem for all A-theories. Due to these structural problems, no A-theory of time can preserve passage even if there is an objectively privileged present moment. This ultimately means that the A-theorist does not have justification to alter STR. Therefore, the standard interpretation of STR should be accepted because there is no plausible reason to endorse a non-standard account.

Second, passage should not be considered to be an illusion. The passage of time is central to our understanding of the world. Williams (1951) captures this best when he claims that

> The final motive for the attempt to consummate the fourth dimension of the manifold with the special perfection of passage is the vaguest but the most substantial and incorrigible. It is simply that we *find* passage, that we are immediately and poignantly involved in the jerk and whoosh of process, of the felt flow of one moment into the next.[72]

As a result, the existence of passage is one that should not be so easily dismissed. In addition, from our experience of the passage of time, there is no reason to think that it is an illusion. As Norton (2010) states, "We know what illusions are like and how to detect them. Passage exhibits no sign of being an illusion."[73] As a result, Norton recommends that one should resist the idea that passage is an illusion. Passage should not be explained away. Doing so would strip the world of something that is fundamental to our understanding of time.

Our best science tells us that the world is a B-theory blockworld. But there is no passage of time in the B-theory blockworld. But there is no good reason to alter STR. So passage, against our intuitive understanding of the world, must be an illusion. Unfortunately, there is good reason to resist passage as an illusion. We face a choice

[72] Williams (1951), pp. 465-466, emphasis in original
[73] Norton (2010), p. 23

between two options that both have significant – and unacceptable – drawbacks. Where does this then leave us?

The rejection of both of the unacceptable options to resolve the problem create motivation for a third option – an option that I set out and defend in the second part of the project. I propose that we do not need to make a choice between STR and passage. I offer a way to avoid choosing either of the first two options by defending a third option: B-coming, which is a relativistically-friendly understanding of temporal becoming at the foundation of passage. We should not dismiss a vivid phenomenal experience such as passage so readily; instead, we should seek to incorporate it into our best theories about the world. In this way, I offer a defense of passage in the B-theory blockworld.

The endorsement of passage in the B-theory blockworld is a small niche to occupy. In the literature, only Dieks (2006), Maudlin (2007), and Norton (2010) defend the possibility of passage in a B-theory account of time.[74] Dieks holds that a relativistically-friendly (partial) temporal ordering of events is sufficient for temporal becoming. Along with the claim that what it is to be an event is to occur or happen, the temporal ordering of events gives rise to the successive happening of events that is the becoming at the base of passage. Maudlin, on the other hand, holds that the passage of time is a primitive and unanalyzable component of the four-dimensional manifold. The passage of time, according to Maudlin, is the basis for the arrow of time as well as the differentiation of space and time, but he does not explicate how this is the case. Norton endorses the B-theory blockworld and gives reasons against considering passage as an illusion, but does not offer a positive account of passage. For Dieks, that a temporal

[74] Dorato (2006) and Savitt (2002), (2006), (2009) also propose a view similar to Dieks. I do not consider these similar to my account because neither Dorato nor Savitt endorse a B-theory blockworld. Instead, they ultimately think there is no metaphysical difference between A-theory and B-theory.

ordering of events gives rise to temporal becoming is a *sui generis* attribute of events. For Maudlin, passage is primitive and unanalyzable. Norton does not articulate a theory of passage.

I aim to offer a more explanatorily satisfactory account than Dieks, Maudlin, or Norton. I explicate a revised model of temporal becoming and a theory of the passage of time based on the revised model. In this revised model of temporal becoming, I offer a relational understanding of becoming very much in the spirit of Dorato (2006). To be scientifically respectable, this relation of becoming must not conflict with the standard interpretation of STR. The relation I offer is based on Stein's (1968) analysis of a relativistically-friendly relation that is not the identity or universal relation. This relation, which I refer to as the B-coming relation, is defined as the relation between an event and any other event in or on the past light cone of the first event. Thus, what has B-come for any event is what is in or on that event's past light cone. I then construct an account of the passage of time based on B-coming. Ultimately, time passes by way of a change in what has B-come for a thing. In this way, I offer a reductionist account of the passage of time in which I need not postulate a new ontological category (Dieks' *sui generis* attribute of events) or a primitive (Maudlin's unanalyzable passage).

1.9 Conclusion

The traditional picture is that temporal becoming is either coming in to existence or becoming present, and that passage is the change or the shift of the privileged present moment. This is the picture I challenge in the next two chapters. I show that the traditional picture of becoming and passage is impossible for *any* metaphysics of time to

accommodate. This seems to imply either that becoming and passage are not possible on any metaphysics of time, or that we should understand these concepts in a different way. In the fourth and fifth chapter, I argue for the latter option and propose a new way to understand becoming and passage. In the absence of any plausible reason for altering it, we should respect the standard interpretation of STR; because of this, I propose an understanding of becoming and passage that is only suitable in a B-theory blockworld. I present a picture of becoming and passage that goes against (almost) all prevailing wisdom in the literature. I end by defending the new picture and arguing that it is an understanding of becoming and passage that is worth wanting.

2

The Changing NOW

Time marches by; anticipated or dreaded events approach me from the future while formerly present events, to my relief or sadness, recede into the past. I am helpless in halting the approach of the future, just as I am helpless in keeping the past from fading away. The continuing transience of events approaching from the future, becoming vivid and fresh in the present, and then fading into the past is the central feature of our temporal experience. This jerk and whoosh of time is most often expressed in terms of the change in what is present; more specifically, the passage of time is based on the change of the NOW. This change in what moment is present (across time) is the traditional understanding of the passage of time.

Each A-theory discussed so far is committed to two particular theses which serves to preserve this traditional understanding of the passage of time. The first thesis, the Present Thesis, identifies a theory as an A-theory while the second thesis, the Change Thesis, serves as the basis for the accommodation of the passage of time. More formally, these theses are:

> The Present Thesis: One, and only one present moment – the NOW – is objectively privileged.
>
> The Change Thesis: What moment is present changes; there is a succession of present moments.

Any plausible A-theory endorses these two theses.[75] The first thesis requires the A-theorist to accept a single privileged present moment to serve as the NOW. The second thesis requires the A-theorist to account for change in order to establish the passage of time in the traditional understanding that has been outlined in the previous chapter. Each of the discussed A-theories accepts these two theses in various forms. For the moving spotlight theorist, the two theses are:

> The Present Thesis (MS): Only the present moment possesses the temporal monadic property of presentness.
>
> The Change Thesis (MS): Which moment possesses the temporal monadic property of presentness changes; the property of NOWness moves from one moment to the next.

For the presentist, the formulation of the two theses reflect the particular ontology of the existence of only the present moment:

> The Present Thesis (P): Only the present moment exists; the past and the future do not exist.
>
> The Change Thesis (P): What exists changes; as one moment is created, the previous is annihilated.[76]

For the proponent of the growing block theory, the formulations of the two theses are as follows:

> The Present Thesis (GB): Only one moment is at the growing (leading) edge of the blockworld.
>
> The Change Thesis (GB): What moment is at the growing (leading) edge of the blockworld changes.

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[75] There are some A-theories, of course, that do not endorse one of the theses. A solipsistic presentist would not endorse the Change Thesis – but without the passage of time, there is little reason to endorse such a bizarre ontology. In addition, there is a theory that rejects the first thesis; this theory is sometimes called thick presentism or overlapper presentism in which the present is extended and can be divided up into earlier and later increments. See Dainton (2010) for an explication of this view. Tallant (2010a) shows that this version of presentism also suffers from McTaggart's Paradox.

[76] This follows Craig's (2001), p. 44 assertion that temporal change is ultimately a conception of continual creation and annihilation of events.

Although each A-theory adheres to the generic versions of the two theses, the specific formulations they accept are based on the metaphysics of time that they uphold.

Any view of time that endorses both a Present Thesis (that the present is somehow special or privileged, either in terms of existence or a property of presentness or by virtue of position) and a Change Thesis (that the privileged present moment changes) faces a significant problem as a result of holding both of these theses. In short, these two components are incompatible. This problem is manifested in different ways in the different A-theories. In the moving spotlight theory, that an event (which is part of a moment) itself can change with respect to temporal properties means that the event must possess the temporal properties of pastness, presentness and futurity. Thus, in this picture, the change in the NOW is understood as the change in an event from present to past in addition to the following event changing from future to present. But this change in what is NOW faces McTaggart's famous Paradox. Because of this, any attempt of the moving spotlight view to account for temporal change faces a contradiction or an infinite regress. I show how a recent appeal to hypertime in order to avoid the infinite regress problem does not help the moving spotlight theorist avoid McTaggart' Paradox because it entails the rejection of the Present Thesis.

Presentism avoids McTaggart's Paradox by abandoning the temporal properties of pastness and futurity and accepting the existence of only the present. In this way, presentism avoids McTaggart's Paradox but is too austere to accommodate temporal change; there is no change in the NOW because the presentist cannot account for the change in the contents of the present over time. The problem for the presentist is that the change upon which passage is based ultimately requires the existence of more than one

moment. As such, the presentist is forced to reject the Present Thesis. I examine the presentist's obvious response of indirectly accommodating change by accounting for the difference between what does exist and what did exist. To do this, the presentist must appeal to presently-existing surrogates as proxy for past things. But for this surrogate strategy to be successful, the proposed surrogate must track what actually happened. I demonstrate, however, that there is no guarantee that this is the case. In fact, we have greater justification to believe that surrogates do not track what the past is really like. As a result, the presentist cannot satisfy the Change Thesis, which means the presentist cannot accommodate the passage of time. The presentist is ultimately stuck in this moment.

The growing block theory has an existing past, but I show that the theory cannot account for the change in the growing edge of the block without encountering a contradiction similar to the one in McTaggart's Paradox. There is, however, a way to rehabilitate the growing block theory, which involves an appeal to absolute becoming. Thus, the success of the growing block theory therefore depends on the success of its model of temporal becoming; I examine this issue in the next chapter, where I show that the two models of temporal becoming should be rejected. Ultimately, there is no passage of time – as it is traditionally understood – in any A-theory world.

2.1 McTaggart and the Moving Spotlight

The moving spotlight view is a combination of the A-theory and eternalism; accordingly, all events exist, yet a subset of these events is the privileged present moment, the NOW. On the moving spotlight view, the present possesses the primitive

property of presentness – but this property has no bearing on the existence (or non-existence) of events. All events exist, but some of them happen to have the property of presentness. For the proponent of the moving spotlight view, however, the section of the universe (the slice of reality) that possesses the property of presentness changes. In this way, the universe is (slightly) different at different times. This understanding of temporal change, however, puts the proponent of the moving spotlight theory at the mercy of McTaggart's famous Paradox.

2.1.1 McTaggart's Paradox

Briefly, McTaggart's Paradox holds that there is no time without temporal change, and because temporal change is contradictory, there is no time. More specifically, McTaggart's argument is composed of the following claims:

1. If there is time, then there is temporal change.
2. Temporal change must be the change in the A-properties of an event.
3. For the A-properties of an event to change, all events must possess all three A-properties.
4. An event's possession of all three A-properties is contradictory.
5. Temporal change is contradictory, and so there is no temporal change.
6. Therefore, there is no time.[77]

Consider these claims in more detail. Suppose that *Pe* stands for the claim that "e is past." This means, among other things, that e does not posses the property of being present. *Ne* stands for "e is present" (or, "e is NOW"). This means that if *Ne* is true, e possesses the primitive property of presentness. *Fe* stands for "e is future." This means (if true) that e does not possess the property of presentness. At the very least, the truth of *Pe* and *Ne* are incompatible; if *Pe* is true, then e does not possess the property of presentness and if *Ne* is true, then e does possess the property of presentness. Thus, they cannot both be true. The same goes for the incompatibility of the truth of *Ne* and *Fe*. All

[77] McTaggart (1908)

events, however, occupy all A-series positions. So the A-theory of time implies that for every event e:

Pe and *Ne* and *Fe*

But any two of these claims are incompatible.[78] That is, the A-series requires that any event e both has the property of presentness (since it is present) and lacks the property of presentness (since it is future or past). Every event must have all of its A-times in order to change A-times. But this is contradictory. There is, however, an obvious response. The A-theory does not need to endorse that an event is both present (and possesses the property of presentness) and future (and does not possess the property of presentness) and past (also does not possess the property of presentness). According to Callender (2000), "the next move is to hold that e (say) *is* in the present, *was* in the future and *will be* in the past."[79] Thus, for event e, the following are true:

FPe and *Ne* and *PF*e.

These three are compatible. However, if you wish to make this move, you must admit that any event e has its simple A-time NOW, so that:

If *Pe* is true, then *NPe* is true.

If *Ne* is true, then *NNe* is true.

If *Fe* is true, then *NFe* is true.

In addition to these equivalencies, each event possesses, instead of three simple A-times, nine complex A-times. The A-times of events are always changing (which is, of course, what accounts for passage), and so all events have all of these nine A-times. Many of these more complex A-times are incompatible. For example, *NPe* and *NNe* are

[78] This version of McTaggart's argument is found in Mellor (1998), pp. 72-78.
[79] Callender (2000), p. S590, emphasis in original

incompatible, since *NPe* is equivalent of *Pe* and *NNe* is equivalent to *Ne* and *Pe* and *Ne* are incompatible. The attempt to escape this incompatibility by introducing third level times will only lead to the introduction of twenty seven new A-times and a new set of contradictions between some of those A-times. As Mellor (1998) claims, "We have an endless regress, a regress that is vicious because at no stage in it can all the A-facts it entails be consistently stated."[80]

Although McTaggart takes his paradox to show that time itself is unreal, most philosophers of time instead interpret the argument as showing that McTaggart's specific formulation of temporal change is untenable. And because the moving spotlight theory is the only view of time that utilizes this particular understanding of temporal change, the moving spotlight theory cannot accommodate the temporal change that is necessary for the passage of time. In this way, there can be no temporal change – as the proponent of the moving spotlight theory conceives of it.

2.1.2 Houses on a Street

Another way to understand this problem is as follows: different sections of the universe are "illuminated" (by the property of presentness) at different times – the spotlight moves across the universe, proving an account of the passage of time. This is the metaphor that Broad (1923) originally offers. The pictures of houses are meant to represent existing moments of time and the spotlight shining on a house represents that the house is present – that particular moment basks in the spotlight of the NOW. According to this metaphor, the picture of the entire world at moment t_1 looks like the following:

[80] Mellor (1998), p. 74

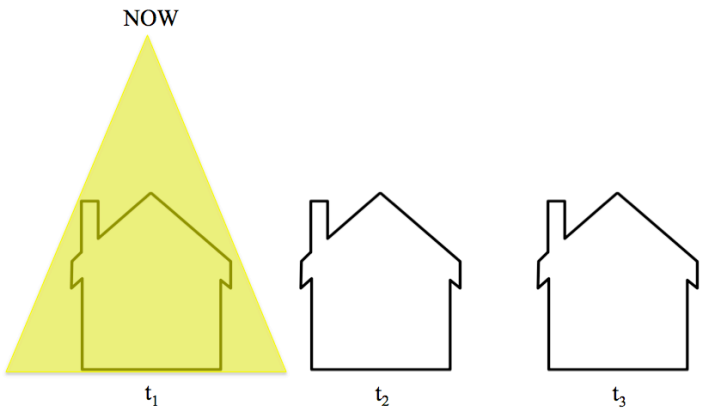


Figure 2.1

By way of this metaphor, it is easy to see the tension between the Present Thesis and the Change Thesis which leads to McTaggart's Paradox. Because this is most apparent in the case of the moving spotlight view, it is the main reason why almost all philosophers of time reject the view. The following illustrates this problem nicely: suppose I occupy the house at t_1 in the moving spotlight street of houses. In this situation, the Present Thesis is easily satisfied; my house is lit up by the spotlight of the NOW. But within this one moment that I occupy, I look out my window and see no other houses that are illuminated by the spotlight of the NOW. In this way, the Change Thesis is not satisfied. But further suppose that the light of the NOW does move on to the next house thus satisfying the Change Thesis. For the Present Thesis to be satisfied in this situation, it must be the case that my house is not lit by the spotlight of the NOW (because the next house is lit by the NOW). Thus, to introduce change, the house I occupy must be both illuminated and not illuminated, and a contradiction results; if there is to be change in what moment is present, all moments must both be present and not-present.[81]

The obvious reply, of course, is that the spotlight of the NOW moves across the houses in succession, one after another. But this itself leads to an inescapable difficulty:

[81] This way of understanding the problem is presented in Price (2011).

the houses are meant to represent the moments in time and so the row of houses represents the succession of moments. In this way, appeal to succession in the original row of houses forces the addition of a second temporal parameter. At first, the addition of a second temporal parameter might not seem so problematic, but the appeal faces the same problem as in the first temporal parameter. Time must pass in this second temporal parameter for it to pass in the first temporal parameter. That is, in the second temporal parameter, at time T_1, the light shines on T_1 and therefore shines on t_1 in the first temporal parameter. When the light shines on T_2 in the second temporal parameter, the light shines on t_2 in the first temporal parameter. Thus, the light must move from T_1 to T_2 in the second parameter for it to move from t_1 to t_2 in the first temporal parameter. The problem of contradiction, however, arises in the second temporal parameter in the same way that it does in the first; for T_1 to change in terms of being illuminated, it must both be illuminated and not illuminated. This is a contradiction that requires appeal to yet another temporal parameter. But the same problem will arise again in this third temporal parameter requiring another additional temporal parameter, *ad infinitum*.[82] The way out of the contradiction by appealing to additional temporal parameters leads to a vicious infinite regress.[83] In short, this is McTaggart's Paradox: temporal change is contradictory, and any way out of the contradiction forces a vicious infinite regress of temporal parameters.

2.1.3 Appeal to Hypertime

The response of the moving spotlight theory is familiar: the events at each time successively lack illumination, then are illuminated (as the spotlight of presentness

[82] For a more technical discussion of this infinite regress see Mellor (1998).
[83] For a detailed argument about why exactly this regress is vicious, see Oaklander (1983).

sweeps over them), and finally, lack illumination once again. Thus, the events can possesses contradictory properties if they have them at different times. McTaggart claims that this leads to a vicious infinite regress, but the proponent of a moving spotlight can offer a way out of this regress by postulating a hypertime – also referred to as a supertime – which can be understood as a collection of meta-moments which form a meta-time series. Both Schlesinger (1980) and Skow (2012) advocate this strategy to avoid McTaggart's regress. In his theory of hypertime, Schlesinger (1980) claims that

> All the moments of our regular time series co-exist together at each moment in super-time, and the position of the NOW in regular time varies from moment to moment in super-time. M_1 and every other moment in regular time can assume different properties at different moments in supertime.[84]

The picture of the moving spotlight view with its added hypertime looks like the following:

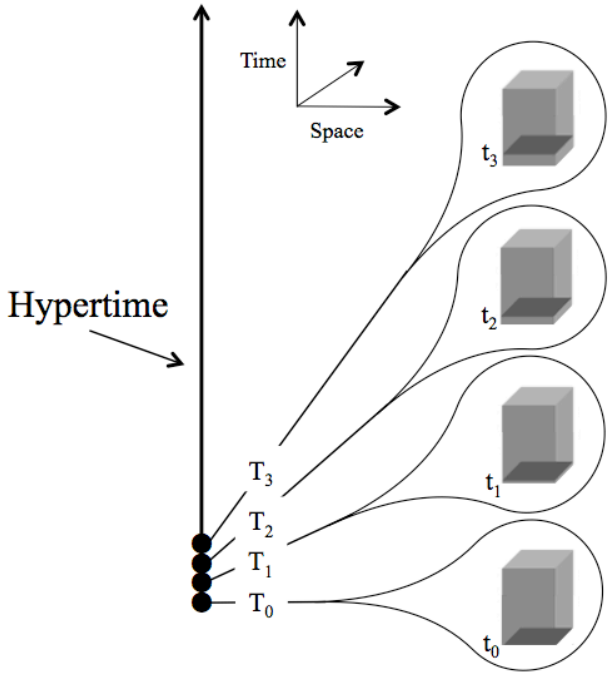


Figure 2.2

[84] Schlesinger (1980), p. 140

Thus, for the proponent of the moving spotlight view, there is temporal change because the NOW is different at different (hyper)times. The postulation of hypertime allows the moving spotlight theory to retain there is a change in which moment is privileged.

At each point in hypertime, a different moment in regular time is objectively privileged. In this way, the temporal properties of the universe change from one point in hypertime to another point in hypertime. Presumably, each point in hypertime is ordered by a relation that is analogous to the *earlier than* relation (but it is not the genuine *earlier than* relation because hypertime is not regular time – it is a meta-time). This meta-*earlier than* relation ensures that the orderly succession of the privileged moment across regular time. Thus, according to the moving spotlight theory, the universe has different properties at different hypertimes. Skow (2012) describes this in the following way: "For the NOW to move is for it to be located at different times relative to different points of supertime."[85] This supposedly is enough to establish the change in what is NOW to accommodate the passage of time.

2.1.4 The Problem With Hypertime

The problem is that the universe does have different properties at different hypertimes, but this is always the case, so there is no way that there can exist change in the NOW. What I mean is this: for there to be a change in the NOW, there must be a change in the temporal facts or states of affairs that exist. If the universe possesses a certain property (the position of the privileged moment) at each point in hypertime, then properties of the universe are relativized to points of hypertime. And these relativized properties never change. For example, suppose the privileged moment NOW is located at t_1 at the hypertime point T_1. Furthermore, suppose that the privileged moment NOW is

[85] Skow (2012), p. 224

located at t_2 at the hypertime point T_2, and that the privileged moment NOW is located at t_3 at the hypertime point T_3 (this situation is illustrated in the picture above). These properties possessed by the universe at each hypertime never change. If the totality of temporal facts (or states of affairs) is to be considered, then one must include in this picture the totality of facts in hypertime. The totality of facts that is a part of hypertime never changes. It is the case that t_1 is illuminated at T_1 and this never changes. Likewise, it is the case that t_2 is illuminated at T_2 and that t_3 is illuminated at T_3. The totality of facts, therefore, never changes. And because of this, there is no temporal change in the moving spotlight theory.

The proponent of the moving spotlight theory can respond by holding that there is a change in temporal facts and states of affairs – in regular time. Thus, the universe has different properties because each universe that exists at each point in spacetime possesses different properties. There can be change, according to the moving spotlight theory, because the universe possesses different properties at each point in hypertime. The problem with this response is that it deliberately excludes the whole picture. That is, by way of this response, the proponent of the moving spotlight theory is comparing the totality of temporal facts at a point in hypertime with the totality of temporal facts at another point in hypertime. This is to avoid the issue that the totality of facts *simpliciter* does not change. The B-theorist could use the same strategy to argue that her theory also allows change – if the B-theory compared the totality of temporal facts at one point in time with the totality of facts at another point in time; the appeal to a higher dimension of variation is not an innocent one. In the end, the proponent of hypertime cannot satisfy the Change Thesis.

2.1.5 The NOW *Simpliciter*

This problem can be approached from a different angle. For there to be change in the moving spotlight view, what is NOW must change. The change of what is NOW means that there was another NOW; in other words, the proponent of the moving spotlight can account for a former NOW. But consider again the picture of the totality of temporal facts in the moving spotlight world that includes a hypertime. In this world, t_1 in T_1 is privileged (or is the NOW), t_2 in T_2 is privileged, and t_3 in T_3 is privileged. Because of this, the proponent of the moving spotlight view cannot hold that any moment is privileged *simpliciter*. If one asks which moment is NOW, the proponent of the moving spotlight answers that it depends on what hypertime one inhabits. But if a time is privileged with respect to a hypertime, there is no time that is privileged *simpliciter*. This means that there is no NOW *simpliciter*. This is clear by considering the following: suppose I am at t_3 in T_3. Because of this, the former NOW is t_2 in T_2 – in my supertime past. But for someone at t_1 in T_1, t_2 in T_2 is the future NOW. What was NOW also will be NOW. And this cannot be the case. Thus, it is clear that what is, was, and will be NOW is a relational concept. This means that there is no NOW *simpliciter*. And as a result, the moving spotlight proponent who accepts hypertime cannot endorse the Present Thesis.

The proponent of the moving spotlight gives up A-theory. The overall problem is that the change in the NOW must make use of hypertime, and the result is that in doing so, there is no moment that is NOW *simpliciter* in the totality of states of affairs. Because of this, the moving spotlight theory gives up the existence of a uniquely privileged moment. No one moment in time is uniquely privileged – each moment is

privileged at a different point in hypertime. In attempting to make room for change, the moving spotlight theory gives up on a privileged moment of time.

The moving spotlight theory can recapture its A-theory status in positing a moment that is privileged (*simpliciter*), and recover temporal change by picking out a privileged hypertime. But for there to be change, there must be a shift in what hypertime is privileged. This is accomplished by postulating a hypertime in which every moment in hypertime does get its turn – that is, every moment in hypertime does get its turn to possess the property of NOWness. In this way, there is a NOW that shines on each hypertime successively. This introduction of the A-series to hypertime seems to accomplish two things: first, this allows the proponent of the moving spotlight theory to retain the principle that there is one privileged moment. Second, it allows that this privileged moment *changes*, enabling the moving spotlight theory to account for the passage of time.

The privileged moment in regular time is the moment in each hypertime which possesses the property of NOWness. In other words, the privileged moment *simpliciter* is the one that is contained in the universe that exists at the hypertime point that is illuminated by the second-order property of NOWness. This is illustrated by the following:

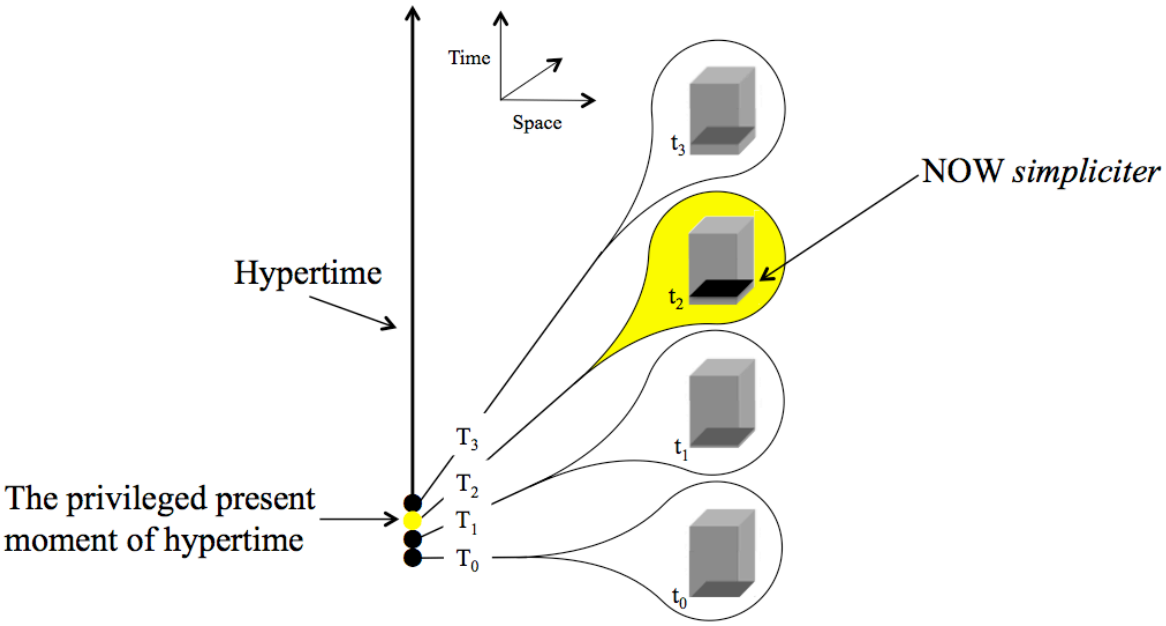


Figure 2.3

Thus, the moment in time that is illuminated (by the spotlight) that is part of the hypertime that is illuminated by the second-order spotlight is the moment in time that is NOW *simpliciter*. All other moments in time possess the property of NOWness, but at other moments in hypertime. But only *one* hypertime possesses the property of NOWness – thus picking out one privileged moment of time. Through this strategy of introducing the A-series into hypertime, the moving spotlight theory can recover its membership to the A-theory. In addition, it seems as if the moving spotlight view now has the ingredients to account for temporal change. The totality of states of affairs differs as each point in hypertime is illuminated and then lacks illumination (as another point in hypertime is illuminated). This changes in the totality of states of affairs then fuels the passage of time.

2.1.6 The Infinite Regress of Hypertimes

Only one point in hypertime can be illuminated. The Change Thesis requires that the hypertime that is illuminated changes. But how can the proponent of the moving

spotlight theory make sense of this change? Can this strategy recover the shift of the privileged moment which is the basis of passage? I argue in the negative – for there to be passage in the traditional understanding, what hypertime point is illuminated must change. This means that each point in hypertime must both possess and lack the property of being illuminated. This leads the moving spotlight theory into familiar dangerous territory. Hypertimes, of course, do not simultaneously possess and lack the property of being illuminated. They instead possess and lack this property successively. That is, a hypertime first lacks, then possesses, and then lacks again the property being illuminated by the spotlight of NOWness. The problem with this situation is the same problem encountered by McTaggart's opponent. Successive lack and then possession (and then lack again) of a property requires that the hypertime possess and lack the property at different times. Appealing to a notion of succession necessarily requires the postulation of a time series. Thus, in appealing to succession in order to account for genuine change in the illumination of different hypertimes, the proponent of the moving spotlight theory must add yet another temporal parameter to his view.[86] The picture, then, looks like the following:

[86] This seems to be what Smith (2011) is pointing to when he makes the following claim: "In order to make sense of the idea that time *flows* (objectively) – that the objective now *moves* – the A-theorist was forced to posit hypertime. But presumably the A-theorist will think that hypertime, if it is to be worthy of the name 'time,' must also flow: there must be an objective hyperNOW, and it must move through hypertime. But in order to make sense of this we shall require hyperhypertime – and so ad infinitum" (246, emphasis in original).

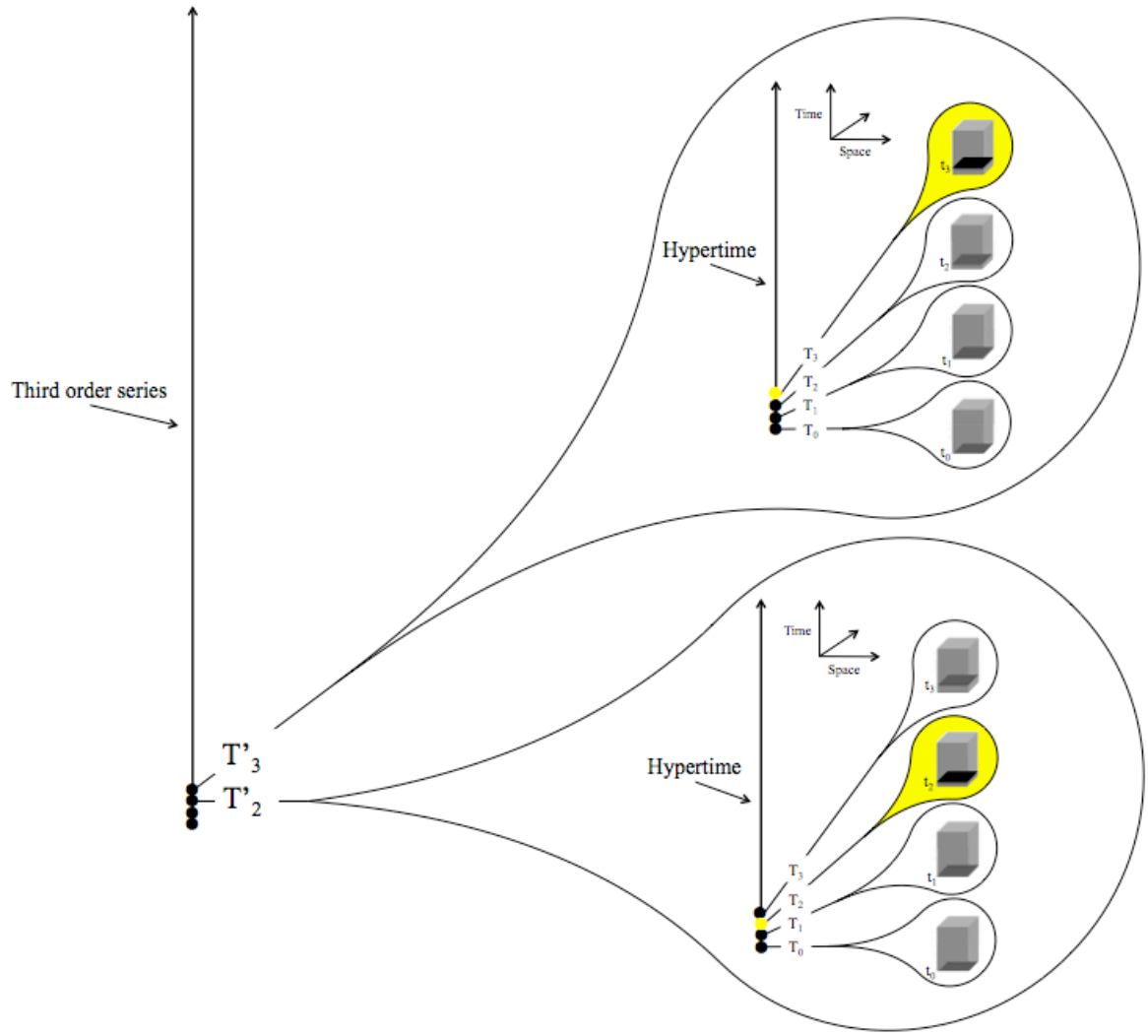


Figure 2.4

In this third order series, the problem for the moving spotlight theory arises again: how to identify the NOW. If this third order series is does not contain a singular privileged moment, then the Present Thesis is not satisfied. If this third order time series, however, adds a privileged moment, and holds that it changes, then the moving spotlight theory faces the same contradiction as the first and second order time series. In order to avoid the contradiction involved in change the addition of another temporal parameter is required.

What is the problem with postulating an infinite number of temporal parameters in order to recover the shift of the spotlight and the passage of time? In other words, must this regress be vicious? Oaklander (1983) declares, "Here I think that the answer is yes, for at no stage along the regress of time series can we stop and say that the questions and problems for which they were introduced have been answered or solved."[87] Thus, at no temporal parameter can the proponent of the moving spotlight theory give an account of the change of the illuminated moment (in that parameter) without appealing to an additional temporal parameter. Appeal to a higher order series at any level does not solve the problem because the problem merely gets pushed up a level. In other words, the contradiction is resolved at one level, only to be produced at another level. In pushing the problem up a level the problem does not get solved at this level either – it must be pushed up another level. And so on – the problem is never solved by appealing to another temporal parameter. And because of this, the infinite regress resulting in attempting to solve the problem is vicious.

In addition, in the moving spotlight theory which adds a hypertime, there can be no NOW *simpliciter*. The moving spotlight theory can recover its status as an A-theory by postulating a privileged moment in hypertime, which then locates the privileged present moment in regular time. The problem is that when the proponent of the moving spotlight theory attempts to incorporate the change of the privileged present moment by way of the change in what hypertime is privileged, a contradiction results. This contradiction necessitates an appeal to an additional parameter, where the same problem resurfaces, thus necessitating an appeal to yet another additional parameter. The result is an appeal to a vicious infinite regress of parameters. The proponent of hypertime finds

[87] Oaklander (1983), p. 396

himself again choosing between contradiction or an infinite regress in his attempt to account for temporal change. Because of this, the postulation of hypertime does not ultimately escape McTaggart's Paradox. In sum, for the moving spotlight theory to satisfy the Present Thesis, it must give up on the Change Thesis if it is to avoid a vicious infinite regress. On the other hand, in order to satisfy the Change Thesis, the moving spotlight must give up the Present Thesis because it cannot identify a moment that is NOW *simpliciter*.

2.2 Presentism and the Myth of Passage

McTaggart (1908) understands temporal change as a change in the temporal properties of an event. That is, an event changes from future to present to past. He points out that for an event to change in this way, it must possess all three temporal properties. But these three temporal properties are incompatible; in this way, there is a contradiction in the account of temporal change. One response involves rejecting pastness and futurity by endorsing presentism. That presentism is a successful solution to McTaggart's Paradox is widely affirmed.[88] The contradiction in McTaggart's Paradox clearly arises by an event's possession of all three temporal properties. If only the present time exists, then no event is ever past or future, and so no event ever possesses the three contradictory temporal properties. Therefore, admitting the existence of only one time, the present, can block McTaggart's Paradox. The presentist's embrace of an austere ontology – in which reality is limited to the present – therefore supposedly allows

[88] See, for example, Le Poidevin (1991), p. 36, (2003), p. 136, Craig (1998), p. 125, and Bourne (2006), p. 76.

his theory to avoid the contradiction in McTaggart's Paradox and preserves the transience of time.

This can be explained by returning to the house metaphor. For the presentist, the problem of contradiction does not arise; it is never the case that a house is both illuminated and not illuminated. This is a result of the presentist's view that if a moment is not illuminated then it does not exist. According to the presentist, a house is either illuminated or does not exist. Therefore no contradiction arises. There is then no need for the presentist to be forced to postulate a vicious infinite regress of temporal parameters.

2.2.1 Temporal Change in Presentism

In presentism, events can only possess one temporal property: presentness. If an event can only be present and not future or past, then temporal change obviously cannot be understood as a change in the temporal properties of a particular event. The presentist, then, must give a different account of temporal change. This account amounts to holding that temporal change is to be found in the difference in what is present; and because only what is present exists, temporal change is a difference in what exists, from one moment to the next. Intuitively, presentist temporal change is something like this: the spotlight of the NOW moves from one moment to the next, granting existence to one moment and then the next. Once the spotlight of the NOW leaves a moment, that moment ceases to exist, just as it had before the spotlight shined on it. This means that if what exists changes, then moments other than the current moment must have been present, or existed. The light of the NOW, in other words, must have shined on other moments. Temporal change for the presentist, therefore, is not the changing of the temporal properties of an

event from future to present to past; instead, it amounts to a difference in what exists, or what is real, or what is concrete, from moment to moment.

2.2.2 The Presentist's Problem

The presentist's successful avoidance of contradiction, however, leads him into a different problem. The presentist's Present Thesis requires that only one moment exist. Returning again to Broad's (1923) house metaphor, the resident of the present house is confined to the house in which he lives, and when he looks out into the neighborhood, he sees no other houses. The resident of the present house is looking at everything that exists – and what exists does not include any other houses. To account for the passage of time, the presentist must satisfy the Change Thesis in which what exists changes. But how is this to be done from the point of the view of the resident of the present house when no other houses exist?

So it seems the presentist faces a problem. More specifically, the Present Thesis – which endorses a single objective NOW – is incompatible with the Change Thesis that accounts for the passage of time. The entire presentist world (an account of what exists) at t_1, for example, looks like:

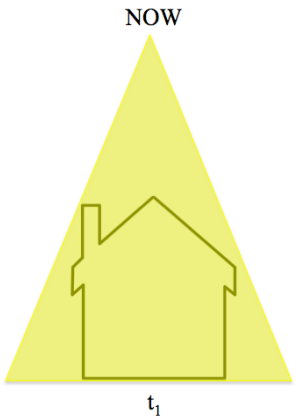


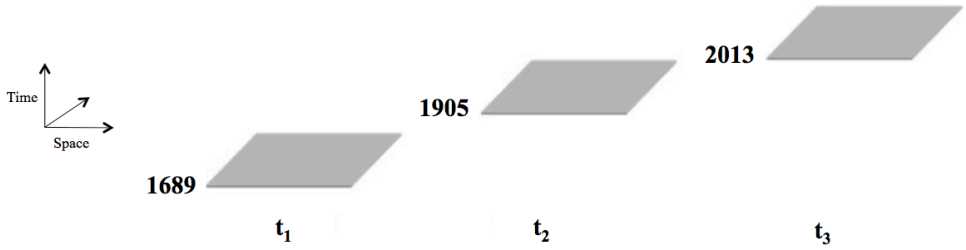
Figure 2.5

In the presentist picture, there is only one house on the street that exists, and this is the house that is lit up by the spotlight of the NOW. Furthermore, a house cannot be included in the picture unless the spotlight shines on it. This is the aspect of the model that corresponds to the Present Thesis: that only what exists (the house) is NOW (spotlight shining on it).

In the presentist version of temporal change, as the spotlight of the NOW moves from one house to the next, that first house goes out of existence, and a new house comes into existence where the spotlight of the NOW next shines. It is the austerity of this presentist picture in this one moment, however, that leads him into inescapable trouble. The Change Thesis, in general, requires that the contents of the present must change. For the contents of the present moment to change, there must be a difference in what the spotlight of the NOW shines upon, and in the presentist's case, a difference in what exists.

Looking back at the presentist picture of what exists, there is no way to understand this difference that what exists changes. When one considers the entire picture of what exists in the world the picture does not show a difference in what exists from moment to moment. From the picture, there is no change in the contents of the present. Furthermore, there never is change. If one considers what exists at another moment that is present, then he gets a similar picture: a lonely house.

Here, the presentist might protest and hold that he can combine the pictures – from t_1 to t_2 to t_3 there *is* a change. In this way, there is change over time; he can point to the picture in Figure 1.4 to establish the difference in the contents of the present over time. That is, in Figure 1.4, we can compare t_1 to t_2 and note the difference:



(Figure 1.4)

But this picture does not accurately capture the presentist view. In the house metaphor, this picture would be equivalent to the following:

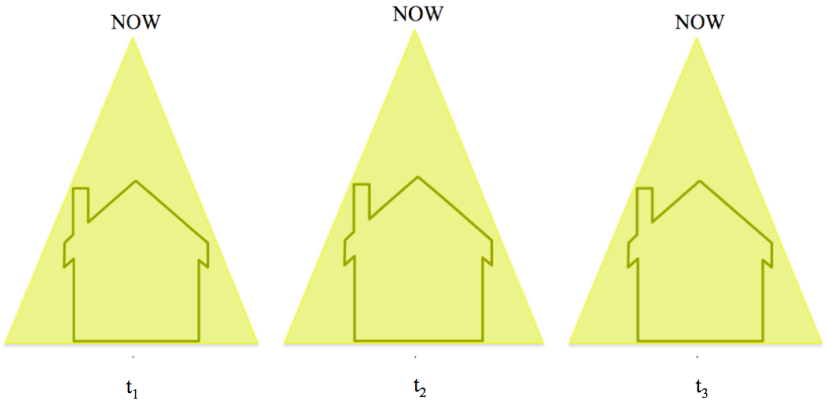


Figure 2.6

And this is not the presentist view: in this picture, there is no way to pick out the privileged present moment. If the picture is meant to show the existing contents of the universe, then all but the present time should be removed; this is required by the Present Thesis. The picture would then look like the lonely house in Figure 2.5. There is no change in this picture and so the Change Thesis is not satisfied.

In sum, if the presentist wants to satisfy the Change Thesis, he must accept a picture of the world that looks like Figure 2.6. But in doing so he violates the Present Thesis. On the other hand, if the presentist wants to endorse the Present Thesis, he must

accept a picture of the world that looks like Figure 2.5. In this case he gives up change and so cannot satisfy the Change Thesis.

The presentist could reply that he can somehow account for the succession of houses that have been created and destroyed all from this one moment; perhaps the resident of the house at t_1 has a row of pictures of the former houses on the street hanging on his wall. In this way, the presentist can appeal to a likeness of change in order to supply an account of the change in what exists without having to give up on the fact that t_1 is the only house on the street. The presentist claims that although there is only one moment that is privileged – this one – there is change in what is privileged because the pictures of the other houses hanging on the wall shows a succession of what existed. But is this good enough? Can this moment's internal pictures of other moments suffice for an account of change? At first glace, it does not seem like enough: after all, there can be change in only one moment, and as a result, as Price (2011) notes, we have lost the notion that change "seem[s] to involve a relation between equals, a passing of the baton between one state of affairs and another." He continues, "[I]n this picture, we've lost one party to the transaction. We've lost genuine change."[89]

In the picture of totality of existence – which is this one moment for the presentist – there is no room for making sense of the requirement that other moments got their turn to bask in the spotlight of existence. The presentist can save change by admitting the existence of more than one moment; this results, however, in giving up presentism. To preserve his ontology of time, the presentist can deny the existence of any other moment, but this results in abandoning change. Ultimately, the presentist's two theses are in

[89] Price (2011), p. 279

conflict. The presentist cannot remain a presentist and also preserve the change that underlies the passage of time.

2.2.3 The Presentist's Ploy

The presentist's problem is that change is something that happens across time, but because the presentist is limited to the existence of only the present, he cannot give an account of full-blown change. But maybe the presentist can respond by pointing to the evidence of other houses in order to show that they in fact did exist; this takes the form of something that stands in for the past that we can access in the present. Furthermore, the presentist can hold, contra Price, that this itself is good enough to accommodate change, even if it is not change itself. That is, if the presentist can make room for a formerly privileged moment (even if that moment does not exist), then he can make room for something that is good enough to satisfy the Change Thesis. The best way for the presentist to do this is to appeal to presently-existing surrogates to establish the former privileged nature of a past moment, and thereby account for the succession of creation and annihilation needed for change in the presentist picture.[90]

This is not an unknown ploy, but it is usually utilized by the presentist in a different guise: as a reply to the grounding problem. The grounding problem, also known as the truthmaker objection, starts with a plausible truthmaker axiom that all truths are grounded. That is, for all true propositions, there is something which makes that claim true. But past-tensed propositions have no grounds because past things do not exist.[91]

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[90] Why is it unacceptable for the presentist to claim that we can establish the existence of the past moment by just rewinding time and going back to the past moment (hypothetically speaking)? This dismissal of the problem is unsuccessful because the proposal that rewinding time and "seeing" that the past moment existed presupposes that we *can* rewind time back to previous moments – the very issue under consideration.

[91] The grounding problem for presentism also involves the presentist's supposed inability to establish the truth of future-tensed propositions because, according to the view, the future does not exist. But this is a

Therefore, the objection goes, past-tensed propositions, such as "Abraham Lincoln was president," cannot be true.[92] The traditional presentist response is to exploit the state of the present world.[93] In doing so, the traditional presentist postulates existing surrogates which stand proxy for past things and thereby provide the truthmakers for past-tensed propositions.[94] The grounding problem shares commonalities with the current problem the presentist faces: in both cases, the presentist's difficulties stem from his inability to directly appeal to the past.

As such, the presentist under attack can borrow from the responses to the grounding problem in order to supply an adequate account of change by establishing that former moments were privileged in that they did exist. By appealing to these surrogates for the past, the presentist can establish that even though this moment is privileged, other moments were privileged. And because other moments were privileged, the presentist can indirectly accommodate the succession of privileged present moments of time. In other words, by appealing to surrogates to show that there was a privileged moment different than the NOW, the presentist can restore change to his view.

2.2.4 The One Instant Test

By supplying surrogates that can stand proxy for past things in order to indirectly account for the change in what exists, the presentist can resolve the conflict between the Present Thesis and the Change Thesis. There is extensive debate, however, about the

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much less worrisome issue for the presentist since it is not as implausible to hold that future-tensed propositions cannot be true as it is to hold that past-tensed propositions cannot be true. As such, I focus on the presentist's problems with past-tensed propositions.

[92] See Crisp (2007b) for extensive discussion of the grounding problem.

[93] Some reject the truthmaker axiom and claim that past truths do not need existent entities as grounds. See Merricks (2007), Tallant (2009), and Baia (2012) for variants of this view. Others hold that truthmakers are to be found in the mind of God, such as Rhoda (2009), and yet others think the past is a *sui generis* entity that provides the truthmakers for past-tensed statements, such as Kierland and Monton (2007).

[94] For a detailed discussion of the role of proxies, see McKinnon and Bigelow (2012).

adequacy of these various surrogate truthmaking strategies, mostly involving the nature of the tenuous connection between the truthmaker for a proposition and the entity which the proposition is about.[95] For example, in the presentist strategy of appealing to a surrogate for truth-making, the truth of a past-tensed proposition such as, "Socrates was snub-nosed" is made true not by Socrates' possession of the property of being snub-nosed as past, but by the relevant surrogate existing as part of the present world. The question is whether, taking this worry into consideration, the appeal to surrogates – rather than appeal to what a proposition is about – is justified in establishing the truth of past-tensed propositions. The following assessment of the presentist's strategy to accommodate change builds on this issue.

The presentist's appeal to surrogates is meant to establish that other moments did exist thereby satisfying the Change Thesis while being committed to only the present existing. When considering the features of change, one of them is that change necessarily entails persistence. Therefore, the presentist's account of change must necessarily entail persistence. In other words, a surrogate for the former existence of another moment must guarantee that this other moment did in fact exist if the presentist is to be justified in appealing to the surrogate to establish change. The constraint that the surrogate must guarantee the former existence of the moment for which it stands proxy is to ensure that a necessary component of change is preserved: that the universe is a persisting object. If the universe is composed of just one instant, and therefore is not a persisting object, then there would be no possibility of change in the universe. Thus, a necessary condition of change in the universe is the persistence of the universe, and if an account of change does not ensure that the universe persists, then that account of change does contain a necessary

[95] See Keller (2004), Tallant (2010a), Sanson and Caplan (2010), and Caplan and Sanson (2011).

condition of change and should be rejected. In this way, the presentist can appeal to surrogates to establish change only if presentist can guarantee that the surrogates can ensure that universe persists.[96]

So, how can we know if surrogates guarantee that another moment did exist? I propose the One Instant Test:

> (OIT): If God creates only this one instant, exactly as it is NOW, then he is unable to create – in this one instant – the relevant surrogate for the past.[97]

Failing the one instant test shows that the strategy of appealing to surrogates is independent of, by failing to coincide with, the former existence of a past moment. Passing this test then ensures the seemingly minor, but important, aspect associated with change that, necessarily, the universe persists. As a result, if the presentist fails the OIT, then he cannot establish change by way of appeal to surrogates. In what follows, I (briefly) consider the most popular presentist truthmaking strategies that appeal to surrogates in the forms of tensed properties, temporal distributional properties, and ersatz times and argue that all fail the one instant test.

2.2.5 Tensed Properties

Bigelow (1996) proposes the classic articulation of the past-tensed properties truthmaking strategy, commonly referred to as "Lucretianism." He argues that what makes propositions about past and future individuals and their temporal relations true are the appropriate past and future-tensed properties that are presently exemplified in the world. For example, the truth of "Socrates was snub-nosed" is grounded by the world possessing the property *being such that Socrates was snub-nosed*. Can these past-tensed

[96] Here I use "guarantee" to mean "metaphysically guarantee" rather than using a logical or nomonological sense of guarantee.
[97] This is inspired Russell's (1921) "five minute hypothesis." It can be viewed as a version of Rhoda's (2009) "discrimination constraint."

properties surrogates establish that another moment existed? After all, how do these past-tensed properties get created if not by the events (now in the past) which brought them about?[98] This option, however, leads the presentist down an unacceptable path. If the events in the past caused the past-tensed properties to exist in the present, then this causal relation necessitates the existence of the relata – both the past-tensed properties and the existence of the past.[99] Since the existence of the past is an expressly forbidden commitment in the presentist theory, there can be no causal connection that obtains between a past event and presently-existing past-tensed properties of the world.[100]

Now consider the One Instant Test: God creates just this one instant and creates all of the requisite past-tensed properties in this one instant as well. God has free reign to create the past-tensed properties in this one instant; past-tensed properties, remember, are unconnected to the past. The past-tensed properties strategy therefore fails the One Instant Test. There is nothing about these past-tensed properties that prevents them from being created by God in this one instant, and so surrogates in this form are independent of the existence of a past moment. This shows that past-tensed properties do not guarantee that another moment did exist and cannot therefore be used to establish change.[101]

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[98] Le Poidevin (2003) and Rhoda (2009) consider this "past traces" strategy.
[99] This is the presentist's problem of cross-temporal relations, to be explored in more detail in Chapter 3.
[100] One could claim both that the past-tensed properties are causally related to the past and hold that the past does not exist by way of maintaining that the causal relation is not a genuine relation that necessitates existence. But this strategy is a dead end because it does not pass the One Instant Test.
[101] Instead of appealing to a causal relation, the proponent of this strategy could appeal to the present state of the world and the uninstantiated causal laws of nature (*à la* Tooley (1977)). In this way, one could retrodict the past state of the world (given that the laws are deterministic). But notice that this strategy will not suffice to necessarily establish the former existence of a past world either: all that this strategy tells us is how a past world *would* have been. This does not entitle the presentist to claim that it actually existed; this option does not pass the One Instant Test either.

2.2.6 Temporal Distributional Properties

The next strategy, positing temporal distributional properties, encounters the same sort of problems as past-tensed properties strategy. Influenced by the work of Parsons (2004) on spatial distributional properties, Cameron (2011) proposes temporal distributional properties to serve as truthmakers for past-tensed propositions. A temporal distributional property is a primitive, indivisible property which fixes how an object is across time. For example, I instantiate the temporal distributional property *being-a-child-and-then-being-an-adult*. This serves to make it true both that I am an adult and was a child. Furthermore, a temporal distributional property cannot be reduced to the properties that object has at different times; instead, a temporal distributional property is distributed over a region of time. The problem with this characteristic is that an object which instantiates a temporal distributional property is confined to one moment (per the constraints of presentism) and lacks an extension of time into which the property can distribute. In short, to endorse temporal distributional properties is to endorse properties that distribute across the non-existent past. This conflicts with the "distribution intuition" that requires the existence of regions over which properties distribute. Cameron (2011) anticipates this objection and responds that the presentist is already committed to the rejection of the distribution intuition with his previous ontological commitments, and so that the endorsement of temporal distributional properties conflicts with the distribution intuition is not a reason to reject the truthmaking strategy.[102]

[102] See Tallant and Ingram (2012) for an elaboration of the original criticism as well as a reply to Cameron's (2011) response to this anticipated objection. Cameron's response is that the presentist's belief in persisting objects as temporally extended results in the distribution of these objects across non-existent times. Tallant and Ingram reply by arguing that the presentist is not already committed to the rejection of the distribution intuition by his previous ontological commitments, so that temporal distributional properties require the rejection of the distribution intuition is a problem with Cameron's view and not presentism itself. I put this issue aside due to length constraints.

This issue need not be solved here because either option results in grave difficulty for the presentist. Either temporal distributional properties require the existence of the region they extend across, or they do not. Choosing the first option forces the presentist to accept the existence of the past, and thereby give up his view. On the second option, the presentist avoids being forced to admit the existence of the past, but at the cost of failing the One Instant Test. If temporal distributional properties require no other region into which to be distributed, God can create this one instant complete with all of the necessary temporal distributional properties as surrogates for the past. In this one-instant world there is a surrogate for the past state of affairs of me being a child without that state of affairs ever existing. Again, it is clear that that independence of the temporal distributional properties dooms this particular strategy; that objects possess temporal distributional properties does not necessitate that another moment has existed.

2.2.7 Ersatz Presentism

The presentist's last option might be his best one; the ersatz presentist postulates a past, albeit an abstract representation of the concrete one. Ersatz presentism involves the idea that the present time is concretely realized and all other times are abstract entities that are not concretely realized. According to one particular version of ersatz presentism, proposed by Bourne (2006), a time is a maximally consistent set of *u*-propositions indexed to a date, where *u*-propositions are supposed to be unembedded present-tensed propositions.[103] These *u*-propositions, Bourne claims, "give a complete, maximally

[103] Bourne calls his view "ersatzer presentism." I use the term "ersatz presentism" to apply to the variety of ersatz strategies proposed by Bourne (2006), Crisp (2005) and (2007), and Markosian (2004). I focus on only Bourne's view for the sake of simplicity and because of the problems for Bourne's main ersatz partner in crime, Crisp, outlined in Oaklander (2010). I take it that my objection applies to any form of ersatz presentism.

specific, description of what is true at that time."[104] Thus, times are ordered pairs of the form $t = \langle \mu, n \in \Re \rangle$, with μ being a set of *u*-propositions and $n \in \Re$ serving as the date. Time in general is the set of sets of ordered pairs that are *E*-related. The *E*-relation, an ersatz *earlier than* relation that represents the genuine temporal relation, relates these pairs in an ordering that is structurally similar to the ordering of a real time series.[105] This *E*-relation allows the presentist to form an "ersatz B-series" which is just a series of abstract times ordered by the *E*-relation.

By way of accurately representing the past, these propositions make true one's claims about the past. In the same way, the existence of the ersatz B-series allows the presentist to ensure that another moment was concretely realized because the past ersatz times accurately represent the concrete past. The question for the ersatz presentist is whether the accurate representation of a past concrete moment necessitates that the moment was concretely realized.[106] We can put this to the One Instant Test: suppose God makes just this one moment. In this one moment, God can also create the entirety of the ersatz B-series since the ersatz B-series is merely an abstract object.[107] In this situation, by appealing to the ersatz B-series, I can establish that another moment did exist, even though the world is only one instant in duration. Ersatz presentism fails the One Instant

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[104] Bourne (2006), p. 54

[105] Oaklander (2010), pp. 231-232 objects to the ersatz temporal relation. After all, our intuitive grasp of a temporal ordering is an ordering relation that holds between concrete things (such as events). The ersatz presentist replies by holding that the *E*-relation represents the genuine temporal relation, thus justifying the *E*-relation's replacement of the genuine temporal relation. Oaklander rejects this by claiming that the relation "purports to have the same logical properties as a B-theoretic temporal relation, but so does the *greater than* relation and no one would claim that greater than is a temporal relation" (231-232). The ersatz presentist, as I explicate, faces more serious problems than the suspicious nature of his ersatz temporal relation.

[106] Tallant (2010a), p. 273 makes a related point about how the past was, not that it existed.

[107] I'm exploiting the strategy that Tallant (2010a), p. 274 suggests.

Test; the existence of the ersatz B-series does not necessitate that another moment did exist.

2.2.8 Saving Surrogates

The presentist's obvious response is that God cannot make these surrogates in the one instant world that I am proposing; this is due to the fact that the presently-existing surrogates, in Tallant's (2010a) words, "*can't* get it wrong."[108] That is, the presentist could hold that present-tensed properties or temporal distributional properties accurately reflect what the world was like. In the same way, the ersatz presentist could hold that ersatz times accurately represent the past and thus supply us with an account of what really happened. These surrogates, therefore, cannot exist without a past, and because of this, their existence ensures that another moment did get its turn in the spotlight, even though only this moment exists.

But why think this is the case? How is it that the surrogates accurately reflect or represent the past? It is not by being caused by the past or being necessitated by the past or being connected to the past in any other way. The presentist cannot offer any kind of link between the past and the surrogates that stand proxy for the past; any relation between the two necessitates that both entities standing in the relation exist.[109] In this particular case, only one entity – the surrogate – exists, and so no relation can obtain between the past and the surrogate for the past. In the case of the ersatz presentist, he holds that because past ersatz times correctly represent what has happened, the existence of these times necessitate the former existence of other concrete moments. But what is

[108] Tallant (2010a), p. 274 fn. 4, emphasis in original. Tallant is referring here only to the ersatz surrogates, but this is a strategy that can be coopted by presentists who postulate other varieties of surrogates as well.
[109] This is of course assuming that relations are existence-entailing. This could be a way out for the presentist, but it is not one that has been favored, and so I put it aside.

the means by which these abstract objects accurately represent the past? We have an idea of the means by which the actual (present) ersatz world correctly represents the (present) concrete world in the form of the representation relation that the actual ersatz world bears to the concrete world. But if the ersatz presentist understands accurate representation as a representation relation obtaining between the ersatz time and the past, then he is forced to accept that more than one moment is concretely realized as a result of this relation, thus giving up his presentism.

Without any relation between the past and its surrogates, the nature of coordination between how the past really was and how the surrogates accurately reflect it to be is mysterious. The presentist can reply, however, by claiming that it is a brute fact that surrogates accurately reflect what has actually happened.[110] In this way, the presentist denies that he need supply an explanation of *how* the surrogates accurately reflect the past; they just *do*. This is what a brute fact is, after all – where the explanation bottoms out. But this is an unacceptable place for the explanation to end: this brute fact happens to be miraculous and miracles always demand explanation. More specifically, that there is precise coordination between the surrogates and the past is a fluke that one could call an outrageous run of luck.[111] Suppose that the presentist endorses past-tensed properties as the surrogate of choice (although any surrogate option will do) and suppose that these surrogates do in fact accurately represent the past; the moment following each past event will be a moment in which there exists a surrogate that accurately reflects what happened in the past. But if each moment is a new slice of reality unconnected to previous moments, as the presentist defines passage, that the past-tensed properties

[110] Zimmerman (2007) is a good example of someone who would be sympathetic to this type of response.
[111] I'm borrowing this phrase from Strawson (1989) and coopting a form of his argument against Humean causation for my own ends.

actually get it right is surely miraculous.[112] The presentist who endorses the brute fact approach posits an extremely surprising state of affairs, and without an explanation, this is akin to endorsing a cosmic-sized coincidence or a continuous fluke. Any account that accepts unexplained miracles should be rejected, and so the presentist's appeal to brute facts in order to avoid the One Instant Test fails.[113]

2.2.9 The Last Ditch Effort

The presentist's last ditch effort is to assert that he needs nothing more than to be able to claim truthfully that "There was a different present moment" in order to establish temporal change. This is the strategy that Craig (1998) appeals to. This strategy amounts to holding that true ascriptions of pastness are enough to account for temporal change. But as is seen above, there needs to be a truthmaker for these past-tensed claims. These truthmakers are usually in the form of the surrogates that have already been rejected as a way to accommodate temporal change.

The last option, however, entails a radical commitment to the austere ontology of presentism; this strategy, found in Baia (2012), Tallant (2009) and Merricks (2007), is to deny that all truth needs grounds and dispenses with any possibly exotic entities. [114] According to this strategy, past-tensed truths are truths that do not need grounds, and so

[112] Tooley (1997), p. 240 makes this point.

[113] The presentist could reply that the existence of the past is the best explanation of the existence of surrogates in order to avoid the one instant test, but the problem with miraculous coordination robs them of this reply. This unconnected coordination is in fact more miraculous than a one instant world in which surrogates exist. That is, in the absence of these connections, it is actually more miraculous that the surrogates track the past. That surrogates do not track the past is a less miraculous state of affairs and would therefore be the better explanation.

[114] Baia (2012) does something similar; he rejects the need for existent grounds, but attempts to formulate a presentist-friendly grounding principle and claim that truth can be grounded even if one rejects that truth supervenes on something that exists. I understand the projects of Baia (2012), Tallant (2009) and Merricks (2007) to be compatible enough that they can be grouped together for the purposes of this discussion. In addition, the end of Sanson and Caplan (2010) contains a (brief) endorsement of this type of view.

no existent entity is required to establish the truth of past-tensed propositions.[115] Tallant (2009) refers to presentists endorsing his strategy as "cheats" because they account for truth without an existing metaphysical basis for this truth. But the cheat can explain the truth of past-tensed statements by appealing to the way the world was. Thus, by appealing to the way the world was, this version of presentism can still account for the truth of past-tensed propositions in a straightforward manner.

To evaluate the truth conditions of past-tensed propositions, Tallant (2010b) proposes the Cheats Grounding Principle:

> CGP: For every proposition, that proposition is true iff it accurately characterizes its subject matter.[116]

No ground cheating in the temporal case requires that every true past-tensed proposition is true in virtue of how the world was. For example, for the past-tensed proposition "There were dinosaurs" to be true, dinosaurs must have existed. In formal terms, this past-tensed proposition is true because it satisfies requirement that there has existed an entity (a dinosaur).

It seems that the cheating strategy is acceptable because it seems to require that the world is longer than one instant. Only in a world in which there is more than one moment is "There was a different moment present" true. This is due to the fact that there *had* been a different present moment. The cheating presentist claims that God cannot make a one instant world in which "There was a different moment present" is true because it is not the case in the one instant world that there had been a different present

[115] The motivation for this type of view is ontological parsimony, while the justification for this ontological parsimony is pointing to a partner in crime: in the case of negative existential propositions, there is no such thing that makes it the case that, for example, "Unicorns do not exist" is true. Thus, the grounding intuition does not hold for *every* proposition. Austere presentists such as cheaters merely take this one step further and, on the basis of ontological parsimony, include past-tensed propositions in the kinds of propositions that do not need grounds.
[116] Tallant (2010b), p. 503

moment. In this way, by appealing to cheating, the presentist can preserve temporal change by endorsing the most radically austere ontology open to him.

Unfortunately, taking the route of endorsing an austere ontology again dooms the presentist. God can, in fact, make a world in which "There was a different present moment" true because it can be the case that there had been a different present moment in the one instant world. The claim that there had been a different present moment is a past-tensed claim and therefore needs no truthmaker. So, in the one instant world, it can also be the case that there had been a different present moment, which means that it is true that "There was a different moment present" in this type of world.

The presentist could respond that this type of one instant world is impossible because it contains a contradiction. It is true that there was a different present moment and it is not true that there was a different present moment. As a result of this contradiction, the one instant world is impossible and so the cheating presentist can be sure that if "There was a different present moment" is true, then the world is not a one instant world. The presentist's response, however, begs the question. The world is only impossible if the truthful claiming of the world having a different present moment requires that the world had a different present moment. But the fact that the world did not have a different present moment even though one can claim that it did shows that the cheating presentist's truthful assertions are doing something other than capturing reality. That is, there is a difference in what the cheating present can truthfully claim and what really is the case. As a result, that the present can truthfully claim that there was a different present moment does nothing to guarantee that the world necessarily persists and so the cheating presentist cannot establish the necessary element of temporal change.

Ultimately, the result is that the presentist cannot reconcile his Present Thesis and his Change Thesis, even by means of an indirect account of change. This means that he must give one of these up. Giving up the Present Thesis forces the presentist to abandon his view. On the other hand, giving up the Change Thesis sacrifices the way by which the presentist can accommodate the passage of time. Thus, the presentist cannot maintain that only the present exists unless he gives up the passage of time. Ultimately, that presentism preserves passage is a myth that has been championed for far too long.

2.3 The Static Growing Block

The growing block theory combines four-dimensionalism with the view that there is a privileged moment of the present – this privileged moment is the leading edge of the growing block. Furthermore, the proponent of the growing block theory holds that the privileged present moment changes in the form of a new slice of reality being added to the block at each moment; in this way, the NOW shifts and the sum of reality increases from one moment to the next. The growing block theory seems to avoid McTaggart's Paradox and does not fall prey to the presentist's inability to account for the former existence of other moments. The latter virtue of the growing block theory is obvious: the growing block world is a four-dimensional one, and as such, the past exists. The former virtue is less apparent: temporal change is not the change in the temporal properties of an event, but – as in presentism – the change in what exists. As a result, the growing block theory purports to avoid McTaggart's Paradox because temporal change is the addition of reality to the block rather than the change in temporal properties of an event. In other words, there are no temporal properties – instead the present is privileged by way of

position on the leading edge of the block. But the leading edge of the block changes at each successive moment, thus leading to the change in what is NOW and the passage of time.

2.3.1 The Change in the Totality of Temporal Facts

According to the growing block theory, there is a change over time in what states of affairs exist, and so this change the totality of states of affairs (or temporal facts) in the world is the basis for the passage of time. In other words, at t_1, the leading edge is t_1. At t_2, a new slice of existence is added to the block, replacing t_1 as the leading edge. In this way, there is a change in the NOW from moment to moment – in growing block terms, this change is explicated in terms of the increasing amount of reality in the universe. Change in the leading edge of the growing block theory can satisfy the Change Thesis and account for the passage of time.

But notice that the change in the NOW requires that the universe contains an increase in the number of moments that exist over time. Suppose that the totality of temporal facts in the universe at t_2 is X. The totality of temporal facts in the universe at t_1 (which is earlier than t_2) must be some number less than X – I will identify it as X-1. This increase in X (representing the totality of temporal facts) from t_1 to t_2 is the basis, according to the growing block theory, of temporal change and thus the foundation of the passage of time. The totality of temporal facts in the universe changes from X-1 to X. That is, to hold that the universe has changed in the amount of temporal facts existing, the totality of temporal facts must be different at X-1 and at X. But this is a contradiction; the universe cannot contain different totalities of temporal facts.

This difficulty can be explicated in terms of the change in the NOW. The difference in the totality of temporal facts can be articulated in the form of the change in the NOW from moment to moment. This means that a moment changes from being at the edge of the block to no longer being at the edge of the block; a moment changes from being NOW to no longer being NOW. But, as in McTaggart's Paradox, in order for a time to change with respect to its NOWness, it must both possess and lack NOWness. In growing block terms, in order for a moment of time to change with respect to its position, it must both possess and lack a position at the leading edge of the block. But this is a contradiction. Briefly, the problem can be summarized as follows: for temporal change, a moment must change from being NOW to not being NOW. This requires that the moment both is and is not NOW – a contradiction. The growing block theorist seems to encounter a McTaggart-like Paradox in his attempt to account for temporal change by way of the growth of the block.

Thus, the Present Thesis requires that only one moment is the leading edge of the growing block. But the Change Thesis requires that what is at the leading edge of the block changes. For a moment to change with respect to its position, it must both possess and lack that position, which leads to a contradiction similar to the one in McTaggart's Paradox.

2.3.2 The Failed Response

The proponent of growing block theory can consider the same response that McTaggart (1908) outlines: it is not the case that a moment is both at and not at the leading edge of the block simultaneously, instead, a moment possesses and then lacks its position at the leading edge of the block successively. The proponent of the growing

block theory therefore responds that the universe does not contain two different totality of temporal facts at the same time – the universe first contains X-1 temporal facts and then contains X temporal facts. This means that a moment is at the leading edge of the block and *then* is not at the leading edge of the block. More specifically, if there is a former NOW that is different from the NOW, then the proponent of the growing block theory can exploit the existence of a former NOW in order to accommodate the shift in the NOW. The NOW is identified as the leading edge of the block. Because of this, that there were different NOWs means that there was a different totality of facts since the NOW is the slice of reality at the leading edge of the block. In this way, accounting for the former NOW allows the proponent of the growing block theory to save the existence of temporal change and satisfy the Change Thesis. In sum, the universe possesses the different amounts of temporal facts at successive times. It is the successive possession of differing amounts of temporal facts that allows the growing block theory to avoid this contradiction.

Does this avoidance of the contradiction lead to an infinite regress, as in the case of the moving spotlight theory? Perhaps not. Appealing to the former NOW need not produce a contradiction. The successive possession of a moment being at the leading edge of the block and then no longer being at the leading edge of the block is not by way of any possession of temporal properties. Instead, this difference in a moment's position is by way of other (more recent) events being added to the block. Because of this, the successive possession and lack of a moment's position at the leading edge of the block need not involve an appeal to any contradictory temporal properties. Because a moment is first NOW and then formerly NOW due to moments being added to the block, the

proponent of the growing block theory need not being forced into any infinite regress; there is no contradiction involved in his account.

Positing successive possession, however, allows the proponent of the growing block theory to escape one problem only to lead him into a different set of problems. That the universe successively possesses two different amounts of temporal facts can be set forth in the following way: in the universe as it exists currently, the temporal facts up until t_{x-1} are different from the temporal facts up until t_x. Thus, the current universe looks like the following:

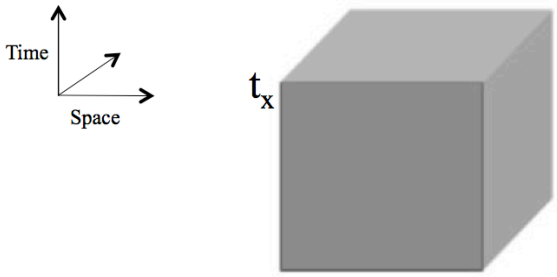

Figure 2.7

From this picture, the proponent of the growing block theory can compare the totality of temporal facts up until t_{x-1} with the totality of temporal facts up until t_x. This looks like the following:

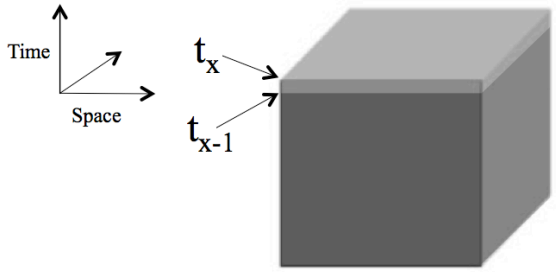

Figure 2.8

In this way, the growing block theory can account for the difference in the totality of temporal facts at t_{x-1} and t_x.

This strategy, however, is not sufficient to satisfy the Change Thesis. The proponent of the growing block theory faces a problem: there are never two different totalities of temporal facts which to compare. There is only one set of total temporal facts. Thus, there cannot be any difference in the totality of temporal facts. The difference must therefore be explicated in terms of the properties of different sections of the universe. Take this universe *as a whole*: there is only one totality of temporal facts:

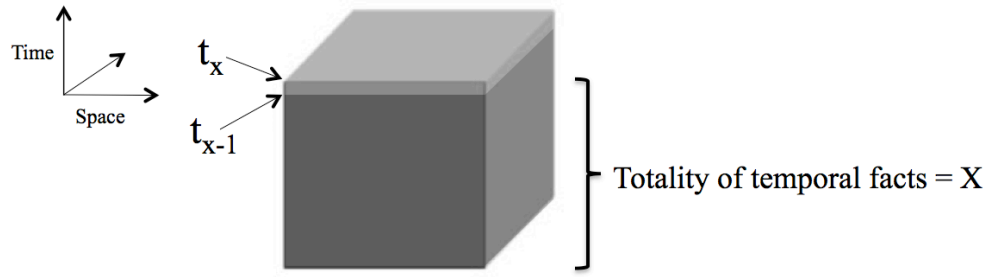

Figure 2.9

The growing block theory accommodates change in this account by way of different parts (of the universe) having different properties. The growing block theory is confined to one universe – this one. And the proponent of the growing block theory must make sense of change in terms of this one universe. The only thing he can do is to point to different parts of the universe (the part existing up until t_{x-1} and the part existing up until t_x) as having different properties.

On this account, the only way the growing block theory can make sense of change is to appeal to different portions of the universe as having different properties. But this does not satisfy the Change Thesis that the moment at the leading edge of the block changes. The growing block theory is forced to give an account of change in terms of the variation of temporal facts in the different parts of the universe. If the growing block theory is forced to give an account of change in terms of differing parts of the universe

possessing different properties, then the growing block does not truly *grow*. There is no way in which the totality of temporal facts increases (*simpliciter*), and so the growth that the block undergoes is purely metaphorical. The set of temporal facts is indexed to a time, and this state of affairs is unchanging. Because of this, there is no temporal change (or growth) in the growing block universe and the Change Thesis is not satisfied. A block universe that does not truly grow is equivalent to a static block universe. On this account of making sense of change in the growing block universe, the growing block universe has become a B-theory.[117]

This complaint can be put another way: how can the proponent of the growing block show that there was a different leading edge of the block? Look at the current diagram of the universe. There is no place in the past where t_{X-1} was the leading edge of the block, so how could t_{x-1} have been the leading edge of the block? In other words, there is only one NOW – t_x – and at no time is there a different NOW. All other moments exist, but there is no point in the past at which they are NOW. There are no other moments in the past of the current universe that are at the leading edge of the block. As a result, the proponent of the growing block view cannot hold that any other moment was present, which means that he cannot establish change. In the growing block, there is no change – there exist events at the edge of the block or in the block.

[117] The growing block theory could resist this B-theory label by pointing out that the edge of the block is "illuminated" in that this slice of the universe possesses the property of presentness. But if the growing block theory wants to endorse this, then the theory opens itself up to even more serious problems. See Braddon-Mitchell (2004) for explication. Specifically, this attempt of the growing block to differentiate itself from B-theory not only does not recover temporal change – it makes the theory worse off than a B-theory account of time because the theory faces McTaggart's Paradox.

2.3.3 Saving Change Through Absolute Becoming

The proponent of the growing block theory can save change if he can identify that events not in the leading edge of the block *were* at the leading edge of the block. How can he do so? The growing block must make room for moments to be formerly NOW rather than just exist in the block. The growing block theorist can in fact do so – because events that exist in the block must *come into being* at the leading edge of the block; thus, the only way events exist are if they become real at the leading edge of the block. If an event exists, it was formerly at the leading edge of the block – in this way, any existing event therefore can be understood to be an event that is formerly NOW. The growing block theorist can thereby account for the change in the NOW by accommodating the existence of formerly NOW moments. But notice that the growing block theorist must appeal to the existence of absolute becoming. If events that exist were once at the leading edge of the block, this is by way of the process of absolute becoming. If there is no absolute becoming, then the growing block theorist cannot account for any existing events being formerly NOW. And if he cannot account for any events being formerly NOW, then he cannot satisfy the Change Thesis. In other words, the growing block theorist's account of change by way of the change in the sum total of reality requires that the future does not exist. Upon reflection, this is straightforward; if the future is real, then the growing block view is merely a static blockworld. And there is no genuine change in the blockworld. As a result, the satisfaction of the Change Thesis in the growing block world depends upon the existence of absolute becoming. The growing block view's ultimate fate as a *growing* block, therefore, rests upon the assessment of the prospects of absolute becoming.

2.4 Conclusion

Every A-theory that endorses passage must be committed to two theses: The Present Thesis and the Change Thesis. The purpose of satisfying the Present Thesis is to identify the theory as an A-theory of time – one in which the present is objectively privileged. The purpose of satisfying the Change Thesis, on the other hand, is to guarantee that the theory can establish the passage of time.

In the moving spotlight view, the incompatibility of the particular version of the two theses produces McTaggart's Paradox, which even appealing to hypertime cannot resolve. Philosophers tout presentism's ability to avoid McTaggart's Paradox, but the presentist cannot escape the incompatibility between his version of the Present and Change Theses. The presentist's strategy of indirectly accounting for change fails, which means that there can be no passage in presentism. The structural problem seems to also plague that growing block theory. For a moment's position at the leading edge of the block to alter – something that the growing block is committed to in order to there to be change – the moment must both possess and lack a position at the edge of the block. It seems as if McTaggart's Paradox strikes again. The obvious way for the proponent of the growing block to avoid this is to appeal to succession. But appealing to succession only allows the proponent of the growing block theory to accommodate change if he can show that events that exist in the block were at the edge of the block. He does this by appealing to absolute becoming; if an event exists, it must have come into being at the edge of the block as a result of absolute becoming. The success of the growing block theory in accounting for passage therefore relies on the plausibility of absolute becoming.

I argue in the next chapter that there can be no absolute becoming. As a result, the only option for the growing block theory to satisfy the Change Thesis fails.

No A-theory can endorse both the Present Thesis and the Change Thesis. This ultimately means that there can be no passage of time in any A-theory. In this way, all A-theories suffer from a structural problem which prevent the existence of temporal change. The passage of time cannot be linked to the change in the privileged moment because there is no plausible account of the shifting NOW that is responsible for the passage of time. In the end, if time does pass, then this passage cannot be defined in terms the shift of the NOW.

The question is, must the passage of time be understood in this way? That is, can there still be the passage of time without the shift in the NOW? Most B-theorists hold that the answer is "no." In due course, I argue that there is no good reason for the passage of time to be tied to the shift of the NOW. All of our intuitions about passage can be satisfied by an alternate account of passage – based on B-coming – which does not suffer from the structural problems associated with the changing NOW. And because of this, the passage of time can exist in a B-theory blockworld.

3

Absolute Becoming and the Existence of the Future

Temporal becoming is that by virtue of which the future turns into the present. It is what allows the fruition of our future plans as it whisks away the present into the past. Successive moments become present, resulting in the shift of the NOW which is the passage of time. Because of this, temporal becoming is the foundation of temporal passage. There are two classic ways of understanding the concept of an event becoming present expressed in the two different models of temporal becoming. The first model, the reality-acquisition view, has come to be known as the commonsense understanding of the nature of temporal becoming in our world; this "absolute" becoming is one in which future events, which do not exist, come into existence. The second model, the property acquisition view, endorses an understanding of temporal becoming as an event's gain of the property of presentness rather than an event's gain in existence.

From the previous chapter, it is clear that the second model of temporal becoming is untenable; a property-acquisition view forces one to accept qualitative change which leads to McTaggart's Paradox. Ultimately, this is the reason why there can be no passage in the moving spotlight theory of time. Absolute becoming, on the other hand, is the key to preserving the passage in the growing block view of time. The growing block theory, it seems, can reconcile the two central commitments of passage – that there is a NOW and that the NOW shifts or changes – that both the moving spotlight theorist and presentist are unable to adequately accommodate. For the growing block theory, the

moment that is NOW is identified as the leading edge of the block. A moment can change with respect to its NOWness if other moments are added to the leading edge of the block. In other words, for the growing block theory, the change in the NOW requires that other moments are added to the block. This is what we understand to be absolute becoming. If, therefore, the proponent of the growing block theory can show that absolute becoming exists, then he can preserve the passage of time. The problem, however, is that absolute becoming cannot exist.

In order to show this, I begin by outlining the two central elements of absolute becoming: (1) the future does not exist and (2) the present (and past) brings the future about by way of causation.[118] I argue that the two elements are in conflict. For the present to be able to bring about the future, a causal connection must exist between the two. And if a causal relation obtains between the present and the future, then both the present and the future must exist.

I then explore the attempts to resolve the conflict in order to preserve absolute becoming. Assuming that adherence to (1) is inviolable, I thus consider the denial that (2) requires a casual *connection* between the present and the future. Instead, the proponent of absolute becoming can endorse an account of causation that avoids positing causation as a relation between the present and the future. There are two ways that this account can be satisfied; one can deny that causation is a genuine relation, or one can hold that causation is a relation that obtains only between presently-existing entities. The first option entails adopting a regularity account of causation. I argue, however, that this option should be rejected because it suffers from what I call the coordination problem:

[118] For simplicity's sake, I'll refer to just the present bringing about the future, although I do accept that both present and past entities can bring future entities about.

that the proponent of absolute becoming must admit that the orderliness of the world (i.e., that we find persistent regularities) cannot be explained. I canvass the various possibilities in which the regularity theorist can avoid the coordination problem, including appeals to brute facts and appeals to the laws of nature, and show that these possibilities can only succeed in avoiding the coordination problem by accepting a connection between the present and the future, thereby re-encountering the original conflict. The types of theories which exemplify the second way of avoiding a causal connection between the present and the future include Bigelow's theory of causation and the theory of causal powers. I argue that both of these theories fail in the same way that the theories in the first option do; they must posit a connection between the present and the future if they are to avoid the coordination problem. The result is that there is no plausible way for the proponent of absolute becoming to satisfy the causal element that the present brings about the future without admitting the existence of the future. The conflict between its two essential elements is irreconcilable, and absolute becoming cannot be a viable model of temporal becoming.

The overall result is that temporal becoming can *only* be plausibly accommodated within a four-dimensional framework. Furthermore, due to the failure of the property-acquisition view, temporal becoming cannot be understood in terms of the gain of the property of presentness. The A-theorist accuses the B-theorist of not having that "something extra" which allows for the existence of temporal becoming, namely, an event's gain of presentness, which serves as the basis of the claim that becoming is to be equated with "becoming present." I hold that the proponent of the B-theory blockworld should not want this "something extra." Ultimately, this "something extra" is an addition

that the B-theory blockworld can, and should, do without. Thus, the traditional models of temporal becoming must be completely discarded. This is a consequence of the (somewhat startling) conclusion that any conception of temporal becoming cannot be one in which events become present, either by way of gaining the property of presentness or coming into existence.

3.1 The Elements of Absolute Becoming

In absolute becoming, an event does not technically change from future to present. Instead, the change from future to present is understood as a non-existent event coming into existence. This absolute becoming has two central elements. The first central element of absolute becoming is that the future does not exist. If absolute becoming is to be understood as gaining existence, there needs to be an ontological asymmetry between the present and the future. Another feature of absolute becoming, however, is the fact that the future is in an important way produced from the present (and the past). The present *brings about* the existence of the future. Thus, the conception of absolute becoming seems to have at least two necessary characteristics:

Non-Existent Future Element (NE): The future does not exist

Causal Element (CE): The present brings about the past such that the present causes the future.

Both the growing block theory and presentism seem to easily accommodate absolute becoming. According to both theories, events in the future do not exist, but present events do exist; an event "becomes" when an event in the future becomes present by way of coming into existence.

3.1.1 The Non-Existence of the Future

The reality-acquisition model in the form of absolute becoming is seen as:

Future Event---------->Present Event

=

Non-Existent Event ---------->Existent Event

There is a non-existence/existence distinction between the present and the future (the past need not concern us at this point) and so becoming in terms of an event going from the future to the present represents a genuine (ontological) shift in the world in terms of a non-existent event coming into existence. That is, there is an ontological difference between the present and future – one of existence. Absolute becoming is therefore conceived as a future event's gaining existence. This gain in existence is then what qualifies the event as "present," thus fulfilling the understanding of temporal becoming as the change of an event from future to present. That the future does not exist allows the proponent of absolute becoming to accommodate what seems to be the ontological shift in the world when something "becomes." The non-existence of the future also allows the proponent of absolute becoming to satisfy our intuitions that the future is in some sense open. The openness of the future is easily explained in this case. The future is open in that it does not exist. This nicely explains why we have the sense, for example, that future possibilities have not yet been realized – because they do not yet exist.

3.1.2 The Present Brings About the Future

The causal element is the less straightforward element of absolute becoming. The purpose of this element is to accommodate that events in our world come into existence by way of being brought about by the present. More specifically, the becoming of

absolute becoming is the *generation* of an event that did not previously exist by another event preceding it. The additional feature of absolute becoming amounts to the present *producing* the future. Another way to understand this is that the future comes out of the present in a special way.[119] Events in the present bring about the existence of future events. Absolute becoming therefore involves more than the idea that the future routinely follows the present (and that the past routinely follows the present); it is also that the present affects what comes to be. What happens in this present makes a difference in what happens next. In order for the presentist to account for this feature of the world, absolute becoming must ensure that this is the case.

What exactly, is the nature of this production in the temporal case? The way in which we commonly understand absolute becoming – as the future being generated by the present, or the future coming out of the present – hints to its nature: one of *causation*. The present causally produces the future. Thus, the relation that holds between a temporal event becoming from another temporal event is a causal connection. Ultimately, this means that the present has a causal connection to the future.[120] In summary, the conception of absolute becoming is one in which the already-existing present *causes* the non-existent future to come into existence. And for this to be the case, there must exist a causal connection between the present and the future. Thus, absolute becoming is the coming into existence of the future. It is an event's coming into existence. There is a transition from non-existence to existence, and this transition is fueled by causation. This understanding is capture by accepting the two elements of

[119] The idea is (briefly) highlighted in Maudlin (2007), p. 110 – but Maudlin mentions it with respect to temporal passage, not temporal becoming (two concepts that I want to distinguish between).
[120] The asymmetry of this causal connection is put to the side for one moment – I hold that the debate about the asymmetric nature of the causal connection has no bearing on this argument.

absolute becoming. Absolute becoming is therefore a transition of coming into existence the future that is causally brought about by present events, and this causal production lies in the causal connection between what is and what comes to be.

3.2 The Conflict in Absolute Becoming

The concept of absolute becoming necessarily entails that the future does not exist. Additionally, in absolute becoming, there is a sense in which what happens in the future (future events) is *affected* by what happens now (or what happened in the past). That is, the nature of present events *influence* the nature of future events. I have understood this as a claim about causation; the present is the cause of what comes to be. This means that the nature of the present determines the nature of what comes into existence. Due to the nature of the present, only certain events come into existence. If this is the case, however, a causal connection must exist between the present and a future entity. But this cannot be the case because a causal connection necessitates the existence of both relata, thereby requiring the existence of the future and violating the first necessary condition of absolute becoming. This is the conflict between the two elements of absolute becoming.

The present brings about the future. Furthermore, what the present is like then determines what the entities coming into existence are like. That the present causes the future to come into existence nicely captures these two aspects of what we think the world is like. Suppose a causal relation obtains between the present and the becoming entity only after the entity comes into existence. Because there is no causal connection between the present and the future, any possibility can be realized by coming into

existence. And if any possibility can be realized, then a causal relation obtaining after a future event comes into existence does not serve to cause what does come into existence because the causal relation does not serve to determine, influence, or affect what comes to be. As a result, a causal relation between the present and the future must obtain prior to an event coming into existence. This causal connection requires the existence of the future – both relata (the present and the future) must exist. Thus, this causal connection necessitates that the future exists. But, the future cannot exist prior to it becoming present. Absolute becoming then seems to demand both the existence and the non-existence of the future.

In this way, for the first element of absolute becoming (NE) to be satisfied, future entities cannot exist. On the other hand, if the second element of absolute becoming (CE) in the form of a causal connection between the present and the future is satisfied, then both the present and the future must exist. In summary, the consequence of adopting the two elements of absolute leads to the commitment that the future does and does not exist.

3.3 Solutions From the Causal Argument Against Presentism

The options for the proponent of absolute becoming to resolve this conflict are inspired by the solutions to a related problem for presentist theories called the problem from relations. This problem from relations can be summarized as follows:

> Take as a first supposition that, in order for a relation to hold between two things, both of those two things will have to exist. Call this the principle that all relations are existence entailing. Add as a further premise the supposition that relations sometimes hold between a present thing and something else which is not present. The conclusion follows ineluctably that some things exist which are not present.[121]

[121] Bigelow (1996), p. 37 – Bigelow does not endorse this argument. He merely sets it out in order to object to it. Also see Crisp (2005) for an articulation of this problem.

If some things exist which are not present, then we must give up presentism. Thus, if presentism is to be committed to the following elements:

1. Non-existence of the non-present (the past and the future)
2. Relations between the present and non-present

then given the assumption that relations are existence-entailing the theory of presentism is contradictory.[122] Most defenders of presentism save their theory from the argument from cross-temporal relations by rejecting the second element of the problem. Thus, most presentists attempt to reject the argument by claiming that present entities do not stand in relations to non-present things.[123] Likewise, one of the characteristics of absolute becoming must be given up. The near unanimous consent in the literature that the non-existence of the future is a central requirement of absolute becoming recommends against the option of rejecting the first characteristic. The less painful bullet to bite seems to be the abandonment of the second characteristic – that the present is causally connected to the future. Suppose this option is rejected; the causal connection between the present and the future is no longer required. The conflict can be resolved quite easily by giving up the requirement of a causal connection between the present and the future.

[122] I put aside the possibility of denying that relations are existence-entailing. Some (see, for example Ladyman and Ross (2007)) defend the view that relations are ontologically fundamental, but the project of articulating the consequences of marrying this view with absolute becoming is outside the scope of this paper. In any case, there are serious doubts as to whether a view of this nature is coherent (See Chakravartty (1998) and (2003)).

[123] One might be worried that a presentist cannot even articulate the temporal relation as a result of this problem. The accepted response is that the use of temporal relations in temporal precedence can be avoided if the presentist interprets temporal precedence claims as claims about the concepts of past, present, and futurity. The claim that A is earlier than B is reinterpreted as the claim, "It will be the case or was the case that A is past and B is present." We can analyze the claim as follows: it is a tensed fact (either future-tensed or past-tensed) that A is past and B is present. For an explication of this strategy, see Schlesinger (1980). Tooley (1997) critiques Schlesinger's attempt.

Once the proponent of absolute becoming gives up the causal element, it seems as if he has given up the ability to claim that what happens in the future affects or makes a difference to what comes into being in the next moment. It seems that without a causal connection between the present and the future, what happens in the future cannot be an effect of what happens in the present. I, however, propose that the proponent of absolute becoming can still preserve the spirit of the causal element by offering an account of causation which denies that causation need be a relation between existing and non-existing entities. In other words, the proponent of absolute becoming can still account for the causation, and his account of causation might enable him to preserve the intuition behind the causal element while avoiding the conflict between the two elements of absolute becoming.

The proponent of absolute becoming has two different ways to capture our understanding of what *seems* to be a causal relation between the present and the future. These two strategies come in the form of the solutions to what is called the Causal Argument against Presentism (CAP), which is a specific formulation of the problem from relations:

1. Causation is a relation requiring the existence of its relata (assumption)
2. If presentism is true, then no wholly non-present events exist (assumption)
3. Some present events cause, and are caused by, wholly non-present events (assumption)
4. Some wholly non-present events exist (from 1, 3)
5. Presentism is false (2, 4)[124]

The presentist can either deny that causation is a genuine relation or hold that causation is a genuine relation that obtains only between presently-existing entities. So, the presentist avoids CAP by rejecting either (1) or (3). The proponent of absolute becoming can

[124] McDaniel (2010), p. 325

resolve the conflict of the elements of his view by adopting one of these strategies. In essence, both options involve reinterpreting the causal element; that its, the causal element can be understood in a different way, while still capturing the intuition behind it. In the first strategy of rejecting premise (1), the proponent of absolute becoming can understand the causal element in a way that does not necessitate a causal connection. The strategy of premise (3) involves understanding causation as a genuine relation, but one that is confined to the present and past and does not involve a connection to the future.

3.4 Non-Relational Accounts of Causation

The presentist's first strategy against CAP, rejecting premise (1) is the more commonly adopted strategy among presentists.[125] In much the same way, the causal element can be understood as the present affecting the future, and accepting causation between the present and future in a way that denies that causation is a relation requiring the existence of its relata. But without a causal connection, is this possible? The proponent of absolute becoming can hold that the causation in the causal element is one in which causation is explicated in terms of either a regular conjunction or counterfactual dependence. These two ways of understanding causation need not require the existence of both causal relata. By this I mean the following: causation, as understood as a transtemporal relation is expressed in the form *causes* (*c*, *e*). For the initial strategy described above, the presentist denies that *c* and *e* are events, but continues to endorse that there is a connection linking *c* and *e*. For the current strategy, the presentist can deny this form of causation insofar as he denies that causation be understood as a connection linking *c* and *e*. Instead, causation must be understood in a different way; it must be

[125] See Crisp (2005) and Bourne (2006).

reinterpreted in a way that allows the proponent of absolute becoming to avoid positing the existence of both relata. By doing this, the proponent of absolute becoming can reconcile the conflicting central requirements of the conception of absolute becoming. There are two main theories to which the presentist commonly appeals, and thus to which the proponent of absolute becoming can appeal: Humean causation and a counterfactual account of causation. I will examine both (briefly) in turn.

3.4.1 Humean Causation

According to David Hume, "We may define a cause to be an object followed by another, and where all the objects, similar to the first, are followed by objects similar to the second."[126] On a regularity account, causation is identified by three conditions; c causes e iff

i. *c* is spatiotemporally contiguous to *e*;
ii. *e* succeeds *c* in time; and
iii. all events of type *C* (i.e., events that are like *c*) are regularly followed by (or are constantly conjoined with) events of type *E* (i.e., events like *e*).[127]

There is no "physical tie" between the cause and the effect. All that is required is that events that are sufficiently similar to *e* regularly follow (are later than) events that are sufficiently similar to *c*, and that *c* and *e* be spatiotemporally contiguous. This is a particular strategy offered by Crisp (2005); he gives the following example:

> "to say that today's flood is caused by yesterday's downpour is to say no more than that
>
> > (3a) Today's flood belongs to an event type *B*, it was the case that yesterday's downpour belonged to an event type *A*, and for every time *t*, if at *t*, some *A*-event occurs, then at some time shortly after *t*, a *B*-event occurs (or, more succinctly, *B* events regularly follow *A*-events).[128]

[126] Hume, *Enquiry*, section 7
[127] Psillos (2009), p. 131
[128] Crisp (2005), p. 14

Thus, one can hold that the present causes the existence of the future by virtue of holding that present events of type *C* regularly precede the coming into existence of events of type *E*.

It seems at first that both relata need not exist in order to ground the fact that *c* caused *e*. But the requirements must be examined more closely. How are we to understand that *c* and *e* are contiguous in space and time? Might the continuity require that both *c* and *e* exist? To be charitable to the proponent of absolute becoming, we can understand the first requirement to be understood as *c* and *e* being 'sufficiently close' in time and space, and interpret sufficient closeness in a way that does not require the existence of both *c* and *e*.[129]

The proponent of Humean causation, however, faces a more serious problem: it does not seem as if the regularity view of causation satisfies any interpretation of the causal element of absolute becoming. In other words, that there is a constant conjunction of events does not seem to be an adequate account of capturing our intuitions that what happens in the present makes a difference (in some way) to what comes after. This difference-making can be taken as the weakest formulation of the causal element: the present *affects* what comes next. In the regularity account what occurs at a later event is in some sense determined by what precedes it due to the constant conjunctions that obtain, but the way in which the regularity account of causation is nothing more than the notion of *C* regularly following *E* seems to fail to meet the demand that what happens in the future is somehow more robustly dependent on what happens in the present. Fortunately, for the proponent of absolute becoming, there is a theory of causation that is

[129] This suggestion is offered by Bourne (2006), p. 111. I'm happy to make this concession, the presentist (and growing block theorist) face more serious problems even with the concession of this point.

more friendly to the non-existence of the future, which seems to also meet this minimum formula that what happens in the future be somehow dependent on what happens in the present.

3.4.2 The Counterfactual Account of Causation

This alternative to the Humean account of causation is the counterfactual account of causation. On the counterfactual theory, what makes a causal claim true is the counterfactual dependence holding between cause and effect. Thus, the fact that *c* causes *e* can be analyzed according to the counterfactual claim that:

(C) Had *c* not occurred, *e* would not have occurred.

Thus, *c* causes *e* by virtue of the truth of the counterfactual claim.[130] Since causation is nothing more than counterfactual dependence and counterfactual dependence is analyzed in terms of the non-occurrence of events, causation not a genuine relation between events. [131] As a result, giving an account of *c* causing *e* in terms of counterfactual dependence does not require the existence of *c* and *e*.[132] Consider an example: in the actual world, Suzy throws a rock at a glass bottle, shattering it to pieces.[133] Suzy's throwing of the rock (*c*) causes the glass bottle to be smashed to pieces (*e*). But this is the case not by virtue of a causal relation holding between *c* and *e*. Instead, it is the case by virtue it being true that:

> (C') Had Suzy not thrown the rock, the glass bottle would not have been smashed to pieces.

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[130] This is a simplified account of the counterfactual analysis. The claim (C) might be more accurately understood as a sufficient condition for causation. I sidestep issues of preemption (see Menzies (1989) for more) and consider only this simplified account due to the fact that the more complex counterfactual accounts also face the problem I pose below.
[131] Bourne (2006), p. 113 makes this point.
[132] McDaniel (2010) offers a similar strategy.
[133] Suzy is clearly a troublemaker.

This fact need not invoke the existence of either *c* or *e*. Furthermore, on the basis of the counterfactual claim, what happens in the present (say, Suzy's throwing of the rock) makes a difference in comes into existence (the glass bottle shattering to pieces). The counterfactual approach to causation then seems to be a more adequate account of the way in which an effect depends on its cause than the Humean approach to causation.

Notice that although the counterfactual analysis avoids existence of the relata, the truth of the counterfactual claim requires that the existence of a cause makes a difference to the existence of the effect, and in this way, the proponent of absolute becoming can then hold that the present affects what comes into existence (at the next moment). More explicitly, the proponent of absolute becoming holds that the present brings about the future insofar as how the present is makes a difference to how the future will be (when it comes into existence). And because of this, the causal element is satisfied without violating the first element of the non-existence of the future. The plausibility of this option is further strengthened by the fact that the counterfactual account of causation is among the common (and respectable) theories of causation.

The problem of this account of causation, however, is exposed when one attempts to answer the question of what makes this counterfactual claim true. The counterfactual claim must be true if one is to hold that *c* causes *e*. Because, as pointed out above, the relata in the counterfactual claim do not exist (e.g., Suzy's not throwing the rock and the glass bottle not shattering to pieces) the assessment of truth does not directly depend on appeal to actual states of affairs.[134] But according to Lewis (1973), there is a systematic

[134] However, later claims that Lewis (2004) makes might doom this strategy. In later writings, he claims that the counterfactual assessment of causation is just a piece of conceptual analysis and that there is a relation between a cause and effect, which he refers to as "biff," on which causation supervenes. Thus, if the fact that *c* causes *e* supervenes on a relation between *c* and *e*, then the counterfactual analysis cannot, in

and objective way to assess the truth of this counterfactual claim. Briefly, Lewis proposes that a counterfactual claim is true if, when considering possible worlds, in the closest possible world in which *c* does not occur, *e* does not occur. Lewis then offers an analysis of the closeness of other possible world in terms of similarity. Similarity, according to Lewis, depends on two main features: (i) particular facts and (2) laws of nature. Two worlds are similar to the extent that they agree in matters of fact and the laws of nature. The inclusion of the laws of nature is therefore of paramount importance for the Lewisian understanding of the assessment of counterfactual claims. Lewis endorses a best systems account of the laws of nature, sometimes called the Mill-Ramsey-Lewis account.[135] In this account, a law is a theorem or axiom in the true deductive system which is the best combination of simplicity and strength. Thus, in the words of Lewis, the laws of nature are the regularities in the world that "buy into these systems of truths that achieve an unexcelled combination of simplicity and strength."[136] Laws of nature at the basic level are nothing more than a (certain kind of) systemization of the regularities in the world.[137]

It is important to note that the best systems account of the laws of nature is a non-governing (or descriptive) account of the laws of nature. This is to be contrasted with the governing account of the laws of nature, such as the so-called necessitarian account,

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fact, avoid cross-temporal relations. See McDaniel (2010) for a discussion of this particular problem. I set this issue aside, and endorse the counterfactual approach to causation that is friendly to the proponent of absolute becoming.

[135] See Mill (1843), Ramsey (1928), Lewis (1973), (1983), (1986)

[136] Lewis (1986), p. xi

[137] In granting that the presentist can appeal to this account of laws, he must at the very least be able to appeal to the regularities in the past; I grant to him, for the sake of the argument, that he can do so. Technically, the best systems account of the laws of nature is understood as the systemization of all of the facts – past, present, and future. According to the proponent of absolute becoming, the future does not exist; the proponents of these views can alter their best systems account slightly to include all available facts (thus excluding future events). I do not take this to be seriously problematic, since the best systems account is merely a descriptive, rather than a governing, account of the laws of nature. However, as explicated below, this issue comes back to haunt the proponent of absolute becoming.

sometimes referred to as the Dretske-Tooley-Armstrong account.[138] Cohen and Callender (2009) describe this distinction as follows:

> Just as librarians enforce the rules of book borrowing and policemen enforce traffic rules, so Governing theorists think that necessitarian relations, primitive accessibility relations, or primitive universals enforce certain behaviors upon the events of the world…[the Non-Governing view] has it that there are genuine laws of nature, but that they do not govern or produce the events of the world. The mosaic of events displays certain patterns, and it is in the features of some of these patterns that we find laws.[139]

According to the governing law conception, laws of nature play a metaphysically robust role – they actually *do* something; in other words, they govern what the world is like. On the other hand, non-governing laws of nature are merely descriptive; by this I mean that, according to the non-governing conception, the laws of nature are ultimately just true descriptions of what happens in the world.[140] The best systems account of the laws of nature, the regularities of the world are what, in the end, determines the truth value of the counterfactual claim. Because of this, the counterfactual analysis of causation is a version of the regularity approach to causation, albeit a relatively sophisticated one.[141]

3.5 Assessing Non-Relational Accounts of Causation

In both regularity accounts, causation is ultimately analyzed in terms of the regularity of the world. Thus, the proponent of absolute becoming can hold that what happens in the present affect what comes into existence while also being committed to the non-existence of the future. Both of these accounts face the same devastating objection: they fail to explain certain phenomena that we traditionally think need explaining – specifically, the regularity of the world. Events of type *E* seem to regularly

[138] Dretske (1977), Tooley (1977), and Armstrong (1983)
[139] Cohen and Callender (2009), p. 2
[140] For a detailed explication of the difference between the two accounts of the laws of nature, see Beebee (2000).
[141] See Beebee (2006) and Dainton (2009) for claims to this effect.

follow events of type *C*. Throwing a rock at a glass bottle regularly results (if the aim is accurate) in the glass bottle shattering to pieces. In other words, objects in the same circumstances behave in the same ways. Thus, there are patterns of behavior of objects or patterns of events in the world. I argue that no regularity account of causation that can explain how the world is regular in its behavior, and that absent any explanation of regularity, these accounts of causation should be rejected as inadequate.

3.5.1 The Ultimate Argument

This problem is most notably explicated by Strawson (1989) and is referred to by Psillos (2009) as the "ultimate argument" against regularity accounts of causation.[142] The ultimate argument starts with the (uncontested) empirical claim that there is regularity in the world. Second, it is charged that the proponents of regularity accounts of causation cannot explain or ground these regularities of the world. Therefore, regularity theories of causation are inadequate in failing to explain or ground something that needs to be explained or grounded. Strawson describes the problem in the following way:

> Consider any large scale natural phenomenon – yourself sitting in a chair in a room in a building – and the massive complexity of regularity of succession involved in this phenomenon from moment to moment. According to the (basic, ontologically outright) Realist Regularity theory of causation, there is *absolutely nothing* about the nature of reality that makes this so, as it continues from instant to instant.[143]

Thus, the ultimate argument against regularity theories of causation leaves the regularities of the world unexplained or ungrounded – and this is something that requires explaining. Because regularity theories fail to explain regularities, they should be rejected.

But what is wrong with supposing that there is nothing in virtue of which the world is regular? That is, why think that a theory that does not explain or ground the regularities of the world should be rejected? According to Strawson, without an

[142] Tooley (1993), p. 178 also makes a similar complaint.
[143] Strawson (1989), pp. 23-24, emphasis in original

explanation or ground for the regular behavior of the world, its uniform nature is a "fluke." Strawson declares that it is "absurd" to insist that the world is a "vast and continuous fluke" and identifies the continued fluke with an "outrageous run of luck."[144] He offers an analogy to highlight his point:

> [Suppose that a] true randomizing device determines the colour value of each pixel on a standard 800 X 400 computer screen, running on a ten-times-a-second cycle – so that each pixel can take any colour value for each $1/10^{th}$ second period. On the screen it appears that there is a film showing. A woman enters a house, walks over to a stove, and puts on a kettle. Life – a world, as it were – goes on in an ordered, regular fashion, exactly as regularly as in our own world.
>
> But the image is being generated by the true randomizing device. It is a pure fluke that what happens on the screen appears to tell a coherent story of a regular, ordered world, rather than filling up with – or suddenly switching to – a fizz of points of colour…this analogy, then, may convey some idea of the true (and astonishing) nature of the Regularity theory of causation as applied to our own world.[145]

Thus, in the absence of something to *enforce* the regularity of the world, one finds the persistent orderliness completely surprising. When considering these regularities which persist without any reason at all, one undergoes what Blackburn (2000) calls "inductive vertigo" – a feeling that arises when one considers that the uniform nature of the world is nothing more than a coincidence or an incredible instance of cosmic luck.[146] To dispel this inductive vertigo, one must offer an account of why the regularities in the world continue to persist. Blackburn states, "We feel that the ongoing pattern would be too much of a coincidence unless there is something *in virtue of which* the world has had and is going to go on having the order that it does."[147] The proponent of any kind of regularity theory posits an extremely surprising state of affairs, and without an explanation, this is akin to endorsing a cosmic-sized coincidence or a continuous fluke. The only way to cure this inductive vertigo is to find something by virtue of which the

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[144] *ibid*, p. 26
[145] *ibid*, pp. 24-25
[146] Blackburn (2000), p. 103
[147] *ibid*, emphasis in original

world is regular. Unfortunately, the proponent of a regularity theory of causation cannot do so, and therefore these strategies are inadequate accounts and should be rejected.

3.5.2 Replying to the Ultimate Argument

The best way for the proponent of absolute becoming to avoid this unfortunate conclusion is to protest the rejection of accounts of causation that cannot explain the regularity of the world. To do so, the proponent of absolute becoming can deny that there need be anything to explain or ground the regularity of the world; the proponent of absolute becoming can hold that the regularity of the world is something that need not be explained or grounded, and thus the options for a causal account open to the proponent of absolute becoming cannot be discounted on the basis that theory does not explain or ground the regularity of the world. This is a strategy largely borrowed from Beebee's (2006) defense of regularity accounts of causation. Beebee's central claim is to deny that the regularities of the world need an explanation – she does this by holding that it is better to resist the demand for explanation or grounds of regularities and she claims that in the absence of a necessary connection between cause and effect the regularities of the world are not as surprising as her opponent makes them out to be.

Beebee first argues that the demand for an explanation or ground of the regularities of the world is one that should not be met; she declares that "the ontological cost of meeting [the demand] is not a price worth paying."[148] By this Beebee is denying that a deeper explanation or ground of the regularities of nature is preferable. That is, there must be some end to the explanation or ground – let us call this a brute fact – and it is not clear why a deeper terminus of the explanation or ground should be preferred. More specifically, a theory that does more than postulate regularities must posit another

[148] Beebee (2006), p. 526

metaphysical entity that enforces (so to speak) these regularities. The explanation or ground of the regularities then stops with the enforcers. But one might wonder why this enforcement of the regularities holds; that is, one might demand a deeper explanation or ground for the enforcement of these regularities. The reply is that no deeper explanation is needed for the enforcement. The defense of the regularity accounts of causation appeal to the same kind of reply – the explanation ends at the level of regularities. According to the proponents of regularity theories, this level of explanation is to be favored because it does not posit extra metaphysical entities to act as enforcers and thus offers a simpler ontology.

There seem to be two choices regarding explanation or ground of the regularities of the world:

> R1: As a matter of brute fact certain kinds of objects exist; these objects have natures which compel them to behave in certain ways, and the regularities are a consequence of this.
> R2: As a matter of brute fact the universe consists of a mosaic of unconnected objects and events, and this mosaic happens to be patterned in a certain way.[149]

For Beebee and other proponents of regularity theories of causation, the explanation or ground comes to an end at the level of regularities – these regularities are a brute fact of the universe – and there is no further level of explanation or ground. That these regularities obtain is a brute feature of the universe because the universe as a whole is uniform in that it happens to be patterned in a certain way. Thus, the regularity accounts of causation can deny that there need be any deeper level of explanation or ground than the level of regularities. It is a brute fact about the world that it consists of a mosaic of unconnected objects and events that are patterned in a certain way.

[149] Dainton (2009), p. 201

3.5.3 The Nature of Surprise

One might resist this terminus of explanation by replying that the very fact that the world has a certain pattern and is uniform in this way is surprising. Of all the ways the unconnected objects and events in the universe can be arranged, it happens to be arranged in a particular pattern that lends uniformity to the world. This itself, even if it is a brute fact, is surprising. And, the reply goes, this surprise should signal discontent with the brute fact that the defender of a regularity account of causation offers. But Beebee disagrees. She points out that other flukes are tolerated without demand for explanation, and therefore not all flukes need be explained or grounded. That the orderliness of the universe is a so-called "fluke" does not itself show that regularities need an explanation or ground. To support the claim that flukes without explanation can be tolerated, Beebee gives the following example:

> Consider, for example, how spectacularly lucky you are to exist at all. It's extraordinary enough that conditions on Earth have for a long time been, and continue to be, compatible with any life at all; the margins of error (climatic conditions, composition of the atmosphere and so on) are very narrow. But that's not the half of it. Consider how many events had to happen in order for you to be conceived, and how many occasions there must have been on which either one of your future parents might unwittingly have said or done something that would have put your future existence into jeopardy…When you think about it, your own existence is an extraordinary fluke.

She then asks

> How much does this bother you? Most likely, not at all. You therefore probably have absolutely no inclination to suppose that there is some kind of underlying 'reason' why things throughout history panned out in such a way as to produce you.[150]

Beebee holds that one's particular existence can be seen as a fluke (and an extraordinary one at that), and yet one does not demand an explanation for why the very delicate and specific combination of conditions obtain to result in one's own existence rather than any other of the combination of objects and events that were possible. She seems to hold that

[150] Beebee (2006), p. 527

this combination of objects and events is analogous to the combination of objects and events that result in the patterned nature of the world. If one can live without an explanation for why the former obtains, then one can live without an explanation of why the latter obtains. Both states of affairs are flukes, but no explanation is demanded of the former. Considering the metaphysical cost to explain or ground the latter situation, the brute fact of the orderliness of the world is among the flukes that can be tolerated.

Beebee ends her reply to opponent of regularity theories of causation by rejecting Strawson's central analogy of comparing the regularity of the world to the film showing on the computer screen. She concedes that one should be surprised by the film that is a randomly generated sequence of colors. The regularity of the world, however, cannot be compared to the randomly generated film – Beebee expresses the reason why when she claims that one cannot make predictions about what will happen in the film, but one can make predictions about what will happen in the future of this world. This is due to the fact that, according to Beebee, we know that the world is an ordered place. Although this thought is not articulated further, I take it that Beebee is attempting to claim something like the following: there is no fact about the film that it is, in its entirety, an orderly object (that is, there is nothing about the nature of the film overall which renders it uniform). Strawson denies this very fact because he presents each image on the computer screen as randomly generated. If there is no fact about the orderliness of the overall film, as in Strawson's example, then one should be surprised by the coherent story that results. But there is a (brute) fact about the orderliness of this world. That is, it is a fact about the world that the contents in it are arranged in an orderly manner. And, the fact that the world is orderly is what saves us from being surprised when regularities persist. There is

no analogous fact about the randomly generated film; to hold that the film is randomly generated is to deny that there is a fact about its orderliness. This is what makes the result of the coherent story surprising – there can be no fact about its orderliness. Thus, there is a crucial difference between the regularities that obtain in Strawson's analogy and the regularities that obtain in Beebee's world. That the regularities in Strawson's analogy are surprising does not show that the regularities postulated by a proponent of a regularity theory of causation need be surprising as well. There is a fact about this world that it is orderly, and because of this, as Beebee claims, the orderliness of the world instead should be completely unsurprising, even given a regularity theory of causation.

3.5.4 The Coordination Problem

By denying that the persistent regularities of the world need be explained or grounded, Beebee sidesteps the ultimate argument against regularity theories of causation. The proponent of absolute becoming, it seems, can appeal to Beebee's response in order to defend the plausibility of an account of causation that avoids the postulation of relations between the present and the future. Beebee maintains that it is a brute fact that the world is uniform in nature, and that if this is a surprise – given all of the other possible ways the world could have been arranged – it is a surprise that can be tolerated. Notice that in order for Beebee's defense of regularity theories of causation to be successful, she must appeal to a brute fact about the world. I argue that this brute fact about the world – that it possesses persistent regularities – is a brute fact that can only be appealed to if the world is an unchanging four-dimensional object. This means that absolute becoming cannot exploit Beebee's defense of the regularity theories of causation. As a result, the proponent of absolute becoming faces his own, more serious,

version of the ultimate argument. This version, which I refer to as the coordination problem, is that the proponent of absolute becoming cannot explain how each new slice of reality that comes into existence preserves the regularity of the world. Without any constraint on what comes into reality (since these new slices must be unconnected), this perfect coordination is miraculous. And because there is a new set of facts that come into existence at each moment, the proponent of absolute becoming cannot appeal to a brute fact about the world in order to account for this orderliness.

3.5.5 Brute Facts and the Changing Universe

That the world is orderly is a brute fact about the *mosaic* of unconnected objects and events that form a certain pattern. Notice that the brute fact about the orderliness of the world is one that is about the entire mosaic. One cannot appeal to a brute fact about the entire mosaic unless the entire mosaic exists. This means that in order for the proponent of absolute becoming to appeal to Beebee's response, the entire mosaic (of past, present, and future) objects and events must exist. Beebee's defense is therefore a claim about the world as a four-dimensional entity; the brute fact that the world is orderly is a claim about an unchanging four-dimensional object.

In contrast, for the proponent of absolute becoming, the universe is a changing entity – the entirely of temporal facts changes from one moment to the next, due to a new slice of reality coming into existence at each moment. New temporal facts cannot come into existence if one is to make claims about the brute facts of the nature of the totality of temporal facts. The totality of temporal facts, according to the proponent of absolute becoming, changes from one moment to the next, which the addition of temporal facts corresponding to a new slice of reality coming into existence. Thus, the proponent of

absolute becoming cannot appeal to a brute fact about the totality of temporal facts. In other words, the proponent of absolute becoming cannot make a claim about a brute fact about the past, present, and future – because, at the very least, the future does not exist. That the world continues to be orderly cannot be explained by a brute fact about the overall nature of the world. This is the root of the coordination problem. For Beebee, there is no coordination problem because it is a brute fact that events are arranged in an orderly way. The brute fact that the world is arranged in an orderly way results in commitment to denying that an additional slice of reality comes into existence at each successive moment. The proponent of absolute becoming therefore cannot appeal to the same brute fact that Beebee appeals to in her defense against the ultimate argument.

The coordination problem is absolute becoming's version of the ultimate argument. Absolute becoming involves a process of creation events, and in each creation event trillions upon trillions (or more) of events give rise to an orderly world. How does this happen? This demands an explanation, but the proponent of absolute becoming cannot respond by appealing to Beebee's defense.

3.5.6 The Failure of Appealing to Brute Facts

Because the future does not exist, the proponent of absolute becoming cannot appeal to the brute fact that the world is orderly in order to explain the persistent regularity of the world. But, perhaps the proponent of absolute becoming can hold that it is a brute fact that the only future that does occur will preserve the uniform nature of the world. If this is a brute fact, then it is a brute future-tensed fact which belongs to the presently-existing world. But if the presently existing world as it exists now is unconnected to the future (which must be the case, since the future does not exist), then

how does a brute fact about the present world impact what happens in the future? For the proponent of absolute becoming, the sum total of reality changes as an additional slice of reality comes into existence. Each new additional slice of reality also possesses a curious fact: that it preserves the uniformity of the past world. Thus, in each successive world – at each sum total of reality – for the proponent of absolute becoming, regularities are preserved. Any additional slice of reality that comes into existence is one which provides a continuing coherent story, so to speak. This also constitutes a very striking fact – one that demands explanation.

In absolute becoming, each moment is perfectly coordinated with the moment that come before. This coordination is something that cannot be explained, and yet needs to be explained. Thus, this coordination is not like the surprising characteristic that the world is one which is hospitable to life. The coordination present in absolute becoming is magnitudes more surprising – while the existence of life is a brute feature of one unchanging set of facts, the coordination the proponent of absolute becoming must endorse is a feature of the many trillions of unconnected sets of facts that come into existence at every moment. In this case, Strawson's film analogy does seem to hold; each screen that comes into existence in the film is randomly generated and therefore is not dependent on what comes before. Because there is no connection between the present and the future, what comes into existence is also not dependent on what comes before – even if what comes before contains brute facts about the future. It is deeply surprising when the film continues to show a coherent story. In the same way, it is deeply surprising when what comes into existence continues to preserve the regularities of the world. The world in which there is absolute becoming, therefore, *is* like the film

showing on the computer screen. Each successive slice of reality comes into existence, unconnected to the other previous slices of reality. One cannot explain this coordination by appeal to Beebee's brute facts.

Furthermore, consider the following associated problem: each set of temporal facts at each moment that exists contains at least the same past-tensed facts as the moment before. But if each moment is a new slice of reality unconnected to previous moments, that these same past-tensed facts exist from moment to moment is surely miraculous. Tooley (1997) makes this point when he claims that

> …in general, according to tensed-facts presentism, the sum total of reality changes from moment to moment in a very systematic way, so that, in every successive world, event F always lies five minutes further in the past than event E, and similarly for all other pairs of events. These exceptionless regularities constitute a very striking fact, and one that surely demands an explanation.[151]

For the proponent of absolute becoming, the sum total of reality changes as an additional slice of reality comes into existence. Each new additional slice of reality also possesses this curious fact: that it preserves the uniformity of the past world. Thus, in each successive world – at each sum total of reality – in both the presentist and growing block theory, regularities are preserved. In the case of absolute becoming, the sum total of reality changes from moment to moment much the same systematic way that Tooley points out in his example. Any additional slice of reality that comes into existence is one which provides a continuing coherent story, so to speak. Every successive slice of reality that comes into existence continues the preserve the regularities that already existed. This also constitutes a very striking fact – one that demands explanation. One option is to hold that there is a connection between the successive slices of reality that come into existence. This connection can then act as the enforcement of the regularities because

[151] Tooley (1997), p. 240

what comes into existence is affected by what exists previously. But if this option is endorsed, then the proponent of absolute becoming is faced with the original problem he attempts to circumvent by appeal to regularity theories of causation: how current moments can be connected to moments that do not exist.

3.5.7 The Appeal to Laws of Nature

Because he cannot appeal to a brute fact about the regularities in the world to defend against the coordination problem, the proponent of absolute becoming needs an enforcement mechanism of some sort in order to give an explanation of the regularities that persist in the world as each future moment comes into existence. But this enforcement mechanism cannot be a relation between present and future events if the proponent of absolute becoming is to preserve his ontology of spacetime in which the future does not exist. One possible option is appeal to the laws of nature. If the laws of nature can enforce the patterns in the world, then perhaps the proponent of absolute becoming can posit laws of nature as the reason the addition of slices of reality are orderly. The proponent of absolute becoming might be able to hold that the laws of nature determine (or influence) what comes into existence, and because of this, the world is orderly thereby giving an answer to the coordination problem. I argue, however, that the proponent of absolute becoming cannot appeal to the laws of nature in order to give an answer to the coordination problem. In doing so, he must appeal to governing laws of nature, but I show that these governing laws of nature cannot reach beyond the present into the non-existent future in order to enforce the regularities in the world.

Suppose the proponent of absolute becoming offers the existence of the laws of nature as a solution to the coordination problem. First, notice that he is forced to offer a

governing conception of laws, rather than a non-governing conception of laws. A non-governing conception of laws, such as regularity theories, lead the proponent of absolute becoming into the very problem he faces, and so he cannot appeal to them as a solution. In other words, according to non-governing conceptions, laws of nature are merely descriptive, rather than enforcers, and because of this, the proponent of absolute becoming cannot appeal to a law of nature that is non-governing as an enforcement mechanism for regularities. Thus, the he must appeal to governing laws of nature in order to give an explanation of why the successive additional slices of reality preserve the orderliness of the world.

The governing conception of laws includes the necessitarian account of the laws of nature, worked out in most detail by Armstrong (1983). According to the necessitarian account, laws of nature are necessary connections between universals. In Armstrong's account, the relation between F-ness and G-ness, where F and G are universals, is one of necessitation which is represented by N(F, G). These laws of nature are grounded by the nomic relation holding between F and G. Thus, N is a relation of necessitation between two properties of an object, and thus is a second-order universal relating first-order universals. For example, if F is instantiated, then G is instantiated, because N – the necessitation relation – holds between F and G. Armstrong proposes the Principle of Instantiation in which universals must be instantiated (to exist).[152] Only the universals that are instantiated exist. A consequence of this principle of instantiation is that the only universals that are instantiated are those in the present (for the presentist) or in the present and the past (for the growing block theorist). This means that, because the necessitation relation is a universal, the necessitation relation only exists if it is instantiated. Because

[152] Armstrong (1983), p. 82

of this, a law of nature can only govern the world that exists. The laws of nature cannot extend beyond the present into the future because the future does not exist. In other words, laws of nature do not govern the future and therefore cannot govern what comes into existence. Thus, Armstrong's theory of the laws of nature cannot explain the orderliness of each slice of reality as it comes into existence. Furthermore, Armstrong has a coordination problem of his own. Each slice of reality that comes into existence preserves the laws of nature that already exist and yet the laws of nature cannot govern what comes into existence. How does the necessitation relation persist? Why is this relation present in each slice of reality that comes into existence?

Are there other options for the proponent of absolute becoming? Possibly; a different account of the governing conception of the laws of nature is offered by Tooley (1977). Tooley's picture is similar to Armstrong's picture with the exception of the rejection of the Principle of Instantiation. Tooley holds that universals can exist without being instantiated. His understanding of universals involves regarding them as transcendent Platonic entities. Universals, for Tooley, exist in a Platonic heaven and bear a primitive relation of instantiation to worldly particulars. Thus, universals do not depend on the world for existence; instead, they are abstract entities. The ties between these abstract entities in Platonic heaven are what ultimately ground the necessitation relation of the laws of nature. Following Tooley's rejection of the Principle of Instantiation, the proponent of absolute becoming can postulate ties between uninstantiated universals which exist as abstract objects and serve to determine the future state of the world. In this way, it seems as if the proponent of absolute becoming can appeal to the laws of nature in order to explain the persistent regularities of the world.

For these laws of nature to be *instantiated*, however, they must bear a primitive relation to particulars. The abstract universals cannot bear a primitive relation to particulars unless these particulars exist. But particulars in the future do not exist, and so the laws of nature that are supposed to govern the future are not instantiated. Again, as in Armstrong's view, a law cannot govern the world unless it is instantiated, and no law which governs the future can be instantiated (because its particulars do not exist). Thus, no law can govern what comes into existence from the future. The laws of nature, therefore, cannot determine what comes into existence, because it can only govern things that exist. Tooley's view of the laws of nature suffers the same coordination problem that Armstrong's view suffers. Until a particular comes into existence, the necessitation relation cannot be instantiated. And yet this necessitation relation is supposed to determine what comes into existence. If this is the case, then the necessitation relation must be instantiated before a particular comes into existence. But this is absurd – what does it mean for a universal to be instantiated without the particular existing?

The last option for the proponent of absolute becoming is to postulate a governing conception of laws in which the laws of nature are primitive. The most well-known proponent of primitive laws of nature is Maudlin (2007). According to Maudlin, lawhood is a primitive status and there need be no analysis given of laws at all; laws of nature are fundamental entities in an ontology that do not admit of analysis. Maudlin describes laws of nature as "the patterns that nature respects."[153] The proponent of absolute becoming might appeal to primitive laws of nature in order to show that what comes into existence is constrained by these laws. That is, if one has primitive laws and the present state as input, then the future is determined to be a certain way – one that is

[153] Maudlin (2007), p. 15

orderly, and admits of persistent regularities on the basis of the primitive laws of nature. Postulating primitive laws of nature might allow the proponent of absolute becoming to successfully predict future events, but these primitive laws of nature do not resolve the original problem: how do these primitive laws of nature constrain what comes into existence? If what comes into existence is constrained by what exists now (as seems to be the case with positing laws of nature), then there must be a connection between what exists now and a state of affairs that has not come into existence. But there can be no such connection. The proponent of absolute becoming can hold that this process is primitive and cannot be analyzed, but this is a merely a solution by stipulation. Laws of nature are supposed to enforce regularities by determining what is brought into existence. But how is this done? Postulating primitive laws of nature and appealing to a primitive process involving these laws of nature is a solution to the original problem of the causation of the non-existent future that is not a genuine solution at all.

For both Armstrong and Tooley, particulars need to exist in order to be instantiated. Because laws of nature are universals according the necessitarian account, particulars must exist in order to be governed by the relevant laws. For the proponent of absolute becoming, the future does not exist, and so future particulars cannot be governed by the laws of nature. As a result, for laws to govern in the accounts of both Armstrong and Tooley, the future must exist. If the proponent of absolute becoming wishes to appeal to governing laws of nature in order to explain the persistent regularities of the world, the only option seems to be an appeal to primitive laws of nature and the primitive status of the enforcing work that these laws perform. But this is to accept that this enforcement work is mysterious and unintuitive, which lends credence to the idea that

primitive laws as a solution to the coordination problem is *ad hoc* and a matter of avoiding the issue.

3.6 Non-Regularity Accounts of Causation

The other viable option for the proponent of absolute becoming to satisfy the causal element while avoiding admitting the existence of the future is to accept that causation does in fact involve a relation, but one that obtains only between presently (and pastly) existing entities. There are two main ways to articulate this kind of view. The first way is exemplified by Bigelow's understanding of causation to hold between tensed properties of the world. The second way is to understand causation in terms of causal powers, where both the power and the manifestation of the power are entities that stand in a internal relation to one another. Both of these strategies involve understanding causation in a way in which the existence of a cause constrains future possibilities without the present standing in a relation to the future. And if this is the case, then the constraining of possibilities then allows the proponent of absolute becoming an intuitive way to explicate the manner in which the present brings about the future without being committed to the existence of the future.

3.6.1 Bigelow's Account of Causation

The first example of this strategy is to endorse a theory of causation proposed by Bigelow (1996).[154] For Bigelow, there exist past and future-tensed properties that are presently exemplified in the world. For example, the property *being such that Socrates was snub-nosed* supervenes on the world as a whole. Bigelow then claims that causal

[154] de Clerq (2006) also wants to endorse Bigelow's understanding of causation.

relations hold between these properties; thus, supposedly cross-temporal causal relations actually hold between presently-instantiated tensed properties of the world:

> [T]he causal relation does not, in fact, ever hold between things that exist at different times. At any given time the causal relation holds between properties, perhaps between world properties, each of which is present and is presently instantiated. These properties may include things like the property of being burdened with a certain sort of past, or (as Leibniz put it) being pregnant with a certain kind of future [155]

For example, suppose Suzy threw a brick which is about to break a window. The event of the brick being thrown is past and the breaking of the window is future, and so a causal connection between Suzy's throwing of the brick and the window breaking seems to entail that the event of Suzy's throwing the brick exists, as does the breaking of the window. But according to Bigelow, the causal relation is instead understood as a relation between the tensed properties of the world; specifically, a relation between the past-tensed property of the world being one in which Suzy has thrown a brick and the future-tensed property of the world being one in which the window will break. Thus, Bigelow endorses a conception of causation that can be understood as a relation, but a relation that is confined to the present. In this way, Bigelow avoids CAP by rejecting the third premise that some events are caused (or caused by) non-present events.

How does this help the proponent of absolute becoming avoid commitment to the existence of the future? One can do this by understanding the causal element that the present brings about the future NOT being about present events and future events, but being about a connection between present-tensed properties of the world and future-tensed properties of the world. Thus, reference to the present in the causal element is reference of the present-tensed (and possibly past-tensed, if we want to include the past as part of the causal element) properties of the world. Likewise, reference to the future in

[155] Bigelow (1996), p. 46

the causal element is reference to the future-tensed properties of the world. Bigelow seems to understand the future in this way; he states:

> [T]he future does not exist yet; yet there is a sense in which the future will be what it will be: the world has always been one with the property of being a world which is going to be thus and so.[156]

Thus, for Bigelow, the causal element can be satisfied without admitting the reality of the future because the causal relation is not between present events and future events, but instead the causal relation is between present-tensed properties and future-tensed properties. All of these properties are instantiated in the present, and so the present can hold that the it is the case that the present brings the future about, this this is by virtue of present-tensed properties standing in the causal relation to future-tensed properties.[157]

These relations holding between tensed properties of the world can then straightforwardly account for the way in which the present brings about the past. If a present-tensed property stands in a causal relation to a future-tensed property, then this means that the future-tensed property must obtain in the future. As a result, the existence of the present – the present properties of the world and the relations in which they stand to the presently-existing future-tensed properties of the world – constrains what comes into existence.

3.6.2 A Powers Theory of Causation

The powers theory is a theory of causation in which, according to Stephen Mumford and Rani Anjum, leading defenders of the view, "causation occurs when

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[156] *ibid*, p. 47

[157] Note that this seems to come at a steep price. That future-tensed properties supervene on the present world means that the future is already determined. In other worlds, the future will be a certain way in virtue of how the present is now. Just as the past-tensed properties which supervene on the world make past-tensed propositions true, the future-tensed properties which supervene on the world make future-tensed propositions true. Thus, if the world is always one in which the future is going to be a certain way the future cannot be a different way. The way in which Bigelow's strategy forecloses the possibility of an open past entails that the possibility of an open future is foreclosed as well – even in the case of a non-existent future.

powers manifest themselves."[158] Briefly, a power is understood to be a fundamental ontological category.[159] Properties are understood to be nothing more than powers; in addition, powers ground the laws of nature.[160] As a result, the account of powers is favored by its proponents due to its parsimonious ontology. According to the powers theory, the casual relation is the necessary connection between the trigger of a power and its manifestation.[161] More specifically, this connection is a necessary connection between universals which holds when the universal are instantiated. Causation is understood as a first-order relation that is entailed by the instantiation of universals. Mumford (2009) expresses this when he states that "the existence of the causal relata…is enough alone to ensure that the causal relations exists."[162]

This option entails holding that the causal relationship between the present and the future exists once the future comes into existence. It seems at first, however, that if the causal relationship obtains only after the existence of the effect, then this causal relationship cannot be responsible for bringing about the effect. Take the (oversimplified) example of Suzy throwing a rock to break a window. The event of the rock being thrown is the cause, and the window breaking is the effect. Suppose there is no causal relationship that obtains between the rock being thrown and the window breaking until after the window breaks. If this is the case, then how is the rock being thrown responsible for the breaking of the window? The effect of the window breaking has already been brought about before a causal relationship between this event and the

[158] Mumford and Anjum (2011), p. 6
[159] I follow Mumford and Anjum (2011) as understanding "power," "disposition," and "capacity" as equivalent terms.
[160] See Bird (2007) for an articulation of this relation between powers and laws of nature.
[161] For the sake of simplicity, I ignore the fact that a more accurate account of powers includes accounting for the cases in which powers must combine in order to result in manifestation.
[162] Mumford (2009), p. 276

event of the throwing of the rock obtains, so the throwing of the rock cannot be responsible for the event of the window breaking. What then brings about the breaking of the window? Surely not a causal relationship that is established after the effect is brought about. Endorsing this option results in a loss of the sense in which the present affects the future.

The proponent of a powers theory of causation can respond by holding that there is a necessary relation that exists between a cause and an effect such that the only entity, *e*, that can come into existence following *c* must preserve the causal relationship of (*c*, *e*). The cause can then limit the future possibilities in such a way that what happens in the present influences what can possibly come into existence without a causal relation needing to obtain between the present and the future. That is, it is a characteristic of an entity, *c*, that it stands in a necessary relation with another entity, *e*; as a result, if *c* obtains, then the only possibility is that *e* must obtain. In this way, that (*c*, *e*) is the only relation that is possible when *c* obtains means that the only entity that can come into being following *c* is *e*.

By holding that a entities have certain causal powers constrains or defines what follows as the manifestation when the powers are triggered or stimulated. Mumford and Anjum describe the dependence of future events on present events in much this way; they claim that a causal power "can be understood as a sort of selection function…that picks out a limited number of outcomes from all those that are merely possible." They then continue, "The idea of a selection function is simply one that identifies a subset from a realm of possibilities."[163] In this way, the causal powers that exist in the present (and the past) constrain the space of future possibilities, thereby fulfilling the requirement that

[163] Mumford and Anjum (2011), p. 189

what happens in the present brings about what happens in the future. In addition, because the causal relation is an internal one, the connection does not exist until both the trigger of the power and the manifestation have come into existence. This means that the proponent of causal power can satisfy the causal element without having to admit of an existence-entailing relation between the present and the future.

3.7 Assessing Non-Regularity Accounts of Causation

Both Bigelow's account of causation and the powers theory of causation analyze causation as a relation between existing entities and seem to avoid the commitment to the existence of the future. Furthermore, both theories can fulfill the causal element of absolute becoming by articulating the dependence of the future on the present in terms of the present limiting the possibilities of the future. I argue, however, neither of these theories can explain how the existence of a connection between presently-existing entities limits the possibilities of what comes into existence without appeal to a connection between a present entity and a future entity. Because this appeal is not open to the proponent of absolute becoming, it is clear that the only remaining option is to accept that there are certain persistent regularities in the world. As a result, these accounts of causation face the very same coordination problem as the regularity accounts of causation and should thereby be rejected as a way to satisfy the causal element of absolute becoming.

3.7.1 The Rejection of Bigelow's Account of Causation

Any regularity theory of causation bases its account on patterns in the world; in this way causation is, at root, nothing more than these regularities. Because of this, a

regularity theory of causation cannot explain *how* it is that the world is regular in this way. I hold that there is a similar problem with Bigelow's account. One might think that the regularities in the world can be accounted for on Bigelow's theory in the following way: given any cause, property *c*, and any effect, property *e*, there is a causal connection between any property of type *C* and property of type *E*. However, in Bigelow's account, for regularities in the world to obtain, the past-tensed properties must accurately reflect how the world was, and the future-tensed properties must accurately reflect how the world will be. Thus, in order to explain regularities in the world by appeal to the causal connection between types of (possibly tensed) properties, the past-tensed and future-tensed properties of the world must accurately record events at times other than the present. But this process cannot in fact be based on any kind of connection between the present and the future.

Suppose that a later moment is partially constituted by the event of the window breaking which is caused by a rock being thrown. According to Bigelow's view, the property of the world being one in which a rock is thrown stands in a causal connection to the property that the world will be one in which the window is broken. For this causal connection to constrain future possibility, however, this future property of the present world must guarantee that a later time is one in which the window breaks. But there cannot be a necessary connection between the present world and a future moment because the future moment does not exist. One could question whether this is really a need to explain how future events follow a present world that exemplifies the relevant future-tensed property. After all, does it not just entail that from the fact that the present contains a future-tensed property that the relevant future event will come to be? This

brings to the front the problem of what Bourne (2006) calls the problem of truth-value links. Bourne states that because other future times do not exist, "it is hard to see how the ontological content of the present time can in itself legislate how other distinct entities, other times, can be comprised."[164] There cannot be a link between the presently existing future-tensed property and the coming to be of the future event and so there is no way for Bigelow to guarantee, let alone explain, why future-tensed properties of the world always precede the relevant presently existing events.

The best that Bigelow can do is to hold that the world's possessing a present-tensed property always follows its respective future-tensed property. In this way, the event of the window breaking always follows the future property of the world being one in which the window will break, which is a process that Bigelow cannot explain further by appeal to any kind of connection between the event and subsequent property. Thus, in summary, Bigelow can explain regularity of the world only if event *e* always follows the property that the world is such that *e* will occur. But Bigelow cannot explain *this*, so he cannot explain regularity. This is the situation facing the regularity accounts of causation; there are regularities in the world but any proponent of a regularity theory cannot explain why these regularities obtain. In Bigelow's account, he must explain much more than a regularity – he must explain how a future event always follows its corresponding future-tensed property. In denying cross-temporal relations, Bigelow can only appeal to regularity. Bigelow cannot explain what it is that *makes* the world regular and so his account should be rejected along with the regularity accounts of causation.

[164] Bourne (2006), p. 46

3.7.2 Causal Powers Without Power

Most importantly, for the causal powers theorist, causation is an internal relation. This means that the relation only obtains when the cause and effect (whatever kind of thing we understand them to be) exist. Thus, the cause and effect are ontologically prior to the causal relation in that the causal relation obtains only if the cause and effect have both come into existence. I hold that as a result, the proponent of causal powers cannot understand a cause as being productive and furthermore cannot claim that a causal dictates or limits what comes into being. The causal theorist, of course, characterizes the causal power as a select function that constrains future possibilities. But when this position is examined more closely, it is clear that the causal powers theorist must be committed to the existence of the future if he is to characterize causation in this way.

If a causal power in fact selects for possibilities, there is a constrained set of future moments that can come into existence. The only future moments that are possible are those that, when they come into existence, stand in a relation to the relevant causal power that was triggered. Future non-existent possibilities are selected by virtue of the powers that exist in the present and the past. As a result of causal powers, only certain entities can possibly come into existence. The question the causal powers theorist must answer, however, is how the powers that exist in the present select the future possibilities. It is clear that the future possibilities that are selected for are the ones that stand in a causal relation with the relevant triggered power once the future possibilities come into existence. For the possibilities to be constrained, what exists must "pick out" a class of possibilities from the total possibilities. Which possibilities are selected? Presumably, the ones that stand in a causal relation with the triggered causal power. This entails that

the class of selected probabilities must stand in a relation to the triggered causal powers. But this cannot be the case unless these selected possibilities exist. Causal powers cannot therefore select for a class of possibilities unless these possibilities exist. The causal powers theorist, it seems, cannot avoid the commitment to the existence of future possibilities.[165]

Perhaps my reading of this selection process is too strong. The selection process could be understood to be nothing more than the claim that given that certain causal powers are triggered, there is a limited class of possibilities that can and do come into existence. The causal powers theorist can just deny that there need be an explanation of this selection. What it means for causal powers to be triggered is just that only certain entities can come into existence. That these possibilities are the only class of things that can come into existence given a certain triggered causal power, on this reading, grounds a power's selection ability. This option, however, leaves the causal powers theorist with no way of explaining how only certain entities regularly follow the relevant causal powers. That these regularities are preserved by causal powers without explaining how the possibilities are constrained. That this is the case requires a miraculous coordination that demands an explanation that the causal powers theorist cannot supply. As a result, the causal powers option should be rejected on the grounds that the theory ultimately faces the very same problems as the regularity theories of causation.

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[165] One reply could be that future possibilities exist in a sense that is not problematic to absolute becoming. This could result in a view similar to McCall's (1994) shrinking tree view where future possibilities exist but are not actual. But this is a problematic way to avoid the objection. First, if actuality is some kind of attribute that a present event gains when it goes from future to present, then McTaggart's Paradox will loom. On the other hand, if there is no gain in any attribute, but merely other existing entities as dropping out of existence, then the present moment that is actualized is always a concrete moment. This means that other future possibilities are also concrete moments (because, as just established, coming into the present cannot be a gain of an attribute) which means that the future branches much be concrete entities. And the question is, how do these concrete entities drop out of existence when the present moment becomes? Due to the limited scope of the paper, this issue will be put aside.

3.8 Conclusion

Absolute becoming is a contradictory notion because its second element that the present brings about the future requires that the future exists, which is in conflict with its first element that the future does not exist. I explore how the proponent of absolute becoming can preserve both elements of absolute becoming by understanding the concept of "bringing about" in a way that does not require commitment to a causal connection between the present and the future, and thus does not requires the existence of the future.

The two options include denying that causation is a genuine relation and understanding causation in terms of constraining future possibilities in a way that avoids a relation between the present and the future. Ultimately, neither of these options is successful. Any theory of causation that denies that causation is a relation faces what I call the coordination problem. The coordination problem is the inability of a non-relational theory of causation to account for the process of creation in which each additional slice of reality that comes into existence give rise to an orderly world. Without a connection between what is and what will become, that the sum total of reality changes in a systematic way is miraculous. It seems, therefore, that the nature of our world demands an account of causation which consists of something more than mere regularity.

The second option seems to fulfill this demand. According to the second option, causation is a necessary connection, but it is not a connection between the present and the future and so does not necessitate the existence of the future. Instead, as a result of the nature of the causal connections which exist between causes and effects, the existence of a cause serves to constrain the future possibilities of what comes into existence as an effect. In this way, the fact that what exists in the present constrains future possibilities

fulfills the causal element that the future is affected by what comes before it. I show, however, that what is present can constrain what comes into being only if there is a connection between the past and the future. Therefore, the strategy of positing a theory of causation between the present and the future without a connection between the present and the future fails.

This means that the conflict between the two elements of absolute becoming is unresolvable and therefore the possibility of absolute becoming must be abandoned. Because the growing block's understanding of the change of the NOW depends on the success of absolute becoming, the rejection of absolute becoming means that the growing block cannot accommodate the passage of time. This, however, does not mean that there can be no passage of time. Note that temporal becoming itself does not necessarily require the non-existence of the future – this is shown by the existence of the second model of temporal becoming in which an event becomes if it gains the property of presentness. But the second model of temporal becoming, as argued above, is inadequate; if one admits that more than one moment gains the property of presentness, then one McTaggart's Paradox.

In order to save the passage of time, I propose a third model of temporal becoming on which my revised understanding of the passage of time is based. This model of temporal becoming endorses the existence of the future, and so does not encounter the contradiction of absolute becoming. In addition, this model is set in an ontology of spacetime that does not admit of any temporal properties of pastness, presentness, or futurity; there are only B-relations, and so it avoids the problems of the second model of temporal becoming. I call this new model B-coming. It is a conception

which remains faithful to the idea of an event coming into being, but one that at the same time does not face any of the devastating problems of the other two models of temporal becoming. In what follows, I defend the virtues of B-coming and outline the resulting nature of the passage of time in the B-theory blockworld.

4

B-coming: A Revisionist's Guide to the Passage of Time

Is passage – and the temporal becoming that underpins it – a myth? So far, it would seem that way. Traditional passage requires that the NOW changes and that moments become by acquiring reality or the monadic property of presentness, but the previous chapters have shown that the NOW cannot change, and that more than one moment cannot become by acquiring reality or presentness. There seems, therefore, to be no becoming or passage in any A-theory of time. The A-theory thus faces the same problem as the B-theory: an inability to accommodate temporal becoming or the passage of time. The straightforward conclusion is to proclaim becoming and passage a myth in *any* theory of the metaphysics of time. I argue, however, that temporal becoming is not a myth, and neither is the passage of time. The failure of any metaphysics of time to accommodate becoming and passage shows that the traditional understanding of both of these concepts should be rejected, not that they are myths. Why retain the existence of passage and becoming and instead revise our understanding of these concepts? In short, because it allows us to preserve the features that are central to the nature of our temporal experiences. The existence of becoming and passage are deeply held intuitions about the world and our place in it, and due to this, they should be retained as part of our metaphysics if it is at all possible to do so.

Thus, the first part of the chapter establishes why we should want passage and reject the idea that it is an illusion. The purpose of the second part of the chapter is to

show that it is possible to retain the existence of passage and becoming by rejecting the features of the concepts that lead to their inability to be accommodated in our metaphysics of time. This means that temporal becoming should not be understood as the acquisition of something (either reality or a property of presentness), nor should the passage of time be understood as the change in the NOW. In rejecting these understandings of becoming and passage, I outline conceptions of both that follow a central insight offered by Williams (1951) in "The Myth of Passage" that is more than half a century old, but has few modern day adherents: in contrast to A-theorists who believe that there is "something extra, something active and dynamic" to the passage of time, Williams holds that

> This something extra I think is a myth: not one of those myths which foreshadow a difficult truth in a metaphorical way, but one which is fundamentally false, deceiving us about the facts, and blocking our understanding of them.[166]

Williams then asserts that "There is passage, but it is nothing extra. It is the mere happening of things, their strung-along-ness in the manifold."[167] Following this insight, the idea is that the transience of time need not be captured by the change in the NOW. In addition, the coming into being of an event need not be captured by the acquisition of something. Becoming and passage are to be found in nothing more than the ingredients of the four-dimensional manifold of the world. There is no extra ingredient – such as the shift of the NOW – that is needed for passage. In the same way, there is no extra ingredient – such as the acquisition of NOWness, either in the form of reality or a monadic property – that is needed for temporal becoming. As Williams holds, becoming and passage can be adequately accommodated within the framework of the manifold,

[166] Williams (1951), p. 460
[167] *ibid*, p. 463

absent any temporal properties of presentness, pastness, or futurity, thus asserting the possibility of the passage of time in the B-theory blockworld.

Thus, in this chapter, I provide an account of becoming and passage that is compatible with our intuitions about what the transience of time is like; specifically, that passage is the foundation for the differentiation of space and time, that it is a process of becoming, and that it is responsible for the transitory nature of our temporal experience. What exactly are these concepts of becoming and passage that do no require any extra ingredients added to the four-dimensional B-theory blockworld? First, I propose a relational model of temporal becoming which I call B-coming. This means that to say that "*x* becomes" is incomplete in the way that saying "Bob is taller than" is incomplete; x must become as of another event, *y*. Thus, *x* has become with respect to *y* means that *x* stands in a relation, **R**, to *y*. This relation, **R**, is the becoming relation, which I explicitly formulate below. This B-coming then is the ontological basis for the passage of time, which is to be understood as the change in which events B-come along the path of a thing's travel through spacetime, known as a worldline. As a consequence of the Special Theory of Relativity, this passage of time is a local phenomenon; it is not the global succession of NOWs in the traditional conception of the passage of time. Thus, the passage of time is the process of becoming insofar as what has B-come along a worldline increases from earlier to later; in this way, the B-coming of events for a thing underlies passage of time. Time does not just *seem* to pass – it does pass. Things just do not *seem* to become – they do become.

The previous chapters establish that time does not pass and things do not become in the way that they are traditionally understood. What follows, then, is my revisionist's

guide to the concept of the passage of time and the temporal becoming that underlies it. I begin by showing that the story so far need not be interpreted as being in favor of the rejection of becoming and passage. Instead, I propose to take the story so far as evidence that our traditional conceptions of becoming and passage must be reinterpreted. That is, the lesson to take from the story so far is that we must endorse a different understanding of becoming and passage. Why understand becoming and passage in a different way? I answer this question by arguing that becoming and passage are deeply held commonsense intuitions about the features of the world, and if they can be respectably accommodated, then they should be. But if passage is not a myth, and it is not the change of the NOW, then what exactly is it? I outline my answer in terms of my reinterpretation of temporal becoming, which I call B-coming. The first important requirement of passage is that it is compatible with our best science; because of this, I explicate how B-coming is relativistically-friendly. I then motivate acceptance of this relational account of temporal becoming. I then outline my accompanying reinterpretation of the passage of time and show that it can satisfy our intuitions about the nature of time. I note that my reinterpretation of becoming and passage seems to follow Williams (1951) but also occupies an unusual and rarely defended niche in the literature: a theory of becoming and passage in the supposedly unchanging four-dimensional manifold of the B-theory blockworld. I end by contrasting my account with similar accounts offered by Dieks (2006) and Maudlin (2007) and explicate how my account is superior.

4.1 The Myth of Passage?

Everything so far points to the rejection of the passage of time and the temporal becoming that underlies it as the most plausible conclusion. I argue, however, that this is in fact *not* the conclusion that should be endorsed. Temporal becoming and the passage of time should not be rejected. Instead, our understanding of becoming and passage should be altered in order to accommodated by our metaphysics of time. Traditional accounts of becoming and passage presuppose an A-theory of time in that the concepts normally require a metaphysical distinction between the present and, at the very least, the future. The lesson from the story so far is that we should reexamine what exactly is required for adequate accounts of temporal becoming and the passage of time. In what follows, I set out my case.

4.1.1 Reconceptualizing the Arguments

In short, the story so far seems to suggest that the traditional understanding of becoming and passage leads to the conclusion that things cannot become and time cannot pass. Formally, the argument rejecting temporal becoming is as follows:

1. If temporal becoming is an event's acquisition of reality or the property of presentness, then there is no temporal becoming.
2. Temporal becoming is an event's acquisition of reality or the property of presentness.
3. Therefore, there is no temporal becoming.

Similarly, the argument against the passage of time is as follows:

1. If the passage of time is the shift in the privileged present moment from earlier to later, then time does not pass.
2. The passage of time is the shift in the privileged present moment from earlier to later.
3. Time does not pass.

Instead of treating the arguments as straightforward *modus ponens* arguments, my strategy is to endorse the negation of the consequent, thereby rejecting the antecedent in the material implication of premise 1. In this way, the arguments should instead be understood in the following ways:

1. If temporal becoming is an event's acquisition of reality or the property of presentness, then there is no temporal becoming.
2. There is temporal becoming.
3. Therefore, it is not the case that temporal becoming is an event's acquisition of reality or the property of presentness.

and

1. If the passage of time is the shift in the privileged present moment from earlier to later, then time does not pass.
2. Time does pass.
3. It is not the case that the passage of time is the shift in the privileged present moment from earlier to later.

What should be concluded from the arguments in the previous chapters, therefore, is *not* that there is no becoming or passage. Instead, we should conclude that in order to preserve becoming and passage, we must alter our understanding of what exactly these concepts are.

4.1.2 The Caloric Theory of Heat

The first step in arguing that time does pass is to reject a premise in the original *modus ponens* argument in order to avoid the conclusion against the existence of time's passage. As such, I propose that the second premise should be rejected. In order to establish the plausibility of its rejection, I seek to find a partner in crime. I offer an example in which scientific discovery prompted the reconceptualization of the world in the history of heat, and hold that the same should be done with respect to becoming and passage.

It might initially be hard to swallow a revised understanding of becoming and passage; one might think, "What else can passage *be* other than the shift of the NOW?" Revising our understanding of these concepts, however, is not necessarily an undertaking at which to balk. In fact, our understanding of the nature of the various features of the world is continually revised as greater knowledge is gained; this often occurs in the history of science (although it is not limited to this specific area). One such example is the revision of the understanding of heat. In the late 18th century, the caloric theory of heat was the accepted understanding; according to the theory, "caloric" is a material substance composed of a fluid of particles which flows from one body to another. Heat is then defined as the effect of the transmission of caloric from one object to another.[168] The dynamical or kinetic theory of heat was a contemporary rival to the caloric theory of heat and eventually replaced the caloric theory of heat as the accepted understanding. In the kinetic theory, heat is the effect of the motion of the particles composing an object. But due to the underdevelopment of the kinetic theory of heat in addition to the pervasive influence of the Aristotelian tradition of associating heat with a substance, the caloric theory of heat, at the time, reigned supreme.

The caloric theory of heat, however, faced significant problems, as pointed out by its opponents. In contrast to the kinetic theory of heat, the caloric theory of heat could not account for heat by friction.[169] In addition, it was well known that heating bodies did not increase their weight, and to account for this, caloric was speculated to be, implausibly by its opponents, a weightless fluid.[170] Because of these problems with the caloric theory of heat, the increasingly detailed articulation of the kinetic theory of heat

[168] See Lavoisier (1790), pp. 1-5
[169] See Davy (1799) for the famous experiment purportedly showing this to be the case.
[170] See Black (1803) and Rumford (1799) for complaints of this type.

resulted in gaining popularity.[171] Joule's (1845) work demonstrating the interconvertibility of heat and work then paved the way for the dominance of understanding heat as the motion of particles.[172] The replacement of the caloric theory of heat by the kinetic theory of heat thus resulted in the abandonment of the material substance of caloric and the reduction of heat to an effect of motion. Heat, therefore, is to be understood as nothing over and above and effect of motion – there need be no extra material substance to account for the phenomenon of heat.

In the caloric theory of heat, the concept of heat is the effect of the material substance of caloric; the kinetic theory of heat – the basis of our modern understanding of heat which replaced the caloric theory of heat – discarded the material substance and reduced heat to the motion of particles. In the same way, the concepts of becoming and passage can and should be accounted for without the extra ingredient of the shift in the NOW. No theory is immune to rejecting commonsense presuppositions and revising concepts. Presentism, for example, rejects the commonsense presupposition that what makes a proposition true is the thing which the proposition is about in order to respond to the grounding objection. In addition, presentists revise our intuitive understanding of causation to avoid the problem of cross-temporal relations. Thus, the revision in understanding becoming and passage due the metaphysical problems these concepts face is neither uncommon nor unwarranted. Before showing how exactly our understanding of becoming and time's passage should be revised, I argue that they should be preserved rather than discarded.

[171] Mayer (1842) was the most prominent of the detailed articulations of the kinetic theory of heat.
[172] See Psillos (1999) and Holton and Brush (2001) for introductions to this period in the history of heat.

4.1.3 Against Illusion

To establish the plausibility of a strategy of revision, I first motivate the second premise of the second set of arguments above: that there is temporal becoming and that time does indeed pass. Why think that premise 2 in the *modus tollens* formulations of the arguments are in fact true? In other words, why accept that things do become and therefore that time does pass rather than discarding these concepts as an objective feature of the world? The latter option, it should be noted, is the overwhelmingly popular strategy endorsed by B-theorists. The vast majority of B-theorists accept the understanding of becoming and passage as requiring a privileged present moment and are swayed by the A-theorist assertion that the lack of a privileged present moment in the B-theory blockworld means that this is no transience of time. For example, Smart (1963) declares that "Our notion of time as flowing, the transitory aspect of time as Broad has called it, is an illusion which prevents us seeing the world as it really is."[173] The normal B-theorist therefore holds that the transience of time is an illusion and that the shift in the NOW can be accounted for as a subjective phenomenon.[174]

In contrast, I hold that becoming and passage are objective parts of the B-theory blockworld. We need no extra ingredients, such as the shift in the NOW, to account for the transience of time. Instead, as in the case of heat, passage and becoming exist, but are nothing over and above the components of the B-theory blockworld. The overarching reason to defend the existence of becoming and passage – and deny that it is an illusion – is that our basic temporal experience is one that is deeply rooted, pervasive, and common. The fact of our experience of becoming and passage as deeply rooted – it is difficult and

[173] Smart (1963), p. 132
[174] For an example of this strategy, see Paul (2010).

perhaps impossible to imagine being a part of a world that lacks becoming and passage – may not be a convincing reason, on its own, to preserve the existence of becoming and passage. But the fact that it is a part of the world that every person experiences at every moment is support for the position that, at the very least, it should not be so easily dismissed. As Dieks (2006) remarks, "It is a central aspect of our ordinary concept of time that history unfolds and that events come into being. It is only natural to take this seriously."[175] This is the sentiment normally expressed by those who want to deny that passage is merely an illusion; the jerk and whoosh of time is real because it is a part of the basic, intuitive picture of the world. For example, Maudlin (2007) remarks that

> [there] is the manifest fact that the world is given to us changing and time as passing…all the philosophizing in the world will not convince us that these facts are mere illusions. Even Descartes, at his most skeptical, willing to question the existence of the external world, never questions the passage of time. Nor is there any evidential reason to suggest that passage is 'only in our minds': it is the passage of time…that leads the iron to rust and fires to burn down.[176]

Later, Maudlin claims that

> it is a central aspect of our basic picture of the world that time passes…its passage is not an 'illusion' or 'merely the product of our viewpoint' or 'an appearance due to our special mode of perception'. Its passage is not a myth.[177]

Williams (1951) also affirms a view of this kind; he states that that we should preserve the existence of passage because "the special perfection of passage is the vaguest but the most substantial and incorrigible." He goes on to grandly declare,

> It is simply that we *find* passage, that we are immediately and poignantly involved in the jerk and whoosh of process, the felt flow of one moment into the next. Here is the focus of being. Here is the shore whence the youngster watches the golden mornings swing toward him like serried bright beakers from the ocean of the future. Here is the flood on which the oldster wakes in the night to shudder at its swollen black torrent cascading him into the abyss.[178]

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[175] Dieks (2006), p. 157
[176] Maudlin (2007), p. 135
[177] *ibid*, p. 144. Note that Maudlin takes passage as a primitive part of the world and denies that it can be analyzed in terms of more basic constituents in the world. This is in contrast to the views of Dieks (2006), Savitt (2002) and (2006), and the view that I articulate below.
[178] Williams (1951), pp. 465-466, emphasis in original. This passage is a good example of how, in Savitt's (2002, p. 153) words, Williams' article is a "gloriously over-written rant," although the quirks of the style should not diminish the important points that are made.

The fading away of the past and the rapid approach of the future, time's slow drift on a lazy day, or its rush by on a hectic one, the continual direct acquaintance with different events at each successive moment – this is all part of the passage of time and the temporal becoming upon which it is based. That time passes is, as Oaklander (1983) states, "an impression deeply felt by all of us."[179] If this is an illusion, it is a collective persistent and pervasive illusion that cannot be dispelled.

Furthermore, holding passage to be an illusion brings with it a predicament: why do those who deny the objective passage of time continue to act as if passage is real even after declaring it an illusion? Schlesinger (1998) outlines this problem in bold terms:

> [The illusion of passage] is, of course not the only instance where the facts are different from the way we strongly feel. However, unlike in other cases where appearance and reality are in conflict, the position of those who claim a conflict in the temporal case is inexplicable. Consider, for instance, individuals afflicted by some psychological maladjustments like claustrophobia, agoraphobia, and the like. In my admittedly limited experience, sufferers with a modicum of intelligence, who fully grasp that in fact their fears have no basis in reality, are prepared to subject themselves to a variety of therapeutical regiments to get rid of their irrationally compulsive behavior…why is it that none of [the defenders of the illusion of passage] are known to have ever done anything to cure themselves of this particular debilitating psychological maladjustment?[180]

Perhaps this signals that we are, as Hume famously claims, letting philosophy interfere too much with real life.[181] But the solution should be neither to endorse metaphysically (and scientifically) problematic concepts nor to abandon these concepts altogether and live a life of cognitive dissonance. Instead, the best solution is to marry philosophy and real life by accepting becoming and passage in a way that fits neatly into our worldview.[182] This position points toward revising rather than abandoning the concepts. When our introspection, philosophical analysis, or science leads to problems with a concept, then we revise our understanding rather than give it up – if its preservation is

[179] Oaklander (1983), p. 364
[180] Schlesinger (1998), pp. 5-6
[181] Hume, *Enquiry*, Section 12
[182] Savitt (2009) proposes a similar view, declaring his intention to "close the circle" between special relativity and the passage of time.

scientifically respectable. This was the case with the caloric theory of heat; scientists theorized that there was no such thing as caloric, but they did not then give up the objectivity of heat by asserting it to be an illusion. Instead, they redefined the concept of heat, and in fact, reduced it to the motion of particles. In the end, heat's reduction to the motion of particles allowed scientists to give up the extra ingredient of caloric. Likewise, the most simple and straightforward way to make sense of the world is to account for these experiences of becoming and passage as real, but to reduce them to the components of the B-theory blockworld.

Norton (2010) is one of the most strident opponents of the idea that passage is an illusion. He claims that, "This passage of time is one of our most powerful experiences."[183] But he also points out that physics has yet to identify the passage of time. As a result, most philosophers (and physicists) are comfortable dismissing passage as an illusion. Callender (2000), for example, declares that there is nothing in physics like the becoming relation and so passage should be discarded. Norton disagrees and holds that passage is not an illusion in part because our experience of passage "is so universal, and so solid and immutable."[184] But there is something special about passage – it is not a typical illusion. More specifically, according to Norton, "it seems impossible to eradicate passage from experience in a way that would reveal its illusory character."[185] This is the key to resisting that there is no room for passage in physics. Norton notes that sometimes our best science requires us to dismiss an experience as an illusion – our experience of water and air as continuous fluids is one such example – but in these cases, our best science reveals illusions in a way that is entirely explicable within science. For

[183] Norton (2010), p. 24
[184] *ibid*, p. 28
[185] *ibid*, p. 29

example, science explains our illusions of water and air as continuous fluids because it reveals that water and air are made up of particles that are undetectable to the naked eye. There is no comparable situation, Norton asserts, in the case of passage. Our experience of passage cannot be explained away by our best scientific theories of space and time. If the best theories of space and time cannot explain away the experience of time, then we should preserve it.

But maybe the B-theorist who feels the long reach of McTaggart's influence will not find my plea for the preservation of becoming and passage very moving. Maybe becoming and passage are illusions. The discussion that follows may weaken the resolve. Even if one does not accept that becoming and passage are real, the positive project that follows is valuable in its own right. It points out a vastly overlooked space of possibility in the time debate in which A-theorists trumpet their monopoly over passage while B-theorists hold fast to their illusion. Thus, the next sections carve a conceptual space that is rarely explored in the literature – this is a solution in which we can have it all (almost): a universe that is scientifically and metaphysically respectable, free of the problems of the presentist, growing block, and moving spotlight views, while also making room for becoming and the passage of time. This, in particular, is the option for those who recognize the problems with A-theory and its traditional understanding of becoming and passage but are unwilling to accept that the central element our temporal experience is an illusion. What follows is an exploration of how one can be committed to both the B-theory blockworld and the objectivity of becoming and passage.

4.2 A New Theory of Temporal Becoming

The passage of time is based on temporal becoming; because of this, any respectable theory of passage must set out an adequate model of becoming as its foundation. The traditional models of becoming, however, are clearly inadequate. Temporal becoming cannot be the transition of an event from future to present, whether in the form of a gain of reality or in the gain of a temporal monadic property. I hold that temporal becoming is instead a relative notion. I propose a revised version of temporal becoming, called B-coming, in which temporal becoming is a relation between two events. One event, *x* has B-come with respect to a second event *y*, iff the two events stand in the becoming relation, **R**. Understanding becoming as a relation avoids the problems associated with understanding becoming as a type of acquisition; it also avoids the conflict that arises between the traditional models of becoming and the Special Theory of Relativity. The lessons learned from relativity lend support to understanding temporal becoming in this revised way. **R** is thus a relation to be defined in terms of the past light cone. This proposed revision ultimately frees becoming and passage from the problems that plague it, including, importantly, its conflict with our leading scientific theories about the nature of the world.

4.2.1 Lessons From STR

The standard interpretation of STR shows that temporal becoming cannot be understood as a gain in reality or the monadic temporal property of presentness. The most obvious way to reject these consequences is to reject the standard interpretation of STR. In this way, A-theories can avoid the problems that result from the standard interpretation of STR. Unfortunately, having to revise the standard interpretation of STR

is but one among many of their problems. Revising STR might avoid the problems the A-theorist faces with respect to the consequences of the relativity of simultaneity, but revising STR does nothing to help A-theories avoid any of the other problems they face.[186] The metaphysical problems A-theories face – as outlined in Chapters 2 and 3 – are independent of the consequences of STR. Thus, the A-theorist can reject the standard interpretation of STR and avoid the scientific problems associated with the conflict between STR and the requirement of a privileged frame of reference – but this does not address its metaphysical problems that result from attempting to account for the shift in the NOW, or the deficiencies in the two models of becoming. Even if the A-theorist can make room for a privileged foliation, he cannot make room for the shift of the NOW. This means that the A-theorist has no justification for rejecting the standard interpretation of STR – because altering STR would not save passage. The overall point, however, should be that the outcomes of metaphysical problems and scientific problems align; this suggest that the A-theory's conflict with the standard interpretation of STR is an additional reason to think that becoming and passage need be revised. I propose a revision that is friendly to Minkowski spacetime. In this way, I show that *if* one accepts the standard interpretation of STR, there are certain lessons to be learned about what becoming and passage must look like.

In addition to the metaphysical difficulties of the traditional models of temporal becoming outlined in Chapters 2 and 3, the models also face scientific difficulties.

[186] In any case, there are good reasons to reject a reinterpretation of the standard formulation of STR. If one accepts a non-standard interpretation of STR, he must adopt a dynamical interpretation of length contraction and time dilation while also accepting a notion of absolute space. Dynamical interpretations face significant problems, including the postulation of brute facts which can be easily explained by other spacetime theories, and the violation of Earman's (1989) symmetry principles. An examination is beyond the scope of this paper, but see Balashov and Janssen (2003).

Accepting the standard interpretation of STR as the correct description of the nature of the world leads to a contradiction in the traditional understanding of temporal becoming. This contradiction can only be avoided if becoming is understood in a different way; if one rejects the assumption that becoming is to be defined in terms of events that are simultaneous with the observer, and instead is defined in terms of an invariant feature of Minkowski spacetime. Thus, in the traditional pre-relativistic understanding of temporal becoming, all events that are simultaneous with the observer are events that have come in to being. Rejecting this assumption prompts the formulation of becoming that is not defined in terms of simultaneity. Instead, becoming is to be defined in terms of the metrical structure of Minkowski spacetime.

4.2.2 Relational Becoming

Temporal becoming cannot be defined as a gain of reality or a temporal monadic property. Because of this, becoming is *nothing more than* an event standing in a certain relation to another event.[187] In the revised understanding, B-coming, an event has become with respect to a second event if the first event stands in an STR-friendly relation to the second event. Temporal becoming, in the traditional models, is a concept in which an event becomes present. Full stop. But in this third model of B-coming, temporal becoming is a concept in which an event becomes *with respect to another event*. That is, there is nothing more to becoming than an event standing in relation to another event. Adding animation to the picture in terms of gain (and loss) only results in difficulties that cannot be avoided. Because of this, I propose to drop the animation and endorse unchanging relations among events. In doing so, I remove presentness from the picture; this means that temporal becoming does not require A-theory. In addition, becoming

[187] Dorato (2006) also offers a relational account of temporal becoming.

must be formulated in terms of Minkowski spacetime; this means that becoming requires a four-dimensional manifold. These two consequences combined means that the revised version of temporal becoming fits within the B-theory blockworld, hence the label B-coming. In what follows, I first define this becoming relation, and then show that this revised understanding of becoming can satisfy our intuitions about the nature becoming: that the future is open, and that the present brings the future about.

4.2.3 Relativistically-Friendly Relations

Temporal becoming must be based on a relation defined over events in our four-dimensional spacetime manifold. What kind of relation must it be? First, relational becoming must be formulated in terms of Minkowski spacetime if we are to abide by what our best science tells us about the nature of the world. What kinds of relations are acceptable in Minkowski spacetime? Putnam (1967) argues that no objective becoming relation can be defined on Minkowski spacetime short of the universal relation. We can see how this works with reference to the case of Sally and Fred. Sally and Fred are co-present, and E is simultaneous with Sally. For Fred, E has not yet occurred, and so, from Fred's point of view, E is in the future. O and E are simultaneous for Sally, and O is Sally's present, so therefore, E must be in Sally's present as well. We agree that an event in one's present has become. So, for Sally, E has become because it is in the present. If E has become with respect to Sally at O, and Sally and Fred are in the same (present), then E must also have become for Fred.[188] By adjusting the frames of reference for Sally and Bob (by adjusting their speeds), Putnam can show that any event in the future of O is real. Because O is just an arbitrarily chosen event, any event in the future of that event is real. This means that all events are real for all other events.

[188] Here, I am implicitly assuming the transitivity of the relation.

Thus, due to the geometry of Minkowski spacetime, there are no relations that are definable besides the identity relation and the universal relation. Clearly, the identity relation cannot account for becoming. The universal relation cannot account for becoming either. If the becoming relation is the universal relation, then this means that all events have become with respect to all other events. And this means that there is no becoming at all.

4.2.4 B-coming

Stein (1968) proposes a response to Putnam (1967) by proving that there is an additional relation that can be defined in Minkowski spacetime that can serve as the becoming relation.[189] Ultimately, Stein identifies the temporal becoming relation as causal connectibility – the relation an event holds to every event in its past light cone. Stein sets forward the necessary conditions that **R** must satisfy in order to be a suitable candidate for objective becoming:[190]

i. **R** is reflexive
ii. **R** is transitive
iii. For any point *x*, there is a point y, such that ~**R***xy*
iv. If *y* lies in the causal past of *x* (the past light cone of *x*), then **R***xy*
v. **R** is definable in terms of the Minkowski geometry of spacetime[191]

First is the requirement of reflexivity: an event must become with respect to itself. Second, if an event has become for another event, then all of the events that have become for the second event have become for the first event. The third requirement holds that that there are some events which have not become with respect to other events. This allows Stein to deny the consequence of Putnam's argument that all events have become

[189] Stein (1968)
[190] This formulation is from Bigaj (2008).
[191] This means that, according to Callender (2000), the relation is "implicitly definable solely in terms of the time-oriented Minkowski metric, i.e., it 'commutes' with automorphisms of the time-oriented metric" (S592).

for all other events. The fourth requirement formalizes the intuition that any event that can possibly influence another event has become with respect to the event it can influence. The last requirement ensures that **R** is defined according to the invariant features of Minkowski spacetime.

Stein shows that the only relation satisfying all of these conditions is the relation of the causal past. And since the relation of the causal past of an event is defined as the events on or in its backward light cone, the becoming relation for any event holds between that event and any other event on or in its backward light cone.[192] What has become as of *x* are the events that are in the causal past of *x*. That is, the becoming relation, **R**, is that relation of past causal connectibility. I hold that these constraints satisfy the intuitions that we have about the nature of temporal becoming. Thus, in what follows, I argue that the conditions set forth by Stein are both necessary *and* sufficient. This means that temporal becoming is nothing more than standing in the **R** relation.

My proposed view of temporal becoming as the **R** relation, meets the minimal requirement of the openness of the future, in a sense. There is an ontological asymmetry between what has B-come and what has not with respect to a particular event. All of the events in the past light cone of an event *x* have B-come for that event. All other events have not B-come for *x*. Thus, there is an ontological distinction between those events that have not B-come as of the event *x* and those that have, by virtue of the **R** relation. In this way, Stein's third requirement is satisfied and I preserve the openness of the future.

More specifically, by way of appealing to **R**, there is an ontological distinction between the events in the past light cone of *x* and all other events in the blockworld

[192] Clifton and Hogarth (1995) extend Stein's result and show that **R** could also be the relation of chronological connectibility – events located inside an event's light cone (i.e., excluding the events to which it is timelike-related).

universe. It is true however, that because *p*'s worldline exists as part of the already real four-dimensional manifold, one can trace the evolution of the worldline from beginning to end. But from *x*'s point of view, at this spacetime point, the future is open. There is an ontological distinction between what has B-come and what has not. This means that the future of *x* has not B-come, and because of this, *x* does not have causal access to its future.[193] This gives rise to an epistemological sense of the openness of the future. An observer at *x*, due to the ontological asymmetry of the B-coming relation, does not have causal access to his future. From the point of view of the observer at *x*, the future is open – future possibilities are yet to be realized. Thus, I preserve openness of what has not become just by way of the becoming relation. And this ontological distinction between what has B-come and what has not B-come captures these particular intuitive views about temporal becoming.[194]

4.2.5 The Advantages of B-coming

Defining temporal becoming in terms of **R** can account for the two important requirements that we hold about the nature of temporal becoming: that the "past" is settled and that the "future" is open, and that the present (and past) brings the future about. With respect to the open future intuition, the B-theory blockworld theorist clearly cannot preserve openness by the unreality of an event. But, as I have explained, the relational view of temporal becoming can capture the motivations behind this intuition;

[193] This, of course, is assuming that the causal relation is an asymmetric one. There is debate about this aspect of causation, although it is far from controversial to do so. See Mellor (1998), Chapter 10 for a discussion of these issues in the context of time.

[194] One might complain that this sense of the openness of the future does not capture how we traditionally understand the openness of the future. The traditional understanding of openness is that the future is does not exist. But I have shown in the previous chapters that openness cannot be understood in this way. And, as a result, we need a new understanding of the sense in which the future is open. I believe that my proposed understanding of the openness of the future can account for enough of our attitudes about the future to be a satisfactory account.

that is, we can preserve openness *in some sense*. This sense is that an event *x* does not have causal access to future, and because of this, *for x*, there are multiple futures that can be realized. This fits neatly into the relational understanding of becoming I propose. Even though all events exist, there are events that have not B-come with respect to an event, *x*. In addition, even though the future exists, there are multiple futures that can be possibly realized, with respect to *x*'s position in spacetime. From the point of view of *x*, because no future events have B-come, there are multiple possible futures that could B-come. The future light cone of *x* does not settle what B-comes for *p*'s worldline. And because of this, the intuition that the future is in some sense open can be preserved.[195] The picture of B-coming with respect to event *x* is as follows:

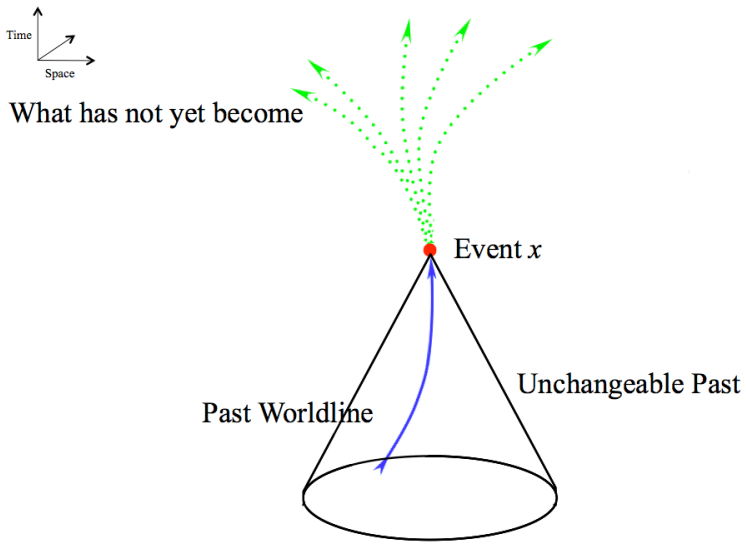

Figure 4.1

My opponent might complain that this does not capture "openness" because the future does indeed exist. But we have seen how openness cannot be understood as the unreality of the future. Due to the difficulties of the traditional model, if we are to find a place for

[195] Why think that the past is settled? This is due to the asymmetry of the B-coming relation; *x* has causal access to the particular past and therefore causal access to the particular past worldline of which it is a part.

becoming, there must be a new model of becoming. The new model of becoming captures our experience of the future as open, and offers the ontological distinctions that underlie the experience. In this way, B-coming satisfies our intuitions that the future is open.

In addition, B-coming satisfies the causal requirement of temporal becoming that the present (and the past) bring about the future. The causal requirement demands of any model of becoming to give an account of a central intuition about temporal becoming: that what has become produces what comes in to being. Thus, what has already become must bring into being what will become. The use of the terms "production" and "bringing about" suggest the notion of causation. Thus, it is natural to interpret this requirement as what has become as affecting what will come into being. B-coming easily accommodates this requirement. Because all events exist, events can stand in cross-temporal causal relations. Thus, events in *x*'s past have brought about *x* because those particular events stand in a causal relation to *x*. Furthermore, *x* itself as well as events in *x*'s past will bring about events in the future of *x* by way of standing in causal relations to events in the future of *x*. In the end, B-coming finds a good balance the requirement that the future is open and the requirement that the present (and the past) brings about the future. This is something that the first model of becoming has spectacularly failed to do. In addition, the second model of becoming cannot even overcome the basic metaphysical challenge that is McTaggart's Paradox. Because of this, the third model, that of B-coming, is superior to both of the traditional models of becoming.

What's more is that B-coming is an objective notion of becoming, thus establishing a place for the mind-independence of temporal becoming. Because light

cones are invariant structures of Minkowski spacetime, what has B-come for an event is frame-independent. This means that **R** holds between two events from any other event in any frame of reference. In other words, suppose **R***xy*; it is the case that *y* has B-come as of *x*, because *y* is located in *x*'s past light cone. That **R** is defined in terms of Minkowski spacetime means that any other observer in spacetime agrees that **R***xy* because the light cone structure at a point does not depend on a frame of reference like simultaneity does. *All* observers agree that **R***xy*; but this result can be extended to *any* becoming relation between two points. In this way, because **R** is objective, B-coming can be held to be an objective feature of our temporal experience.

4.2.6 Capturing Our Basic Intuitions About Becoming

Is defining a relativistically-friendly relation between events and calling it a form of temporal becoming good enough to be able to capture what we understand becoming to be? In other words, is **R**, to quote Callender (2000), just a "philosophically empty technical result?"[196] Contrary to Callender's beliefs, I assert that B-coming captures enough of our intuitions about temporal becoming to avoid being a meaninglessly defined relation in Minkowski spacetime.[197] First, keep in mind that Stein (1968) did not define just any relation in Minkowski spacetime, but instead defines a relation that is constrained by our intuitions about what the temporal becoming relation is like. The first two constraints that Stein outlines (that **R** is reflexive and transitive) are somewhat straightforward; an event, e_1, has become as of itself and if e_1 has become for a second event, e_2, and if e_2 has becoming for a third event, e_3, then e_1 has also become for e_3. The third constraint merely denies that **R** is a universal relation. Thus, the third constraint

[196] Callender (2000), p. S594
[197] The problems that arise from defining becoming in this way will be worked out in the next chapter.

captures the intuition that not all events have become for all other events. There are events in the world that are yet to become. In this way, the relation **R** can preserve the idea that the future is open, but it can also preserve the important aspect that what has B-come can change.[198] The last constraint, of course, merely requires that **R** is a relation that is relativistically-friendly because it can be defined in Minkowski spacetime.

Much of the intuitive pull of the **R** relation, however, comes from the fourth constraint; if *y* is in the past light cone of *x*, then *x* stands in the **R** relation to *y*. The speed of light in Minkowski spacetime can be understood as the speed limit of the universe – this captures the platitude that nothing can travel faster than the speed of light. This essentially means that the light cone of an event is the realm of what an event can have causal access to – in other words, what can causally effect that event.[199] This tracks closely with our traditional understanding of becoming. We can only have causal access to what has become. I take this idea one step further and define what has B-come as just that which we have causal access to. This tracks our commonsense understanding of becoming. When I hold that my drinking of a beer after work has come into being, I just mean that I see, smell, and taste the beer – that I have causal access to the beer. Everything outside an event's past light cone is causally inert. It is impossible for the events outside the light cone of the first event to have any causal effect on that event. Thus, we can say that these events outside of the past light cone have not become for that event.

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[198] This characteristic is explored in depth in the next section.

[199] Some believe that EPRB experiments show that causation can be faster than the speed of light. I hold, however, that the correlations in the experiment can be accounted for without appealing to causation and thus preserving the idea that causal influences cannot travel faster than the speed of light. See Fine (1989) for a similar view. This issue, however, is far beyond the scope of the project and so will be set aside.

That **R** is defined in terms of the past light cone of an event also gives rise to one of the most important aspects of time; the direction of time. This direction of time is supplied by the asymmetric nature of **R**. If *y* lies in the past light cone of *x*, then *x* cannot lie in the past light cone of y. In this way, the B-coming relation holds asymmetrically between *x* and *y*. Thus, as a result of **R**, the events in Minkowski spacetime can only be (partially) ordered in one particular way – from earlier to later. This ordering as a result of the asymmetry of the relation is the foundation of the direction of time. In response to Callender, therefore, it is clear that **R** is not a philosophically empty technical result. B-coming preserves the two central elements of temporal becoming: that the future is open and that the present (and past) bring the future about. Furthermore, the constraints placed on the becoming relation that is defined in Minkowski spacetime allows **R** to capture enough of our basic intuitions about becoming that it can be considered a legitimate model of temporal becoming.

4.2.7 The Challenge to B-coming

Because B-coming is a relational account of temporal becoming, the obvious initial complaint is that the sense of coming and going that is supposed to be the hallmark of temporal becoming is lost when the concept is defined as relational. That is, because B-coming is defined in terms of relations holding between events in spacetime what B-comes for events is unchanging. There is no sense of something gained or lost because becoming is no longer understood in terms of acquisition. As a result, there is no change in the totality of temporal facts in the universe – whether in terms of an addition to reality or a shift in what is present – with this understanding of becoming. As Le Poidevin (1997) points out, "The whole point of becoming…is that it is supposed (by its

defenders) to be *absolute* becoming. That is, there is a genuine change in the world when the future arrives."[200] On the relational conception of temporal becoming, there is no shift in the world when an event "becomes." All that exists are the (timeless) relations between events that are labeled as the "becoming" relation. B-coming therefore cannot capture our intuitions that the universe is significantly altered as things become. Ultimately, the problem with B-coming is that there seems to be no sense of something gained in the B-coming of an event.

This sense of gain that is experienced with respect to temporal becoming, however, can be accounted for without a change in the totality of temporal facts in the universe. First, *contra* Broad, temporal becoming seems to involve qualitative change. As Rea (2003) remarks, for example, that when a horse comes into being, "some matter changes from being arranged non-horse-wise at one time to being arranged horse-wise at some other time."[201] Thus, there is no reason to think, given our experience, that the sense of gain in temporal becoming is one in which reality is added to the existing world. In addition, our temporal experience is not one of events *being* present, but instead of event *as* present. Another way of putting this is that we do not see the spotlight of the NOW shine on a certain event and then change to shine on another event. Our experience is one in which direct acquaintance of one class of events is replaced with our direct acquaintance with another class of events. Thus, our experience of becoming is not one of an event coming into the spotlight of the NOW. Because of this, there is no reason to think that our experience of change alone (without the addition of reality or the spotlight of the now) is not sufficient for temporal becoming. Thus, temporal becoming

[200] Le Poidevin (1997), p. 545
[201] Rea (2003), p. 258

need not be a change in the totality of temporal facts. It need only to account for our sense of gain when something becomes. And B-coming can account for the change that underlies our sense of gain when something becomes. But how does B-coming – a relational model – account for a concept of qualitative change? What has become for an event at a spacetime point does not change. But what has become for a thing along a worldline *does* change. And in this is the change that provides our sense of gain as something becomes and establishes the foundation for the ebb and flow of time. The explication of how this is the case is the project to which I now turn.

4.3 A New Theory of Passage

The traditional conception of the passage of time is that the NOW shifts from earlier to later. But the fact that the NOW does not shift does not mean that there is no passage. It just means that there is a mistake in what we take time's passage to be. We are mistaken in thinking it is something extra; in fact, it can be reduced to the various properties of the B-theory blockworld. Instead of thinking that passage is an illusion, we should think that it is part of the world, just reduced to components. The abandonment of caloric did not mean that heat was an illusion – it just meant that heat was reduced to motion. In the same way, passage can be acceptably reduced to a certain kind of change, but it is mistake to hold that passage itself is a merely an illusion. I have formulated the passage of time more generally as the process of temporal becoming. In the traditional model, this process is precisified as the aforementioned shift in the NOW. But the metaphysical and scientific problems that this account faces casts doubt on the ability to articulate the passage of time in this way. Thus, I propose an account of passage based

on the process of B-coming; this account avoids the problems of appealing to the shifting NOW while faithfully tracking our experience of the transience of time.

4.3.1 Traditional Passage

The shift in the NOW from earlier to later is the hallmark of the traditional understanding of the passage of time. More precisely, the proponent of this traditional understanding of passage is committed to three requirements:

1. The NOW – a privileged present moment.
2. A shift or change in what moment is the privileged present.
3. Directed change from earlier to later.

From the arguments in previous chapters, it is clear that the privileged present moment cannot shift or change. And because there cannot be a shift in the NOW, the first two requirements of passage should be rejected. The third requirement, however, is important, and can be preserved – the arrow of time is a central part of any account of time and the direction of change – from earlier to later – is a central characteristic of all accounts of the passage of time. In contrast, the privileged present moment and its shifting across time can in fact be successfully discarded. The two requirements are not central components to an account of the passage of time – or so I argue. This is due to the fact that the transience of time can be captured without an appeal to these two requirements.

4.3.2 The Process of B-coming

This means that passage is not a myth, but, with the abandonment of the privileged present moment, passage is less than it has traditionally been taken to amount to. The following are elements that a B-theory of passage must meet:

1. A change or shift in what has become.
2. Directed change from earlier to later.

Thus, the process of becoming that is the passage of time is, in B-theory terms, a change or shift of what has B-come from earlier to later. In this way, the passage of time involves change, but not change in the NOW. The basis of passage is then the change in what has B-come – and this need not be formulated in terms of a shifting NOW. Instead, passage is formulated in terms of the change in what has B-come and this formulation can capture our intuitions behind the nature of passage.

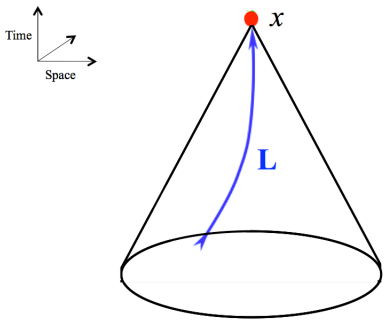
The problem the alert critic points to is that this revised temporal becoming is a relation between two events located at points in Minkowski spacetime. This means that what has B-come for an event does not change. In other words, event *x* stands permanently in **R** with respect to all of the events in *x*'s past light cone; how can there then be a *change* in what has B-come? The critic holds that what has B-come for *x* does *not* change. But, the passage of time is to be formulated not in terms of events at spacetime points because the world is more than mere a collection of spacetime points. The world is composed of temporally extended things, objects with histories and observers with pasts. Thus, passage is to be formulated in terms of these things.[202] In this way, what has B-come for an event at a spacetime point cannot change, but what B-comes along a worldline can change. Objects and observers endure; things extend across time according to their worldlines. These temporally extended things have distinct parts – temporal parts – and so change over time can be formulated with respect to temporal parts.[203] In this way, a thing can change if it has temporal parts with incompatible properties. A lighted candle can melt into a puddle of wax; an outing with friends can

[202] I assume that I can address these equally without any impact on the conclusion of my argument. I refer to these together loosely under the not-altogether accurate label "things," although the label is good enough for my purposes.
[203] See Sider (2001) for a full explication of this view.

turn from relaxed to raucous; I can grow old and (more) curmudgeonly.[204] Change in what has become then fits naturally into this type of account. The process of B-coming is thus the change in what has B-come for a temporally extended event, object, or observer. In this way, the process of B-coming is formulated in terms of the change in what has B-come along a worldline representing the life of an event, object, or observer. Passage is then understood as difference in what has B-come at one point in a thing's history with respect to what has B-come at an earlier point in that thing's history.

In summary, passage is the change in what has B-come for an event, object, or observer along that particular thing's worldline from earlier to later. This change is interpreted as the temporal part of the thing possessing additional becoming relations with respect to an earlier temporal part. The progression of the unfolding of the future and the fading away of the past is captured by the direction of this change from earlier to later. This direction is set by the asymmetry of the becoming relation itself; if *y* has become for *x*, then *y* is earlier than *x*. Thus, the arrow in times passage is based on the asymmetry of **R**. This passage can be represented by appeal to what has become for each point in *p*'s worldline, L. From the point of view at *x*:

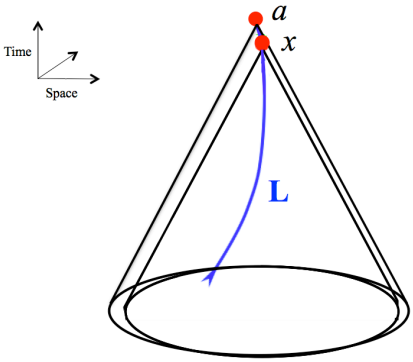
[204] Of course, there are many different accounts of change in the B-theory blockworld such as the indexicalism of Van Inwagen (1990), the adverbialism of Haslanger (1989) and Johnston (1987), and the stage theory of Hawley (2001). For now, I assume a temporal parts theory of change proposed by Sider (2008), although I hold that any B-theory account of change can just as easily be substituted into my account of passage. The complaint against these theories is that they contain no real change; there is nothing that first possesses a property *simpliciter* and then lacks it. This view ultimately faces the same problem as passage in the B-theory blockworld itself: that there is no change in the totality of temporal facts from moment to moment. But we have already seen that this possibility should be rejected, and so the complaint poses no problem for my view.



t_0

Figure 4.2

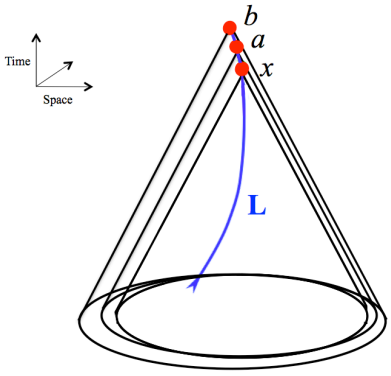
From the point of view at *a*:



t_3

Figure 4.3

From the point of view at *b*:



t_6

Figure 4.4

There is an increase in what events have B-come from earlier to later along worldline L.[205] That is, a certain set of events come into being at t_0 with respect to *x*. At t_3, with respect to *a*, there is an increase of events that have come into being as compared to *x*. And at t_6, there is yet another increase with respect to what has come into being for *b* as compared to both *a* and *x*.[206] Because *x*, *a*, and *b* are events along the worldline of *p*, there is a change in what has B-come along the *p*'s worldline. And because **R** supplies direction, there is a change in the later than direction, thus establishing a kind of progression of change. Thus, there is a continual change in what has B-come from earlier to later along a worldline, and, in this way, we find the passage of time.

4.3.3 The Transience of Time

From a "God's eye view" of the B-theory blockworld, however, all becoming relations are established and because of this, there is no gain of what has B-come from the God-like view outside the B-theory blockworld. But from event *b*'s point of view, there has been a gain in what has B-come as compared to what has B-come earlier in the worldline at event *x*. This gain for events that have B-come for *b* compared to events that have B-come for the past part of *b* is the basis for the passage of time. One might object that there is no transience in this picture; there is no shift in the NOW and so this means that time cannot, in fact, pass. But I have rejected transience as associated with the shift of the NOW and hold that transience is to be found in the increase in what has B-come along an event's, object's, or observer's worldline. This is in line with Savitt's

[205] Notice that I go from t_0 to t_3 to t_6. This is merely to clearly show the difference in the points of view between the times. If the diagrams showed the light cones from t_1, t_2, and t_3 stacked on top of one another, it would merely look as if the edge of the *light cone* became thicker.

[206] This process technically goes from t_0 to t_1 to t_2 to t_3, and so on, but I am following the diagrams. So, more accurately, at t_1, there is an increase with respect to t_0, and at t_2, there is a further increase in what has become for the event at that spacetime point along L as compared to t_1, and so forth.

understanding when he declares that, "We do not need an animated picture to have a picture of animation."[207]

Is this transience good enough? I argue that it is; this is due to the fact this transience captures our temporal experience of the future unfolding and the past fading away. Because events in my past cause me to have memories of those events, I can compare my experiences at *b* with the experiences I had at any other point along my past worldline. These memories are generally less vivid than my current experiences, and older memories are usually slowly crowded out by newer, more recent, ones.[208] Hence the experience of the past fading away. On the other hand, I have no causal access to things outside my past light cone and therefore no experiences or memories of things that have not B-come. Memory is an effect of what has B-come. Because of this, it seems as if I am free to realize any possibility in the future. In this way, the future is full of possibilities not yet realized for me at this point in time. Furthermore, the present are the experiences that have not yet been replaced by other experiences and relegated to memories. Because of this, the experiences of the present are the most vivid and fresh for me. At each point along my worldline, different events are vivid and fresh for me. I remember the vivid and fresh events of the previous point along my worldline. I also remember the events of other previous points along my worldline, although they are less vivid and fresh, in general, the earlier they are. This is due to the other later events crowding out the earlier events in my memory. At a later spacetime point along my worldline, I have memories of the change in what has B-come from one spacetime point

[207] Savitt (2002), p. 163

[208] There are exceptions to this claim of course. I may have vivid memories of an important event in my far past but little memory of an ordinary day last week. But generally, this claim I make holds true. Further exploration of our phenomenal experience of time is set aside but is a good foundation for future research.

to the next earlier along my worldline. Because of this, my experience of the transience of time is my experience of change in what has B-come by way of memory.[209]

My memory contains the accumulation of events that have B-come; my memory of the change in what has B-come from moment to moment of my past existence is the basis of my experience of the transience of time. Thus, my memory of the continual change in what has B-come allows me to experience the unique flow of time. That is, there is a set of events that are most vivid and fresh for me – the ones most recently experienced by my respective part along the worldline, that superseded any memories of times earlier than my most recent experiences. This is the case for each point in the worldline. Change in what has B-come along a worldline causes the accumulation of memories of what has B-come thus seeming to take us into what we consider the future, thereby laying the grounds for the experience of the transience of time. In this way, what is in one's future unfolds as the past fades away.[210]

4.3.4 Dieks' View of Temporal Becoming

Dieks (2006) is a proponent of temporal becoming in the B-theory blockworld who also utilizes the **R** relation, but gives a different account of temporal becoming than I give here. Specifically, Dieks asserts that temporal "becoming is nothing but the happening of events, in their temporal order."[211] Dieks first notes that events come into being by "occurring" or "happening." Coming into being thus means the same thing as "occurring" or "happening." In addition, part of what it means to be an event – for an

[209] Much more needs to be said about the details of a B-theory account of temporal experience. But I maintain that the basic pieces are in place. A further explication would take me too far afield from the main purpose of setting out the general guidelines of a theory of becoming and passage in the B-theory blockworld and thus is a project for another paper and another time.
[210] Note that Mellor (1998), Ch. 11, discusses memory and its relation to our experience of the direction of time that is similar to the current discussion.
[211] Dieks (2006), p. 171

event to exist – is for it to occur or happen. As Dieks claims, "So 'coming into being,' 'happening,' 'taking place,' 'occurring,' are what it is for an event to be an event."[212] Thus, we can all accept that events *happen*. This is what it is to be an event.[213]

The temporal ordering of events can be defined with reference to the light cone at a particular point. Dieks uses the ordering relations that are initially proposed by Stein in order to "represent how events come into being with respect to each other."[214] An event is earlier than the events in its future light cone and later than the events in its past light cone. Furthermore, the event is not ordered with respect to those events it is spacelike separated from, resulting in a partial ordering of events. In this way, the ordering of events are local, and thus temporal becoming is local. According to Dieks, if we accept this local nature of temporal becoming, then we can offer an account of temporal becoming that seems to fit our intuitive ideas of the notion: once we can order events, and we admit that events occur, we can order the occurrence of events. This occurrence of events as temporally ordered is what gets us the "successive occurrence of events" that defines our conception of temporal becoming.[215]

Dieks' account of temporal becoming, however, is not sufficient to capture the nature of our temporal experience. First, note that occurrence or happening is part of what it means to be an event. Thus, if an event exists, then the event occurs. From the consequences of STR, all events in the past, present and future exist; this means that, since every event exists, every event occurs. Thus, from one spacetime point, every other event occurs. The occurrence of an event is equated with the coming into being of an

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[212] *ibid*, p. 172
[213] Dorato (2006) and Savitt (2002) propose similar views.
[214] Dieks (2006), p. 172
[215] *ibid*

event. This means that every event has become for every other event. But Dieks holds that temporal becoming is instead to be understood as this occurrence of events being temporally ordered in a certain way (according to the structure proposed by Stein). Events have already occurred for all other events, but the events can be ordered in a certain way with respect to another event. Dieks' claim that becoming consists in the "successive" occurring of events is therefore somewhat misleading. As pointed out above, all events have become for all other events. So, events cannot "successively" become for another event. All events occur for all other events, and some events can be ordered with respect to another event. But this is not equivalent to saying that events "successively" become.[216] For Dieks, an event's occurrence is equivalent to an event's existence. If Dieks' understanding of temporal becoming as the successive occurrence of events is translated in terms of existence, then temporal becoming is the successive existence of events. It is true that an event exists before some and after other, but this is a far cry from what Dieks is trying to convey with his labeling the "successive occurrence of events" as temporal becoming. This shows that his view is far from our intuitive understanding of the concept.

This complaint can be explained with the following example. Consider the four-dimensional manifold of events, each carrying a light bulb that can be switched on or off.[217] When an event has occurred, the light is switched on, and when an event has not occurred, the light is switched off. In the four-dimensional manifold, all of the light bulbs are switched on. This is due to the fact that all events exist, and part of what is

[216] Dieks could respond by holding that existence is a relativized notion and events exist only relative to other events. But relativizing existence, as I explain above, is a highly unattractive position to take, and thus do not consider it to be a viable reply.
[217] The original (different) example is given by Callender (1998).

means for an event to exist is for it to occur. Now consider that I am at a certain spacetime point. At my spacetime point, the light bulb at the point is turned on. With respect to my spacetime point, all other light bulbs are turned on as well. Thus, all other events that exist have occurred for me.

Dieks' explication of the concept of temporal becoming as a "successive occurrence" of events seems to suggest that, from the point of view of my worldline, each light bulb in my past, ordered from earlier to later, has been turned on, at each tick of the clock. This successive occurrence of events brings to mind the happening of one event after another, along a worldline. This happening of one event after another event can be illustrated with respect to the light bulb example mentioned above. The happening of one event after another seems to suggest that as I move up my worldline, each light bulb on my world line has lit up, one by one, from the light bulb in my most distant past, to the light bulb that is in my most immediate past. The successive occurrence of events suggests a "transient now" that is crawling up my worldline, represented by the light bulbs along my worldline lighting up, one after another. This is clearly not Dieks' view, since he is committed to the fact that all of the light bulbs in the world are on, and so this leaves no room for the light bulbs to be turned on, one by one. If this is the case, then our "successive occurrence" of events must be explicated in a different way. With respect to the light bulb example, the "successive occurrence" of events is nothing more than light bulbs that are on being placed in a particular order. To say that there is a successive occurrence of events when all that is being asserted is that events can be put in a certain order with respect to a spacetime point is an attempt to smuggle more into the account than it can hold. Thus, the "successive occurrence" of events that is proposed by Dieks is

nothing more than a simple partial ordering of events that all have become with respect to each other. In other words, with respect to my position, all light bulbs are turned on, but I can order the light bulbs in my past in a certain way. This ordering of the light bulbs is supposed to be sufficient for an account of temporal becoming. This account of temporal becoming is one that is much more austere than what the words "successive occurrence of events" suggests.

Although I noted it above, I must emphasize that Dieks' view violates what we might take to be one of the central intuitions of temporal becoming: that there is some things that have not yet become in the world. If all events have become – as is the case with Dieks' view – then there is no sense in which there is a process of becoming, contrary to Dieks' attempt at defining temporal becoming as the successive occurrence of events. That is, Dieks' view violates Stein's third requirement that there are events in this world that have not yet become. This is something that Dieks' cannot capture with his view, and because he fails to capture this, he does not satisfy the minimal assumption that Dorato proposes above of the ontological distinction between a fixed past and an open future.

The complaint above builds on a more basic complaint of Dieks' view: the temporal becoming defined by Dieks cannot be sufficient to account for the transience of time. In other words, the transience of time must be something more than the successive occurrence of events. This is highlighted by my requirements of a theory of the passage of time that requires (1) a change in becoming and (2) a direction of time. For Dieks, there is no change in what has become. Different events have become for other different

events, but this difference is not sufficient for change. And because this difference is not sufficient for change, this difference is not sufficient for capturing the transience of time.

4.3.5 The Mere Ordering Objection

The alert critic notices that this process of B-coming along a worldline seems to be a "mere" temporal ordering of sets of events. Temporal ordering is in the form of what has B-come for the earliest point in the worldline followed by what has B-come for the next (later) point in the worldline followed by what has B-come for the next (later) point in the worldline, and so forth. Thus, ultimately, the passage of time at its foundation seems to be nothing more than a temporal ordering of events. Can a mere temporal ordering of events be enough to account for temporal becoming? Events, after all, can be spatially ordered as well, and there is no such thing as spatial becoming. In other words, this nature of passage is problematic because events can be arranged in a spatial ordering and a spatial ordering clearly does not suffice to show that space passes. So, the critic presses, why does a temporal ordering suffice for time's passage? Dieks (2006), in particular, takes note of this complaint with respect to his view; he points out that "Events can be spatially ordered as well, and this does not lead to spatial becoming (from left to right, for example)." His answer is that there is a difference in space and time that allows one to label temporal ordering as temporal becoming.[218] Thus, the dimension of time is different in nature from the three dimensions of space, and because of this, a temporal ordering is different in kind from spatial ordering. There is a qualitative difference between space and time which makes it a mistake to point to the absence of becoming in spatial ordering as a reason to dismiss the possibility of becoming in temporal ordering.

[218] Dieks (2006), p. 171

Dieks claims that this difference is given to us by spacetime physics: space and time are treated differently in Minkowski spacetime – the temporal dimension is distinguished from the spatial dimension by the metric tensor in the Lorentz coordinates. This difference in treatment is a reflection of the objective difference between space and time. So, the fact physics distinguishes between space and time is enough to ground a distinction between spatial ordering and temporal ordering. Thus, Dieks concludes, temporal ordering of events, as distinguished from spatial juxtaposition, is enough to generate temporal becoming.

I agree with Dieks that the difference in space and time allows for becoming in temporal ordering, but hold that this distinction between space and time can be based on something more than the difference in how physics treats the two concepts. The differentiation in time and space is located in the fact that time is the dimension of **R**, and **R** cannot hold merely in space.[219] Thus, time is the realm of **R**. This is due to the fact that one of the requirements of temporal becoming is the presence of a causal relation, and time is the realm of causal connections. This means that spacelike separated events cannot stand in a causal relation, and because of this, spacelike separated events cannot stand in the becoming relation with each other.[220] The fact that spatial relations cannot stand in a becoming relation with each other means that there is no "becoming" across space. And without any becoming across space, there can be no process of spatial becoming, which is why even though events space can be ordered, there is no passage resulting from the ordering of events in space. Thus, variation over events in space

[219] This may be a claim that Dieks would agree to.

[220] Note the reliance on a particular view of the nature of causation. This account depends on the denial of simultaneous causation, and although this point is occasionally disputed (see Brand (1980)), I take it that the conflict of simultaneous causation with STR is enough to dismiss it as a possibility in my current formulation of a Minkowski spacetime-friendly version of the passage of time.

cannot be the result of the temporal becoming relation. This spatial ordering is not set by **R**, and so spatial ordering cannot be sufficient for becoming or passage.

4.3.6 Maudlin's View of Passage

Another view of passage in the B-theory blockworld is set out by Maudlin (2007). Maudlin claims that this passage "is a fundamental, irreducible fact about the spatio-temporal structure of the world."[221] He further states that "the passage of time is an intrinsic asymmetry in the temporal structure of the world, an asymmetry that has no spatial counterpart."[222] Passage, for Maudlin, however, seems to be more than just the objective direction of time; he holds that space can contain asymmetry, but this fact does not mean that space passes. The passage of time, therefore, is something more than just the direction of time. Maudlin hints at this when he states that "the passage of time underwrites claims about one state 'coming out of' or 'being produced from' another."[223] Thus, for Maudlin, passage seems to be something associated with the ideas of production and direction but explicitly declares that he cannot say much more: "I cannot explain what I mean by paraphrasing or analyzing the notion of time's passage in terms that do not already presuppose the notion."[224]

According to Maudlin, passage cannot be conceptually analyzed. Some feature of the world is labeled as passage which provides the direction of time. But Maudlin's account of passage in the B-theory blockworld faces two majors problems. One complaint comes from each of the two sides of the debate about passage. The A-theorist objects to Maudlin's view by claiming that the passage of time without a NOW is

[221] Maudlin (2007), p. 107
[222] *ibid*, p. 108
[223] *ibid*, p. 110
[224] *ibid*, p. 107

incoherent, or confused, or implausible because it lacks the conceptual features needed to support the existence of passage. Without well-developed details, Maudlin's account is completely unattractive to the A-theorist. On the other hand, postulating the passage of time as primitive and irreducible also leaves Maudlin open to complaints from B-theorists. Without an explanation of how the notion of passage manages to capture our understanding of the nature of passage, B-theorists can protest that Maudlin has merely introduced an unanalyzable property by fiat and labeled it as passage. In this case, the question still remains as to why Maudlin can call this property "passage."

My account of passage addresses the problems that Maudlin's account suffers from. In my account, I give the A-theorist a reducible, analyzable account of passage without a NOW, showing that such an account is possible. In addition, I explain how my account of passage satisfies the important commonsense intuitions we have about passage, thereby assuaging the B-theorist's concerns that what I identify as "passage" really is what we hold to be the passage of time.

4.4 Conclusion

The majority of B-theory blockworld proponents hold that passage is an illusion and that the supposed transience of time can be accounted for as a subjective phenomenon. I am a B-theory blockworld proponent, but I argue instead that we should understand passage as an objective part of the world because of its enduring prominence as a part of the nature of our temporal experience. To find a place for passage in the B-theory blockworld, one must deny that the passage of time is to be understood as the shift or change in the NOW; this task is made easier by the fatal metaphysical and scientific

problems that this traditional formulation of passage faces. Thus, the ultimate conclusion of the negative part of the project is that becoming is not an acquisition of presentness and passage is not the shift of the NOW based on this acquisition.

Contrary to the prevailing wisdom among the proponents of the B-theory blockworld, passage and the becoming that underlies it is not a myth – but it is something less than what we traditionally have taken it to be. Because of this, there is a place for objective becoming and the passage of time in the B-theory blockworld. My proposed account of B-coming and the passage of time need no extra ingredients beyond those of the four-dimensional manifold of spacetime. As in the example of the history of heat, becoming and passage are nothing over and above the blockworld's basic components. This position echoes William's (1951) statement that, "The system of the manifold is thus 'complete' in something like the technical logic sense, and any attempted addition to it is bound to be either contradictory or supererogatory."[225]

My proposed revision to our understanding of the passage of time preserves the intuition that passage is a process of temporal becoming; that is, ultimately passage is a change in what has become. I define temporal becoming, however, in terms of the Minkowski spacetime-friendly relation **R**. The relativization of temporal becoming to an event at a spacetime point allows this account to avoid both the metaphysical and scientific problems that face the two traditional models of temporal becoming. In B-coming, an event has become with respect to another event iff the first event stands in the **R** relation to the second event. This **R** relation is sufficient to define temporal becoming because it satisfies our intuitive constraints of becoming being reflexive, transitive, and asymmetric. In addition, B-coming captures the sense of the openness of the future and

[225] Williams (1951), p. 464

allows a straightforward account of how it is it the case that the past and present bring about the future. In addition, it is an objective notion definable in Minkowski spacetime. So, although this revised account of B-coming has abandoned an acquisition view in favor of a relational view, in doing so, the account avoids the weaknesses of the traditional views while plausibly capturing the important elements that any understanding of temporal becoming need to provide.

The passage of time is then defined in terms of B-coming as the change in what has B-come from earlier to later. What has B-come for an event at a spacetime point does not change, but what has B-come along the worldline of a thing does change. This change is articulated in terms of different events having B-come for different temporal parts along the worldline. Furthermore, what has B-come progresses from earlier to later according to the asymmetric nature of **R**; there is an increase in what has B-come along a worldline, thus allowing for our temporal experience of the realization of the future and the fading away of the past and thereby accommodating our sense of the transitory nature of time. In this way, the passage of time is the process of B-coming and B-coming is defined solely in terms of the four-dimensional manifold of the B-theory blockworld. In Schlesinger's (1969) words, the first notion of the passage of time as the "seemingly continual shift in the position of the 'now'" is replaced by the second way of understanding the passage of time – "one in which no reference is made to the supposedly ever changing position of the 'presentness' and one which may be carried on with respect to the so-called 'static' universe."[226] Therefore, this revised conception of the passage of time is based on a metaphysically and scientifically respectable

[226] Schlesinger (1969), p. 2

understanding of temporal becoming as B-coming and is faithful to the central elements of our experience of time. What more could one ask for?

5

Defending Revisionism: Objections and Replies

The passage of time in the B-theory blockworld is based on a relational version of temporal becoming – B-coming – in which the change of what has B-come along a worldline is the *locus* of the transience of time. This revised understanding of both temporal becoming and the passage of time avoids the metaphysical and scientific problems of more traditional formulations while satisfying our intuitions and capturing the central elements of our temporal experience. I ended the last chapter with the question of what more could one want from a theory of passage based on B-coming. But according to opponents, there is plenty that is missing from this revised account of B-coming and passage which make it an unsuitable replacement for the traditional understanding of the concepts central to time. In what follows, I defend my theory of B-coming and passage in the B-theory blockworld by considering and responding to the most plausible and serious complaints this revised version faces.

First, the opponents of theories of passage set in Minkowski spacetime hold that Stein's (1968) original becoming relation (which is the basis for B-coming) is unacceptable because there can be no two events that have mutually become for one another, thus technically limiting an event's present moment to a point rather than a plane of simultaneous events. The objection continues that as a consequence of this result, the becoming relation **R** is not a relation (to use Dennett's (1984) words in a different context) "worth wanting." Other critiques of the nature of passage in the B-theory

blockworld include the charge that without a NOW there can be no temporal change as the basis of the passage of time. Lacking this kind of temporal change supposedly ultimately renders my account unable to accommodate an acceptable picture of passage. I respond to each of these objections in turn, showing that they can either be decisively refuted or suitably minimized to a problem one can live with.

5.1 Stein's Point Present

The only acceptable account of temporal becoming is a relational one; accounts of temporal becoming formulated in terms of acquisition of presentness (whether as a temporal property or in terms of reality) face insurmountable problems. Stein has shown how to define a relativistically respectable becoming relation by appealing to the light cone structure of Minkowksi spacetime. This relational account of temporal becoming faces obstacles in the form of supposedly unacceptable and unintuitive consequences. Below, I present some of the obstacles relating to the opponent's claim that the present in relational becoming must be a point and show that these obstacles can be overcome.

5.1.1 The Non-Uniqueness Condition

Callender (2000) aptly points out that Stein's identification of a relation in Minkowski spacetime that is not the universal or identity relation "crucially hangs on the acceptance or rejection of a 'non-uniqueness' condition that may be further imposed upon R."[227] This non-uniqueness condition is formalized as

(NU) $\exists x \exists y \exists R(Rxy \ \& \ Ryx \ \& \ x \neq y)$.

[227] Callender (2000), p. S592

Translated literally, NU holds that there is at least one set of non-identical events in the universe that have mutually become for one another. But Callender interprets NU as saying "merely that at least one event in the universe shares its present with another event's present" and then asserts that "this seems the thinnest requirement one might put on becoming."[228] The importance of the non-uniqueness condition thus seems to be to ensure that the present is extended – for example, that there are other events in my present; my experience, after all, is one of sharing the present with other things. In this way, the non-uniqueness condition ensures that the present of an event is more that just that event itself.

Callender declares that "*all* versions of the traditional tensed theory hold this meager assumption"[229] and notes that this non-uniqueness condition is Putnam's (1967) second assumption, one that Stein subsequently drops in defining the becoming relation. This is one of the reasons that Callender holds that Stein's formulation of becoming is too far removed from our traditional understanding to be acceptable. Specifically, acceptance of Stein's requirement (iii) requires the endorsement of the *uniqueness* condition, which holds that for some event *x* and some event *y*, if R*xy* and R*yx*, then *x* must be the same event as *y*. What does this mean? According to Stein, "in Einstein-Minkowski space-time *an event's present is constituted by itself alone*."[230] Because of this, the present for *x* cannot be constituted by any event other than *x*. Callender thus asserts that if one accepts the intuition that there are events outside of one's "here-now" that are present – that is, if we think the present for an event is constituted by *more* than just that one event – then Stein's becoming relation is unacceptable.

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[228] *ibid*
[229] *ibid*, emphasis in original
[230] Stein (1968), p. 15, emphasis in original

5.1.2 A Shared Present

The defender of Stein's temporal becoming relation can respond by holding that the uniqueness condition implies that the concept of mutual becoming is not a relativistically respectable idea – a response that Callender explicitly considers. But he replies to this response by claiming that all traditional understandings of time accept that events can share a present, and because of this, the non-uniqueness condition can be used as a *reductio* argument against Stein's becoming relation. Although both Stein and Callender assert that Stein's becoming relation means that the present for an event cannot be constituted by another event, the more accurate translation of the uniqueness condition – as pointed out above – is that two events cannot mutually become as of each other. This is a different claim than holding that the present for an event is limited to that event. It is plausible to hold that only two events that have mutually become share a present, but the concept of "sharing a present" need not be thought of in this way. Thus, Stein can accept that no two events mutually become for each other, but deny that this means that the present of an event is constituted by that event alone. In other words, Stein can deny that the present of an event are those events with which is has mutually become. This is the type of reply that I want to defend here.

In this way, one can construct a relativistically respectable present that is not composed of events that have mutually become, but does satisfy our experience of the present. First, note that, as a consequence of STR, signals cannot propagate faster than the speed of light. This means that observation is a local process; what one observes at a point cannot be outside the light cone at that point. This means that what one observes is not the plane of events that are simultaneous with oneself at a point. This is emphasized

by Dieks (2006) who states that simultaneity "plays no role for the content of observation."[231] Thus, if we take as among the things that are present the things that one observes at a spacetime point, then the present cannot be those events that are simultaneous with one at that point. The things one observes are instead limited to those which are in one's past light cone. This is where one can make use of the *specious present* in order to accommodate our experience of the present.

5.1.3 The Specious Present

The specious present, also known as the psychological present, is the duration of time of which we are immediately aware. This idea, introduced by the psychologist William James (1890), is that the "present is no knife-edge, but a saddle-back, with a certain breadth of its own on which we sit perched."[232] This is the interval between events that is perceived as both present and extended in time. It is defined as the set of events between the "intersection" of two light cones:

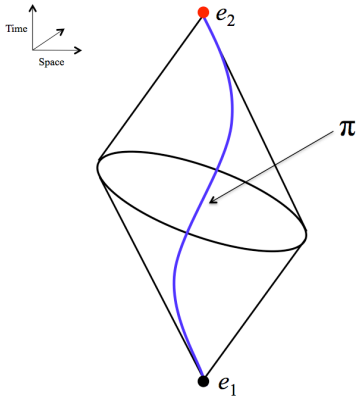

Figure 5.1

The worldline of an object (or temporally extended event or observer) is shown by π. In addition, e_1 and e_2 are the points that mark the end and the beginning of the thing's

[231] Dieks (2006), p. 159 emphasis in original
[232] James (1890), p. 609

specious present. This intersection of the future light cone of e_1 and the past light cone of e_2 is known as the Alexandroff interval. In this way, any thing's worldline will have a present that is composed of a region of spacetime. But what exactly is this set interval? For the human observer, the psychological extent of the specious present is estimated to be between .5 and 3 seconds.[233] The specious present is then the Alexandroff interval from the event in question to the event along the thing's worldline from .5 to 3 seconds into the past, as measured by the thing (and thus, is in proper time). Thus, the present for an interval of a thing are all events contained within this intersection of the light cones.[234]

5.1.4 The Present in B-coming

The specious present, however, does not fit nicely into the account of B-coming. The problem with adopting the specious present is that if an interval along a worldline is designated as the present, then there will be events along the worldline that have not B-come with respect to other events. And it is counterintuitive to hold that one event is present for another event when that first event has not B-come for that second event. This problem is illustrated in the following picture:

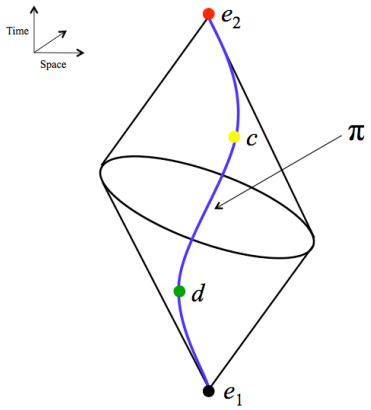

Figure 5.2

[233] Savitt (2009), p. 356
[234] See Arthur (2006) for a more detailed discussion of the specious present.

Both *c* and *d* are present along the interval π, but *c* has not B-come with respect to *d*. This means that the present for *d* is made up partially of *d*'s future. And this result is so counterintuitive to be unacceptable.

The spatial extent of the present can be preserved in my revised account of B-coming by slightly altering our understanding of the nature of our psychological present. The *B-coming present* of an event is to be understood as the collection of events that are contained in the light cone of that event extending up to 3 seconds along the worldline of the object of which the event is a part.

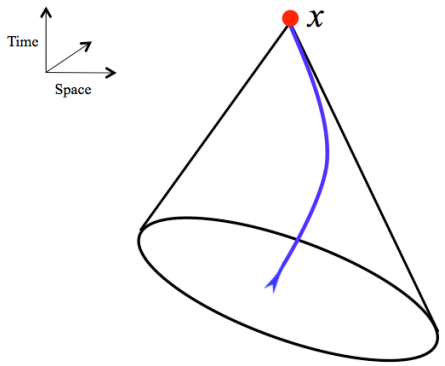

Figure 5.3

This B-coming present roughly approximates the collection of events of which we are immediately aware at a particular point in spacetime. This is, of course, an approximation – in some cases what I am immediately aware of at a point are events that are far away in the past light cone (such as my observing the explosion of a star). But this is the exception rather than the rule. What I am generally immediately aware of at a point are the events in my B-coming present.

What is the motivation for accepting the B-coming present over a more traditional understanding of the present? Callender's complaint still haunts the B-coming present – that the B-coming present is too far removed from our traditional understanding of the

present to be of any use to us in a theory of time. I argue, however, that the B-coming present is in fact more closely aligned with our *temporal experience* than the traditional understanding of the present and because of this, is acceptable. The traditional understanding of the present of an event is the set of events that are simultaneous with the present event. In addition, the present set of simultaneous events is traditionally taken to be either instantaneous or of an infinitesimally small duration. The B-coming present, in contrast, is not instantaneous because it identifies a spatiotemporally extended region of spacetime as the present. The B-coming present better captures our experiences that the present is something that we interact with and live in, rather than something that is razor thin. We take the present to be something in which interactions occur. Thus this requires that the present is not razor thin. In other words, having an extended present is one that tracks with our *experience* that the present has a duration rather than being instantaneous. And if the traditional understanding of the present is one that conflicts with our experience, then it is all the more reason to jettison it in favor of something that more closely tracks our temporal experiences.

In addition, if we take what is present with me at some point along my worldline as something that I can observe, the traditional understanding of what shares my present does not align with my observations. I cannot observe what is simultaneous with me because causal influences are limited to my past light cone. This is obvious when considering a picture of spacetime:

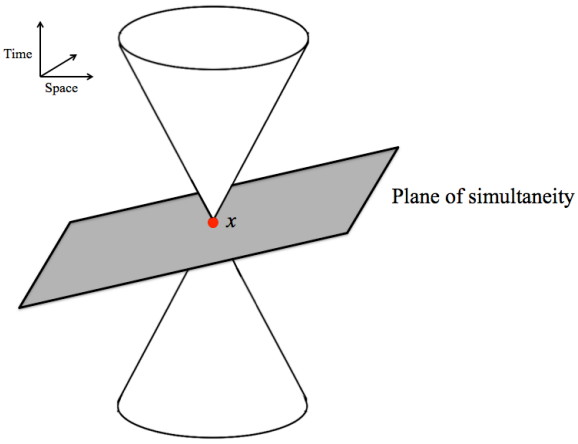

Figure 5.4

In the traditional understanding of the present, what is present is the set events on the plane simultaneous with *x*. But because *x* can only observe the events that are in its past light cone, the result is that *x* cannot observe any of the events that are present with it. What I do observe are the events in my past light cone, and so it turns out that according to STR, what I observe as present are actually events that are past. Thus, if the "shared present" of a spacetime point is as it is traditionally understood, then the result is that the shared present of a spacetime point is a present that an observer at that point cannot observe, let alone interact with! This itself seems like a highly counterintuitive consequence – and one that in fact conflicts with our temporal experience. If one wants to maintain that what I experience at a certain point is the present, then adopting a concept of the present that includes the utilization of the past light cone is going to be the conception that is most faithful to our temporal experience.[235]

[235] It is clear that on my conception the relation "is in the present of" is neither symmetric nor transitive. Does this mean that two people can never share a present? In the next section, I answer in the negative and show how two people can – to an extent – share a present, thus avoiding tragic consequences for human love and intimacy.

In the traditional conception of the present, the present of an event is composed of events that are simultaneous with it, but these events have no causal influence on each other, and therefore, cannot satisfy our experience that not only can we observe event that are co-present, but we can also interact with them as well. Therefore, if one wants to be faithful to his experience that his present is composed of events that he can not only observe, but interact with, then the best way to do so is to reject the traditional understanding of the present and accept something like a B-coming present. In this way, the B-coming present can not only account for the idea that what is present at a point is constituted by more than just that point but also that what is present for me at a point are events that I can observe and interact with. In the end, I have offered a relativistic version of the present that extends beyond a point. In doing so, I avoid the charge that the present of a point is constituted by that point alone. The present is extended by way of the B-coming present that is based on the specious present. The advantage of this view is that it is a relativistic notion that tracks our commonsense ideas about the present as well as our experience of time.

5.2 B-coming Worth Wanting

A further problem resulting from the relational nature of B-coming is the worry that it is not a notion worth wanting. What exactly does this mean? This is essentially a different formulation of the charge that **R** is too different from our traditional understanding of temporal becoming; this charge is based largely on the grounds that becoming must be a local rather than a global notion. This result, in addition to other counterintuitive results, means that B-coming is too far from our intuitions about

becoming and so, as Callender complains, there is no reason to believe that the becoming relation exists in our world. But, contrary to Callender, that B-coming is different from the traditional understanding of temporal becoming does not, by itself, mean that **R** does not qualify as an adequate conception of becoming. Even if **R** is as different from the traditional understanding of becoming as Callender holds it is, this does not mean that it cannot be an adequate account of the nature of time. What Callender must show is not only that **R** is unacceptably different from our traditional understanding, but also that it fails to account for our central intuitions of what temporal becoming is.

I have shown in the previous chapter that B-coming can adequately account for our intuitive understanding of temporal becoming. B-coming preserves the central elements of absolute becoming that the future is open and that the present and the past bring about the future. Furthermore, my theory of passage based on B-coming satisfies our intuitions about the flow of time: that passage is a process of becoming, that it is the foundation of the differentiation between space and time, and that it can accommodate the transitory nature of our experience. In this section, I show that the fact that **R** does not preserve the global notion of becoming does not warrant its rejection. McCall (1976) declares that "it is far from clear that a 'single tide' of becoming or time flow is something that any philosophy could reasonable want,"[236] but I hold further that this single tide is something that the understanding of B-coming does not *need*. In addition, I argue that the other counterintuitive consequences of B-coming do not warrant its rejection. Thus, if one wants to make room for temporal becoming in the B-theory blockworld, B-coming is a good option to choose.

[236] McCall (1976), p. 345

5.2.1 The Global Objection Against B-coming

Gödel (1949) describes that the traditional understanding of becoming "means (or, at least, is equivalent to the fact) that reality consists of an infinity of layers of 'now' which come into existence successively." He then points out the difficulty with situating temporal becoming within a theory of relativity when he states that, as a consequence of STR,

> [R]eality cannot be split up into such layers in an objectively determined way. Each observer has his own set of 'nows,' and none of these various systems can claim the prerogative of representing the objective lapse of time.[237]

Fitzgerald (1969) expresses the same idea when he states that accepting relativity means that "we not longer have a single tide of 'Absolute Becoming' surging into 'the future,' but an infinite plethora of little crisscrossing ripples."[238] In this way, localizing becoming by dividing events into what has and has not become in relation to a single event is far too different from the traditional view of temporal becoming as involving a global plane of simultaneous events designated as the present. Because of this, there is not one "becoming event" that all points across the global plane of the present share. Instead, the process of B-coming along each worldline is unique to that worldline – there is no global unfolding of the future in the revised local version of temporal becoming.

5.2.2 Local B-coming

B-coming can account for our temporal experience of becoming without the need to appeal to a global notion of the NOW. This is due again to the fact that observation is a local process, not a global one. What I observe at my spacetime point are not the events on the global plane of simultaneous events identified as the NOW, but instead the events

[237] Gödel (1949), p. 558
[238] Fitzgerald (1969), p. 319

that belong to my past light cone. This is because of the constraints set by STR – I don't observe other simultaneous events but only those events that have causally influenced me at or slower than the speed of light (since observation requires causal influence). Thus, it does not matter to my experience what the global plane of the NOW is. This is why, according to Dieks (2006), "observation is a process of finite spatiotemporal extension that does *not* depend on simultaneity within the region of observation."[239] Because my observation of what is present with me is not based on a global plane of simultaneous events, but instead on my past light cone, there need be no global hyperplane of the NOW in order to accommodate my experience of the present and temporal becoming. As Dieks states, "our time experience – local as it is – does not depend on the concept of global time."[240]

In this way, global layers of becoming play no role in our experience of becoming. This means that the new understanding of becoming as local does not conflict with our experience. Both our experience and our science show that we do not need this global succession of NOWs. That is, B-coming does not result scientific problems and still remains faithful to our temporal experience. Thus, it is a lesson from relativity that becoming cannot be a global notion. Although this goes against our traditional understanding, this new understanding is acceptable because our experience of temporal becoming is not of a global notion. The lack of a global becoming does not contradict our temporal experience. And so we should sacrifice our traditional understanding as a lesson of relativity; relativity forces us to give up many commonsense ideas, including the objectivity of simultaneity, and so this denial of a global notion of

[239] Dieks (2006), p. 159, emphasis in original
[240] *ibid*, p. 169

temporal becoming is a lesson from relativity that we can acceptably accommodate in our experience of time. Therefore, because our experience of time can be accommodated locally, **R** being a local notion and different from our traditional understanding of becoming as a global notion does not, *contra* Callender, mean that the abandonment of a global notion of becoming is unacceptable.

5.2.3 Sharing What Has B-come

We need not bother with global simultaneity to do justice to our observations of temporal becoming. But there is a problem that results from understanding temporal becoming as a local notion that might underlie Callender's dismissal of **R**: that B-coming is not global and that there is not one plane of B-coming means that no two observers agree on what has B-come. This is another reason that **R** is so far from our traditional understanding that Callender holds that the relativity-friendly notion of **R** is "*not remotely similar to that found among advocates of the tensed view of time*."[241] Because B-coming is relativized to points in spacetime, **R** is, as Callender points out, maximally observer-dependent. This means that no two observers in the entire B-theory blockworld agree exactly on what has B-come. The traditional understanding of temporal becoming is one in which becoming is observer-independent; in the traditional understanding of becoming, *all* observers agree about what has become. In **R**, no observers agree on everything that has B-come, and some observers disagree completely on what has B-come. Due to this nature of **R**, there can be legitimate disputes about what has B-come that is not something that is found in the traditional understanding of becoming. Thus, **R** is so different from the traditional conception of temporal becoming that it should not be

[241] Callender (2000), p. S592, emphasis in original

taken to be an understanding of becoming at all; it appears to be, in fact, as Callender charges, "philosophically idle."[242]

But the lesson from relativity is that global notions must be dismissed; because of this, observers cannot agree about what has B-come and so should not agree about what has B-come. Thus, that all observers agree on what has B-come is an intuition, like absolute simultaneity, that is sacrificed to relativity. But endorsement of **R** can capture enough of the underpinnings of the original intuition that all observers agree on what has become to blunt the counterintuitive nature of this result. What exactly are the underpinnings of this intuition that temporal becoming must be observer-independent? Presumably, the thought is that if two observers cannot agree on what has become, then they cannot have a mutually common experience of the present and the past. It is true that two observers cannot have a completely mutually common experience of the present and the past, but two observers can have *enough* of a mutually common experience of the present and the past to dispel complaints about the observer-dependence of B-coming. Two observers can partially share a B-coming present:

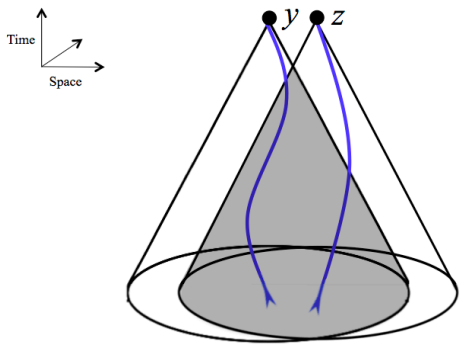

Figure 5.5

[242] *ibid*, p. S595

The problem remains, however, that two observers who are very far apart in spacetime do not agree on anything that has B-come:

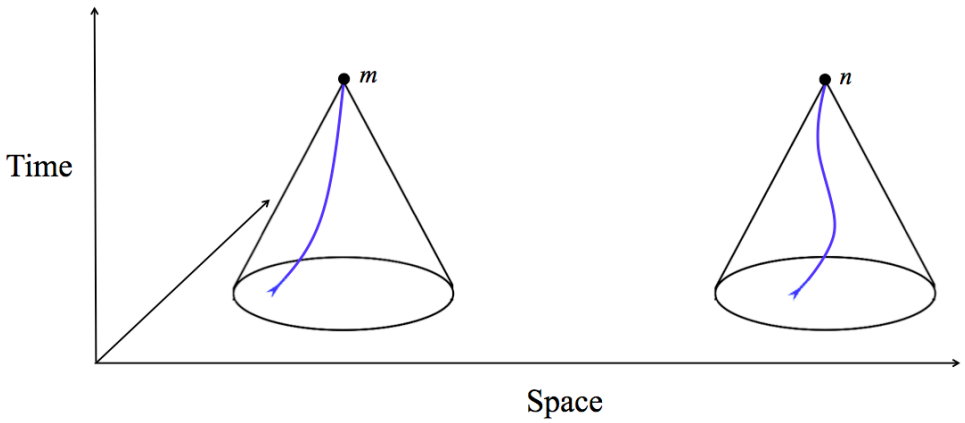

Figure 5.6

The two observers agree on what exists (because everything exists for both of them), but disagree completely about what has B-come. But why think that this is a problem? B-coming, as postulated, is ultimately a conception of causal access – so the fact that two observers with no causal contact and no causal contact between each other in their respective past light cones have two completely different observations about what has B-come is not counterintuitive.

In addition, why think that these two observers need to share a set of events that have B-come? Yes, the traditional understanding of becoming is one in which all observers agree on what has become because there is a global notion of becoming, but with the fall of the global notion of becoming, there is no reason to hold that all observers must agree on what has B-come. That all observers do not agree on what has B-come does not change their temporal experience. For example, that what has B-come for observer A (as represented on the left) is different than what has B-come for observer B (as represented on the right) does not affect their temporal experience; the observers are

spacelike separated and so their past and present experiences are completely independent of each other. The revised understanding of temporal becoming reflects this. Therefore, there is no reason to think that one needs a global notion of temporal becoming; abandoning temporal becoming as observer-independent is merely a result of abandoning a global notion of the NOW. But this revised understanding of becoming – brought about by respecting the lessons of relativity – does not alter our temporal experience in any way. The observer-dependence of becoming does not mean that observers cannot share enough of a past and present to when it matters (i.e., when they come into causal contact). Because of this, that the endorsement of B-coming leads to disagreement about what has B-come is not a complaint that should lead to its rejection.

5.2.4 More Counterintuitive Consequences of B-coming

B-coming entails yet further counterintuitive consequences. First, it is the case that one's past is not defined as the union of one's former NOWs. As Callender puts it,

> Consider the Yankees winning the World Series in NY in 1998. Since I wasn't in NY at that time, and yet the event is now in my backward light cone, the Yankees' win determinately happened for me but at no time was it present for me.[243]

This, however, is not as counterintuitive as it seems under careful reflection. Because the Yankees' win in 1998 could possibly causally influence me – the knowledge of the Yankees' glory luring me into fandom – it is a part of my past even though I never experienced the glory firsthand. Furthermore, the traditional understanding of temporal becoming faces an analogous problem; in the traditional understanding of becoming, there are events that are present for me but can never be experienced in that present. The traditional understanding of becoming is in fact more counterintuitive than its revised counterpart. According to the traditional understanding, an event that is spacelike

[243] *ibid*, p. S594

separated from me, and therefore can never be observed by me NOW, is part of my present. In addition, an event that was never observed by me and cannot be part of any of my interactions is held to be, in the traditional conception, part of my past. If anything, this is the more counterintuitive of the results.

Callender points out a second counterintuitive consequence of **R** that the events that are in my past light cone (and thus have become for me at a certain spacetime point) depend on my velocity. He pithily notes that a vast number of stars have B-come for me because of my detour to the kitchen in search of a snack. But this complaint is also not as problematic as it seems. These stars exist for me, but now they have B-come for me. B-coming means I have causal access to them; and this is not counterintuitive – my actions in this moment determine what events I can observe and interact with.

Our intuition of temporal becoming is of a plane of simultaneous events becoming real. But, relativity tells us this cannot be the case. The counterintuitive results of revising our understanding of becoming does not mean that B-coming should be rejected. This is because our *experience* of temporal becoming is *not* one of a plane of simultaneity becoming real. Simultaneity of events with my present can have no effect on what I currently experience. Thus, I cannot experience anything of the plane of events that are simultaneous with my present. In addition, I have no clear-cut experience of events becoming *real*. I merely observe a change in the objects around me – the fading sun, the melting wax of the candle, the continual sway of the trees in the wind – and therefore my experience need not be necessarily interpreted as one of events "gaining reality." Instead, my observation is of events that I have causal access to – things that can causally affect

me. And the only things that can causally affect me are those events in my past light cone.

A relativized understanding of B-coming in terms of the past light cone of an event does in fact track our experience of becoming, even if it has counterintuitive consequences. These counterintuitive consequences can be dismissed or minimized. Thus, because B-coming is different from our traditional understanding does not mean that it cannot be a replacement for the more traditional account of time. Although B-coming is different from our traditional understanding of temporal becoming, it captures our central intuitions and insofar as it has counterintuitive results, they are results that can be lived with. Therefore, despite its supposed difficulties, B-coming *is* a relation worth wanting instead of being a philosophically idle concept.

5.3 No NOW in Passage

Our intuitions about temporal becoming are that it is a global notion; but this is an intuition that can be discarded. Our intuitions about passage also tell us that it requires a privileged present moment – a NOW. That there is a privileged present moment thus is almost universally held to be a prerequisite for any conception of passage as a part of the world. My revised version of passage does not include any appeal to the NOW; as a result, this theory of passage does not meet the basic prerequisite for a conception of passage. The straightforward complaint is that without a NOW, the proposed revision cannot suffice for a theory of passage. Put simply, there is no passage without a NOW. Because of this, there can be no theory of passage that finds a home in the B-theory blockworld.

5.3.1 Revising Temporal Change

But that passage requires a privileged present moment is a relic of the tyranny of McTaggart's legacy. Philosophers of time (presentists in particular) have proved willing to revise McTaggart's views on the passage of time to meet metaphysical objections, and so my revision should be understood as part of the same tradition. By this I mean the following: passage has always been formulated in terms of temporal change. The original understanding of temporal change is offered by McTaggart as the change in the temporal properties of an event. McTaggart (1908) states,

> Take any event – the death of Queen Anne, for example – and consider what changes take place in its characteristics. That it is a death, that it is the death of Anne Stuart, that it has such causes, that it has such effects – every characteristic of this sort never changes…But in one respect it does change. It was once an event far in the future. It became every moment an event in the nearer future. At last it was present. Then it became past, and will always remain past, though every moment it becomes further and further past.[244]

In this way, McTaggart considers temporal change to be the change in the temporal properties (the A-properties) of an event. The change in the temporal properties of an event is therefore the basis for the passage of time; time passes by way of events being future, and then present, and then past. But this, according to McTaggart, leads to a contradiction: every event cannot possess all three properties – but this is required for temporal change.

Enter the presentist, who asserts that the way to avoid McTaggart's Paradox is to hold that no event has all three incompatible properties of pastness, presentness, and futurity. Instead, events can only be present. If an event is not present, then it does not exist. Because of this, no event can possess the temporal properties of pastness or futurity, and no contradiction arises. In this way, the presentist revises McTaggart's understanding of temporal change. Originally formulated as a change in the temporal

[244] McTaggart (1908), p. 460

properties of an event, the presentist formulates temporal change as the change in what exists from one moment to the next. This revision in the formulation of temporal change allows the presentist to avoid McTaggart's Paradox.

But in response to both McTaggart's Paradox and the problems of temporal change faced by the presentist, the understanding of temporal change must again be revised. Thus, my proposed revision is in response to metaphysical problems just as the presentist's revision is in response to the problems posed by McTaggart. Temporal change is formulated in my account as a change in what has B-come for a thing over the span of the temporal dimension. This change is more specifically formulated as a difference in what has B-come for the different temporal parts of a thing. Or, in other words, temporal change is a thing having different temporal parts that stand in becoming relations to different events.

5.3.2 Temporal Change Without a NOW

There have been differing conceptions of temporal change: the change with respect to the three temporal properties; the change with respect to what exists; and the change with respect to differing temporal parts standing in different becoming relations. McTaggart holds that we cannot have temporal change without the three temporal properties. Thus, the three temporal properties are central to McTaggart's account of temporal change. The presentist denies that temporal change requires the three incompatible temporal properties and holds that we can have temporal change with just one of the temporal properties. Presentness is the central part of the temporal change of the presentists, but presentists drop pastness and futurity in response to the problem of McTaggart's Paradox. In response to problems that the A-theories face, I revise the

central role of presentness by dropping it altogether. In this way, I deny that presentness is required for temporal change and hold that we can have temporal change without any of the temporal properties. This just continues the revision of temporal change started by the presentist. Dropping presentness from the picture is just continuing the revision in response to philosophical problems. In response to the problem that this is not what we understand to be the passage of time, I reply: the arguments in the project show that we must, as the presentist has done, revise our understanding of the passage of time. Thus, without good reason for an objective privileged present, holding that the NOW is required for passage is begging the question against the proponent of the B-theory blockworld. Dropping the NOW from an account of passage is just the natural evolution of the understanding of passage in response to the metaphysical (and scientific) problems it faces. As long as my account of passage meets the standard of temporal change, dropping the NOW from passage should be acceptable.

5.4 Passage and the Lack of Temporal Change

Dropping the privileged present from the picture of passage, however, is not as easy a task as I might have made it seem to appear. Is change that does not involve a NOW qualify as *temporal* change? The denial of temporal change as the change in what is present results in the most significant problem for a proponent of passage in the B-theory blockworld: the doubt that the B-theory blockworld proponents have the resources to accommodate an adequate account of temporal change. According to the traditional understanding of passage, the change in the NOW is what separates the march of time from the frozenness of space. As Dieks (2006) explains, "Without a unique series of

nows all events must have their places in spacetime in the same way as the objects on my desk possess their spatial positions."[245] Thus, the complaint against the revised version of passage brings us back to the original problem of the B-theory blockworld: the B-theory blockworld lacks the kind of change that is required for the passage of time; therefore, any account of passage set in the B-theory blockworld is inadequate.

5.4.1 The Problem of Temporal Change in the B-theory Blockworld

More specifically, the objection is that the whole four-dimensional object of the spacetime manifold in the B-theory blockworld does not change; all of the becoming relations are forever the same for each temporal part of the object. Thus, difference in temporal parts of the four-dimensional object amounts to mere variation – the very same as the "change" in the spatial dimension. In other words, my version of temporal change amounts to different temporal parts possessing different relations. But, the objection goes, this is no different than spatial parts of an object possessing different relations. And, as a result, this temporal variation does not differ from spatial variation. Time's passage must provide the differentiation of time from space; but if temporal change is no different than spatial change, then an account of passage based on this temporal change cannot provide a differentiation of time from space. According to the objection, my version of temporal change that can also be found in space – because both temporal change and spatial change amount to mere variation. In the end, the objection is that without temporal change in the form of the change in the NOW, the revised version of passage has no room to claim that time sometimes flies and sometimes crawls while space stands still.

[245] Dieks (2006), p. 168

5.4.2 Justifying Temporal Change in the B-theory Blockworld

The dominant theme of the first half of the project is that no theory of time can accommodate temporal change in the form of change in the NOW while the dominant theme of the second half is that a theory of the passage of time need not involve this kind of change. The revised version of passage is based on an objective process of temporal becoming which accounts for the transitory nature of our temporal experience while providing the differentiation of time from space. Because of this, the fact that there is no change in the NOW in the revised version of passage does not mean that it does not suffice as a successful account of time's passage. In short, I deny that the temporal change in a theory of passage needs to be change in the NOW.

In my revised version of the passage of time, I propose dropping the privileged present moment and argue that there is no need for this NOW. But without the NOW it seems as if there is no room for "genuine" change in the form of the change in the NOW. But do we really need this genuine change for the passage of time? I hold that if my proposed version of temporal change can satisfy the need that so-called genuine change fulfills in the traditional understanding of passage, then I can show that genuine change (change in the NOW) is not an indispensible part of a theory of passage. That is, my revised version of passage does not need to appeal to change in the NOW because my version of temporal change can achieve that which the change in the NOW is traditionally put forward to accomplish.

This involves two claims: that temporal change is not analogous to spatial variation, and that because of this, change in the NOW is not needed to provide the foundation for a differentiation of time and space. First, the traditional understanding of

passage, change in the NOW serves to distinguish time from space.[246] That is, the NOW changes from one moment to the next which means that the NOW changes in the temporal dimension. The totality of temporal facts changes from one moment to the next; on the other hand, the totality of facts throughout space does not change from one position in space to the next. Thus, the purpose of including change in the NOW as temporal change is to accomplish one of the tasks that any adequate theory of passage must do: to differentiate space from time. The problem for the B-theory blockworld, according to its opponents, is that time is static like space is static – there is no genuine temporal change in the temporal dimension. The traditional charge against the B-theory blockworld is that its version of temporal change cannot differentiate space from time because temporal change in the form of temporal variation is analogous to spatial variation. My reply is to show that temporal change in B-coming is not analogous to spatial variation, and because of this, temporal change in B-coming can provide a foundation for the passage of time. If this is the case, then the role of change in the NOW can be fulfilled without needing to propose an account of passage that includes this kind of change. In this way, I am justified in dropping change in the NOW from the picture.

5.4.3 The Temporal Realm of **R**

Temporal change in my version of passage is not analogous to spatial change because the variation in time is different in kind from the variation in space. This is due to the fact that time is qualitatively different from space. This difference in the temporal dimension from the spatial dimensions is found in the existence of **R** in the temporal dimension and its absence from the spatial dimensions. Furthermore, this **R** relation serves as the foundation of the element of the present and the past bringing about the

[246] This has been briefly addressed in Chapter 1.

future. In contrast, there is no relation that any spatial objects can stand in that licenses one to hold that an event to the north brings about an event to the south of it, for example. Because of this, it is not change itself that differentiates time from space, but the relations that hold in the temporal dimension. That is, time is different from space because time is the dimension in which earlier events bring about later ones. As a result of this qualitative difference between time and space, the temporal change involved in the revised version of passage is not like the change of the color of the lawn when one walks across it. In this way, time is different from space, but not in a way that requires appeal to change in the NOW. The change in the NOW is originally required to differentiate time from space and to provide the foundation for the difference between temporal change and spatial variation. In my revised account, I can successfully differentiate time and space and provide the foundation for the difference between temporal change and spatial variation all without appeal to a privileged present moment.

Thus, one does not need change in the NOW to differentiate time from space; can do this through the **R** relation. The revised account achieves the purpose that change in the NOW is put forward to achieve by the traditional understanding of the passage of time. Because of this, I am justified in dropping the requirement that change in the NOW is needed for the kind of temporal change required by the passage of time. Time is different from space because there is B-coming in time, but not in space. Temporal change in B-coming, therefore, is not "mere" variation, and it is, in fact, different from the mere variation in space. Thus, opponents of passage in the B-theory blockworld cannot point to the fact that because the variation space does not support the passage of space, the variation in time cannot support the passage of time. The variation in time *can*

support the passage of time. This is due to the fact that temporal change has a property that the mere variation in space labeled "spatial change" does not – that temporal change is the difference in **R** among a thing's temporal parts. Spatial parts of a thing cannot stand in an **R** relation and so time is differentiated from space by virtue of this relation. In this way, there is a qualitative difference between space and time by way of B-coming. The variation in time is the change in **R**; and this variation of what has B-come for things gives rise to the passage of time.

There is no passage in space because there is no variation of the **R** relation – that is, there is no B-coming that is limited to the spatial dimensions. Thus, the lack of B-coming in space is not because there is a lack of change in the NOW in space. This is achieved because B-coming occurs across time but not across space. Therefore, the passage of time in the B-theory blockworld does not need change in the NOW.

5.4.4 The Experience of Temporal Change

An opponent might object that without change in the NOW, the revisionist cannot account for the shift we experience when time passes. In other words, without change in the NOW, there is no way for the revised version of passage to accommodate our experience that there is a shift in how the world is when the future arrives through the change in what has become. My response is to call for a closer examination of the nature of our experience of temporal change. The experience of temporal change is not one of experiencing a new thing coming into existence from nothing or an event being lit up by the spotlight of the NOW. Furthermore, my experience of temporal change is not one in which the temporal facts of the world as a whole alter. Instead, the only experience we have of time is a qualitative change in other things. The seed changes into a sapling

which then changes into a tree. We do not experience the tree coming into existence out of nothing. Nor do we experience the tree becoming present by being lit up by the NOW. Instead, we experience the qualitative change in the tree – it's being a seed and then a sapling and then a tree. This qualitative change is accommodated by the temporal change proposed in the revised version of passage. At this point, that this shift in how the world is requires change in the NOW begs the question, because our experience of the shift is not one which requires this kind of change and not one which is necessarily needed.

5.5 Conclusion

In this revised version of passage that takes place in the B-theory blockworld, there are no extra ingredients added to the events in the four-dimensional manifold and the relations in which they stand with respect to one another. Opponents object that without this extra ingredient of the NOW, there is no passage in the B-theory blockworld. The most plausible objections share a common theme that neither temporal becoming nor passage can exist without a privileged present moment. The charge is that the view is too metaphysically austere; the B-theory blockworld, opponents hold, needs more than the events and relations in the four-dimensional manifold.

This complaint is expressed in the various formulations above. The first objection is that Stein's relativistically respectable becoming relation – which amounts to B-coming – must be rejected because it cannot make room for events to share a present. That is, because temporal becoming is defined as an asymmetric relation that holds between events, no events can mutually B-come as of one another; thus the present of an event cannot be constituted by more than that event alone. But I point out that the fact

that one need not consider "sharing a present" to be equivalent to "mutually becoming." Instead, the present of an event is to be considered the "B-coming present" based on the "specious present" which is an extended spatiotemporal area defined in terms of the light cone. The B-coming present, I argue, satisfies our intuitions that the present consists of events that we can observe and interact with better than the traditional alternative of the present as a plane of simultaneous events. Postulation of the B-coming present not only meets the objection that the present of an event is not extended, but it also tracks our understanding of the present better than the A-theory's conception of the present.

The second objection is that B-coming is not a relation worth wanting; B-coming is supposedly too far removed from our understanding of the traditional conception of temporal becoming due to its counterintuitive consequences and, although it is technically adequate, it is nonetheless philosophically idle. I concede that **R** is different from our traditional conception of temporal becoming, but respond that it is not the case that these unintuitive consequences cannot be overcome. The traditional conception of becoming involves ordered global hyperplanes coming into existence or gaining presentness; the revised conception of becoming involves a local process – what has B-come is relativized to an event. Our temporal experience, however, does not in any way depend on becoming as a global notion, and so I hold that abandoning a global notion of becoming may be different from our commonsense intuitions, but this abandonment is a justified response because the nature of our temporal experience can still be preserved.

The third objection, in essence, denies the possibility of passage without a NOW. I respond that a theory of passage that is based on B-coming is good enough; dropping the NOW from the theory is the best way to avoid the problems that the traditional theory

of passage faces. In dropping the NOW, I give a revised version of temporal change which preserves the intuition that time's passage importantly involves a shift in the temporal dimension that is absent from the spatial dimension. The last complaint against passage in the B-theory blockworld is that my version of temporal change cannot suffice for passage because it is not change in the NOW. The objection is that without a privileged present moment, any account of change in the B-theory blockworld involves unchanging relations, and because of this, time must be static in the same way that space is static. I reply that the purpose of the inclusion of change in the NOW in a picture of passage – to ensure that time is differentiated from space – can in fact be fulfilled without appeal to change in the NOW. Because of this, insistence on the inclusion of changing NOWs in a theory of passage simply begs the question against the proponent of the B-theory blockworld.

In the end, this revised version of passage is that which differentiates space from time and provides the transitory nature of our temporal experience. In addition, this passage is based on an account of temporal becoming, thereby satisfying the requirement that passage be a process of temporal becoming. We can do this without appeal to a NOW and therefore without appeal to change in the NOW, thereby allowing that time passes in the B-theory blockworld. Our science has shown that we must revise our traditional understanding of concepts; I have outlined how this is the case here with passage. This revision is acceptable because it captures our essential understanding of the nature of time. In addition, the revised understanding of passage is dictated by the best scientific description of the world and is at the same time faithful to our temporal experience. As a result, there is passage in the B-theory blockworld.

Conclusion: Future Directions

I defend the combination of ideas that time passes and that the universe a four-dimensional block without an objectively present moment. This is almost universally taken to be a strange – and inconsistent – combination of views to endorse. The conventional wisdom is that these two beliefs are incompatible. My overall project, therefore, is to reject this conventional wisdom and defend the unusual combination of time's passage and this supposedly unchanging and static universe; I show that time *can* pass in the B-theory blockworld.

The traditional articulation of passage is the change (or shift) in the NOW. The problem with this understanding is that the standard interpretation of STR rejects the possibility of picking out a class of simultaneous events as the privileged present. Without a NOW, there can be no change in the NOW, and therefore no passage of time in the kind of world required by relativity. As a result, almost all philosophers of time hold that one must choose between STR and the passage of time. We are then left with an unattractive choice: reject the best scientific theory of the nature of time or hold that our pervasive and common temporal experience of time's passage is an illusion. I argue that we do not need to make this unattractive choice; we can endorse a special relativistic B-theory blockworld and preserve the passage of time.

To do so, I first argue that the passage of time cannot be understood as the change of the NOW as things "temporally become" present. The passage of time requires commitment to two theses: The Present Thesis that there is one objectively privileged

present moment and the Change Thesis that the one objectively privileged present moment changes across time. I show that the two theses are in conflict, although this conflict manifests in different ways in the different A-theories of time. In the moving spotlight view, the conflict of the two theses is the basis of McTaggart's Paradox. In presentism, the conflict of the two theses is highlighted through the presentist's inability to adequately account for the difference in what moment is present as a result of his austere ontology. In the growing block view, it seems that the conflict between the two theses can be avoided through appeal to absolute becoming. But I show that absolute becoming itself requires commitment to two contradictory elements, and should be rejected. The conclusion of the first part of the project is that if time does pass, it does not pass by way of change in the NOW.

I then suggest an alternative understanding of the passage of time that fits within the metaphysics of the B-theory blockworld; instead of defining the temporal becoming that underlies passage in terms of the pre-relativistic planes of simultaneity, I define temporal becoming as B-coming – a relativistic-friendly relation, **R**, of "having become" between two events in spacetime. This relational becoming avoids the metaphysical problems encountered by the more traditional models of temporal becoming. Passage is thus to be understood as the process of B-coming; more specifically, the process of B-coming involves temporal change as defined in terms of what has B-come for a thing. On this understanding, temporal change is the difference in what has B-come for different temporal parts of a thing. I defend this account by showing that it satisfies all of our important intuitions about passage: that it is a process of temporal becoming involving temporal change, that it provides the basis for the difference between space and time, and

that it accommodates the transience of our temporal experience. I end by considering the most plausible objections against B-coming and passage, including that the B-coming relation has unacceptably counterintuitive consequences and that passage cannot be formulated without a NOW.

The most important question is why we should want B-coming and a theory of the passage of time based on B-coming. This echoes Callender's (2000) complaint to the effect that "one can define *some* relation on Minkowski spacetime and *call* it becoming. The interesting question is whether one can define on Minkowski spacetime a relation that is philosophically well-motivated."[247] Callender holds that there is no such motivation for **R** and so **R** is not a notion of becoming worth wanting. His objection concerns two separate problems: that **R** is too different from the traditional understanding of temporal becoming and that **R** has objectionably counterintuitive consequences.

I respond that **R** is indeed different than the traditional understanding of temporal becoming, but this is due to the fact that the traditional understanding must be (significantly) revised as a result of its scientific and metaphysical problems. But that B-coming is far from the traditional understanding of becoming does not necessarily mean that it should be rejected. The question we should ask is whether B-coming captures our important intuitions about becoming. I argue that it does. B-coming can account for the openness of the future and the fact that the present and the past bring the future about. Appealing to **R** can explain why we do not experience things that have not B-come. In addition, **R** provides the differentiation of space and time.

I admit that there are counterintuitive results to holding that **R** is temporal becoming, including giving up the observer-independence of becoming, and having to

[247] Callender (2000), p. S594, emphasis in original

deny that two events can mutually B-come. But I show that the observer-independence of B-coming is not as problematic as it seems. Furthermore, I make room for a shared present in the form of the B-coming present in order to alleviate the worries that endorsing **R** results in a point present.

Adding a theory of passage based on B-coming serves to increase the number of intuitions about the transience of time that can be captured by the theory: passage is a process of B-coming, passage involves temporal change, and this temporal change can accommodate this experience of the shift in the world as time rushes or crawls by. In this way, my theory of the passage of time in the B-theory blockworld is an account worth wanting because it is a scientifically respectable way of accommodating a fundamental part of the world while at the same time capturing all of the important intuitions about what passage and becoming is like.

Overall, my project addresses a central issue in metaphysics: the metaphysical conflict between what our best science tells us the world is like with respect to time – a four-dimensional manifold without an objectively privileged present moment – and our temporal experience in which time passes by way of the change of the NOW. In the metaphysics of time, those philosophers who want to preserve the existence of the passage of time reject STR on the basis of our commonsense intuitions. In its stead they offer alternate theories aimed at preserving the existence of time's passage. My dissertation defends a revised account of the understanding of the passage of time that allows us to save the passage of time without rejecting our best science.

In this project I hold that the constraints of STR should be respected. My opponents, however, reject the standard formulation of STR due in large part to its

conflict with our common sense. The natural starting point of future research explores this issue in a larger context; what should give way in cases like these: common sense or our best scientific theories? Thus, the debate follows the more general theme of deciding what path to take when conflicts arise between commonsense or basic intuitions and what our best scientific theories tell us about the world. Some advocate commonsense metaphysical commitments – desert landscapes in the place of ontological extravagance, for example. Others advocate a strict allegiance to science; science is king in deciding ontological debates.[248] An in-depth exploration of this particular issue is fascinating, complex, and a research project in its own right. In the temporal case, I take the central path of reconciliation between commonsense and science. I attempt to straddle the two options by offering a justified revision of our central concepts in order to preserve both our commonsense intuition that time passes and the integrity of the standard interpretation of STR.

In some cases, however, commonsense and science cannot be reconciled. In these types of cases, our science and our commonsense or metaphysical commitments are in conflict. One particular example is the many worlds interpretation of quantum mechanics.[249] If this is the correct interpretation of the quantum world, then our commonsense beliefs that there is only one universe – ours – that exists is in conflict with what is actually the case – that there are infinitely many branching universes which we never causally interact with.

For some, commonsense or metaphysics intuitions should constrain what scientific theories are to be accepted. Zimmerman (2007) expresses his commitment to

[248] See, for example, Ladyman and Ross (2007).
[249] The fundamental idea is found in Everett (1957).

this view in the case of the nature of time when he claims that "we should admit that being part of commonsense gives a belief a *non-negligible* positive status."[250] In addition, because our scientific theories are underdetermined by empirical evidence, there is a strong argument to be made in favor of those views that respect our common sense. In other words, the methodological problems in science count against scientific theories trumping commonsense. On the other hand, it is not clear that appeal to common sense or intuition is itself an adequate methodology, particularly when there is little to no reason to think that this commonsense is in any way an objective guide to the world. The scholastic worldview that dominated in the centuries leading up to the Scientific Revolution is a good illustration of the way in which metaphysical assumptions can lead scientists astray. This worldview was made up of a combination of Christianity and a collection of the ideas from Aristotle, including the division of the Earthly and Heavenly realms and the perfection of the circle. As a result, geocentric models of the universe which included circular orbits of the planets and the stars dominated as the standard metaphysical assumption of the commonsense view of the world and the scientific understanding of the world followed suit.[251]

It is therefore important to undertake a more fundamental project – one of the exploration of the standards of deciding metaphysical debates. I support a defense of naturalistic metaphysics – the defense of an appeal to science over our commonsense intuitions. This approach has been gaining favor recently.[252] Largely absent from the approach, however, is any justification of the appeal to science; this is especially important in light of the difficulties of the scientific method.

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[250] Zimmerman (2007), p. 223, emphasis in original
[251] Koestler (1959) and Westfall (1971)
[252] See, for example, Ross, Ladyman, and Kincaid (2013).

There are two main (linked) problems in scientific methodology that must be overcome. The first is the problem of underdetermination.[253] This problem is essentially the problem that many theories in science are empirically equivalent; the empirical evidence – by itself – does not support one theory over another. Thus, in theory choice, one must appeal to extra-empirical standards. This is where the second problem comes in. If "the facts" do not solely determine which theory is the accepted scientific description of the world, then it seems as if subjective factors of social bias and *a priori* commitments must come into play in decision-making in science, which then undermines the objectivity of scientific methodology.

Some, Laudan (1990) for example, hold that underdetermination is not as significant a problem in science as it is often presented to be. But, as issues involved in the interpretation of STR shows, underdetermination is a significant problem. In the standard interpretation of STR, all frames of reference are equivalent; there is no one frame that is singled out as objectively privileged. In the neo-Lorentzian interpretation of STR, there is an absolute frame of reference that cannot, in principle, be detected due to the behavior of the measuring instruments.[254] Because the two interpretations are empirically equivalent, no additional data can determine which interpretation is correct. Merely appealing to empirical data, therefore, cannot give us any information about what spacetime is really like.

I examine the ways in which these problems can be mitigated in order to defend the appeal to science in metaphysics. In other words, the appeal to science in metaphysics needs to be justified, and this justification can only be supplied if the

[253] See Duhem (1914) and Quine (1951) for classic formulations of the problem of underdetermination.
[254] Tooley (1997) presents a detailed version the neo-Lorentzian interpretation of STR.

problems with the scientific methodology can be overcome. I seek to fill this void by justifying a specific appeal to the specific extra-empirical criteria of aesthetic virtue. I further by argue that this appeal itself is justified because it preserves the objectivity of science. As a result, the problem of the subjectivity of theory choice is also avoided.

Scientists do in fact make theory choices based on aesthetic considerations to some extent.[255] Specifically, these aesthetic virtues include the properties of simplicity, symmetry, power, and elegance. These virtues, however, must be systematically set out and justified. Thus, the project is to first examine what it means for a scientific theory to possesses these various aesthetic traits. The second part then involves justifying the appeal to these virtues by arguing that these traits are objective features of a scientific theory. And if this is the case, then theory choice can be based upon objective criteria, thereby avoiding the subjectivity of the methodology of science. I hold that the aesthetic virtue of a scientific theory is known by rational reflection. Insofar as we can grasp the aesthetic evaluation of a scientific theory through this rational insight, our judgment of the aesthetic virtue of a scientific theory is free from the biases and presuppositions that are the basis of the subjective nature of scientific methodology.

In this way, I defend the view that appealing to our best scientific theories as judged by its aesthetic virtue is in fact the best methodology in deciding metaphysical debates. Ultimately, I hold that the challenges to the methodology of science can be overcome and that science can in fact retain its special epistemic status. This is only the case, however, if the extra-empirical criteria that must be appealed to in the process of theory choice preserve objectivity. Appealing to the aesthetic virtues, I hold, is an objective standard, and, as a result, can preserve the objectivity of scientific

[255] For an examination of this process, see McAllister (1996).

methodology. In the end, in appealing to beauty as a standard for theory choice, the methodology of science can in fact render an objective verdict on the ontology of the world. The result is a justification of the appeal to science as the standard by which to resolve metaphysical debates.

Proposing a theory of passage based on B-coming is my defense of a way to reconcile science and commonsense. But, this reconciliation is not always something that can be achieved. In the case of irreconcilable conflict between science and commonsense, commonsense should give way to science. But this standard needs to be justified. And this justification is what I seek to give in my future research. In giving this justification of appealing to science, we can, in turn, strengthen the position that the discipline of metaphysics is the study of the nature of reality.

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