

Chapter 2: McTaggart's Paradox and the A- and B-Theories of Time

Questions about time have long been among the most discussed and most perplexing questions in metaphysics. What is the nature of time? Is change a necessary feature of time? Is the passage of time from past to future an illusion? As long as these questions have been asked, they have been at the center of major debates not only within philosophy but also at its boundaries. Disputes about topics which, like time, are central to the sciences but nevertheless appear to raise serious metaphysical questions, when closely examined, can serve to highlight the boundaries between science and philosophy—in particular, between science and metaphysics.

One of the most contentious and productive disputes in contemporary philosophy of time is due in part to the work of the idealist J.M.E. McTaggart, who by entertaining, among others, the questions above developed a distinction between two views of time which has since become perhaps the primary divide among contemporary philosophers of time.

McTaggart's Argument

McTaggart (1908) begins his argument by describing two distinct ways of conceiving of time, which he calls “the A-series” and “the B-series”:

A-series: “the series of positions running from the far past through the near past to the present, and then from the present to the near future and the far future.”

B-series: “the series of positions which runs from earlier to later.”

The A-series is a temporal series in which every moment is either past, present, or future, while the B-series is one in which each moment is either earlier or later than each other moment. McTaggart notes that while we regularly use both concepts on a practical basis, an interesting metaphysical question can be raised: is time more fundamentally an A-series or a B-series? Are the A-properties *past*, *present* and *future* ontologically dependent on the B-properties *earlier* and *later*, or vice versa?

McTaggart also considers change to be an essential feature of time.¹ Since facts about the B-series are eternal (“if M is ever earlier than N, it is always earlier”), argues McTaggart, it involves no change, and thus cannot

¹“It would, I suppose, be universally admitted that time involves change. A particular thing, indeed, may exist unchanged through any amount of time. But when we ask what we mean by saying that there were different moments of time, or a certain duration of time, through which the thing was the same, we find that we mean that it remained the same while other things were changing. A universe in which nothing whatever changed (including the thoughts of the conscious beings in it) would be a timeless universe.” (ibid.)

be an account of time. Facts about the A-series, on the other hand, are always changing (“from future to present, and from present to past”). For this reason, he argues, a proper account of time must be an account of the A-series.

But he then identifies an apparent contradiction in the A-series from which he sees no escape:

Past, present, and future are incompatible determinations. Every event must be one or the other, but no event can be more than one. This is essential to the meaning of the terms . . . The characteristics, therefore, are incompatible. But every event has them all. If M is past, it has been present and future. If it is future, it will be present and past. If it is present, it has been future and will be past. Thus all the three incompatible terms are predicable of each event which is obviously inconsistent with their being incompatible. . . It may seem that this can easily be explained. Indeed it has been impossible to state the difficulty without almost giving the explanation, since our language has verb-forms for the past, present, and future, but no form that is common to all three. It is never true, the answer will run, that M is present, past and future. It is present, will be past, and has been future. Or it is past, and has been future and present, or again is future and will be present and past. The characteristics are only incompatible when they are simultaneous, and there is no contradiction to this in the fact that each term has all of them successively. But this explanation involves a vicious circle. For it assumes the existence of time in order to account for the way in which moments are past, present and future. Time then must be pre-supposed to account for the A series. But we have already seen that the A series has to be assumed in order to account for time. Accordingly the A series has to be pre-supposed in order to account for the A series. And this is clearly a vicious circle.

Faced with a contradiction in one direction and an infinite explanatory regress in the other, McTaggart concludes that there simply can be no consistent account of time. Since the B-series is constructed based on temporal relations (‘earlier’ and ‘later’ are relations which can only hold between events or positions in time), and the existence of time is dependent on the existence of the A-series (an inconsistent notion), McTaggart argues, the B-series too must be inconsistent, and we must give up both notions of time altogether.

What then, if not the existence of an A-series or a B-series, is responsible for our perception of time? “It is possible. . .” says McTaggart, “that the realities which we perceive as events in a time-series do really form a non-temporal series. It is also possible, so far as we have yet gone, that they do not form such a series, and

that they are in reality no more a series than they are temporal. But I think—though I have no room to go into the question here—that the former view... is the more probable.”

While McTaggart’s radical view about the unreality of time itself will in general not concern us here, the distinction between the A-series and the B-series and the apparent inconsistency in the A-series (henceforth called “McTaggart’s paradox”) have become central to some of the most active debates in philosophy of time, many of which now involve appeals to science—in particular, appeals to physical theories of time and semantic theories of temporal language.²

The A-Theory and the B-Theory

The questions raised by McTaggart’s work can be roughly classified as follows: (1) Does the existence of change imply the absence of a static description (a description whose truth never changes, e.g. a set of B-series statements like “t0 is before t1 and t1 is before t2 and t2 is before t3, etc.”), or can such a static description account for change? (2) Is change, however construed, a necessary feature of time? (3) Are (A-)properties of time like *past*, *present* and *future* ontologically dependent on (B-)properties like *before* and *after*, or vice versa? (4) Is the A-series consistent? (5) Is time real, or some sort of illusion?

These questions cannot in general be answered independently of each other. For example, if we answer (2) that change is a necessary feature of time and answer (1) that change cannot be accounted for by a static B-

²Excursus: The A-Series and the B-series as Formal Objects

Taken as formal structures, the A-series and the B-series are equivalent. In other words, whether we create a temporal series by taking the set of all moments, adding the transitive asymmetric relation **R** (which when interpreted temporally includes the meanings of both ‘before’ or ‘after’), and specifying the present moment, or by taking the set of all moments and then assigning, for each possible assignment of presentness to a moment, pastness and futureness to all other moments, the series which results will have precisely the same structure.

B-series < **R**, @ >

A-series { PAST, PRES, FUT }

In the B-series construction method, the relation **R** specifies the order of moments and the direction of time, and @ provides the location of ‘now’—of the present moment. The A-properties past, present and future can be defined in terms of earliness or lateness than the present: for all times t, if t is earlier than now then t is past, if t is now then t is present, and if t is later than now then t is future.

In the A-series construction method, the sets of moments which are past, present, and future serve to specify at least some of the structure of the temporal series: given that some moment is present, the specification of the moments which are past and future serve to establish the direction of time and at least some of the order of moments. For example, if we know that t0 is present and t1 is past, we know that t1 comes before t0 in the series of moments. But if t2 is also past, we can’t know given simply the set of past, present and future moments alone in what order t2 and t1 appear in the time series—t1 could be before t2 or vice versa, and the structure given above would be the same. It seems to be necessary in a formal construction of the A-series not only to have an identification of the present moment and a specification of which moments are past and future with respect to it, but also a specification of which moments are past and future with respect to an arbitrary assignment of presentness to a moment. In other words, we need to know, for a given moment t1, when another (but possibly identical) given moment t0 is present, whether t1 is past, present, or future:

A-series { < t1, t0, PAST >, < t1, t0, PRES >, < t1, t0, FUT > }

In any case, no matter how we choose to construct the temporal series, its formal structure will be that of an ordered set with an asymmetric transitive relation on it; the differences McTaggart discusses between the A-series and the B-series are not formalizable.

series description, we are likely to answer (3) that A-properties are ontologically dependent on B-properties. If we further answer (4) that the A-series is contradictory, we are left with little choice but to answer (5) that time is unreal. (This, of course, is McTaggart's position.)

Relatively few philosophers of time ever get as far as (5)—very few seem even willing to consider denying reality to time, though there are some notable exceptions: McTaggart (1908) mentions Spinoza, Kant, Hegel, and Schopenhauer, for example—but questions (1)–(4) have enjoyed great popularity. Question (3) has probably received the most direct attention, in effect generating the above-mentioned divide among philosophers of time: those who answer that A-properties are ontologically dependent on B-properties can be identified as “A-theorists,” and those who answer conversely as “B-theorists.” Debate between the two groups has become increasingly active in the last several decades, especially as alleged presumptions and consequences of each view are identified in areas outside of philosophy. Let us now examine the typical views of each group and how their answers to (3) influence and are influenced by their answers to (1), (2) and (4).

Like McTaggart, contemporary A-theorists typically hold that certain aspects of reality or of our experience cannot be accounted for without the postulation of an A-series. But unlike him, they maintain that the notion of an A-series is not inconsistent. Contemporary B-theorists, on the other hand, typically hold that all aspects of reality and of our experience can be accounted for by the existence of a B-series alone. Unlike McTaggart, they maintain that the B-series is genuinely temporal yet not ontologically dependent on the A-series and that an account of time as a B-series can provide a satisfactory account of change.

For instance, B-theorists generally hold that all facts which appear to involve A-series properties can be reduced to facts involving only B-series properties: *the meeting ended five hours ago* is reducible to *the end of the meeting is [tenseless] five hours earlier than the time of this statement*. And according to the typical B-theorist (for example Russell 1903), for something to change is simply “for it to be in a certain state at one time and not in that state at a later time” (LePoidevin 1998). The B-theory position is well-supported by the alleged existence of McTaggart's paradox, the burden of resolving which is generally considered to fall on the A-theorist.

A common response from the A-theorists, due to A.N. Prior and sometimes called “taking tense seriously,” is to claim that the tensed expressions which McTaggart claims begin an infinite regress (e.g., “If it *is* present, it *has been* future and *will be* past”) don't actually involve reference to past and future times, but are rather “primitive” and “unanalyzable”—true or false simply, not in virtue of facts about any series, temporal or otherwise.

But B-theorists are rarely satisfied with this response: inasmuch as ‘was,’ ‘is,’ and ‘will be’ are simply asserted to be meaningful enough to remove the contradiction but not meaningful enough to imply the existence of a series of one sort or another, it can be seen as begging the question. Moreover, there are alleged incompatibilities of the A-theory of time with physics, namely that if special relativity is true, then all facts about A-properties are relative, and there can thus be no objective account of the A-series.³ Since special relativity is widely regarded as well-confirmed, the A-theorist must reject or reinterpret it. With neither option being particularly attractive (though both have been pursued), any A-theorist faces a serious challenge here.

The small though not insignificant group of A-theorists who deny reality to past or future events (or both) face especially serious challenges in special relativity. For example, “growing universe theorists” like C. D. Broad, who deny reality to the future while maintaining the reality of the past and present, must accept “the relativization of existence”—that the set of objects which exists at a given time is relative to the inertial reference frame with respect to which existence is being determined, a decidedly extreme view. “Presentists” like A. N. Prior, William Lane Craig and Peter Ludlow, who deny reality to both past and future events, face a yet more extreme version of the relativization of existence.

Physical considerations aside, defenses of the A-theory, often formulated as charges of inadequacy against the B-theory, have frequently involved appeals to semantic phenomena. Consider a standard objection to the B-theory due to Prior (1959). Prior argues that the content of a statement like “Thank goodness that’s over,” uttered upon the conclusion of something unpleasant, is impossible to convey using only B-series facts. According to Prior, to do so would be to give it a meaning like *Thank goodness the date of the culmination of that thing is Friday, June 15, 1954*, a fact about which the utterer could be totally impartial—if it was ever true, it was always true—yet we “thank goodness” only when such culminations become *present*. According to the A-theorist, the postulation of an A-series is necessary to characterize the content of these and other tensed utterances.

There have been two main responses by the B-theorists to this objection. The first, typically associated with Hans Reichenbach, Michael Dummett and D. C. Williams, among others, is to adopt a so-called “token-reflexive” theory of meaning in which the meaning of any temporal indexical expression, including “now,” “soon,” and tensed verbs, makes reference to the utterance event itself:

³According to special relativity, whether two events are observed to be simultaneous or not depends on the inertial (non-accelerated) reference frame in which the observation is made. Two spatially separated events e_1 and e_2 observed to be simultaneous by an observer O will be observed as non-simultaneous by another observer O' moving at a high speed relative to O . If O' is moving from e_1 toward e_2 , he will observe e_1 to happen after e_2 ; if he is moving from e_2 toward e_1 , he will observe the opposite. If special relativity is true, then there is no absolute simultaneity (Sklar 1977), and thus there can be no objective facts about the A-properties of events (e_1 may be present for O and future for O' , or present for O' and past for O), and thus no objective facts about the A-series (Markosian 2009).

An utterance u of “That’s over” is true iff that culminates [*tenseless*] at time t earlier than the time of u .

The presence of u in the truth conditions for indexical sentences, such as that above, is supposed to distinguish their meanings from those of non-indexical sentences, the truth conditions of which do not include reference to the utterance event:

An utterance u of “The date of the culmination of that thing is Friday, June 15, 1954” is true iff the date of the culmination of that thing is [*tenseless*] Friday, June 15, 1954.

So while an utterer might be completely indifferent to the fact that the unpleasant event culminated at a time prior to June 15, 1954, he may not be indifferent to the corresponding token-reflexive fact that it culminated prior to his utterance.

The B-theorists’ second response, sometimes called “the new B-theory” and prompted by, among other things, charges of inadequacy against the token-reflexive account in its ascription of meaning to certain modal expressions⁴, is to admit “that tense is indispensable, and that indeed we rely on it to explain our actions” (Ludlow, p. 95, characterizing the views in Mellor 1981), but to maintain that tense is an “extra-semantic” phenomenon—in other words, even if “The date of the culmination of that thing is Friday, June 15, 1954” and “That’s over” have identical meanings, knowing or believing one may still have very different

⁴A token-reflexive semantics will never allow utterances like “There are no utterances” to be true:

An utterance u at time t of “There are no utterances” is true iff there are no utterances at time t , the time of u . Since the truth conditions here can never obtain, then the sentence is necessarily false. But it is certainly possible that there were never any utterances (if no organisms capable of verbal expression ever evolved, for example). Thus, the objection goes, the B-theorist’s attempt to account for indexicality via token-reflexivity is inadequate.

However, in a framework in which sentences are not “immortal platonic objects” whose modal properties (necessary, contingent, etc.) are supposed to respect their relationship with all possible worlds, but one in which sentences are objects which always exist in a context that includes an utterance, the necessary falsehood of “There are no utterances” is perfectly tolerable. This second framework is more characteristic of contemporary linguistic semantics than the first, and will be discussed later as part of the “I-language” approach to linguistic analysis.

Another objection, adopted by Ludlow (1999), is due to Yourgrau (1987), note 21:

The Kaplan-Perry rule for ‘now’, if put precisely, would be: “For all times t and speakers s , if s employs ‘now’ correctly at t , he refers to t .” Now a rule is no good unless you can use it, but, if you try to employ this rule, it becomes obvious that, in grasping it, you get a handle not on any particular time, but only on a universal conditional on times (and speakers). The problem is that to use the rule to get to a time you must instantiate the universal quantifier, but, to accomplish this instantiation, you must already have a particular time t in mind. But how do you get to have it in mind? By describing it (e.g., as Saturday, 10:00 A.M.)? (This is vigorously denied by Kaplan and Perry.) By taking t to be the present moment—i.e., now? (This is circular; it is the rule itself that was supposed to show how we use ‘now’ to get to a particular time.) It seems, rather, that Kaplan and Perry have mistaken a necessary constraint on a mode of designation for a particular use of ‘now’ (that if ‘now’ is used at t , the mode of designation should determine t) for the mode of designation itself.

One way around this could be to incorporate a more forcefully “demonstrative” expression into the truth conditions:

“That’s over” is true iff that culminated at time t earlier than this very utterance

“The meeting starts now” is true iff the meeting starts at the time of this very utterance

But, Ludlow objects, if “this utterance” is a genuine demonstrative, then it should technically refer to the statement of the axiom itself, and if it’s not, “then it is not clear how the token-reflexive theorem can be generated” in the first place (p. 90).

effects on our behavior from knowing or believing the other. The differences, argue the “new” B-theorists, ought to be explained in a theory of, e.g., belief and knowledge, in psychology perhaps, and ignored by semanticists and metaphysicians both. New B-theorists include D. H. Mellor, Murray McBeath, Nathan Oaklander, David Lewis and Robin LePoidevin, among others.

Viewed in this way, the new B-theory position characterizes much of contemporary semantics, where it is often simply taken for granted that the ideal semantic theory will, like other scientific theories, be stated tenselessly, and that any differences between the effects on behavior of utterances with temporal indexicals and those of utterances without them will/should be accounted for elsewhere. Lepore & Ludwig, before providing their “Outline for a Truth-Conditional Semantics for Tense” (2003), briefly motivate this approach:

(1) ‘I am tired’ in L means that I am tired.

(2) ‘I am tired’ in L is true iff I am tired.

But (1) and (2) express nothing unless relativized to a context of utterance, and what they express in a context depends on who utters them and the time of utterance. This creates two related difficulties. First, theorists employing identical adequacy criteria will arrive at nonequivalent theories, since they will express different propositions by the sentences they use. Second, no one will give the correct account of the meanings or truth conditions of sentences with context-sensitive elements. Were we each to assert (1), one of us would assert that ‘I am tired’ means that Ludwig is tired at such and such a time, while the other would assert that it means that Lepore is tired at such and such a time. But ‘I am tired’ means neither.

A semantics for a language should be couched in a context-insensitive metalanguage. We want theories that any inquirer can reach by meeting generally agreed upon theoretical constraints and that can be used to express the same thing in every context. This requires metalanguage expressions, including semantic predicates, to be untensed.

Indeed, Lepore & Ludwig’s comments can be applied to any scientific theory. A theory in physics, for example, whose formulation included indexical expressions of any sort would be near useless: it would mean something different for every theorist, it would be impossible to reproduce experimental results, etc. It is for these and associated reasons that science is typically conducted assuming a B-theoretical view of time, and that scientific theories are formulated tenselessly.

But this hasn’t stopped A-theorists from arguing for tensed reformulation of certain scientific theories, a move which, though it might appear at first to be against the interest of science for the reasons mentioned

above, A-theorists consider to be ultimately in its interest. Because time is a central topic in the physical sciences and tensed language plays a central role in just about every metaphysical debate about time, physics and semantics seem to be the points of greatest contact. A-theoretical interpretations of special relativity have been proposed (Sklar 1981), for example, and arguments for tensed semantic theories have been made, at least one of which (Ludlow 1999) has been a serious attempt at integrating linguistic semantics (as opposed to philosophical semantics; the difference will be explored later) with an A-theory metaphysics of time.