Why Special Relativity is a Problem for the A-Theory

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January 30, 2016

The (unimaginatively named) 'A-Theory' comes in many different varieties, but they all agree on two things: (i) a particular moment in time is metaphysically privileged, and (ii) there is continual change in just which moment is privileged. This privileged moment is The Present. This suggests that there is a notion of absolute simultaneity: points that are both in The Present are absolutely simultaneous. Einstein's theories of relativity — the complex 'general' theory, but the simpler 'special' theory as well — are supposed to rule out absolute simultaneity. Thus (goes the argument) the A-Theory is incompatible with relativity, which is part of our best science.

Several authors have resisted this argument. According to them, once we get clear on what special relativity does and does not say, and once we get clear on what the A-Theory does and does not say, we will see that the two are not inconsistent after all. I agree with their diagnosis, and will defend it below. A number of these authors seem to conclude that relativity poses no special problems for the A-Theory. Here I think they are wrong. It causes problems all right; the problems just aren't ones of consistency.

1 The Players

1.1 A-Theory

There are many ways to be an A-Theorist, but three versions of the A-Theory are particularly prominent. I won't try to define 'A-Theory' here; rather I'll describe the most prominent variants.

According to the *moving spotlight* theory, past, present, and future things are all equally real. Reality consists of a vast manifold, a four-dimensional tapestry of events. One temporal 'slice' of this tapestry has a metaphysically special property of Presentness. As time marches on, Presentness moves inexorably to later and later slices, like a spotlight shining on ever more distant points on a road. Events in the tapestry start out as future, become present as the spotlight shines on them, and then become past as it moves beyond them.[1]

According to *presentism*, only present things are real. The universe is not a four-dimensional tapestry, but a three-dimensional container. In this container are three-dimensional objects — objects which *change* as time marches on. Everything there is, is present. There are truths about how the present things used

[1]Cf. Broad 1923: 59-60. Cameron (2015) and Deasy (2015) each defends a view they call 'the moving spotlight', but for present purposes both views are better thought of as modifications of presentism. Sullivan (2012) defends a view similar to Deasy's, calling it 'the Minimal A-Theory'.

to be and will be, and it is true that there were other things that are now gone, and will be things that have not yet come to be. But there are no things that are now gone or yet to be; the past and future are not temporally distant countries, but are nothing at all.[2]

According to the *growing block* theory, reality is a tapestry still being woven. When the universe began, it was only a single strand, a three-dimensional 'present'. As time went on, new layers were woven into the design, and the tapestry grew along its fourth dimension. There will be things that have not yet come into being; when they come into being they flash on the edge of the block for a moment and then become buried as more layers are added. To be present is to be at the edge of the block. Past and present things are equally real, but there are no future things.[3]

On each of these representative A-Theories we can define a notion of absolute simultaneity. It is easy enough on the moving spotlight view: if at any point in its journey the spotlight of PRESENTNESS shines both on e and f, they are absolutely simultaneous; otherwise, they are not. We can do something similar for the growing block theory: if e and f were added in the same layer, they are absolutely simultaneous; otherwise they are not.

According to Presentism, whatever there is, is present; so every event is simultaneous with every other. This doesn't quite get to the heart of the matter, though. Note that everything's simultaneity does not entail the implausible claim that World War II and the Vietnam War were simultaneous, because according to presentism there is no World War II and there is no Vietnam War. But presentism *also* does not let us make the plausible claim that World War II was concurrent with the Chinese Civil War, because neither of those exist anymore, either.

One way to think sensibly about the issue constructs an 'ersatz spacetime' out of the presentist's truths about how things were and will be.[4] Let an *ersatz time* be a story that purports to describe reality at an instant of time. (It will be an abstract object, of course; no author has ever been fool enough to try to write such a story.) An *ersatz spacetime* is a series of ersatz times with the following property: (i) each story is such that it either is true, was true, or will be true; and (ii) one ersatz time t_1 is before another, t_2, in the series if and only if it is always the case that, if t_1 is true, t_2 will be true, and if t_2 is true, t_1 was true.

The ersatz spacetime acts as a 'proxy' for the moving spotlighter's four-dimensional manifold. The spotlighter's manifold is made up of events and things, and the ersatz spacetime is made up of stories about events and things. Each story in the ersatz spacetime gets its turn to be true; the events it describes are present (and so exist) when and only when it is true. The march of the spotlight up the four-dimensional block is thus traded for the march of truth up the ersatz spacetime's stories.

[2]Cf. e.g. Prior 1970, Crisp 2003, Markosian 2004, and Bourne 2007.

[3]Cf. e.g. Broad 1923: 67-68 and Tooley 1997.

[4]See Prior 1977, Chisholm 1979: 357–359, and Crisp 2007 for inspiration.

We can now make sense of what we wanted to make sense of: WWII and the Chinese Civil War are concurrent, according to presentism, because there is an ersatz time in the ersatz spacetime according to which they are both taking place. On the other hand, WWII and the Vietnam War are not concurrent because there is no ersatz time in the ersatz spacetime according to which they are both taking place. Thus the presentist must recognize a notion of absolute simultaneity: two events are (or were, or will be) absolutely simultaneous if and only if according to some ersatz time in the ersatz block they are both occurring.

These three A-Theories are representative, not exhaustive. Some philosophers — motivated by issues we have yet to discuss — have tried to develop versions of the A-Theory according to which there is no notion of absolute simultaneity.[5] Call such theories *deeply relativistic A-Theories*. Whether there are any coherent ones isn't something I'll look into here.[6] For present purposes, we will pretend all A-Theories are committed to a notion of absolute simultaneity. If it turns out that A-Theories, thus understood, have problems with special relativity, that will give us reasons to see how viable deeply relativistic A-Theories are. On the other hand, if A-Theories turn out to have no problems with special relativity, deeply relativistic A-Theories will be unmotivated.

1.2 Special Relativity

Special relativity treats reality as a four-dimensional tapestry. We might worry that this is enough by itself to make it inconsistent with presentism (and maybe the growing block theory), but this isn't obvious. A physical theory may decide to treat time as a four-dimensional tapestry as a mere heuristic device; so long as a metaphysical theory can find a way to make sense of that device, it need not also treat time as a four-dimensional tapestry. For instance, certain formulations of non-relativistic, Newtonian mechanics treat reality as a four-dimensional manifold. But this doesn't mean those formulations are *inconsistent* with presentism. It may be instead that those formulations are describing the ersatz spacetime built up out of the tensed truths about how things were, are, and will be.

Non-relativistic physics treats the four-dimensional block of reality as being made up of many three-dimensional geometries all 'stacked' together along a fourth, temporal dimension. The geometry allows division of the block into a distinct set of chunks we call 'times'. Not so the geometry of special relativity. There is no unique way to slice the block into 'times': some slicings will be possible, but there will always be other slicings that are geometrically indistinguishable from the original.

Let's get a little bit more precise. In non-relativistic spacetimes, there will be two kinds of 'distance' between any two points: a spatial distance and a

[5] See e.g. Skow 2009 and 2015: 157–177.

[6] Though see my (vaporware) for discussion.

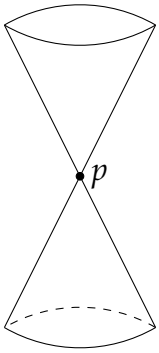

Figure 1: p's light cone

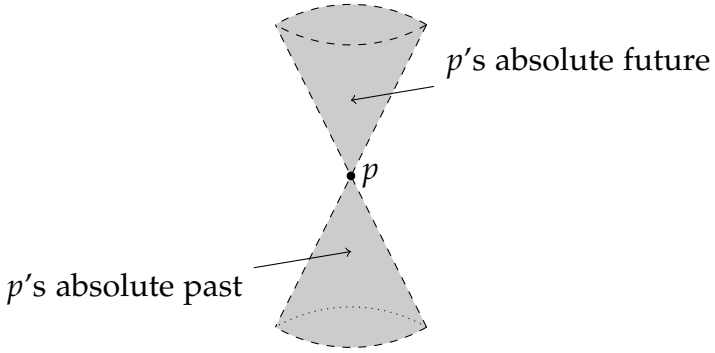

Figure 2: Points timelike separated from p

temporal distance.[7] In special relativity, however, there is only one kind of distance-like relation: the relativistic *interval*. Any two points have an interval value between them. This value can be positive, zero, or negative, and two distinct points can be at zero interval from each other. (This makes it a little misleading to think of the interval value as a 'distance', but there's nothing closer to 'distance' in relativistic, Minkowski spacetime.)

When two points are at a zero interval from each other, they are *lightlike separated*: light, if traveling in a vacuum, could get from one point to the other. Given a point p, all the other points at interval zero from p make up p's *light cone*. (See figure 1). The points at a negative interval from p are all *inside* p's light cone; those on one side are said to be in p's 'absolute future', and those on the other side in p's 'absolute past'. (See figure 2)

Finally, the points at a positive interval from p are said to be 'spacelike separated' (see figure 3). No signal could get from p to any point spacelike separated from p, no matter how fast it travelled.

There's one more bit of geometric structure in relativistic spacetime: affine

[7] This isn't exactly true; if the spacetime is Galilean (also called 'Neo-Newtonian') there won't be a well-defined spatial distance between points with a non-zero temporal distance. This needn't detain us here.

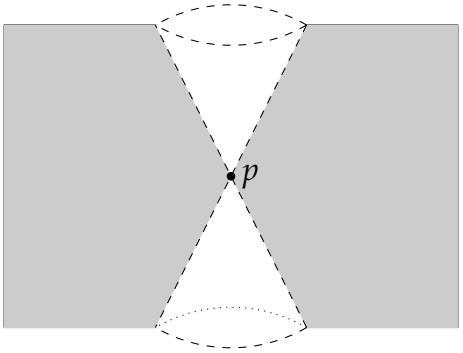

Figure 3: Points spacelike separated from p

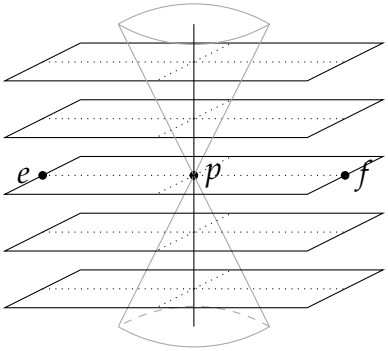

Figure 4: An inertial trajectory through p and its time slices

structure. That means only that some lines count as *straight*, and some count as *bent*. Through a given point p, there will be tons of straight lines that all pass through p and are inside p's light cone. (Infinitely many, in fact.) These lines are *inertial trajectories*: any body moving through space, unaccelerated, which passed through p would have to travel along one of these lines.

Although the spacetime has given us a notion of 'timelike separation', notice that there's nothing in the geometry corresponding to a *time*: there are no 'slices' of the block that contain events that are thought of as happening 'at the same time'. When it comes to relativity, that's a feature, not a bug. In relativity there *is* no 'absolute simultaneity', which is to say there is no absolute notion of 'happening at the same time' — and there isn't supposed to be.

There is a *relativized* notion of 'happening at the same time', though. Remember all those 'inertial trajectories'? Well, if you pick one, you can use it to cut up the block into 'time slices' (see figure 4). Anyone traveling, unaccelerated, along that trajectory would experience time as though it were made up of just those slices, one after another. So if two events, say e and f, are on one of these slices, and you were traveling along that inertial trajectory, you would experience e and f as simultaneous. That is, those events would be simultaneous *relative to your inertial trajectory* — or, as is more often said, *relative to your frame of reference*.

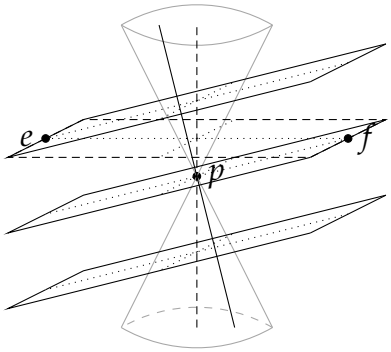

Figure 5: Another inertial trajectory and its 'times'

Pick a different inertial trajectory through the same point. You can also use it to cut the block into a *different* set of 'time slices'. These slices really are different; none of them will contain both e and f.[8] Someone traveling along this different trajectory would experience e and f not as simultaneous, but as one after the other. These would be non-simultaneous relative to this *other* frame of reference. (See figure 5)

But — and this is the important thing for present purposes — special relativity contains absolutely no resources whatsoever for distinguishing just *one* intertial trajectory through p as the 'real' one. As a result, it has no resources whatsoever for saying whether e and f are 'really' simultaneous or not. They are simultaneous relative to some trajectories, and not simultaneous relative to others— and the relativistic geometry recognizes no further sensible question to be asked.[9]

2 The Inconsistency Argument

That should be enough to get us to the argument standardly leveled against the A-Theory:

The Inconsistency Argument

(i) According to the A-Theory, there is absolute simultaneity.

(ii) According to special relativity, there is no absolute simultaneity.

(iii) Therefore, the A-Theory is inconsistent with special relativity.

This argument, or at least something that sounds very much like it, has been offered by several authors.[10] And several other authors have responded, rely-

[8] Assuming that e and f are instantaneous events; if they last a little while, some slices might also have (parts of) both e and f in them, although many won't, for a sensible value of 'many'.

[9] The discussion here follows Sider 2001: 43–45 in structure; see Maudlin 2011: ch. 2 for a more extensive, but very accessible, discussion of the relevant issues.

[10] See e.g. Rietdijk 1966, Putnam 1967, Sider 2001: 42–52, and Saunders 2002.

ing on essentially the same insight. Roughly, it goes like this: According to the A-Theory, there is a *metaphysically privileged present*, and as a result there is *metaphysically absolute simultaneity*. That is to say: the sum total of metaphysical facts determine whether any two events are simultaneous or not, full stop. However, all that Special Relativity says is that there is no *physically privileged present*: the sum total of the *physical* facts does not let us say whether any two events should count as simultaneous or not, full stop. Physics does not give us the resources to make sense of the question 'Are e and f absolutely simultaneous?' But unless we insist that metaphysics must be exhausted by physics, this does not entail that metaphysics does not give us the resources to make sense of the question.[11]

To see the fallacy, consider an imaginary metaphysical theory. According to this theory, in the beginning, God said, 'Let there be a relativistic spacetime,' and then placed herself at a single point in that spacetime. She then floated along that inertial trajectory, an invisible, undetectable, and never accelerating presence. On such a theory, the resources given to us *by the physics* don't let us make sense of the question, 'Are e and f absolutely simultaneous?' But we might naturally think that to be *absolutely* simultaneous is to be simultaneous from *God's* perspective — that is, simultaneous relative to the inertial trajectory that God is traveling. Being simultaneous in this sense wouldn't give the events any physically interesting property — but they might still give them a theologically interesting one.

Of course, contemporary A-Theorists do not generally resist the argument by appealing to a tiny God. They resist instead by appealing to brute metaphysics. The moving spotlighter, for instance, says that there is *some* inertial trajectory with the following feature: if you use it to cut the block into slices, then each slice will, at some point during the spotlight's inexorable march, contain all and only the events that the spotlight is then shining on. The presentist and the growing block theorist will say similar things, although perhaps convoluted by a detour through some ersatz times. In any case, though, the difference-maker will be something distinctly *metaphysical*: something about the distinct metaphysical property of Presentness, or something about what exists and what does not (yet). The fact that physics can't 'see' these features is no argument against the A-Theory, but a healthy reminder that physics need not exhaust metaphysics.

3 Another Version of the Argument?

The Inconsistency Argument, as I presented it, was pretty quick. Some might worry that more sophisticated arguments for the inconsistency of special relativ-

[11] See e.g. Markosian 2004: 73–75, Zimmerman 2007: 219–221, Cameron 2015: 18, and Skow 2015: 144–148. Bourne's (2007: 173–176) response to the argument involves quibbling over the proper definition of 'simultaneous', but I believe once properly unpacked it is best thought of as a version of this response as well.

ity and the A-Theory aren't so easily dismissed. Further consideration, though, suggests that essentially the same response will work for the argument's more detailed cousins.

Take, for instance, Hilary Putnam's (1967) argument for the incompatibility of special relativity and presentism.[12,13] I won't present the argument quite as Putnam did, but I believe it does not differ in its essentials.

Suppose that special relativity is true, and consider a complete relativistic description of the world, from the beginning of time to the end. The presentist won't accept this description as *literally* true, but will think that it is something close to true: the truths about what was, is, and will be the case will determine an ersatz spacetime, and the truths of the ersatz spacetime will give rise to this relativistic description of the world.

As a *relativistic* description of the world, it includes nothing about simultaneity. But it will have lots of simultaneity relative to different inertial trajectories. The presentist will think that one of these trajectories gives the 'real' simultaneity relations. It is the trajectory that, when used to carve the block into slices, gives us slices that correspond one-to-one with the ersatz times in the ersatz spacetime. Let's call this special trajectory The Trajectory.

Suppose that, according to the relativistic description of the world, throughout all of time (throughout the entire four-dimensional manifold) Pippin just happens to be traveling along The Trajectory. (This means he never accelerates; the life of a hobbit is a sedentary one.) In this case, the privileged division of the block into time slices will privilege Pippin: to exist is to be (absolutely) present, which is to be simultaneous relative to Pippin's frame, which is to 'count' as simultaneous from Pippin's perspective.

Now suppose that Frodo is traveling along another inertial trajectory, and according to Pippin's frame, they both finish eating second breakfast at the same time. Since Frodo's finishing eating second breakfast is simultaneous, from Pippin's perspective, to Pippin's finishing second breakfast, both of those events are real. That is, talking of 'these events' isn't just a fancy fiction licensed by some ersatz spacetime. They are real events actually happening right now.

So far, so good. But Putnam relies on a principle which he calls "the principle that There Are No Privileged Observers":

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

[12]See also Rietdijk 1966. In fairness to Putnam, it is less clear that he was trying to show *presentism* incompatible with special relativity; he attacks instead the "man on the street's view", which includes, but is not exhausted by, presentism. Many have taken his argument to have the narrower target, though; it is their interpretation I'm interested in here.

[13]Stein 1991 presents a criticism of Putnam's argument, but one that, if I understand it right, implies a 'deeply relativistic A-Theory', and so is quite different from the response to be given.

Of course, this principle is meant to be nothing special about me and you (or Putnam and his readers); it presumably applies to Pippin and Frodo, too. Now define xRy as 'x is simultaneous with y relative to x's inertial trajectory'. The presentist clearly must say that the real things are all and only the ones standing in *this* R to Pippin's finishing his second breakfast. (At least, so long as his finishing is real.) And, according to the story, Frodo's finishing *his* second-breakfast is also real. Thus, by NPO, whatever is simultaneous to Frodo's finishing his second breakfast, relative to *Frodo's* inertial trajectory, is also real.

But there will be lots of things which (in the relativistic description of reality) are simultaneous with Frodo's finishing his second breakfast, relative to Frodo's trajectory, which are *not* simultaneous with Pippin's finishing his second breakfast relative to Pippin's trajectory. According to presentism, those events aren't real. More precisely — since 'reality' isn't something extra 'added' to events — there *are no such events*. (We can talk as though there were by appealing to the ersatz block, but this is just a useful fiction.)

Suppose that the ersatz block licenses a relativisitc description of the world where, relative to Frodo's trajectory, his second-breakfast finishing is simultaneous with Gandalf's pipe-smoking. And suppose further that no ersatz time contains both Frodo's second-breakfast-finishing and Gandalf's pipe-smoking; that is, these two are not simultaneous relative to The Trajectory. Then according to presentism, Gandalf's pipe-smoking isn't real, which is just to say: Gandalf is not smoking his pipe. But by NPO, Gandalf's pipe-smoking *is* real, which is just to say: Gandalf *is* smoking his pipe. Contradiction.

Before going on, notice a lacuna in the argument. In the story, Pippin was traveling along the special Trajectory. That was needed in order to deploy NPO; it's a principle about *observers*. But Pippin might not have been on The Trajectory; in fact, maybe *nobody* was. If so, NPO could not be used to cause problems for presentism.

Presumably the appeal to observers is an unnecessary distraction. The argument could do just as well with a principe saying that there are "no privileged trajectories":

> **NPT** If it is the case that all and only the things that stand in a certain relation R to a certain trajectory T and point p are real, and if q is a real point and S a trajectory through q, then all and only the things that stand in a certain relation R to S and q are real.

Now we re-run the argument. Let p be the point on The Trajectory simultaneous (relative to The Trajectory) with Frodo's finishing second breakfast, and suppose Gandalf's pipe-smoking is simultaneous with Frodo's finishing second breakfast relative to Frodo's trajectory, but not relative to The Trajectory. Then, since the objective Present contains no pipe-smoking by Gandalf, Gandalf is not smoking is pipe; but by NPT, Gandalf *is* smoking his pipe. Contradiction.

This is a reductio, sure enough; but any clear-thinking presentist will insist that it is a reductio of NPT. Now notice: NPT says, in effect, that every trajectory is just as good as any other when it comes to deciding what is real. Since the metaphysically privileged present, by the presentist's lights, is exactly what singles out one trajectory as The Trajectory, NPT comes to nothing more or less than the insistence that there is no metaphysically privileged present. The presentist flat-out rejects this claim. The argument was a reductio of a claim they would never have allowed in the first place.

Special relativity can pose a problem for the presentist via this argument, then, only if special relativity somehow makes it bad to reject NPT. But how could this go? Presumably the worry is that if NPT is rejected, then there will be a kind of feature — a privileged trajectory, an absolute simultaneity, or what-have-you — that special relativity rules out. The presentist will of course respond that special relativity only rules out these features being *physically* privileged, but NPT is about which entities are real — a distinctively *metaphysical* kind of privilege, and thus not the sort of thing physical theory gets to rule on. The details are different, but in the end, the response is the same.

4 Why Not All is Well for the A-Theorist

The A-Theory is thus consistent with special relativity. But so what? The two may be consistent, but that's no reason to go around combining them. Despite its consistency, the combination may still be a *bad theory* — bad because it incurs costs that we ought not pay.

Let a *relativistic A-Theory* be the result of combining an A-Theory with special relativity in a way that adds a metaphysically privileged Trajectory, not given to us implicitly or explicitly by science. This addition strikes many of us as an unfortunate, costly extra, one we have no wish to pay. If we are right, relativistic A-Theory should be rejected, consistency notwithstanding.

But why think it costly? I'll consider some suggestions here, starting with some less compelling ones and moving to better ones as we go along.

4.1 First Try: 'Going Beyond the Science'

Sometimes philosophers claim that privileging a particular trajectory is *scientifically revisionary* (cf. Sider 2001: 47). If that were true, it would be a real cost; but as we have seen, it isn't true. It would be scientifically revisionary to insist that *science* accept a privileged trajectory in special relativity — to insist, in other words, that one trajectory is *scientifically* privileged. But the A-Theorist need not say that; she should say instead that one trajectory is *metaphysically* privileged — singled out not by things that science can 'see', but by further metaphysical considerations invisible to science. Adding extra-scientific metaphysical structure can't revise the science unless the science itself says that nothing is

extra-scientific; and science has no business saying *that*.[14]

A related objection is *methodological*: It says that we should *only believe* in features of reality that are given to us by science. In other words, while it isn't scientifically revisionary to believe in extra-scientific structure, it *is* bad methodology. Science has been so good at figuring out what the world is like that we should listen to her, and only to her; philosophy should give up all pretensions at being anything other than her under-laborer. Positing an extra-scientific mechanism for privileging The Trajectory is pretentious in just this way, so we shouldn't do it. Call this the *Science-Only Method*.

If the Science-Only Method were good methodology, relativistic A-Theory would be in trouble. But it is not good methodology; it rules out far more than we should be comfortable ruling out.

Dean Zimmerman (2007: 219–220) points out that a constraint like this would rule out belief in composite objects, such as tables and chairs. Science doesn't talk about tables and chairs, or composite objects at all. It can do everything with particles (or maybe even just fields). The Science-Only Method thus tells us that we should not believe in tables and chairs; surely an overreach of the Method.

Or consider propositions. A number of philosophical theories of thought and language hold that there is a special realm of entities, *propositions*, which are both the objects of thought and the contents of assertions. Proposition-theory gives us a nice explanation of how linguistic communication works: since beliefs and sentence-meanings are the same kind of thing, it is easy to see how asserting sentences can alter beliefs. Whatever the merits of the proposition-theory, though, it posits entities — propositions — which are not to be found in science. And whatever proposition-theory's potential demerits, the simple fact that *science* has found no need for propositions is no reason to reject it.

Zimmerman also points out that, if the Science-Only Method were right, the A-Theory would be in trouble *independent* of special relativity (2007: 220). Consider, for instance, Newtonian moving-spotlight theory. Since the physics is Newtonian, there *is* a privileged way to slice spacetime into distinct times. But the moving spotlight adds something extra: the *spotlight* itself, a metaphysically special property of Presentness that moves along the block. Newtonian physics says nothing about this special property, so Newtonian growing block theory violates the Science-Only Method.

Of course, some mad-dog naturalists have found the Science-Only Method persuasive; presumably these philosophers will happily throw out composite objects, propositions, and Newtonian growing-block theory with the bathwater. But the addition of a privileged Trajectory into special relativity seems far less

[14]Skow 2015: 148 considers an alternative objection, that in relativistic A-Theory 'the laws do not treat differently regions of spacetime that are geometrically the same". I take it the idea is that in relativistic A-Theory the laws will be formulated with respect to The Present, but I do not quite see why that must be so. The relativistic A-Theory must *believe* in an objective Present, but I do not see why that means they have to appeal to it in formulating physical laws.

palatable than, say, a belief in propositions or Newtonian growing-block theory. Whatever the problem is, it cannot be simply 'going beyond the physics'; some other diagnosis is needed.

4.2 Second Try: Empirical Undetectability

A second, related complaint has it that The Trajectory is empirically undetectable.

To fix ideas, suppose the relativistic moving spotlight theory is true. Then the actual world, $w_@$ consists of a four-dimensional tapestry plus a spotlight moving along it, following one of its particular inertial trajectories, namely, The Trajectory. Now consider a different possible world w which is made up of the very same four-dimensional tapestry, and differs only in that the spotlight is now moving along a different trajectory. In other words, the two worlds are alike in every respect except in which trajectory is The Trajectory. Call worlds like this *B-Twins*.

(We can, of course, define 'B-Twin' for relativistic presentism and growing-block theory, too. The easiest way is perhaps the roundabout one that goes via some ersatz times and an ersatz block, but we needn't fuss over the details here.)

The objection from empirical undetectability notes that no possible experiences, no experiments — nothing at all that is empirically available to us — can distinguish between B-Twins. We can describe $w_@$, and we can describe w, and we can see that the descriptions are different, at least in their A-Theoretic parts. But even if we could know that we were in one of these two, we could never know *which*. Worse yet: Since each world has infinitely many B-Twins, we couldn't even narrow it down to two. Empirical evidence can perhaps tell us that we are in a class of B-Twins containing w, but it cannot winnow down the candidates further than that.

How bad is this? It's hard to tell. Empirical detectability doesn't seem *in general* to be a requirement on a philosophical theory. For instance, we know of no empirical evidence that would tell for or against proposition-theory. Proposition-theory is a theory about abstract objects, and we have no way to interact with abstract objects.

That may be too quick. Proposition-theory is a theory about abstract objects, and our reasons for believing it consist in its explanatory power. We may well think that the theory's explanandum is empirically tractable: That people manage to communicate is itself something that we know from experience, after all. Even if propositions themselves are not *directly* empirically detectable, it may be that their role in theorizing give them a certain, indirect connection with empirical reality. If there were no propositions, something that stands in need of explanation — our ability to communicate, for instance — would be inexplicable.

Does The Trajectory have a similar indirect connection with the empirical? It is hard to see how. Suppose trajectory T is The Trajectory in world w_1, but

not in world w_2. It is hard to see what empirical facts are thereby explicable in w_1 but not explicable in w_2. The Trajectory's being T doesn't seem to explain anything in w_1; whatever is explicable in w_1 is just as explicable in w_2.

Be that as it may, I don't want to put too much weight on the empirical objection. In part this is because I don't have a good enough grip on 'empirical' to really evaluate it. Granted, we in fact communicate; this is something we know. It is an *empirical* fact? I really have no idea. On the one hand, we do have experience communicating. On the other, I know of no 'test' that could possibly tell me whether a given interaction was genuine communication or simply random behavior that *looked* like communication. Nonetheless, our warrant for believing in propositions does not hinge on how this question should be answered. As a result, I suspect our warrant for believing in a privileged trajectory shouldn't hinge directly on anything about empirical detectability either.

4.3 Third Try: Unacceptable Arbitrariness

A third worry starts by considering the Newtonian moving-spotlight theory discussed above. Consider a Newtonian moving-spotlight world, w_n. In w_n, the spotlight of Presentness will (right now) be shining on some particular moment. The other moments are left out. But if we consider w_n from its beginning to its end — if we stand outside it and 'watch' it from creation to annihilation — we see that every moment gets its turn to bask in the spotlight's glow. As we stand our vigil, no moment gets left out. As a result, there is a kind of *completeness* to the Newtonian moving-spotlight theory. Every sort of thing that could be Present gets its turn to be Present.

Now return to the relativistic w_1. In w_1 there are also lots of slices which are candidates to be Present. If we stand vigil outside w_1, we will see some of these candidates *be* Present, one after another. All the slices that are given by The Trajectory will get their turn. But lots of *other* slices — all the ones given by other trajectories — won't. Of course, in *other* worlds they get their turn; in w_2, a different series of slices get a chance to each be Present, and the slices from w_1 don't. But in each world, only some of the slices that *could* be present ever will be.

Suppose we are in w_1, rather than w_2, or any of w_1's other B-Twins.[15] We might wonder: why are *these* the slices that get a turn at being Present, rather than the slices that get to be Present over in w_2?' No answer can be given. Reality simply chose these rather than those to get a turn at Presentness. Equivalently, we might wonder 'Why is this trajectory, rather than that one, The Trajectory?' Again, no answer can be given. Reality simply chose this rather than that to be The Trajectory.

Something about this strikes us as *arbitrary*. There were several equally good candidates to be The Trajectory, or (equivalently) several equally good candi-

[15]Maybe we couldn't *know* this, given the considerations of the last section, but set this aside.

date series of slices to get a turn at being PRESENT. One trajectory or series was chosen over another. Since the candidates seem equally good, the choice seems objectionably arbitrary.

I think there is something right about this objection. But arbitrariness objections are hard to make stick. Unless we accept some Principle of Sufficient Reason, which tells us that, for every truth, there is some further Reason that it is true, we will always find *some* truths that have no explanation. We can always ask why *they* are true, rather than some alternative, and the answer will always come back silence. A Principle of Sufficient Reason would let us demand a reason for every truth, but Principles of Sufficient Reason are hard to maintain; time and again, we come up against *some* truth or another which seems 'brute', without further explanation. Whether it is the initial physical distribution of the universe, or the existence of an Uncaused Cause that kicked the whole thing off, or what-have-you, we always come up against some claim that seems to be bedrock, unsupported by further Reasons.

This isn't to say that arbitrariness charges are never in order. When we complain that some feature of a theory is objectionably arbitrary, we aren't merely complaining that it is brute, without further explanation. We are complaining instead that it seems to be the wrong *kind* of feature to be brute. Only certain features of a metaphysical theory make good candidates for bruteness; features that strike us as 'arbitrary' thereby strike us as bad bruteness candidates.

Choosing one of the infinitely many trajectories to be THE TRAJECTORY strikes me as arbitrary in just this way; as a result, it strikes me as a bad candidate for bruteness. So I am happy to think, on these grounds, that special relativity augmented with A-Theory incurs a serious cost.

The problem is that I don't know what to say someone who doesn't think a thus-chosen privileged TRAJECTORY is arbitrary. It certainly seems arbitrary *to me*, and insofar as others don't find it so, I think they are mistaken. But I doubt that's going to carry much weight. Unfortunately, I don't know of any uncontroversial criterion for 'arbitrariness' that goes beyond these snap judgments. As a result, I don't know how to *argue* that the relativistic A-Theory has this bad feature, although I believe it does.

4.4 Fourth Try: Irrelevance

Go back to worlds w_1 and w_2. Do you care which one you live in? *Should* you? It seems not. After all, being extra-scientific and empirically undetectable, the privileged TRAJECTORY has no effect on science or our day-to-day lives. And having one TRAJECTORY privileged over another solves no pressing philosophical problem and forms no part of any theoretical explanation. We have, in fact, *absolutely no reason* to care about which trajectory is privileged. Even if we are convinced that *one* is, there is nothing to be gained by wondering — let alone settling — *which* one it is. In short, the privileging of a particular trajectory is *irrelevant* to everything we care about.

Well, almost. You might care whether we lived in w_1 or w_2 simply because you like knowledge for knowledge sake, and if there is a fact of the matter here, you might want to know what it is. Fair enough; there is that one reason. It is a reason that every truth has; if you want to know truths, then every truth is worth knowing for its truth. But is there any *other* reason to want to know it — any reason that distinguishes it from the most trivial of truths? It seems not. The question of which trajectory is privileged is *irrelevant* to absolutely everything else.

Theorizing is a systematic, broadly explanatory endeavor. There are phenomena, and we want to systemize and explain them. Metaphysics is theory like any other; we are trying to systematize and explain the whole of reality. Some of what gets included in theory is there because it is part of the phenomena. We need that in the theory insofar as its part of what's getting systematized and explained. Other stuff gets included because it helps systemize and explain.

Sometimes a theory ends up with parts that do no work towards sytematizing or explaining the phenomena. They are free-wheeling extras — choice points where the choice doesn't matter, where the phenomena get the same explanations no matter how the choice is made. These extras are *irrelevancies*, and we would like to avoid them if possible. Theories with irrelevancies aren't explanatorily tight. They have more in them than is needed to deal with the phenomena.

Whatever else it is, the privileging of one trajectory is a theoretical irrelevancy. None of what we want explained — whether it is a scientific explanation of physical interactions or a metaphysical explanation of what change is — is explained *by the choice of trajectory to be privileged*. Those explanations, and the broader systematic project, remain the same no matter which trajectory gets privileged. And that is a badmaking feature. It is a problem with relativistic A-Theory.

Notice that this diagnosis helps explain why the first and second diagnoses were tempting. If the science *did* provide us with a privileged trajectory all on its own, then the privileged trajectory would already be part of the broader explanatory project — doing its work in explaining whatever physical phenomena the scientists posited it for — and so would be relevant. Likewise, since the metaphysical project includes all empirical facts as part of the pheneomena it aims to systematize, if the privileged trajectory were empirically detectable it would automatically be relevant. Those objections went wrong by forgetting that these weren't the *only* way to be relevant; a theory's features can pull their weight in more indirect ways, too. But the objections were *right* insofar as they were latching on to the broader suspicion that the selection of a privileged trajectory wasn't just empirically irrelevant, or scientificially irrelevant, or what-have-you, but that it was *theoretically* irrelevant, *tout court*. It is, and that is why it is an undesirable feature of the relativistic A-Theory.

5 Is the Cost Worth It?

So relativistic A-Theory must have theoretical irrelevancies, and that is a cost. A *serious* cost, and one that any theorist should think hard about paying. Still, there will be some that *do* think it is worth paying. We should consider their position here.

First, let's be clear on just what the cost *is*. Suppose that relativistic A-Theory is true, and that, as a matter of fact, trajectory T is the privileged trajectory. Now consider these two propositions:

(A) Trajectory T is metaphysically privileged.

(B) Some trajectory or other is metaphysically privileged.

Proposition (A) is an irrelevancy; that trajectory T, rather than some other trajectory, is privileged does no theoretical work. By contrast, proposition (B) *does* theoretical work. The truth of (B) is a consequence of the A-Theory, and the truth of the A-Theory is pretty obviously a critical part of the way that the theory systematizes and explains the phenomena. What's irrelevant is not that some trajectory or other is privileged, but that it is *this* one rather than *that* one. The cost is not in saying some trajectory is privileged; the cost is in the fact that it makes not one iota of difference as to which trajectory it is.

Of course, there's no way to get the truth of (B) without getting the truth of some (A)-like claim, too. So although (B) is not itself an irrelevancy, we have no way to get (B) without getting an irrelevancy in the bargain. If the benefits of (B) are strong enough, we might simply grit our teeth and pay the price of (A).

But (B) is what relativistic A-Theory saddles us with.[16] Irrelevancies are the cost of relativistic A-Theory; A-Theory's benefits are what we get for our coin. The irrelevancies provide a presumptive mark against the A-Theory, but the arguments in its favor may outweigh the mark against.

What *are* the arguments in its favor? I can think of three. The first, which goes back to McTaggart (1908: 459), insists that change is impossible without A-Theory. The second holds that we need the A-Theory in order to endorse an *endurantist* picture of persistence, whereby we persist by being wholly present at every moment of our existence (Cameron 2015: 152–157). And the third argues that the A-Theory is to be preferred because it allows us to retain our commonsense picture of ourselves and the world around us (Zimmerman 2007: 221–223, Bourne 2007: 168–169).

I have little to say about the second argument; I merely note that endurantism's attractiveness is controversial. I will say something about the first and third in turn, though.

[16] Setting aside deeply relativistic A-Theories, of course.

5.1 The Argument From Change

Here is the idea. The alternative to the A-Theory — the (also unimaginatively named) B-Theory — sees reality as a vast four-dimensional block, a tapestry of events spread out in time and space. There are various spatiotemporal relations between these events, but that's all there is. No time is past, or present, or future absolutely; each is past relative to some times, future relative to others, and present relative to (and only to) itself. The complaint is that this four-dimensional block is *static*: there may be variation across time *within* the block, but the *block itself* does not change. It just sits there. To get real change, we need to add something else — something *dynamic*, something that makes the block itself change. The moving spotlighter thinks the block changes by the motion of a spotlight over it; the growing blocker thinks it changes by getting bigger. The presentist doesn't think there is any four-dimensional block at all; but she thinks there is a *three*-dimensional universe, and its contents change as things happen.

For my part, I find the argument from change absolutely uncompelling. Granted, if you stand outside the B-Theoretic block for a while, you won't 'see it change'. But B-Theorists think this carries little weight; there's no reason to think that change is constituted by what you would see if you (*per impossible*) stood outside of space and time and watched. Rather, they insist that change *just is* temporal variation. Things in the block differ between their earlier ends and their later ends. As these things vary over time, they change. The B-Theorist analyzes change in a certain way; the A-Theorist may reject that analysis of change, but that's no evidence that the analysis is *wrong*. If the B-Theory is correct, then change is temporal variation; since everyone agrees that there *is* temporal variation, then if the B-Theory is correct, there is change. (Cf. Sider 2001: 212–216)

Perhaps the idea is not that the B-Theorist makes change impossible but rather than the A-Theorist has a *more satisfying* account of change. Fair enough; it is always nice to have satisfying theories. We will then have to decide whether a satisfying account of change is worth freewheeling theoretical apparatus. For my part, I find the B-Theoretic account of change perfectly satisfying, so I have a hard time getting into the heads of those who think otherwise. They will have to weigh up the costs and benefits for themselves.

5.2 The Argument from Commonsense

Here's a statement of the final argument, from Dean Zimmerman:

> My reason for believing the A-Theory is utterly banal (some philosophers reading this will want to say 'inspid'): it is simply *part of commonsense* that the past and the future are less real than the present; that the difference between events and things that exist at present and ones that do not, goes much deeper than the difference between

> events and things where I am near where I am and ones that are spatially far away… (2007: 221)

Of course, Zimmerman doesn't insist that every part of commonsense is automatically true; rather, the idea is that a claim's commonsense status gives it a strong presumption of truth, and we should only reject it if we have really good reasons (2007: 222). Presumably, then, that a theory accords with commonsense is a kind of theoretical virtue. If that's right, it could conceivably be set against the vice of theoretical irrelevancies. If it's a powerful enough virtue, it could outweigh that vice, making relativistic A-Theory worth the cost.

I am not sure what I think of the general strategy of pitting commonsense against other theoretical virtues. But I think that the strategy faces a *special* problem in this case. The problem is that relativistic A-Theory itself undercuts many of the very commonsense claims that the A-Theory is supposed to save.

Commonsense doesn't just rule on generalities, such as 'events in the past and future are less real than the present'; it rules on particular events, too. Suppose, for instance, that you are an astronomer. You are looking at two stars, each one million light years away. Suddenly – they wink out! Five minutes pass. They wink back into existence again! Something strange has happened. Commonsense tells you that, since the two stars were both one million light years away, they both winked out at the same time — exactly one million years from when you saw them – and winked back exactly five minutes after that. Commonsense tells you that both winkings-out ad winkings-back are lost to the past, less real than your current thoughts. And commonsense tells you something else: That when the star on your left winked out, the winking-in of the star on your right was not yet real, being (then) in the future; and when the star on your left winked back in, the winking-out of the star on your right was no longer real, being (then) lost to the past.

Quite possibly, though, commonsense was telling you bunk. There are ever-so-many inertial trajectories. Relative to some of those trajectories, the winking-out of the left star was *simultaneous* with the winking-in of the right star. One of these trajectories may in fact be the privileged Trajectory. If it was, then when the star on your left winked out, the star on your right was — objectively, absolutely — winking in; the two were objectively Present together. The events that *seem* out of sync to you are in fact simultaneous (see figure 6). The truth of relativistic A-Theory undermines some of the very judgments that, according to the argument from commonsense, gives us reason to accept it.

Commonsense accepts the general claim about the relative reality of things across time on the merits of lots of particular claims about the relative reality of particular events. But the mechanism generating these particular judgments is clueless about relativity, and as a result isn't very reliable. Insofar as it *is* reliable, this is a lucky coincidence — something that stems from us being fairly small and slow compared to light's speed and the distances it quickly covers. Even if commonsense generally has probative force, commonsense judgments that we safely make only thanks to a lucky coincidence should be discounted. Our

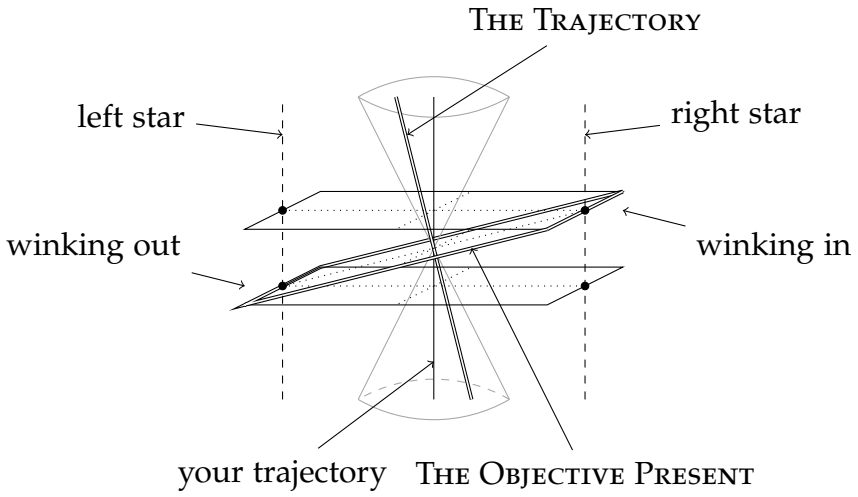

Figure 6: Lefty and righty winking out and back in

commonsense judgments about time stem from a hard-wired, crude, Newtonian way of thinking about time. We know that our native apparatus for thinking about time is generally misguided; that's reason enough to avoid giving the judgments it produces too much weight when evaluating theories.

6 Conclusion

The (special) relativistic case against the A-Theory isn't watertight. The A-Theory is not, as has been sometimes claimed, inconsistent with special relativity or scientifically revisionary. On the other hand, combining special relativity and the A-Theory is costly. A-Theorists may choose to pay the cost, finding it good value for money. Although I was silent about endurantism, I'm not particularly attracted to it. And while I expect disagreement, I have said why I don't think either the A-Theoretic account of change or the salvation of commonsense worth the coin. On these merits, then, I am no A-Theorist.

I could still be persuaded, though, and from two directions. First, I have not here considered deeply relativistic A-Theories, which attempt to preserve much of what A-Theorists want without allowing a unique, privileged moment of time. If such theories can live up to their advertising, they could provide a cost-free relativistic A-Theory.

Second, special relativity is not finished science. It isn't even currently our best science of space and time, being supplanted by general relativity. I have heard some express hope that features of general relativity, at least as they play out in worlds like ours, will provide resources for privileging a unique carving of spacetime into 'times'.[17] I have neither the space nor the technical expertise to

[17]See e.g. Saunders 2002: 290–291 and Bourne 2007: ch. 7 for relevant discussion.

evaluate the case, but if it could be made, that would cut the cost of theoretical irrelevancies from the bill.

Persuading me using either of these strategies will have to await to another day. For now, the costs of relativistic A-Theory strike me as outweighing the benefits. Since I will not reject relativity, I bid the A-Theory farewell for now.

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