

## ESSAY REVIEW

### **Abusing Probabilities, and Other Pseudo-Skeptics' Misdeeds**

**Reality Check: How Science Deniers Threaten Our Future** by Donald R. Prothero. Bloomington/Indianapolis: Indiana University Press, 2013. 369 pp. \$35 (hardcover), \$29.99 (e-book). ISBN 978-0-2530-1029-2.

A common ploy by pseudo-skeptics<sup>1</sup> is to make a correct statement warning against a general sort of error, followed by committing that error in some minimal sort of disguise. For instance, warn against taking correlations as reflecting causation but do that very thing concerning, say, carbon dioxide and global temperature; or about cancer and smoking: “the link between cancer and smoking is about 99%” (p. 32).

No source is given for this claim, reprehensible in a book that professes to be evidence-based. But what does this even mean? Is a link a cause, as the context implies but as the book explicitly warns against presuming?

Does it mean that 99 out of 100 smokers will get cancer? Or that 99 out of 100 researchers say so? Or that only 1 study out of 100 did not support the connection? Or that there is a 1% probability that smoking does not cause cancer?

Whatever the meaning, “Based on statistical analysis, we can show that if something has a 99% likelihood of occurring, or being true, then this level of confidence is so overwhelming that it would be foolish to ignore it” (p. 32).

This is nonsense. There is no statistical analysis that determines whether or not something is foolish. Foolishness is a human characteristic diagnosed subjectively and statistical analysis has nothing to say about it.

The asserted foolishness is then “illustrated” by the high likelihood of injury or death if one jumps off a building, an entirely inappropriate, unwarranted analogy. The evidence about the consequences of jumping off buildings is quite directly observable, no inferences needed; by contrast, the link between cancer and smoking is based on inferences from data that are probabilistic: analyzing records from people who have smoked varying amounts for varying lengths of time and applying statistical tests of significance.

The most subtly misleading or deceitful aspect of that “99%” assertion is the implication that smokers will inevitably get lung cancer, and this

illustrates a highly important point about probabilities and their (mis) interpretation, a point that crops up in a number of quite different matters.

If a smoker dies of lung cancer, there is a high likelihood that smoking was a causative factor; but that is not at all the same as saying that smoking is highly likely to cause death by lung cancer. In actual fact: “Smoking accounts for 30 percent of all cancer deaths and 87 percent of lung cancer deaths” *but* “fewer than 10 percent of lifelong smokers will get lung cancer” (Wanjek 2008).

The same point applies to the risk of false positives in medical tests, for example positive mammograms in a woman with no known risk factors is highly likely to be a false positive—whereas of course a woman with breast cancer will very likely have a positive mammogram (Strogatz 2010). All sorts of inferences can be quite unsound if one does not understand that probabilities cannot be turned around in this sort of way. O. J. Simpson benefited from a statistic cited by Alan Dershowitz that only about 0.1% of wife-batterers go on to actually kill their wives. But this was misleading. Although the probability that a wife-batterer will actually kill his wife is indeed very small, the turned-around or commutated probability that the murdered wife of a battering husband was killed by the husband is high. As I. J. Good pointed out, that latter probability is greater than 1 in 3 (Good 1995) and perhaps as high as 90% (Good 1996).

At any rate, *Reality Check* is guilty of ignorance about probabilities and also misleading about how smoking was proven to be a cause of lung cancer: not by statistics but because dogs forced to inhale tobacco smoke did develop lung cancer at an appreciable rate. The book is ignorant about science as a whole by claiming that the way not to get fooled is to use “the scientific method”; as David Goodstein (1992) pointed out, “I would strongly recommend this book [Bauer 1992] to anyone who hasn’t yet heard that the scientific method is a myth. Apparently there are still lots of those folks around.” Including among scientists and pseudo-skeptics like Prothero, more than two decades on.

The errors and flaws in this book are so numerous that it would be wearisome as well as impractical to list even most of them. Just for the flavor:

- As with smoking, so with many other things. Prothero believes that everyone should accept whatever mainstream science happens to say at the moment, and that those who don’t are foolish or worse: those who question whether HIV causes AIDS, or who resort to chiropractic instead of always trusting mainstream medicine. At times the book is more than a little self-contradictory since it rants throughout against greedy corporations even though the latter includes the greedy pharmaceutical

industry that is in cahoots with supposedly to-be-trusted mainstream medicine.

- “Vioxx . . . remains an isolated case of a drug that was not pulled off the market as soon as the test data became available” (p. 148) displays colossal ignorance about the reality of drugs improperly approved and withdrawn only after too many have suffered harm and death; see numerous documented instances in many of the books listed in the bibliography *What’s Wrong with Present-Day Medicine*.<sup>2</sup>
- Regarding the paper by Wakefield et al. reporting 12 cases of autism apparently related to multiple simultaneous vaccinations, Prothero asserts that “it is customary *not* to publish such preliminary results” (p. 150). Nonsense. Medical journals publish “case reports” about as few as a single patient. Such reporting is invaluable for working physicians who are thereby able to realize that something inexplicable that they themselves come across is not unique. For example, it was a succession of case reports that brought recognition of “AIDS”. *Every* discovery of a previously unknown condition must inevitably begin with a case report, a “mere” anecdote.
- While claiming to be evidence-based, Prothero just takes as “science” whatever the current mainstream consensus is. However, the history of science shows quite clearly that science progresses as the mainstream consensus is modified or overturned. That most published articles support the consensus is cited as evidence for its validity (p. 91). However, Scientific Explorers, independent thinkers, and researchers who differ from the mainstream view know that this is not owing to any validity of the mainstream view, it is because the mainstream successfully, for instance through peer review, keeps dissenting claims from being published—read for example about the emasculation of *Medical Hypotheses* for daring to publish evidence against HIV/AIDS theory (Bauer 2012: Chapter 3).
- Technology is conflated with science, whereas historians have published innumerable volumes showing that those two enterprises, while of course related, are not a matter of technology being applied science: Instead, scientific understanding has often followed after technological invention, as thermodynamics followed from the invention of steam engines.
- Cold fusion, according to Prothero, was proved impossible within a month of the announcement by Pons and Fleischmann (p. 18). However, hundreds of researchers have continued to report and publish positive results of excess heat or energy in systems similar to those of Pons and Fleischmann (Bailey & Borwein 2015).
- In several places, Prothero makes the typical pseudo-skeptical claim that only those who have worked in a given field are truly qualified to

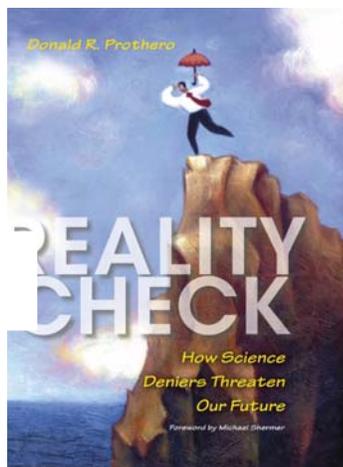
evaluate work in it. Yet Prothero himself displays considerable ignorance about the history of science, philosophy of science, and sociology of science, but does not hesitate to pronounce dogmatically about matters in the purview of those disciplines. Moreover, he has not himself worked on most (evolution is the exception) of the technical issues he purports to evaluate in this book—he just parrots mainstream sources, mostly secondary ones at that.

- ❑ Prothero describes scientists, using himself as an example, as idealists making sacrifices instead of going into business or law with their “huge salaries” (pp. 62–63). Scientists in recent times have become wealthy, and even celebrities, through patents and the like (say, inventing a new anti-HIV drug).
- ❑ “[W]e [scientists] do not get away with biases for long” because “the rest of the scientific community will jump in and criticize it” (p. 63). I know of no such instance, and none is cited.
- ❑ Guilt by association is routinely invoked; thus “the membership lists of creationists and climate change deniers have a great deal of overlap, and both causes are promoted equally by right-wing political candidates, news media (especially Fox News), and religious organizations such as the Discovery Institute” (p. 3); “Fox News, Glenn Beck, and Rush Limbaugh” (p. 98). Moreover, both “denier movements” are “heavily funded by wealthy entities with vested interests”—Howard Ahmanson, Coors family, McClellan Stewardship Foundation, ExxonMobil, Koch Industries. This book is an unrestrained rant, without nuance or distinction, against 9/11 Truthers, conservatives, Flat-Earthers, fundamentalists, Holocaust deniers, snake handlers, anti-vaxxers, right-wingers, corporate greed, and cults and cultists.
- ❑ The degree of *ad hominem* labeling is extreme. Anyone who has conservative political views is denounced as a corporate or right-wing shill, including among others (p. 53) eminent physicists William Nierenberg, Edward Teller, and Frederick Seitz (president of Rockefeller University and of the National Academy of Sciences).
- ❑ “The evidence for climate change has been accumulating since the 1950s, and was a minor political topic in the 1970s and 1980s.” Yes, indeed. There was marked climate change in the form of *cooling* in mid-20<sup>th</sup> Century and public media were reporting in the 1970s scientific fears of a new Ice Age,<sup>3</sup> whereas global *warming* hysteria took off in the 1990s; and the latter was re-named “climate change” because the carbon-dioxide-warming hysteria could not be justified as temperatures have failed to increase appreciably in the last fifteen years or so while CO<sub>2</sub> has continued to increase.<sup>4</sup>

- “[T]he fact that AIDS was caused by the HIV virus was as well established and uncontroversial as gravity or the idea that the earth is round and goes around the sun” (p. 164). This is typical pseudo-skeptical sleight of words, and is simply not true. There is a vast literature debunking HIV/AIDS theory, and its flaws are evident in the mainstream literature itself.<sup>5</sup>
- Elementary errors:
  - \* Ozone is “made of three oxygen molecules bonded together” (p. 56); no, 3 *atoms*.
  - \* Thimerosal in vaccines was mistakenly blamed for causing autism: “Intuitively, having heard that mercury in its raw elemental form is toxic, some people naturally jump to the conclusion that any mercury compound is also dangerous” (p. 153). Nonsense. Elemental mercury is harmless, it can’t get absorbed. Some inorganic mercury compounds are unhealthy, but the most dangerously toxic ones are the *organic* mercury compounds—of which thimerosal is one. Prothero compounds this blunder by asserting that there was no difference in side effects from vaccines after thimerosal had been withdrawn from use—not realizing, apparently, that withdrawal from use is acknowledgment that it is potentially harmful. That it was present in only tiny amounts and that global statistics showed no correlation with autism is also misleading. Human beings are not all the same, and some number might be specifically sensitive to a given material; if that number is not large, it will not show up in global statistics. Vaccination guidelines stipulate that the multiple vaccine not be given to babies under one year of age. So at 364 days it is risky but at 366 days completely safe? For every child everywhere? Moreover, no one claimed that the multiple vaccine was the only cause of autism, only that it could be one such stimulus for some babies at some times. When it comes to environmental matters, Prothero adopts the precautionary principle: When not entirely sure, err on the side of being overly careful. Vaccination is a challenge to the immune system. Babies have only partly developed immune systems. Does it not make perfect sense to administer vaccines singly over a period of time rather than all at once? And should not parents be allowed to choose a later rather than earlier age for their baby to have its immune system challenged?

So this is a really, really bad book.

*JSE* former Book Review Editor David Moncrief and I discussed at various times whether bad books should be reviewed, more particularly reviewed in the *Journal of Scientific Exploration*, and we usually concluded that they should not be, kinder to authors and publishers just to ignore them



and kinder to readers of the *Journal* not to clutter up space and waste their time even glancing at negative reviews. Yet here, I believe, is an exception; in part because it allows illustration of that important general point about probabilities, but also because the book has received such plaudits: published by a university press, it has close to 5-star rating at amazon.com, and it gained a Foreword Silver Award for Science.

If anyone still pays attention to amazon.com rankings or ratings, here is an opportunity to be disillusioned. But what about a Foreword Silver Award for Science? Apparently some putatively qualified group found this an outstanding example of good science writing?

The for-profit corporation Foreword Reviews<sup>6</sup> publishes 150 reviews every quarter in their magazine *Foreword Reviews*. But if your book fails to make the cutoff for inclusion there, the services of the same professional reviewers can be retained to have published “objective, 450-word reviews (including a star rating) by *Clarion Reviews*, Foreword’s fee-for-review service”—at just \$499 per review.

This adds another arrow to the quiver of self-publishing: Pay not only for the actual costs of publishing but also for any and every way to get publicity, including having “objective” and star-rated reviews “published” for books that were not regarded as good enough to be among the 150 most noteworthy ones published in the same quarter of a given year.

The chances of receiving an award are greatly increased because there are 62 theme categories handing out “IndieFab” awards in each, and it costs only \$99 to nominate your book for an award<sup>7</sup>—you are not paying for the award itself, of course. And after the “award” is made, you can purchase “foil seals” to stick on each book as evidence of the award, only 20¢ per seal when ordering 500. I was not able to negotiate the Internet well enough to discover whether the IndieFab awards included Foreword’s Book of the Year award, which may or may not include its *Gold Book of the Year* award. Google does have images of a Gold Seal for Foreword’s Book of the Year *Finalist* as well as for Foreword’s Book of the Year *Winner*.

At any rate, how *Reality Check* qualified for a Foreword Reviews Silver (but not Gold) Award for Science is no longer a mystery to me. Why the book’s Foreword is laudatory was never mysterious since it is written

by leading pseudo-skeptic Michael Shermer. Nevertheless, I am more than a little sad about all this praise, for it requires no recognition of Prothero's numerous gaffes to recognize the pervasive *ad hominem* comments and the over-generalizations unsupported by any cited evidence, which ought to be obvious to any halfway observant reader.

I would nominate the book for a Wolfgang Pauli (WP) award. Pauli is often cited for dismissing some writings as so uninteresting and badly done as to be "not even wrong." Consequently, the WP award is for books so bad that they are nothing but wrong.

### Notes

- <sup>1</sup> Those who are skeptical only about the views of others, not their own; in particular self-styled "Skeptics" who demand allegiance to every contemporary scientific consensus.
- <sup>2</sup> <https://dl.dropboxusercontent.com/u/56983081/What%27sWrongWithMedicine.pdf>
- <sup>3</sup> <https://stevengoddard.wordpress.com/1970s-ice-age-scare>
- <sup>4</sup> <http://www.bbc.com/news/science-environment-28870988>;  
<http://www.nature.com/ngeo/focus/slowdown-global-warm/index.html>
- <sup>5</sup> The Case Against HIV; <http://thecaseagainsthiv.net>
- <sup>6</sup> <https://publishers.forewordreviews.com/reviews>
- <sup>7</sup> <https://publishers.forewordreviews.com/awards>

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