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## Tough love for science

**Henry H. Bauer: Science is not what you think: How it has changed, why we can't trust it, how it can be fixed. Jefferson, NC: McFarland & Company, Inc., 2017, viii + 251 pp, \$35.00 PB**

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Published online: 1 February 2018  
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Henry H. Bauer's *Science Is Not What You Think* is an engaging book on the nature of science. Above all, *Science Is Not What You Think* presents a realistic picture of the current state of scientific activity. Throughout the course of the book, Bauer explores the way that the scientific enterprise has changed over time as well as several common misconceptions about the nature of science. A chemist and scholar of science and technological studies himself, Bauer is careful to make clear that his goal is not to denigrate the sciences or the work of individual scientists. Rather, he aims to show that our love of science should be critical, and he gives science some of this tough love throughout the book. Ultimately, his goal in *Science Is Not What You Think* is to demonstrate that professional science is in need of reform. This he sees as a first step toward the implementation of a "science court", which is a completely neutral governing body that would have the power to adjudicate on matters of scientific controversy. On the whole, *Science Is Not What You Think* is well written and accessible. Nevertheless, there are a few places where conclusions drawn outstrip arguments given. Before presenting these criticisms, it is worth briefly discussing the contents of *Science Is Not What You Think* in more detail.

After a short introduction and chapter synopses, Bauer begins in Chapter 1 by explaining how the practice of science has changed over time. Importantly, he notes that as science has transitioned from a hobby to a profession, some problems have arisen. The most pressing problem is the conflicts of interest that face scientists today. As Bauer points out, when one's livelihood depends upon publishing and getting grants, there is pressure to make sure that results are obtained. As this sort of pressure mounts, there is a conflict between pursuing the truth and continuing to receive funding. This can lead to overly hasty publication, which has resulted in many retractions of findings, and in some cases even "fudging" of data. While

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Bauer is quick to point out that science is, and always has been, fallible, the rise of conflicts of interest seems to make this fallibility even more pronounced.

In the next several chapters, Chapters 2–5, Bauer turns his attention toward important misconceptions concerning science. In Chapter 2, he argues that there is no such thing as *the* scientific method. As he explains, there simply is not a single method that accurately describes what scientists do. Bauer takes on two other common misconceptions in Chapter 3. The first is the thought that experimental results in science are not accepted until they have been replicated by multiple experiments. The second is that a theory has to be falsifiable in order to count as scientific. In Chapter 4, Bauer argues against the misconceptions that everyone means the same thing by “science” and that science speaks with one voice. Hence, he maintains that we should be especially skeptical when someone claims, “science says X”. Chapter 5 is Bauer’s take on the idea of objectivity in science. As Bauer emphasizes, science is an activity that is done by people. Individual scientists, and science as a whole, cannot be completely objective.

After explaining the various ways that science differs from how it is often perceived, Bauer turns his attention to describing how scientific knowledge is generated in Chapter 6, and what exactly scientific knowledge is in Chapter 7. The major takeaways from these two chapters are that the information and theories of science are more reliable the longer they have been around and tested, and scientific knowledge is never absolutely certain. Of course, neither of these points is surprising or newsworthy to epistemologists, most of whom accept fallibilism about knowledge in general, or philosophers of science, most of whom are quick to emphasize that scientific knowledge should be held tentatively. However, *Science Is Not What You Think* targets a general audience, so emphasizing these points is critical, and apt to be surprising to many readers of this book.

Having discussed the nature of scientific knowledge, Bauer returns to clearing up common misunderstandings in Chapter 8. This chapter, on statistics, is truly excellent. In it, Bauer explains how statistical information can be misleading as well as basic features of statistics that everyone should understand. For the average reader, taking the lessons of this chapter to heart would be invaluable. Bauer follows up this discussion by describing, in Chapter 9, various ways that the social and behavioral sciences are different from the natural sciences. He warns that misunderstandings of the nature of science at times lead social and behavioral sciences to misappropriate “the mantle of science”. His worry is that the desire to identify with the success of the natural sciences can, and does, lead to misguided claims of objectivity and pronouncements on what “science” says on topics. This point is further expounded upon in Chapter 10 where Bauer argues that public pronouncements of science are merely statements of opinion. The reason for this is that no one is in a position to speak for science as a whole. Even when there is a large consensus among scientists, Bauer claims that this does not license speaking for science because consensus is no guarantee of truth. This is why in Chapter 11 he explicitly points out that his overarching message in the book is that the current scientific consensus on an issue should not be automatically accepted as a fact. Rather, we should approach such announcements with a healthy dose of skepticism. And we should be careful not to dismiss minority views without close consideration simply because they go against

the current consensus. Finally, Bauer concludes *Science Is Not What You Think* with a discussion of how we might ensure that minority views are given their due. In Chapter 12 Bauer describes how a “science court”, which would adjudicate between conflicts in science, could be organized and implemented.

Although *Science Is Not What You Think* is a very good book, especially when one keeps in mind its intended audience, there are a few points where criticism is appropriate. Of course, one might question the plausibility of the sort of “science court” that Bauer recommends. Nevertheless, such a criticism is not apt for two reasons. First, Bauer only offers a tentative proposal for how such an institution might be established. Second, it is made plain that the primary purpose of *Science Is Not What You Think* is simply to demonstrate the need for something like a “science court”, not defend the particular form that such reform should take. There are, however, legitimate points of criticism. Here are four that stand out.

First, while Bauer is correct that we should be careful not to accept a consensus view uncritically, at times it seems that he does not give consensus the credit it deserves. Consensus among scientific communities is no guarantee of truth, but it is certainly significant evidence of it. Second, in Chapter 1, when Bauer discusses how conflicts of interest cause problems for the reliability of science, he takes things further by claiming that “science works best when knowledge-seeking is the only motive and researchers can follow their scientific interests without constraints on what they can do” (25). Important work by philosophers of science, such as Philip Kitcher (1993), undermines this idea. Kitcher argues that “impure” motives, i.e., those other than simply knowledge-seeking, can lead to a division of labor that makes the success of science more likely than if scientists are only driven by the desire to pursue knowledge. Further, while Bauer correctly points out that science does not have one voice and that no one is in a position to speak for science, he seems to treat other disciplines as if they were monolithic. For instance, at times, Bauer speaks of what “philosophy” says on an issue. This sort of collective picture fits philosophy no better than it fits science. Philosophy does not have one voice, and no one is in a position to speak for all of philosophy. Finally, throughout his discussion, and explicitly in Chapter 7, Bauer embraces an anti-realist approach to science. Such an approach to science is not warranted by the arguments that Bauer gives. In fact, a scientific realist could accept the main claims that Bauer makes in *Science Is Not What You Think* without comprising her realist stance.

Even though *Science Is Not What You Think* is not immune to legitimate criticism, it is a welcome contribution to the literature on the nature of science. Bauer aims at reaching a general audience, and his book hits its mark. Overall, *Science Is Not What You Think* is clear, well written, and, at times, insightful. It is definitely worth reading.

## Reference

- Kitcher, P. 1993. *The advancement of science: Science without legend, objectivity without illusions*. New York: Oxford University Press.