

THE CAMBRIDGE HISTORY OF SCIENCE

VOLUME 8

Modern Science in National, Transnational, and Global Context

This volume in the highly respected Cambridge History of Science series is devoted to exploring the history of modern science using national, transnational, and global frames of reference. Organized by topic and culture, its essays by distinguished scholars offer the most comprehensive and up-to-date nondisciplinary history of modern science currently available. Essays are grouped together in separate sections that represent larger regions: Europe; Africa, the Middle East, and South Asia; East and Southeast Asia; the United States, Canada, Australia, New Zealand, and Oceania; and Latin America. Each of these regional groupings ends with a separate essay reflecting on the analysis in the preceding chapters. Intended to provide a balanced and inclusive treatment of the modern world, contributors analyze the history of science not only in local, national, and regional contexts but also with respect to the circulation of knowledge, tools, methods, people, and artifacts across national borders.

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*Modern Science in National, Transnational,
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Edited by

HUGH RICHARD SLOTTEN
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Ronald L. Numbers is Hilldale Professor Emeritus of the History of Science and Medicine at the University of Wisconsin-Madison, where he taught between 1974 and his retirement in 2013. A specialist in the history of science and medicine in the United States, he has written or edited more than two dozen books, including *The Creationists* (1992; 2nd ed. 2006), *Science and Christianity in Pulpit and Pew* (2007), and *Galileo Goes to Jail and Other Myths about Science and Religion* (ed.) (2009). A fellow of the American Academy of Arts and Sciences and a former editor of *Isis*, the flagship journal of the history of science, he has served as the president of the American Society of Church History (1999–2000); the History of Science Society (2000–1), which awarded him the Sarton Medal; and the International Union of History of Philosophy of Science/Division of History of Science and Technology (2005–9).

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Dominique Pestre is a social and political historian of nineteenth and twentieth-century science and technology. He has worked on the history of the physical sciences, war, industry, and military research. He worked on “science and society” questions and now works on the history of environmental management. He co-edited *Science in the Twentieth Century* with John Krige, is co-author of *History of CERN*, 3 volumes, wrote *Introduction aux Science Studies* (2007) and *A Contre-science. Politiques et savoirs des sociétés contemporaines* (2013), and was the editor in chief of *Histoire des sciences et des savoirs*, 3 volumes (2015).

The late **John V. Pickstone** (1944–2014) founded and directed the Centre for the History of Science, Technology and Medicine at the University of Manchester where he was Wellcome Research Professor. He was the author of the pathbreaking *Ways of Knowing: A New History of Science, Technology, and Medicine* (2001) and made major contributions to the history of British and French physiology and medicine, including *Medicine and Industrial Society: A History of Hospital Development in Manchester and Its Region, 1752–1946* (1985). He edited (with Peter Bowler) *The Modern Biological and Earth Sciences*, volume 6 of *The Cambridge History of Science*.

Yakov M. Rabkin, born and educated in the Soviet Union, has taught at the University of Montreal since 1973. His areas of interest include the history of science and, studies of modernization, as well as contemporary Jewish history. His most recent books are *A Threat from Within: A Century of Jewish Opposition to Zionism* (2006, available in fifteen languages) and *What Is Modern Israel?* (2016, also published in French, Italian, Japanese, and Russian). He is co-editor of the collective volume *Demodernization: A Future in the Past* (2018).

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Brigitte Schroeder-Gudehus (PhD, 1966, Geneva, International Relations) taught at the University of Montreal until her retirement, with the exception of a three-year guest appointment in Paris (1989–91), where she headed the *Centre de recherche en histoire des sciences et des techniques* at the *Cité des sciences et de l'industrie*. Her interest in the political history of science, national and international, manifest already in the dissertation (as a book: *Les Scientifiques et la paix. La Communauté scientifique internationale au cours des années vingt* [1978]), continue to be reflected in her research projects and publications alongside new perspectives in the study of universal exhibitions.

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Hugh Richard Slotten is Associate Professor in the School of Social Sciences at the University of Otago in Dunedin, New Zealand. He has published extensively in the history of science, technology, and medicine as well as in communications and media history. He is the editor in chief of the two-volume *Oxford Encyclopedia of the History of American Science, Medicine, and Technology* (2014), and he has received numerous fellowships and grants, including the Charles A. Lindbergh Chair in Aerospace History from the Smithsonian Institution's National Air and Space Museum. His forthcoming book explores the origins of the first global satellite communication system.

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James Spiller is Professor of History at the College at Brockport, SUNY where he teaches about the modern United States and the histories of American science and technology and environment. The author of *Frontiers for the American Century: Outer Space, Antarctica, and Cold War Nationalism* (2015), Spiller is now researching how Americans have promoted and commemorated military service and sacrifice since the Second World War.

John Stenhouse is head of the History Programme at the University of Otago. He teaches courses in the history of science, historiography, and European and New Zealand history. Recent publications include *Eugenics at the Edges of Empire: New Zealand, Australia, Canada and South Africa* (2018), co-edited with Diane B. Paul and Hamish G. Spencer. He is currently writing a monograph on Christian missionaries, science, and medicine, from 30 to 2000 CE.

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Hebe Vessuri is an Argentine social anthropologist who has contributed to the emergence and consolidation of the social studies of science and technology in Latin America. In 2014, she was awarded the Varsavsky Prize for

lifetime achievement from the Latin American Association of Social Studies of Science and Technology (ESOCITE); in 2017, the Bernal Prize from the Society for the Social Study of Science (4S) for her distinguished contributions to the field of Science and Technology Studies (STS); and in 2018, the Argentine government's Houssay Prize for lifetime contributions to the Social Sciences and Humanities. She is currently a visiting researcher at CIGA-UNAM, Mexico, and is emeritus researcher at the Venezuelan Institute of Scientific Research (IVIC).

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Michael Worboys is Emeritus Professor in the History of Science, Technology and Medicine at the University of Manchester. He has worked across the field on the history of science and imperialism, the history of infectious diseases, and, most recently, on the dog in science and science in the dog. His most recent publications are: *Fungal Disease in Britain and the United States: Mycoses and Modernity* (2013), with Aya Homei, and *The Invention of the Modern Dog: Breed and Blood in Victorian Britain* (2018), with Julie-Marie Strange and Neil Pemberton.

Shellen Xiao Wu is Associate Professor of History at the University of Tennessee, Knoxville. Her first book is *Empires of Coal: Fueling China's Entry into the Modern World Order, 1860–1920* (2015). She is particularly interested in the history of science in modern China and how changes in the uses and exploitation of natural resources affected the modern Chinese state and society.

Suzanne Zeller is Professor of History at Wilfrid Laurier University in Waterloo, Ontario, Canada, where she teaches Canadian history, history of science, environmental history, and history of culture and ideas. The author of *Inventing Canada: Early Victorian Science and the Idea of a Transcontinental Nation* (1987; 2nd ed. 2009) and co-editor of the *Journal of Historical Geography* special issue on “Science, Environmental Knowledge, and the New Arctic” (2014), she is completing a study of the artist-naturalist and author Ernest Thompson Seton. Her ongoing research includes a study in the history of physical science in Canada.

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GENERAL EDITORS' PREFACE

The idea for *The Cambridge History of Science* originated with Alex Holzman, former editor for the history of science at Cambridge University Press. In 1993, he invited us to submit a proposal for a multivolume history of science that would join the distinguished series of Cambridge histories, launched over a century ago with the publication of Lord Acton's fourteen-volume *Cambridge Modern History* (1902–12). Convinced of the need for a comprehensive history of science, and believing that the time was auspicious, we accepted the invitation.

Although reflections on the development of what we call “science” date back to antiquity, the history of science did not emerge as a distinctive field of scholarship until well into the twentieth century. In 1912, the Belgian scientist–historian George Sarton (1884–1956), who contributed more than any other single person to the institutionalization of the history of science, began publishing *Isis*, an international review devoted to the history of science and its cultural influences. Twelve years later, he helped to create the History of Science Society, which by the end of the century had attracted some 4000 individual and institutional members. In 1941, the University of Wisconsin established a department of the history of science, the first of dozens of such programs to appear worldwide.

Since the days of Sarton, historians of science have produced a small library of monographs and essays, but they have generally shied away from writing and editing broad surveys. Sarton himself, inspired in part by the Cambridge histories, planned to produce an eight-volume *History of Science*, but he completed only the first two installments (1952, 1959), which ended with the birth of Christianity. His mammoth three-volume *Introduction to the History of Science* (1927–48), more a reference work than a narrative history, never got beyond the Middle Ages. The closest predecessor to *The Cambridge History of Science* is the three-volume (four-book) *Histoire Générale des Sciences* (1957–64), edited by René Taton, which appeared in an English translation under the title *General History of the Sciences* (1963–4).

Edited just before the late twentieth-century boom in the history of science, the Taton set quickly became dated. During the 1990s, Roy Porter began editing the very useful Fontana History of Science (published in the United States as the Norton History of Science), with volumes devoted to a single discipline and written by a single author. Between 2001 and 2004 Sandro Pertruccioli, as editor-in-chief, brought out a lavishly illustrated, ten-volume *Storia della Scienza*.

The Cambridge History of Science comprises eight volumes, the first four arranged chronologically from antiquity through the eighteenth century, the latter four organized thematically and covering the nineteenth and twentieth centuries. Eminent scholars from Europe and North America, who together form the editorial board for the series, edit the respective volumes:

Volume 1: *Ancient Science*, edited by Alexander Jones, University of Toronto, and Liba Taub, University of Cambridge

Volume 2: *Medieval Science*, edited by the late David C. Lindberg and Michael H. Shank, University of Wisconsin-Madison

Volume 3: *Early Modern Science*, edited by Katharine Park, Harvard University, and Lorraine Daston, Max Planck Institute for the History of Science, Berlin

Volume 4: *Eighteenth-Century Science*, edited by Roy Porter, late of the Wellcome Trust Centre for the History of Medicine at University College London

Volume 5: *The Modern Physical and Mathematical Sciences*, edited by Mary Jo Nye, Oregon State University

Volume 6: *The Modern Biological and Earth Sciences*, edited by Peter J. Bowler, Queen's University of Belfast, and John V. Pickstone, late of the University of Manchester

Volume 7: *The Modern Social Sciences*, edited by Theodore M. Porter, University of California, Los Angeles, and Dorothy Ross, Johns Hopkins University

Volume 8: *Modern Science in National, Transnational, and Global Context*, edited by Hugh Richard Slotten, University of Otago, Ronald L. Numbers, University of Wisconsin-Madison, and David N. Livingstone, Queen's University of Belfast

Our collective goal is to provide an authoritative, up-to-date account of science – from the earliest literate societies in Mesopotamia and Egypt to the end of the twentieth century – that even nonspecialist readers will find engaging. Written by leading experts from every inhabited continent, the essays in *The Cambridge History of Science* explore the systematic investigation of nature and society, whatever it was called. (The term “science” did not acquire its present meaning until early in the nineteenth century.) Reflecting the ever-expanding range of approaches and topics in the history of science, the contributing authors explore non-Western as well as Western

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science, applied as well as pure science, popular as well as elite science, scientific practice as well as scientific theory, cultural context as well as intellectual content, and the dissemination and reception as well as the production of scientific knowledge. George Sarton would scarcely recognize this collaborative effort as the history of science, but we hope we have realized his vision.

David C. Lindberg †
Ronald L. Numbers

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