sophical problem is perhaps that of the characterizing the notion of "necessity" involved, labeled "mathematical" since both logical and metaphysical seem ruled out.

There remains vastly more in the book that will repay careful reading than there has been space here even to mention.

JOHN P. BURGESS, PRINCETON UNIVERSITY

Robert Crease and Evan Selinger (eds.), ***The Philosophy of Expertise***. New York: Columbia University Press (2005), 432 pp., $51.50 (cloth).

This is a boundary crossing book. Containing essays from both analytic and continental philosophy, concerning a range of expertise from scientific to moral, and providing both philosophical and sociological insights, it may frustrate some, but it will certainly challenge most. And the challenge it lays before philosophy of science is crucial: What does philosophical examination of science look like when science is set in the context of a society that is dependent on science for reliable knowledge claims?

The essays have been previously published elsewhere, but in bringing them together, the editors have helped to map a largely unexplored terrain. Indeed, it is the complaint of several of the essays that both philosophy of science and sociology of science, as the disciplines are currently performed, ignore the study of expertise. Philosophy of science pays scant attention to the role of scientists as public experts, and sociology of science reduces expertise to mere social location, while working to undermine any distinction between expert and non-expert. (See the essays by Mialet, Selinger and Crease, and Ihde.) While the essays occasionally feel too self-referential (e.g., the set of Dreyfus, Selinger and Crease, and Mialet could have been reduced to just Selinger and Crease), some are clearly essential to any discussion of expertise (Hardwig, Goldman, Brewer, Turner), and then there are the breaths of fresh air (Annas, Ihde), the essays that one might not otherwise think to look at in discussing expertise, and which provide unexpected insight.

There are two basic kinds of questions that pervade the collection. Of what does expertise consist (an ontological question)? And how should we construe the knowledge claims of experts (an epistemological question)? As most of the contributions make clear, simple answers to these questions will not do. We cannot *just* say that experts are people who know things that we do not. While this is part of expertise, it ignores the skills, the complex understanding, and the honed sense of judgment that accompany expertise. And we cannot *just* say that we should trust experts, and blindly rely upon their claims. There are (and always have been)

competing experts, who must be assessed in some way. It also becomes increasingly apparent that these questions are not unrelated. Some assessment of expert claims rests on who gets counted as an expert and who does not; and some assessment of the nature of expertise rests on how epistemically reliable we think expert claims are.

In analyzing what constitutes expertise, some of the essays unfortunately define expertise as something inaccessible to the non-expert (what Ihde calls the "myth of expertise," which he rejects). Hubert Dreyfus's and Steve Fuller's essays are particularly marred with this analytic flaw. Such an account of expertise would leave philosophers of science with no role to play vis-à-vis science. Even more worrisome, it would also make it impossible for citizens to perform any epistemically meaningful assessment of expertise.

Happily, most of the essays do not fall into this trap. One rich and plausible account of expertise can be found in Julia Annas's elegant essay. There, she argues that expertise (she focuses on "practical expertise," but the analysis is also applicable to science) should have the following qualities: (1) it should be teachable to others; (2) it should demand a complete understanding of the particular area; and (3) it should allow experts to give accounts of what they are doing (286–287). By describing expertise in this way, Annas's analysis undercuts the hysteria one sees in some discussions of expertise—that it is utterly inaccessible, that we have no way of evaluating expertise, that it will destroy democracy. By requiring that experts be able to provide accounts of their process, and evaluating those accounts against other expert accounts or the expert's own statements, one can assess expertise as a non-expert.

Such a view of expertise can then assist with the epistemological issues that expertise presents, which center on trust. When should we trust experts? In essays by John Hardwig and Alvin Goldman both trust of experts by non-experts and trust among experts are addressed. While Hardwig argues for the inescapability of trust, Goldman's essay provides some plausible avenues for the novice to assess the expert (thus providing reasonable bases for both trusting and contesting expertise).

Other assessments of our ability to evaluate experts are less optimistic. In Scott Brewer's account of expertise, focused on scientific experts in the courtroom, he notes that it would be theoretically possible for non-experts to assess experts. However, in the vast majority of cases, he doubts non-experts have an adequate set of skills. I think his assessment, while clear and constructive, is overly pessimistic. It is here that philosophy of science has something useful to offer. In the analysis of arguments, including those elucidated by opposing attorneys, philosophers of science can help develop useful skills to assess the claims and arguments of experts. An understanding of how science should work, how theory should relate to

evidence, can be used as a normative measure for assessing whether we should trust scientific experts, particularly as we demand transparent accounts from our experts.

Like Brewer's essay, several essays address expertise in particular historical or political contexts. Stephen Turner's essay attempts to treat carefully the political context and history of expertise, although he focuses on a rather narrow and non-scientific form of expertise for most of the essay. Edward Said's commentary, which is a critique of over-disciplinarity in the construction and cultivation of expertise in literary theory, is ironically so embedded in the traditions of literary theory it may be difficult to glean its important message.

In general, one might have hoped for more specific contextual details in the final section of the book, "Contesting Expertise". The essays provide tools to contest expertise primarily on the largest of scales—critiquing the very idea of expertise. This is not the most helpful tack, as it is little doubted that experts and expertise are useful to us. Rather than the extreme critiques this section presents (e.g. Fuller's argument that experts are basically manipulative charlatans, 347–348), we need more nuanced avenues for engaging with and potentially contesting particular experts in particular contexts. Feyerabend's classic essay hints at these possibilities (365), and Ihde's brief essay sketches a few examples (399–403), but it is an avenue that needs more development. Ironically, it is the essays by Goldman and Brewster from the opening section of the book, "Trusting Experts," that develop avenues for contesting experts most thoroughly.

The essay most likely to frustrate philosophers is the one by Collins and Evans, which, while providing a useful overview of recent sociological work on the public and science in the appendix, is hamstrung by incoherencies. (Selinger and Mix also provide a critique of Collins' work on expertise.) In their essay, Collins and Evans attempt to generate a normative account of scientific expertise (focused on how it should be used in public decision making), but without giving up on the relativism of social constructivism (44). They lack the normative resources to pull this off, and although they claim allegiance to social constructivism, they are continually undermining this commitment as they pursue their normative claims. This leads them to such confusions as an eschewal of boundary work concerning expertise but then in the next section doing boundary work by fiat (55–58). While it is helpful to see the normative commitments of sociologists placed squarely on the table, a basis for normativity as thin as their preferences (47, 50) is inadequate. Some of their descriptive insights are helpful, but they could use more dialogue with philosophers to better develop the normative claims. That is, after all, our area of expertise.

Despite occasional weaknesses of selection and organization, the

strength of the collection is in bringing together a rich and disparate set of essays, particularly with the interesting intellectual synergies that emerge when the essays are read together. It provides an entré into a long neglected territory, and it succeeds at least in showing where some good work has been done, where some of the pitfalls are, and where much more work is needed. It is an essential starting point for any endeavors on expertise and an invitation to philosophy of science to engage with the philosophical issues of expertise.

HEATHER DOUGLAS, UNIVERSITY OF TENNESSEE

Mathias Frisch, ***Inconsistency, Asymmetry, and Non-locality: A Philosophical Investigation of Classical Electrodynamics***. Oxford: Oxford University Press (2005), 222 pp., $49.95 (cloth).

This book is a stimulating and engaging discussion of philosophical issues in the foundations of classical electromagnetism. In the first half, Frisch argues against the standard conception of the theory as consistent and local. The second half is devoted to the puzzle of the arrow of radiation: the fact that waves behave asymmetrically in time, though the laws governing their evolution are temporally symmetric.

The book is worthwhile for anyone interested in understanding the physical theory of electromagnetism, as well for the views it presents on philosophical issues such as causation, counterfactuals, laws, scientific theories, models, and explanation. While philosophers of physics tend to focus on quantum mechanics and relativity, Frisch's book shows that there are deep foundational issues in classical physics, equally worthy of attention.

That said, let me lodge disagreement on some key points. Frisch argues from an alleged inconsistency in classical electromagnetism—that Maxwell's equations, the Lorentz force law, and the conservation of energy cannot be jointly true—to the conclusion that the standard view of scientific theories as a formalism plus an interpretation is incorrect. Consistency is a necessary condition of any view on which scientific theories give us an account of "ways the world could be" (7). Since classical electromagnetism is successfully used by practicing physicists, consistency must be just one criterion of theory choice weighed equally among others.

This is an intriguing idea, but I am not sure that consistency can be given up so easily. That road leads dangerously close to accepting orthodox 'Copenhagen' quantum mechanics. Surely the inconsistency of that theory's basic axioms is a large problem, and it is a problem because it spells trouble for its depiction of the world. Philosophers want to figure