Time Reconsidered

DENIS CORISH

In 'McTaggart's Argument' we saw that past-present-future time, McTaggart's so-called A series, which he thought of as an impermanent, shifting series of temporal positions, can be understood as not a series at all but a shifting arrangement within and consistent with the 'permanent' earlier-later order of the B series.[1] We saw that although time is very different ontologically from number or space, logically all three have the same structure: that of a dyadic, precedes-succeeds series.[2] In terms of time the relation of order of the series is read 'earlier-later', in terms of space 'left-right', for example, in terms of number 'smaller-greater'.

The past is always earlier, the future always later, though not necessarily vice versa, and the present is always a temporal position earlier or later than some other, all of which signals that past-present-future time is logically consistent with earlier-later time. This is further supported by the logically possible construction within the smaller-greater number series, similar in every logical respect to the earlier-later time series, of a three-term arrangement similar to that of past-present-future. We simply introduce into that 'permanent' number series an impermanence, a shifting marker moving in one direction along the series, which corresponds to the impermanence of the present in the time series. For example, let each number in turn, going from smaller to greater, be designated *it*. It does not matter what '*it*' means; all that matters is that, for example, three, four and five, and whatever numbers, fractions or decimals, and so on, that are between, are each designated *it* in turn—and so on up the series. This is, from the logical point of view, exactly like the present moving along the earlier-later series, if that is a proper way to describe it. And from this same logical point of view it does not matter either what 'present' means. Logically, just as 100, let us say, becomes greater than *it* by less and less, becomes *it*, and then becomes smaller and smaller than *it*, as we move up the series, so

[1] Denis Corish, 'McTaggart's Argument', *Philosophy* **80** (January, 2005) 77-99.

[2] For an account of such series see Edward V. Huntington, *The Continuum* and Other Types of Serial Order (Cambridge, Mass.: Harvard University Press, 1917) 10-18.

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some future event becomes future by less and less, becomes present, and then becomes more and more past. As the moving designation of *it* is consistent with the smaller-greater series in which it takes place, so the moving designation of present is consistent with the earlier-later series in which it takes place, so that past may be considered earlier than present, and future later than present, whatever the present is—and whatever else it may be, it is always a temporal position earlier or later than some other temporal position, just as *it* is always a number smaller or greater than some other number. Of course the introduction of the *it* into the number series is artificial whereas the present of the temporal series appears to be quite natural, but that does not affect the logic, which is exactly the same in both situations. If the logic works for the one situation, that of the artificially introduced *it* in the number series, the same logic works for the other, that of the naturally occurring present in the time series, since, quite apart from the question of artificial or natural occurrence, the structure of the impermanent, shifting designator within the dyadic precedes-succeeds series is exactly the same for both.

All this is merely summary here, being discussed in greater detail in the aforementioned 'McTaggart's Argument'. We may add here though a further, clarifying comment about the logic. Past-present-future is, we have indicated, a three-term but not triadic arrangement within the two-term, dyadic temporal relation of earlier-later.[3] Such arrangements are not uncommon. They obtain wherever you have a standard of some kind, variable or fixed, within a simple up-down scale. The scale provides the basic dyadic relation, the standard within the scale the three-term arrangement, so that you get in order positions below standard, standard and above standard, which latter may in some situations become a new standard. But each position, standard or above or below it, is simply a position in the scale, up or down from every other. Such an arrangement occurs with, for example, a varying measure such as the Dow Jones average in stocks, with any record in sports, with the variable doh or the fixed A-440 in music. That there may be a three-term reference under a two-term relation is not confined to time and is not, from a logical point of view, any way odd or anomalous. The further question of why the present seems to keep shifting in one direction is not a logical but an ontological question. It may be remarked logically even of it, though, that the present need not be a moving individual but can be simply, in each case, a different member of the succession under the same definition, just as a moveable doh in music,

[3] Denis Corish, op. cit. 83-84.

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defined, let us say, as the tonic of a scale, can be embodied by successive notes, going up or down by, let us say, a half tone.[4] The present then is not a moving individual but a succession of individuals of the same species, that is, all having the same definition.

What our above summary is sufficient to show is that, *pace* McTaggart, the logic of past-present-future time is consistent with that of earlier-later time, and does not fall into contradiction. But of course it leaves unanswered the ontological question of what the naturally occurring present is. And that is the, or at least a, question that we must try to answer here. To put the question in another way: What is the ontology that allows or requires this logic of time? In this paper, as in the last, we shall think it very important to distinguish between the logic of time, which is similar to that of space and number, and the ontology, which is quite different from theirs. The distinction between the logic and the ontology is important because we have, it seems, a strong temptation to reify the logic, to think that if the logic is so, there must be real entities on that same level (that is, on some such level as that of Plato's forms) which justify that logic. But in fact the level of logic is at one or more removes of abstraction from the ontological facts which may justify it (a rather more Aristotelian arrangement), which is why time, space and number can all have the same precedes-succeeds logic.

Time and space as continua are abstractions. That means, in the final analysis, that they are idealized to a mathematical condition—one which we should be hard put to discover in their ontological state, even as measured. Sir Isaac Newton, in his great foundational text of modern physics, *Philosophiae Naturalis Principia Mathematica*, realized with admirable clarity this distinction between the idealized mathematical and the seemingly cruder ontological reality. As he put it in the case of time, it was a distinction between the 'absolute, true, and mathematical' on the one hand and the 'relative, apparent and common' on the other:

> Absolute, true, and mathematical time, of itself, and from its own nature, flows equably without relation to anything external, and by another name is called duration: relative, apparent, and common time, is some sensible and external (whether accurate or

[4] See Denis Corish, op. cit, 84, n. 9. For a recent controversy, from the A-series and B-series points of view, on the moving now, see L. Nathan Oaklander and Quentin Smith (eds.), *The New Theory of Time* (New Haven and London: Yale University Press, 1994) 202-285. The participants are Smith, Oaklander, George Schlesinger and David Zeilicovici.

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> unequable) measure of duration by the means of motion, which is commonly used instead of true time; such as an hour, a day, a month, a year.[5]

Newton was moved to introduce this distinction because, as he says:

> I must observe that the common people conceive those quantities [time, space, place, and motion] under no other notions but from the relation they bear to sensible objects. And thence arise certain prejudices, for the removing of which it will be convenient to distinguish them into absolute and relative, true and apparent, mathematical and common.[6]

He does not detail the 'prejudices' which this tying of time, space, etc. to sensible objects gives rise to. A major one, we might guess, is that the 'relative, apparent, and common' quantities of common observation are not 'absolute, true, and mathematical', and do not seem to give us any sure means of deriving the latter from them. Newton was a Platonist of sorts, though he puts the mathematical entities higher than Plato does, and Plato had already pointed out admirably that a drawn figure, for example, is an altogether different matter from the mathematical ideality of a figure of that kind.[7] One obvious disadvantage which the 'absolute, true, and mathematical' side of Newton's own system has is that its foundation upon observation (something that we shall see later, in the case of space, is a concern of Aristotle, Leibniz and Einstein) appears to be quite wanting.[8] On the other hand, and this is perhaps something that is

[5] Florian Cajori (ed.), *Sir Isaac Newton's Mathematical Principles of Natural Philosophy and His System of the World*, translated into English by Andrew Motte in 1729. The translations revised, and supplied with an historical and explanatory appendix by Florian Cajori (Berkeley and Los Angeles: University of California Press, 1966) Vol. I, 6.

[6] Cajori, ibid.

[7] Plato, *Republic* 510d5-511a1.

[8] It is this, presumably, which moves Newton to claim in the case of the famous bucket experiment, that the force evident in the spinning bucket of water—the water tending to climb the sides of the bucket, away from the axis of motion—indicates the effect of absolute, rather than merely relative, motion (Cajori, op. cit. 10-11). If, for example, the bucket were held still and the room were spun around it, we should not have the effect, though the relative motion of bucket and room could be the same. However, Ernst Mach's famous remark: 'Try to fix Newton's bucket and rotate the heaven of fixed stars and then prove the absence of centrifugal forces' throws Newton's reasoning here into doubt—Nick Huggett (ed.), *Space from Zeno to Einstein* (Cambridge, Mass.: The MIT Press, 1999) 174.

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not reflected on enough, if one simply accepts the existence of Newton's 'absolute, true, and mathematical' then the practical relation between that and the 'relative, apparent, and common' is unproblematic—that is, the mathematical ideals are reconciled to the cruder, ontological reality.

Newton's system, in terms of time and space, and therefore in terms of motion, consists of a pre-existing, purely mathematical framework into which the physical world is introduced by God the creator. The temporal and spatial positions already exist, so that the world is created at a particular set of places at a particular set of times, and not east or west of there or earlier or later. This is what Leibniz objects to in *The Leibniz-Clarke Correspondence*, largely on the ground that such pre-physical points and instants could offer no sufficient reason why God should choose these places and these times over others. Clarke, for his part, argues the Newtonian view.[9] We shall not be pursuing this most interesting controversy here, which is the *locus classicus* for the argument about whether time, space and motion are absolute, in Newton's sense, or relative, in the sense that he introduces as the prejudiced view of 'the common people', and which Leibniz espouses as the only correct view. We shall, however, refer to this or that aspect of the controversy as we go. What we may point out here is that, although the Newtonian absolute is deficient from the point of view of observation, it nevertheless works extremely well from the point of view of tying the ontological physical to the ideal mathematical. The physical world placed by God into the pre-existing framework of the mathematical occupies that framework directly, so that any physical line, for example, corresponds, however roughly, to an ideal line, which it actually occupies, at least roughly, and any physical time, measured by celestial motions or artificial clocks, corresponds similarly to an actually occupied ideal, mathematical time. Those correspondences are usually referred to in terms of the notion that the physical approximates to the ideal mathematical. And this Newton's system provides without more ado, so that the idealized science of the *Principia* may be applied to the physical measurements. On the other hand, if one considers time and space as not absolute but relative, as Leibniz considers them, it is one thing to say, as Leibniz does, that that time and space are 'ideal' or 'merely ideal', and quite another thing to show just how that physical yields that ideal.[10]

[9] H. G. Alexander, *The Leibniz-Clarke Correspondence* (Manchester: Manchester University Press, 1956).

[10] Again, we shall not be considering this problem here, as it would take us further than our simpler quest: to discover the ontology which justifies

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To the extent that time and space are idealized, however we are to arrive at that idealization, though they are ontologically quite different from each other, they have the same logic. So time may be represented as a line, an instant as a point, an earlier position as a position to, say, the left. There is nothing wrong, logically, with such a representation, but there seems something redundant about it. For to represent the line itself, by, say, a chalk-mark on a board, or even to conceive of the line as a mathematical entity, one must, it seems, already have taken time for granted—or, in the latter case, one might more properly say, take the timeless for granted, since mathematical entities may be regarded as timeless, or as some would put it, eternal. But the timeless here has something in common with at least the same time: in both cases the things in question exist together, coexist.

Consider the chalk-line AB. We must, it seems, assume A, B and the line all to exist at the same time (or at least to exist together—which coexistence, as soon as we relate it to anything which exists earlier or later than it, becomes a matter of the same time). If we do not assume them to exist together, then, as we draw the line, we must follow with the eraser in the other hand, so that the line is erased as it is being drawn. A exists when B does not, and B exists when A does not. There never is a line but only a point, represented by a chalk-mark which is immediately erased. Such a consideration of continual disappearance, or continual change or shifting, is featured very prominently in the modern theory of space-time, and, as applied to time itself, formed one of the *aporiai*, the difficulties, with the consideration of which Aristotle began his study of time in Book IV, chapter 10 of the *Physics*,[11] and St. Augustine dwelt on it in Book XI of the *Confessions*.[12] Later, Leibniz used a similar reduction to try to show that time does not exist as real but must only be ideal, asking: 'For how can a thing exist, whereof no part does ever

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the logic of time. I have said something about the problem in Denis Corish, 'Time, Space and Freewill: The Leibniz-Clarke Correspondence' in J. T. Fraser, N. Lawrence, D. Park (eds.), *The Study of Time III* (New York: Springer Verlag, 1978) 634-655. There is, I believe, a good deal more to be said. I made some preliminary attempts to say it, in a somewhat generalized form, in Denis Corish, 'The Continuum', *The Review of Metaphysics* **XXII** (March, 1969), 523-546. That article, also 'dead-born from the Press', is indeed about the grounding of the logic of the continuum in ontology, but the original model for the contemplation of the continuum was time.

[11] Aristotle, *Physics* 217b32-218a8.

[12] St. Augustine, *Confessions*, 11. 14. 17, ff.

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exist? Nothing of time does ever exist, but instants; and an instant is not even itself a part of time'.[13] But that the representation of time by a line must presuppose time itself—that is, that our consideration of space seems to take time, in the sense of the *same* time, for granted, appears to make time the more fundamental consideration. As Kant puts it, in terms of his own doctrine of the a priori status of time and space, which, whatever we may think of it as explanation, seems to present a pretty accurate description of experience:

> Time is the formal *a priori* condition of all appearances whatsoever. Space, as the pure form of all *outer* intuition, is so far limited; it serves as the *a priori* condition only of outer appearances. But since all representations, whether they have for their objects outer things or not, belong, in themselves as determinations of the mind, to our inner state; and since this inner state stands under the formal condition of inner intuition, and so belongs to time, time is an *a priori* condition of all appearance whatsoever.[14]

This might fairly be paraphrased, without the Kantian apparatus of the a priori, as: Space appears to be the region of every physical event which my consciousness records as outside me (outside being different for different senses, so that the hand, for example, is also outside in terms of vision); time appears to be the region of any event whatsoever, including those of consciousness, the occurrence of which may not be spatially determinable by any usual method. Time seems to play a very fundamental role in our experience, more so than space, and therefore more so than the scientific abstraction 'space-time'. We should therefore, it seems, try to get the notion of time cleared up in some way first before tackling either space or space-time. (As regards the latter, we may think of time within a single inertial frame, the clock being at rest with respect to an inertial observer, something without which there would be no standard for considering time outside of, moving uniformly or non-uniformly with respect to, such a frame.)

But we may of course get what help we can, with due caveats, from other quarters, and we are not yet quite finished with time

[13] H. G. Alexander, op. cit. 72-73. Leibniz's letters here are translations by Clarke from the original French. There is, it seems to me, a problem with declaring time to be ideal (having thus the ideal, mathematical properties) on the ground that it is not possible that it should exist, but we shall not be discussing this here.

[14] Norman Kemp Smith (tr.), *Immanuel Kant's Critique of Pure Reason* (London: Macmillan & Co Ltd; New York: St. Martin's Press, 1963) 77.

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itself as an abstraction. Both time and space fit the further abstract schema of the continuous series. This sees the logic of time, and of space, as conforming to the logic of the number series. More accurately, we may say that time, space and number are all equally possible interpretations of a neutral, that is, uninterpreted, series which consists of a collection of elements related to each other by a precedes-succeeds relation of order which is connected (of any two elements, say M, N, O, … one precedes the other); irreflexive (no element precedes itself); and transitive (if M precedes N and N precedes O, then M precedes O). It will follow that such a relation of order is also asymmetrical (if M precedes N, then N does not precede M). For continuity some further properties are required (such as denseness: between any two elements there is at least one other), but these need not concern us just here.

In the temporal interpretation 'M precedes N' is read 'M is earlier than N', just as in the spatial it is read, say, 'M is to the left of N', just as in the numerical it is read 'M is smaller than N'. All of these are equally possible interpretations, and so the abstract logic for space, at least as one-dimensional, time and number is all the same. (Space as three-dimensional depends of course on viewing each dimension as one similar to that of time or number, and then viewing all three as at a relation to each other, which relation defines the right angle; they are at right angles to each other. Space-time, as four-dimensional, depends on the further complication, first projected as the imaginary number, viewed in terms of graphing at the zero position a line at right angles to the number continuum represented as a line, and involving, in terms of finding distances via the square on the diagonal, the square root of minus one, time being thus considered as being 'at right angles' to all three spatial dimensions. This further complication will not here concern us.)

We recognize that M being earlier than N is, ontologically, very different from M being to the left of N or in front of N or below N, or from M being smaller than N; nevertheless, the abstract logical structure is exactly the same in all these cases; it is M precedes N. The different ontology, particularly as between time and space, giving the same logic, has, I believe, led to some confusion between the ontology and the logic of time. This is the source, it seems to me, of the unnecessary view, embraced by some followers of McTaggart, that past-present-future time is a kind of logical rival to earlier-later time, whereas, as we saw in 'McTaggart's Argument', past-present-future is really history, actual or potential, rather than logic, and not in any kind of rivalry to or conflict

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with the logic of earlier-later, which it must conform to.[15] Also, we get from many philosophers the notion that to think of time in terms of the earlier-later relation, calling, it seems, for the tenseless use of verbs, and the fixed or permanent relationship of M earlier than N, is to 'spatialize' time, to make time spacelike.[16] In fact the resemblance between time and space, and number, and the possibility of representing time, and the number continuum, by the spatial line, goes back to the deeper, in the sense of more abstract, identity of the precedes-succeeds logic of time, space and number, so that the question of spatialization or spacelikeness of time is really not a logical question so much as one of familiar representation.

Space is simply more familiar to us, in the sense that we can imagine it more easily, taking time implicitly for granted in order to do so. This seems adequately attested historically by the fact that the Greeks developed geometry, and number theory to the extent at least of discovering irrational numbers, while time was still a matter of some quandary. What is implicit in our knowledge, and dealt with casually and correctly in everyday terms, may often breed problems when it begins to emerge as explicit.[17] In the case of time this is admirably put by St. Augustine's famous complaint: '*Quid est ergo tempus? Si nemo ex me quaerat, scio, si quaerenti explicare vellim, nescio*—What then is time? If nobody asks me, I know; if I want to explain it to someone who asks, I don't know.'[18] And, much later, George Berkeley said the notion of time, as 'abstracted from the succession of ideas in [his] mind' caused him to be 'lost

[15] Denis Corish, 'McTaggart's Argument' 82-83.

[16] For the spatialization of time see Henri Bergson, for example *Duration and Simultaneity* with Reference to Einstein's Theory, translated by Leon Jacobson (Indianapolis; New York; Kansas City: The Bobbs-Merrill Company, Inc., 1965) 53. For time as spacelike see Willard Van Orman Quine, *Word and Object* (Cambridge, Mass.: Harvard University Press, 1960) 172.

[17] As a good example, consider that Homer could be quite grammatical long before the science, as such, of grammar was contemplated. Again, Homer had no difficulty expressing ordinary, though ultimately quite complex, temporal notions, though there was as yet no explicit theory of time. The history of philosophical concepts may often be fruitfully regarded as the history of the becoming explicit (often with considerable difficulty and paradox) of notions long handled implicitly with ease and without confusion. In fact I should be inclined to propose such an approach as a useful principle of historical comment in this area, especially, but not exclusively, for Greek philosophy.

[18] *Confessions*, 11. 14. 17.

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and embrangled in inextricable difficulties'.[19]

But in fact the logic of time, since it does conform to that of space and number, is relatively straightforward. It is simply a matter of positions being earlier and later in an ordered series, the earlier-later relation being connected, irreflexive, transitive and asymmetrical. And, as we saw in 'McTaggart's Argument', the past-present-future arrangement of time will conform to that, to the extent that the present is always a temporal position earlier or later than others and the past is always earlier, the future always later. What has to be kept in mind is that the ontology should not be confused with the logic.

What is not so straightforward, it seems, is what that ontology is, what 'earlier than' and 'later than' actually mean. From a purely logical point of view we need not worry about what they mean, since they plainly can be regarded as interpretations of 'precedes' and 'succeeds', respectively, just as 'to the left of' and 'to the right of', or 'in front of ' and 'behind', can on the one hand, and 'smaller than' and 'greater than' can on the other—and 'precedes' and 'succeeds' can be taken simply as representative of the connected, irreflexive, transitive, asymmetrical, dyadic order. For this reason many who are interested in the logic of time may be willing to accept 'earlier' and 'later' as primitive. But from the ontological point of view it is a somewhat different story. 'Earlier' and 'later' are clearly temporal, as 'to the left' and 'to the right', and also 'smaller' and 'greater' clearly are not, and as 'before' and 'after' are only with further interpretation. For the latter can be interpreted as either the temporal 'earlier' and 'later' or the spatial 'in front of' and 'behind', not to mention the possibility of using the spatial metaphorically in order to express the temporal, as in Andrew Marvel's famous poem 'To His Coy Mistress': 'And yonder all before us lye/ Deserts of vast eternity'—where 'before' signifies 'out before' in space, as a place to travel to, used metaphorically here for future time. The before in space, however, involves, in terms of travel, afterwards in time, in the sense that we will reach it afterwards, later. For future time is later time, which is after, not before. And yet the spatial 'before' used metaphorically in the quotation for the temporal 'after' causes us no confusion; we handle all that knowledge implicitly and quite easily.

Aristotle, who used the Greek terms *proteron* and *hysteron*, which,

[19] George Berkeley, *A Treatise Concerning the Principles of Human Knowledge*, edited by Jonathan Dancy (Oxford; New York: Oxford University Press, 1998) §98, 138.

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like the English 'before' and 'after', can be used either spatially or temporally, and so should properly be translated by those terms rather than by 'earlier' and 'later', had some resulting difficulty in determining the relation of the order of time to that of space. He thought the order of space to be more fundamental, and that of time to be derivable from it, through that of motion, but made, I believe, a *petitio principii* in implicitly thinking of motion as temporal in the first place.[20]

That 'earlier' is temporal, though 'permanent' is recognized by McTaggart in his attempt to show that the 'permanent' B series is not sufficient for change: 'The B series, however, cannot exist except as temporal, since earlier and later, which are the distinctions of which it consists, are clearly time-determinations'.[21] Clearly, for McTaggart the meaning of 'earlier' is determined by the notions of the 'A series', that is, the notions of past, present and future. For, although 'where there is no A series there is no time', it

> does not follow that, if we subtract the determinations of the A

[20] For an analysis of what Aristotle does here see Denis Corish, 'Aristotle's Attempted Derivation of Temporal Order from That of Movement and Space', *Phronesis* **XXI** (Nr. 3, 1976) 241-251. Anthony P. Roark disputes the claim that Aristotle begs the question here, and makes, in a doctoral dissertation, the ingenious claim that Aristotle's account of change in terms not of time but of potentiality and actuality can provide a pretemporal meaning for 'before' with respect to motion, which then, as Aristotle claims, determines the temporal meaning—Anthony Phillip Roark, *Time in Physics* IV: Aristotle's Reductionistic Vision in Four Movements (Doctoral Dissertation for The University of Washington, 1999) 58-71. My difficulty with Roark's claim is that change, in the Aristotelian terms of potentiality and actuality, does not seem to provide as clear a directionality as time does. For example, the travelling by something from A to B may be represented in Aristotelian terms as the ongoing fulfilment of the potentiality of that thing, which is not actually at B, for being at B, and that would certainly provide a direction from A to B. But what about a circular round-trip, from A to A, where the thing could, it seems, be both actually at A and potentially at A? In terms of time the matter is simple: something is at A and at A again later. How does the actuality-potentiality analysis give us this? For here it appears that the spatial direction is reversed but the temporal direction remains the same. Again, something that has been brought up by others: How does this deriving of the order of time from that of space apply to, say, the heating of water, which change, in Aristotle's terms, does not involve movement through space?

[21] J. Ellis McTaggart, 'The Unreality of Time', *Mind* New Series **68** (October 1908), 461.

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> series from time, we shall have no series left at all. There is a series—a series of permanent relations to one another of those realities which in time are events—and it is the combination of this series with the A determinations which gives time. But this other series—let us call it the C series—is not temporal, for it involves no change, but only an order. Events have an order [but may run M, N, O, … or O, N, M, for example] … It is only when change and time come in that the relations of this C series become relations of earlier and later, and so it becomes a B series.[22]

For McTaggart the past-present-future determinations are required to constitute the earlier-later determinations. The other constituent is the 'not temporal' series of whatever is to become events, the C series. So, for McTaggart, 'earlier-later' seems to mean something like 'position in the C series plus the determination of past, present or future'. Without that plus, the thing, whatever it is, would be in a series but not in a temporal series, and so would not be an event, since 'event' is as temporal a term as 'earlier'. What, though, could a series of such things be? Presumably it is not a spatial or numerical series, identified as such. It seems to be, rather, something quite neutral, like our precedes-succeeds series. That series, however, is 'not temporal' only because it is at a level of abstraction beyond time, or space, or number, and constitutes the ultimate logic of any one of these. It is an equally possible abstraction from any of these. And these are, respectively, temporal, spatial, numerical to begin with. 'Earlier' is not temporal because 'past-present-future' is added to some 'not temporal' series; it is temporal in its own right, as temporal as 'past'. 'Earlier' is the temporal interpretation of 'precedes', just as 'left' or 'before' ('in front of') is the spatial interpretation, or 'smaller' the numerical. And 'past', 'earlier than present' is simply part of a three-term, shifting, reference system which is temporal just as 'smaller than *it*' is part of a three-term, shifting, reference system which is numerical.

Now since the present, whatever else it is, is a temporal position earlier or later than others, that is, a temporal position exhibiting the connectedness of the time relation, perhaps we shall get a better notion of what 'present' means if we find out what 'earlier' and 'later' mean, that is, if we find out what time is, ontologically speaking. For it seems that the three-term, shifting arrangement 'past-present-future', though logically equivalent to the three-term, shifting, arrangement 'smaller than *it*-*it*-greater than *it*', both being

[22] McTaggart, op. cit. 461-462.

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equally possible interpretations of, say, 'precedes *marked*-*marked*-succeeds *marked* (using '*marked*' in an obvious, ordered, way as the uninterpreted term corresponding to '*it*' or 'present')—it seems the temporal arrangement is, unlike the numerical, not artificially introduced but natural, that is, arranged by nature itself. It is ontologically determined. And we must try to see how.

And we must, it seems, break new ground. For there are not, in fact, so far as I know, many philosophical attempts to describe our experience of time, in parallel, say, to attempts to describe our experience of space, in such a way as to show what the foundation is for the logical or mathematical structure. Certainly we can point more easily to the spatial attempts.

In *Physics*, Book II, Chapter 2 Aristotle, distinguishing between the natural philosopher and the mathematician, says:

> The mathematician also deals with these things [points, lines, surfaces, volumes], but not as the limit of a natural body. Nor does he view the attributes [such as shape] as those of natural bodies. And so he separates [abstracts]. For in thought they are separable from movement [of the natural bodies]; and the separating makes no difference, and no error results.[23]

Again, Leibniz, in trying to combat Newton's notion of absolute time and space and show that time and space, as viewed by people in general, are relations between physical things, says:

> I will here show, how men come to form to themselves the notion of space. They consider that many things exist at once [note here the taking of time for granted] and they observe in them a certain order of co-existence, according to which the relation of one thing to another is more or less simple. This order is their *situation* or distance. When it happens that one of these co-existent things changes its relation to a multitude of others, which do not change their relation among themselves; and that another thing, newly come, acquires the same relation to the others, as the former had; we then say, it is come into the place of the former; and this change, we call a motion in that body wherein is the immediate cause of the change. [Throughout the changes] one may always determine the relation of situation, which every co-existent acquires with respect to every other co-existent; …And that which comprehends all those places, is called *space*. Which shows, that in order to have an idea of place, and consequently of space, it is sufficient to consider these relations, and the rules of their

[23] Aristotle, *Physics* 193b31-35.

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> changes, without needing to fancy any absolute reality out[side] of the things whose situation we consider.[24]

Leibniz gives here no equivalent, everyday, account of time.

Einstein too gives an account of space which is very pertinent to our concern here, and with a particularly instructive introductory paragraph:

> Scientific thought is a development of pre-scientific thought. As the concept of space was already fundamental in the latter, we must begin with the concept of space in pre-scientific thought. There are two ways of regarding concepts, both of which are indispensable to understanding. The first is that of logical analysis. It answers the question, How do concepts and judgments depend on each other? In answering it we are on comparatively safe ground. It is the certainty by which we are so much impressed in mathematics. But this certainty is purchased at the price of emptiness of content. Concepts can only acquire content when they are connected, however indirectly, with sensible experience. But no logical investigation can reveal this connection; it can only be experienced. And yet it is this connection that determines the cognitive value of systems of concepts.[25]

Einstein gives the imaginary example of a text of Euclidean geometry, with no diagrams, found by some future archeologist, when Euclidean geometry is unknown. 'He will discover how "point," "straight-line", "plane" are used in the propositions', how propositions are deduced, even how new propositions are to be produced; but this will all be 'an empty play with words for him as long as "point", "straight-line", "plane", etc., convey nothing to him.' And 'conveying something' here

> means that one can point to the sensible experiences to which those words refer. This extra-logical problem is the problem of the nature of geometry, which the archeologist will only be able to solve intuitively by examining his experience for anything he can discover which corresponds to those primary terms of the theory and the axioms laid down for them.[26]

[24] Alexander, op. cit. 69.

[25] From Albert Einstein, 'The Problem of Space, Ether, and the Field in Physics,' translated by S. Bargmann, in *Ideas and Opinions* (New York: Crown Publishers, 1954, 1982. Quoted from Nick Huggett (ed.), *Space from Zeno to Einstein* (Cambridge, Mass.: The MIT Press, 1999) 253.

[26] Ibid.

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The difference between the logic and the ontology could hardly be better put. But that is for space, whereas our concern is with time, which is not nearly so well studied, it seems. McTaggart plunges *in medias res*, simply accepting, at least provisionally, 'earlier', 'later', 'past', 'present' and 'future' when he says:

> Positions in time, as time appears to us *prima facie*, are distinguished in two ways. Each position is Earlier than some, and Later than some, of the other positions. And each position is either Past, Present, or Future. The distinctions of the former class are permanent, while those of the latter are not.[27]

A.N. Prior says of this passage that 'McTaggart presented what might be broadly called the phenomenology of time with singular accuracy',[28] and himself goes on to develop a tense logic for past-present-future time. But we still don't have, for time, anything corresponding to Aristotle's ostensive abstraction of 'point', 'line', 'surface' and 'volume', or Leibniz's or Einstein's appeal to experience. Strictly speaking, the corresponding temporal terms would be 'instant' and 'interval', with perhaps 'simultaneity' entering in at the same level, though Einstein's 'spatial relations', below, will clearly correspond to our temporal relations—but it seems that we don't know how to begin with time in the same way we begin with space, especially if, in the latter case, we implicitly take time for granted.

Einstein, in the case of space, does something similar to what Aristotle does and, in a way, similar to what Leibniz does. He says:

> In any ontological question, our concern can only be to seek out those characteristics in the complex of sense experiences to which the concepts refer.
>
> Now as regards the concept of space: this seems to presuppose the concept of the solid body. The nature of the complexes and sense-impressions which are probably responsible for that concept has often been described. The correspondence between certain visual and tactile impressions, the fact that they can be continuously followed through time, and that the impressions can be repeated at any moment (touch, sight) [again, note the references here to time], are some of those characteristics. Once the concept

[27] McTaggart, op. cit. 458.

[28] Arthur Prior, *Past, Present and Future* (Oxford: Oxford University Press, 1967) 1.

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> of the solid body is formed in connection with the experiences just mentioned—which concept by no means presupposes that of space or spatial relation—the desire to get an intellectual grasp of the relations of such solid bodies is bound to give rise to concepts which correspond to their spatial relations. … These spatial relations are obviously real in the same sense as the bodies themselves.[29]

Einstein goes on to say that for Euclid 'The point, the plane, the straight line, the segment are solid objects idealized',[30] and we might say, it seems, that Euclid is Aristotelian here. To get some grasp of what we need to do in order to represent time as an abstraction, it may be worth our while to take some guidance from such a long, revealing quotation from Einstein.

But the process of idealizing space, and the source idealized, is somewhat easier to grasp than in the case of time, if only because we seem to take time for granted in considering space—as we indicated in parenthesis above, in quotations from both Leibniz and Einstein. The notion of time thus taken for granted is implicit, and needs to be abstracted out, pretty much as, I take it, the notions of space and spatial relation referred to by Einstein are implicit, when he says above that the concept of solid body 'by no means presupposes that of space or spatial relation'. The notion of solid body does not presuppose the more abstract notions of spatial relation and space as such, in the sense of their having to be first recognized explicitly as being 'real in the same sense as the bodies themselves'. But they are lurking there, so to speak, as implicit, and as guiding, needing to be abstracted out, made explicit, at some stage. And time, as an entity as real as objects, lurks even further back in our consciousness. We don't have so obvious a source there as we have with the solid bodies which underlie the notion of spatial relations.

So we must ask: What does underlie in this way the notion of temporal relations? It will not be, simply, solid bodies, as in the case of space, though solid bodies are candidates, among others. It seems that what we are up against, in the case of time, is things that come into or go out of existence in some way, or appear to. So solid bodies are candidates in the sense that they appear or disappear, when, for example, a light is turned on or off, or, more gradually, as when the sun or moon rises or sets. But it appears then that any kind of change, fast or slow, that can be observed or reasoned to by an extension of observation provides such a candidate. We notice

[29] Huggett, op. cit. 254.
[30] Huggett, op. cit. 255.

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change, and in doing so notice time, as Aristotle remarks in *Physics* IV 11: 'For when we do not change with respect to thought, or miss the changing, it does not seem to us time has passed'.[31] Or again:

> we notice movement and time together. For even when it is dark and we experience nothing through the body, if there is some movement in the soul, immediately it seems there is time. And when there does seem to be time there does seem to be movement together with it.[32]

All of this raises the question whether time and change are really the same thing.

But that question may be left open for now, since we are not necessarily committed to an Aristotelian or any other view, but simply, after the manner suggested by Einstein's remarks about space, looking to see what may underlie our temporal notions. Instead, we may ask: What is it that is common to all these, physical or mental, things that seem to come into or go out of existence, quickly or slowly, suddenly or gradually? And surely it is this coming into or going out of existence itself, which is certainly some sort of change. Asserting this of course may put us at odds with those who, in the interests of a block-universe space-time, deny that there is any change at all. But we are, at this level, no more committed to such a view than to an Aristotelian one. Things, it appears, do come into and go out of existence, for any change, it seems, may be described in that way: the thought which I had no longer exists; the sun no longer exists as at that position; the leaf no longer exists as green, or does not yet exist as red; Queen Anne, or McTaggart, no longer exists as living; our own existence as living will cease; I, as looking at this writing, exist, but did not and will not; this individual heartbeat comes into, goes out of, existence. All of these descriptions involve time, and many of them tense; what is common to them all seems to be existence and nonexistence. But, it should be added, it is the existence and nonexistence of the same thing, of the heartbeat, of myself or the sun or the leaf as this or that, under this or that description and identification.

Now we know, in terms of logic, that the same thing cannot both exist and not exist at the same time. To think or say it could would be contradiction. But we also know that the same thing can both exist and not exist, and it is not contradiction to think or say so, pro-

[31] *Physics* 218b21-23.

[32] *Physics* 219a3-6. Notice with regard to these two quotations from Aristotle that Kant, as quoted above, is in substantial observational agreement.

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vided that it is not at the same time. Both 'Anne is sitting in this chair' and 'Anne is not sitting in this [same] chair' can then be true. That is, they can both be true, provided that the temporal reference in one, in terms of the present tense, is not the same as the temporal reference in the other, in terms of its present tense. Anne can be both sitting and not sitting in this chair, only not at the same time.

And this may tell us what time is. The difference between 'Anne is sitting in this chair' and 'Anne is not sitting in this chair', if both are true, is not a tense difference, since both are present tense.[33] But it is of course a time difference. What obtains in both is a present tense, but not with reference to the same time. This does not yet tell us what the present is, but it gives us at least a function for the present tense, and then for other tenses by reference to the present. That function is clearly demonstrative. The present tense refers to a particular, individual time. This has often been expressed by the claim that the present tense is 'token reflexive', that is, that it refers to the particular time *t*, the time of the utterance itself which contains that present-tense usage. But there seem to be problems with this claim, particularly as it seems possible that there might be a time at which no such token was ever used.[34] But this would not affect the truth that where the present tense is used it points demonstratively to its own time. And here we need not worry about the quarrel between upholders of 'earlier-later' accounts and 'past-present-future' accounts, since, if the claim of 'McTaggart's Argument' holds, both of these accounts are consistent with each other—at least to the extent to which each does not try to deny the other in its own favour. There is no rivalry, as in our ordinary speech habits we implicitly realize.

Now if 'Anne is sitting in this chair' and 'Anne is not sitting in this [same] chair' are both, as present-tense statements, true, then the difference is that each refers demonstratively to a different time—that is, one statement is earlier or later than the other, different times being instances of the connectedness of the temporal rela-

[33] That McTaggart fails to recognize sufficiently such different time references by different uses of 'past' or 'present' or 'future' is something I point out in Denis Corish, 'McTaggart's Argument' 88-96.

[34] D. H. Mellor calls this the 'so-called *token-reflexive* B-theory of what gives A-propositions their truth values'. D. H. Mellor, *Real Time II* (London and New York: Routledge, 1998) 32. Mellor goes on to say however that this account, and any corresponding, rival 'A-theory' account of token-reflexive theory will fail 'at a time *t* when no one has written or is thinking or saying anything, i.e. when there are no tokens of any proposition'—ibid.

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tion. And precisely what makes it possible that both of these statements are true is time—time, that is, as earlier *and* later, as present *and* past or future.[35] The 'and' is clearly important. There is no earlier without a correlative later, no present without a correlative past or future. And it is the existence of both sides of the correlation that enables two seemingly contradictory statements to be both true. 'Anne is sitting in this chair' and 'Anne is not sitting in this chair' cannot be true at the same time, that is, with demonstrative reference of the present tense of each to the same time. But they can both be true. And the difference is time itself.

Now if we revert to our notion that a statement such as 'Anne is sitting in this chair' denotes an existence of some kind, it will follow that the denial, 'Anne is not sitting in this chair', denotes the corresponding nonexistence—which is why both of these statements cannot be true at the same time. But time, as earlier *and* later, as present *and* past or future, allows them both to be true. Now we may have a choice. Either time is something absolute which *allows* both A and not-A to exist, or time itself *is* simply the existence of both A and not-A. Here I do not wish to go over the extensive ground of the Newton-Leibniz controversy about whether time is absolute or relative; I suggest, on the reasonable ground that an absolute time is unobservable, that time is relative.[36] If that is so, then the second alternative above is the choice: Time is the existence and nonexistence of exactly the same thing in exactly the same respect. Given that existence and nonexistence, you have time.

If that is so, since time is, as we recognize, essentially a matter of earlier and later, it suggests that if the existence is later, the nonexistence is earlier; if the existence is earlier, the nonexistence is later. Now it is of course a serious matter to suggest that nonexistence plays an ontological role in anything. Yet it does seem to be a matter of experience that not merely existence but nonexistence is important. Nonexistence is a foundation for longing, planning, pursuing and avoiding. The achieving the existence of what we wish for, the nonexistence of what we are oppressed with, is very important in our lives as we live them. Again in biological, evolutionary science, and in astronomy and geology, for example, nonexistence

[35] Note here something we tend to take implicitly for granted: the difference between time and *a* time. Time is both the earlier and later correlatives; a time is the earlier or later position as such.

[36] In Denis Corish, 'Time, Space and Freewill: The Leibniz-Clarke Correspondence', referred to in note 10 above, I go over some of this area, and also, in terms of its working out, in Denis Corish, 'The Continuum', also mentioned in that note.

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seems to be a very important consideration. So it seems realistic to take account of nonexistence somehow. And time is a very important way of doing that.

But it should be observed that to recognize nonexistence as a temporal correlative, an earlier or a later, is not necessarily to assert that nonexistence possesses the property of being earlier or later—such an assertion, it seems to me, would call for an absolutist rather than relativist notion of time. Nonexistence, it seems clear, possesses no property whatever. However, that does not prevent nonexistence, as opposed and related to its opposite, existence, from *constituting* one pole of the earlier-later relation. I shall call the correlative earlier and later poles of the relation *relationships*. Earlier is a relationship, and so is later. The two together, in the sense that they correlatively require each other, are the relation. And that relation is time. And that relation amounts simply to the fact that things, the same things, both exist and do not exist. And that means that the nonexistence of something is, as such, earlier or later than the existence of that thing, provided that thing does come to exist or to cease to exist.

Mere existence or mere nonexistence does not give time. For that both are needed. If something, God, or something else, existed forever, there would in that existence itself be no indication of time.[37] The same is true of the nonexistence of something that never exists. It is only when something does not exist, and then exists, or exists and then does not exist, that there is time. And that *then*, which is, or is the ontological ground for, a temporal indicator, is constituted by that situation. The thing in question then comes into or goes out of existence. Time is a shift, a change, from nonexistence to existence, or from existence to nonexistence. So time is, in a sense, change—and any change involves time.

If anything at all of any kind comes into or goes out of existence, there is time. And if there is ever time, there is always time. This follows from the fact that time is both the existence and nonexistence of the same thing in the same respect. If the existence is later, the nonexistence is earlier. (And that, I think, is about as fundamental as we can get with earlier and later; there is no further resolution of them into anything else but such, recognized, correlative existence and nonexistence). But that nonexistence could be nothing at all, if the existence is, say, of the physical universe. Before, earlier than, physical existence there may be nothing. But this does not mean that it is a case of not earlier, even though nonexistence, nothing, possesses no property at all. It is a question not merely of

[37] A realization that becomes explicit as early as Parmenides.

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nonexistence but of nonexistence and then existence; it is a question of change. And it is therefore a question of correlation. In that context the nonexistence constitutes, rather than possesses the property of, earlier. At least the nonexistence in retrospective relation to existence is earlier, just as not-A may be in the relation of contradiction to A. It is something that cannot be done without in a non-Parmenidean universe.

Such an earlier nonexistence then constitutes, itself, a first moment of time. It is only a moment, it seems, for there is nothing in it to constitute anything else—but if anything comes into existence from nothing (and we do not here examine whether this really is possible), that nothing is earlier, and constitutes a first moment of time. Similarly, if existence gives way to nothing, that nothing constitutes a last moment of time. So if there is ever time there is always time, though it may be time with a first or a last moment, or both.

This does, however, raise another problem, and I am not sure that I am metaphysically qualified to solve it: how to distinguish nothing as earlier from nothing as later. If there should be nothing, then something, then again nothing, the two nothings, it seems, cannot be distinguished, since each, equally with the other, has no properties whatever. But this failure to discriminate would do away with time as both the existence and nonexistence of the same thing in the same respect—at the very least it would do away with the connectedness of the temporal relation, since the nothing as earlier and the nothing as later would have no basis upon which the one could be earlier than the other, or constitute the relationship of earlier than the other. One solution might be to say that earlier and later are after all absolute, and it is simply the case that the one nothing is earlier than the other. This again would do away with the definition of time as the existence and nonexistence of the same thing in the same respect. Earlier and later, that is, time itself, is now simply a given, *abs[que] relatione ad externum quodvis*, 'without relation to anything external', which ill accords with our observations of temporal situations.

Another solution, which would keep to the relativist account, might be to urge (rather, I am afraid, than argue) that given any existence, there can never subsequently be nothing. If creation occurs, annihilation will not.[38] The temporal sequence, assuming the possi-

[38] St. Thomas Aquinas indicates that, whereas continued creation requires conservation by God, without which creation would revert to nothing, the intention of God in creation, given divine wisdom and foreknowledge, argues the non-reversion of created things to nothing. *Quaestiones de quodlibet* iv. 3.

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bility of creation, would then be: nothing, something, not that thing. And that is about as much as I can do with that question. If there is no creation, or, more accurately, if time has no beginning, then there is no difficulty, it seems, with the assertion that time is both the existence and nonexistence of the same thing in the same respect, though it will be assumed that any earlier thing will not be identical to any later thing as such (distinguishing here between something which is later and something which, as an identity, persists, if that is possible)—for real identity would destroy the ground for distinguishing between the preceding and the succeeding states. (It may also follow, if the present account of the nature of time is correct, that we shall have to rethink the concept of identity through time).

Such an assumption would, it seems, rest on a causal theory of time. The causal force, though, is merely existence itself, and then, at least by consequence, nonexistence. This should not be surprising when we reflect that existence is the primary actuality by which any causal force is such a force. As Thomas Aquinas puts it: *ipsum esse est perfectissimum omnium: comparator enim ad omnia, ut actus*—'existence itself is the most perfect of all things; it is related to all as their actuality'.[39] We need, ontologically, nothing else but existence, together with the corresponding, correlative, nonexistence, to constitute time, to constitute earlier and later.

The reality of time is this: any identity, x, comes into or goes out of existence. This constitutes a relativist view, rather than an absolutist view, of time. It also constitutes a causal theory of time, in the broad, existential sense mentioned above. And also, it appears, it forbids as contradictory the notion of time travel. For on this account by time travel some identity, x, exists when it does not exist. It appears that for time travel to be justified an absolutist rather than relativist account of time would be required.

If we think epistemologically, in terms of notions in the human mind, though much here remains, I suspect, implicit and is not at all explicitly worked out, existence is in some clear way the most

[39] *Summa Theologica*. Pars Prima. Question iv. Article One, reply to the third objection (1a. iv. 1, ad 3). Thomas, with his characteristic admirable clarity, distinguishes between what we might call 'mere existence', as opposed to existence plus life, or plus life plus wisdom, for example, and says: 'nevertheless the very existence [esse] of God includes in itself life and wisdom, because not one of the perfections of being [de perfectionibus essendi] can be lacking in him that is subsistent existence itself [quod est ipsum esse subsistens] (1a. iv. 2, ad 3). And he calls 'Who is' the most proper or suitable [maxime proprium] name of God (1a. xiii. 11).

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fundamental of those notions. The next should appear to be nonexistence, negation in the most fundamental sense, involving in its realization at least some implicit notion of relation. Identity must then come in at some next basic level, possibly requiring implicit knowledge of negation, and leading to the notion of number. After that, it seems to me, is the notion of time, that is, the notion of the relation between the existence and nonexistence of the same identity. Time is in that sense a more fundamental notion even than contradiction, which is the relation between the existence and nonexistence of the same identity only at the same time. The same thing can both exist and not exist, but not at the same time (and not eternally). Time is therefore one of the most fundamental notions we have—which justifies Kant's and Aristotle's views, as quoted earlier, and the views implicit in Leibniz and Einstein, that the representation of space requires the taking of time for granted in some sense. It is no wonder then that we can have Augustinian-type difficulties with the notion of time, or, given our ease with it as implicit, prefer to take it as in some sense primitive (and hence also, perhaps, our temptation to think of it as absolute), if it is indeed so very fundamental in our consciousness

So if time is, ontologically, the existence and nonexistence of exactly the same thing in exactly the same respect, what then is present time? A. N. Prior, not long before his death, said that the two concepts of the present and the real 'are closely connected; indeed on my view they are one and the same concept, and the present simply *is* the real considered in relation to two particular species of unreality, namely the past and the future'.[40] Note here that we should need something like our before-mentioned notion of subsequent nonexistence to distinguish between the 'two … species of unreality'. But we should now, to be consistent with our definition of time, modify Prior's view with the assertion that nonexistence may also be present, or constitute presentness. The nonexistence of Queen Anne, or of McTaggart, or of Prior, is present; the corresponding existence is earlier than the present. And the present nonexistence extends into any possible future; it persists.

There need be no problem about that when we reflect that a present may be a very extended time. We have no difficulty in talking about the present day, week, month, year, century, millennium. But this does not necessarily mean that the notion of the present is vague. It is a perfectly clear notion. But the references which mark

[40] A. N. Prior, 'The Notion of the Present', *Studium Generale* **23** (1970), 245.

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or fix it, so to speak, are various, without necessarily contradicting each other, but depending on the circumstances of reference. The present millennium goes back to, let us say without arguing about it, the year 2000, and will go forward, will still be present, until the end of 2999. From one point of view that incorporates both past and future, both earlier and later; from another all that time is present. So similarly the time of the (later) nonexistence of Queen Anne is still present, and will continue to be so. So far, that present has coincided, at least in part, with the present of let us say a chair in which Queen Anne did 'sometimes counsel take—and sometimes tea'. That is, that chair still survives. It has been and continues to be present. And so also the nonexistence of Queen Anne is present.

What is true, of course, is that that is not a very useful reckoning of the present, though it is not false. It is much more useful for us to reckon the present by much more minute references—so the present minute or second or tenth of a second, or nanosecond, if the need be. And it is in this sense that Prior is right in linking the present to existing rather than non-existing things. It is a matter of convenience, though, rather than of truth versus falsehood. This follows from our definition of time as the existence and nonexistence of exactly the same thing in exactly the same respect. The nonexistence is as 'real' as the existence here, since both are necessary for time.

But it also follows that the present is perfectly real. It is as real as the earlier or later position. If there is an earlier, that earlier may be a present, and so the later is a future. If there is a later, and of course there cannot be one without an earlier, and vice versa, that later may be a present, and the corresponding earlier is a past. If there is an earlier and later then, there is a present and a past or future. The 'A series' has exactly the same ontological reality as the B series.

We take it as an obvious truth that any time t is, at time t, present, so that indeed it makes sense to define 'present time' as, simply, 'time t at time t'. But now any earlier or later position is such a time t, and therefore at that time is present. Present time is in that sense as real as the earlier or later position of any such time t, without which there could be no correlative later or earlier, and therefore no time at all. Again, the so-called A series, which is really only a shifting arrangement within and consistent with the earlier-later B series, is as real as the reality of that series itself.

The definition of 'present time' applies to any time t, just as the label '*it*' was applied by us to any number. We could then also designate some particular number, say 100, *it*, which would make any smaller number less than *it* and any larger number greater. In the

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same way some particular time *t* is naturally, not artificially, designated present, and we tend to call it *the* present. When we refer to *the* present, without further qualification, we are referring to the time, the earlier-later position, of any one or many of very many markers of that present, that earlier-later position—this second, the time of the existence of this thought, of this utterance, of this body, of this chair—but are not thereby excluding possible reference to much more extensive present existences or non-existences: the time of the (later) nonexistence of Queen Anne, the time of the existence of this galaxy. But what we are saying then is that if 'present' in a general sense denotes any time *t* at time *t*, 'present' in a particular sense refers demonstratively, as the present tense also does, to some particular time *t*. (And given that, at least implicitly, it becomes also possible to refer demonstratively to an earlier or later time, to the past or the future.) The difference is that between the species as such and the individual members of it, between present as defined and present as identified.

The particular present or now is the *this* of time. If it is possible to identify any particular, of whatever kind, and so attach a 'this' to it as a label, that is also possible for a particular of time, a particular temporal position. And since time is so fundamental, ontologically and epistemologically, all we need do to identify the particular in question is refer to this time or now, or use the present tense. It can be the time of this utterance or this heartbeat or this chair.

Where does the impermanence of the particular present come from? From the fact, it appears, of the replacement of the existence with the nonexistence or vice versa, the change from the one to the other. The change goes in one direction merely because there is no return to identical nonexistence once existence occurs. Each subsequent existence or nonexistence (simplifying, so as to ignore for now such complexities as partially overlapping existences and nonexistences, though indeed each overlap is itself, in terms of what we said earlier, an existence)—each subsequent one is a new present. To exist or to cease to exist, that is to become earlier or later, is to become present, as existence or nonexistence. So 'earlier-later if and only if present and past or future, or both' is true. The coinciding of the so-called A series with the B series is ontologically justified.

This will have to suffice for an at least preliminary investigation of the ontology of time, as opposed to, but as justifying, its logic. We have seen how that ontology permits that logic, to the extent at least of providing, in the definition of time as the existence and nonexistence of the same thing in the same respect, a foundation for the dyadic, earlier-later temporal relation. And we have seen, as a

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result of 'McTaggart's Argument', that there is nothing to prevent time as past, present and future from following the same dyadic logic. What we have not done here is gone into the mathematical aspects of time, such as interval, instant and simultaneity, the temporal equivalents of Aristotle's or Einstein's lines, points, surfaces, volumes. To go into those mathematical aspects would take us much further afield, and must be left for another occasion.[41] But at least for now we have seen that it is not hopeless to think, *pace* McTaggart, that earlier and later and past, present and future time go together, and are in some sense as perfectly real as each other, as indeed our common notions of time seem implicitly to tell us. More explicitly, what we know now is that past-present-future is a three-term arrangement under a two-term, that is, dyadic, relation. The middle term of the three is taken, logically, in an either-or fashion; it is either later than one or earlier than another term (which gives two), or both (which gives three). The ontological foundation of the dyadic, earlier-later relation is the dichotomy existence-nonexistence (or nonexistence-existence), as referring to the same identity; the ontological foundation of the three-term arrangement, past-present-future is nonexistence-existence-nonexistence, of the same identity.

Bowdoin College

[41] I have made a summary attempt, in Denis Corish, 'The Continuum', referred to in notes 10 and 36 above, to go into these topics in the relational direction indicated (but not, I think, followed) by Leibniz.

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