Review of : Joseph November (2012) Biomedical computing : digitizing life in the United States

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signed to challenge underlying political reasons for mistrust of the “establishment,” including the scientific community. In the second half of the book, Nattress turns to AIDS denialism, which she suggests has three major characteristics: skepticism toward the science of HIV pathogenesis and treatment; neglect of advances in antiretroviral treatment; and support of alternative, unproven therapies. She capably captures the interconnecting networks, institutions, and key personalities that propagate AIDS denialism. In particular, her assiduous chronicling of numerous counternarratives about AIDS is instructive, as is her identification and treatment of such figures as Peter Duesberg, Eleni Papadopoulos-Eleopoulos, and Roberto Giraldo, among others.

Two core strengths of *The AIDS Conspiracy* are the explicit focus on political leadership and the structural approach offered by Nattress. First, her handling of South African President Thabo Mbeki and his AIDS policy illustrates a complicated relationship among scientific experts, interest groups, and policymakers. When he took seriously the claims that HIV science was fundamentally flawed and initiated a Presidential AIDS Advisory Panel incorporating AIDS denialists, Mbeki rejected the strongest available evidence and acted against the best interests of his own population. In Nattress’s view, it was his leadership that was flawed, not the science: Mbeki’s willingness to promote scientific debate was reckless and he ought to have deferred to experts. Second, Nattress charts the group dynamics of the AIDS denialist community and classifies four separate and significant players: cultpreneur, hero scientist, living icon, and praise-singer. While the “cultpreneur” offers alternative cures, the “hero scientist” lends credence to the rejection of mainline medications and the science underlying them. “Living icons,” for their part, stand as living examples of the concept, whereas “praise-singers” trumpet the positive message of the AIDS denialist movement to the broader public. It is worth noting, on the one hand, that this categorization is explicitly Nattress’s and that she is not revealing an evident framework of actors; on the other hand, this taxonomy of individuals provides a means to confront AIDS denialism more effectively and thereby redress the long-run consequences of ignoring the best scientific evidence on HIV/AIDS.

The AIDS Conspiracy takes aim at relativist philosophical stances, antiscience conspiracy mongers, practitioners of pseudoscience, and misguided policymakers. Nattress’s qualitative and quantitative arguments are robust and persuasive, while her tone is cool and measured.

Her tightly written book plays with and showcases big ideas of scientific authority, AIDS counterknowledges, and political leadership. The cumulative effect is a book rich with insight that should find a wide audience among scholars of health politics and historians of science.

LUCAS RICHERT

Joseph November. *Biomedical Computing: Digitizing Life in the United States.* 344 pp., illus., apps., index. Baltimore: Johns Hopkins University Press, 2012. \$60 (cloth).

Twenty-first-century biology depends deeply and widely on computers. Biologists use computers for collecting, storing, managing, and analyzing data and for operating instruments, simulations, visualization, communicating, and presenting their work. It is hard for most contemporary biologists to imagine their lab or their work without these machines.

But all this is a relatively recent development. For decades after digital electronic computers were developed in the 1940s most biologists continued to believe that these calculating machines were ill suited to the qualitative reasoning needed for good biological work. Somehow, between the 1960s and the present, biology has “evolved from exemplars of systems that computers could not describe into exemplars of systems that computers could indeed describe” (p. 7). How did this transformation take place? And what are the consequences of biology’s and medicine’s new dependence on computers?

Joseph November’s book offers an account of the earliest attempts to deploy electronic computers in biology and medicine between the 1940s and the 1970s. This approach promises the reader important insights into the complex and multiple origins of fields such as bioinformatics, computational biology, and medical informatics. November claims not only that attempts at computerization in the 1950s and 1960s altered the practices of biomedicine (although not as deeply as some enthusiasts hoped), but also that biomedical computing had an important influence on the development of computing practices.

The story of biomedical computing begins with operations research (OR). During World War II, operations researchers devised ways of reducing the messy problems of warfare to simple models and equations that could be analyzed and computed (using either human or, as they became available, electronic computers). Many of those who introduced computers into biology—including John Kendrew, who applied computers to protein crystallographic data, and Robert S. Ledley, who attempted

(unsuccessfully) with George Gamow to crack the genetic code using a computer—were trained in OR. This legacy meant that the National Institutes of Health's push to computerize biology and medicine in the 1960s (largely driven by Ledley and his colleague Lee B. Lusted) began as an attempt to mathematize biology, to find problems that would yield data that could be analyzed with the help of computers. The computer was a calculator or a tabulating machine, and deploying it in biology meant transforming biology, along the lines of high-energy physics, into something resembling a large engineering or industrial project.

One of the more successful and unique projects to emerge from these 1960s intersections between computing and biomedicine was the LINC (Laboratory Instrument Computer). Designed by Wesley Clark under the sponsorship of MIT's military-funded Lincoln Lab, the LINC was a small (by 1960s standards) machine that could be owned, programmed, and adapted for use in individual laboratories. The NIH had committed itself to funding large, centralized computing resources for biologists; Clark's vision was of a computer as a convenient tool equipped with graphical capabilities, fully at the disposal of one team. The LINC, November argues, proved popular and influential, not merely among biologists but also on computer designers. Its small size, graphics capability, and real-time user control anticipated many of the features of 1980s personal computers.

Another contact zone between computer scientists and biomedical researchers emerged at Stanford University in the 1970s. There the NIH sponsored the application of computing, and particularly artificial intelligence, to a range of projects, including the search for life on Mars, the prediction of chemical structures from mass spectrograph data (DENDRAL), and the planning of molecular genetics experiments (MOLGEN). Ultimately, however, Stanford's efforts at computerizing biomedicine experienced as many failures as successes. Indeed, many of Stanford's projects would strike present-day biologists as "quixotic or downright bizarre" (p. 221).

It was not just Stanford: many of the NIH's efforts toward biomedical computing also met with fierce resistance or insurmountable difficulties. The hoped-for transformation of biology did not take place (and hospitals and physicians proved even more resistant). Even the LINC, ultimately cut off from military funding and "cast out" of MIT, was marginal to mainstream computer development in the 1960s and 1970s.

The limited lifespan of such endeavors raises

difficulties for November's narrative. There is still a wide gap between the efforts of the NIH, Stanford, and the LINC and the massive, ubiquitous, DNA-centered biological computing of the 1990s and 2000s. Even in 1980, at the end of the period on which November focuses, computers remained rare in biology. What happened to computing in biomedicine in the 1980s and 1990s was different in scale and kind from what went before. November's book doesn't show us how we got from one to the other. The stories *Biomedical Computing* tells are crucial: their importance, however, is not in telling us about how computers have succeeded in colonizing today's biology but, rather, in helping us to understand why and how computers failed to find a significant place in biomedicine before 1980.

HALLAM STEVENS

Duncan Wilson. *Tissue Culture in Science and Society: The Public Life of a Biological Technique in Twentieth Century Britain.* x + 183 pp., illus., bibl., index. New York: Palgrave Macmillan, 2011. \$80 (cloth).

Another title for this book could simply have been "Tissue as Culture," as its main idea is that tissue culture—the art of keeping human or animal cells alive outside their original organisms—is a prime site for investigating the engagement between science and culture and the blurring of the line between the two.

Tissue Culture in Science and Society offers a series of case studies that follow the development of practices and attitudes to tissue culture in the twentieth century from its inception in 1907 to current discussions. The main focus is on the public reception of tissue culture, and the cases are often chosen not just because of their centrality to scientific development but also for their role in public debates about tissue culture.

The book offers only a little framing, but it explicitly presents itself as a British version of Hannah Landecker's *Culturing Life: How Cells Became Technologies* (Harvard, 2007). There is not, however, just a difference between British and American case histories; this is a very different project. Where Landecker is interested in general changes in the biological sciences in the direction of greater plasticity and manipulability, Duncan Wilson is interested in the connections between science and the public and in demonstrating that these interactions are historically contingent.

The first half of the book follows the Strangeways Research Laboratory in Cambridge in its