

## BOOK REVIEWS

**Scientific Literacy and the Myth of the Scientific Method**, by Henry H. Bauer. Urbana: University of Illinois Press, 1992. pp. 180 plus ix. \$24.95. Hard-back.

In this work Henry Bauer has undertaken to examine some widely held misunderstandings about how scientists work to accomplish what they achieve. He believes the misunderstandings are so widespread and uncritically accepted that they warrant his calling them "myths." In describing these myths and exhorting his readers to abandon them, Bauer provides an excellent account of the main processes of modern science. The contents of his book can be conveyed best by the chapter titles: Scientific Literacy; The So-called Scientific Method; How Science Really Works; Other Fables about Science; Imperfections of the Filter; Consequences of Misconception; and In Praise of Science.

Reading this important book reminded me of an aphorism by Andre Gide: "Everything has been said before, but since nobody listens we have to keep going back and beginning all over again." Thus although it is true that earlier authors have said before nearly everything that Bauer tells us about science, it all needs to be said again. Moreover, he has said altogether in one short volume what we can only find in scattered places elsewhere. He has also said it with the most commendable clarity.

This is not just one more book on the philosophy of science. Indeed, Bauer has little to say about philosophy, let alone its corner called epistemology. He writes from the perspective of a practicing scientist—a chemist—who has learned, both from personal experience and from extensive reading, the scope and also the limits of modern science.

For me, the most important message of the book is that there is no single scientific method applicable to all phenomena that may nevertheless be studied by scientists using appropriate different methods. At the end of the twentieth century a large and dominant group of scientists—carrying much of the public with them—believe that there can be no science without experimental variation in the conditions of observation. They form a club extolling and enforcing a single method for science: the experimental one. This pernicious doctrine has led to the near exclusion from scrutiny by scientists of many phenomena that we cannot vary or control. Yet exceptions are unevenly admitted into the ranks of legitimate science. Meteors and earthquakes cannot be controlled, but most scientists agree that we can study them with scientific methods. And yet most would not admit this of alleged paranormal phenomena or of the experiences of persons who come close to death and survive. What makes the difference? Bauer suggests that the senior or established branches of science have developed a cumu-

lative knowledge, and he quotes Ziman as saying that textbook physics is about 90 percent correct, which means that it will endure. We cannot say this of the social sciences or even of that remarkable intermediate science—still half art—medicine. Textbooks in these fields become rapidly out of date; they lack cumulative knowledge.

Bauer's adversaries are not only an insufficiently and incorrectly informed general public and almost equally uninformed science writers. He believes that many scientists have also become entrapped by aspects of the myth of the scientific method. He inveighs, for example, against obsessive demands for predictability as an essential feature of an acceptable theory.

His book is not, however, just a diatribe against ignoramuses, although any of them who read it will become distressed. Along the way, and especially in the fourth and seventh chapters, Bauer gives a lucid account of how scientists make their advances. He emphasizes the collegial nature of the scientific process—beginning with friendly criticism by colleagues, then extending to more severe scrutiny by editors and their referees and ending in citation or oblivion meted out by one's contemporaries and successors. Bauer likens the process to that of a filter or a series of filters, which gradually eliminate what is unsound from what merits addition to accepted knowledge. He believes that the peer-review system as presently practiced is on the whole sound, at least in the maintenance of high standards in the published product. The process is slow, but the very slowness increases confidence in what becomes finally accepted as part of scientific knowledge. He makes an important distinction—using Velikovsky as an example—between pseudoscientists and scientists. The latter submit their work to the judgment of other scientists through publication in refereed journals and scholarly monographs; the former do not, but instead take their case directly to the general public through popular books and—too often—with the compliance of members of the media, who are eager to publish the latest claimed advance.

Of not many books can I say that I wish they were longer; but this is one. I wished that Bauer had expanded his brief discussion of "open-mindedness" among scientists. He distinguishes three categories of knowledge and knowledge to come: the known, the known unknown, and the unknown unknown. The first of these is already packed down in textbooks; the second is pursued by the majority of scientists who work a little beyond what is already known and can almost see in advance what they will find. But what about the third category? Many of the greatest scientific discoveries—perhaps even most of them—have been surprises; they came from the vast territory of the unknown unknown. Erwin Schrodinger said that "the first requirement of a scientist is that he be curious; he must be capable of being astonished, and eager to find out." Unfortunately, although most scientists are publicly committed to fostering and welcoming novelty, in practice they usually show an obstructive conservatism. This is probably not a matter only of venality leading those giving grants to award them to their like-minded colleagues. Conservatism among scientists runs much deeper; it is easier to take away their gold than their ideas. Bauer could have enlarged on this important topic, and I hope he will do so in another work.

In the meantime, I commend the present one to everyone who has confidence in scientific methods (note the plural), and wishes to see them applied to the full extent of their powers. All who write about science should read this book, but so should all who work as scientists and who may unthinkingly accept and propagate the myths that Bauer exposes.

This book is well produced. It includes adequate notes about sources, useful suggestions for further reading, and a good index.

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### **Erratum**

In the SSE News Items (JSE, Vol. 6, No. 2, 1992, p. 199, line 25), an error was made in the discussion title. The title should read: "Geophysical Correlates of Skilled Human Performance." Also on p. 199, line 37, the title should read: "Historical Modeling of Perceptual Trace Anomalies from the Time of Classical Greece."