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LEIBNIZ' THEORY OF SPACE: A RECONSTRUCTION

BY EDWARD J. KHAMARA

I. INTRODUCTION

My aim in this article is partly to give a coherent restatement of Leibniz' relative theory of space, partly to defend it against some recent criticisms. The first task is certainly worthwhile, since Leibniz' own statement of his views about space has come down to us in a very disjointed form; it was in fact written during the very last weeks of his life, and in the heat of controversy, as a series of rejoinders to critical points made by Clarke in their famous Correspondence.

And there is a further complication. The fact of the matter is that in his controversy with the Newtonians Leibniz met his opponents half-way, adopting what I would call an *ad hominem* stance. By this I mean that he granted for the sake of argument certain assumptions upheld by his opponents which he himself regarded as false. In particular he granted the reality of spatially related material bodies, though his considered opinion was that material bodies are not irreducibly real but merely 'well-founded phenomena' whose basis are the mind-like, non-spatial monads. And he granted the irreducible reality of relational properties (particularly those involving spatial and temporal relations), though his official view was that relational properties cannot stand on their own but are always parasitic upon, or reducible to, non-relational (intrinsic) properties.[1] In a real sense, then, Leibniz was here impersonating a philosophical position in which he did not ultimately believe. Yet it is this impersonated position that I want to restate and discuss under the label 'Leibniz' relative theory of space'. How this impersonated position is to be reconciled with the non-spatial monadism to which he officially subscribed is a question that I shall set aside.

[1] Cf. C.D. Broad, 'Leibniz' Last Controversy with the Newtonians', reprinted in his *Ethics and the History of Philosophy* (London: Routledge & Kegan Paul, 1952), p. 187.

II. SUMMARY STATEMENT OF LEIBNIZ' VIEWS

An important feature of the controversy, which is common to both Leibniz and the Newtonians and which (for historical reasons) I shall hold constant, is the assumption that space necessarily has a three-dimensional Euclidean geometry. With this in mind, we may restate Leibniz' views on space, as they emerge in the Clarke Correspondence, in eight different theses R1–R8 as follows.[2]

R1. The central thesis of Leibniz' relative theory of space and time concerns their *ontological status*: it asserts that they are, as Leibniz put it, 'relative beings', in that their existence is parasitic upon the existence of things which we ordinarily regard as their occupants. Thus if there were no material bodies, there would be no space; and if there were no events or processes, there would be no time.[3] (The remarks which follow are for the most part concerned with Leibniz' relative theory of space; his doctrine of time is not as fully articulated.)

R2. The theory holds that spatial relations (e.g., *being 3 feet distant from*) obtain primarily between simultaneously existing material bodies or physical objects. Spatial relations are held to be primitive and irreducible; but what they primarily relate are co-existing physical objects and not regions of space, for in reality there are no such things. Thus Leibniz declares in his Third Paper (L.iii.4):

> For my part, I have stated more than once that I hold *space* to be something purely relative, as *time* is: that I hold it to be an order of co-existences, as time is an order of successions. For space denotes in terms of possibility an order of things which exist at the same time, in so far as they exist together, without considering their particular ways of existing.

Thus Leibniz' theory is reductive with regard to the *existence* of space, as a separate container, but not with regard to spatial relations. (This contrasts with the Newtonian view that spatial relations obtain primarily between fixed regions of absolute space, and only derivatively between any physical objects that occupy them. However, on both the Newtonian and the Leibnizian views, spatial relations are taken to be primitive and irreducible.)

[2] References to the *Leibniz–Clarke Correspondence* are here given by letter (or reply) and section, using the abbreviations L and C: thus L.iii.4 = Leibniz' Third Letter, section 4; and C.iv.15 = Clarke's Fourth Reply, section 15; page references, where necessary, are to H.G. Alexander's edition (Manchester UP, 1956). In the quoted passages Clarke's spelling and punctuation have been modernized, and I have not always adhered to his translation of Leibniz' French text.

[3] In his Fifth Paper Leibniz declares that 'space, taken apart from things, . . . has nothing actual about it' (L.v.67); cf. L.iii.4, L.iv.41, and L.v.62.

R3. The theory requires a frame of reference, consisting of a set of *actual* physical objects, relatively to which spatial positions can be assigned to *other* physical objects, whether these other objects are actual or merely possible. Leibniz elaborated the theory in two stages: by first defining 'sameness of spatial position' in terms of spatial relations to a frame of reference, and then defining 'place' (i.e., spatial position) in terms of being in the same place at different times. And he regarded space as a collection of places, so defined. This feature of Leibniz' theory will be elaborated in the next section.[4]

R4. Though all motion is relative (in virtue of the relativity of place), there is room for a distinction between what Leibniz calls 'true motion' and 'mere change of relative situation'. For there to be true motion within Leibniz' theory two necessary conditions have to be satisfied. X *moves truly* relatively to Y if and only if: (i) X changes its situation relatively to Y; and (ii) the cause of that change of situation lies in X rather than in Y. An example of true motion in this sense would be that of a man W walking towards another man S who is seated. Here both S and W undergo a change of situation relatively to each other; but whereas S undergoes a mere change of situation relatively to W, W is in true motion relatively to S, since it is he who is the cause of this change of situation.[5] In a well-known passage Leibniz characterizes the distinction he has in mind as follows (L.v.53):

> I grant that there is a difference between a true absolute motion of a body and a mere relative change of its situation in relation to another body. For when the immediate cause of the change is in the body, that body is truly in motion, and then the situation of other bodies relatively to it will be changed in consequence, though the cause of that change is not in them.

This passage, as we shall see, has generated a good deal of misunderstanding. Leibniz' use of the term 'absolute', in connection with the kind of true motion which he takes his own theory to allow, is certainly unfortunate; and I shall avoid using it in my own exposition. For what he means by true motion is still relative, and must be distinguished from Newtonian absolute motion which presupposes the existence of absolute space and time as autonomous entities.

[4] See L.v.47, and L.v.104.

[5] This example is borrowed from Henry More; see his letter to Descartes dated 5 March 1649, in Descartes, *Correspondance*, ed. C. Adam and G. Milhaud (Paris: PUF, 1963), vol. 8, p. 177; see also More's letter of 23 July 1649, in the same volume, pp. 246–7. I owe the example and the references to G.H.R. Parkinson, 'Science and Metaphysics in the Leibniz–Newton Controversy', in *Studia Leibnitiana Supplementa*, vol. II (Wiesbaden: Franz Steiner, 1969), p. 106.

R5. Matter is continuous (i.e., infinitely divisible), and the material universe is infinite in extent. However, it is more reasonable to assume that the material universe had a beginning, so that time is not infinite with respect to the past.[6]

R6. There is no vacuum, i.e., there are no empty pockets of space, within the material universe; and similarly there are no empty lapses of time.[7]

R7. Space and time are contingent beings, since their existence is parasitic upon the existence of created things (physical objects and processes) which are always contingent beings (L.v.63).

R8. God is not in space and time. If there were no created beings there would be no space or time, but God would still exist as a necessary being. Thus God's existence is non-spatial, and he is eternal in a non-temporal or timeless sense.[8]

This completes our outline of Leibniz' views on space. The question next arises: are we to regard these eight theses as constituting a 'package deal', so that to accept Leibniz' theory one must accept all of them? My answer is no: we must isolate the core of the theory from the rest. The core of the theory is constituted by the conjunction of R1, R2, and R3, which are logically inseparable. R1 declares that the existence of space is derivative and depends on the existence of physical objects; R3 explains exactly how this dependence is to be understood; and R2 is presupposed by R3. But the remaining theses R4–R8 are all logically independent of that core; and in a moment (in section IV) I shall argue the point in each case.

III. THE RELATIVITY OF SPATIAL POSITION

Before I do so, however, we need to clarify the central theses R1 and R3. How exactly does the existence of space depend on the existence of material bodies?

About half-way through the Correspondence, Clarke got the impression that Leibniz was identifying space with matter. And against this alleged identity Clarke argued that, since (as he thought) space exists necessarily and is both eternal and infinite in extent, 'those who suppose matter and space to be the same' are committed to the view (which he found absurd) that the material universe too exists necessarily, and is both eternal and infinite in extent (C.iv.15). To which Leibniz replied:

[6] See L.iv.21, L.v.30, and L.v.73–4.
[7] See L.ii.2, L.iv.PS (Alexander pp. 43–5), L.v.24, and L.v.33.
[8] See L.iv.41, L.v.79, and L.v.106.

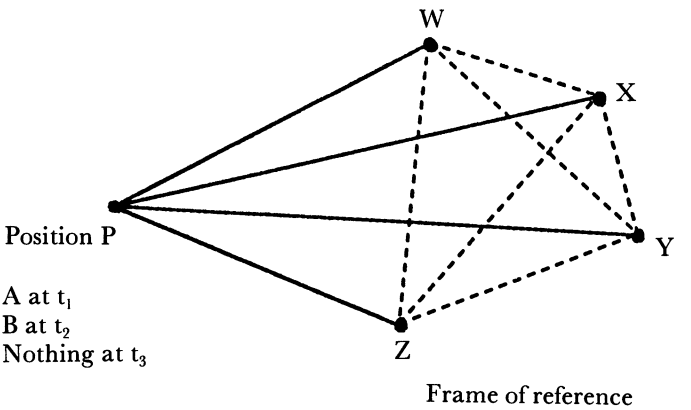
> I do not say that matter and space are the same thing; I only say that there is no space *where* there is no matter, and that space by itself is not an absolute reality. Space and matter differ as time and change [*mouvement*]. However, these things, though different, are *inseparable*. But it does not at all follow that matter is eternal and necessary, unless we suppose that space is eternal and necessary – an altogether unfounded supposition (L.v.62–3; emphasis added).

This crucial passage may be read in two different ways, yielding what I would call an extreme and a moderate version of Leibniz' theory. (i) On the *extreme* version, Leibniz rules out the possibility of unoccupied places. The word 'where' is to be given a literal, locational reading as indicating a spatial position; and what Leibniz is saying here is that there is no spatial position unless it is occupied by some material object. (ii) On the *moderate* version, Leibniz does not rule out the possibility of unoccupied places; what he does rule out is the possibility of a spatial world containing no material objects at all. The word 'where' in the above passage is to be taken non-spatially as a mere logical 'if'; and what Leibniz is saying here is that if there are no material objects then there is no space at all, but if there *are* material objects then it is possible to have unoccupied as well as occupied places.

The *extreme* version of Leibniz' theory is open to some pretty strong objections, to be discussed later (in section V).[9] But I believe the moderate version to be truer to the Leibniz of the Clarke Correspondence when we take the totality of his views on space into account. A weighty point in my favour is that the moderate interpretation permits a fuller articulation of Leibniz' package deal, distinguishing the issue of ontological dependence (R1 and R3) from that of the non-existence of a vacuum (R6); whereas the extreme interpretation conflates these two issues. Yet if I am right in claiming that Leibniz was in fact *impersonating* a position which, he thought, the Newtonians should find worth arguing against, it would be very wise of him to take the question of ontological dependence first, in the weak sense, before raising the question of the existence or non-existence of a vacuum. For these reasons it seems to me that the moderate version is at least a defensible reading of Leibniz' position, and in what follows I shall assume that it is the correct interpretation of his theory.[10]

[9] Among Leibniz' precursors as spatial relativists, Aristotle undoubtedly upheld what I have called the extreme version of the theory. Thus he believed that there is a maximal finite distance at any time because the material universe is (and cannot but be) finite in extent, and the maximal distance is dictated by the maximally distant point-particles of the material universe at any time. On this and related issues, see the illuminating article by William Charlton, 'Aristotle's Potential Infinites', in L. Judson (ed.), *Aristotle's Physics: a Collection of Essays* (Oxford: Clarendon Press, 1991).

[10] Here I am indebted to John Bigelow.



Our next task is to see how exactly the thesis R3 is to be elaborated under the moderate interpretation. To simplify Leibniz' detailed account, we may restate it in terms of point-particles rather than material bodies. The introduction of point-particles is intended to be a mere simplifying device: it does not commit the theory to the existence of point-particles, which Leibniz would certainly reject. He held that the infinite divisibility of matter does not entail the existence of material points as its ultimate constituents.

Let W, X, Y, Z be four distinct point-particles, not in the same plane, which preserve all their mutual spatial relations unchanged during a certain period of time, T. These would then constitute a frame of reference F, relatively to which places may be assigned to other point-particles during the period T. Now let A and B be two other point-particles, and t_1 and t_2 an earlier and a later moment falling within the period T. And suppose that at t_1 A stands in certain spatial relations to each of the four items in the frame F (A will stand in a definite distance-relation to each of the four items in the frame F). Suppose next that, at t_2, A no longer stands in those same relations to the frame F, but that B does. Then we can say that, relatively to the frame F, B at t_2 is *in the same place as* A was at t_1. Thus to say that B at t_2 is in the same place as A was at t_1 is to say that B at t_2 stands in the same spatial relations to the frame F as A did at t_1. Let R be the set of relations to the frame F which obtains in either case.

Next suppose that at a still later moment t_3 (also falling within the period T) no actual particle stands in the relations R to the frame F.[11]

[11] This stage is not explicitly stated in Leibniz, but I take it to be essential to what I

Even so, it would be true to say that if a particle C were to stand in the relations R to the frame F, then C at t_3 would have been in the same place as A was at t_1 and B was at t_2. And in general, throughout the period T, there is a place, P, a point-position, which is entirely determined by the set of relations R to the frame F. Thus the place, P, is an abstraction, an 'ideal thing': it is simply the *possibility* of a point-particle standing in the relations R to the actual point-particles which constitute the frame F. Different sets of spatial relations to the frame F will determine different places, each of which is a different possibility. And according to Leibniz, space is the set of all places relatively to our frame of reference.

The above reconstruction is largely based on what Leibniz says in his Fifth Paper, particularly the following passage:

> To give a kind of definition, *place* is that which is said to be the same for A and for B when the relation of co-existence between B and [W, X, Y, Z], etc., entirely agrees with the relation of the co-existence which A previously had with those same bodies, supposing there has been no cause of change in [W, X, Y, Z], etc. It may also be said, without entering into particulars, that *place* is that which is the same at different moments for different existents when their relations of co-existence with certain other existents, which are supposed to continue fixed from one of those moments to the other, agree entirely. And *fixed existents* are those in which there has been no cause for any change of the order of their co-existence with others, or (which is the same thing) in which there has been no motion. Lastly, *space* is that which results from places taken together.[12]

We are now in a position to grasp the sense in which (according to R1) the existence of physical objects is necessary for the existence of space. This does not rule out a world with unoccupied places; what it does rule out is a spatial world in which no actual physical objects exist. The frame of reference must consist of actual physical objects; and this is enough to bestow reality on a whole space with every place in it. For a real space, according to this theory, is a set of places, a set of locational possibilities relatively to an actual frame of reference; and given an actual frame, all the possibilities of being situated relatively to that frame are also given. This at once guarantees, *a priori*, both the continuity and infinite extent of relative space.[13]

have called the moderate version of his theory. Leibniz did not recognize this third stage because he did not believe in the existence of a vacuum; but, as I shall argue later, this view is not dictated by the core of his relative theory.

[12] L.v.47; in the bracketed bits I have substituted my own symbols for Leibniz'.

[13] See W.H. Newton-Smith, *The Structure of Time* (London: Routledge & Kegan Paul,

In the above account and the accompanying diagram I have assumed that the minimum frame of reference needed by the Leibnizian theory to generate a three-dimensional space is one consisting of four distinct point-particles that are not in the same plane. It is interesting to see what happens when this minimal frame of reference is diminished. The most exiguous frame would consist of a single point-particle, Q. In such a spatial world the space generated would consist of half a straight line with Q as its terminus; for any point which is at a certain distance x from Q will be identical with any 'other' which is at the same distance. What if we increase our frame of reference to two distinct point-particles, Q and R? We should then have a space consisting of half a plane; for any point at distances x and y from Q and R respectively will be identical with its 'mirror image' on the 'other side' of the line joining the two point-particles. And if we consider a richer frame consisting of three point-particles, Q, R and S, they will generate half a three-dimensional space; for any point determined by the distances x, y and z from Q, R and S, will be identical with its 'mirror image' on the 'other side' of the plane determined by the point-particles Q, R and S. Thus to get a full three-dimensional space, we need a frame of reference consisting of at least four point-particles that are not in the same plane.[14]

IV. GETTING AT THE CORE OF THE LEIBNIZIAN THEORY

Assuming, then, that the conjunction of R1, R2 and R3 (so interpreted) constitutes the central core of Leibniz' theory, I now want to argue that each of Leibniz' remaining theses R4–R8 is logically independent of that core. And to show this in detail, I shall take R4–R8 in reverse order.

To begin with R8, the thesis that God is not in space or time, it is clear that this is not dictated by the core of the theory, which is theologically neutral. That space and time are relative beings is independent of whether or not God exists, and is also independent of whether or not He is a temporal or spatial object. Only if we assume, with Leibniz, that everything spatial and temporal is created by God and exists contingently, will it follow that God, as the creator and only necessary being, exists outside space and time.

And the case is similar with R7, the view that space and time are contingent beings. R7 would follow only if we assumed, with Leibniz,

1980), pp. 38–42.

[14] Cf. Andrew Newman, 'A Metaphysical Introduction to a Relational Theory of Space', *The Philosophical Quarterly*, 39 (1989), pp. 200–2.

that whatever is in space and time exists contingently. But the core of the theory is compatible with the existence of necessary spatial and temporal objects. Thus if God exists and God is a necessary but temporal being, then the existence of time, though relative, will be necessary in virtue of the necessary existence of God as a temporal being. This point is worth dwelling on, since at least one influential writer has considered the type of relative theory espoused by Leibniz as constituting a good reason for placing God outside time. Richard Sorabji writes (*Time, Creation and the Continuum* (London: Duckworth, 1983), p. 254):

> A very big difference is made by the doctrine, attributed . . . to a good many thinkers from Philo to Augustine, that time had a beginning, along with the moving creatures that God created, since time cannot exist in the absence of motion. This immediately makes it impossible to say that God exists in time. For, first, this would now imply that He too, like time, had a beginning and a finite past. And, secondly, it would imply that He depended for existence on His own creatures. For He could not exist without time, nor time without motion and the moving creatures created by Him. This is a very strong reason indeed for thinking God timeless.

But all this is a *non sequitur*. A relative theory of time such as Leibniz' can certainly be combined with the view that the material universe had a beginning in time (as Leibniz did believe), but without having to place God outside time. Assuming with Leibniz that God is a necessary being and everything else exists contingently, all one has to do is assume that before the creation of the material universe God existed in time from all eternity, so that, in virtue of God's necessary existence as a time-occupant, the existence of time would also be necessary; but time would be relative none the less.

And similarly with R6: the theory does not logically require the denial of a vacuum; for, on the moderate version, the possibility of unoccupied places is not ruled out. Leibniz' real reasons for denying a vacuum were in fact theological: one reason being that 'the more matter there is, the more God has occasion to exercise His wisdom and power' (L.ii.2).

R5 too is not dictated by the central core, which is compatible with matter's being either continuous or discontinuous, and also with the material universe's being either finite or infinite in extent. Leibniz' reasons for holding that matter is continuous and infinite in extent were theological and speculative. 'There is no possible reason', Leibniz declares, 'that can limit the quantity of matter; and therefore such a

limitation cannot take place' (L.iv.21). And the same argument is used for the infinite divisibility of matter; for 'what reason can be assigned for limiting nature in the process of subdivision?' (L.iv.PS, p. 44). Likewise, the central core of the theory is compatible with the material universe's having a finite or infinite history, whether in the direction of the past, or in the direction of the future, or both.[15] Leibniz' reasons for espousing the infinite extent of the material universe but its finite history are again theological and speculative. In support of these views, Leibniz writes:

> Absolutely speaking, it appears that God is able to make the material universe finite in extent, but the contrary seems more consistent with His wisdom . . . . If it is in the nature of things on the whole to grow uniformly in perfection, then the universe of creatures must have had a beginning. Thus there will be reasons for limiting the duration of things, even though there would be none for limiting their extension (L.v.30, 74).

Finally, R4 does not seem to be dictated by the central core either. Now many scholars have claimed that R4 must indeed be separable from the core of Leibniz' theory because it is in fact inconsistent with that core. The claim is that in admitting what he called true motion Leibniz was, in effect, retracting his official view that all motion is relative, a view which is entailed by R3. That was Clarke's verdict in his Fifth Reply (C.v.53), and many modern scholars have sided with him.[16] But this is surely wrong. As was explained earlier, what Leibniz means by true motion is a species of *relative* motion; so it is sheer distortion to equate Leibniz' true motion with Newtonian absolute motion, which requires the separate existence of absolute space and absolute time. But though R4 is quite consistent with the core of the theory, it is not logically dictated by that core. Leibniz does not seem to have intended the distinction between true motion and mere change of relative situation to have universal application; rather, he regarded the distinction as a matter of convenience which we may sometimes apply.[17]

[15] Cf. Broad pp. 185–6.

[16] A notable and specially unfortunate case is Alexander (*op. cit.* fn. 2 above), who says in his editorial Introduction (p. xxvii), 'There is . . . no doubt' that Leibniz' admission of true motion 'is inconsistent with his general theory of space'. For references to other modern scholars who have sided with Clarke's verdict, see Parkinson (*op. cit.* fn. 5 above, p. 106, n. 68).

[17] These points are ably argued by Parkinson, pp. 105ff.

V. SOME RECENT OBJECTIONS

We are now in a position to rebut some current objections to the relative theory, raised by Hugh Lacey and Cliff Hooker in two influential articles which were published in the early seventies.[18]

Lacey says (p. 319) that on the relative theory, the continuity and infinite extent of space become empirical matters open to investigation, and not conceptual matters. Hooker agrees, and claims (pp. 109–11) that these would depend on whether the occupants of space are in fact continuous and infinite in extent; he also claims that the theory does not admit the possibility of a vacuum.

It seems to me that these claims do indeed constitute serious objections to what I have called the extreme version of the relative theory; but they do not apply to the moderate version to which I take Leibniz to be committed. Against what I regard as Leibniz' own theory the objections before us rest on two mistaken assumptions. (i) The first is that according to that theory the reality of space requires that every place in it should be occupied (by something real); and (ii) the second is that the theory is committed to the view that the continuity of space can only be a consequence of the continuity of whatever occupies it. From (i) it would follow that the infinity of space would depend on the infinity of the material universe, and that a vacuum (unoccupied place) would be impossible.

But (as we saw in section IV) neither of these assumptions is entailed by what I regard as the core of the theory, namely the conjunction of R1–R3. It is true that Leibniz himself believed that matter is both continuous and infinite in extent (R5); and, of course, this could only be the case if space too were continuous and infinite in extent. But while the continuity and infinite extent of matter would, if true, be matters of contingent fact discoverable by empirical investigation, the continuity and infinite extent of space would (as was pointed out in section III) be matters of necessity, guaranteed *a priori*. Leibniz also believed that there is no vacuum (R6), a belief which he supported by theological arguments; but he did not wish to deny the possibility of a vacuum, i.e., the possibility of an unoccupied place. The non-existence of a vacuum is, for him, a contingent matter; but the possibility of a spatial world with unoccupied places is a matter of necessity, which is again guaranteed *a priori*.

[18] H. M. Lacey, 'The Scientific Intelligibility of Absolute Space: a Study of Newtonian Argument', *British Journal for the Philosophy of Science*, 21 (1970), pp. 317–42; C.A. Hooker, 'The Relational Doctrines of Space and Time', *British Journal for the Philosophy of Science*, 22 (1971), pp. 97–130.

Hooker also asks: what are the *relata* of the relational theory of space? Extended physical objects? Physical fields? He argues that neither would do the job of securing the continuity and infinite extent that one wants geometrical space to have.[19] But behind this objection is the same false assumption as we encountered before; namely, that according to the relative theory, the continuity and infinite extent of space can only be secured as consequences of the continuity and infinite extent of what is in it. Nor is it clear why the *relata* (or actual occupants) should all belong to one and the same category of spatial objects: why, that is, they cannot be a mixed bag of physical objects, fields, shadows, etc., or anything that requires a spatial position.

VI. ARMSTRONG ON ABSOLUTE AND RELATIVE MOTION

So far I have been dealing with objections generated by a failure to distinguish the moderate version of the theory from the extreme version. I now turn to two further objections which seem to me to rest on a mistaken reading of the theory on either version. In this section I will deal with one of these objections which was raised by David Armstrong in an article published many years ago.[20] The article is worth discussing because it contains a subtle misunderstanding the dispelling of which will, I believe, cast a good deal of light on Leibniz' actual theory.

Armstrong distinguishes two components of the relative theory of space: (i) first, its denial of the independent existence of absolute space as a container over and above what it contains; (ii) second, its insistence that only the simultaneous can be spatially related, and its consequent denial that different objects (or different phases of the same object) existing at different times can be spatially related. He believes that the second component is logically separable from the first; so that while the second component entails the first, the converse does not hold, i.e., the first does not entail the second. One can, on his view, consistently deny the existence of space as a separate container without also denying that temporally separated objects can be spatially related; one can, in other words, reject the existence of absolute space as a container without insisting that only the simultaneous can be spatially related. But if so, then one can have absolute motion without absolute space; for if we allow that different phases of the same object can be spatially related,

[19] See sections 3–4 of his article.

[20] D.M. Armstrong, 'Absolute and Relative Motion', *Mind*, 72 (1963), especially pp. 215–18.

we do not need a frame of reference to specify a change of spatial position. We can then say (i) that an object has moved if its present phase is at a distance from its earlier phase (if it is no longer where it was); and (ii) that the object has been at rest if its present phase is at no distance from its earlier phase (if it is at no distance from where it was); and in either case the motion and the rest would be *absolute* and not relative.

In what way does this constitute an objection to the Leibnizian theory that I am defending? In section II, I isolated as the core of that theory the conjunction of the theses R1–R3, which I regard as logically inseparable. In particular I regard R1 as entailing R3: R1 declares that the existence of space is derivative and dependent on the existence of physical objects; R3, which insists on the relativity of place, explains exactly how this dependence is to be understood. Now R3 requires that all motion is relative, in virtue of the relativity of place. But if Armstrong is right, then R1 need not have this consequence, and R3 would be separable from R1. Thus in terms of our exposition of the Leibnizian theory, Armstrong's objection boils down to this: on my view R3 is not logically separable from R1, on his view it is.

How does Armstrong defend his position? Basically he conducts his discussion in terms of two statements involving two physical objects, *A* and *B*, which for the sake of simplicity we will assume to be point-particles (or temporally distinct phases of point-particles).[21] The two statements may then be expressed as follows:

(1) *A* is *now* (at t_1) three feet from *B*,

and

(2) *A* is *now* (at t_1) three feet from where it *was* (at t_2).

Armstrong finds it strange that the relative theory should treat these two statements so very differently. For while the first statement is regarded as 'complete', the second is treated as 'elliptical', standing in need of completion by specifying the relevant frame of reference. But could we not regard the second statement as equally complete and non-elliptical, specifying a direct relation between temporally distinct phases of *A*? In both cases, 'it would simply be a matter of objects [or phases of objects] having a certain relation to each other, without any question of absolute space' (p. 218; cf. p. 215).

[21] The reader is reminded that this simplifying device is intended to be existentially non-committal.

To clear up the issues, let us first consider the above two statements from the standpoint of the *absolute* theory of space. Statement (1) would then express a derivative distance-relation based on a primary distance-relation of being permanently three feet apart obtaining between two point-regions of absolute place that are now occupied by *A* and *B*. It should be read as saying that there are two point-regions of absolute space, r_1 and r_2, which are permanently three feet apart; and that these point-regions are now occupied by *A* and *B*. And statement (2) would express an equally derivative relation: it would be regarded as saying that there are two point-regions of absolute space, r_1 and r_2, which are permanently three feet apart, and that *A* now occupies r_1 but occupied r_2 at the earlier time.

From the standpoint of the *relative* theory, statement (1) does indeed express a primary, non-derivative distance-relation between the point-particles *A* and *B*. But not so with statement (2): it purportedly relates *A* to a *place* which is other than its own at the moment (t_1) and which may not be occupied at that moment by anything else. My suggested rendering would be either of the following:

> (2*) If *C* were a point-particle distinct from *A*, and *C* were now (at t_1) to occupy the *same place* as *A* did (at t_2), then *A* would now (at t_1) be three feet away from *C*

or

> (2**) If *C* were a point-particle distinct from *A*, and *C* had then (at t_2) occupied the *same place* as *A* does now (at t_1), then *C* would then (at t_2) have been three feet away from *A*.

Either way we satisfy the requirement that only the simultaneous can be spatially related. But the two readings make it plain that statement (2) involves being at the same place at different times, a notion which on the relative theory can only make sense relatively to a frame of reference held to be fixed for a period of time that bestrides the earlier and later times, t_1 and t_2. So there is nothing surprising about treating statement (2) differently from statement (1), since statement (1) does not involve sameness of place at different times. My conjecture is that Armstrong misunderstands Leibniz' theory because he approaches it from a four-dimensional framework, which is quite natural with many contemporary philosophers but quite foreign to the Leibniz–Clarke debate. R2, according to Leibniz, is an indivisible thesis which requires that spatial relations obtain primarily not just between material bodies,

but between *simultaneously* existing ones. And what Armstrong's argument has implicitly shown is that the four-dimensional approach permits the division of Leibniz' thesis R2 into two separate subtheses, namely (a) that the primary *relata* of spatial relations are material bodies, and (b) that only the simultaneous can be spatially related.[22]

VII. ON AN ALLEGED IMPURITY

I turn finally to an objection, raised notably by Graham Nerlich,[23] to the effect that Leibniz' theory is 'impure'. The objection really concerns R2, the thesis that spatial relations are primitive and irreducible, but obtain primarily between material bodies and only derivatively between regions of space (for in reality there are no such things). Nerlich, and others, see in this admission of undefined spatial relations a weakness, an 'impurity', claiming that if the theory cannot dispense with spatial *relations* altogether then it has failed to deliver the goods and execute its reductionist programme.

The same objection is implicitly made by Hooker, who, as was pointed out earlier (in section V), wrongly assumed that Leibniz' theory made the continuity and infinite extent of space dependent on the continuity and infinite extent of matter. Proceeding on that assumption, Hooker argues (pp. 3–4) that even if matter were indeed continuous and infinite in extent, it would not do the job; for a material object consists of parts that are spatially related, and spatial relations should not figure in the final analysis. Here he seems to be at one with Nerlich in assuming that the theory aims at analysing away spatial relations into something entirely non-spatial.

Nerlich himself presses this objection by latching on to Leibniz' famous 'genealogical tree' analogy, in which he likened what he took to be the correct account of place (or spatial position) to a genealogical place. Given a genealogical tree, the genealogical place of a person who figures in it is determined by certain blood relations (of conjugal and ancestral links) to certain ancestors taken as 'fixed'. And allowing the possibility of metempsychosis, i.e., transmigration of souls, Leibniz suggests that we can conceive of one member of the family coming to occupy a different genealogical place in another life, and thus be in the same genealogical place as another member was: for example, 'he who had been father or grandfather might become son or grandson', and so on (L.v.47 pp. 70–1). Nerlich finds this analogy 'pretty thoroughly

[22] Here again I am indebted to John Bigelow.

[23] See *The Shape of Space* (Cambridge UP, 1976), ch. 1, especially pp. 5–9 and 24–8.

obscure'; but goes on to argue that 'even if we were quite clear about how to understand the suggestion Leibniz made, we would be no better off'. For 'there is no way to make sense of a thing's being extended in genealogical space, of filling up a region in the family system'. Moreover, with family space, 'we cannot construct a continuous space', and 'we have no foothold for many dimensions' (*The Shape of Space*, pp. 26, 28).

By now it should be pretty obvious that Nerlich fails to see the point of Leibniz' analogy, and wrongly reads into it far more than it is intended to convey. I take the main point of that analogy to be the following. It is no less a mistake to think of spatial position (or place) as an independently existing entity than it is to think of a genealogical place as an independent entity. In both cases what we have is an 'ideal thing': the spatial position (or place) of a body is entirely analysable in terms of the spatial relations of that body to other co-existent bodies, just as the genealogical place of a certain individual is entirely analysable in terms of his blood relations to other individuals in his family tree. Leibniz is not here suggesting that spatial relations are themselves reducible to something entirely non-spatial, such as the blood relation of father and son. Nor is he suggesting that (in Nerlich's words) 'space is like a genealogical tree': that, in other words, what is really behind what we call space is a non-spatial reality of which a genealogical tree is a more accurate model.[24] And he drew the analogy, not between space as a whole and a genealogical tree, but between place as a location (or spatial position) and a genealogical place.

Nor is it difficult to see why Leibniz is led to modify his analogy by introducing the fiction of metempsychosis. It is to secure an analogue of a change of place, of how a body *A* may come to occupy the same place as *B* did at an earlier time. The unmodified genealogical tree analogy has no room for that, but when we add the fiction of metempsychosis we can do better. Take Abraham, Isaac, and Jacob as constituting a genealogical line of grandfather, father, and son (respectively), with Abraham as a 'fixed' ancestor. Then, on the assumption of metempsychosis, we would have to say that, although genealogically their bodies are unalterably related by ancestral links, what their names really refer to are their souls and not their bodies. Now suppose that upon the death of Isaac his soul comes to inhabit Jacob's body, and that the latter's soul migrates elsewhere outside this genealogical line.

[24] Of course at a deeper level Leibniz did want to do away with both space-occupants and their spatial relations; but that level does not belong to the relative theory which he put forward in the Clarke Correspondence; and it is with that theory that we are here concerned, see section I above.

Then we can say that Isaac has now come to occupy the *same genealogical place* (relatively to Abraham) as Jacob did before the migration of their souls, and that from being a son he has now turned into a grandson. I fail to see anything objectionable in this modified analogy, unless we totally misrepresent its purpose.[25]

VIII. CONCLUDING REMARKS

I believe I have shown that Leibniz' relative theory of space, as reconstructed, is subtler and more interesting than it is commonly taken to be: it is not open to some of the allegedly serious objections that are currently held against it. Moreover, it would appear that none of the properties of space on which the Newtonians insisted need be surrendered by the Leibnizian relativist. Relative space, as much as Newtonian space, admits of unoccupied places, and is both infinite and continuous. And as the Newtonians would have it with regard to absolute space, the parts of relative space too are inseparable (or, as Clarke put it, 'indiscerpible'); for relatively to a frame of reference, a spatial position is necessarily *where* it is. The identity of that position is constituted by the spatial relations which an actual or possible object has to the frame of reference; so that a change in these relations would mean a change of place. Hence, given two adjoining parts (or 'regions') of relative space, A and B, it is self-contradictory to suggest that they might be torn apart (or spatially separated), for that would destroy the identity of at least one of them.[26]

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[25] Contrast Nerlich (p. 27): 'It is hard to see how this really helps the problem of explaining motion by way of systems of relations'. The Nerlich heresy seems to be spreading. Here is how a recent article on our subject begins: 'Relational theories of space can be divided into two sorts, pure relational theories and impure relational theories. Pure relational theories reduce spatial things . . . to non-spatial things; it is usually difficult to specify exactly what those non-spatial things are. Impure relational theories reduce some spatial things, such as spatial points, to other spatial things, such as the shapes of material objects and the spatial relations between them' (Andrew Newman, *op. cit.* fn. 14 above, p. 200). More recently I noticed that the same view had been expressed earlier in J.J.C. Smart, *Between Science and Philosophy* (New York: Random House, 1968), pp. 208–9; so perhaps I should call this error the Smart heresy.

[26] Cf. L.v.51. This article is based on a paper read at a colloquium entitled *Analogia y Expresion en Leibniz* held in Madrid on 20–22 September 1989 by the Leibniz Society of Spain. I have profited from subsequent staff seminar discussions at Monash and La Trobe, and I am particularly grateful to Lloyd Humberstone and John Bigelow for many helpful comments.