BOOKS: HISTORY OF SCIENCE

Explosive Rhetoric

Gregory Benford

John Canaday's first line in *The Nuclear Muse* proclaims "this book crosses boundaries," and indeed it does, though not always with success.

The author's central point is that "[b]efore they became physical facts, atomic weapons existed as literary fictions." Here Leo Szilard is the pivotal figure. In 1932, he read H. G. Wells's *The World Set Free*, which had in 1913 correctly predicted the discovery of artificial radioactivity in 1933. Wells depicted atomic power; bombs; and a world war between an alliance of England, France, and perhaps the United States, against Germany and Austria. Wells's bombs probably began the misnomer "atomic" instead of "nuclear," but they did work by "chain reactions." The novel was dedicated to Frederick Soddy, whose study of radium gave Wells the idea. Szilard saw the coming possibility of such weapons, and for decades was a driving force toward first making and then controlling them.

The Nuclear Muse
Literature, Physics, and the First Atomic Bombs
by John Canaday

University of Wisconsin Press, Madison, 2000. 328 pp. $60. ISBN 0-299-16850-6. Paper, $22.95. ISBN 0-299-16854-9.

In Canaday's view, "since World War II nuclear weapons have exercised their power in a purely symbolic form" and "atomic weapons are useful because of the stories people tell about them." Canaday is a prize-winning poet and playwright who has taught literature, history, mathematics, and physics. His postmodernist agenda sees scientific knowledge as a "construction" rather than a discovery. He notes that "representations in physics suppress their relationship to human individuals." Much the same can also be said of most postmodern prose, including much of the author's own serviceable but scarcely supple text. In *The Nuclear Muse*, Canaday studies as stylistic texts a Bohr paper on complementarity, the "Los Alamos Primer" used to train physicists, memoirs of the wartime era, and Szilard's own deft science-fiction novella, "The Voice of the Dolphins."

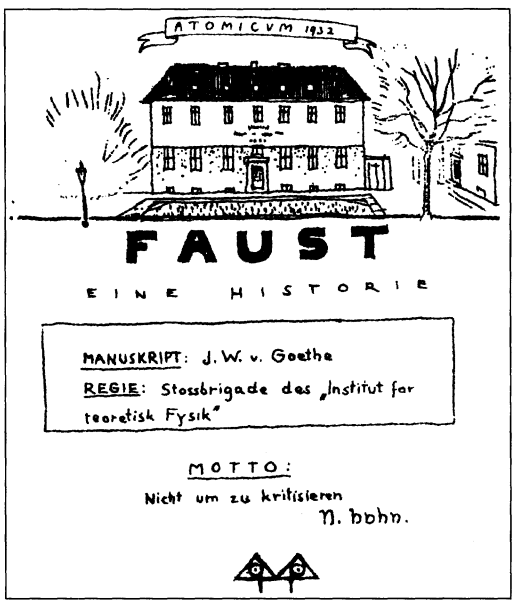
Szilard was an artful prose stylist in his fiction, to which he turned when he could not get his views through on the larger policy stage. Canaday contrasts literary rhetoric with everyday scientific language that "remains so flat and detached from its social consequences, hewing instead to the conventions of scientific rhetoric: abstract, relational verbs ('is,' 'to produce,' 'known,' 'to show'); passive voice ('is released,' 'known'); avoidance of direct attribution of agency; complex noun groups." That these awkward devices also make the results a bit less tinged with the "social consequences" of the day, Canaday does not seem to believe important.

Yet why did the bomb stir "many Manhattan Project scientists [to] find metaphors and narratives of exploration and discovery so compelling"? Because new territory demands metaphor, of course—an unsurprising observation. This kernel of truth Canaday at times tries to inflate into intellectual puffed rice.

His conclusion that "nuclear weapons have been constructed in our society not only as textual entities but more specifically as literary ones" seems unremarkable. Canaday seems unaware that in the 1930s and early 1940s science fiction had worked extensively beyond Wells's vision. Quite plausibly, the views of physicists were powerfully shaped by the considerable body of literature they read in science-fiction magazines. Edward Teller told me in the 1960s that he believed a conversation about a short story in *Astounding Science Fiction* overheard in wartime Los Alamos brought agents, sniffing after a leak, to interview its editor. The story's author had simply extrapolated a shaky knowledge of nuclear physics to foresee how bombs might work and end the war. Similarly, Robert Heinlein's 1941 story in the same magazine, "Solution Unsatisfactory," predicted the postwar nuclear stalemate. Workers at Los Alamos must have known these stories; Szilard was not the only physicist who read this literature.

Canaday uncovers "crucial relations between literature and physics in the development of quantum mechanics and the subsequent construction and dissemination of the first atomic bombs." (Note the defusing "dissemination" instead of a straightforward "dropping"; physics is not alone in using rhetoric.) Anticipating that "scientists who (sometimes rightly) perceive these studies as inept or hostile intrusions on their domain" will disagree, he argues that "disciplinary boundaries also obscure. The conceptual grid they superimpose on the world obscures the continuity of our experiences and actions." Yet the author uses only a narrow, bounded range of literature to reflect on physics. He ignores other texts that are often more influential within the scientific community, such as Walter Miller Jr.'s "A Canticle for Leibowitz" (1959).

Canaday believes that physicists labored to construct "a rigid distinction between 'symbolic,' literary knowledge and 'experiential,' scientific knowledge" by "privileging the latter" to "limit debate and dissension, and even manage to police their own ranks." Here his postmodernist desire to read conspiracy about epistemology into what are really just natural turf wars, which use terminology as territory, gets carried a bit far.



The physicists' bargain. At the April 1932 conference on quantum mechanics hosted by Niels Bohr's Institute of Theoretical Physics, participants led by Max Delbrück wrote and staged a parody of themselves in the guise of Goethe's *Faust*. The characters included Wolfgang Pauli in the role of Mephistopheles, Bohr as God, Paul Ehrenfest as Faust, and Pauli's "neutron" (the neutrino) as Gretchen.

Although Canaday admits that physics quantifies (focusing objectively on natural phenomenon) whereas literature qualifies (stressing subjectively the human world), he seems to consider the two activities epistemologically equal. The distinction represents the key difference between scientists and postmodernists. The author even resists the "two cultures" argument advanced by C. P. Snow; he sees the two approaches as "complementary and interconnected," not disconnected socially or empirically.

Most odd, Canaday ignores the very real power structures of the literary world itself. These have discounted fiction about science, and especially science fiction, to de-

The author is in the Department of Physics and Astronomy, University of California, Irvine, CA 92697–4575, USA. E-mail: gbenford@uci.edu

fend an aging humanist-academic culture. Ignoring and ignorant are not far apart. The arguments advanced in *The Nuclear Muse* catch a worthy piece of the intellectual fabric, without grasping it whole cloth.

BOOKS: PUBLIC HEALTH

Things Fall Apart

Robert E. Shope

Is the public's health important? Is public health the responsibility of government? Is health of major portions of the world's population neglected today? Journalist Laurie Garrett gives a resounding "yes" to each question.

Garrett takes the reader to India, the Congo, and the states of the former Soviet Union to see through her eyes the destruction in the infrastructure of the public health systems in the face of plague, HIV/AIDS, Ebola, and tuberculosis. She shows that poverty, war, the collapse of governments, and the resulting failure to maintain essential disease-prevention skills and programs are to blame for the remarkable decline in health in these parts of the world and elsewhere. Comparing New York City, Los Angeles County, and the state of Minnesota, she issues a wake-up call for the United States as well.

Garrett begins by delving into the definition of public health. Is it curative medicine supplied by efficient health management and health care for all? No, she concludes, it is preventive services such as clean water, sanitation, safe food, pristine environment, prophylactic drugs and immunizations, health education, and effective screening for communicable and preventable diseases. In the developing world and the United States, these services are rapidly deteriorating in the face of urbanization, newly recognized diseases such as AIDS, recurring old diseases such as tuberculosis, complacency, antigovernmentalism, and political opportunism. Garrett does not, however, offer a definitive solution to the problems she documents. Rather, she implies that her answer is that given in response to the same question asked about her previous book, *The Coming Plague* (Farrar, Straus, and Giroux, New York, 1994). "As a journalist I felt uncomfortable: it wasn't my role to solve society's dilemmas, only to describe them." She worried that "some of the answers appeared so complex that I felt inadequate to the task of elucidation."

Betrayal of Trust
The Collapse of Global Public Health
by Laurie Garrett
Hyperion, New York, 2000. 768 pp. $30, C$42.95, £22.95. ISBN 0-7868-6522-9.

Throughout the book, Garrett reminds us that public health is fragile. Where there is a choice, societies choose curative medicine over prevention. Sadly, I agree and I believe the reader will be convinced by her arguments.

In India in the fall of 1994, Garrett encountered an outbreak suspected of being pneumonic plague. The prosperous industrial economy of the city of Surat was completely devastated, not by the few deaths from plague but by the hysteria resulting from the perception of an enormous outbreak. At fault, according to Garrett, were the public health authorities, unable to establish rapid and accurate laboratory diagnoses; the press, which reported erroneous morbidity and mortality; and national and international agencies, unable to allay fears in other cities and nations. The combined damage (considering immediate medical costs, refugee control, loss of tourism, and international embargoes of Indian goods) was estimated at $2 billion. Garrett identifies some villains, including the director-general of the World Health Organization.

Bearing the burden. Counties such as Los Angeles have had to provide more basic health services for more people, with less money.

Garrett next takes us to the Democratic Republic of the Congo (formerly Zaire). Here we are treated to a fascinating, detailed account of the circumstances surrounding the 1995 Ebola outbreak in Kikwit. Garrett gathered much of the information first hand through her interviews there. She portrays many heroes including University of Kinshasa virologist Tamfum Muyembe, David Heymann of the World Health Organization, and Ali Khan of the U.S. Centers for Disease Control and Prevention. Garrett is at her best in this chapter and the reader will be captivated. In spite of the complex situation she portrays with such excitement, the message comes through that here, again, there is a villain. This time it is the central government under Mobuto Sese Seko, whose corruption and mismanagement left the public health sector stripped of resources. Hence the epidemic flourished, to some extent spreading via contacts at hospitals.

The author then turns to Russia, documenting what she calls "the most astounding collapse in public health ever witnessed in peacetime in the industrialized world." She recites a litany of governmental deterioration, corruption, failure to pay salaries, alcoholism, exposure to radiation, environmental pollution, and breakdown of vaccination and control of antibiotics. Garrett devotes sections to multidrug-resistant tuberculosis and to AIDS and hepatitis associated with the use of intravenous drugs. The vital statistics reflect the breakdown in public health; according to Garrett "between 1990 and 1994 Russian men lost...six years of their life expectancy and women lost three years."

One could argue that these chapters discuss sites where there are extreme problems with public health, but I do not think the cases are unique. For instance, many nations in South America, Africa, and Asia have just as serious problems with HIV/AIDS.

Garrett devotes a third of the book to a lengthy discussion of public health deterioration in the United States in the context of diminishing federal funding for health. This is a detailed, annotated, well-researched indictment of what the author terms "antigovernmentalism." In addition, she maintains, the nation has succumbed to the concept that in health matters the rights of the individual trump the rights of the community. In Minnesota, a state previously known for its high standard of public health, antigovernmentalism was exemplified by public support for Jesse Ventura, Garrett's local villain. Her hero there is Michael Osterholm, whom she depicts as a person driven from public service by systematic rationing of resources. In Los Angeles County, as a result of California's Proposition 13, the public health infrastructure has suffered a similar marked deterioration. The book details for the United States many of the same problems that are found in developing countries, including AIDS, multidrug-resistant tuberculosis, and bacterial resistance to antibiotics.

I also found the chapter on biowarfare to be an accurate account of the current risks. It presents the useful perspective that any countermeasure will depend on and require a strong public health infrastructure for surveillance and response.

Garrett is an outstanding investigative reporter. *Betrayal of Trust* is a reflection of her meticulous research and her ability to write an engaging, scientifically credible text that can be understood by scientist and nonscientist alike. Antigovernmentalists will not be pleased, but Garrett has traveled the world to gather her material and has a message that we should all take seriously.

The author is at the Center for Tropical Diseases, 301 University Boulevard, University of Texas Medical Branch, Galveston, TX 77555–0609, USA. E-mail: rshope@utmb.edu