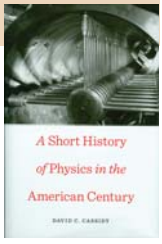
Humbler days ahead for the physics enterprise?

A Short History of Physics in the American Century

David C. Cassidy
Harvard U. Press, Cambridge, MA, 2011. $29.95 (211 pp.).
ISBN 978-0-674-04936-9



Reviewed by Benjamin Wilson

In 1883 Johns Hopkins University physics professor Henry Augustus Rowland was expressing cautious optimism about the state of physics in the US, telling an audience that "American science is a thing of the future, and not of the present or past." By 1900 there were signs that his vision was taking shape. In 1893 three physicists had founded what would become the nation's preeminent physics journal, the *Physical Review*, and in 1899 a few dozen more inaugurated the American Physical Society and elected Rowland as its first president.

A Short History of Physics in the American Century by David Cassidy presents a brisk but excellent institutional and political history of the discipline, ornamented by lucid descriptions of physics concepts and discoveries. Cassidy is a historian of science at Hofstra University and author of several noted books, including the celebrated *Uncertainty: The Life and Science of Werner Heisenberg* (W. H. Freeman, 1992; reviewed in PHYSICS TODAY, June 1992, page 79) and its update, *Beyond Uncertainty: Heisenberg, Quantum Physics, and the Bomb* (Bellevue Literary Press, 2009; reviewed in PHYSICS TODAY, January 2010, page 49). His latest offering deserves a wide audience, including physicists curious about their discipline's prominent role in modern US history.

This volume synthesizes more recent scholarly insights with an older generation of interpretations, most notably Daniel Kevles's 1978 classic *The Physicists: The History of a Scientific Community in Modern America* (reprinted by Harvard University Press, 1995). At just 169 pages of primary text, Cassidy's treatment of a large subject is necessarily swift, but his hand is sure. The book's brevity is among its strengths and weaknesses: A snappy and enjoyable read, it revisits familiar territory with a fresh perspective, even as it passes quickly over opportunities to integrate more thoroughly the content of physics with its institutional settings.

Rowland's elitist ideal of pure science, Cassidy argues, drove the professional development of physicists in the early decades of the century. In 1900 it was common to view physics as the handmaiden of engineering rather than as the pursuit of fundamental natural knowledge. But changes were afoot. A few scientist-administrators leading the National Research Council—a World War I–era experiment in the central coordination of research for military needs—developed a strategy for "pushing the peaks higher" in US physics. They channeled the preponderance of funding—much of it from private philanthropy—to a handful of topflight research institutions. In the flush years after the war, the Rockefeller Foundation paid for the best postdoctoral scholars to visit the major centers of European physics; they brought their experiences—and quantum mechanics—back to US soil. Young guns such as Arthur Compton, J. Robert Oppenheimer, and I. I. Rabi started making discoveries that won them admiration from their European colleagues. By the 1920s US physics had come of age.

As Cassidy shows, World War II vaulted US science to world dominance. The bond between physics and the federal government was cemented by the fantastic successes of the Manhattan Project and the development of radar technology. The discipline exploded in the postwar era in terms of funding, the size and scale of experiments, and numbers of trained researchers and graduate students. Physicists were now political insiders, advising the new atomic energy establishment and even the president. As the cold war grew colder during the 1950s and 1960s, the Pentagon disbursed the greatest fraction of federal R&D spending, with physics commanding by far the biggest share of the military's R&D budget.

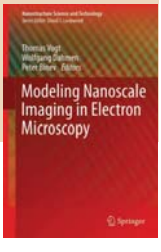
Throughout every subfield, but especially in solid-state, nuclear, and high-energy particle physics, US research was the envy of the world. Yet the rising peaks of federal largesse did not lift all would-be climbers; as they had been for decades, women and other minorities were disproportionately excluded from new professional opportunities in physics. A measure of equality would only begin to arrive in subsequent decades. By the 1970s, the historic compact between physics and federal power had been chiseled apart by defense budget cuts, anti–Vietnam War activism, and a serious economic downturn. The result was a staggering employment crunch: Far more new physics PhDs competed for far fewer jobs, a reversal of the previous decade's trends.

In a fascinating final chapter, Cassidy charts the shifting patronage of physics in the 1980s and 1990s. In 1981 corporate outlays for industrial R&D surpassed federal funding for the first time since the late 1950s. Cassidy contends that as the sources of support shifted, so did the orientation of much of the profession, "from free research to product development." Physicists might well ponder Cassidy's observation that the profession today—more interdisciplinary and internationalized than at any time in recent memory—is also a chastened enterprise, occupying "a less transcendent intellectual status as one among many other intellectual disciplines." Will humility prove a better strategy for the 21st century than soaring confidence? Another hundred years will tell.

Benjamin Wilson is a doctoral student in the history of science at MIT. He is writing a dissertation on the history of US physicists' nuclear arms control efforts during the cold war.

Modeling Nanoscale Imaging in Electron Microscopy

Edited by Thomas Vogt, Wolfgang Dahmen, and Peter Binev
Springer, New York, 2012. $129.00 (280 pp.).
ISBN 978-1-4614-2190-0



Imaging with electrons, in particular scanning transmission electron