REVIEWS AND BRIEF NOTICES

HISTORY, PHILOSOPHY, AND ETHICS OF BIOLOGY

SCIENTISTS CONFRONT CREATIONISM: INTELLIGENT DESIGN AND BEYOND.

Edited by Andrew J. Petto and Laurie R. Godfrey. New York: W. W. Norton. $27.95 (hardcover); $17.95 (paper). 463 p.; ill.; index. ISBN: 978-0-393-05090-5 (hc); 978-0-393-33073-1 (pb). [Originally published as *Scientists Confront Intelligent Design and Creationism,* by W. W. Norton, New York, 2007.] 2008.

This anthology, which updates the original 1983 version, adds to the steadily expanding arsenal of books for people who wish to counteract creationism, especially intelligent design (ID). The 17 articles are grouped into three parts. Part One is a history of creationism, including both young Earth creationism (YEC) and intelligent design (ID). Two of the three articles give special attention to ID, the most recent variant of creationism and the most troublesome in recent years.

Part Two offers fairly technical responses by scientists to creationist mistakes and distortions of science. All relevant scientific disciplines are addressed: physics and cosmology, astronomy and geology, the origin of life, paleontology, biology, anthropology, and information theory (as used by ID creationist William Dembski). The discussion of YEC in this section might be considered anachronistic; however, the media attention generated at the recent opening of a much visited YEC museum built by Answers in Genesis, a Kentucky creationist organization, indicates that understanding this form of creationism is still necessary.

The final part analyzes creationists' flawed understanding of science and the rhetorical strategies they use to promote their viewpoints. Among the most frustrating (but effective) of those strategies critiqued here is the constant charge by both YEC and ID proponents that evolution is "only a theory." "Teach the controversy," the successful sound bite that has become the trademark of the Discovery Institute's ID creationist Center for Science and Culture, also receives special attention. The pedagogical arguments against teaching creationism are addressed, as is the importance of tailoring evolution instruction to student grade levels.

This book covers all of the important angles from which to counteract creationism, offering important scientific information and reference lists for further reading. It will be useful to scientists, educators, and others who want to become activists and can also understand the sophisticated (but reasonably accessible) scientific discussion.

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OBJECTIVITY.

By Lorraine Daston and Peter Galison. Brooklyn (New York): Zone Books; distributed by MIT Press, Cambridge (Massachusetts). $38.95. 501 p. + 40 pl.; ill.; index. ISBN: 978-1-890951-78-8. 2007.

In this book, the authors provocatively claim that the concept of scientific objectivity has a history that is concrete, developing, and that began rather

The Quarterly Review of Biology, September 2008, Vol. 83, No. 3

recently. A traditional conception of objectivity may take it to be synonymous with science itself, simply referring to the careful and unbiased investigation of the world. However, according to Daston and Galison, history reveals objectivity to be one science-guiding virtue among three. These three virtues—what the authors call "truth-to-nature," "mechanical objectivity," and "trained judgment"—developed between the early 18th and the mid-20th centuries. All three continue to shape scientific practice and influence the ways scientists understand themselves.

Objectivity proceeds through the analysis of atlases, compendiums of images that compile the knowledge of scientific fields. The authors identify trends in the practices of image making and image use that have spread across disciplines. They also investigate the history of the notion of objectivity, analyzing its travels through the philosophical views of Kant, Frege, logical empiricists, and others.

The first of the three virtues to emerge historically is what Daston and Galison call "truth-to-nature." A scientist working under this virtue strives to create idealized images of her or his objects of study. For example, if working under this virtue, a botanist creating an entry for an atlas of plant species would not simply make an image of a particular existing plant; the botanist would depict an ideal specimen that captures the characteristic form of that kind of plant. Incidentally, according to the authors, the field of botany is an anomalous discipline in that it retained truth-to-nature as its primary virtue while other sciences shifted to mechanical objectivity in the mid-19th century.

Daston and Galison use the term "mechanical objectivity" to refer to the second virtue they identify. Working under this virtue, a scientist creates an image through established protocols and techniques made to restrict his or her individual influence on its content. This notion is closest to the standard conception of objectivity. "Objectively" depicted images may contain less-than-ideal specimens, unhidden instrumental artifacts, or other imperfections. For one subscribing to this virtue, such imperfections are an acceptable consequence of the attempt to create images with minimal human interpretation or intervention. One compelling example explored in *Objectivity* is the contrast between atlases of snowflakes. Drawings and photographs of snowflakes created under the virtue of truth-to-nature depict perfect specimens. Atlases created under mechanical objectivity instead contain snowflakes that are uncorrected, irregular, and often broken.

Emerging in the early part of the 20th century, "trained judgment" presented an alterative to the dominant virtue of mechanical objectivity. With this virtue, images are created in ways that emphasize the atlas reader's ability to interpret content based on his or her expertise. Working under the virtue of trained judgment involves the use of the tacit knowledge gained through scientific schooling and experience. According to Daston and Galison, all three virtues continue to inform scientific work. Also, their identification presents a challenging philosophical implication: science can, has and, at times, does operate without mechanical objectivity.

The authors take this project further by considering the type of scientific self that corresponds to each virtue. Subjectivity is conceptually anchored to objectivity, and a different kind of subject is required for practice under each virtue. According to Daston and Galison, scientists toiling under a particular virtue cultivate an ethos, a way of seeing. For example, it takes a certain kind of scientist to engage in the systematic restraint and passivity required for practice under mechanical objectivity.

Daston and Galison conclude *Objectivity* with short reflection on a new virtue that may be emerging today. They suggest that an "image-as-tool" virtue may be developing in contemporary scientific practice. Under this virtue, images themselves are used to modify the world, such as in the case of images of matter manipulated on the "nano" scale. The authors' initial thoughts on this contemporary virtue are ripe for further expansion. For example, I suggest that related work can be done to explore the increasingly common practice of creating images from a collection of information, such as fMRI brain images that include data from numerous subjects, or images of the results of many runs of a simulation.

Objectivity is an engaging read and full of fascinating historical detail. This is one of those works that will provoke readers from the start, and yet through its compelling and well-structured arguments will leave those same readers feeling as though this account had seemed obvious all along. I look forward to seeing how these ideas are used by others to investigate contemporary scientific practice and politics.

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