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God and Real Time

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Whether God is timeless or temporal depends on whether an A-Theory or B-Theory of time is correct, where the former posits tensed facts and the latter only tenseless facts. Given the superiority of the A-Theory, it follows that God is temporal.

But since the Special Theory of Relativity relativizes simultaneity to reference frames, the question arises as to which "now" is God's "now"? In order to answer that question, we must distinguish between time and our measures of time. Relativity concerns only measured time and so does not affect God's real time.

How does God's time relate to measured time? Contra Alan Padgett, God's time must coincide with a measured time, most plausibly the cosmic time of the General Theory of Relativity.

Introduction

While certain of the traditional attributes of God such as omnipotence or omniscience (particularly divine foreknowledge) have been thoroughly--and, one is tempted to say, nearly exhaustively--analyzed and defended in recent philosophical literature, others of the divine attributes such as God's eternity have received scant and generally superficial analysis.¹ Current discussions of God's eternity have been for the most part carried out in almost complete ignorance of the philosophy of space and time and without any profound knowledge of Relativity Theory and its analysis of time²--a remarkable shortcoming, when one thinks about it, for how can one pretend to formulate an adequate doctrine of God's eternity and His relationship to time without taking cognizance of what modern philosophy and science have to say about time?

Now Alan Padgett, a doctoral candidate under Richard Swinburne, has attempted to remedy that lack by presenting, in full conversation with philosophical and scientific discussions of time, a view of divine eternity which he characterizes as "relative timelessness."³ As one who has recently been working in this same area, I wish to

endorse the direction in which Padgett is moving and to offer some refinements of this view.

God's Timeless Eternity: A- vs. B-Theory of Time

Padgett rejects the classical Plotinian-Augustinian analysis of divine eternity in terms of timeless existence, a view he calls "absolute timelessness." He deems the classical analysis inadequate because God, in order to sustain created things, which are ever changing in their ontological status, must Himself change in His activity and cannot therefore be timeless.

What Padgett's article does not make clear, however, is that this line of argument goes through only if one has made a prior commitment to an A-theory of time.⁴ According to the A-theorist, temporal becoming is a real and objective feature of the universe; transience is essential to the nature of time, a truth expressed metaphorically by saying that time "flows." Temporal properties of events cannot be adequately analyzed in terms of *earlier than*, *simultaneous with*, and *later than* alone, but must include reference to *past*, *present*, and *future*, which are not merely indexical expressions but are

irreducibly tensed. The present represents the edge of becoming, and future events do not merely not *yet* exist, rather they do not exist *at all*. By contrast, according to the B-theorist, temporal becoming is mind-dependent and purely subjective. Time neither flows nor do things come to be except in the sense that we at one moment are conscious of them after not having been conscious of them at an earlier moment. Things simultaneous with different moments on the time-line are equally existent and are tenselessly related to each other by the relations of *earlier than*, *simultaneous with*, and *later than*, to which *past*, *present*, and *future* can be reduced. Anything that from our perspective has, does, or will exist in the universe in fact simply *exists* (tenselessly).

I am convinced that the decision between an A- or a B-theory of time constitutes a fundamental watershed for our conception of divine eternity. For if we adopt a B-theory of time, most of the typical arguments against divine timelessness, including Padgett's, are doomed to failure. For if every event in the space-time manifold *is* equally real and existent and God transcends space and time, then He can easily be conceived to cause and sustain (tenselessly) every space-time event, regardless of its location. Such a conception implies neither that things always exist nor that things are changeless, for to exist always would be to exist at every temporal moment (which most things do not), and things do change in the sense that they have different properties at different temporal moments, in the same way that the landscape can be said to change from east to west. On the B-theory of time, the different ontological status which things possess at different times is interpreted to mean that some entity *x* exists (tenselessly) at some time *t_n*, but does not exist (tenselessly) at, say, *t_{n-1}* or *t_{n+1}*. Anything in the space-time manifold (and, indeed, space-time itself) exists only because of God's creatorial power, as He timelessly sustains it in being.

By contrast, on the A-theory of time, the concept of a timeless God who is really related to the world does seem incoherent. For given that future states of the universe actually do not exist, God cannot be causing them (even tenselessly) to exist; otherwise, they would in fact exist at their respective times. The same holds for past states of the universe. Hence, Aquinas's argument that God causes timelessly things to come to be at their respective times only succeeds in proving that things caused timelessly need not exist everlastingly and in fact betrays a B-theoretic point of view.⁵ Even if God wills changelessly from eternity that a temporal event exist, there must be conjoined to that will an exercise of divine causality at the moment of the thing's creation if it is to genuinely come to be at that moment rather than exist tenselessly at that moment. About the only way to stave off this conclusion would be to deny with Aquinas that God is really related

to the world, a wholly implausible move system-dependent upon an elaborate Aristotelian metaphysic.⁶

It can be plausibly argued, I think, that the A-theory of time is both philosophically and theologically superior to the B-theory. Philosophically, one should agree with D. H. Mellor that "Tense is so striking an aspect of reality that only the most compelling argument justifies denying it: namely that the tensed view of time is self-contradictory and so cannot be true"⁷ and then proceed to show that in fact all such attempts to elicit a contradiction, such as McTaggart's, fail,⁸ leaving us secure in our naturally intuitive A-theoretic understanding. No B-theorist, on the other hand, has successfully answered, in my estimation, the charge that his theory is incoherent because the mind-dependence of physical becoming requires a real becoming in the subjective contents of consciousness.⁹ In favor of the A-theory, one might argue that it gives the most adequate analysis of personal identity¹⁰ and that the tensed-ness of our language and experience is uneliminable.¹¹

Theologically, there seems to be a decisive reason for Christian theists' rejecting the B-theory, namely, that it cannot give an adequate analysis of the biblical doctrine of *creatio ex nihilo*. On the B-theory *creatio ex nihilo* is reduced to the ontological dependence of the creation upon God and the space-time continuum's having a front edge. But the creation as a whole is co-eternal with God in the sense that it exists as tenselessly as He. There is no state of affairs in the actual world which consists of God existing alone without creation. But such an analysis is a wholly inadequate understanding of the biblical doctrine that the created order began to exist and was brought into being by God. Though Aquinas (unlike Bonaventure) thought that one could not *prove* philosophically this aspect of the doctrine of *creatio ex nihilo*, he was nevertheless firmly committed to it on the basis of revelation, a fact which contemporary theologians, who sometimes appeal to Aquinas to justify their undue diffidence on temporal *creatio ex nihilo*, tend to forget.¹²

Padgett's argument against divine timelessness, then, is sound only if the case for an A-theory is successful. What the reader of Padgett's article will not realize is that Padgett himself is fully aware of this point and argues for the superiority of the A-theory in his unpublished thesis. On this point, therefore, we are in fundamental agreement.

God's Time and Ours

If the A-theory of time is correct, then, and God is in time, the question naturally arises in the context of Relativity Theory, "Whose time is He in?" For according to that theory, events which are present for an observer in one inertial frame may be future for an observer in another inertial frame. Certain events will even occur in reverse

temporal order relative to some frames as compared to others. An observer at rest relative to an observer who goes on a high speed round trip journey will experience moments of time or "now's" to which there literally exist no correlated, simultaneous moments in the experience of the traveller. According to Einstein, none of these perspectives is privileged, and there is, therefore, no absolute "now" in the universe. Absolute simultaneity has been vanquished from the universe in favor of simultaneity relative to a reference frame. There is, for example, no event happening "now" in an absolute sense on the planet Neptune or even on the other side of the earth. For observers in relatively moving reference frames will at this same space-time point draw different planes of simultaneity in space-time and thus measure different events, say, on Neptune, to be occurring in their respective "now's." But which, then, is God's "now"?

Ontological Time and Measured Time

It is the merit of Padgett's work that he has cut this Gordian knot by distinguishing between "time" and "measured time."¹³ Time itself, according to Padgett, has to do with God's everlasting duration; measured time is clock-time, time according to some metric. Padgett argues that while God is in time, He is not in any measured time, and, therefore, His "now" is not to be identified with any of the relative "now's" of measured time.

This distinction between ontological time and measured (or empirical) time seems to me an extremely important insight, which is a salutary counterbalance to the universally repeated and extravagant assertions that STR has forced us to abandon the classical views of time and space.¹⁴ This erroneous inference is rooted precisely in the failure to draw the sort of distinction which Padgett has emphasized. That failure can be laid at Einstein's own doorstep. I find it surprising that anyone reading Einstein's 1905 paper can think that Einstein *demonstrated* that absolute simultaneity does not exist and that time is therefore relative to reference frames.¹⁵ For the entire theory depends upon acceptance of Einstein's arbitrary (and, indeed, highly counter-intuitive) definition of simultaneity,¹⁶ coupled with a philosophical positivism of Machian provenance¹⁷ according to which a notion like absolute simultaneity is meaningless if it is empirically undetectable. Since the æther frame of nineteenth century physics could not be empirically detected, Einstein discarded it as meaningless and along with it absolute simultaneity, which had reference to events occurring simultaneously in the æther frame. By redefining simultaneity in terms of the light signal method of synchronization, Einstein was able to give empirical meaning to the notion of simultaneity, but the simultaneity which emerges from the theory is relative due to the invariant velocity of light. Since light signals are measured as possessing the velocity c regardless of the

motion of the emitter or receiver of the signals, two relatively moving observers will measure the same event to be occurring at different times, which runs counter to the traditional notion of simultaneity.¹⁸

One who is not a positivist and who therefore rejects Einstein's definitions would regard these relatively moving observers as deceived due to the nature of their measurements, which fail to detect the true time.¹⁹ In a real sense, he would not regard Einstein's theory as a theory about time and space at all, but, as Frank put it, as "a system of hypotheses about the behavior of light rays, rigid bodies, and mechanisms, from which new results about this behavior can be derived."²⁰ Trapped in our locally moving frames, we may be forced to measure time by devices which are inadequate to detect the true time, but that in no way implies that no such time exists. The fact that uniformly moving clocks run slow says more about our clocks than about the nature of time. Einstein's theory may thus be regarded as pragmatically useful and scientifically fruitful without considering that absolute simultaneity and absolute time have thereby been abolished.

It might be thought that Einstein's positivism was merely a historically accidental feature of the theory, but no part of the philosophical foundations of that theory. Such an attitude would, however, be mistaken. For as J. S. Bell points out, it is primarily this philosophical positivism which serves to distinguish the Einsteinian interpretation of STR from the Lorentzian interpretation, which differentiates between ontological time and measured time:

The difference of philosophy is this. Since it is experimentally impossible to say which of two uniformly moving systems is really at rest, Einstein declares the notions 'really resting' and 'really moving' as meaningless. For him, only the relative motion of two or more uniformly moving objects is real. Lorentz, on the other hand, preferred to view that there is indeed a state of real rest, defined by the 'aether,' even though the laws of physics conspire to prevent us indentifying it experimentally. The facts of physics do not oblige us to accept one philosophy rather than the other.²¹

Since the Lorentzian interpretation of STR is empirically equivalent to the Einsteinian interpretation, the only way the latter can discount the former is by means of a positivist critique of the notions of absolute simultaneity, and so forth. According to Lawrence Sklar, "Certainly the original arguments in favor of the relativistic viewpoint are rife with verificationist presuppositions about meaning, etc. And despite Einstein's later disavowal of the verificationist point of view, no one to my knowledge has

provided an adequate account of the foundations of relativity which isn't verificationist in essence."²² "I see no way of rejecting the old aether-compensatory theories . . . without invoking a verificationist critique of some kind or other."²³

Now this constitutes a truly serious drawback of the Einsteinian interpretation. For as Healey observes, although positivists tried to restrict the content of scientific theories to ensure that they were meaningful, "More recently positivism has come under such sustained attack that opposition to it has become almost orthodoxy in the philosophy of science."²⁴ Philosophers of religion hardly need to be reminded of positivism's untenability in view of its radical critique of religious language, which would regard Padgett's distinction between God's time and our time as cognitively meaningless.

Given that God is in time, therefore, it is evident that His is not the time which is determined by Einstein's operational definitions and subject to dilation, the relativity of simultaneity, and inversion of events. Rather, God's time is the true A-series time, determined by the succession of events in the divine consciousness and activity and characterized by the absolute "now" of the present and the edge of becoming. His is, to borrow D. H. Mellor's phrase, "real time."

Therefore, I think it quite unfortunate that Padgett has chosen to call his view "relative timelessness," for it is precisely the opposite. It is God who exists in the true, ontological time, while we finite observers, restricted to our locally moving reference frames and dependent upon light signal synchronization of clocks, have to make do with our manufactured measured time. Contrary to Padgett, ordinary usage of time concepts cannot justify calling God relatively timeless, for our naturally intuitive view of time is an A-theoretic point of view, and this is precisely the time in which God lives. Hence, the view Padgett presents is better labeled as "True Temporality."

God's Time and Cosmic Time

But how, then, does God's time relate to ours? Padgett answers that while we are in God's time, God is not in any measured time. But this response seems to me in fact false. From God's perspective in real, A-series time, there is an absolute present in which He is now conscious of what is happening in the universe, and He is now causally sustaining the events in the universe. But if, as we saw in our critique of divine timelessness, God's causally sustaining the universe in being is simultaneous with the events' being so sustained, then there must be an absolute, cosmic "now" which describes the state of the universe as it is present to God. Events future to this moment do not at all exist, since God has not yet caused them to be. But is there a frame of reference in the universe which yields a

measured time which can naturally be associated with the succession of such moments? Yes, there is. It is not, indeed, the inertial frame of any spatially local observer, rather it is the reference frame of the cosmic expansion of space itself. The relativity of simultaneity depends upon the assumption that there is no preferred reference frame; but if there exists a preferred frame, as the Lorentzian interpretation would have it, then the relations of simultaneity in it would be absolute, and relativity would apply to all other frames. But the frame associated with the cosmic expansion seems naturally suited to such a privileged position. Michael Shallis explains,

It is also possible, however, to take a single clock as standard, taking it to define a universal time coordinate, and to relativize everything to it Of course, the choice of a coordinate time is, to a certain considerable extent, arbitrary -- in principle, one could take any clock as one's standard. But in a cosmological context, it is natural to take as standard a clock whose motion is *typical* or *representative* of the motion of matter in general--one which simply 'rides along,' so to speak, with the overall expansion of the universe.²⁵

We must not forget that Einstein proposed his Special Theory long before the cosmic expansion was discovered, so that in the absence of the characterless and moribund æther there seemed to be no empirical basis for positing any universal frame beyond the multitude of locally moving frames. But with the discovery that the universe is expanding, it became possible to envisage a universal reference frame by imagining observers to be associated with fundamental particles (that is, galaxies or galactic clusters) having mutual recessional velocities. Indeed, the "gas" constituted by these fundamental particles is at rest relative to the expansion of cosmic space and therefore is an æther. Already in 1920 Eddington recognized that the General Theory of Relativity posited a sort of cosmic time, but he objected that such a cosmic time was unknowable and, hence, irrelevant for observers in locally moving frames.²⁶ Within a few years, however, the expansion of the universe predicted by Einstein's field equations (minus the cosmological constant) had been confirmed by observational astronomy, thus providing a sort of cosmic clock which the abandonment of the æther theory seemed to have rendered otiose. Of course, it might still be objected that this universal time is unknowable and, hence, irrelevant. But not only does this objection seem to be infected with a defunct verificationist attitude, but it does not even appear to be true. Recent observations have disclosed an apparent anisotropy in the cosmic microwave background radiation which is due to the earth's motion relative to the cosmic reference frame, resulting in what has aptly been characterized as a "new

æther wind" of approximately 360 kilometers per second.²⁷ P. C. W. Davies comments,

At any given place in the universe, there is only *one* reference frame in which the universe expands isotropically. This privileged reference frame defines a privileged time scale (the time as told by a clock at rest in that frame). Two separated places have their privileged reference frames in mutual motion, because of the expansion of the universe. Nevertheless, the time measured by the entire collection of imaginary standard clocks are obviously correlated such that the global condition (e.g. average separation of two galaxies) of the universe appears the *same* at equal times as registered by every privileged clock (assuming they are all properly synchronized). Happily, the earth is moving very slowly relatively to the local privileged frame in our vicinity of the universe, so that Earth time is a fairly accurate measure of cosmic time.²⁸

Not only, then, does a cosmic time exist, but we even have a pretty fair idea of what time it is.

Given the existence of this cosmic time, it is my contention that the moments of God's real, A-series time, while not perhaps *identical* with the moments of measured, cosmic time, are nonetheless *coincident* with them. God's ontological time clearly exceeds cosmic time in that the former may have preceded the latter (imagine God leading up to creation by counting "1, 2, 3, . . . , *fiat lux!*"), but once cosmic time comes to exist, its moments would coincide with the moments of real time. How could they fail to do so? If the duration of the universe is measured in cosmic time to be 15 billion years since the singularity, then is not the duration of God's creatorial activity in real time the same duration? In God's "now" the universe has (present tense) certain specific and unique properties, for example, a certain radius, a certain density, a certain temperature background, and so forth; but in the cosmic "now" it has all the identical properties, and so it is with every successive "now". Is it not obvious that these "now's" coincide and designate the one and the same present?

Perhaps we can state this consideration more formally by means of the following principle:

P: For any constantly and non-recurrently changing universe *U* and temporal intervals *x*, *y* large enough to permit change, if the physical description of *U* at *x* is the same as the physical description of *U* at *y*, then *x* and *y* coincide.

Given that in real time there is a temporal interval or duration during which a certain physical description of the

universe is true and that in cosmic time a similar interval exists, it follows from *P* that those intervals of real and cosmic time coincide. Notice that the argument makes no reference to and therefore does not depend upon any particular metrication of time. It seems to me, then, that real time and cosmic time ought naturally to be regarded as coincident since the inception of cosmic time.

Padgett's objections to this understanding of the relation of God's time to measured time seem to be quite weak. He objects, first, that God is not subject to the laws of nature, as anything in measured time must be. He argues that since God acts freely rather than uniformly and has the power to alter the laws of nature, He cannot be in any measured time. But why could not God's time contain its own intrinsic metric, as Newton believed, of which physical clocks provide a more or less 'sensible measure'?²⁹ In this case, an ideal physical clock would measure God's time. Moreover, the premiss that anything in measured time must be subject to the laws of nature is a *non sequitur*. It is the *instrument* of measurement, that is, one's *clock*, that must be subject to the laws of nature, not the *object* of one's measurement, which could be a wholly random process. To say that 15 billion years ago, God created the universe is not to say that God is subject to the laws of planetary motion, but is merely to apply to God's time a conventional metric which marks off a duration equal to the duration of an earthly orbit about the sun. It is to say that the duration during which God thought or did something is equal, say, to the duration it would take the earth to complete a certain number of orbits. Even on a purely mundane level, global proper time near the singularity is not a direct counting of simple and actual phenomena, for the earth will not have actually completed, say, 1010 orbits in the past 1010 years and even a Cesium atomic clock would not have functioned at very early intervals. Rather global proper time is an elaborate mathematical extrapolation from physical phenomena.³⁰ In a similar way, any arbitrarily chosen metric may be applied to the duration of God or the universe.

Padgett anticipates such an objection, surmising that the universe could be considered to act as a kind of clock to measure the duration of God's time. But let us be quite clear about this, for the universe does not merely *act* as a clock for God. The universe *is* a clock; it is God's clock. For example, some conventional unit of God's time could be the time it takes the radius of the universe to increase by a certain factor. Padgett retorts that it does not follow that because two events *e*₁ and *e*₂ are separated by one hour in one reference frame, they are separated by one hour in God's time. He appeals to time dilation between relatively moving frames to show that the duration between two identical events can be variously measured. But the analogy fails here, since we are not comparing two relatively moving frames using light signals to

synchronize their respective clocks. Since God is really related to the universe and is not moving with respect to it, there exists no basis for any relativity of simultaneity between His present and the cosmic present. God is an unembodied Mind utilizing a physical clock.

Padgett objects that cosmic time is contingent and applies to our universe alone. We cannot, therefore, assume that it applies to anything beyond it. But we have no reason, biblically or philosophically, to think that other universes exist. Parsimony justifies the assumption that ours is the only universe. In that case it follows only that real time and cosmic time *contingently* coincide; there are possible worlds in which they do not.³¹ But why is that an objection? Since God's decision to create at all was free, cosmic time is essentially contingent; indeed, I should say that even real time is contingent.³² But given that cosmic time exists, there is no objection to holding that God's time contingently coincides with it for the duration of the cosmos.

Padgett's second objection to this view is that measured time is relative to a particular reference frame, which need not apply to God. He argues that because God transcends space, His life need not occur in our four-dimensional space-time continuum. Therefore, His life is not limited to the temporal dimension of our space-time.

This objection raises some interesting questions about divine omnipresence,³³ which we may forego. One might also question whether the objection takes sufficient cognizance of the difference between parameter time and coordinate time.³⁴ In Newtonian mechanics time functions as a parameter, which is wholly independent of space. In relativity theory, however, time functions not merely as a parameter, but also as a coordinate which is united with the spatial coordinates. That theory is, however, susceptible to reformulation wholly in terms of parameter time. One could thus argue that God is in measured time, but that one means thereby parameter, not coordinate, time, so that God's independence from space is preserved. The essential point that needs to be made, however, is that God's time may be measured by coordinate time without His thereby being measured by spatial coordinates as well. For on the understanding I have proposed, the moments of ontological time may be thought to coincide with the moments of measured time without being identical with them. Thus, even if it is true that a being whose duration is measured exclusively by coordinate time must have spatial coordinates as well, it does not follow that a being whose duration in ontological time coincides with his duration in measured time must also be in space. Again, the fact that this coincidence is contingent constitutes no objection, but is in fact entailed by traditional theism.

Thus, it seems to me that Padgett's view needs to be refined with regard to the relationship between ontological

time and measured time, and, hence, between God's time and ours. Real time is the A-series time in which God thinks and acts and in which things come into being; the moments of this time coincide since the beginning of the universe with the moments of cosmic time determined by ideal clocks stationary with respect to the expansion of space itself.

Conclusion

I think, therefore, that Padgett has gone a long way toward formulating a philosophically sound and scientifically informed doctrine of divine eternity which is also faithful to the biblical revelation. The philosophical and theological grounds for preferring an A-theory of time also provide justification for rejection of the Plotinian-Augustinian doctrine of divine timelessness because that theory seems incompatible with a timeless God's real relation to the world. God thinks and acts in real time, that is, the A-series of temporal moments, in which becoming, absolute simultaneity, and the absolute "now" exist, and His relationship to time should be characterized as "true temporality." In contrast, by conventionally defining simultaneity in terms of the light signal method of clock synchronization and by adopting arbitrary metrics for quantizing time, men have developed a measured time, which is extremely malleable for relatively moving time-keepers. Since God is not in any inertial frame, His time, ontological time, is not subject to these effects. Nevertheless, in our universe, due to its isotropic expansion from an initial singularity, there contingently exists a cosmic time which records the successive moments in the history of the universe. Although ontological time may precede (or succeed) measured cosmic time--whether ontological time has a beginning is an issue we have not tried to adjudicate in this piece--, nonetheless the moments of ontological time and cosmic time will coincide for the duration of cosmic time, since they concern the identical succession of states in the universe. To object that this makes God subject to the laws of nature is a *non sequitur*, since it is only one's clock that need be so subject. To object that this view traps God in space-time is equally erroneous, since ontological time only contingently coincides with cosmic time, so that God in ontological time can exist at a moment which coincides with a moment of measured time without thereby having to possess spatial co-ordinates as well. One of the interesting implications of this understanding is that a Lorentzian rather than an Einsteinian interpretation of the Special Theory of Relativity is correct: there is a preferred reference frame in which light is propagated with the velocity c , and relativistic effects are due to local motion relative to this frame. With these refinements, Padgett's view of divine eternity seems to be coherent and plausible.

Endnotes

¹Notice that literature on divine eternity is so scant that it does not even merit a mention in William J. Wainwright's *Philosophy of Religion: an Annotated Bibliography of Twentieth Century Writings in English* (New York: Garland Publishing, 1978).

²See, for example, Nelson Pike, *God and Timelessness* (New York: Schocken Books, 1970); Stephen T. Davis, *Logic and the Nature of God* (Grand Rapids, Mich.: Wm. B. Eerdmans, 1983); Eleonore Stump and Norman Kretzmann, "Eternity," *Journal of Philosophy* 78 (1981):429-58.

³Alan Padgett, "God and Time: Toward a New Doctrine of Divine Timeless Eternity," *Religious Studies* 25 (1989): 209-15; see further idem, "Divine Eternity and the Nature of Time" (Ph.D. thesis, Oxford University, 1988) [now published as *God, Eternity, and the Nature of Time* (New York: St. Martin's, 1992)].

⁴The distinction between the A- and B-series of temporal events was originally made by J.M.E. McTaggart, *The Nature of Existence*, 2 vols., ed. C.D. Broad (Cambridge: Cambridge University Press, 1927; rep. ed.: 1968), Book V, chap. 33; for discussion, see C.D. Broad, *Examination of McTaggart's Philosophy*, 2 vols. (Cambridge: Cambridge University Press, 1938; rep. ed.: New York: Octagon Books, 1976), 2:265-344. See also Richard Gale, "Introduction" to Section II: "The Static versus the Dynamic Temporal," in *The Philosophy of Time*, ed. R. Gale (London: Macmillan, 1968), pp. 65-85.

⁵On the connection between classical conceptions of divine eternity and a B-theory of time, see Wm. L. Craig, *The Problem of Divine Foreknowledge and Future Contingents from Aristotle to Suarez*, Brill's Studies in Intellectual History 7 (Leiden: E.J. Brill, 1988), pp. 116-21; idem, "St. Anselm on Divine Foreknowledge and Future Contingency," *Laval théologique et philosophique* 42 (1986):93-104. See also Delmas Lewis, "Eternity, Time and Tenselessness," *Faith and Philosophy* 5 (1988):72-86.

⁶For a brief critique, see Wm. L. Craig, "God, Time, and Eternity," *Religious Studies* 14 (1979):497-503.

⁷D.H. Mellor, *Real Time* (Cambridge: Cambridge University Press, 1981), p. 5.

⁸See refutation in Paul Horwich, *Asymmetries in Time* (Cambridge, Mass.: MIT Press, 1987), pp. 26-27. Horwich's own rejection of the A-theory is based on the mistaken view that an A-theory implies the denial of semantic bivalence for future contingent propositions.

⁹Such an objection needs to be formulated more carefully, but is adumbrated in Milic Capek, *The Philosophical Impact of Contemporary Physics* (Princeton: D. Van Nostrand, 1961), p. 165; idem, "Introduction," in *The Concepts of Space and Time*, ed. M. Capek, Boston Studies in the Philosophy of Science 22 (Dordrecht: D. Reidel, 1976), p. XLVII; Frederick Ferré, "Grünbaum on Temporal Becoming: A Critique," *International Philosophical Quarterly* 12 (1972):432-33; James A. McGilvray, "A Defense of Physical Becoming," *Erkenntnis* 14 (1979):275-99.

¹⁰See Ronald C. Hoy, "Becoming and Persons," *Philosophical Studies* 34 (1978):269-80.

¹¹See Quentin Smith, "Problems with the New Tenseless Theory of Time," *Philosophical Studies* 52 (1987):371-92 and the therein cited literature.

¹²See, for example, John Polkinghorne, "Cosmology and Creation," paper presented at the conference "The Origin of the Universe," Colorado State University, Ft. Collins, Colorado, 22-25 September, 1988. The proceedings will probably be published by SUNY Press.

¹³This much misunderstood distinction was carefully drawn by Newton himself in the *Scholium* to the Definitions at the beginning of his *Principia* (Isaac Newton, *Sir Isaac Newton's 'Mathematical Principles of Natural Philosophy' and his 'System of the World'*, trans. Andrew Motte, rev. with an Appendix by Florian Cajori, 2 vols. [Los Angeles: University of California Press, 1966], pp. 6-12). Cf. M.F. Cleugh, *Time and its Importance in Modern Thought* (London: Methuen, 1937), pp. 29-67; Philipp Frank, *Philosophy of Science* (Englewood Cliffs, N.J.: Prentice-Hall, 1957), pp. 140-43; Herbert Dingle, "Time in Philosophy and Physics," *Philosophy* 54 (1979):99-104.

¹⁴Typical are the recent assertions by Hawking: ". . . the theory of relativity put an end to the idea of absolute time The theory of relativity does . . . force us to change fundamentally our ideas of space and time" (Stephen Hawking, *A Brief History of Time* [New York: Bantam Books, 1988], pp. 21, 23).

¹⁵A. Einstein, "On the Electrodynamics of Moving Bodies," in *The Principle of Relativity*, trans. W. Perrett and G. B. Jeffery with Notes by A. Sommerfield (New York: Dover Publications, 1952), pp. 37-65.

¹⁶Two spatially separated events are simultaneous iff they both occur at the same clock times recorded by two synchronized clocks A and B situated respectively at the places of the events, where A and B are stationary relative to each other and B reads the same as A at the temporal mid-point of the time required for A to send a light signal

to B and receive it back again. The assumption is that A and B are not *both* moving with reference to the æther-frame, so that the travel-time of the signal is not greater (or less) on the return leg of its journey. Now clearly, unless one is an operationalist, this is not what simultaneity *means*, and unless one is a positivist, the underlying assumption of the definition is wholly gratuitous.

¹⁷The influence of Mach's positivism upon Einstein and his Special Theory of Relativity is widely recognized by historians of science, but is surprisingly rarely discussed by philosophers exploring the philosophical foundations of that theory. For discussion, see G. Holton, "Mach, Einstein, and the Search for Reality," in *Ernst Mach: Physicist and Philosopher*, Boston Studies in the Philosophy of Science 6 (Dordrecht: D. Reidel, 1970), pp. 167-77; P. Frank, "Einstein, Mach, and Logical Positivism," in *Albert Einstein: Philosopher-Scientist*, ed. P.A. Schilpp, Library of Living Philosophers 7 (LaSalle, Ill.: Open Court, 1949), pp. 271-86; H. Reichenbach, "The Philosophical Significance of the Theory of Relativity," in *Albert Einstein*, pp. 289-311.

¹⁸For alternative operational definitions of "simultaneity" and "synchronization" which preserve absolute simultaneity see T. Sjödin, "On the One-Way Velocity of Light and its Possible Measurability," paper presented at the conference *Physical Interpretations of Relativity Theory*, British Society for the Philosophy of Science, Imperial College, London, 16-19 September, 1988.

¹⁹This is, in fact, the modern Lorentzian interpretation of STR, which holds that velocity affects one's measuring devices so that moving rods contract and moving clocks run slow. Such an interpretation does not commit one to a substantival æther, but merely to an æther *frame*, *i.e.*, a privileged frame of reference. That the Lorentzian interprets length contraction and time dilation as not merely apparent, but real, cannot be cited as a disadvantage of the theory, since the Einsteinian also must posit real contraction and dilation (see Peter Kroes's paper "The Physical Status of Time Dilation within the Special Theory of Relativity" at the conference mentioned in note 18; see also Dennis Dieks, "The 'Reality' of the Lorentz Contraction," *Zeitschrift für allgemeine Wissenschaftstheorie* 15/2 (1984):330-42). The difference between the two on this score is that the Lorentzian offers some explanation for these effects, while the Einsteinian does not. The decision between a Lorentzian and an Einsteinian interpretation of STR will probably depend on whether God's time can be plausibly construed to coincide with some coordinate time, which would thereby be the privileged time of the æther-frame.

²⁰Frank, *Philosophy of Science*, p. 140.

²¹J.S. Bell, "How to Teach Special Relativity," in *Speakable and Unsayable in Quantum Mechanics*, ed. J.S. Bell (Cambridge: Cambridge University Press, 1987), p. 77.

²²Lawrence Sklar, "Time, reality and relativity," in *Reduction, Time and Reality*, ed. R. Healey (Cambridge: Cambridge University Press, 1981), p. 141.

²³*Ibid.*, p. 132.

²⁴R. Healey, "Introduction," in *Reduction, Time and Reality*, p. vii.

²⁵Michael Shallis, "Time and Cosmology," in *The Nature of Time*, ed. Raymond Flood and Michael Lockwood (Oxford: Basil Blackwell, 1986), pp. 68-69.

²⁶Arthur Eddington, *Space, Time and Gravitation*, Cambridge Science Classics (Cambridge: Cambridge University Press, 1907), p. 168:

"In the first place, absolute space and time are restored for phenomena on a cosmical scale The world taken as a whole has one direction in which it is not curved; that direction gives a kind of absolute time distinct from space. Relativity is reduced to a local phenomenon; and although this quite sufficient for the theory hitherto described, we are inclined to look on the limitation rather grudgingly. But we have already urged that the relativity theory is not concerned to deny the possibility of an absolute time, but to deny that it is concerned in any experimental knowledge yet found; and it need not perturb us if the conception of absolute time turns up in a new form in a theory of phenomena on a cosmical scale, as to which no experimental knowledge is yet available."

²⁷G.F. Smoot, M.V. Gorenstein, and R.A. Muller, "Detection of Anisotropy in the Cosmic Blackbody Radiation," *Physical Review Letters* 39 (1977): 899.

²⁸P.C.W. Davies, "Space-Time Singularities in Cosmology and Black Hole Evaporations," in *The Study of Time III*, ed. J.T. Fraser, N. Lawrence, and D. Park (Berlin: Springer Verlag, 1978), p. 76. I have corrected spelling errors in the quotation.

²⁹See Charles W. Misner, Kip S. Thorne, John A. Wheeler, *Gravitation* (San Francisco: W.H. Freeman, 1973), pp. 813-14. The authors' attempt to criticize global proper time as inadequately physical fails to appreciate the counterfactual nature of the metric's application; the time elapsed is measured *as if* an atomic clock were present and functioning.

³⁰See helpful discussion in Peter Kroes, *Time: Its Structure and Its Role in Physical Theories*, Synthese Library 179 (Dordrecht: D. Reidel, 1985), p. 49.

³¹By postulating a cosmic rotation of matter, Gödel was able to draft model universes satisfying Einstein's field equations in which no cosmic time exists (Kurt Gödel, "A Remark about the Relationship between Relativity Theory and Idealistic Philosophy," in *Albert Einstein*, pp. 557-62). In such worlds, Padgett's view would be correct. But in fact, there is a cosmic time, and it would naturally seem to coincide with real time.

³²See my "God, Time, and Eternity," pp. 497-503, where I argue that God existing without creation is timeless and

that He enters time at its inception with His creation of the universe. Since creation is a freely willed act of God, the existence of real time is therefore contingent.

³³See for example, Eddington's remark, "Just as each limited observer has his own particular separation of space and time, so a being co-extensive with the world might well have a special separation of space and time natural to him. It is the time for this being that is here dignified by the title 'absolute'" (Eddington, *Space, Time and Gravitation*, p. 168).

³⁴See Kroes, *Time*, pp. 60-96.

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