

Do the past and future exist?

March 7, 2001

1. The question

Is there anything that doesn't exist now? Are there, for example, sabre-toothed tigers? Personal computers that run at 10 GHz? Presentists say *no*, eternalists say *yes*.

2. The B-theoretic reduction of tense

A-sentences: 'It is now snowing'; 'There used to be dinosaurs'; 'In five minutes, there will be a break'...

B-sentences: 'On March 7th, 2001 it is snowing'; 'The time of the dinosaurs precedes the time of this lecture'...

A-sentences have different truth values depending on when they are uttered. B-sentences don't.

An *indexical* is a word that contributes different things to the truth-conditions of the sentences in which it appears, depending on the context of utterance. 'I', 'here' and 'to the north' are good examples. An utterance of 'I am happy' is true iff the utterer is happy. An utterance of 'There is treasure here' is true iff there is treasure in the place where it is uttered. An utterance of 'The zoo is to the north' is true iff the zoo is to the north of the place where it is uttered.

Most eternalists are "B-theorists": they hold that words like 'past', 'present' and 'future' are indexicals. An utterance of 'there are now computers that run at 1 GHz' is true iff there are computers that run at 1 GHz at the time of the utterance. An utterance of 'In the past, there were sabre-toothed tigers' is true iff there are sabre-toothed tigers before the time of the utterance. The same is true of all A-sentences.

NB: Sentences in the grammatical present tense are ambiguous between 'tensed' and 'timeless' readings. In the former sense, 'There are dinosaurs' is equivalent to 'There are dinosaurs now', and thus false; in the latter sense, it is true.

3. Presentism and tense

A presentist who believed the B-theoretic reduction of tense would have to think that sentences like 'There used to be sabre-toothed tigers' are false. For, according to the reduction, an utterance of this sentence is true only if it is preceded by some sabre-toothed tigers. But according to presentists, there are no sabre-toothed tigers, and indeed there are no two things such that one precedes the other. So this sentences, and in fact all past- and future-tensed sentences, come out false.

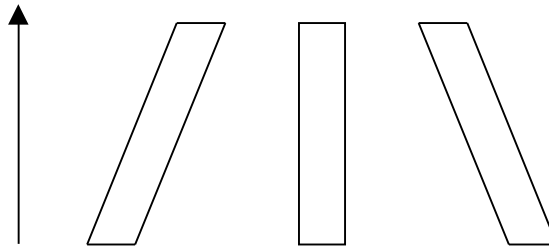
Presentists normally don't think such sentences are false! So they deny the B-theoretic reduction of tense. The operator 'It is now the case that...' is redundant, just like 'It is the case that...'. The operators 'It will be the case

that...' and 'It used to be the case that...' are not reducible to talk about spatiotemporal location.

4. Special relativity

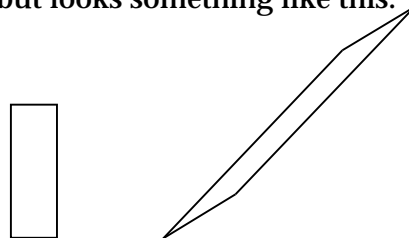
When you draw a spacetime diagram, not all the facts about your diagram correspond to objective facts about the bit of the world that is represented by your diagram. Some choices are arbitrary, or made simply for the sake of convenience. The choice of scale for time and space are like this. Stretching your diagram in space or time doesn't affect what it represents the world as being like.

Neo-Newtonian spacetime is a geometrical structure with the property that when you draw diagrams of it, there is no objective sense to be made of the distinction between diagrams which differ only by a *Galilean transformation*: a 'shear' perpendicular to the time axis. So the following diagrams are equally good representations of the same situation:



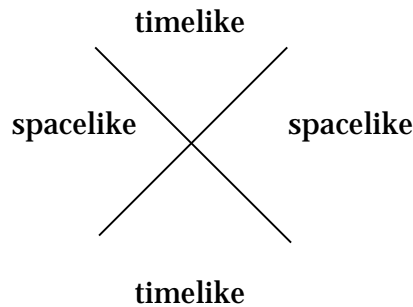
The principle of *Galilean Relativity*, which is a consequence of Newton's laws of motion, says that there is no observable difference between two situations which differ only by a 'boost'. This suggests that the notion of absolute velocity doesn't make sense, and that the spacetime we live in is Neo-Newtonian.

Minkowski spacetime is a much stranger geometrical structure. In Minkowski spacetime, two diagrams which differ only by a *Lorentz transformation* are equally good representations of the same situation. A Lorentz transformation is hard to draw, but looks something like this:



Note that a line which used to be horizontal is transformed into one that isn't horizontal. This tells us that there is no objective sense to be made of the notion of simultaneity in Minkowski spacetime. All that's objective is the

'light cone structure': the distinction between points that are space-like, time-like and light-like separated from a given point:



Einstein's special theory of relativity, as it is normally interpreted, proposes that our spacetime is Minkowski spacetime.

5. Presentism and special relativity

A presentist can explain what goes on when we draw a spacetime diagram in terms of the operators 'It was the case n units of time ago that...' and 'It will be the case n units of time hence that...'.
A presentist will think that to make a diagram fully explicit, you should say which [hyper]plane in the diagram corresponds to the present. The other bits of the diagram represent facts about what was and will be the case.

In Newtonian or Neo-Newtonian spacetime, it's objective which hyperplanes count as *times*, so you know what sort of thing you should pick out. But in Minkowski spacetime, the presentist, in picking out a distinguished hyperplane, must also pick out a distinguished frame of reference. Given this, you can make objective sense of a lot of notions which aren't supposed to be objective in special relativity: absolute simultaneity, absolute spatial and temporal distance, absolute rest and velocity.

Some presentists (e.g. Prior) respond: 'OK, so much the worse for the standard interpretation of special relativity. All the experimental facts really establish is that we can't *know* anything about the absolute notions; we can't tell whether we're in absolute rest or absolute motion, etc.' But is this really credible?

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6. What makes tensed claims true?

The sceptical hypothesis that the world, popped into existence five years ago in exactly its actual configuration seems to be *possible*. If so, the fact that the world existed ten years ago doesn't supervene on facts about the configuration of the world *now*. It doesn't supervene on the current number of particles of different sorts, and their current positions, and their current velocities... and the current states of any non-physical entities there might be.

But if presentism is true, then what I have been calling ‘the facts about the configuration of the world *now*’ are the only facts there are about the configuration of the world. So the fact that the world existed ten years ago doesn’t supervene on the facts about things like positions, velocities, etc.

A very strange sort of fact! This seems to be a big difference between ‘it was the case that’ and ‘it will be the case that’ and other operators like ‘It is alleged that’ and ‘Bill Clinton believes that’ and ‘It says in the manual that’. The facts about what is alleged, what Bill Clinton believes, what it says in the manual, etc., do seem to supervene on the “configuration of the world”.