

Introduction to Special Issue on Seventeenth Century Absolute Space and Time

Geoffrey Gorham and Edward Slowik

This issue of *Intellectual History Review*, which grew out of a 2008 symposium of the Society for the History of Philosophy of Science (HOPOS), is dedicated to the topic of the philosophy of space and time in the seventeenth century. There are many reasons for the growing interest in the study of space and time in the Early Modern period. It has long been recognized that Newton's revolutionary defense of 'absolute' space and time in the *Principia* marked a dramatic shift in thinking whose reverberations are still felt. Owing to the continuing vitality of the 'absolute-relationist' debate with philosophy of science, historians of natural philosophy have tended to emphasize the dramatic 'Clarke-Leibniz' correspondence on the ontological status of space and time. Yet more recent research has revealed the extent to which the elements of this discussion – the possibility of spatial and temporal vacuums, God's relation to space and time, the independence of space and time from matter and motion, and the mathematical structure of space and time – are widely debated and refined by natural philosophers of the sixteenth and seventeenth century. One of the remarkable features of these debates is the rich intermingling of empirical, metaphysical and theological considerations, the echoes of which in Newton's own writings on space and time has sometimes puzzled scholars. The papers in the present volume reveal that with respect to the metaphysics of space and time, Newton's philosophy is not so much a revolution as the culmination of a century-long discussion.

As Emmaline Bexley shows in her paper, 'Quasi-absolute time in Francisco Suárez's *Metaphysical Disputations*', the influential late scholastic Suarez propounds an 'extrinsic time' that anticipates Newtonian absolute time in important respects while hewing to an essentially Aristotelian metaphysics. Extrinsic time is conceived as an inherently successive 'immutable flux' that serves as the absolute reference frame for particular motions and for God's operations. Suarez follows earlier scholastics in labeling extrinsic time 'imaginary', as opposed to the 'real' intrinsic times of celestial and mundane motions. But drawing on a wide range of scholastic texts, Bexley maintains that Suarez goes much further than his predecessors in according extrinsic time a mind-independent reality.

Like nearly all seventeenth century philosophers, Scholastic or not, Suarez treats time and space in tandem. In his contribution, 'The Twin-Brother of Space: Spatial Analogy in the Emergence of Absolute Time', Geoffrey Gorham traces this parallelism to Aristotle's canonical analysis of time as 'the number of movement'. In the sixteenth and early seventeenth-centuries, philosophers were for a variety of reasons increasingly willing to countenance, against the authority of Aristotle, a void space independent of body. But these early spatial absolutists were more reluctant to assert an 'empty time' independent of motion, because their most powerful arguments for the existence of void space were not easily extended to the time. It is in this context, Gorham argues, that a doctrinal space-time parallelism gains considerable appeal among early modern anti-Aristotelians. A diverse range of seventeenth century philosophers, including Gassendi, Barrow and

Newton, having little independent rationale for absolute time, drew on the long tradition of space-time parallelism to freely extend attributes of absolute space to time.

For early modern philosophers, God's relation to infinite void space and time was impossible to avoid since God was generally acknowledged to be the only infinite substance. Most struggled to adapt traditional accounts of the ubiquity of God, and the presence of immaterial minds, to the new absolutist context. In her article, Hylarie Kochiras explores the concept of "holenmerism", a notion coined by Henry More but conceived much earlier, which holds that God or a spirit is "whole in every part of space". Holenmerism promised to account for the real presence of immaterial agents in bodies and space while at the same time upholding the idea that these agents are not actually divisible. Kochiras provides the historical background of holenmerism from Aquinas and later Scholastic philosophers to the debates that raged in the seventeenth century, and concludes by defending this thesis against the objections raised by the seventeenth century Thomas Hobbes and Cambridge Platonist, Henry More.

Richard Arthur's essay concerns an issue with a pedigree as ancient time's relation to motion: whether time is discrete or continuous. Arthur presents a concise overview of the much-discussed question of the alleged discontinuity of Cartesian time, and then develops a novel perspective on this issue focusing on Descartes' early analysis of free fall in collaboration with Isaac Beeckman. Descartes' ingenious solution to the problem of fall required him to treat instantaneous states of motion as involving durationless instants of time, contrary to Beeckman's temporal atomism. Despite its role in Descartes' early physics, Arthur argues that such 'instantaneism' is in serious tension with ultimately in serious tension with other aspects of his natural philosophy, such as his doctrine of continuous creation and his conception of force as a quantity of motion. For these latter doctrines seem to require moments with a 'least conceivable' interval of duration. So it is not surprising that the question of temporal atomism was a pressing matter for his immediate posterity and has remained controversial among commentators to this day.

Two essays are devoted to Leibniz, whose metaphysics of space and time is perhaps the deepest (and most perplexing) among major seventeenth century philosophers. One of the major difficulties for Leibniz is accounting for the temporality of natural processes, especially their asymmetric order or 'arrow', within the framework of a fundamentally timeless monadic ontology. Leibniz has commonly been thought to espouse 'causal theory of time, whereby the temporal relations among monadic states -- priority, posteriority, and simultaneity -- are somehow derived from their more basic causal or logical relations. As Michael Futch explains, eminent readers of Leibniz have worried that any such derivation must be circular. Kant argued that the relevant relations between monadic states, consistency and inconsistency, cannot be specified without recourse to time, while Russell maintained that the very individuation of states themselves presupposes time. Futch shows that Leibniz has the conceptual 'resources' to account for the relations and individuation among the states of monads, particularly his subtle explication of the contingency of certain monadic states, and therefore the order of time itself, without illicitly smuggling time into the account.

Michael Futch's essay investigates the temporal order of the states of Leibniz' monads, a longstanding problem that concerns how the asymmetry, or direction, of time can be based on the order of reasons or causes among things, which ultimately implicates monads and their internal states. That is, Leibniz posits that the incompatibility of various monadic states allows for the relations of to be established among these monadic states. The problems that can be raised against this strategy stem from the potential circularity that any such ordering can unwittingly engender, since the proposed temporal order of states may tacitly presupposes time. Futch's essay addresses these issues, in particular, the arguments advanced by Kant and Russell against Leibniz, by defending the view that monadic states can be individuated without presupposing time.

Besides the causal theory of time, the other influential doctrine about space and time commonly traced to Leibniz, which has framed modern view of his opposition to Newton, is relationism. Edward Slowik shows that, whatever the dramatic appeal of this stark intellectual face-off, Leibniz's metaphysics of space is far more complicated than traditional, especially if we take into consideration his detailed views about God's relation to the world and his holistic conceptions of geometry and matter. If one insists on characterizing relationism as the thesis that space can be reduced to the relations among bodies, many difficulties in his natural philosophy will remain obscure to modern readers. Slowik offers a number of alternative conceptions Leibnizian relationism, including nominalism and the property theory of space, which help to clarify problematic texts and clarify disparate strains within his philosophy as a whole.

The seventeenth century represents a singular moment in the philosophy of space and time because so many perennial debates were transformed and invigorated by the rise of natural philosophy, especially mathematical physics. But we hope these essays reveal that early modern science is also deeply indebted to the long and rich tradition of metaphysical investigation of space and time within philosophy and theology. We hope these essays will stimulate new research and debate on this remarkable historical convergence of intellectual activity.