



Physically locating the present: A case of reading physics as a contribution to philosophy



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ABSTRACT

By means of an example, special relativity and presentism, I argue for the importance of reading history of physics as a contribution to philosophy, and for the fruitfulness of this approach to doing integrated history and philosophy of science. Within philosophy of physics, presentism is widely regarded as untenable in the light of special relativity. I argue that reading Newton's *Principia* as a contribution to philosophy reveals a law-constitutive approach to the unity of what there is, from which an alternative approach to presentism within physics emerges. This view respects the methodological and epistemological commitments of philosophy of physics in "taking special relativity seriously", but proposes an alternative approach to the status of spacetime (as epistemic) and to the ground of what is real (law-constitution). While this approach to presentism does not preserve all of the contemporary presentist desiderata, it offers the possibility that the spatiotemporal extent of an existing thing is less than its entire history as represented in the block universe. I argue that the approach warrants further philosophical investigation.

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1. Introduction

What is "integrated" history and philosophy of science? How do you do it? Why is it interesting? Why is it useful? Recent scholarship presented under the banner of "&HPS" displays a rich variety of ways of doing "&HPS": there are many different things that we are trying to achieve, and many different ways of going about it.¹ In this paper I argue that reading history of physics as a contribution to history of philosophy is important for contemporary philosophy of physics, offering in the process an example of one kind of activity we might engage in under the broad umbrella of "&HPS".

My argument centers on a particular case: special relativity versus presentism. By means of resources drawn from reading aspects of Newton's work as contributions to philosophy, I argue that there is in physics an alternative way to approach what we mean by

the "present", distinct from ideas familiar from special relativity such as a preferred spacetime foliation. I offer this proposal for further philosophical investigation, and claim that if it is to be refuted empirically then this will require resources that go beyond those available in special relativity. Section 2 explains what I mean by the phrase "reading physics as a contribution to philosophy." Section 3 sets out the dispute between special relativity and presentism, as it is standardly understood. Section 4 outlines the resources that I will draw on from reading Newton, and then in Section 5 I deploy these resources to motivate an alternative version of presentism. My goal is to offer an example of reading history of physics through the eyes of a philosopher, as a contribution to philosophy, and to offer it as an example of one fruitful way in which we pursue integrated HPS.

2. Reading physics as a contribution to philosophy: the general project

Famously, the divide between philosophy and physics is modern, originating in the philosophical developments of the seventeenth

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¹ See [Mauskopf and Schmaltz \(2012\)](#) and [Arabatzis and Schikore \(2012\)](#), and references therein, for discussion and examples.

century. While Descartes's *Principia Philosophiae* of 1644 continues to be studied by philosophers, Newton's *Philosophiae Naturalis Principia Mathematica*, published in 1687, does not appear on the standard reading list for early modern philosophy and is today thought of by most philosophers as a text in physics. Nevertheless, physics and philosophy from then to the present continue to have overlapping domains of investigation: space, time and matter being the most obvious examples. Just as philosophy begins from everyday experience and investigates our concepts of space, time and matter, clarifying and changing them along the way, so too does physics. Moreover, I am willing to argue that in its conceptual investigations into the nature of time, physics explores our experience of material temporality without remainder. Thus, because there are no aspects of this experience left out of the investigations of physics, there are no resources within this experience for the philosopher to draw on in her own conceptual investigations that lie outside the project of physics.² But even granting this, the questions that a physicist seeks to answer may not be those that interest the philosopher, and it may not be readily apparent how to bring the work of physicists to bear on the concerns of philosophers. As philosophers of physics well know, reading physics as a contribution to philosophy is not just a matter of reading physics.

There are different ways to engage with physics philosophically. Very often, philosophers of physics work on “interpretations” of theories in physics: they begin with a piece of theoretical physics and work their way *from* this *towards* philosophical questions. Here is an example of a philosopher of physics describing this work³:

Physics provides theories which typically consist of a mathematical formalism and some procedures for applying that formalism to particular concrete situations. But both the formalism and the procedures may admit of alternative ontological interpretations. It may not be clear, for example, which part of the mathematics corresponds to real physical magnitudes and which is an artefact of arbitrary choices of units of gauges. It may not be clear which mathematical models represent real physical possibilities, and which do not. And it may not be clear which pairs of mathematical models represent the same physical situation. All of these problems confront even the philosopher who tries to take, for example, the Theory of Relativity ‘at face value’.

This is one possible approach, and there is important conceptual work to be done here, but I do not think it is the most profound philosophically. An alternative is to begin with the deepest of our philosophical questions, and to use the development of physics *read as a contribution to philosophy* to explore how these questions are transformed, re-worked, addressed, and sometimes rendered non-questions. One does not “help oneself” to a philosophically shallow formalism, and then attempt to do philosophy: *one sees physics as a part of the history of philosophy*, and engages with it on those terms. This is the kind of historical approach that I advocate. Not only must the philosopher read developments in physics as contributions to the projects in which the physicist is engaged, but she must also read between the lines, with the questions of a philosopher as her guide, re-reading developments in physics in that light.⁴

As an example, consider again Newton's *Principia*. This is a very difficult book to read, and is most especially difficult to read as a philosophical text: Newton does not explain the whys and wherefores of what he is doing, let alone the philosophical context and ramifications. It is not surprising that philosophers of the period (Leibniz, Locke, Berkeley, Hume, Kant and so forth) did not see all of the philosophical moves and their implications, but this does not mean they are not there. We have now had over 300 years to begin to understand the *Principia* as a philosophical text. To re-visit it as a philosophical text of its time, and to weave what we learn into our philosophical history up to the present day, is to undertake the kind of work that I have in mind.⁵

The re-reading and re-telling of history of philosophy plays a vital role in contemporary philosophy: we better understand our own philosophical questions and the philosophical space in which we work by paying attention to how we got here. So too I maintain that the re-reading and re-telling of history of physics, read as a contribution to philosophy, is important for contemporary philosophy. In this paper, I make a case for this claim by means of an example: special relativity and “presentism”.

3. Special relativity versus presentism

Within philosophy of physics, there is a clear consensus that the advent of special relativity spells the death of “presentism”⁶ as a respectable philosophical position within philosophy of time. All that is needed to reach this conclusion is to “take special relativity seriously”, which means understanding the critique of our concepts of space and time that it involves (I give more details below) and then accepting the theory as a complete account of spatiotemporal structure. This, in turn, is to accept a methodology and epistemology that emphasizes sensitivity to empirical considerations in theories and theorizing. Here is not the place to elaborate this methodology and epistemology, but I am persuaded by it and I take special relativity seriously. Indeed, it is important to be clear that the argument of this paper takes place within a framework that accepts this methodology and epistemology. With that in place, through attention to history of physics I argue that the debate over presentism within philosophy of physics, and therefore within philosophy of time more generally, should not yet be considered closed.

Special relativity (thus “taken seriously”) is relevant to various aspects of our “experience of time”. One way to investigate this would be to take the Minkowski structure of spacetime and ascertain which things have correlates in that structure and which things don't. Then we decide whether special relativity explains, explains away, or is just silent about that feature of our “experience of time”. For example, temporal intervals between events, perhaps as measured by clocks, are *explained*: the structure of Minkowski spacetime provides an absolute spacetime interval between any pair of events, and this spacetime interval can be decomposed into a spatial interval and a temporal interval relative to a frame of reference. So we can find within the structure of Minkowski spacetime elements that enable us to explain temporal intervals. The directionality of time, on the other hand, is something about

⁵ Indeed, to read Newton's *Principia* solely from the perspective of history of physics is to impose a disciplinary division that post-dates the composition of the *Principia*, and historiographical concerns alone should give one pause. For situating Newton's work in his intellectual context see especially the groundbreaking work of J.E. McGuire and B. J. Dobbs. For references to recent work on Newton as a philosopher see Section 4, below.

⁶ By “presentism” I mean positions in philosophy of time which accord a privileged ontological status to the “present”, and I will say in more detail what I take the presentist thesis to be below.

² DiSalle (2006) can be read as an extended argument in support of this claim for space and time. The claim is made explicitly on p. 157.

³ Maudlin, in Loux and Zimmerman (eds.) (2003), pp. 461–2. I quote Maudlin here not as an example of a philosopher of physics who endorses this approach, but because of the clear description he gives of it.

⁴ For an example of this approach, see Chang (2004).

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