THE DEEP METAPHYSICS OF SPACE

EDWARD SLOWIK

Reviewed by Marius Stan

The Deep Metaphysics of Space: An Alternative History and Ontology beyond Substantivalism and Relationism
Edward Slowik
Cham: Springer, 2016, £58.99
ISBN 9783319448671

Debates on the ontology of space used to gesture at some root in history—of philosophical groundings of dynamics and gravitation theory—a history as old as the physics it engaged with. In our century, however, this tribute to the philosophical past has become an absent-minded nod, a ritual invocation of credos whose real origins are now occulted by mythopoiesis. A regrettable outcome, in many ways, but not entirely unexpected. History of philosophy of science has matured greatly, and the threshold of admission to its peerage has gone up dramatically—it is now too high for most full-time workers in 'general' philosophy of science to pass. Conversely, the latter field has taken a broadly naturalistic bent, and turned away from (philosophical) history as a source of insight. Instead, it often finds analytic metaphysics a more congenial interlocutor. Hard-headed spectators might find it a bit self-serving; historians are a demanding bunch, whereas latter-day metaphysicians are kind to anyone who does not mind relying on personal intuitions.

This raises questions many metaphysicians of space nowadays would rather not hear: What is the epistemology of their approach, that is, what counts as evidence for their various cases, be they for or against this or that ontology of space? Could it be just intuitions, even if brought into reflective equilibrium? Their value as warrant for

knowledge is even flimsier than the market for virtual currencies. Consider a key predicament they face. Currently, ontologies of space claim membership in one of two exclusive families of views, namely, relationism and absolutism (or substantivalism). But, what is the evidence that these categories—hence the very framing of the central issues, and the self-understanding of nearly everyone who relies on them—are correct? Here is one answer: 'relationism' and 'absolutism' come from the 'traditional debate' (North [forthcoming]). They come from the older generation of theorists (Howard Stein, Michael Friedman, John Earman), and these men allegedly were justified in coining the two categories above by evidence from their historiographic work on Newton, Leibniz, Kant, Mach, and Einstein.

But what if Stein *et Cie* were wrong? Empirically wrong, that is. Rynasiewicz ([2000]) cast doubt that 'absolute' and 'relative' can be given clear analyses that capture stable concepts from Newton in the 1680s to Einstein and our times. But what if they all had misread the very nature of the debate? What becomes of the debate being traditional, and of its framing as canonical? Is it still legitimate to cast it as relationism versus absolutism? Enter Slowik, a skilled historian of early-modern natural philosophy, and an equal-time participant in current debates on the ontology of spacetime. His *Deep Metaphysics of Space* (hereafter, DMS) is a strong, extensive case that the 'traditional debate' (as Jill North has it) is a great misconception; and another case for a new framing for space ontologies. The ancestry of DMS as presented above helps explain both its overarching theme and its structure.

Note the stratagem behind Slowik's approach: Suppose that if we restrict it to contemporary-physics contexts, his proposed ontology of space—a species of property view; see below—does as well as some relationist or absolutist variants. Then historiographic evidence—namely, that traditionally the debate was about space being a property—will put Slowik's proposal in the lead. Specifically, it is because his ontology is more consilient with the philosophical history of space representations, and so it is evidentially better supported.

A point of departure for Slowik is the astute observation that, despite their opposition, both substantivalism and relationism share a key premise, namely, that space is ontologically basic, or fundamental (if it is a thing). But this is quite wrong, DMS shows. Many Early Moderns took something else to lie even deeper than space and to support it, as it were, hence the 'deep metaphysics of space' that Slowik set out to uncover. That deeper substratum was God for Newton and also Leibniz, and physical monads for the early Kant—in brief, genuine substances. If we read these figures carefully, as the author does, it turns out that space rests on top of this ground-level ontology, not alongside or on a par with it. 'On top of' and 'alongside' are, of course, my metaphors; Slowik is quite careful with his terms. One sense of the property-theory he advocates is that of ontological dependence, for a family he calls 'P(O-dep) [theories]: space is either an emergent, supervenient, or internal property of a grounding entity, and space cannot exist in the absence of that grounding entity' (p. 11). This family has a sibling, dubbed P(T-dep), which replaces ontological dependence between entities with explanatory dependence between levels of (spacetime) theory.

The property-view framework is his lens for some rich, contextualist accounts of major seventeenth- and eighteenth-century voices. In Chapters 2 and 3, Slowik goes on to defend his general thesis by way of detailed re-readings of Newton's and Leibniz's ontologies of space *qua* property (in the exact sense above) of true basic substance as codified by their respective doctrines. The metaphysical glue holding the two layers (namely, substance and space) together is an essential property of genuine substancehood: 'being somewhere', for Newton; and whereness, or ubeity, in Leibniz's theory.

Slowik then moves to examine, in Chapter 5, the chances of a P(O-dep) property theory accounting for the ontology of spacetime. He diagnoses several obstacles for this programme. Some stem from the fact that spacetime would be a property of matter, if of anything at all. However, general relativity (GR) notoriously complicates any attempt to draw a principled distinction between matter and vacuum, or non-stuff; drawing sharp lines between them smacks of 'arbitrary ontological stipulation' (p. 140). Further, it is not clear that (in modern-physical contexts) property theories could do better than sophisticated variants of relationism and substantivalism, for example, as put forward

by Belot, Teller, Dieks, Hoefer, and others. Lastly, construing spacetime as a property of matter would diverge from the early-modern projects that grounded space in substance-hood (for the figures surveyed in DMS, matter was not substance). In consequence, Slowik decides to reach for a version of structural realism so as to explain the ontology of GR's dynamical spacetime: 'a structural realist conception of spacetime theories will eventually take center stage [in the remainder of the book], a conception that will ultimately prove to be one of the most compelling third-way alternatives to traditional substantivalism and relationism, as well as embody many of the ideas implicit in the seventeenth century's natural philosophy of space' (p. 136).

That conception is ESR, epistemic structural realism, which focuses on epistemic facts, or truths, knowable about the spacetime structures embedded in our best physical theories—but without committing to the existence of the entities (whatever their ontological status) represented by those structures. For that reason, Slowik argues that ESR is at least compatible with property theories, even ontological-dependence ones. Finally, in Chapter 8, Slowik explicates his ESR, then motivates and applies it to spacetime against the background of latter-day quantized theories of gravitation (QG). He ends, in Chapter 9, with a new taxonomy of early-modern and contemporary accounts of the metaphysics of space(time). This classification is meant to overcome the obsolete division between relationist and substantivalist pictures, a division that Slowik perceptively attributes to the 1970s' reading of Huygens's partial and rather perfunctory thoughts on the matter.

Now one might wonder about the point of the conjunction in the subtitle, 'history and ontology'—is it mere juxtaposition or something stronger? The latter, Slowik answers. His taxonomy opens our eyes to an otherwise invisible sameness of structure between seventeenth-century views of space and current theories of QG. The strongest similarity is between the grounding relation obtaining between the Early Moderns' God and space, and between our quantum field theories and the GR emerging from them, respectively. Slowik details three key facets of this similarity: the grounding and the grounded can share structure (which, in turn, can be either metric or merely topological), or they can have no space-structure in common. In each case, novel similarities come to light between the views of figures like Gassendi, Henry More, or Newton, and modern-physics programmes to quantize gravity. Collectively, Chapters 9 and 10 yield solid evidence that Slowik's interpretive framework—the conjunction of property theory, ESR, and definitional approaches—does a much better job of capturing both the true space metaphysics of the Early Moderns and their enduring commonalities with our agenda for spacetime.

Now for the ritual quibbles. On account of my narrow expertise, I limit them to the historical part of DMS. It is certainly fascinating to see Newton and Leibniz (on space) being much closer than the received view has had it—certainly closer than each of them would have liked to acknowledge. And yet I cannot help notice that even on Slowik's property view of space ontology, they remain somewhat apart. Specifically, for Newton, 'being somewhere' is a constraint on existence (for anything to be actual), whereas Leibniz's version of *ubeitas* makes it into a three-fold feature of a substance exercising its powers. This difference is not trivial, and we may hope that in future work the author will explain how it is weak enough to be outweighed by commonalities between Newton and Leibniz on space.

In addition, Kant remains a bewildering figure, hard to classify even on Slowik's new taxonomy of positions. It is certainly admirable to see the author give him considerable and detailed attention (and Huygens too, another deep but so far superficially read thinker). Still, Kant eludes even the most determined attempts to pigeonhole him. In the 1780s, Kant becomes aware (however dimly and implicitly) that space must carry three kinds of structure: topological, metric, and affine-inertial. Yet it is far from clear to me that Kant assigns to space a single ontological regime carrying all three structure-kinds. Take his 'space as form of outer sense': it is admittedly the seat of topological structure, namely, of the serial order of places possibly occupied by bodies. However, Kant lets matter ground inertial–kinematic structure, via his 'absolute space', which really is a material frame misleadingly baptized (as Slowik sees clearly). In short: sameness-of-place-at-one-time facts depend on minds, via transcendental

space *qua* mental form; whereas sameness-of-place-at-different-times, and also sameness-of-direction facts, are parasitic on matter via the Kantian absolute space. (I leave out here the question of metric structure in Kant's account; its exact source remains a vexing problem.)

To be sure, none of this detracts from the overall merit of Slowik's book. I expect it to reset the agenda for research in HPS studies of space, time, and their ontologies; and also to give young scholars the impetus and guidance to read early-modern giants with fresh eyes, better aware of their full-fledged views and how their insights still speak to us Late Moderns coming to grips with quantum gravity.

Marius Stan
Boston College
marius.stan@bc.edu

References

North, J. [forthcoming]: 'A New Approach to the Relational–Substantival Debate', *Oxford Studies in Metaphysics*.

Rynasiewicz, R. [2000]: 'On the Distinction between Absolute and Relative Motion', *Philosophy of Science*, **67**, pp. 70–93.