

Four-Dimensionalism

An Ontology of Persistence and Time

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chapter 2 Against Presentism

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 spacelike. 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.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

¹¹ Defenders of eternalism include Goodman (1951, ch. XI); Mellor (1981); Quine (1960, sect. 36); Russell (1915); Smart (1962); Williams (1951).

consists only of actuals. The opposing position in the philosophy of modality, possibilism, according to which reality also contains merely possible things, is analogous to eternalism.¹²

Intermediate between the polar opposites presentism and eternalism is the view, defended by C. D. Broad (1923, ch. 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:

It is *now* raining.

It *was* the case that there existed dinosaurs.

I *will* one day visit Utah.

Not all sentences involving time are tensed, for example:

It is raining on 28 June 2000.

World War 1 occurred after the American Civil War.

There existed dinosaurs before the appearance of this book.

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 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 28 June 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.)

¹² On presentism see Adams (1986); Bigelow (1996); Hinchliff (1996); Markosian (forthcoming); Merricks (1994*a*); Prior (1968*a*, 1968*b*, 1970); Zimmerman (1998*b*); and my (1999*b*); for a more complete list of references see Markosian (forthcoming, n. 3), and Bigelow (1996, bibliog.).

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.¹³ 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 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

¹³ See esp. Mellor (1981). Revisions to this ‘token-reflexive’ theory along the lines of Kaplan (1989) are desirable; see e.g. Mellor (1998).

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

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, 29 June 2000.

The poker is not hot on Friday, 30 June 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 Ch. 6, Sect. 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 of the reduction of the tenses. But no sensible presentist

¹⁴ Contemporary discussion of the status of tense springs from the seminal McTaggart (1908, 1927, ch. 33). Reductionists about tense include Goodman (1951, ch. XI); Mellor (1981, 1998); Quine (1960, sect. 36); Russell (1915); Smart (1962); Williams (1951). Atheorists include Gale (1968); Prior (1957a, 1967, 1968d); and Schlesinger (1980). For further discussion and references see Le Poidevin (1991); Markosian (1992, 1993, 1995); Oaklander and Smith (1994); Smith (1993).

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 ‘(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 ($\exists x . . .$) Δ $\exists x . . . \Delta$ WILL ($\exists x . . .$)’.¹⁵ 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*

¹⁵ Compare Sellars (1962 : 546–50, 566).

exists a set containing a dinosaur and a computer, but the presentist will reject the disjunction:

WAS ($\exists x x$ is a set containing a dinosaur and a computer) or ($\exists x x$ is a set containing a dinosaur and a computer)
or WILL ($\exists x x$ is a set containing a dinosaur and a computer)

One can think informally of $\lceil \text{WAS}(\phi) \rceil$ as saying that at some past time, t , ϕ 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 would collapse the view into presentism; presumably the exact sense in

¹⁶ See Smith (1993, ch. 5) (though note that Smith calls his theory ‘presentism’). For an interesting critical discussion see Zimmerman (1998b : 212).

¹⁷ Compare Broad (1923 : 59–60) (who does not support this view).

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.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, Section 6 that the moving spotlight view can be used to solve the 'problem of temporary intrinsics'. That might be thought to be a reason to believe it. But it will be shown that the solution requires a particularly implausible version of the moving spotlight view.

Some think that Arthur 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 20 October 1998, at 5.23 p.m., 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 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

¹⁸ Or are constructed from propositions and the tenses themselves, and so are unavailable for use in a reduction, as in Prior (1968/).

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

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

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

²⁰ How exactly one cashes this out is a matter of controversy; see e.g. Chisholm (1979), Lewis (1979), and Perry (1979).

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.²¹ Let us understand *propositions* atemporally, as being true or false *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 ‘*over*’, that assigns to any time the atemporal proposition that Ted's painful experience ceases immediately before *t*.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 *over*. Standing in the psychological attitude of relief

²¹ Cf. Lewis (1979).

²² Compare Kaplan's (1989) notion of character.

to *over* at t is *not* the same thing as being relieved, at t , that the *atemporal* proposition *over* (t) is true. For as Prior 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 *over* as corresponding to the indexical 'now' that we use to express *over*: 'Ted's pain is just now over.' A temporal proposition represents a 'perspective' within time; the temporal proposition *over* represents the perspective shared by the set of moments t at which Ted had a painful experience immediately before t —that is, the set of times, t , such that *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, *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 *now*'. I am dreading at the time that my then-current perspective is that represented by *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 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.²⁴ On the other hand, the reductive truth conditions for tokens of tensed sentences do not seem applicable to

²³ Compare Mellor (1981, ch. 5).

²⁴ I do not say I accept these arguments. For a critical discussion see Tooley (1997, ch. 3).

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* 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, chs. 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:²⁵

. . . 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 predicate relating between states of affairs and times, $\lceil S \text{ is actual}$

²⁵ Tooley (1997 : 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.

at t , has been replaced by a sentential operator \ulcorner at t , $\phi \urcorner$, where t may be replaced with a name for a time and ϕ with a sentence. Moreover, this sentential operator shares the following feature with the presentist's operators WILL and WAS: \ulcorner at t , $\exists x\psi \urcorner$ can be true even if $\exists x\psi$ is false—existential quantification inside the scope of the \ulcorner 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 reintroduces irreducibly tensed notions. One would be to say that quantification inside the scope of \ulcorner 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 \ulcorner at t operators. He could claim, without embedding this claim within an \ulcorner 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 ‘ \ulcorner WAS $\phi \urcorner$ ’ and ‘ \ulcorner WILL $\phi \urcorner$ ’, as well as the metrical tense operators ‘ \ulcorner WAS, n units of time ago, $\phi \urcorner$ ’ and ‘ \ulcorner WILL, n units of time hence, $\phi \urcorner$ ’. These may be thought of, informally, as meaning, respectively, that ϕ is true at some past time, that ϕ is true at some future time, that ϕ is true at the time n units before the present, and that ϕ is true at the time n 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 ϕ 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 involves cross-time relations, for example the claim that some American philosophers admire some ancient Greek philosophers.

This claim is hard to capture in the presentist's tensed language. The present-tense sentence:

$\exists x \exists y (x \text{ is an American philosopher, and } y \text{ is an ancient Greek philosopher, and } x \text{ admires } y)$

is false because there do not (currently) exist any ancient Greek philosophers. The sentence:

WAS: $\exists x \exists y (x \text{ is an American philosopher, and } y \text{ is an ancient Greek philosopher, and } x \text{ admires } y)$

is no better, because at any time at which an ancient Greek philosopher exists, no American philosopher exists. The best bet would seem to be the following:

$\exists x [x \text{ is an American philosopher, and WAS: } \exists y (y \text{ is an ancient Greek philosopher, and } x \text{ admires } y)]$.

There is no longer a problem with existence, because only the quantifier over ancient Greek philosophers is embedded within the past-tense operator. However, there is still a problem: the predication ' x admires y ' is within the scope of the 'WAS' operator, and is therefore required to be true at some one time in the past—a time at which ancient Greek philosophers existed. However, the admiration of an ancient Greek philosopher by a current American philosopher does not seem to be something that occurs at any one time in the past; it rather is a fact about two times at once. Thus, the claim that some American philosophers admire some ancient Greek philosophers is hard to capture in the presentist's tensed language. Similar issues are raised by David Lewis's (forthcoming) examples involving tensed plural quantifiers, for example the claim 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': $\lceil \text{WAS } \phi \rceil$ means that ϕ is true at some one instant—one slice of the past. The presentist might instead think of WAS and WILL as 'span-operators'. $\lceil \text{WAS } \phi \rceil$ would then be regarded as true iff (as the eternalist would put it) ϕ 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 'WAS $\exists x \exists y$ (x is a king of England named George and y is a king of England named George)'.²⁶

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 (then-) 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 'WAS $\exists x \exists y$ (x = Socrates and y = Kant)' comes out true, since its component sentence ' $\exists x \exists y$ (x = Socrates and y = 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 = Socrates and y = 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

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 (1999*b*), 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.²⁷ 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

²⁶ The defender of span operators faces other difficulties as well. First, one worries that presentism thus construed is just eternalism in disguise. Secondly, 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: WAS (a is F & WAS (a is not- F)). But with span operators we seem to have the apparently contradictory: WAS (a is F & a is not- F). This must somehow be dealt with.

²⁷ Yet another strategy is Ned Markosian's (forthcoming): admit the untruth of sentences ascribing cross-time relations but explain why they *seem* true to us.

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 substantial 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 spacetime. Secondly, these places stand in the same spatial relations to each other at all times. Thirdly, 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 2 feet away from my computer screen because I currently occupy an enduring place that is 2 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:

(*) There is a place *p* occupied by object *a*, and WAS (there is something occupying *p* 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* (1974: 202–9), 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, $\langle x, y, z, t \rangle$, 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 $\langle x, y, z, t \rangle$ and $\langle x', y', z', t' \rangle$ 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 reused 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 spacetime 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 spacetime 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 in the class 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 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 1999*b*) 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 5 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 spacetime 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 in his tensed language.

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

It WAS/WILL BE the case n units of time ago/hence that: ϕ .

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 Sect. 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) through (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, ch. 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 \mathbf{v} at a time is for the derivative of one's position function $\mathbf{p}(t)$ to have value \mathbf{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) through (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*. This view's 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 to Tooley (1988, sect. 3), the term 'velocity' is to be given a theoretical definition of the Ramsey–Lewis style²⁸ 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:

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

I myself prefer the Russellian theory because of its simplicity and reductive 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 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

²⁸ See Lewis (1970).

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 : 309–17) when he calls it a 'howler'; see also Prior (1967 : 4–7).

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