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Pincock, Christopher

Mathematics and scientific representation.

Oxford Studies in the Philosophy of Science. Oxford: Oxford University Press (ISBN 978-0-19-975710-7 /hbk). xv, 330 p. (2012).

The purpose of this book is to discuss the role mathematics plays in the success of science. Pointing out that the topic falls somewhere between the philosophy of mathematics and the philosophy of science in their modern understanding, the author hopes that the book under review will be "a step in the right direction toward reconnecting philosophers of mathematics with the philosophy of science and scientific practice." Since Dr. Pincock asserts that "many readers will find much to disagree with in this book", we provide the author's own presentation of the principal ideas in the book extracted from the introduction (pages 21–22). "Here are claims I clarify and defend in the course of this book: 1. A promising way to make sense of the way in which mathematics contributes to the success of science is by distinguishing several different contributions (Chapter 1). 2. These contributions can be individuated in terms of the contents of mathematical scientific representations (Chapter 2). 3. A list of these contributions should include at least the following five: concrete causal, abstract acausal, abstract varying, scaling, and constitutive (Chapters 3–6). 4. For each of these contributions, a case can be made that the contribution to the content provides an epistemic aid to the scientist. These epistemic contributions come in several kinds (Chapters 3–6). 5. At the same time, these contributions can lead to scientific failures, thus complicating any general form of scientific realism for representations that deploy mathematics (Chapter 7). 6. Mathematics does not play any mysterious role in the discovery of new scientific theories. This point is consistent with a family of abstract varying representations having some limited benefits in suggesting new representations that are worthy of testing (Chapter 8). 7. The strongest form of indispensability argument considers the contributions I have emphasized and argues for realism of truth-value for mathematical claims (Chapter 9). 8. These contributions can be linked to explanatory power, so we can articulate an explanatory indispensability argument for mathematical realism (Chapter 10). 9. However, even such an argument based on explanatory contributions faces the challenge of articulating a plausible form of inference to the best explanation (IBE) which can support mathematical claims (Chapter 10). 10. This challenge to IBE for mathematical claims is consistent with mathematics contributing to successful IBE for nonmathematical claims, as in the extended example of the rainbow (Chapter 11). 11. Fictionalist approaches to mathematics and scientific models face challenges that undermine their main motivations (Chapter 12). 12. The way our physical and mathematical concepts relate to their referents suggests that our representations depend for their contents both on our grasp of concepts and our beliefs (Chapter 13)." The book under review summarizes research undertaken by Dr. Pincock over the last decade and is aimed at readers interested in philosophical aspects of mathematics, science, and relationships between them. *Svitlana P. Rogovchenko (Kristiansand)*

Classification: E20
Keywords: philosophy of science; philosophy of mathematics; relation between mathematics and science; inference to the best explanation