

government monopoly over radium. Then, in the post-war years, regulation of radiation exposure, as imposed in Britain in 1922, was delayed by almost a decade.

As a business history, *Seduced by Radium* has its weaknesses. Although the first account of an important company that is very clear about the corporation's beginnings, it neglects events marking the end of the Standard Chemical Company in the 1930s. Nor does it illuminate the company's scale by comparison with the standards of contemporary chemical or pharmaceutical concerns. But, of course, the book is not primarily a business history. Rather, it is a most innovative contribution to the study of the use and abuse of science in validating brands, and, indeed, as a brand in itself. There are few works which do this, and by studying the marketing, production technology and medical history together, Rentetzi provides a most useful model for others to emulate.

Yet, broad as is the scope, perhaps surprisingly, Rentetzi does not place the account in the context of literature about early twentieth-century pharmaceuticals. Long ago, Rima Apple told the story of *Vitamina* in America and the enthusiasm for vitamins contemporary with the radium craze (1996). More recently, in *Remaking the American Patient* (2016), Nancy Tomes told of 'How Madison Avenue turned patients into consumers'. Neither of these important histories is mentioned even in the bibliography. The excitement over the medical use of radioisotopes discussed by Angela Creager in *Life Atomic* (2013) occurred slightly later but also in the context of minimization of the dangers of radioactivity. Creager's book is referenced, but only incidentally. Equally, the development of the chemical industry at the time is glancingly referred to, though there was much ambivalence about its products – particularly poison gas and corresponding boosterism. Andrew Ede's work on the promotion of Abraham Cressy Morrison's *Man in a Chemical World* provides a stimulating comparison (*HYLE* (2006) 12(2), pp. 193–214). Doubtless, there are distinctive features to the radium story, but by avoiding these contexts, Rentetzi leaves the elucidation of such issues to future scholars. Her well-written account of a topic of wide public interest should undoubtedly attract students and others from a wide range of backgrounds.

doi:10.1017/S0007087423001048

Cyrus C.M. Mody, *The Squares: US Physical and Engineering Scientists in the Long 1970s*

Cambridge, MA: MIT Press, 2023. Pp. 422. ISBN 978-0-262-54361-3. \$65.00 (paperback).

Benjamin Gross

Linda Hall Library of Science, Engineering & Technology

The physical scientists and engineers at the centre of Cyrus Mody's new book are simultaneously familiar and elusive figures. Anyone who has studied the transformative effects of Cold War funding on American academic and industrial laboratories will recognize them. They were overwhelmingly white, middle-class men who tended to dress conservatively and downplayed their political stances, even during increasingly tumultuous debates over their contributions to the conflict in Vietnam. Yet despite comprising the

bulk of the nation's scientific workforce in the 1960s and 1970s, these researchers have largely avoided collective analysis. Instead, historians investigating this period have devoted more attention to activists protesting the military-industrial complex and individual scientists engaging with countercultural ideas.

Framing his study in deliberate contrast to previous explorations of 'groovy' science, Mody seeks to understand how 'squares' working in the scientific mainstream reacted to political, economic and environmental crises between the late 1960s and the early 1980s. He acknowledges the shortcomings of 'squareness' as an analytical category, since it encompasses researchers with a wide range of professional and ideological backgrounds, unified partially by demography but primarily by their public reticence. It is precisely this ambivalence, however, that makes the squares an intriguing lens through which to view changes in American science during the 'long 1970s'. As military budgets for basic research shrunk, universities grew increasingly entrepreneurial, and the government pivoted from directly sponsoring research and development to fostering partnerships between industry and academia, the squares embraced a variety of tactics to secure financial support and reaffirm their professional standing.

Through a series of case studies set at universities, government agencies and corporations, Mody demonstrates how the pursuit of these objectives led some squares to advocate for the kind of socially relevant projects that one might normally associate with their groovier counterparts. At the University of California, Santa Barbara (UCSB), the physics department responded to new limits on federal funding and dwindling enrolment numbers by creating a Master of Scientific Instrumentation programme that emphasized the development of new civilian technologies. A similar dynamic played out at Stanford University, where administrators promoted interdisciplinary research to defuse tensions over the school's association with the national security state. At both universities, students helped design new types of biomedical equipment, environmental sensors and aids for people with disabilities.

The change in research priorities at UCSB and Stanford occurred elsewhere, though the motivations behind each realignment varied. At NASA, the decision stemmed from what Mody terms a crisis of 'existential success' following the Apollo 11 moon landing. Neil Armstrong's 'one small step' provided compelling evidence of America's technical superiority over the Soviets but raised questions about the space programme's long-term future. The Nixon administration and Congress could not justify the expense of future lunar missions and urged NASA's leaders to turn their attention from the heavens to the earth. In response, squares at the Johnson Space Center (JSC) and Jet Propulsion Laboratory (JPL) started brainstorming ways to address issues like crime and poverty. Some of their projects, like fingerprint recognition software for the Federal Bureau of Investigation, reaffirmed Nixon's 'law and order' agenda, whereas others, including telemedicine systems for rural and indigenous communities, were more progressive.

One research topic that bridged the political divide was solar energy, which took on greater importance after the 1973 oil embargo. As gasoline prices spiked, the government launched several new renewable-energy initiatives. Researchers at JSC and JPL played an important role in these efforts, and soon they were joined by colleagues in academic and corporate labs. Even relatively strait-laced scientists like Jack Kilby, the co-inventor of the integrated circuit whom Mody characterizes as the 'squarest of squares', took an active interest in solar power, despite its association with the environmentalist movement.

Kilby's experiences illustrate the factors that prompted some squares to pursue socially relevant research, as well as the limits of their involvement. The energy crisis inspired him to design a new form of photovoltaic panel that theoretically offered increased efficiency and lower manufacturing costs. He persuaded Texas Instruments (TI) to invest in the technology but found it difficult to make headway in the burgeoning solar industry.

Instead of partnering with experts at the Department of Energy, who struck them as overly idealistic reformers, Kilby and TI sought patrons in the military who shared a more pragmatic vision of solar power. Despite promising back-channel conversations, the Pentagon ultimately deferred, arguing that expanded fossil-fuel production was the best way to ensure America's energy security.

The collapse of TI's solar-energy system mirrored the fates of similar projects that the squares initiated during the long 1970s. Regardless of their desire to solve civilian problems, many found it difficult to disconnect from Cold War military partnerships or acknowledge the expertise of stakeholders with different political views or professional backgrounds. In addition, most of the squares' public-facing initiatives relied on external incentives. Once that pressure was removed, those programs were shelved. The Reagan administration's cuts to alternative-energy funding in the early 1980s curtailed future solar projects, while the completion of the space shuttle led NASA to abandon its various terrestrial endeavours.

Still, the persistence of academic rhetoric surrounding interdisciplinarity and responsible innovation reminds us of a period when it was possible to imagine that the squares' technical expertise would be mobilized for the public good. If we wish to cultivate a similar sense of civic duty among contemporary researchers, there is much to learn from their 1970s predecessors, many of whose stories remain untold. Mody suggests a number of potential follow-up studies, most notably an examination of racial politics and technoscience in the post-civil rights South. His book also leaves room for a gendered discussion of squareness that examines the relationship between masculinity and scientists' professional identities. Whether considered on its own or as a starting point for future investigations, *The Squares* deserves attention from historians and policy makers for demonstrating the importance of scholarly engagement with the scientific 'silent majority.'

doi:10.1017/S0007087423000857

Jeffrey Womack, *Radiation Evangelists: Technology, Therapy, and Uncertainty at the Turn of the Century*

Pittsburgh: University of Pittsburgh Press, 2020. Pp. 288. ISBN 978-0-8229-4609-0. \$35.00 (hardcover).

Christine Y. L. Luk and Longkai Zang

Tsinghua University

Immediately after Wilhelm Röntgen's discovery of X-rays in 1895, a surge of technological enthusiasts swiftly seized upon its therapeutic potential. Spanning a diverse spectrum of backgrounds and orientations, these radiation therapists – including physicians, physicists, experimental biologists, diagnosticians, X-ray technicians and radium salespeople – are gathered together using Jeffrey Womack's evocative label: 'radiation evangelists'. Womack's book presents a captivating account of the early history of the contentious practice of radiation medical practitioners in Britain and America between 1895 and 1925. Womack chooses a religious term to capture the fervent faith of these technological