BOOK REVIEW

What Science Knows and How It Knows It by James Franklin. New York & London: Encounter Books, 2009. 283 pp. $23.95 (hardcover). ISBN 978-1-59403-207-3.

Extreme views about science are widespread. The media, policymakers, self-styled "skeptics," and a variety of other science groupies take any contemporary scientific consensus as Gospel truth. Some go so far as to attempt to censor those who question mainstream dogmas, labeling them "denialists," the modern term for heretics, even as the actual evidence gives good grounds for holding the mainstream consensus as at best inadequate (Bauer 2012).

At the other extreme are the postmodernists, New Agers, and proponents of the "strong programme" in sociology of science, who deny that science can offer any authentic knowledge or understanding of reality.

The rational middle (where this book lies) is sparsely populated, if not in principle then certainly on specific issues. James Franklin hews determinedly to logic and evidence in seeking to clarify what science can know and the degree of probability that scientific knowledge can attain. His discussion is unfailingly clear-headed and thought-provoking, and the range of material he draws on is impressive.

Chapter 1, "Evidence," argues that the popular view that induction is always uncertain tends to be overly emphasized. Persistently pointing out that a "black swan" can at any time pop out at us from the "unknown unknown"—as many including me do—neglects the degree to which it is perfectly rational to draw inferences from gained experience about what is most probable. Chapters 2 and 3 extend this train of thought to demolishing the pretensions of "Enemies of Science," namely some early philosophers and the recent postmodernists.

Chapter 4, "The Furniture," discusses fundamentals: commonsense knowledge; problems of classification; the objective reality (or otherwise) of properties, of relationships, of classifications, of laws, and of concepts. Later chapters apply these insights to "The Physical Sciences" (Chapter 5); "Biology and Cognition" (6); "Mathematics" (7); "Enemies of Mathematics" (8); "The Formal Sciences" (9)—they include operations research, control theory, computer science.

Chapter 10, "Probabilities and Risks," explains the two kinds of
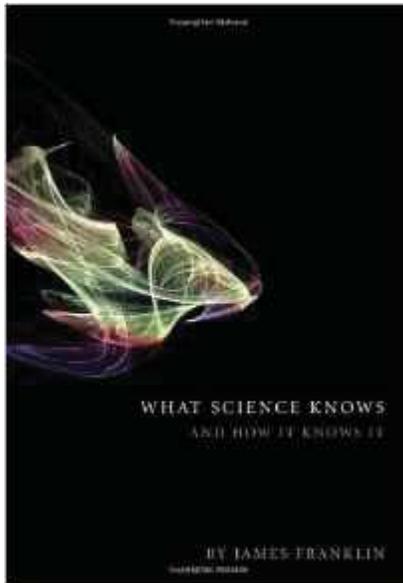
probability and elucidates issues of extreme risk, common sense, gut feelings. Everyone should have drummed into them the consequences of treating a statistical significance of $p \leq 0.05$ as noteworthy: "If one wants results at the 5 percent significance level one should have 20 graduate students repeating the experiment" (p. 205).

Chapter 11 discusses the scientific status of the social sciences. How "Actually Existing Science" differs from the ideal version is the subject of Chapter 12, and the following Chapter 13 explicates how complex issues present barriers to understanding. The two examples given, evolution and global warming, are handled with an admirable impartiality calculated to infuriate dogmatists of every stripe. Franklin points to one successful counter-example (bacterial flagellum) to arguments for the "irreducible complexity" claimed by scientific creationists and intelligent-design proponents, while not allowing the other side to pretend that there is already adequate understanding of how evolution made what seem like some quite discrete steps. As to global warming, "the complexities of the evidence are such that a higher standard of politeness to skeptics who raise serious problems would be well-advised" (p. 235).

That last quote illustrates the admirable clarity, even-handedness, and wry humor that enliven this book. After detailing early know-nothings—Gorgias who told Athenians "Nothing exists" and others of that ilk—Franklin describes a blending of those views as "a purée [that] has come to be called postmodernism, . . . now settled as a fixture on the intellectual scene" (p. 26); "Postmodernism is not so much a theory as an attitude" (p. 41), followed by a lengthy quotation from the French guru Gilles Deleuze (pp. 50–51) that defies any attempted satire in its opaque lack of meaning: Referring to Alan Sokal's hoax of the postmodernist journal *Social Text*, "Gödel's theorem, . . . a subtle result that angels fear to interpret, became . . . a favorite for postmodernists rushing in" (p. 139). I also enjoyed the quip that "Concepts that need to be expressed in German are, in general, dubious" (p. 194).

Chapter 13 mentions (p. 208 ff.) the 1993 *Daubert* decision by the Supreme Court on how to assess the quality of scientific evidence, a decision grounded in serious misunderstanding of science, since its recommended criteria include reliance on the prevailing consensus and the concept of falsifiability. Ethics in science is illustrated by Tom Lehrer's ditty: "'Once the rockets are up, who cares where they come down? That's not my department' says Wernher von Braun" (pp. 212–213).

The last chapter (14), "Is that all there is?", mentions consciousness and ethics and concludes, "We cannot believe that what science knows is all there is" (p. 251).

This book is a delightful intellectual treat, recommended for all readers.

I also recommend two other books by Franklin that will, however, appeal only to limited special audiences: *Corrupting the Youth: A History of Philosophy in Australia* (2003) which interested me for nostalgic reasons (events and people I had known first-hand) and *The Science of Conjecture: Evidence and Probability before Pascal* (2001), very detailed, for people seriously concerned with the history of thought about what became the formal discipline of statistics and probability.

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Reference Cited

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