The Other Demarcation Problem

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Superstition is an awkward category for historians of science, and they do not typically use it. Scientists, on the contrary, frequently do, often in loose terms to describe those beliefs that conflict with or simply ignore what science has revealed about nature's truths. Occasionally the term has been weaponized to decry claims of which they decidedly do not approve, most memorably in the 1994 opening salvo of the Science Wars, Paul R. Gross and Norman Levitt's *Higher Superstition*—a frontal attack on science studies as an anti-science movement engineered by feminists and the "academic left"—which inspired Alan Sokal's hoax and a great deal of hand-wringing within our field.[1]

Rarely, scientists invoke superstition more concretely. My favorite example is B. F. Skinner's classic 1948 article "'Superstition' in the Pigeon," which describes how he randomly fed hungry pigeons some tasty pellets. The pigeons, which were of course bobbing and weaving hither and yon as pigeons are wont to do, associated some of their intrinsic maneuvers with the arrival of pellets, which reinforced a nonexistent relationship and led to a repetition of those behaviors in expectation that they would yield another meal. "The experiment might be said to demonstrate a sort of superstition," Skinner wrote puckishly. "The bird behaves as if there were a causal relation between its behavior and the presentation of food, although such a relation is lacking."[2] The joke here, of course, is that the arch-behaviorist Skinner did not believe that internal states of mind were accessible to the scientist, and what is superstition except an internal belief? Skinner deployed the category ironically; we are not meant to take it seriously.

John Burnham, by contrast, intended the readers of *How Superstition Won and Science Lost* to take superstition very seriously indeed.[3] Burnham's "superstition" was not an actors' category but an analytic one, and he wielded it somewhat more in the fashion of Gross and Levitt than Skinner. (The latter has a cameo on p. 104, but, sadly, it is not in reference to the pigeons.) In this impressive study of the popularization of science across two centuries of American history—a research burden that is almost unimaginable for an age before computerized databases and text searching—Burnham penned a polemic in an elegiac mode about the decline of a genuine public conversation on science that had been replaced by a morass of fads, fantasies, and sheer poppycock

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[1] Paul R. Gross and Norman Levitt, *Higher Superstition: The Academic Left and Its Quarrels with Science* (Baltimore: Johns Hopkins Univ. Press, 1994). On the Sokal hoax see, most recently, Jennifer Ruark, "Anatomy of a Hoax," *Chronicle of Higher Education*, 6 Jan. 2017, 63(18):B6–B10.

[2] B. F. Skinner, "'Superstition' in the Pigeon," *Journal of Experimental Psychology*, 1948, 38:168–172, on p. 171.

[3] John C. Burnham, *How Superstition Won and Science Lost: Popularizing Science and Health in the United States* (New Brunswick, N.J.: Rutgers Univ. Press, 1987). All references to this work are indicated in the text by page numbers.

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as the "yellow press" (a frequent analytic category in these pages) crowded out genuine interest in and knowledge about science. This deplorable state of affairs he blamed largely on scientists' own abandonment of popularization; instead, they outsourced it to journalists conditioned by the profit motives of the media industry and unable to discriminate between the real McCoy and the Flying Dutchman. The core of Burnham's argument hinged on a demarcation between "science" and "popularization." I leave it to the specialists in this forum to evaluate that argument in the light of the three decades of intense work on that topic since the appearance of the book.

Here, I will focus on the other demarcation problem highlighted in the book, although one Burnham treated much more casually: that demarcation problem, identified by Karl Popper in 1953, between science and nonscience—and, more specifically, between science and "pseudoscience."[4] (Popper is not invoked by Burnham.) The concern is best illustrated not by something Burnham includes in the text but, rather, by a surprising absence. The word "eugenics" does not appear in the index of this book that discusses popular science and the media primarily during the period from 1850 to 1950. The omission is particularly striking because Burnham specifically stressed that the dominant topics covered by his primary source material occupied the interface between health and psychology, "often . . . confused with each other as well as with sex" (p. 42). This is precisely the nexus where we find eugenics. Why was such a large domain omitted from this assiduously comprehensive book? Might it have been an oversight?

Not at all; Burnham tells us, in passing, that the exclusion was deliberate. In discussing J. McKeen Cattell's efforts in *Scientific Monthly* to get scientists to write about scientific topics, Burnham laments that even there "the subject matter was very frequently set by journalistic priorities and in the 1920s included such topics as vitamins, Madame Curie, relativity, eugenics, and the endocrines" (p. 212). (By now, the reader is conditioned to understand "journalistic priorities" as pejorative, but I confess that I do not see a problem with any of those topics being understood as perfectly suited for scientific popularization.) Burnham explains in a footnote that "no attempt is made here to describe the eugenics movement, which is now the focus of a large and substantially irrelevant literature" (p. 280 n 30), before citing, as his only source, Mark Haller's *Eugenics: Hereditarian Attitudes in American Thought* (1963), which appeared twenty-four years before *How Superstition Won and Science Lost*; he skips over the substantial intervening scholarly literature, to which he surely had access, which argues forcefully that one of the salient features of eugenics was that it blurred the boundaries between scientific and popular.[5] Burnham excluded eugenics because for him it was not science in 1987—and thus necessarily not science in 1897 or at any other time. His account of popularization presumes as a starting condition that Popper's demarcation problem had been solved and that the phenomenon to be explained was how sciences that *we* consider legitimate were bowdlerized in transmission.

This premise is very problematic: by artificially resolving the blurriness of historical science, it oversimplifies and undercuts its own causal claim. I have discussed the demarcation of science and pseudoscience at length elsewhere, and for the purposes of this short essay I need stress only one feature of that analysis.[6] As the history of science amply indicates, many of

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[4] Popper claimed he coined the term "problem of demarcation" in the late 1920s, but he published his account only in a 1953 lecture sponsored by the British Council, reproduced as Karl Popper, "Science: Conjectures and Refutations," in *Conjectures and Refutations: The Growth of Scientific Knowledge* (1963; New York: Routledge, 2002), pp. 43–78.

[5] To pick just two salient examples: Kenneth M. Ludmerer, "American Geneticists and the Eugenics Movement: 1905–1935," *Journal of the History of Biology*, 1969, 2:337–362; and Daniel J. Kevles, *In the Name of Eugenics: Genetics and the Uses of Human Heredity* (New York: Knopf, 1985). Burnham does cite Mark Haller, *Eugenics: Hereditarian Attitudes in American Thought* (New Brunswick, N.J.: Rutgers Univ. Press, 1963).

[6] Michael D. Gordin, *The Pseudoscience Wars: Immanuel Velikovsky and the Birth of the Modern Fringe* (Chicago: Univ. Chicago Press, 2012), esp. Ch. 1; and Gordin, "The Problem with Pseudoscience," *EMBO Reports*, 2017, *18*:1482–1485.

the doctrines that are now broadly considered "pseudoscientific," such as astrology—also omitted from *How Superstition Won and Science Lost*, even though it had become a staple of daily newspaper columns, to the consternation of astronomers—were at one point respectable domains of natural science.[7] Standards of what counts as legitimate knowledge change, and some doctrines come to be fringed out of the mainstream scientific consensus. Studying the luminiferous ether was constitutive of what it meant to pursue classical electrodynamics in the nineteenth century; advocating for it today will quickly render you a pariah. So, if we want to narrate the history of science without a presentist or whiggish cast, we should treat as proscribed or demonized doctrines ("pseudosciences") only what our actors did according to their contemporary standards.

Burnham chose instead to render judgments of legitimacy in terms of his own day. To a degree that is a little shocking to someone reared in the anti-presentist historiography of science of the last three decades, Burnham is rather cavalier in denigrating specific beliefs that do not accord with present-day scientific knowledge:

> Closely allied to old science was another source of error, pseudoscience. Pseudoscience differed from discarded science because it was never respectable but merely took on the forms of science. Unlike folk beliefs, pseudoscience has a basis in the authority of only the scientific forms, not tradition. By the twentieth century, as has been suggested above, Americans in their increasingly bureaucratic society found that the forms of science in pseudoscience commanded more respect than conventional superstition, but the two were often lumped together along with outdated science. [P. 227][8]

The culprit once again is the yellow press: advertising coupled with a profit motive.

It might seem churlish to champion astrology, of all things (which was "respectable" at least through the Renaissance), against Burnham's offhand dismissal of fields like eugenics, but the point is extremely important. Burnham is interested in how "good science" was turned into something bad, even intermixed with "pseudoscience," through a process of popularization, but he never articulates the criterion for goodness.

What most strikes me reading this book in 2019 is how it is deeply, profoundly partial and unsymmetric about "true and false" and "correct and incorrect" knowledge, to use the terms put forward by David Bloor back in 1976 in the "Strong Programme" for the Sociology of Scientific Knowledge (SSK).[9] Most of the literature on "fringe sciences" since the 1970s has been heavily indebted to SSK, both for granting permission to treat these doctrines (creationism, phrenology, mesmerism, what have you) as systematic attempts to gain knowledge of the natural world and also, therefore, for making them tractable with the same tools we use to analyze "mainstream science."[10] This lesson came to me first as a liberation, then as an axiom. You won't find this literature cited in Burnham's book, and the SSK-derived literature on which I was reared returns the compliment. The segregation of the literatures marks a fundamental

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[7] On scientists' attempts to push back against the proliferation of astrology columns see Bart J. Bok and Lawrence E. Jerome, *Objections to Astrology* (Buffalo, N.Y.: Prometheus, 1975).

[8] See also Burnham, *How Superstition Won and Science Lost* (cit. n. 3), pp. 55, 103, 141, 172, 190, 201, 202, and 244, among others. Mesmerism and spiritualism are discussed in similar terms on p. 86.

[9] David Bloor, *Knowledge and Social Imagery* (London: Routledge, 1976).

[10] Two salient early instances (hence accessible to Burnham when he wrote this book) are Roger Cooter, *The Cultural Meaning of Popular Science: Phrenology and the Organization of Consent in Nineteenth-Century Britain* (Cambridge: Cambridge Univ. Press, 1984); and H. M. Collins and T. J. Pinch, *Frames of Meaning: The Social Construction of Extraordinary Science* (London: Routledge, 1982).

divergence on what it means to historicize science: SSK concentrates on science in the making, as an unsettled, protean process; Burnham emphasizes science made—and thus static.

As far as demarcation problems go, then, we are left with two literatures. On the one hand, there are those works that emphasize symmetry and in the spirit of this impartiality tend to be a little dismissive about popular science. On the other, there is the literature on popularization, demarcating between elite and lay discourses, often explicitly arguing that mainstream science is correct and has frequently been corrupted in the transmission, whether through blissful amorality (Burnham's version) or malice aforethought.[11] Rereading John Burnham's *How Superstition Won and Science Lost* does not resolve the tension between these two demarcation problems, but it brings the issue into especially sharp focus.

[11] An exemplary recent case of the latter is Naomi Oreskes and Erik M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (New York: Bloomsbury, 2010).