

&HPS 2009 Abstract Submission

Newton on the Structure and Parts of Space

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This presentation will investigate the parts of space, and its relationship with metrical structure, in Newton's natural philosophy. The historical background to Newton's claims will form an important part of the investigation, in addition to an assessment of the recent articles by Nerlich, Huggett, Maudlin, DiSalle, Torretti, McGuire, and several others, on this subject. While various aspects of these previous contributions will prove informative, it will be argued that the underlying goals of Newton's pronouncements on the parts of space, including their ontological implications for absolute and/or substantival space, have largely eluded prior analysis.

Newton's arguments for the immobility of space are mainly contained in the early tract, *De Gravitatione*.

[(Aii)] [T]he parts of space are individuated by their positions, so that if any two could change their positions, they would change their individuality at the same time and each would be converted numerically into the other. The parts of . . . space are understood to be the same as they really are only because of their mutual order and position; nor do they have any principle of individuation apart from that order and position, which consequently cannot be altered. (2004, 25)

Among the immobility arguments that appear in the *De Grav* and the *Principia*, all of which will be discussed in the presentation, it is (Aii), dubbed the identity argument, that has raised the most controversy: the parts of space are understood to be the same due to their "the mutual order and position", any since any interchange of parts preserves the same order, thus there can be no interchange of parts. The problem with (Aii), as noted in recent articles by Nerlich and Huggett, is that every point in a symmetric space, like Euclidean space, has the same metrical relations to all other points, and so all the points

in Newton's space would be the same point (since they have no *identity* apart from their metrical relations to each other, as mandated by (Aii)).

Nevertheless, commentators have failed to take into account the historical background to the immobility arguments. These arguments are specifically intended to offer reasons for denying that the parts of space can be physically divided or parted from each other, thus securing the immobility of space. More's *Enchiridium Metaphysicum* greatly influenced Newton's similar arguments:

In what way that infinite immobile extension distinct from matter is one, simple, and immobile. . . . [Infinite extension] is one to the extent that . . . it has no physical parts from which they can be combined and into which they can be physically divided For, no infinite extension . . . can be moved, either from part to part, since the whole is simple and indiscerpible [i.e., parts cannot be torn or cut from each other] . . .” (More 1995, 58).

Newton argues similarly in the *De Gravitatione*: “[L]est anyone should for this reason imagine God to be like a body, extended and made of divisible parts, it should be known that spaces themselves are not actually divisible” (2004, 26). And Clarke makes the same point in the Leibniz-Clarke Correspondence: “For infinite space is one, absolutely and essentially indivisible, and to suppose it parted is a contradiction in terms, . . . The immensity or omnipresence of God is no more a dividing of his substance into parts than his duration or continuance of existing is a dividing of his existence into parts” (C.III.3). The presentation will explain how these historical revelations impact on the recent debate concerning the identity argument. One aspect of Newton's theory that these quotes reveal quite clearly, however, is that the ontological foundation of Newton's one, simple, and indiscerpible space is a one, simple and indiscerpible God—and thus there is an irreducible “object” that underwrites the identity of the parts of space, as well as its immobility and infinity (as was the case with More).

Some commentators have also argued that a “holistic” account of the metric of space could help to resolve the identity argument problem: “Assume that space is real, but it is not *made up* of its parts, nor yet *analyzable into* parts with any kind of ontic *independence*” (Nerlich 2005, 131; based on Healey 1995). Although these commentators are seemingly unaware of the specifics of Newton’s geometric conception of space, there are numerous tracts that lend credence to this holistic conception, as we shall call it, the most important being the following:

Space is not compounded of aggregated parts since there is no least in it, no small or great or greatest, nor are there more parts in the totality of space than there are in any place which in any place which the very least body of all occupies. In each of its points it is like itself and uniform nor does it truly have parts other than mathematical points, that is everywhere infinite in number and nothing in magnitude. For it is a single being, most simple, and most perfect in its kind. (Tempus et Locus; early 1690s)

From at least the time of the *De Grav*, Newton takes a view on the parts of geometry, and space, that is indebted to the Aristotelian/Euclidean tradition that aggregate points do not form a line, etc. Furthermore, like Aristotle, “place” serves as a means of individuating points, lines, etc., as will be demonstrated. This upholds the Healey/Nerlich conception that the metric, i.e., “order of position”, does not supervene on the points/parts of space, but is a primitive, irreducible notion. There are various difficulties with the holistic account of Newton’s metric of space, nevertheless, all of which will be explained in the presentation, along with a somewhat skeptical verdict on the (alleged) problem of the identity argument for Newton’s spatial ontology.

References have been omitted to minimize the word count.