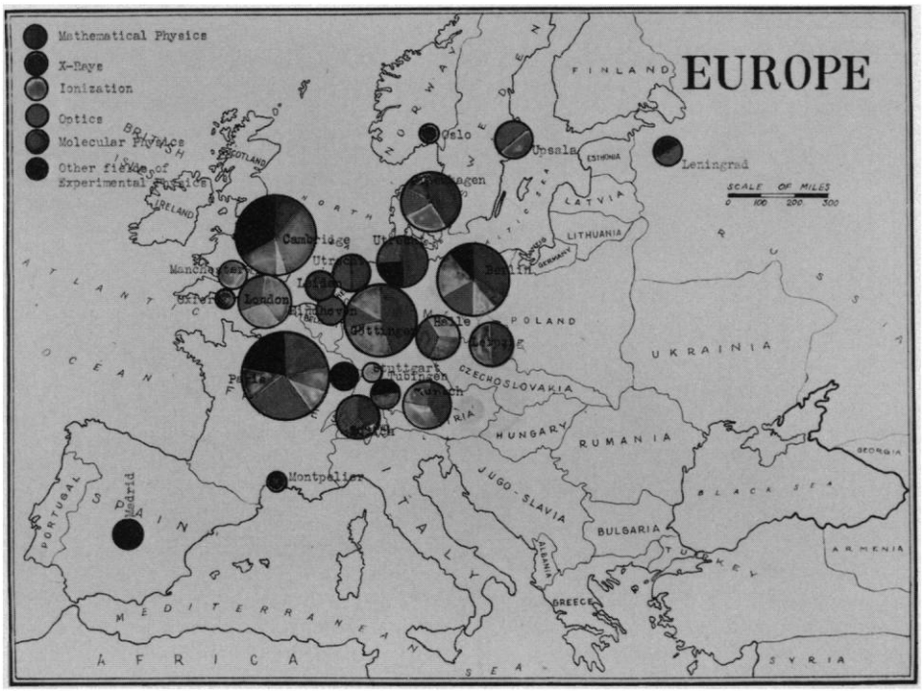
Boons to Science

Partners in Science. Foundations and Natural Scientists, 1900–1945. ROBERT E. KOHLER. University of Chicago Press, Chicago, IL, 1991. xvi, 415 pp., illus., + plates. $34.95.

Who would have anticipated that the spoils of the infamous robber barons would prove a boon to science? But they did. In fact, before the federal largess that followed the Second World War, philanthropic foundations created by men like Andrew Carnegie and John D. Rockefeller were the primary source of funding for academic research. Throughout the 19th century, U.S. science was largely anemic and impoverished; when it came of age in the decades before the Second World War, it was philanthropic patronage that fueled its maturation. Robert Kohler, one of our best historians of U.S. science, tells how in his most recent book.

One consequence of 19th-century industrialization was the accumulation of unprecedented personal fortunes that seemed to many to threaten the nation's democratic fabric. Sensitive to criticism and variously driven by political prudence and notions of religious stewardship, powerful figures like Carnegie and Rockefeller turned to philanthropy, building free public libraries, battling disease, and generally supporting a variety of politically safe causes that demonstrated the beneficence of the industrial order. They also caught the attention of the country's increasingly vocal and ambitious scientific community. Arguing that science, medicine, and public health were especially beneficial and noncontroversial, advocates managed to get their feet in the door of the philanthropic treasure-house at a time when old-fashioned charity was being remade, as Kohler notes, in the image of big business, complete with boards of trustees, holding and operating companies, and line and staff structures. In 1901 came the Rockefeller Institute for Medical Research, followed a year later by the Carnegie Institution of Washington and Rockefeller's General Education Board; the Carnegie Corporation and the Rockefeller Foundation were established in 1911 and 1913; the Laura Spelman Rockefeller Memorial was founded in 1918, and in 1923 the GEB was joined by the International Education Board. These early years saw federal scientists and academic administrators moving into these new foundations as "middle managers," standing between businessmen on the one side and scientists on the other, adjudicating often conflicting expectations and defining in the process what became a new system of scientific patronage.



The International Education Board's map of European centers of physics, 1926. The strategy of the Rockefeller-supported IEB was one of "making the peaks higher" by supporting existing centers of high-quality work rather than offering relief to scientists and institutions at the margins. Niels Bohr's Institute of Theoretical Physics and the University of Göttingen were among the beneficiaries; in their efforts to carry out projects in Spain and Bulgaria the administrators learned "how hard it was to do things in countries where higher education was narrowly based and vulnerable to volatile, highly partisan politics." [From *Partners in Science*; courtesy of the Rockefeller Archives Center]

Kohler details the importance of this new system for the development of 20th-century natural science. One key event occurred in 1919, amid the enthusiasm for science that followed the First World War, when the Rockefeller Foundation established a program of postdoctoral fellowships in science to be administered by the National Research Council of the National Academy of Sciences. Both the NRC and the fellowships were the brainchildren of an elite group of scientist-entrepreneurs—notably A. A. Noyes, Robert Millikan, and George Ellery Hale—who used their status, official positions, and newfound financial leverage to implement a program to advance the quality of U.S. science. In the '20s, concerned with scientific survival in a Europe recovering from war, the IEB under Wycliffe Rose channeled significant support to institutional centers that played essential roles in the development of modern physics—most notably Niels Bohr's Institute of Theoretical Physics in Copenhagen. In 1932, Warren Weaver became head of the Rockefeller Foundation's Division of Natural Sciences and devised a program of support for research into "vital processes." Weaver was especially interested in the application of physics and chemistry to biological problems and lent vital aid, in Kohler's words, to disciplinary poachers and wanderers like William Astbury, The Svedberg, and Linus Pauling who were laying the foundations for what Weaver would later call "molecular biology."

This is a book with a great many strengths. It rests on massive research; an intimate understanding of the sciences on which the account depends (Kohler has written the most important book on the history of biochemistry); an appreciation of the organizational trends in American history without which the institutionalization of patronage makes little sense; and a keen appreciation for the subtle cultural differences among the many sites with which the

Warren Weaver of the Rockefeller Foundation in 1932 and in retirement, around 1970. [From *Partners in Science*; courtesy of Helen Weaver]

foundations had to deal and which determined, more often than not, the success or failure of their efforts. Kohler's descriptions of the convoluted landscape of European science are masterful. Moreover, he tells a good story, especially when his attention shifts to Warren Weaver and the prehistory of molecular biology. Needless to say, there are omissions. Foundation interest in the social sciences has been the subject of extensive study by historians seeking to understand the connections between organized philanthropy and the dynamics of industrialized, capitalistic societies. Kohler admits that he excluded the social sciences from his study largely for practical reasons. That decision lends the book a noncontroversial tone (Carnegie involvement with eugenics is barely mentioned) that suggests, maybe wrongly, that whatever was omitted would have made no difference in any case. Might it be that foundation interest in social order and strategies of social control subtly influenced policies and programs in both the natural and the social sciences? If that is the case, then this important book might be shy a chapter.

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A Center for Science

Millikan's School. A History of the California Institute of Technology. JUDITH R. GOODSTEIN. Norton, New York, 1991. 317 pp. + plates. $25.

Before reading further, put the question to your nearest colleague: what famous American institution of higher education was once known as Throop University? Chances are you will be met by a shrug of indifference or a whoop "*Throop?*"—unless your victim happens to be a graduate of the California Institute of Technology.

If the scores to this spot quiz are as dismal as I expect, they reveal the first (and last) obstacle Judith R. Goodstein must have faced while contemplating her *Millikan's School: A History of the California Institute of Technology*. That is, how can a non-initiate be persuaded to read past the first chapter, or, for that matter, the cover? Two general solutions suggest themselves. Approach 1 is to make Caltech such an exciting endeavor that even a reader who has never heard of the place will be captivated by its saga. Approach 2 is to assume the aura surrounding its very name is so pervasive that any browser who wanders into the book's vicinity will immediately be hypnotized into reading it.

Goodstein, Caltech's former archivist and current registrar, appears to lean toward the second, Calocentric approach. This is the harder route. On the one hand, *Millikan's School*, published on Caltech's 100th anniversary, becomes something of a deserved birthday salute. On the other hand, that evident purpose also invites criticism that the book is little more than a "puff piece"—to borrow a not-so-complimentary term from the magazine industry. Although the sobriety of Goodstein's writing forestalls such criticism, she is treading a fine line. *Millikan's School* is prefaced by no fewer than four "presidential perspectives," penned by past and present Caltech leaders. Ostensibly these essays are to convince the uninitiated of Caltech's importance (a nod to approach 1), but declarations like "There is no place like Caltech" (retreat to approach 2) are unlikely to win converts. Indeed, we learn early on that Caltech is "perhaps the country's leading center for science and technology." "Perhaps" was undoubtedly inserted to mollify MIT graduates; nonetheless one already hears war chants rising from the banks of the Charles.

"Linus Carl Pauling entered Caltech as a graduate student in 1922, completing his Ph.D. in chemistry in 1925. Then he sailed for Europe. . . . By the time Pauling returned to Pasadena in 1927, his quest to formulate a quantum theory of the chemical bond had begun." [From *Millikan's School*; California Institute of Technology photo]

The presumption that Caltech is located somewhere near the center of the universe will undoubtedly limit the audience which might have found *Millikan's School* of interest, but it seems to me that Goodstein has problematically restricted herself yet further. Her story is first and foremost the tale of three men: the astronomer George Ellery Hale, the chemist Alfred Noyes, and the physicist Robert Millikan. It is the story of their attempts to transform an undistinguished little school founded in 1891 by one Amos Throop—an intrepid frontiersman, businessman, and philanthropist—into a world-class scientific establishment. During the course of this endeavor we meet some of the men who made Caltech famous: geneticist Thomas Hunt Morgan, aeronautical engineer Theodore von Kármán, and chemist Linus Pauling, among others. Each of these scientists deserves a biography—and many have had them—but because Goodstein's focus is on their contributions to an institution, they do not receive fully developed portraits here.

As an archivist, Goodstein stays close to the sources, holding personal commentary and speculation to a minimum. One gathers that more financial memoranda than scientific records survive, because she devotes as much space to the efforts of Hale, Noyes, and Millikan in fund-raising as she does to science. Again this is a problematic choice: Though the effort required to secure dollars may be an edifying lesson to scientists these days, it does not form the basis of an exciting narrative.

Yet a third difficult decision was to end the narrative with the resignation of Robert Millikan from Caltech's helm at the close of World War II. (A chapter on the Dubridge era is appended.) In one sense this is useful since it preserves traces of a generation now passing over the horizon. But it does mean that those searching for Feynman or Gell-Mann anecdotes will search in vain. Undergraduates themselves do not rate more than a passing mention. Ditch-day antics and other emblems of Caltech cleverness are not part of the story, all of which might lead a potential matriculate to conclude that, in the words of an administrator from my own alma mater, students are indeed no more than "transient parasites."

At the end, therefore, we are left with a