Though the central topic in this book is the metaphysics of persistence, I first want to discuss some related issues in the philosophy of time that bear on the question of temporal parts. The goal is to explain and defend a “B-theory” of time, which I then presuppose for the remainder of the book.

1. Two issues in the philosophy of time: ontology and tense

There is first the ontological status of the past and future. According to eternalism, past and future objects and times are just as real as currently existing ones. Just as distant places are no less real for being spatially distant, distant times are no less real for being temporally distant; the ontological significance of distance is thus a respect in which time is space-like. Reality consists of a four-dimensional spatiotemporal manifold of events and objects — the so-called “block universe”. In the block universe, dinosaurs, computers, and future human outposts on Mars are all equally real.\(^\text{11}\)

According to presentism, on the other hand, only currently existing objects are real. Computers, but not dinosaurs or Mars outposts, exist. Though I think presentism ultimately must be rejected, its guiding intuition is compelling: the past is no more, while the future is yet to be. Presentism is analogous to modal actualism, according to which reality consists only of actuals. The opposing position in the philosophy of modality, possibilism, according to which reality also

\(^{11}\) Defenders of eternalism include Goodman 1951, chapter XI; Mellor 1981; Quine 1960, section 36; Russell 1915; Smart 1962; Williams 1951.
contains merely possible things, is analogous to eternalism.\textsuperscript{12}

Intermediate between the polar opposites presentism and eternalism is the view, defended by C. D. Broad (1923, chapter II) and more recently by Michael Tooley (1997), that the past is real but the future is not. On this view reality consists of a growing four-dimensional manifold, the “growing block universe”.

The status of tense is a second issue in the philosophy of time. Tensed sentences are those which presuppose a certain position or vantage point within the whole of time, for example:

\begin{quote}
It is now raining
It was the case that there existed dinosaurs
I will one day visit Utah.
\end{quote}

Not all sentences involving time are tensed, for example:

\begin{quote}
It is raining on June 28, 2000.
World War I occurred after the American Civil War
There existed dinosaurs before the appearance of this book
\end{quote}

Following McTaggart (1908), tensed and tenseless temporal judgments are often called A-judgments and B-judgments, respectively. The concepts now, was, will and the like are called A-concepts, whereas the concepts before, after and related concepts are called B-concepts. The

\textsuperscript{12} On presentism see Adams 1986; Bigelow 1996; Hinchliff 1996; Markosian 2002; Merricks 1994a; Prior 1968a, 1968b, 1970; Zimmerman 1998b; and my 1999b; for a more complete list of references see Markosian’s note 3, and Bigelow’s bibliography.
mark of B-concepts is that they can be applied without knowing at what point in time they are being applied, whereas A-concepts require a vantage point. Relatedly, A-judgments typically change in truth value. A current utterance of ‘It is now raining’ is true, but future utterances will be false. In contrast, B-judgments are permanent: it is, always has been the case, and always will be the case that it rains on June 28, 2000. (If, as some say, the future is “open”, the permanence of B-judgments should instead be characterized as follows: once a B-judgment takes on a certain truth value, it forever after retains that truth value.)

Do tensed judgments concern features of reality that are in some sense irreducibly tensed, or can their truth be reduced in some way to tenseless facts about time, those expressed by B-judgments? The leading idea for the reduction of tense is that tokens of tensed sentence types, whether uttered or thought, can be given tenseless truth conditions. Consider a token, \( o \), at some time, \( t \), of the tensed sentence ‘It is now raining’. This token may be given a tenseless truth condition: \( o \) is true iff it is raining at \( t \). The truth condition is tenseless because ‘raining at \( t \)’ is a tenseless locution: if it is in fact raining at some particular time, \( t \), then it always has been the case and it always will be the case that it is raining at \( t \). The tenseless truth condition for a token at \( t \) of the tensed sentence ‘There existed dinosaurs in the past’ would be that there exist dinosaurs before \( t \). Early reductionists set themselves the goal of translating tensed sentence types into synonymous tenseless sentence types, but contemporary reductionists content themselves with providing truth conditions for tensed tokens in the way described.

On this account, A-locutions like ‘past’, ‘present’ and ‘future’ may be usefully compared

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13 See especially Mellor 1981. Revisions to this “token-reflexive” theory along the lines of Kaplan 1989 are desirable; see for example Mellor 1998.
with indexical words like ‘I’ and ‘here’. These indexical words make different contributions to
the truth conditions of sentences depending on the context in which they are uttered. If Gore says
‘I will win the election’, what he says is true iff Gore wins; using the very same sentence, Bush
makes a statement with different truth conditions — that Bush wins. Someone located at the
North Pole will speak the truth by saying “It is cold here”, whereas the very same sentence
expresses a falsehood when uttered at the equator. It is part of the semantics of ‘I’ that it refers to
the person who utters it, and part of the semantics of ‘here’ that it refers to the place of utterance.
The temporal reductionist claims that tensed locutions are similarly indexical. ‘Present’ applies
to an event iff it occurs at the time of utterance, ‘past’ to an event iff it occurs before the
utterance, and ‘future’ to events occurring after the utterance.

The reductionist goes on to give a general account of tensed language in this way, and
concludes that nothing corresponding to tense need be admitted as a fundamental feature of the
world. Anti-reductionists deny this reduction of tense, for one reason or another, and claim that
tensed facts, for example the fact that dinosaurs existed in the past or that it is now raining, are
ultimate features of reality. The pastness of dinosaurs is not simply the fact that dinosaurs are
located before the time of this utterance. Anti-reductionism about tense is often called the “A-
theory” of time; its defenders are said to “take tense seriously”. The traditional dispute over
whether time “flows” is perhaps this same dispute: A-theorists accept time’s flow or movement,
whereas reductionists are said to accept a “static” account of time.14

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14 Contemporary discussion of the status of tense springs from the seminal McTaggart
1908 and 1927, chapter 33. Reductionists about tense include Goodman 1951, chapter XI;
Mellor 1981 and 1998; Quine 1960, section 36; Russell 1915; Smart 1962; Williams 1951. A-
theorists include Gale 1968; Prior 1957a, 1967, and 1968c; and Schlesinger 1980. For further
discussion and references see Le Poidevin 1991; Markosian 1992, 1993, and 1995; Oaklander
The reductionist’s account is called “static” because B-judgments do not change in truth value. Since a B-description is claimed to capture all of the facts about time, in a sense the reductionist claims that the totality of temporal facts does not change. This is not to say that reductionists deny the existence of what is ordinarily thought of as change. Ordinary change, for the reductionist, emerges from the truth of B-judgments such as these:

The poker is hot on Thursday, June 29, 2000
The poker is not hot on Friday, June 30, 2000

Neither judgment changes in truth value; nevertheless, the temporal reductionist says, the poker changes, in virtue of the truth of this pair of statements. (This account of change is discussed further in chapter 6, §2.)

Our two disputes — over the reality of past and future and over the status of tense — are intimately linked. The most obvious link is that only the eternalist seems to be in a position to offer the aforementioned reduction of tense. The alleged truth condition for a current token of ‘there existed dinosaurs in the past’ is that there exist dinosaurs before t, where t is the time of the token. But this truth condition says that there exist dinosaurs, albeit located before t, which no less commits one to dinosaurs than saying that there exist dinosaurs located on the moon. Reductionists about tense, then, are invariably eternalists. The combination of reductionism about tense and eternalism is commonly called the “B-theory of time”.

Presentists reject the existence of merely past and future objects and so cannot make use

and Smith 1994; Smith 1993.
of the reduction of the tenses. But no sensible presentist would flat-out reject all temporal talk. Presentists must therefore be anti-reductionists about tense; they must deny that tokens of ‘there once existed dinosaurs’ have truth conditions involving quantification over past dinosaurs. The usual move here is to regiment such sentences using sentential “tense operators”, analogous to the sentential modal operators of modal logic, and claim that these tense operators are primitive. The tense operators include ‘WILL’ and ‘WAS’, as well as the metrical tense operators ‘it WILL be the case \( n \) units of time hence that’ and ‘it WAS the case \( n \) units of time ago that’. These tense operators combine with present tense sentences to form complex sentences, for example: ‘WAS(there exist dinosaurs)’. For the presentist, such a sentence can be true despite the non-existence of a past containing dinosaurs; existential quantification within the scope of a tense operator like ‘WAS’ is not ontologically committing. (Note the parallel between the presentism/eternalism and actualism/possibilism disputes. The possibilist analyzes the modal sentence ‘\( \Box \) (there exists a unicorn)’ in terms that quantify over possibilia: ‘there exists a unicorn located in some other possible world’, whereas the actualist admits the truth of the modal claim while denying the existence of non-actual unicorns and thus denies the correctness of the analysis.)

Some say presentists and eternalists do not genuinely disagree since each side admits tensed talk. The alleged disagreement is over quantified sentences such as ‘there exists a dinosaur’. But the dispute would disappear if the presentist and eternalist meant different things by the quantifier. Suppose, for example, that what the eternalist means by ‘there exists (atemporally) an \( x \) such that ...’ is what the presentist would express by a disjunction of combinations of tense operators and present tense quantifiers: ‘WAS(\( \exists x \ldots \)) \lor \exists x \ldots \lor \ldots’
WILL(∃x...)\footnote{15 \textit{Compare Sellars 1962, pp. 546-550 and 566.}}. Then, it might be claimed, the disagreement vanishes, for the presentist will accept the first disjunct of ‘Either there was a dinosaur, or there is a dinosaur, or there will be a dinosaur’. However, this translation procedure will not dissipate all ontological disagreement between eternalists and presentists, for it sometimes maps claims the eternalist accepts to claims the presentist rejects. Since this translation procedure is the most likely strategy for reconciliation, genuine opposition is restored. An eternalist who believes in sets would accept the claim that there exists a set containing a dinosaur and a computer, but the presentist will reject the disjunction:

\[
\text{WAS}(\exists x \ x \text{ is a set containing a dinosaur and a computer}) \text{ or } (\exists x \ x \text{ is a set containing a dinosaur and a computer}) \text{ or WILL}(\exists x \ x \text{ is a set containing a dinosaur and a computer})
\]

One can think informally of $[\text{WAS}(\varphi)]$ as saying that at some past time, $t$, $\varphi$ is true at $t$. (The presentist will not, of course, accept this as an analysis since it quantifies over merely past entities — times — but should accept it as a useful heuristic). The first disjunct, then, says (informally) that at some time in the past there existed a set containing a dinosaur and a computer; the second says that there exists such a set at the present time, and the final disjunct says that at some future time, some such set exists. Since at no one time did there exist both a dinosaur and a computer, it follows that at no time will there exist a set containing a dinosaur and a computer (assuming that a set exists only if its members do). Thus, from a presentist’s perspective, each of the three disjuncts is false. The eternalist avoids this difficulty by avoiding
the need to locate the set within any one time. Past, present and future, for the eternalist, exists in its entirety as a single block universe, which contains both dinosaurs and computers as parts and thus contains sets with dinosaurs and computers as members.

Some will deny the existence of sets or the principle that a set exists only if its members do. We could consider instead a fusion of a dinosaur and a computer, but some will deny the existence of this thing or its dependence on its parts, just as with sets. However, I am inclined to think that even if these philosophers are correct, the argument still shows that presentists and eternalists genuinely differ. Even if I did not believe in entities like sets or fusions whose existence is contingent on their members or parts, I would regard the argument as showing that if there were any such things, presentists and eternalists would disagree about the truth of statements about them; and that would convince me that in fact presentists and eternalists have differing views about the world.

The idea that presentists and eternalists do not genuinely disagree is seductive, but it leads to claiming that too many other ontological disputes are not genuine, for example over whether numbers or merely possible entities exist. If the “no-disagreement” position were correct for the eternalism/presentism dispute, it would likewise be correct for these other ontological disputes. Actualists and possibilists would not genuinely disagree, nor would mathematical Platonists disagree with nominalists. Applied to the mathematical case, the no-disagreement position would be that ‘exists’ could mean ‘mathematically exists’, in which case it is uncontroversially true to say that there are numbers, or it could mean something like ‘physically exists’, in which case it is uncontroversially true that there are no numbers. In the modal case, the view would be that if ‘exists’ expresses possible existence then there uncontroversially are merely possible
things, but if it expresses actual existence then there uncontroversially are not. Philosophical ontology, on this view, is an impossible discipline. As discussed in the introduction, it is a premise of this book that the no-conflict view of ontology is incorrect. There is a single notion of existence relative to which there can be meaningful dispute. One can meaningfully ask: do numbers or merely possible objects exist — that is, exist *simpliciter*? Given this view of existence we can meaningfully ask: do dinosaurs exist *simpliciter*? The eternalist says they do, while the presentist disagrees.

We have seen that presentists are A-theorists, but some eternalists also reject the reduction of tense.\(^{16}\) According to one such view, reality consists of the four-dimensional manifold accepted by the B-theorist, with an equally real past, present and future. But one slice of the manifold enjoys a special metaphysical privilege: it is the *present*. Which slice is present of course varies over time; the picture of the present is that of a “moving spotlight” successively highlighting different portions of reality.\(^{17}\) Reductionism about tense fails on this view since an atemporal description of the world using B-concepts would leave out which slice of the block universe is present. The temporal reductionist has an “indexical” notion of the present, on which any utterance of ‘the present time’ refers to the time of utterance. There is no metaphysical distinction to what I call the present; I truly call it present simply because it is when my utterance is located. The moving spotlight picture, on the other hand, is that of a “metaphysical” notion of the present; the present is metaphysically privileged. The privilege is not existence, for that


\(^{17}\) Compare Broad 1923, pp. 59-60 (who does not support this view).
would collapse the view into presentism; presumably the exact sense in which the present is privileged is taken as an unexplained primitive. This anti-reductionist notion of the present then yields anti-reductionist notions of the past and future: the past is that which is earlier than the distinguished present; the future is that which is later than the distinguished present.

The problem with the moving spotlight view is that it is unmotivated. It is obvious why a presentist would resist the reduction of tense: the materials for the analysis do not exist.\textsuperscript{18} But if you believe in the existence of past dinosaurs and future Mars outposts, why not employ them in a reduction of the tenses?

It will be seen in chapter 4, §6 that the moving spotlight view can be used to solve the “problem of temporary intrinsics”. That might constitute a reason to believe it. Unfortunately, the solution requires a particularly implausible version of the moving spotlight view.

Some think that Prior’s “thank goodness that’s over” argument can be used to motivate the moving spotlight view. (Prior himself used it to argue for presentism.) Suppose after a painful experience I remark “thank goodness that’s over!” If tenseless facts exhausted reality, then the facts after the experience would be the same as the facts before the experience, so the argument goes; thus it would not be clear what I was thanking goodness for. I am clearly not thanking goodness for the fact that the painful experience is over on October 20, 1998, at 5:23 PM, for I might know beforehand the exact date and time when the pain will cease, but I will not then thank goodness for anything. Himself a presentist, Prior takes the moral to be that we should not believe that past and future pains exist. I am thanking goodness for the fact that the

\textsuperscript{18} Or are constructed from propositions and the tenses themselves, and so are unavailable for use in a reduction, as in Prior 1968b.
pain is no more. However, the defender of the moving spotlight can draw a different moral: the relief is not misplaced since the world has changed in virtue of the pain ceasing to have the property of being PRESENT. The pain has become past, and anyone who has been in pain knows the difference between past and present pains.19

This argument for combining eternalism with irreducible tense is suspect. Compare John Perry’s (1979) case of indexical belief. While shopping in a supermarket Perry follows a trail of sugar leaking from the cart of some shopper, and finally comes to realize that *he himself* is the person making a mess. In coming to this realization he does not come to recognize any new relevant impersonal facts, for he already knows all those. He already knows that *some shopper is making a mess*. He may even already know that *some philosopher is making a mess*. Indeed, he may even know already that *John Perry is making a mess*, for if he has amnesia he may not know that he himself is John Perry. What he comes to realize is that *he himself is making a mess*. What he comes to realize cannot be captured without using personal indexicals like ‘I’, as when Perry says ‘I am making a mess’, or ‘he himself’, as when we say ‘Perry believes that he himself is making a mess’. But this should not drive us to claim that, in addition to all the facts describable in an impersonal language, a complete description of the world must acknowledge metaphysically new facts only expressible in language with indexicals. We should say instead that belief and related attitudes are not exhausted by relations to impersonal propositions. Our understanding of belief, not our understanding of the world, is what is challenged.20

19 See Prior 1959, 1970, and 1996; for discussion see the essays in Oaklander and Smith 1994, part III.

20 How exactly one cashes this out is a matter of controversy; see for example Chisholm 1979, Lewis 1979 and Perry 1979.
What we learn from Perry’s case, we can apply to Prior’s. The cases are not perfectly analogous. For example, Perry’s case crucially involves ignorance. But each concerns psychological attitudes involving expressions that are capable of being regarded as indexical: ‘I’, ‘now’. This parallel points to a serious problem with Prior’s argument, as well as towards a constructive response to Prior.

The problem is that there exist arguments parallel to Prior’s for clearly incorrect conclusions. Suppose the right response to Prior’s puzzle really were to postulate irreducibly tensed facts. We could then construct analogous spatial and personal cases that would force us to postulate irreducibly personal facts and irreducibly spatial facts. But surely we don’t want to do that. Rather than populating the world with this menagerie of perspectival facts, we should instead revise our understanding of psychological attitudes. We have already seen the case pushing us towards irreducibly personal facts: Perry’s messy shopper. And we can push Perry’s case closer to Prior’s by imagining the shopper saying “thank goodness that’s not me making the mess”. For the spatial case, imagine I am relieved that a forest fire has occurred over there, rather than over here. The object of my relief is not captured by sentences lacking spatial indexicals, for example ‘the fire is in New Mexico, not in Syracuse’ for I may not know where I am. If I am ignorant of my spatial surroundings, I may not know the location of the fire by any description other than ‘it is there, not here’. If the right response to Prior’s puzzle really were Prior’s — past and future objects and events do not exist — then parallel examples would push us towards the apparently ludicrous position that other persons and distant places do not exist. And if the right response really were that of the moving spotlight theorist, parallel examples would lead us to postulate irreducible facts of ME-NESS and HERE-NESS.
These parodies show that something is wrong with Prior’s argument, but they do not tell us what that something is. What is wrong with Prior’s argument is that it assumes an incorrect understanding of the nature of attitudes to time, and ignores a way of understanding those attitudes that blocks Prior’s conclusion. The right response to Prior’s example is, in a slogan, to build irreducible temporal perspective into psychological attitudes rather than the world. Relief is inherently perspectival, in that attitudes of relief do not reduce to attitudes towards eternal propositions. One way of developing this idea runs as follows.\textsuperscript{21} Let us understand propositions atemporally, as being true or false \textit{simpliciter}, not relative to time. Prior succeeds in showing that psychological attitudes are not simply relations to propositions, thus understood. A more appropriate object of the attitudes would be what one might call “temporal propositions”: functions from times to (atemporal) propositions. Temporal propositions may be thought of as the linguistic meanings of sentences expressed using temporal indexicals. For example, the sentence ‘Ted’s pain is just now over’ would have as its linguistic meaning the temporal proposition, call it “\textit{over}”, that assigns to any time the atemporal proposition that Ted’s painful experience ceases immediately before \( t \).\textsuperscript{22}

That temporal propositions are appropriate objects of psychological attitudes may be seen as follows. Psychological attitudes are relations between persons and temporal propositions at times. When at \( t \) I thank goodness that my pain is over, the object of my attitude at \( t \) is the temporal proposition \textit{over}. Standing in the psychological attitude of relief to \textit{over} at \( t \) is \textit{not} the same thing as being relieved, at \( t \), that the \textit{atemporal} proposition \textit{over}(t) is true. For as Prior

\textsuperscript{21} Compare Lewis 1979.

\textsuperscript{22} Compare Kaplan’s (1989) notion of character.
points out, where \( t \) is the time at which the pain is over, the person may have known ahead of time that the pain would be over at \( t \). That relief is not reducible to relations to atemporal propositions is, after all, the moral of Prior’s example. Think of the temporal argument \( t \) of the function \( \text{over} \) as corresponding to the indexical ‘now’ that we use to express \( \text{over} \): ‘Ted’s pain is just now over’. A temporal proposition represents a “perspective” within time; the temporal proposition \( \text{over} \) represents the perspective shared by the set of moments \( t \) at which Ted had a painful experience immediately before \( t \) — i.e., the set of times, \( t \), such that \( \text{over}(t) \) is true. To be relieved at a time that my pain is over is to be relieved that I am then in just such a perspective.

Similarly, when I bear the relation of dread to the temporal proposition, \( \text{approaching} \), that assigns to a time, \( t \), the proposition that a pain will occur to me shortly after \( t \), I could express this dread using the sentence ‘a pain will occur to me shortly after \( \text{now} \)’. I am dreading at the time that my then-current perspective is that represented by \( \text{approaching} \).

This conception of the attitudes does not require postulating irreducible tense. Temporal propositions were constructed from purely B-theoretic notions, as functions from times to eternal propositions. Thus, the phenomenon of temporally indexical belief does not require one to reject the reducibility of tense.\(^{23}\)

It is natural, then, for an eternalist to be a reductionist about tense. As noted earlier, presentists must be anti-reductionists. The status of tense on the growing block universe, on the other hand, is rather delicate. On one hand it might seem that Broad and Tooley can accept the eternalist’s reduction of tense. The past exists, on this view, and thus is available for providing truth conditions for tokens of past-tense statements. Since the future is absent, most future-tense

\(^{23}\) Compare Mellor 1981, chapter 5.
Four-Dimensionalism, Chapter 2

I do not say I accept these arguments. For a critical discussion see Tooley 1997, chapter 3.

statements would turn out uniformly false, or lacking in truth value, depending on the details of the account. But this consequence is at least intuitively palatable (unlike an analogous claim about the past), and may even be welcome, for it is part of one argument for the growing block universe view that truths about the future would rule out free will. On the other hand, these truth conditions do not seem applicable to tensed sentences about the growing block universe itself. Broad and Tooley want to say that a current utterance of ‘it once was the case that the entire four-dimensional reality contained only one world war’ is true, since in 1935, for example, the growing block universe only contained what had occurred up until that point. However, if we evaluate the component sentence ‘the entire four-dimensional reality contains only one world war’ with respect to 1935 (let me stipulate that ‘the entire four-dimensional reality’ is to apply to ALL of reality), we obtain falsehood. The reason is that the component sentence concerns all of reality rather than just the “time of evaluation”, and hence evaluating the sentence with respect to 1935 is the same as evaluating the sentence for truth simpliciter. Since reality (now) contains a second world war, the sentence is false. A similar point can be made by invoking the notion of “the crest of the wave”, which is the present edge of reality, the portion of reality such that no events exist after it. The crest of the wave is, while I write this sentence, in 2000, but, Broad and Tooley want to say, it once was in 1935. The problem is that the proposed analysis of a current utterance of ‘WAS-64-years-ago(the crest of the wave is present)’ seems false, since when we inspect the 1935 slice of reality we find no crest.

These examples show that the defender of the growing block universe must accept two

24 I do not say I accept these arguments. For a critical discussion see Tooley 1997, chapter 3.
senses of the tenses. One sense is given an eternalist-style analysis in terms of the manifold; the other captures the *growth* in the manifold. (The defender of the moving spotlight must also accept two senses of the tenses, one reducible to B-facts, the other expressing the movement of the spotlight.) The latter seems not to be reducible to the former, for if it were, the actual growing block universe — a dynamic four-dimensional manifold whose crest is in 2000 — could not be distinguished from a B-theoretic world in which time comes to an end in 2000. On the first sense, the tenses are in an important sense relative to times, since we need a reference point — the time of the token of a tensed sentence — to give an evaluation for truth. The tenses on the second reading are not relative in this way: it is true *simpliciter* that reality used to be smaller, and will be larger.

Michael Tooley appears to deny this (1997, chapters 1, 6 and 7). He defends the growing block universe theory of time, but holds that tenseless notions are analytically more basic than tensed ones. His core temporal notion is that of a state of affairs being *actual at a time*. Like the paradigmatic B-notion of having a property at a time, being actual at a time is a tenseless notion; whether a state of affairs is actual at a time does not change. He then uses this B-notion to give a reduction of various A-notions. The basic idea may be illustrated with an example. An utterance at *t* of ‘there were dinosaurs’, is true iff some time, *t*, is before *t*, and is such that some state of affairs involving dinosaurs existing is actual at *t*.

Tooley applies this account of tensed statements to statements expressing the growth of the block universe:

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25 Tooley 1997, p. 19. I have changed his references to the year 2000 with a date safely guaranteed to be future whenever this book is read — the year 3000.
. . . the states of affairs that are actual as of the year 1990 do not include any that involve purple sheep, whereas, given appropriate advances in genetic engineering, the states of affairs that are actual as of the year [3000] might very well do so. But such a difference is one that, on the face of it, can be described without using any tensed terms, since it is simply a matter of there being a spatiotemporal region in which various non-temporal properties, such as that of being purple, are instantiated, and which is actual as of the year [3000], but not as of the year 1990.

This passage is very confusing. Tooley appears to be saying there are states of affairs involving purple sheep, which are actual as of 3000 but not actual as of 1990. This seems to imply that there are states of affairs involving purple sheep; how then can he uphold the growing block universe view? Granted, he denies that these states of affairs are “actual as of 1990”, and would also deny that they are actual as of 2000, the current time. But they seem nevertheless to exist, on his view.

In interpreting Tooley’s remarks in this way, I have implicitly construed his notion of actuality at a time as a binary relation between states of affairs and times. Given this construal, the statement that there is a state of affairs actual as of 3000 but not actual as of 1990 is parallel to saying there is a democrat who voted for Clinton but not for Carter. It asserts the existence of a state of affairs, and goes on to describe its relations to the times 3000 and 1990. But Tooley may complain that I have not been fair to him. It was a slip, he might say, to make it sound as if there are states of affairs that are actual at 1990 but not 3000. It would be better to say: “at 1990, it is not the case that there is a state of affairs of there being a purple sheep, whereas at 3000 it is the case that there is such a state of affairs”. On this alternate construal of actuality at a time, the binary relation between states of affairs and times, $\tilde{S}$ is actual at $\tilde{t}$, has been replaced by a
sentential operator \([\text{at } t, \varphi]\), where \(t\) may be replaced with names for times and \(\varphi\) with a sentence. Moreover, this sentential operator shares the following feature with the presentist’s operators \(\text{WILL} \) and \(\text{WAS} \): \([at \ t, \exists x\psi]\) can be true even if \(\exists x\psi\) is false — existential quantification inside the scope of the \([at \ t]\) operator is not ontologically committing.

This new position succeeds no better than the first. Tooley can now say that at 3000 there exists a state of affairs involving a purple cow without admitting that there exists any such state of affairs, just as a presentist can admit the truth of ‘WAS(There exist dinosaurs)’ without being committed to the existence of dinosaurs. The problem is that Tooley’s statements about the past, for example ‘in the Jurassic period, there exist states of affairs involving dinosaurs’ are not ontologically committing either. So Tooley has no way to say that the past exists. For that matter, he has no way to say that the present exists. The quantification over states of affairs in the sentence ‘in 2000, there exists a state of affairs involving Ted typing’ remains inside the scope of the ‘in 2000’ operator, and hence is not ontologically committing. To commit to the existence of the past and present but not the future, Tooley would have to say one of two things, either of which re-introduces irreducibly tensed notions. One would be to say that quantification inside the scope of \([\text{at } t]\) is ontologically committing when \(t\) denotes a time at or before the present time. This use of ‘present’ would be irreducible to B-theoretic locutions, and thus would represent irreducible tense. The other would be to state his ontological commitments without using \([\text{at } t]\) operators. He could claim, without embedding this claim within an \([\text{at } t]\) operator, that there exist states of affairs involving dinosaurs and computers, but not purple cows. But this claim cannot be read as being eternally true — before there were computers it was false, and when there are purple cows it will be true — and thus represents an irreducibly tensed state of
affairs. Thus, I continue to maintain that anyone who wants to defend the growing block universe theory must accept irreducible tense.

My discussion of Tooley has crucially employed a notion of existence that is not qualified or indexed in any way. In particular, I have assumed that in order to defend the thesis of the growing block universe Tooley must claim that dinosaurs and computers exist, and deny that purple cows exist. Whatever else he says about what exists or is actual at times, Tooley must make these claims about existence simpliciter. Compare what was said above about the genuineness of the dispute between presentists and eternalists. The difference between the views emerges when we ask: “what exists”? Not “exists at t”; rather, “exists”! Likewise, the modal actualist and the possibilist disagree over what exists, not what exists at worlds; the mathematical Platonist and nominalist disagree over what exists, not over what “mathematically exists” or what “physically exists”. That questions about existence simpliciter are meaningful is central to the legitimacy of ontology.

* * *

In this book I will presuppose the B-theory — eternalism plus the reducibility of tense. It has already been argued that the moving spotlight view is unmotivated; that leaves two main competitors to the B-theory: presentism and the growing block universe. As a matter of fact, the growing block universe theory has pretty much the same bearing on the question of temporal parts as does the B-theory, so most of what I say while presupposing the B-theory could be easily rephrased if the growing block theory is correct. That leaves only presentism. Accordingly, for
the remainder of this chapter I will set out the case against presentism.

2. **Cross-time spatial relations**

The typical presentist’s tense operators include \( [\text{WAS } \phi] \) and \( [\text{WILL } \phi] \), as well as the metrical tense operators \( [\text{WAS}, n \text{ units of time ago, } \phi] \) and \( [\text{WILL}, n \text{ units of time hence, } \phi] \).

These may be thought of, informally, as meaning, respectively, \( [\phi \text{ is true at some past time}] \), \( [\phi \text{ is true at some future time}] \), \( [\phi \text{ is true at the time } n \text{ units before the present}] \), and \( [\phi \text{ is true at the time } n \text{ units after the present}] \). These tense operators in a sense require talk of the past and future to proceed “one time at a time”, for in each case one can think of \( \phi \) as asserted to be true at some one time. This fact was exploited above in demonstrating a genuine disagreement between presentists and eternalists, for the eternalist’s claim that there exists a set containing a dinosaur and a computer could not be located within any one time. This fact also leads to an objection to presentism, that the presentist must deny the truth of everyday claims that concern multiple times taken together.

One example of this concerns cross-time relations, for example the assertion that many current philosophers admire Socrates. Another example, due to David Lewis (2002), involves tensed plural quantifiers, when we say, for example, that there have been two kings of England named George.

It might be objected that the problem is due to overly narrow strictures on the sorts of tense operators the presentist is allowed to use. On the interpretation of the tense operators given above, WAS and WILL might be thought of as “slice-operators”: \( [\text{WAS } \phi] \) means that \( \phi \) is true at some one instant — one slice of the past. The presentist might instead think of WAS and WILL
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as “span-operators”. \( [\text{WAS } \varphi] \) would then be regarded as true iff (as the eternalist would put it) \( \varphi \) is true in some extended region, or span, of the past. The problems then would be easy to solve.

For example, Lewis’s ‘there have been two kings of England named George’ could be represented as ‘\( \text{WAS } \exists x \exists y (x \text{ is a king of England named George and } y \text{ is a king of England named George}) \)’. 

In fact the presentist cannot coherently make use of the span tense operators. Presentists do not think that it merely happens to be the case now that only currently existing objects exist. They think that it is always the case — indeed, that it necessarily is always the case — that only currently existing objects exist. (Compare: modal actualists do not think that it just happens to be the case that no non-actual things exist; they think that actualism is a necessary truth.)

Presentists cannot admit, therefore, that there once were exceptions to presentism. But they would have to admit just this, if they accepted the span operators. For example, the sentence ‘\( \text{WAS } \exists x \exists y (x = \text{Socrates and } y = \text{Kant}) \)’ comes out true, since its component sentence ‘\( \exists x \exists y (x = \text{Socrates and } y = \text{Kant}) \)’ is true of many spans of time in the past. And yet since there is no one instant at which Kant and Socrates exist, this component sentence ‘\( \exists x \exists y (x = \text{Socrates and } y = \text{Kant}) \)’ constitutes a violation of the presentist doctrine that there cannot exist non-present things — if two things never exist at the same instant then one or both must fail to exist at the present time.\(^ {26} \)

\(^ {26} \) The defender of span operators faces other difficulties as well. First, one worries that presentism thus construed is just eternalism in disguise. Second, as David Lewis pointed out (personal communication), the description of change using span operators is not straightforward. A situation where an enduring thing \( a \) is F yesterday and not-F the day before can be described with slice operators thus: \( \text{WAS}(a \text{ is F } \& \text{ WAS } (a \text{ is not-F})) \). But with span operators we seem to have the apparently contradictory: \( \text{WAS}(a \text{ is F } \& a \text{ is not-F}) \). This must somehow be dealt with.
I will continue to assume, therefore, that the presentist must employ the slice tense operators. The problem remains how to represent sentences that concern multiple times taken together. Some presentists will attempt to paraphrase the problematic sentences into true sentences in their tensed language. Another strategy, which I discuss in Sider 1999b, is to admit the sentences are untrue but supply “underlying truths”, in virtue of which the sentences are in a sense grounded, and in virtue of which the utility of the sentences is explained. But either strategy will have difficulty with certain fundamental cross-time relations that do not depend on facts expressible using the tenses. I have in mind spatial comparisons between objects at different times. Comparing the spatial positions of things at different times is crucial to science, for such comparisons are constitutive of notions like velocity and acceleration. The problem, roughly, is that these comparisons seem not to be captured by sentences formed from the presentist’s tense operators since they involve comparing what happens at one time with what happens at a different time.

The problem evaporates if the presentist is willing to accept a Newtonian conception of substantival space, complete with the notion of absolute rest. On this picture there exist such things as *enduring places*, which have three important features. First, these places endure over time, unlike the momentary place-times of relativistic space-time. Second, these places stand in the same spatial relations to each other at all times. Third, material things *occupy* enduring places at times, and these facts about occupation ground all facts about the spatial relations between material things. I am currently two feet away from my computer screen because I

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27 Yet another strategy is Ned Markosian’s (2002): admit the untruth of sentences ascribing cross-time relations but explain why they *seem* true to us.
currently occupy an enduring place that is two feet away from the place currently occupied by my computer screen.

If these enduring places are accepted, cross-time spatial comparisons could then be captured in the presentist’s tensed language. For example, the claim that there used to be something with property $F$ located at the very same place that object $a$ currently occupies would be captured by the following sentence:

\[(*) \text{ There is a place } p \text{ occupied by object } a, \text{ and WAS (there is something occupying } p \text{ with property } F\)]

The Newtonian theory of enduring places is known as a theory of “absolute position” because the notion of remaining in one and the same place over time is well-defined on the theory — it is simply continuing to be located at one and the same enduring place. The problem is that there is no empirical basis for assuming that absolute comparisons of position make any sense. Such comparisons go far beyond the relative comparisons of position that are required for science, which are discussed below.

Newton, however, thought otherwise, because of his rotating bucket thought-experiment. In a world with nothing but a bucket of water there could still be a difference between a rotating and a stationary bucket, for only the water in the rotating bucket would produce a meniscus. These are empirically distinguishable scenarios, and hence any acceptable theory of space and time must allow them to be distinguished. Distinctions of rotation are distinctions of acceleration, but the rotating bucket does not accelerate with respect to any other objects since,
by hypothesis, the world contains nothing other than the bucket. Acceleration is always acceleration *with respect to something*, Newton thought, and that something can only be an absolute space with enduring positions. However, as the subsequent development of spacetime geometry has shown, absolute position is not required to make sense of absolute acceleration. In both Minkowski spacetime and “neo-Newtonian spacetime” absolute position is not well-defined, but certain classes of spacetime points correspond to the paths of unaccelerated particles. Absolute positions are not required to characterize these paths; the paths are simply the straight lines of the space’s affine structure.

These ideas are described in detail in Lawrence Sklar’s *Space, Time, and Spacetime* (pp. 202-209), but the basic idea is as follows. Think of constructing an abstract representation of the points of Newtonian spacetime in a familiar way, as ordered quadruples of real numbers, \( <x,y,z,t> \), where \( x, y, \) and \( z \) represent spatial position and \( t \) represents the time (in some suitable units of measure). The square of the distance separating the points represented by \( <x,y,z,t> \) and \( <x',y',z',t'> \) is \((x-x')^2+(y-y')^2+(z-z')^2\). It is implicit in this representation that cross-time sameness of position is a meaningful notion, since the numbers representing spatial comparison are re-used in points chosen from different times and figure in the calculation of distances between such points. But suppose we want to represent the structure of space-time in such a way that cross-time sameness of position is *not* well-defined. We need, then, to find a representation of the structure of space-time on which only notions that are empirically meaningful have corresponding components in the representation. We need to abstract away from cross-time sameness of position while retaining other meaningful comparisons.

To this end, let us construct an abstract representation of spacetime as a set of points, but
in which these points are not quadruples of real numbers. Rather, the points are “mere points” — for the moment they have no representational features beyond numerical distinctness from each other. These points are to be regarded as representing place-times — places at an instant. Now, a mere set of points represents nothing about spacetime beyond the number of points in spacetime. More structure must be introduced into the representation. Modern geometry has shown us various sorts of structure that can be introduced on a set of points; what is relevant here is what is called affine structure. The basic idea is to introduce notions which allow definition of the concept of a straight line. One way of doing this is to introduce a three-place relation on the points of the space, \( R(x,y,z) \), interpreted as meaning that point \( y \) is linearly between points \( x \) and \( z \). Suitable axioms must be laid down constraining this relation \( R \). Given how \( R \) holds over the points in the space, we can then categorize certain classes of points as straight lines (roughly: maximal classes such that any three distinct points are such that one is linearly between the other two). But there will be no binary relation on points definable from \( R \) that would represent two place-times being at the same position.

Let us speak for the moment as eternalists. To say that an abstract representation of spacetime represents real-live physical spacetime is to say that there are physically meaningful relations whose distribution over physical spacetime points is isomorphic to the distribution of abstract relations (such as the betweenness relation \( R \)) over the points of the abstract spacetime, and that there are no physically meaningful spatiotemporal relations beyond those corresponding to the abstract relations built into the abstract space.

Finally we are in a position to relate these concepts to Newton’s rotating bucket. The straight lines in an affine space may be physically interpreted as being the paths of unaccelerated
bodies. In other words: in an abstract affine space, given how relation R holds, certain classes of points may be defined as abstract straight lines; any physical space represented by that abstract space will contain corresponding classes of physical points that may be thought of as physical straight lines; and these physical straight lines are the paths of unaccelerated bodies. In this sense, the notion of an unaccelerated path is meaningful in a physical affine space. In such a space, a stationary bucket of water is distinguished from a rotating bucket by its water molecules following straight paths through spacetime. Abstract Minkowski and neo-Newtonian spacetimes differ in important ways from each other, but each includes at least an affine structure. Thus, rotating and stationary buckets may be distinguished in physical Minkowski and neo-Newtonian spacetimes. But in neither Minkowski nor neo-Newtonian spacetime is same-position-as well-defined. That is to say, in abstract Minkowski and neo-Newtonian spacetimes there has not been introduced sufficient structure to define a binary relation of same-position-as, and hence there is no corresponding physically meaningful relation in the physical spacetimes they represent. The point, then, is that the physical considerations in Newton’s rotating bucket thought experiment do not support the claim that cross-time comparisons of position are meaningful, since Minkowski and neo-Newtonian spacetimes account for the thought experiment (and are physically adequate in other ways as well).

The presentist cannot accept this argument, literally construed anyway. The notion of an abstract spacetime representing physical spacetime presupposed the existence of points of physical spacetime isomorphic to the abstract spacetimes, which contain points representing past and future place-times. Nevertheless, presentists should be moved by this argument not to presuppose absolute comparisons of position. Philosophical presentists, with whom this chapter
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is concerned, do not uphold presentism as a scientifically revisionary theory. While the typical scientist may speak as if eternalism is true in her talk of a single spacetime including past, present and future, the presentist hopes such talk can be paraphrased (or at least regarded as quasi-true in the sense of Sider 1999b) using the tense operators. Since the scientists have given up on absolute comparisons of position, the philosophical presentist should not allow their analogs within his tensed statements, and so should disallow claims like (*) above.

Let us then set absolute rest aside. The presentist can still accept claims of object-relative spatial position over time, for example:

It WAS/WILL BE the case \( n \) units of time ago/hence that: (Ted Sider is five feet from Bill Clinton)

Such claims specify my location at other times relative to where Bill Clinton is located at those times, but that is not good enough. Without a way of specifying Clinton’s state of motion over time in some way that is not relative to the positions of other objects, these claims leave out certain kinds of information about my changing spatial position over time. The omitted information is not information about my absolute position, for as argued above there is no reason to suppose comparisons of absolute position to be meaningful. It is rather information about the affine and topological structure of my path through spacetime. As mentioned above, the notion of an unaccelerated path through spacetime is well-defined in both neo-Newtonian and Minkowski spacetime. Moreover, from the topological structure of both neo-Newtonian and Minkowski spacetime (a further level of structure even more fundamental than affine structure),
the notion of a continuous curve through space-time is also well-defined. Thus, there are three
distinct possibilities for my state of motion over, say, the last five minutes:

(P1) I have moved along a continuous unaccelerated path
(P2) I have moved along a continuous but accelerated path
(P3) I have moved along a discontinuous path

The problem for the presentist is that it is unclear how the possibilities can be distinguished.
Recall that the facts about accelerated paths in an affine space flow from a three-place relation,
R, of linear betweenness. This is a cross-time relation — the very sort of relation the presentist
has difficulty capturing.

The presentist must describe the world using sentences of the form:

It WAS/WILL BE the case $n$ units of time ago/hence that: $\varphi$

The totality of such sentences specifies a series of “snapshots” of the world at successive
moments of time, complete with the order and temporal distance relations between the snapshots.
(I here ignore relativity, and thus focus on neo-Newtonian spacetime; the Minkowski spacetime
of special relativity introduces its own complications, explored in §4 below.) But the sentences
do not specify how the snapshots line up with each other spatially, since such facts are not facts
about what things are like at any one time. Any one of (P1) through (P3) is consistent with the
totality of the sentences; the presentist’s tensed facts do not fix which is true.

To simply accept this conclusion, that there is never any fact of the matter about the most
basic dynamical physical facts, is just not an option. The only course open to the presentist would be to provide some sort of necessarily true “bridge principles” that say: if the series of snapshots takes a certain form, then the snapshots “automatically” line up in such and such a way. The bridge principles might, for example, line up the snapshots so as to maximize continuous unaccelerated motions. A little more carefully: consider constructing an eternalist model of the world, an abstract Neo-Newtonian spacetime with a selected time to serve as the present moment, based on the set $P$ of the totality of the presentist’s tensed truths. $P$ constrains what goes on at the various times of the model, including single-time spatial relations between objects, but does not constrain cross-time spatial relations. Thus, $P$ can be embedded in eternalist models in various ways. In any such model we can evaluate the degree to which motions are continuous and unaccelerated by comparing the distances between different particles at successive times, which $P$ does fix. On one way of lining up the snapshots the distance between a pair of particles might vary linearly with time, whereas on another it might vary non-linearly, or even discontinuously. Consider, now, the class $E$ of eternalist models that are consistent with $P$ and maximize continuous and unaccelerated motions. In any such model one can evaluate the truth value of a sentence (like (P1) - (P3)) that makes a cross-time spatial comparison. The presentist, then, can say that one of these sentences is true iff it is true in every member of $E$.

On this view, possibilities (P1) - (P3) can be distinguished in cases where the world is sufficiently rich. If the world is like the actual world, containing a vast number of things in motion, most of which are moving inertially (or nearly inertially), there will be only one way of lining up the “snapshots” that maximizes continuity and unaccelerated paths. Relative to this
way of lining up the snapshots, some particles may undergo non-inertial or discontinuous motion. But in simple cases possibilities (P2) and (P3) will disappear. If the world consists of just a solitary electron existing at all times, the theory has the result that the electron is moving inertially at all times; but, one might have thought, the electron could have been accelerating or even moving discontinuously. The presentist must deny these possible differences. The eternalist, of course, can accept them. Pre-analytically, the possibilities exist; the case of cross-time spatial relations therefore favors eternalism.

The argument has been that the presentist’s tensed language contains the resources to specify a series of “snapshots” capturing what the world is like at various instants, but not the resources to specify how to spatially line up the snapshots; the presentist cannot, therefore, capture certain facts about the states of motion of particles. But if states of motion are themselves specified by the snapshots, the objection fails. Which of (P1) through (P3) holds would then depend on which of the following groups of tensed claims is true:

(G1) I am not accelerating AND
    WAS-1-minute-ago(I am not accelerating) AND
    WAS-2-minutes-ago(I am not accelerating) AND
    etc.

(G2) I am accelerating AND
    WAS-1-minute-ago(I am accelerating) AND
    WAS-2-minutes-ago(I am accelerating) AND
    etc.

(G3) I am moving discontinuously OR
    WAS-1-minute-ago(I am moving discontinuously) OR
    WAS-2-minutes-ago(I am moving discontinuously) OR
    etc.
In fact I do not think that such claims would be legitimate for the presentist to invoke. The reason is that I, like many others, accept Bertrand Russell’s (1903, chapter LIV) “at-at” theory of motion and related dynamical quantities, according to which motion is simply the occupation of successive places at successive times. To have a velocity at a time, $t$, on this view, is to be appropriately located at moments of time immediately prior to and immediately following $t$. More carefully, to have an instantaneous velocity $v$ at a time is for the derivative of one’s position function $p(t)$ to have value $v$ at that time. Given the familiar definition of the derivative in terms of limits of ratios, this means that velocity is not an intrinsic property of an object at a time; to have a velocity at a time is to be located at appropriate places in the “infinitesimally immediate” past and future. The same goes for acceleration; to be accelerating at a time, $t$, is for the second derivative of one’s position function to be non-zero, and therefore is a matter of the positions one occupies before and after $t$. Likewise for the state of moving continuously: one moves continuously depending on what one’s positions are over time.

Given the Russellian theory, my instantaneous state of motion is a matter of my positions at various times. Claims like (G1)-(G3) are therefore not ultimate, but must be grounded in facts of location over time. But these facts are precisely what I have been arguing the presentist cannot capture. Given the Russellian theory of motion, then, the argument from cross-time relations stands.

There does exist an alternative to the Russellian theory of motion, according to which dynamical quantities are intrinsic to times. Whether and how an object is moving at a time is a fact about what that object is like then.
On this view velocity is independent in some sense of successive spatial position; but if the anti-Russellian introduces a quantity that is entirely unrelated to position it is hard to see what this quantity would have to do with velocity. Its leading contemporary defender, Michael Tooley, therefore holds that velocities are irreducible “first-order” properties that are picked out as those properties that are, in fact, nomically correlated with the first derivative of the position function. According Tooley (1988, section 3), the term ‘velocity’ is to be given a theoretical definition of the Ramsey-Lewis style\(^\text{28}\) in which the reference-fixing postulates are the laws of motion. Thus, Tooley picks out velocity as the property, \(v\), that actually satisfies the following equation, among others:

\[
T_1: \quad s(x,t_2) = s(x,t_1) + \int_{t_1}^{t_2} v(x,t)dt
\]

I myself prefer the Russellian theory because of its simplicity and reductionist nature. If it is true, no spatiotemporal facts beyond those of spatial and temporal distance need be postulated. It seems to me there are no good reasons to introduce Tooley’s complications into the theory of space and time, and in the absence of such reasons the simpler Russellian theory is preferable. But even if I am wrong about the virtues of Tooley’s theory, it is of no help to the presentist in solving the problem under discussion. According to Tooley we are to pick out velocity by its role in the laws of nature. This role concerns the relation between velocity and spatial position over time. But the latter is precisely what I have been arguing the presentist cannot capture in his tensed language. The presentist, therefore, has no way to pick out Tooley’s

\(^{28}\) See Lewis 1970.
non-Russellian velocities.

3. **The truth-maker objection**

A second argument against presentism addresses the legitimacy of taking the tense operators as primitive.\(^{29}\) The presentist claims that ‘WAS(there exist some dinosaurs)’ is true. But if there do not exist any past dinosaurs, what *grounds* the truth of this sentence?

The vague assumption that truths must be “grounded” can be made precise in a couple ways. One is the *truth-maker principle*: for every truth, \(T\), there exists a entity — a “truth-maker” — whose existence suffices for the truth of \(T\).\(^{30}\) These truth-makers are often called states of affairs or facts, and are thought of as concrete constituents of the world in the tradition of Russell 1918 and Wittgenstein 1961.

Many have objected to the requirement that negative existential sentences like ‘there are no unicorns’, must have truth-makers. It is comparatively easy to see how there could be an entity that necessitates the truth of ‘there exists a cat’ — for any cat, \(c\), the fact of \(c\)’s existence seems like the kind of entity one can bump up against and kick around. In contrast we never bump up against any fact whose existence entails that there are no unicorns. It is only the positive states of affairs whose inclusion in the concrete world seems unproblematic. And even very large positive states of affairs are not truth-makers for ‘there are no unicorns’, for given any

\(^{29}\) Another objection to primitive tense operators is McTaggart’s (1908) infamous argument for the incoherence of the A-theory. It amazes me that this argument is still advanced. I sympathize with Broad (1938, pp. 309-317) when he calls it a “howler”; see also Prior 1967, pp. 4-7.

\(^{30}\) See Armstrong 1997, especially chapter 8; Martin 1996; and Mulligan, Simons and Smith 1984.
such state of affairs $S$, it would be possible for there to exist a unicorn in addition to $S$.

To avoid this sort of difficulty John Bigelow (1988, pp. 130-133) and David Lewis (1992, pp. 215-219) formulate the grounding principle instead as the claim that truth is supervenient on being: what is true supervenes on what objects exist, what properties those objects have, and what relations they stand in. This principle does not require the existence of a fact that there are no unicorns; it merely requires that since ‘there are no unicorns’ is true in the actual world, it must also be true in any world in which the same objects exist, those objects instantiate the same properties, and those objects stand in the same relations as they do in the actual world.

Either way the grounding principle is cashed out, the point is to rule out dubious ontologies that posit “ungrounded” truths, for example “brute counterfactuals” with no basis in the way things actually are. The thought is that it is illegitimate to postulate truths that “float free” of the world. At first glance it would appear that the presentist’s tensed truths float free of the world — they seem not to have truth-makers and not to supervene on being. For the presentist, all states of affairs are currently existing states of affairs, and the properties and relations of objects are confined to those of currently existing objects. But surely the truth about the past is not fixed by such facts about the present.

Lewis invokes the principle that truth is supervenient on being in a discussion of something entirely different, but mentions in passing that presentism seems to be inconsistent with that principle (1992, p. 219). Bigelow, on the other hand, is himself a presentist, but wishes to uphold the principle that truth is supervenient on being. What he claims is that the world — the sum total of everything — instantiates properties like previously containing dinosaurs. Tensed truths then supervene on the instantiation of these properties (Bigelow 1996). The
A defender of the truth-maker principle could, in a similar vein, postulate tensed states of affairs such as there once existing dinosaurs as truth-makers. Clearly, the success of the truthmaker argument against presentism depends crucially on whether such moves are legitimate or whether they “cheat”. In fact, I think they do cheat, and I will say below in what sense I think they cheat. But first, it must be argued that the presentist must indeed cheat in this way; it must be argued that no other truth-makers or supervenience base for tensed truths can be found in the present.

The presentist might try to ground tensed truths in facts about current objects and the laws of nature. On this approach, ‘there once existed dinosaurs’ is true because its truth is allegedly entailed by the laws of nature and the properties and relations instantiated at the present time by currently existing objects.

Note that no regularity theory of laws of nature could then be accepted. In its simplest form, a regularity theory says that a law of nature is simply a true statement of the form “All Fs are Gs” — a “regularity”. (Much modification is needed for this simple statement to approach adequacy; see Armstrong 1983, Part I.) If tensed facts are to be grounded in the laws, the laws could not themselves be grounded in the tensed facts. The only regularities available for securing the laws would therefore be current regularities, and regularity theories are only plausible if the regularities are drawn from all of time. Some more robust account of laws of nature would appear to be required, some account allowing the presentist to say that what counts as a law of nature does not supervene on the distribution of non-nomic properties over currently existing objects.

The Armstrong 1983/Tooley 1987/Dretske 1977 view that laws of nature are relations between universals, for example, would better suit the presentist. On this view, nomic facts are
facts over and above the totality of non-nomic facts. A law that all $Fs$ are $Gs$ involves the holding of a higher-order relation, the nomic necessitation relation, $N$, between the universals $F$-ness and $G$-ness. Whenever $N$ holds between $F$-ness and $G$-ness then there is a regularity that all $Fs$ are $Gs$, but the converse does not hold — it is possible for there to be a regularity without a corresponding law. Thus, two possible worlds alike in what regularities hold, and thus alike in the instantiation of first-order universals like $F$-ness and $G$-ness, might yet differ in how the higher-order relation $N$ is instantiated, and thus might differ in what the laws of nature are.

Appealing to this theory to reply to the truth maker argument would represent an added commitment associated with presentism. Moreover, David Lewis (1986b, xii) and Bas van Fraassen (1989, chapter 5) have argued powerfully that Armstrong, Tooley and Dretske cannot explain how $N$’s holding between $F$-ness and $G$-ness could possibly entail the regularity that all $Fs$ are $Gs$.

More importantly, grounding the tenses in the present plus the laws of nature threatens to imply that the past is “open”, just as some have claimed that the future is open. If the laws of nature are present-to-past indeterministic, current facts plus the laws do not imply all the facts about the past; given presentism and either the truth-maker principle or the principle that truth supervenes on being, for many statements, $\varphi$, neither $\lceil$it was the case that $\varphi\rceil$ nor $\lceil$it was the case that not-$\varphi\rceil$ will be true. Jan Lukasiewicz (1967, pp. 38-39) was one philosopher who was willing to accept the openness of the past, and in fact pointed out a welcome feature of this doctrine:

> There are hard moments of suffering and still harder ones of guilt in everyone’s life. We should be glad to be able to erase them not only from our memory but also from existence.
But few, I suspect, would be willing to follow Lukasiewicz in this belief, however comforting it may be. (And of course it may well not be comforting, given that the good in the past would be erased along with the bad.) Perhaps we will never know what caused the dinosaurs to become extinct, but very few of us are so verificationist as to doubt there is a fact of the matter!\footnote{The class of philosophers, as always, provides exceptions. Michael Dummett (1969) expresses sympathy for the verificationist position; see also Crispin Wright 1987, essays 3 and 5.}

Even if the laws are deterministic, the problem of the open past still arises if the presentist accepts the Russellian theory of motion discussed in the previous section. If velocity is a matter of one’s location in the past and future, fixing the properties and relations of present objects will not fix their velocities (I continue to set aside “cheating” by allowing tensed properties or relations). And there is no hope whatsoever that the laws of nature plus non-dynamical properties of present objects will entail anything interesting at all about the past.

As before there is the possibility of rejecting Russell’s theory of motion in favor of Tooley’s. I continue to think this would detract from presentism’s attraction since the Russellian theory is intrinsically preferable. But this issue need not be joined, for as in the previous section the presentist cannot make use of Tooley’s theoretical definition of velocity as the property, \(v\), that actually satisfies the following equation, among others:

\[
T_1: \quad s(x,t_2) = s(x,t_1) + \int_{t_1}^{t_2} v(x,t)dt
\]

\(T_1\) is a law stated from an eternalist’s point of view; the presentist’s version must involve tensed
properties of location. But now the velocities are being grounded in the tensed properties (via the Tooleyan theoretical definition that utilizes $T_1$), while the tensed properties are being grounded in the velocities (to answer the challenge to presentism from the principle that truth supervenes on being or the truth-maker principle.) The worry can be brought out more carefully, as follows. Unless we “cheat”, the truth-maker principle or the principle that truth supervenes on being require truths to supervene on, or be made true by, facts about which non-tensed properties and relations are instantiated by which objects. A law of dynamics, for example $T_1$, must then hold in virtue of these facts. But it can’t, for once the tensed facts of location are left out, the law $T_1$ can only involve the necessitation relation (since it is a law of nature and we are assuming the Armstrong-Tooley view) and the primitive velocity properties, and thus cannot relate velocity to location.

I conclude, then, that if the presentist is to continue to uphold the principle that truth supervenes on being, or the truth-maker principle, she must “cheat” by somehow incorporating tense into the properties or relations of present objects. She must stubbornly insist that, for example, it is a “rock-bottom fact about the world” that the world has the property of previously containing dinosaurs. What should we make of this?

The point of the truth-maker principle and the principle that truth supervenes on being is to rule out dubious ontologies. Let us consider some. First, brute dispositions. Many would insist that the fragility of a wine glass — its disposition to shatter if dropped — must be grounded in the non-dispositional properties of the glass, plus perhaps the laws of nature. It would be illegitimate to claim that the glass’s disposition to shatter is completely brute or ungrounded. Second example: brute counterfactuals. Most would say that when a counterfactual
conditional is true, for example ‘this match would struck if lit’, its truth must be grounded in the actual, occurrent properties of the match and its surroundings. Someone who postulates counterfactuals not grounded in this way is Alvin Plantinga (1974, p. 180). Imagine God deliberating whether to create a certain free creature, C. According to Plantinga this amounts to deciding whether to cause a certain individual essence to be instantiated; the essence exists whether or not instantiated. God must take into account certain true counterfactual conditionals specifying what free choices C would make if placed in certain circumstances. These counterfactuals hold even if God decides not to create C, and therefore seem objectionably ungrounded, since they depend in no way on what existing things are like. Third example: the theory that there is a law of nature that Fs are Gs iff each object in the world has a certain “brute” property being such that all Fs lawfully must be Gs. Fourth example: imagine someone who believes in only one point in space, but introduces irreducible “spatial tense operators”, for example NORTH(ϕ), much like Prior’s temporal tense operators. Final example: Prior himself (1968b) once investigated the possibility of introducing “personal tense operators”, which were formally analogous to temporal tense operators. Instead of writing “everyone taller than me is sitting”, one would replace the quantifier over persons with an operator ALL-TALL, resulting in the sentence “ALL-TALL(Sitting)”. Now imagine a solipsist claiming that the operators are primitive (Prior himself advocated no such thing). The solipsist claims to reject the existence of other people but reconstructs what the rest of us regard as talk of other persons using these personal tense operators.32

The argument against allowing the presentist to “cheat” by invoking primitive properties

32 I thank Roy Sorensen for this example.
like previously containing dinosaurs, or by invoking the tenses themselves as primitive, is that this cheat seems of a kind with the dubious ontological cheats of the previous paragraph. In each case the cheater is unwilling to accept an ontology robust enough to bear the weight of the truths he feels free to invoke.

What seems common to all the cheats is that irreducibly hypothetical properties are postulated, whereas a proper ontology should invoke only categorical, or occurrent, properties and relations. Categorical properties involve what objects are actually like, whereas hypothetical properties “point beyond” their instances. The presentist’s primitive tensed properties (or operators, or whatever) would be hypothetical. Whether the world has the property previously containing dinosaurs is not a matter of what the world itself is like, but points beyond itself, to the past. The distinction between categorical and hypothetical is admittedly elusive, though it seems to get at the core of what is wrong with the dubious ontologies. But note that the argument against presentism is not strictly tied to the hypothesis that non-categoricity is to blame. The argument without this claim would simply be that the presentist’s primitive tenses share some unspecified negative feature with the rejected ontologies.

This argument against primitive tense would work just as well against taking modal operators as primitive, for modal notions are paradigmatically hypothetical. Here the argument hits close to home, since many philosophers do precisely this. I have been urging that we reject the presentist’s primitive tense operators and instead accept the B-theoretic reduction of tense, which reduction requires postulating past objects. But only David Lewis pursues the analogous strategy in the modal case. In his infamous On the Plurality of Worlds Lewis gives a reduction of modality analogous to the B-theoretic reduction of tense by interpreting modal operators as
quantifiers over non-actual but existent possible worlds and individuals. Most philosophers, myself included, are unwilling to accept Lewis’s modal realism, and instead are actualists. The question, then, is whether we actualists can consistently uphold the ban on primitive non-categorical notions.\textsuperscript{33}

In fact we can, by reducing modality to categorical notions. Though this is not the place to pursue this reduction in detail,\textsuperscript{34} this is the place to show why one cannot equally well reduce the presentist’s tenses. The crucial difference is that there is a hope for reducing modality to notions like logical consistency, analyticity, and so on, which (hopefully!) are themselves categorical notions, or at least reduce to categorical notions. Though the project faces obstacles, I believe they are surmountable. But there is no chance whatsoever of reducing the tense operators to anything like logical or analytical consistency. Beef up the notion of consistency any way you like; there will still remain consistent things that never happened. Thus, the symmetry between time and modality is broken. An actualist can object to the presentist’s primitive tenses provided she is willing to forgo primitive modal operators.

4. Presentism and special relativity

I turn finally to what is often (justifiably, I think) considered to be the fatal blow to presentism: that it is inconsistent with special relativity. The notion of the present time that is so crucial to presentism is meaningless within Minkowski spacetime, in which there is no

\textsuperscript{33} I thank Trenton Merricks for persistently pressing me on this issue.

\textsuperscript{34} For recent reductive theories of modality see Armstrong 1989, Peacocke 1999 (chapter 4) and 1997, and my unpublished “Reducing Modality”.
distinguished partition of spacetime into space and time, and no observer-independent notion of simultaneity.\footnote{The literature on presentism and special relativity includes: Godfrey-Smith 1979; Hinchliff 1996; Prior 1970 and 1996; Putnam 1967; Rietdijk 1966 and 1976; Savitt 1994 and forthcoming; Sklar 1981; Stein 1968 and 1970; Weingard 1972.}

Some presentists have said: so much the worse for special relativity, at least in its Minkowskian formulation.\footnote{Prior 1970, p. 248: “all physics has shown to be true or likely is that in some cases we can never know, we can never physically find out, whether something is actually happening or merely has happened or will happen”; see also Prior 1996.} Perhaps future empirical research will bear out this position, but in cases of science versus metaphysics, historically the smart money has been on science.\footnote{Note, however, that some recent work within physics has suggested a need for a distinguished simultaneity relation; see the end of Balashov 2000, who cites Cushing 1994, section 10.4.2.} At any rate, the present discussion will assume that consistency with something fairly close to current physics is a constraint that must be met by any adequate theory of time.

I begin by describing informally the important differences between classical and Minkowski spacetime. Classical spacetime, whether in a Newtonian form that includes absolute rest or a Neo-Newtonian form that does not, may be based on a four-dimensional manifold of spacetime points that includes all that happens in the past, present and future. In this spacetime, simultaneity is a well-defined, absolute concept. For any given point, \( p \), the set of points simultaneous with \( p \) is called a hyperplane of simultaneity. Since classical simultaneity is an equivalence relation, the set of hyperplanes of simultaneity is a partition of classical spacetime. Think of any one of these hyperplanes as the “present” and the rest of the spacetime divides into those points that are temporally after all the points in the hyperplane (the future), and all the
points temporally before the points in the hyperplane (the *past*). These temporal relations of simultaneity, before, and after, are absolute, in the sense that they are intrinsic to the geometry of classical spacetime, and do not depend in any way on observers.

Minkowski spacetime also consists of a four-dimensional manifold of space-time points that contains all of what happens in what we normally call the past, present and future. But Minkowski spacetime does not include the classical notion of simultaneity. Just as the notion of absolute rest is not well-defined in Neo-Newtonian spacetime, the notion of simultaneity is not well-defined in Minkowski spacetime. Thus, Minkowski spacetime is not partitioned into ordered hyperplanes of simultaneity. With any given point in spacetime, there cannot be associated a set of those points simultaneous with the given point. There are, however, three well-defined sets worth mentioning, relative to any given point \( p \): i) the *absolute future* of \( p \): the set of points that could be reached from \( p \) by a signal traveling at or below the speed of light; ii) the *absolute past* of \( p \): the set of points from which \( p \) may be reached by a signal traveling at or below the speed of light; and iii) the set of points *spacelike* separated from \( p \): those points that cannot be connected to \( p \) by any signal traveling at or below the speed of light (see diagram). These sets are well-defined: although simultaneity is not well-defined it is well-defined which points can be reached from which by a signal traveling below the speed of light.
The relation between points, \( p_1 \) and \( p_2 \) when \( p_2 \) can be reached by a sub-luminal signal originating at \( p_1 \) is an intrinsic feature of the spacetime. Note that the relation of spacelike separation is intransitive, and therefore cannot be used to partition Minkowski spacetime into anything like hyperplanes of simultaneity.

I have said that simultaneity is not well-defined in Minkowski spacetime, but what is strictly speaking true is that absolute simultaneity is not well-defined. A relative notion of simultaneity can be defined via the Einsteinian “radar” definition of simultaneity for a given observer. Imagine an observer moving on some inertial (unaccelerated) path, \( F \). Such a path is called a frame of reference. At a certain point, \( p_1 \), along path \( F \), the observer sends out a light signal, which bounces off some other point, \( p \), and intersects \( F \) at another point \( p_2 \). On the radar definition of simultaneity, point \( p \) is regarded as being simultaneous relative to the observer’s state of motion along path \( F \) with the midpoint, \( m \), between \( p_1 \) and \( p_2 \) on \( F \). Simultaneity thus defined varies depending on the state of motion of the observer; points other than \( p \) will be regarded as simultaneous with \( m \) if the observer’s path through \( m \) is something other than \( F \).

Given this definition of simultaneity relative to a frame of reference, one can also introduce frame-relative notions of past and future. Relative to any frame of reference \( F \) through point \( p \), another point \( q \) may be defined as being in the past of \( p \) relative to \( F \) iff \( q \) is in the absolute past of some point simultaneous with \( p \) relative to \( F \); \( q \) may be defined as future to \( p \) relative to \( F \) iff \( q \) is in the absolute future of some point simultaneous with \( p \) relative to \( F \).

In what sense is Minkowski spacetime inconsistent with presentism? There is a superficial inconsistency right at the surface since Minkowski spacetime includes all of history’s events in a single existent manifold. But by this measure presentism is already inconsistent with
classical spacetime, which also consists of a four-dimensional manifold. This is not surprising: scientific spatiotemporal theories are typically formulated under eternalist assumptions since the formulation is much easier, and since scientists do not typically share philosophers’ scruples about the ontology of past and future objects.

The more interesting question is whether, despite the superficial inconsistency, there might yet be a consistent hybrid theory that departs in letter from presentism or special relativity (or both), but in some sense preserves the essential spirit of each. To give the idea of what is sought, return to classical spacetime. The presentist could replace the four-dimensional classical spacetime with a single hyperplane of simultaneity, the present. Assertions about other points in the spacetime would then be translated into tensed claims in which all quantifiers over non-present points or events or objects are inside the scope of tense operators. This is, in effect, what presentists who are not thinking about relativity usually do. This seems like a coherent view (although there are of course philosophical objections, for example those discussed above). The question is whether one can formulate this sort of presentism/Minkowskian hybrid.

My argument from relativity against presentism will be that no plausible presentism/Minkowskian hybrid exists. I will survey various possibilities for constructing a hybrid theory and raise objections in each case.

What would the hybrid look like? The presentist wants to deny existence to some of the events and objects accepted by the eternalist. The classical presentist wanted to banish past and future events and objects, but the notions of present, past, and future look very different in Minkowski spacetime. Each hybrid theory I will examine will be a claim that only a certain proper subset of the eternalist’s Minkowski spacetime is real. Talk of the rest of spacetime must
be captured in some way by primitive tense operators. The hybrids differ by selecting different portions of spacetime as the real portions.

**Hybrid 1: here-now-ism.** First, the presentist might banish all of spacetime other than a single point.\(^{38}\) (A related proposal would be to banish all of spacetime other than a single point plus its past light cone.\(^{39}\)) Thus construed, presentism is more rightly called “here-now-ism”. Note that the right way to assert here-now-ism is to say that only a single point of spacetime is real, that there exist no spatiotemporally distant events. The wrong way is to say that at any point in spacetime, only a single point of spacetime is real. This suggests a misleading picture, that there are multiple points in spacetime, but somehow, from the perspective of one of them, the others are not real. Unless the presentist is indulging in a Meinongian distinction between being and existence, this can only be a confusion.

The first problem for here-now-ism involves the tense operators that must be postulated. The here-now-ist cannot simply take over the classical presentist’s WAS and WILL, since those presuppose that there are absolute facts about what is before, simultaneous, or after a given point-event. What WAS the case or what WILL be the case should depend on the states of motion of observers. The natural way to incorporate this in a relativistic context would be to relativize the tense operators to frames of reference. The sentence ‘WAS\(F, \text{There exist dinosaurs}\)’ might be thought of as expressing a relation between a frame of reference, \(F\), and the proposition that there exist dinosaurs. The eternalist would say that this sentence, as uttered at point \(p\), is true iff there exists some dinosaur located in the past of \(p\) relative to frame of reference \(F\), though of course


\(^{39}\) See Godfrey-Smith 1979 and Hinchliff 1996.
the presentist takes the tense operator as primitive. But the problem for the here-now-ist is that
the tense operators cannot be relations to frames of reference. A frame of reference is a path
extending through spacetime, whereas the here-now-ist’s ontology consists only of a point.

Secondly, the truth-maker objection to presentism becomes more acute than ever. Reality
has shrunk to a single point, and seems to contain few truthmakers and little Being on which
Truth might supervene.

Finally, here-now-ism is solipsistic in a way that presentism was not. While the
presentist denied reality to all times other than a single one, multiple objects within the present
time were equally real. Not so for the here-now-ist. (‘Solipsistic’ is in fact a bit of a misnomer,
for there may be no person located at the sole point that is real. One might worry that persons
and other macro-objects would never exist given here-now-ism since no macroscopic object
could fit into a single point. But the here-now-ist might claim that a person can exist without
fitting into reality, just as the standard non-relativistic presentist claims that I exist despite not
temporally fitting into the present moment.)

Hybrid 2: retain an arbitrary “hyperplane”. A second possibility would be to banish all of
Minkowski spacetime save a single “hyperplane” of simultaneity relative to some frame of
reference. From the eternalist’s point of view the idea can be put as follows: for some frame of
reference, $F$, and some point, $p$, the presentist accepts the reality of all and only points
simultaneous with $p$ relative to $F$. I call this accepting an “arbitrary” hyperplane because, from
the eternalist’s point of view, the presentist’s selection of the frame of reference, $F$, which is used
to pick out the set of points deemed real, is arbitrary — no suitable frame of reference is
distinguished by the intrinsic geometry of Minkowski spacetime.
Hybrid 2 improves on here-now-ism by eliminating the solipsistic element — spatially distant planets, for example, become real. In this way it is closer to the spirit of traditional presentism. Being, moreover, includes a bit more on which Truth might be thought to supervene. The tenses must still presumably be taken as primitive, but at least some statements, for example present-tense statements about Mars, may be grounded in Being.

The main problem with Hybrid 2 is that it is scientifically revisionary, for it in essence recognizes a distinguished relation of distant simultaneity. According to the eternalist Minkowskian, if I snap my finger there are events such that there is no fact of the matter whether they are simultaneous with the snapping. But according to hybrid 2 this is not the case, for one may define simultaneity with the snap as coexistence. If you snap your finger across the room and your snap and my snap equally exist, there surely is an affirmative answer to the question whether they occur at the same time. No such answer can be given by the eternalist Minkowskian.

So, the defender of Hybrid 2 must admit the existence of an absolute simultaneity relation. It would be natural to be even more scientifically revisionary and admit all the other spatiotemporal comparisons of classical (or at least Neo-Newtonian) spacetime, including absolute comparisons of temporal and spatial distance. From the eternalist’s point of view, admitting absolute simultaneity is in effect choosing an arbitrary frame of reference, $F$, to pick out a distinguished relation of simultaneity. The admission of absolute comparisons of temporal and spatial distance in addition seems to be of a piece with the admission of absolute simultaneity: absolute spatial and temporal comparisons would be, from the eternalist’s point of view, temporal and spatial distance comparisons relative to this same frame $F$. Moreover,
suppose the defender of hybrid 2 resisted admitting absolute comparisons of absolute spatial and temporal distance. She would then need to relativize the metrical tense operators \( \text{WAS } n \text{ units ago} \) and \( \text{WILL } n \text{ units hence} \) to frames of reference. But since reality according to Hybrid 2 consists only of a plane, frames of reference do not exist.

**Hybrids 3-5: retaining four-dimensional regions.** A different reaction to special relativity would be to retain a four-dimensional region rather than merely a point (or hypersurface), of Minkowski spacetime. Three possibilities present themselves: i) retain a past light cone — a point \( p \) plus every point in \( p \)'s absolute past; ii) retain a future light cone — a point \( p \) plus every point in \( p \)'s absolute future; iii) retain some point, \( p \), plus every point space-like separated from \( p \) — a “bowtie”:

![Diagram of Past and Future Light Cones](image)

The ontology of each of Hybrids 3-5 is a four-dimensional region, and hence includes inertial paths through spacetime — frames of reference — to which tense operators may be relativized. This is a great improvement on Hybrids 1-2. Another improvement is that reality contains more truthmakers and more Being; fewer truths must float on nothing. None of Hybrids 3-5 is
scientifically revisionary in the way Hybrid 2 is. Each of the three sorts of region (a past light cone, a future light cone, and a bowtie) are regions definable within Minkowski spacetime, once point \( p \) is chosen. None of these hybrids resurrects absolute simultaneity. Of course, the eternalist will deny that any point \( p \) within Minkowski spacetime is distinguished in the way required by these Hybrids. But this just represents the core disagreement between presentists and eternalists. Even in classical or Neo-Newtonian spacetime the presentist chooses a single hyperplane of simultaneity as the solely existing present; the choice of \( p \) is analogous.

However, new difficulties emerge. A serious problem with Hybrids 3 and 4 is that they are quite distant from the intuitive picture with which presentists began. Reality contains dinosaurs according to the first, and (perhaps) Martian outposts according to the second. Gone is the intuition that the past is no more, and the future is yet to be. These were the intuitions motivating the presentist to adopt his theory in the first place. If they must be sacrificed, why be a presentist? (As Steven Savitt (forthcoming) points out, similar remarks apply to the view mentioned parenthetically above, that reality consists of a point plus all the points on the surface of its past light cone.)

Moreover, all three Hybrids lack certain theoretical features that have been claimed to be distinctive of presentism. First, it has been argued (Hinchliff 1996, Merricks 1994a) that presentism is to be accepted because only the presentist can acceptably account for the phenomenon of change without relativizing property instantiation. This argument will be discussed fully in chapter 4, §6, but the quick version runs as follows. A changing thing apparently exemplifies contradictory properties \( F \) and not-\( F \). Any adequate theory of change must resolve the apparent contradiction. One way is to relativize property instantiation to times:
a changing thing is $F$ relative to one time but not relative to another. This is argued by some to be objectionable, since it makes all properties relational. But Merricks and Hinchliff argue that the presentist can account for change without relativizing property instantiation. Suppose $x$ used to be $F$ but is not any longer. Reality consists only of the present, and so we can say that $x$ lacks $F$ *simpliciter*, and capture the fact that $x$ changed by saying that it WAS the case that $x$ instantiated $F$ (*simpliciter*). This is a nice solution, but it is ruined by the acceptance of any of Hybrids 3-5. On any of these views, if $x$ is appropriately situated reality contains multiple points along $x$’s worldline (see diagram). To avoid contradiction, instantiation will need to be relativized to points in spacetime — $x$ is $F$ at certain points of spacetime but not others. The presentist’s distinctive solution to the problem of change would thereby vanish.

![Diagram of spacetime with points labeled F and Not-F](image)

**Change for hybrid presentists**

Other common arguments for presentism are similarly undermined. The “thank goodness that’s over” argument for presentism is clearly undermined by the past light-cone formulation (Hybrid 3), since for any point $q$ on any worldline, any earlier point on that worldline is equally part of reality — pains never “go away”. As can be seen from the diagram, it is also true on the
other two formulations that reality contains both pains (F) and subsequent painless states (not-F) as equally existing events along a single worldline. However, it is hard to say whether this undermines the argument in those cases. As with Broad’s growing block universe view, on any of these three versions of “presentism” we must distinguish two senses of the tenses, (now relativized to frames of reference), one given by an eternalist style analysis in terms of four-dimensional reality, the other describing the change in that reality. On the second sense, it will be the case (with respect to some chosen frame of reference) that the relief exists but the pain does not (on either the second or third versions of relativistic presentism). What is unclear is whether this supplies the explanation of relief that the argument requires, for despite the truth of this tensed claim the relief and the past pain are equally parts of reality.

There is also the argument that the reality of the future must be denied to make room for free will (this argument of course does not favor presentism over Broad’s growing-block-universe view). Like the thank-goodness-that’s-over argument, this argument is clearly undermined by one of our three formulations, and has an unclear status on the other two. On the future-light-cone formulation, from any point \( q \) in reality all points in the absolute future of \( q \) are themselves parts of reality; thus, if the existence of the future undermines free will, the defender of this formulation is in no better shape than the eternalist. As for the other two formulations, suppose reality contains a case of agent \( S \) deliberating whether to do a certain action, as well as

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40 This second sense of the tenses is of course primitive, but it may help to give the picture by seeing how an eternalist would view this sense (just as the gloss “WILL(\( \varphi \)) is true iff \( \varphi \) is true at some future time” clarifies, though does not provide an analysis for, the non-relativistic presentist’s tense operator). Let \( p \) be the “generator point” of reality, in the sense discussed in the text below. A truth, \( \varphi \), about changing four-dimensional reality WILL be true, relative to F, iff there is (in the eternalist’s spacetime) another point \( p' \), such that i) relative to F, \( p' \) is in the future of \( p \), and ii) \( \varphi \) is true of the segment of spacetime “generated by” \( p' \).
containing the commission of this action A. When S deliberated whether to do A, was S free?

Using the tense operator ‘WAS’ in its irreducible sense, the defender of Hybrids 3 and 5 can say truly that it WAS the case (relative to some frame of reference) that the deliberation existed but act A itself did not. Nevertheless, the deliberation and action are equally part of reality, which (according to the defender of the argument) undermines S’s freedom while deliberating.

A final critical problem is that each of Hybrids 3-5 grants a special privilege to a single point in reality. On each view there exists a “generator point”, a point p such that all other points in reality are: i) in the absolute past of p (Hybrid 3); ii) in the absolute future of p (Hybrid 4); or iii) spacelike separated from p (Hybrid 5). The rest of the points in spacetime are equally part of reality, but are not generator points. According to non-relativistic presentism, no particular point (or event, or object) is granted any such status — given that classical simultaneity is an equivalence relation, each point (or event, or object) is a generator point of the present, and hence of all of reality. Nor does Hybrid 2 postulate any such privileged point; and even here-now-ism grants no point any special status at the expense of others (since only one point is real.)

Notice that in Broad’s (non-relativistic) growing block universe there is a privileged class of points. The points on the crest of the wave generate reality (in the sense that spacetime consists of the class of points before the members of this class), whereas other points in spacetime are not generators in this sense. This inegalitarianism is related to the (not unintuitive) conviction on the part of the view’s defenders that time and space are importantly disanalogous. While it would be implausible to say that one region of space is ontologically privileged, it is not implausible, Broad could claim, to say that one region of time is ontologically privileged. This defense of inegalitarianism could perhaps be extended to Hybrids 3 and 4, since the generator
point in each case enjoys a purely temporal distinction: it is time-like related to all other points. But the defense utterly fails for Hybrid 5, the bowtie view, since on that view the generator point is simultaneous, relative to suitably chosen frames of reference, with other points in reality. This asymmetry is important. As noted above, Hybrids 3 and 4 do not retain much of the original spirit of presentism, since reality contains dinosaurs on Hybrid 3 and Martian outposts on Hybrid 4, but Hybrid 5 seems closer to the original spirit of presentism. The additional argument against it is therefore welcome: Hybrid 5 implies the existence of an implausibly distinguished point. Located at the generator point, I could say truly that reality consists of all points with spacelike separation from me. An utterance by you, located across the room, would be wrong.\footnote{Compare Putnam’s rejection of “Privileged Observers” (1967, p. 241).}

We have considered five hybrid theories combining elements of presentism and special relativity. None avoids being scientifically revisionary or otherwise unbelievable while retaining the alleged virtues of traditional presentism. Only Hybrid 2 really preserved the spirit of traditional presentism, but it was Hybrid 2 that was the most scientifically revisionary. I conclude that presentism can be upheld only by those willing to revise their science because of their metaphysical views on the nature of time. A physical theory of time other than special relativity must be constructed which is stateable using the usual (classical) presentist’s tense operators, but which is consistent with the observed experimental data that has led scientists to special relativity.\footnote{See Tooley 1997, chapter 11.} For all I know this may be possible. And I do not say that philosophical argumentation can never push us to revise science. Berkeley’s objections to infinitesimals were a valuable gadfly prodding mathematicians to develop foundations for the calculus, to which Prior
(1996) compares his defense of presentism. But given the other arguments of this chapter, presentism is in independent philosophical trouble. Moreover, there is an alternative theory, the B-theory, which is consistent “as-is” with contemporary science and suffers no apparent philosophical defects. At least tentative rejection of presentism seems in order.