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Brian Balmer. *Secrecy and Science: A Historical Sociology of Biological and Chemical Warfare*.  
Secrecy and Science: A Historical Sociology of Biological and Chemical Warfare by Brian  
Balmer

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ical insights to bear on an issue that has gotten a lot of traction in the popular press but relatively little historical attention. This book begins to fill that gap and lays a strong foundation for future work on this important and continuing problem.

MARIE HICKS

**Brian Balmer.** *Secrecy and Science: A Historical Sociology of Biological and Chemical Warfare.* xiii + 168 pp., bibl., index. Farnham, Surrey: Ashgate Publishing, 2012. \$99.95 (cloth).

This book presents a series of case studies related to the United Kingdom's biological and chemical warfare research programs. It was born out of a "mopping up exercise" of "left-over archival sources" (p. xi) acquired by the author after the publication of his 2001 book on the British biological warfare program. Brian Balmer takes these case studies and uses them as opportunities to engage a preexisting academic literature on scientific secrecy.

Of the eight chapters, one is an introduction, six are case studies, and the last is a conclusion. The introduction contains an excellent literature review of how the issue of scientific secrecy has been handled in science and technology studies, history of science, anthropology, and sociology. It emphasizes, quite correctly, that the study of secrecy and science has long revealed that the assertion of the fundamental openness of science (*pace* Robert Merton) is on flimsy ground when it comes to the actual practice of science. It offers up a synthesis of the literature on secrecy that emphasizes the need to focus on secrecy as a "complex series of social arrangements" (p. 17).

The case studies mostly focus on individual incidents pertaining to the U.K. biological weapons program (one concerns chemical weapons). In general, the actors featured are bureaucrats, politicians, journalists, and scientists. There are fewer of the last than one might expect in such a book. Chapter 2 discusses scientists' justifications for working on biological weapons research and their (unrequited) desire for the government to make a more vigorous moral defense of their efforts in the face of public criticism. Unsurprisingly, they do not see themselves as monsters but, rather, believe that their work is both important and ethical. Chapter 5 looks at an episode where scientist advisors first argued to their superiors that biological weapons should continue to be researched, because their effects were uncertain; later, other scientist advisors

argued that no such weapons should be developed, because their effects were uncertain.

Other chapters look at the game of withholding and revelation that takes place in any secret weapons program where the fact of the existence of the program is known publicly. Familiar patterns of scandal, denial, and selective revelation develop. In Chapter 6, negative press and subsequent protest about the U.K. biological weapons program led government officials to mull whether more openness, or continued secrecy, would lead to the best public outcome. They opted for a little of both. In Chapter 7, a media story on an alleged patent for nerve gas leads first to the patent's withdrawal, then to the assertion that it was not really a dangerous patent after all—and not really a secret.

The other two case studies look at the act of creating classification policy itself and at an experiment gone awry. Chapter 4 considers U.S. and U.K. differences in classifying biological weapons work, as well as their general classification schemes: the United States had a "Top Secret" category that they used liberally, the United Kingdom had a "Most Secret" category that they used conservatively. The United Kingdom eventually was pressured to adopt the U.S. standard to harmonize information sharing. Chapter 3 looks at how the Ministry of Defense handled the potential exposure of a crew of fishermen to the plague during field testing. Instead of notifying the crew, which would reveal the secret of what they were testing, they opted to shadow the boat to see if it reported any medical emergencies, with the idea that they would then contact the crew and save their lives. No emergencies developed, in the end.

Balmer begins and ends *Secrecy and Science* with the assertion that this work shows that "secret science" is "not simply the same as open science but just done behind closed doors" (p. 147). I still find myself puzzled about what he means by this—and who might have claimed the contrary. Both major varieties of the literature on scientific secrecy (the Mertonian and the anti-Mertonian) argue that "secret science" is an entity of interest different than "open science"; where they differ is on their understanding of the "open," not the "secret."

What one takes away from Balmer's book, rather, is that the construction of secrecy is a messy affair, especially with regard to scientific subjects. Though necessarily limited in chronological and geographical scope, Balmer's six case studies illustrate well that scientific secrecy took many forms and did many different types of "work" for the British government. Secrecy, here, is seen less as a state of being than as a

generative activity, sometimes working for, and sometimes working against, those who sought to deploy it.

ALEX WELLERSTEIN

**William J. Clancey.** *Working on Mars: Voyages of Scientific Discovery with the Mars Exploration Rovers.* xvi + 328 pp., illus., bibl., index. Cambridge, Mass.: MIT Press, 2012. \$29.95 (cloth).

Contemplating the frailty of humans' perceptive apparatus, Plato once wrote of a prisoner chained in a cave, unable to witness more than flickering shadows on walls illuminated by candlelight. Ignorant of anything that lay beyond his cave, this prisoner, noted Plato, would surely view the universe as nothing more than an interplay of light and dark. The sleepy scientists at the National Aeronautics and Space Administration's Jet Propulsion Laboratory in Pasadena, California, would know something of this prisoner's dilemma—glued to workstations in blacked-out rooms, they watch flickering computer monitors filled with images that, at best, only approximate the realities they purport to depict. Yet the remote-control geologists who managed NASA's Mars rover *Spirit* did not see themselves as trapped; rather, they were flying: through space and time to distant worlds, less moored by technology than liberated by it.

The culmination of participant observation at JPL during 2004, William Clancey's *Working on Mars* is a Mixmaster smoothie of physics, field science, and laboratory culture—part Peter Galison, part Robert Kohler, and part Bruno Latour—aimed at defining the professional contours of a new spin on an old scientific craft: deskbound outer-space field geology. Clancey, the Chief Scientist of Human-Centered Computing in the Intelligent Systems Division at California's NASA Ames Research Center (and a Senior Research Scientist at the Florida Institute for Human and Machine Cognition), knows of what he speaks, and while he dutifully connects Mars rovers to the work of Sherry Turkle, Martin Rudwick, and other fellow travelers in the history of science, the experiences of joystick jockeys at JPL lie at the center of his tale.

NASA made Humboldtian science cool again when it sent its astronauts to the Moon in 1969; by that time, though, it had also forced an unpleasant choice on planetary scientists: support manned flight into space (and maybe send a geologist to the lunar surface) or be starved of funds. The end of the Apollo lunar program freed up resources for robotic probes, but the data they would return to Earth would come in teaspoons, not buckets. With the advent of new

technology, particularly in computing and imaging, though, modern landers and rovers like the twin Mars Exploration Rover (MER) missions launched from Earth in 2003 provided their operators with more than just a trickle of telemetry and grainy black-and-white imagery. High-resolution color photography and programmable scientific equipment made *Spirit* (which stopped communicating with Earth in 2010) and *Opportunity* (which still functions) portals through which Earth-based geologists could explore the surface of another world.

Clancey tells the story of these scientists largely in their own words, recounting their enthusiasms, frustrations, and fears as they come to view the spacecraft they control as colleagues or even adjuncts of their own personhood. The Mars rovers aren't dumb remote-control cars, but nor are they fully autonomous: they require complex monitoring and programming each Martian day, and the planning of even more elaborate "campaigns" precedes any sojourn to a particularly nice boulder or crater. The perilous nature of the environment in which these craft operate—freezing nights that deprive the solar-powered craft of electricity, the real danger of falling into a ditch with no one around to offer a nudge out of it—fills *Spirit's* operators with the kind of worry one might feel for a pathologically clumsy but brilliant lab partner.

Those who "work" Martian craters in this marvelous monastery of planetary science (like Science Operations Working Group chair Steve Squyres) are an interesting bunch, and this volume is a fitting tribute to them. MIT Press has also demonstrated a nifty production aesthetic in recent years (see Nicholas de Monchaux's rubberized *Spacesuit: Fashioning Apollo* [2011]), and *Working on Mars* is no exception, with ample illustrations and lavish color plates within. In placing a three-dimensional image on the dust jacket and not providing the glasses needed to view it, though, the Press has perpetrated a cruel joke on the reader. More significantly, the tiny sans-serif type plaguing volumes from MIT in recent years is doing serious damage to the eyeballs of space historians, who should not require a microscope to read a thoughtful book about a very big scientific landscape.

MATTHEW H. HERSCH

**Xiaoping Fang.** *Barefoot Doctors and Western Medicine in China.* xii + 294 pp., illus., tables, bibl., index. Rochester, N.Y.: University of Rochester Press, 2012. \$90 (cloth).

Xiaoping Fang's book offers a rich analysis of a subject frequently referenced but poorly under-