BOOKS: SCIENCE AND SOCIETY

Unreal Science

Kenneth R. Foster

"Pathological science," Nobel laureate Irving Langmuir said in an amusing 1953 lecture (*1*), "is the science of things that aren't so." Robert Park, in these 10 well-written essays for a lay audience, uses pathological science as a starting point for far-reaching discussions of science and society.

Voodoo Science
The Road from Foolishness to Fraud
by Robert Park
Oxford University Press, New York, 2000. 240 pp. $25. ISBN 0-19-513515-6.

Park is an articulate and skeptical voice of reason about science. A former chair of physics at the University of Maryland and head of the Washington office of the American Physical Society, he is also an editorial writer, a sometimes talking head on television, an occasional Congressional witness on science policy, and the author of a weekly Internet newsletter (*2*).

For these essays, he rounds up the usual suspects: cold fusion, homeopathy, perpetual motion machines, and parapsychology. Other less familiar targets include "Vitamin O" (water with dissolved oxygen, whose ads in *USA Today* promised to maximize nutrients and purify the blood). One essay complains about the unwarranted credibility the media give to such claims; the title, "It's Not News, It's Entertainment," tells its story succinctly.

But Park is less interested in debunking weird claims than in commenting, often by narrating stories, on public issues involving questionable science. Not all of the episodes he describes had irrational outcomes. One inventor persuaded the U.S. Congress to hold hearings on whether to force the Patent Office to issue a patent for a machine that supposedly created more energy than it used. Careful questioning by then Senator John Glenn scotched his case. Another chapter describes recent U.S. Supreme Court decisions that exclude egregiously flawed or invalid technical testimony from federal courts.

Other essays deal more broadly with science and technology. Park describes the limitations of manned space flight and the space station (which he views as scientifically sterile) and the strategic defense initiative (which he considers technically unworkable and politically dangerous). The book's penultimate essay describes the wreckage found in 1947 near Roswell, New Mexico, which fueled a UFO frenzy that has continued for many years. The military knew all along, Park reports, that the wreckage was from Project Mogul, a secret high-altitude test to monitor nuclear explosions. But the military kept silent, which produced a case of "voodoo science [being] protected by official secrecy."

Park's accounts lack the anger at science that is evident in some conservative writing about junk science. Park wants to "help [people] judge which claims are science and which are voodoo." People generally read what they find agreeable, and Park may be preaching to the choir. But his essays are delightful to read, and their critical views may be unfamiliar to many nonscientists.

Park's popular approach limits his ability to delve into the details of the issues, which are clearly more complex than he lets on. For example, Park dismisses homeopathy on the sensible grounds that a drug cannot be effective when diluted so highly that not one molecule of it remains. But in the past few years, at least three seemingly well-controlled clinical trials published in peer-reviewed Western journals have reported positive effects of homeopathic treatments in patients. Is this, as one of the articles asked, proof of an effect or proof of the ability of double-blinded clinical trials to yield false positive results? Thus, believers in homeopathy will find in peer-reviewed papers in conventional scientific journals at least a scintilla of scientific evidence in its support. Try explaining that to the folks back home.

CREDIT: JOE SUTLIFF

The author is in the Department of Bioengineering, University of Pennsylvania, 120 Hayden Hall, 3320 Smith Walk, Philadelphia, PA 19104, USA. E-mail: kfoster@seas.upenn.edu

References
1. A transcript edited by R. N. Hall was published in *Phys. Today* **42** (no. 10), 36 (1989).
2. Newsletter available at www.aps.org/WN/.

BOOKS: PHYSIOLOGY

Approaches to Studying Sex

Montserrat Gomendio

In biology, questions may be addressed from four different perspectives: proximate causes (mechanisms), ultimate causes (function), development, and evolution. Much has been said about the fruitfulness of combining these approaches, particularly proximate and ultimate explanations, but progress has been slow. Scientists interested in proximate explanations, however, wish to understand which underlying mechanisms bring about particular outcomes, and they tend to focus on a few model species, which they study under controlled conditions in the lab. Inter- and intraspecific variation are often dismissed as "noise," and individuals within a species are seen as uniform. Scientists interested in ultimate explanations wish to understand how selective pressures shape whole organisms and why different environments have favored different strategies. In their efforts to infer general principles, they tend to study a variety of organisms in natural environments. Because selection acts on differences in reproductive success between individual organisms, researchers place much emphasis on the strategies of individuals. Poor knowledge of the mechanisms, however, too often prevents generalization of the conclusions and impedes progress beyond the descriptive phase.

Reproduction in Context
Social and Environmental Influences on Reproduction
Kim Wallen and Jill E. Schneider, Eds.
MIT Press, Cambridge, MA, 2000. 534 pp. $60, £37.50. ISBN 0-262-23204-9.

The science of reproduction has traditionally been focused on the study of mechanisms. This focus is mainly due to the development of the science's more applied aspects such as enhancing reproduc-

The author is in the Departamento de Ecología Evolutiva; Museo Nacional de Ciencias Naturales (CSIC); José Gutiérrez Abascal, 2; 28006 Madrid, Spain. E-mail: mcnc125@mncn.csic.es