

## Lecture 2: Time and Relativity

### 2.1 Putnam's argument

- I I-now am real.
- II At least one other observer is real.
- III If all and only things that stand in relation  $R$  to me-now are real, and if  $b$  is real, then it is also the case that all and only things that stand in relation  $R$  to  $b$  are real.

It follows that  $R$  is an equivalence relation.

$R$  is further required to be a “physical relation” that is “independent of the choice of coordinate system” and which does not “depend on anything *accidental* (physically speaking)”.

**Conclusion:** “on every natural choice of the relation  $R$ , it turns out that *future* things (or events) are already real!”

#### 2.1.1 Comments

1. Following Dickson (1998, 167–9) one can distinguish amongst the following similar ‘block universe’ arguments: (1) the *reality of the future* version, (2) the *truth of future contingents* version, (3) the *determinism* version (Rietdijk 1966) and (4) the *determinateness* version (Maxwell 1985).
2. Care is needed in interpreting “already” real.
3. Care is needed in interpreting the claim that “future” things are real. Does this even make sense in a relativistic context?

If I wanted to be uncharitable, I would summarize the logic of these arguments as follows: from the premise of the relativity of simultaneity (which is presumed when we accept special relativity), we infer the truth of a doctrine that presupposes an absolute notion of simultaneity. Being slightly more charitable. . . from the premise of the relativity of simultaneity, these authors infer the falsity of a doctrine. . . that presupposes an absolute notion of simultaneity; from there, they conclude the *denial* of this doctrine, but still in the context of a supposed absolute simultaneity. (Dickson 1998, 170)

But one *can* (re)state the positive doctrines in relativistic language. The arguments are to the effect that, of two mutually exclusive and exhaustive alternatives available in the context of pre-STR physics, only one makes sense in the context of STR. Perhaps the issue is whether Putnam *et al.* overlook the possibility that, in the context of STR, there is a viable alternative to eternalism that is also distinct from the various non-eternalist options available in the pre-STR context.

4.  $x$  is real  $\leftrightarrow x$  is occurring now; why seek to salvage the right to left direction, rather than the left to right (Cf. [Stein 1968](#), 18)? The answer is that a non-solipsistic notion of reality is being presupposed.
5. There are two ways of trying to resist the eternalist conclusion: (1) accept that denying the block universe view involves the existence something like a privileged “now”, but argue that, e.g., absolute simultaneity *is* compatible with STR (see, e.g., [Tooley 1997](#), [Hinchliff 2000](#), [Craig 2001](#)); (2) accept that there is “no time like the present” but argue that there exist genuine alternatives to the block universe view ([Stein 1968](#), 1991, [Dickson 1998](#)).

## 2.2 Presentist/probabilist options

Holding to a notion of an absolute (i.e., non-relativized) reality that is nevertheless *not* coextensive with everything in the absolute past, future and elsewhere of every event, one can opt for:

1. Point presentism
2. Cone presentism/probabilism
3. ‘Neo-Lorentzian’ surface presentism/probabilism

(1) and (2) violate the principle of No Privileged Observers. Ironically, (3) does not (no *observer* need stand in a natural, privileged relation to the surfaces of absolute simultaneity). However, (3) is rendered implausible by a benign form of verificationism (see [Stein 1991](#), 154–5, n 3). At the very least, on this view STR is “badly deficient as a fundamental theory of the world” ([Saunders 2002](#), 279) in its failure to represent the preferred foliation of spacetime.

## 2.3 Stein’s ‘rebuttal’

The central conclusion of both papers... is that special relativity is incompatible with a notion of temporal evolution as (in some sense) a *becoming real, or becoming determinate, of what is not yet real or determinate*. But the arguments are incorrect, and the conclusion is mistaken. The notion of “becoming” may be epitomized as follows:

For an event—a man considering, for example—at a space-time point  $a$ , those events, and only those, *have already become* (real or determinate), which occur at points in the topological closure of the past of  $a$ . ([Stein 1968](#), 14)

### 2.3.1 Reality relativized, or privileged observers?

This...move...flagrantly violates the idea that there are no Privileged Observers. Why should a statement’s having or not having a truth value depend upon the relation of the events referred to in the statement to just one special human being, *me*? ([Putnam 1967](#), 246)

The answer is that “having or not having a truth value,” in this question, must be understood classically to mean “at a given time” (the puzzle about the sea-fight tomorrow is whether there is a definite truth value *today*); but “at a given time is not a relativistically invariant notion, and the question of truth value, *to make sense at all* for Einstein–Minkowski space-time, has to be interpreted as meaning “definiteness at a given space-time point (or event)” (Stein 1968, 14–5)

### 2.3.2 Time in STR?

Not only is there no time like the present in STR, there is no time at all.

... Einstein–Minkowski structure gives us... *temporal relations*, but no “time” *simpliciter*. In the context of special relativity, therefore, we cannot think of temporal evolution as the development of the world *in time*, but have to consider instead... the more complicated structure constituted by, so to speak, the “chronological perspective” of each space-time point...

“a time coordinate” is not “time.” (Stein 1968, 16)

## 2.4 Determinateness and determinism

If the block universe view is true [the view that the future is open] is wrong, for the future is just as real, solid and immutable as the past. How our lives will unfold from now until the moment of our deaths is (in a manner of speaking) already laid down. How could it be otherwise if the future stages of our lives are just as real as the past stages? This is not to say that we have no power over the ways our lives will unfold, for we do. We will all make choices, and the choices that we make will contribute to the ways our lives will turn out. But if the block view is true, the choices that we will make are inscribed in the fabric of reality in precisely the same way as the choices that we have already made. (Dainton 2001, 9)

**Ontological probabilism:** the basic laws are probabilistic *and the future is now in reality open with many ontologically real alternative possibilities* (note the apparently ineliminable reference to “now”)

**Predictive probabilism:** the future, like the past, is now in reality entirely fixed and determined even though the basic laws are probabilistic and not deterministic (See Maxwell 1985, 25)

**Relativistic ontological probabilism:** the basic laws are probabilistic and for any given observer, *O*, the future light cone for *O* is now in reality open for *O*, with many ontologically real (for *O*) alternative possibilities, whereas the past light cone for *O* is not. (Dickson 1998, 170; what is the status (for *O*) of events outside *O*’s past and future light cones?)

**N.B.** predictive probabilism is not about what is in practice (or even in principle) predictable.

One metaphysical picture, sometimes called the ‘quantum block universe’, that can serve to underwrite “relativistic ontological probabilism” is familiar from recent discussions of Everett’s ‘Many Worlds’ interpretation of quantum mechanics. It is anticipated and rejected by Maxwell (1985, 28). (He later explicitly links it to the Everett interpretation (Maxwell 1993, 344–5).) The view has been articulated and defended by Saunders (1995, 1998, 2000). This view is importantly like the standard (classical and relativistic) block universe view in that (i) becoming and temporal passage are to be analysed in terms of the structure associated with sequences of perspectives on reality from particular spatiotemporal points of view and (ii) there is an unambiguous notion of a conception of reality from no point of view.

Upholding ‘relativistic ontological probabilism’ without adopting the quantum block universe view would seem to involve rejecting the idea that one can have an absolute conception of reality. Is such a radical relativized notion of reality coherent?

## 2.5 Beyond relativity

General relativity is as inhospitable to the presentist’s now as STR. Foliations that are preferred only relative to a particular solution, or class of solutions won’t do (they depend on something ‘accidental (physically speaking)’). *Alternatives* to GTR *might* prove more hospitable to presentism (e.g., Anderson et al. 2002, but note that, although their theory involves a fundamentally preferred foliation of ‘spacetime’, it does not involve enduring entities—unlike the non-relativistic analogue—and thus does not rehabilitate the notion of a *single*, 3-dimensional reality).

## 2.6 Persistence revisited

If we concede that STR is inhospitable to every view according to which absolute reality is not coextensive with the 4-dimensional totality of everything that is, was or will be happening in spacetime, but rather is some proper subset of it, what should we say about:

- endurance versus perdurance?
- ‘worm theory’ versus ‘stage theory’?

Balashov (2000, 2002) argues that considerations involving what co-existence must mean in a relativistic context favour worm theory over both endurantism and stage theory. However, it is far from clear that his (relativistic) notion of co-existence (as everything in the absolute elsewhere) is really the proper analogue of pre-relativistic notions. For the materials for a much more plausible alternative, see Stein (1991, 159ff).

Taking the relativistic perspective seriously might seem to favour the stage view. Although there is no preferred slicing of an object’s world-tube to serve as *the* stages or as *the* multiple locations for an enduring object, this doesn’t force one to the view that the world-tube *is* the object (i.e., worm theory). Starting from the thought that one’s

current experience supervenes on a particular *temporally extended* section of one's world-tube, one might adopt the view that one is, ultimately, simply that very segment, and further adopt (by analogy with a counterpart-theoretic notion of trans-world 'identity' in the context of modality) a counterpart-theoretic account of the truth of statements concerning one's own past and future (a sort of temporally extended notion of the classical stage view, as defended by [Sider \(2001\)](#), [Hawley \(2001\)](#)). Which temporally extended segments of other objects' world-tubes count as the perceived objects of particular experiences should then be answered by considering which parts of the relevant world-tubes are in the right sort of mutual interaction with the temporally extended but momentary subjects of each experience.

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