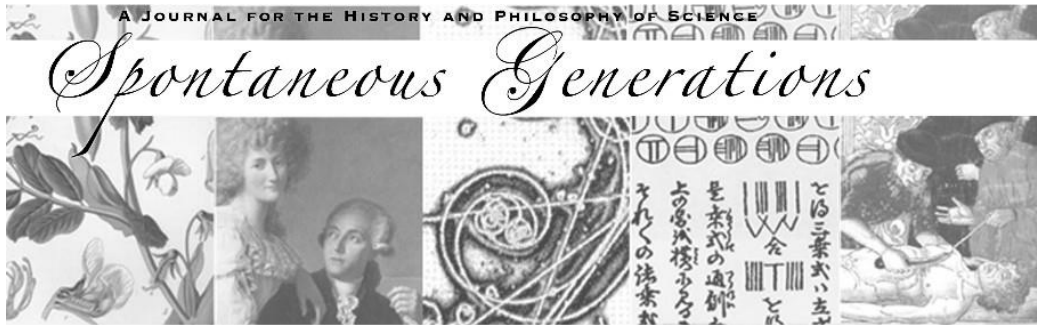




Review of *Why Trust Science?* by Naomi Oreskes. Princeton, NJ: Princeton University Press 2021. 338pp.

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In a world with so much, and such persistent, vaccine and climate science skepticism, the question of whether and why we should trust science has a practical urgency. We should thus be grateful that Oreskes' has written a clear and stimulating book.

Why Trust Science? is based on Naomi Oreskes' Princeton University Tanner Lectures on Human Values from 2016, and includes commentaries from scholars from a variety of disciplines connected to science studies: Susan Lindee, Marc Lange, Ottmar Edenhofer and Martin Kowarsch, and Jon Rosnick. Oreskes offers an extended reply to these four commentaries, as well as a new preface (in the paperback version) connecting these issues to the COVID-19 pandemic.

Oreskes' contribution is divided into two substantial chapters. The first chapter surveys efforts in history and philosophy of science to answer the central epistemological question: when and why should we trust science? Here she discusses the usual suspects, including Comte's positivism, verificationism, Popper's falsifiability and critical rationalism, Fleck and the social nature of science, Duhem, Quine, Kuhn, and the sociology of science. She concludes with a discussion of social epistemology, emphasizing recent feminist philosophers of science such as Longino. The second major chapter consists in six case studies where science seems to have gone wrong in one way or the other: the defense of limited energy theory, the rejection of continental drift, defenses of eugenics, dismissal of the role of hormonal birth control in depression, and skepticism about the efficacy of dental floss.

Each chapter thus focuses on various challenges to the idea that science is trustworthy – one more theoretical, the other, more practical. The theoretical challenges include underdetermination, the problem of induction, whether there is progress across scientific revolutions, and so on. The practical challenges are the case studies where science has apparently been untrustworthy.

One lesson that Oreskes draws from the theoretical discussion is that science's trustworthiness cannot be reduced to that of a single method; instead, it is science's "engagement with the world" and "its social character" (55) that is the key to its success and trustworthiness. Science engages with the world through observations and experiments, but crucially, science also involves a set of social practices that, when working well, enable scientists to criticize one another via the development of competing theories, peer review, conferences, and so on. Central to her picture of the successful social practice of science is diversity. Scientists with different theoretical or ideological commitments can challenge one other and through this process of sifting, consensus will often emerge. When it does, you have science that you can (usually) trust.

After discussing her case studies, Oreskes revisits her answer to the question of

why we can trust science. She points to five important factors: consensus, method, evidence, values and humility. Because science has no characteristic method, we should instead trust a scientific consensus. She defends this view against some putative counterexamples where one might have thought there was a misleading or mistaken consensus (*e.g.*, in the cases of eugenics and continental drift she argues that there was in fact no scientific consensus in favour of eugenics or against continental drift).

Philosophers of science such as Heather Douglas¹ have argued that values are an ineliminable part of science. In a similar vein, Oreskes argues that rather than hide or try to eliminate their values, scientists should be up front with them. She agrees with Douglas that science is not value free (152), but argues that in some cases facts and values can be disentangled: “I believe that, however imperfectly, we can distinguish between the scientific and normative aspects of many questions...” (63). ‘Is human caused climate change occurring?’ is a scientific question whereas ‘What policies should we adopt to mitigate or prevent climate change?’ is a normative one.

One general question about the format of the book concerns the relationship between the theoretical and practical chapters. Some of the trust issues Oreskes raises are at a general level: underdetermination, the problem of induction, the pessimistic meta-induction, whether there can be progress across scientific revolutions. These generate skeptical worries of a more global nature, and are different in kind from the objections that are raised to particular issues like climate change or evolutionary theory.

Focusing on the social features of science addresses some of these concerns but not others. Longino² emphasizes that individual scientists often have different background assumptions and biases. With a healthy community of criticism, scientists can criticize the (often implicit or unrecognized) biases or unjustified claims of other scientists. This is connected to the value of diversity. If scientists all have the same biases or implicit background assumptions, it will presumably be more difficult for them to recognize these. Oreskes spends some time defending the importance and role of diversity in science.

Oreskes’ chapters and those of the commentators are written in an accessible style, with lots of interesting examples. Although many of her remarks are quite sensible (and she uses different examples to illustrate views defended in the feminist philosophy of science literature), Oreskes’ discussion suffers from several important limitations.

The first concerns her discussion of diversity in science. Oreskes claims that diversity plays a central role in the epistemic virtues of the scientific community. Following Longino, even if individual scientists aren’t objective because they have trouble noticing their own biases, the community as a whole can still be objective if the community has sufficient robust methods to identify, criticize and weed out unjustified and biased assumptions. She suggests that “diversity can result in a more rigorous intellectual outcome by fostering critical interrogations that reveal

¹ Heather Douglas, *Science, Policy, and the Value-Free Ideal* 1st Edition (University of Pittsburgh Press, 2009)

² Helen Longino, *Science as Social Knowledge: Values and Objectivity in Scientific Inquiry* (Princeton University Press, 1990); Helen Longino, *The Fate of Knowledge* (Princeton University Press, 2001).

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embedded social prejudice” but then adds “[a]dmittedly, this claim cannot be proved” (137).

Here she neglects recent literature on the epistemic benefits of diversity that would help her case. For example, Elizabeth Anderson³ has argued that conditions exist under which the epistemic success of democratic decision-making is improved by diversity. In the philosophy of science, Kevin Zollman⁴ and others have used models to argue for the epistemic benefits transient diversity. Of course, these claims don’t “prove” their results in the sense of providing certainty, but this is an unreasonable standard.

Another limitation of Oreskes’ approach is her failure to keep the global and local challenges to our trust in science distinct. After discussing the pessimistic meta-induction she writes “We simply do not know which of our current truths will stay and which will go” (75). This might be the case when it comes to the truths of very general theories such as whether our best theory of gravity will involve superstrings or whether we will discover new particles or the nature of dark matter; but it also overlooks a lot of more mundane truths about which, short of global skepticism, we have every reason to think will not be overturned: that humans have contributed to climate change, that smoking causes cancer, the germ theory of disease, that vaccines work, and so on.

Now, it is true that we may not have a way of knowing whether Einstein’s general theory of relativity will be overturned when or if physicists discover a way of reconciling it with quantum mechanics. But short of discovering that we’re dreaming or living in the Matrix, we can be sure that, in fact, stars generate energy by turning hydrogen into helium, and that the Earth is billions, rather than thousands, of years old. We’re not going to discover that in fact there is no atomic nucleus with protons and neutrons. No doubt we’ll discover new things about them, and we might get a whole new theory of particle physics. But these new theoretical developments aren’t going to undermine the claim that we’re made up of cells, and that DNA exists inside of cells, short of discovering that it is all a dream.

Some philosophers are of course interested in responding to hyperbolic doubt or global skeptical arguments. These are open, still debated questions. But we must be careful not to misuse our lack of consensus about how to respond to *global* skeptical arguments to conclude that certain science isn’t settled or trustworthy. This is because for most of the topics about which ordinary citizens have sometimes expressed a lack of trust or knowledge – including examples Oreskes has discussed such whether smoking causes cancer, whether human activity contributes to climate change, whether flossing prevents tooth decay or whether continental drift theory or hormone treatments can cause depression – the basis for skepticism in these cases is not radical skeptical doubt. (And when philosophers do raise radical skeptical doubts, they don’t discuss these cases because it is a much broader class of knowledge that is under threat, such as whether we can ever trust our senses).

In her commentary, Lindee suggests that we use the success of ordinary technologies such as iPhones and frozen peas to convince people to trust climate

³ Elizabeth Anderson, “The Epistemology of Democracy,” *Episteme: A Journal of Social Epistemology* 3 no. 1-2 (2006): 8-22.

⁴ Kevin Zollman, “The Epistemic Benefit of Transient Diversity,” *Erkenntnis* 72 no. 1 (2010): 17-35.

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science and vaccines. In her reply, Oreskes rightly points out that people compartmentalize their skepticism, and so this strategy is not likely to prove effective. True. However, science studies scholars such as Oreskes need to pay attention to the epistemological differences between global vs. local skeptical arguments.

In his commentary, philosopher of science Marc Lange laments that philosophers of science need to do more to defend and explicate a positive account of scientific epistemology, rather than merely raising skeptical problems. This strikes me as correct. Thus, the fault here isn't just with Oreskes. That said, there is considerable work in the foundations of statistical inference that presents a more positive account of scientific epistemology – e.g., the work of Deborah Mayo⁵ or Elliott Sober.⁶ Oreskes' discussion of history and philosophy of science would have benefited from engagement with this work.

Over a century ago, Comte dreamed of positive (reliable) knowledge: science is trustworthy because it has a unique method. The last 100 or more years of science studies have shown that science is more complicated than Comte thought, not to mention that scientific practices have evolved since Comte's time. Science is not characterized by a single method. Even so, we shouldn't be too quick to dismiss the idea that science might be reliable because of its *methods*.

I don't want to end on a negative note. Oreskes' book is clear and accessible and would be a useful text in introductory courses in science studies.

⁵ Deborah Mayo, *Error and the Growth of Experimental Knowledge* (University of Chicago Press, 1996).

⁶ Elliot Sober, *Evidence and Evolution: The Logic Behind the Science* (Cambridge University Press, 2008); Elliot Sober, *Ockham's Razors: A User's Manual* (Cambridge University Press, 2015).

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