

THE CAMBRIDGE HISTORY OF SCIENCE

VOLUME I

Ancient Science

This volume in the highly respected Cambridge History of Science series is devoted to the history of science, medicine and mathematics of the Old World in antiquity. Organized by topic and culture, its essays by distinguished scholars offer the most comprehensive and up-to-date history of ancient science currently available. Together, they reveal the diversity of goals, contexts, and accomplishments in the study of nature in Mesopotamia, Egypt, Greece, Rome, China, and India. Intended to provide a balanced and inclusive treatment of the ancient world, contributors consider scientific, medical, and mathematical learning in the cultures associated with the ancient world.

ALEXANDER JONES is Leon Levy Director Professor of the History of the Exact Sciences in Antiquity at the Institute for the Study of the Ancient World at New York University and author of *A Portable Cosmos: Revealing the Antikythera Mechanism, Scientific Wonder of the Ancient World* (2017).

LIBA TAUB is Director of the Whipple Museum of the History of Science and Professor of History and Philosophy of Science at the University of Cambridge. She is the author of *Ptolemy's Universe: The Natural Philosophical and Ethical Foundations of Ptolemy's Astronomy* (1993), *Ancient Meteorology* (2003), *Aetna and the Moon: Explaining Nature in Ancient Greece and Rome* (2008), and *Science Writing in Greco-Roman Antiquity* (2017).

THE CAMBRIDGE HISTORY OF SCIENCE

General editors

David C. Lindberg and Ronald L. Numbers

VOLUME 1. *Ancient Science*

Edited by Alexander Jones and Liba Taub

VOLUME 2. *Medieval Science*

Edited by David C. Lindberg and Michael H. Shank

VOLUME 3. *Early Modern Science*

Edited by Katharine Park and Lorraine Daston

VOLUME 4. *Eighteenth-Century Science*

Edited by Roy Porter

VOLUME 5. *The Modern Physical and Mathematical Sciences*

Edited by Mary Jo Nye

VOLUME 6. *The Modern Biological and Earth Sciences*

Edited by Peter J. Bowler and John V. Pickstone

VOLUME 7. *The Modern Social Sciences*

Edited by Theodore M. Porter and Dorothy Ross

VOLUME 8. *Modern Science in National and International Context*

Edited by Ronald L. Numbers, Hugh Richard Slotten, and David N. Livingstone

David C. Lindberg[†] is Hildale Professor Emeritus of the History of Science and past director of the Institute for Research in the Humanities at the University of Wisconsin–Madison. He has written or edited a dozen books on topics in the history of medieval and early-modern science, including *The Beginnings of Western Science* (1992). He and Ronald L. Numbers have previously coedited *God and Nature: Historical Essays on the Encounter between Christianity and Science* (1986) and *When Science and Christianity Meet* (2003). A Fellow of the American Academy of Arts and Sciences, he has been a recipient of the Sarton Medal of the History of Science Society, of which he is also past president (1994–5).

Ronald L. Numbers is Hildale Professor of the History of Science and Medicine at the University of Wisconsin–Madison, where he has taught since 1974. 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, 2006), *Science and Christianity in Pulpit and Pew* (2007), *Galileo Goes to Jail and Other Myths about Science and Religion* (ed.) (2009), and the forthcoming *Science and the Americans*. A Fellow of the American Academy of Arts and Sciences and a former editor of *Isis*, the flagship journal

[†] Deceased 2015.

Cambridge University Press
978-0-521-57162-3 — The Cambridge History of Science
Edited by Alexander Jones, Liba Taub
Frontmatter
[More Information](#)

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), and the International Union of History and Philosophy of Science/Division of History of Science and Technology (2005–9).

THE CAMBRIDGE
HISTORY OF
SCIENCE

VOLUME I

Ancient Science

Edited by
ALEXANDER JONES
LIBA TAUB



Cambridge University Press
978-0-521-57162-3 – The Cambridge History of Science
Edited by Alexander Jones, Liba Taub
Frontmatter
[More Information](#)

CAMBRIDGE UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom
One Liberty Plaza, 20th Floor, New York, NY 10006, USA
477 Williamstown Road, Port Melbourne, VIC 3207, Australia
314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre,
New Delhi – 110025, India
79 Anson Road, #06–04/06, Singapore 079906

Cambridge University Press is part of the University of Cambridge.
It furthers the University's mission by disseminating knowledge in the pursuit of
education, learning, and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9780521571623
DOI: 10.1017/9780511980145

© Cambridge University Press 2018

This publication is in copyright. Subject to statutory exception
and to the provisions of relevant collective licensing agreements,
no reproduction of any part may take place without the written
permission of Cambridge University Press.

First published 2018

Printed in the United States of America by Sheridon Books, Inc.

A catalogue record for this publication is available from the British Library.

Library of Congress Cataloging-in-Publication Data

NAMES: Jones, Alexander, editor. | Taub, Liba Chaia, 1954– editor.
TITLE: The Cambridge history of science / edited by Alexander Jones, Liba Taub.
DESCRIPTION: [2018 edition]. | Cambridge : Cambridge University Press, [2018]– |
Includes bibliographical references. Contents: Volume 1. Ancient science / edited by
Alexander Jones, Liba Taub

IDENTIFIERS: LCCN 2018016122 | ISBN 9780521571623 (hbk.)
SUBJECTS: LCSH: Science – History. | Social sciences – History.
CLASSIFICATION: LCC Q125 .C32 2018 | 509–dc23
LC record available at <https://lccn.loc.gov/2018016122>

ISBN 978-0-521-57162-3 Hardback

Cambridge University Press has no responsibility for the persistence or accuracy of
URLs for external or third-party internet websites referred to in this publication
and does not guarantee that any content on such websites is, or will remain,
accurate or appropriate.

CONTENTS

	<i>List of Illustrations</i>	<i>page</i> x
	<i>Notes on Contributors</i>	xii
	<i>General Editors' Preface</i>	xvii
	<i>Acknowledgments</i>	xix
	Introduction	i
	PART I MESOPOTAMIA	5
1	Science and Ancient Mesopotamia FRANCESCA ROCHBERG	7
2	Babylonian Medicine as a Discipline MARKHAM J. GELLER	29
3	Mesopotamian Mathematics JENS HØYRUP	58
4	Babylonian and Assyrian Astral Science JOHN M. STEELE	73
	PART II EGYPT	99
5	The Cultural Context of (Mathematical) Experts in Ancient Egypt ANNETTE IMHAUSEN	101
6	Egyptian Medicine JOHN NUNN	120
7	Egyptian Calendars and Astronomy ROLF KRAUSS	131

viii	<i>Contents</i>	
8	Egyptian Mathematics JENS HØYRUP	144
	PART III GREEK AND GRECO-ROMAN	161
9	Physical and Cosmological Thought Before Aristotle DANIEL W. GRAHAM	163
10	Aristotle: An Overview ANDREA FALCON	181
11	Aristotle's Physical Theory ERIC LEWIS	196
12	Aristotle and the Origins of Zoology JAMES G. LENNOX	215
13	Botany LAURENCE TOTELIN	238
14	Science After Aristotle: Hellenistic and Roman Science LIBA TAUB	248
15	Late Antiquity: Science in the Philosophical Schools MIIRA TUOMINEN	278
16	Medicine in Early and Classical Greece PHILIP VAN DER EIJK	293
17	Hellenistic and Roman Medicine VIVIAN NUTTON	316
18	Greek Mathematics NATHAN SIDOLI	345
19	Greco-Roman Astronomy and Astrology ALEXANDER JONES	374
20	Greek and Greco-Roman Geography KLAUS GEUS	402
21	Greek Optics A. MARK SMITH	413
22	Harmonics ANDREW BARKER	428
23	Greek Mechanics SERAFINA CUOMO	449
24	Greco-Egyptian Alchemy CRISTINA VIANO	468

<i>Contents</i>		ix
PART IV INDIA		483
25	Astronomy and Astrology in India KIM PLOFKER	485
26	Mathematics in Early India (1000 BCE–1000 CE) CLEMENCY MONTELLE	501
27	Indian Medicine and Ayurveda PHILIPP A. MAAS	532
PART V CHINA		551
28	Mathematical Knowledge and Practices from Early Imperial China until the Tang Dynasty KARINE CHEMLA	553
29	Medicine and Healing in Han China VIVIENNE LO	574
30	Chinese Astronomy in the Early Imperial Age: A Brief Outline CHRISTOPHER CULLEN	595
	<i>Index</i>	617

ILLUSTRATIONS

2.1	Catalog tablets from the Esagil-kīn-apli school	<i>page</i> 36
3.1	The procedure of BM 13901 n° 1	67
8.1	Method for finding the area of a circle	154
11.1	Schematic showing the relationship between elements and qualities	200
11.2	Diagram of the cosmos representing the natural positions of the four elements	201
14.1	Roman mosaic described as depicting the Academy of Plato	250
14.2	The philosophical schools of Hellenistic Athens	251
14.3	Pythagoras, depicted on a coin produced at Samos, under Trajan Decius, Emperor 249–51 CE	262
19.1	Homocentric spheres	387
19.2	A simple eccentric model for Mars	389
19.3	A simple epicyclic model for Mars	389
20.1	The cosmology of Anaximander	404
20.2	The system of five geographical zones	405
20.3	Modern reconstruction of the map of Hecataeus	407
20.4	Schematic reconstruction of the world map of Ephorus	407
21.1	Binocular vision according to Ptolemy	419
21.2	Equal-angles law of reflection according to Euclid	420
21.3	Equal-angles law of reflection according to Hero of Alexandria	420
21.4	Equal-angles law of reflection according to Ptolemy	421
21.5	Principles determining image location in reflection	422
21.6	Analysis of reflection in concave mirrors	422
21.7	Analysis of refraction	424
21.8	Ptolemy's experiment to determine the angle of refraction from air to water	424
21.9	Ptolemy's tabulations for refraction from air to water	425
21.10	Atmospheric refraction according to Ptolemy	426
21.11	Refractive image distortion according to Ptolemy	427

List of Illustrations

xi

24.1	Alembic	475
24.2	Kerotakis	476
24.3	Ouroboros	478
24.4	Inkwell from Vaison la Romaine, first century BCE, Louvre	481
26.1	Examples of the <i>nāgarī</i> numerals from various manuscripts	512
26.2	Various trigonometric components	524
29.1	Black lacquer figurine excavated from a tomb at Shuangbao shan 雙包山	582
29.2	The earliest extant diagram of the vulva, Mawangdui tomb 3, closed 168 BCE	584

NOTES ON CONTRIBUTORS

Andrew Barker is Emeritus Professor of Classics at the University of Birmingham and a Fellow of the British Academy. He has published 8 books and over 100 articles on ancient Greek music and musical theory.

Karine Chemla, Researcher (CNRS, laboratory SPHERE) has edited: *The History of Mathematical Proof in Ancient Traditions* (2012); *Texts, Textual Acts and the History of Science* (with Virbel, 2015); *The Oxford Handbook of Generality in Mathematics and the Sciences* (with Chorlay and Rabouin, 2016); and *Cultures without Culturalism* (with Fox Keller, 2017).

Christopher Cullen read Engineering Science at Oxford, and later did a PhD in Classical Chinese at SOAS, University of London, under the supervision of D. C. Lau. He has published widely on the history of science in China, and served as editor of the *Science and Civilisation in China* series. He is Emeritus Director of the Needham Research Institute and an Emeritus Fellow of Darwin College, Cambridge.

Serafina Cuomo is Professor of Ancient History at Durham University. She works on the history of science and technology in ancient Greece and Rome, and has published on ancient mathematics, land-surveying, and military technology. She is completing a book on ancient numeracy.

Andrea Falcon is Associate Professor in the Department of Philosophy at Concordia University, Montreal. He is the author of *Corpi e Movimenti. La fortuna del "De caelo" nel mondo antico* (2001); *Aristotle and the Science of Nature: Unity without Uniformity* (Cambridge 2005); *Aristotelianism in the First Century BCE: Xenarchus of Seleucia* (Cambridge 2012); and *Aristotelismo* (2017). He is the editor of *Brill's Companion to the Reception of Aristotle* (2016).

Markham J. Geller is Professor für Wissensgeschichte at the Freie Universität Berlin and Topoi Excellence Cluster since 2010, on secondment

Notes on Contributors

xiii

from University College London. The PI of the ERC Advanced Grant Project, *BabMed* (2013–2018), he is also co-PI with Philip van der Eijk on a multi-year project, *The Transfer of Medical Episteme in the “Encyclopaedic” Compilations of Late Antiquity*, within the Collaborative Research Center *Episteme in Bewegung* at the Freie Universität Berlin. He has worked extensively on Sumerian, Akkadian, and Aramaic magic and medicine.

Klaus Geus is an ancient historian, philologist, and geographer. In 2009 he was appointed professor of the historical geography of the ancient Mediterranean at the Freie Universität Berlin. Geus works in the areas of ancient geography and astronomy. He has published 20 books and 250 papers and articles.

Daniel W. Graham is Professor of Philosophy at Brigham Young University. He is president of the International Association for Presocratic Studies. His books include *Explaining the Cosmos* (2006); (with co-editor Patricia Curd) *The Oxford Handbook of Presocratic Philosophy* (2008); *The Texts of Early Greek Philosophy* (2010); and *Science before Socrates* (2013).

Jens Høyrup was educated as a physicist at Copenhagen University. From 1973 he taught first in the domain of social, then human sciences, at Roskilde University, Denmark, until he retired in 2005. Much of his research has dealt with the conceptual, cultural, and social history of pre-modern mathematics.

Annette Imhausen studied mathematics, chemistry, and Egyptology at Mainz University and the Freie Universität Berlin. She completed her doctoral dissertation in the history of mathematics and held fellowships at the Dibner-Institute (Cambridge, MA) and Trinity Hall (Cambridge, England). Since 2009 she has been Professor for the History of Early Science at Frankfurt University.

Alexander Jones is Leon Levy Director and Professor of the History of the Exact Sciences in Antiquity at the Institute for the Study of the Ancient World, New York University. His research interests include contacts between Babylonian and Greco-Roman astronomy and astrology, texts and artifacts of Hellenistic and Roman period astronomy, and the scientific work of Claudius Ptolemy.

Rolf Krauss studied Egyptology, history, and geography at the Freie Universität Berlin, earning a doctorate in 1981 with his dissertation “Problems of the Egyptian Calendar.” In 1996 his “Astronomical Concepts in the Pyramid Texts” was accepted at Hamburg University for German Habilitation (2nd dissertation). From 1982 until 2007 he was on the academic staff of the State Museums in Berlin.

James G. Lennox is Professor Emeritus of History and Philosophy of Science at the University of Pittsburgh. His research in history and philosophy of biology includes a translation with commentary of Aristotle's *On the Parts of Animals* (Oxford 2002), *Aristotle's Philosophy of Biology* (Cambridge 2001), and many articles and book chapters on Aristotle and Charles Darwin.

Eric Lewis is an associate professor of Philosophy at McGill University. He has published in ancient philosophy, and the philosophy of music and new media art.

Vivienne Lo 羅維前 is the Director of the UCL China Centre for Health and Humanity. Her research focuses on the social and cultural origins of self-care. She translates and analyzes manuscript material from early and medieval China and studies the transmission of scientific knowledge along the so-called Silk Roads through to the modern Chinese medical diaspora.

Philipp A. Maas is an Indologist who currently works at the University of Leipzig, Germany. His main interests are the pre-modern cultural and intellectual history of South Asia and the multiple genres of Sanskrit literature. Maas has published widely, especially on early classical Ayurveda and Yoga.

Clemency Montelle is Associate Professor in the School of Mathematics and Statistics at the University of Canterbury, Christchurch, New Zealand. She has research interests in the mathematical history of early cultures, including Mesopotamia, Greece, India, and the Islamic Near East. Her *Chasing Shadows: Mathematics, Astronomy, and the Early History of Eclipse Reckoning* (Johns Hopkins University Press) focuses on the theoretical treatment of eclipse phenomena in the ancient world. She is, with Kim Plofker, completing a book on the history of Sanskrit astronomical tables in the second millennium.

John F. Nunn retired from his role as Head of the Anaesthesia Division of the Clinical Research Centre, British Medical Research Council. He has published widely on ancient Egyptian medicine, including a book with that title (British Museum Press, 1996).

Vivian Nutton, FBA, is Professor of the History of Medicine at the First Moscow State Medical University. His recent books include *Ancient Medicine* (2nd edn, 2013), a translation of Johann Guinter and Andreas Vesalius' *Principles of Anatomy according to the Opinion of Galen*, 1538 (2017), and *John Caius, An Autobiography*.

Kim Plofker is Associate Professor in the Department of Mathematics at Union College in Schenectady, New York, USA. Her areas of interest

Notes on Contributors

xv

include the history of mathematics and astronomy in India and the medieval Islamic world, and the cross-cultural transmission of scientific models.

Francesca Rochberg is Catherine and William L. Magistretti Distinguished Professor of Near Eastern Studies in the Department of Near Eastern Studies and the Office for the History of Science and Technology at the University of California, Berkeley. She publishes widely on the Babylonian astral sciences, especially celestial divination and astronomy.

Nathan Sidoli received his PhD from the University of Toronto, in the History and Philosophy of Science and Technology, and is currently Associate Professor of the History and Philosophy of Science at Waseda University, Tokyo. His research focuses on the Greek mathematical sciences and their development in medieval Arabic sources.

A. Mark Smith is Curators' Distinguished Professor of History at the University of Missouri. He has published widely in the history of optics and visual theory from antiquity to the seventeenth century, with special focus on the work of Ibn al-Haytham.

John Steele is Professor of the History of the Exact Sciences in Antiquity in the Department of Egyptology and Assyriology at Brown University. A historian of astronomy, much of his work focuses on the development of the astral sciences in Babylonia.

Liba Taub is Professor of History and Philosophy of Science at the University of Cambridge, where she is Director of the Whipple Museum of the History of Science; she is also a Fellow of Newnham College. Having published extensively on Greco-Roman science, as well as scientific instruments and models, her most recent monograph is *Science Writing in Greco-Roman Antiquity* (CUP, 2017).

Laurence Totelin is a senior lecturer in ancient history at Cardiff University. Her research focuses on Greek and Roman botany and pharmacology. She is the author of *Hippocratic Recipes: Oral and Written Transmission of Pharmacological Knowledge in Fifth- and Fourth-Century Greece* (Brill, 2009) and, with Gavin Hardy, *Ancient Botany* (Routledge, 2016).

Miira Tuominen (PhD 2002, University of Helsinki) is tenured at the University of Jyväskylä. She has published on a wide array of topics, including two monographs, *Ancient Philosophers on Starting Points for Knowledge* (2007) and *Ancient Commentators on Plato and Aristotle* (2009). She is now finishing a monograph on Porphyry's ethics in his *On Abstinence*.

Philip van der Eijk is Alexander von Humboldt Professor of Classics and History of Science at the Humboldt-Universität zu Berlin. He has published on ancient medicine, philosophy, and science, and comparative literature and patristics. Among his most recent publications is *Galen, Works on Human Nature, Vol. 1: Mixtures (De temperamentis)* (Cambridge, 2018) (co-authored with P. N. Singer).

Cristina Viano is Senior Researcher (Directeur de Recherche) at the Centre National de la Recherche Scientifique, Paris, Centre Léon Robin. Her main research fields concern the history of philosophy and ancient science, in particular Aristotle (natural philosophy, ethics, and rhetoric) and Alexandrian alchemy. She has published *La matière des choses. Le livre IV des Météorologiques d'Aristote, et son interprétation par Olympiodore* (Paris: Vrin, 2006).

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 4,000 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.

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 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 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, 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 and International Context*, edited by Ronald L. Numbers, University of Wisconsin–Madison, Hugh Richard Slotten, University of Otago, 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 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

ACKNOWLEDGMENTS

We thank David C. Lindberg and Ronald L. Numbers for the invitation to edit Volume 1 on *Ancient Science* in *The Cambridge History of Science*. David Lindberg was committed to this volume having broad coverage; with this in mind, we are pleased to have persuaded authors to contribute chapters covering such a wide geographical and chronological span. We are very sad that David did not live to see the final product, and we record our gratitude to him for his encouragement and thoughtful guidance. Ron Numbers was also extremely helpful and encouraging; for his continued enthusiasm, we are grateful.

Editorial staff at Cambridge University Press have been supportive throughout, providing skillful oversight and suggestions. In particular, we thank Alex Holzman, Eric Crahan, Deborah Gershenowitz, Dana Bricken, Kristina Deusch, Bethany Thomas, and Cassi Roberts, as well as Joshua Hey and Auriol Griffith-Jones. In Cambridge, Frances Willmoth, Emma Perkins, and Arthur Harris gave valuable assistance at various stages as did Michael Coxhead (London). Finally, we thank the authors for their contributions, patience, and good humor in bringing this volume to publication.

Alexander Jones
Liba Taub