Katerina Ierodiakonou and Sophie Roux, eds., *Thought Experiments in Methodological and Historical Contexts*
Thought Experiments in Methodological and Historical Contexts by Katerina Ierodiakonou; Sophie Roux
Review by: James Robert Brown and Michael T. Stuart
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variety of fields who motivated their projects through a reading of Kuhn—Barry Barnes in sociology of science, for example, or Randy Harris in rhetoric of science. If done quickly, such a volume could have retrospective essays by philosophers like Hacking, Van Fraassen, Ronald N. Giere, John Earman, and others who began their careers in the 1960s during the era of Kuhnian engagement. *The Structure of Scientific Revolutions* is the most important, most well-read, most influential, and, in many ways, greatest book in history and philosophy of science of the second half (if not the whole) of the twentieth century; no book is more well suited for a HOPOS-inspired critical treatment.

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Katerina Ierodiakonou and Sophie Roux, eds. *Thought Experiments in Methodological and Historical Contexts*. Leiden: Brill, 2011. Pp. vii+233. €99.00 (cloth).

How is it possible, just by thinking, to learn new things about the world? This is the central problem of thought experiments (TEs), and the spectrum of answers ranges from rationalism to empiricism to Kantianism and many more. There is also the reply that they do not tell us anything new. Of course, the main problem is not the only one, but most others are related to it: How can we evaluate TEs? What are the different ways in which TEs work? Have people in the past held different views about TEs from ours? This excellent volume is a contribution to the growing literature on TEs. It covers a variety of topics, some concerned with historical features, others with epistemic evaluation, many with both.

There are nine essays in all, as well as a long introduction. Six of them are largely historical, mainly ancient and medieval. Three are focused on contemporary philosophical problems. All are significant contributions. Since we have limited space, we can only briefly discuss a small sample.

Katerina Ierodiakonou considers the history of a single TE, which is well known from Lucretius. Could the universe be finite; that is, could space have an edge? Throw a spear at it. Either the spear will go through the alleged edge of space or it will not. If it does go through, then that is not the edge of space. If it fails, then there must be something there that stopped the spear, something that is outside the alleged edge of space. Either way, that cannot be the edge of the universe. We could carry out the spear tossing anywhere with this same result, so there is no edge. The universe is infinite.

The originator of this TE, says Ierodiakonou, is Archytas of Tarentum, a Pythagorean who lived in the first half of the fourth century BCE. It was much used by Epicureans, Stoics, Aristotelians, Aquinas, Buridan, Locke, and Newton, just to name a few. Ierodiakonou raises two questions (38): Did the TE change from its original form when used in later Hellenistic times? And can this example tell us anything more general about TEs in antiquity?

In answer to the first question, the original by Archytas and the Epicurean version seem to have been used to show that the universe is infinite. The argument may have been aimed at either Aristotle or Plato, as both considered the universe to be finite. The Stoics, however, seem more concerned to show that the void exists beyond the heavens. But it is not clear whether this void is itself infinite or indefinite.

Ierodiakonou's second question concerns the legitimacy of TEs. This particular TE assumes an impossible initial condition; that is, it is not merely counterfactual but impossible to be at the edge of the universe (at least most would have thought so). She notes, however, that there are precedents. Plato and Aristotle both used TEs with impossible initial conditions, suggesting that antiquity was relatively liberal on the issue.

Ierodiakonou does not distinguish among physical, metaphysical, and logical or mathematical impossibility. Perhaps it would be anachronistic to do so, but it is required for current evaluations. The majority attitude today would doubtless allow impossible initial conditions for TEs, even logical and mathematical impossibilities. Many important theorems in mathematics journals are of the following form: "If the Riemann hypothesis is true, then …" and "If the Riemann hypothesis is false, then … ." Either the Riemann hypothesis is true or it is false, and, whichever one it is, it will be necessary. Kathleen Wilkes (in *Real People* [Oxford: Oxford University Press, 1988]) is at odds with this outlook. She, for instance, insists that a TE not violate a law of nature; it must be physically possible. Since Parfit's people who split like amoebas violate biological laws, they are, in her view, quite illegitimate. It would seem from Ierodiakonou's discussion that, if the ancients were with us today, they would be happy to join us in thinking about quite unreal, bizarrely splitting people.

In the chapter by Sophie Roux and Jean-Yves Goffi, TEs are portrayed as arguments that introduce counterfactual scenarios. TEs work by prompting us to rearrange our beliefs into accordance with these new scenarios, and this rearrangement helps us to discover conflicts. They propose three conditions meant to be necessary and sufficient for any successful TE. First, it must deal with beliefs only—not objects or laws or intuitions or anything else. Second,

there will be background beliefs that are necessary to understand and discuss a given TE, and these must be shared by the community that engages with it. Finally, these background beliefs must be organized in a logical hierarchy that makes it clear which beliefs are to be rejected when inconsistency arises.

This kind of clarificatory work is sorely needed in a debate that suffers from widespread disagreement about the taxonomy and success conditions of TEs. Yet these three conditions are not satisfactory. The first condition limits thought experimental resources to beliefs. However, many "good" TEs (and arguments) are not about beliefs but objects or possibilities. Most of the TEs in this collection are from physics or philosophy. Those from physics do not refer to beliefs but to the size of the universe, the properties and existence of atoms, the motion of physical bodies, and so on. Those from philosophy consider metaphysical possibilities: what God can or could have created, the properties of the soul, and so on. Engel (158ff.) argues that Gettier cases aim to disprove the metaphysical identity of knowledge itself (not the concept) with justified true belief. TEs draw on existing knowledge, and that knowledge can be of anything: objects, relations, properties, and so on. So why limit their subject matter to beliefs?

The last two conditions are conditions for communities—individuals with sets of beliefs—not TEs. This is because Goffi and Roux believe that TEs are arguments, and "to work" means "nothing other than to be successful as an argument, in other words, to be able to convince one's interlocutors" (166). They do not believe that there is any internal feature that could be used to identify a good TE. Rather, "a thought experiment can be successful in the sense that a majority of people admit that it has a certain outcome that is considered as intuitively obvious" (167). However, many bad TEs rely on shared and organized background beliefs (e.g., Leibniz's presented by Virvidakis; 132ff.). And many good TEs, especially in science, do not resolve into concrete, intuitive conclusions (e.g., Einstein's clock-in-the-box has been going on for more than 70 years, and there is a large literature on how it works, if it works at all). In addition, there are TEs that are still recognized as successful, despite drawing on beliefs no longer held. This is why we breathe new life into old TEs: because the same TE can succeed despite dramatically different background beliefs.

Therefore, Goffi and Roux have provided criteria for psychological or sociological success. This in itself is quite important, but what we need for a normative theory of TEs are criteria for epistemic success. However, their insight that the conditions for thought experimental success must reach beyond mere logical form to encompass intersubjective features is, we think, important

and correct. This article, like others in this significant collection, should stimulate a great deal more work on the wonderfully rich topic of TEs.

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Alfred I. Tauber. *Science and the Quest for Meaning*. Waco, TX: Baylor University Press, 2009. Pp. xi+255. $29.96 (cloth).

Alfred I. Tauber has written an ambitious book. It has two closely connected functions. On the one hand, it draws a large synthesis of the philosophy of science from nineteenth-century positivism to most recent challenges from science studies. On the other hand, it outlines the direction to which philosophizing about science should now go. These two tasks amount jointly to a learned and an impressive personal statement on the state and future of science studies and philosophy of science.

The central element in the book is positivism, for which Tauber devotes one chapter (chap. 2) out of five main chapters. The focus is on nineteenth-century positivism and not on logical positivism. Positivism also frames the discussion of another chapter, which deals with "the fall of positivism" (chap. 3). It analyzes Kuhn's, Feyerabend's and Quine's philosophical critique of what they considered positivist philosophy and also studies sociology of science, which brought an even more fundamental challenge. These two chapters form a prelude, and are seen historically to lead, to "The Science Wars" (chap. 4). Two other main chapters provide a thematic rather than a historical presentation. After a brief (unnumbered) introductory chapter, chapter 1 discusses the main themes of the book at length (see below). Chapter 5, entitled "Science in Its Socio-Political Contexts," sets science in a larger social and political context. Finally, the last (unnumbered) chapter characterizes the place that science should now take in our lives.

Tauber's characterization of the history of philosophy of science and science studies is fair, although often general and personal in nature. This is of course fitting for a book whose central message is that we should pay more attention to how scientific findings and theories become personally significant. Indeed, it might be said that after many turns (linguistic, historical, social, practical, local), Tauber calls for a "personal turn" (my term).