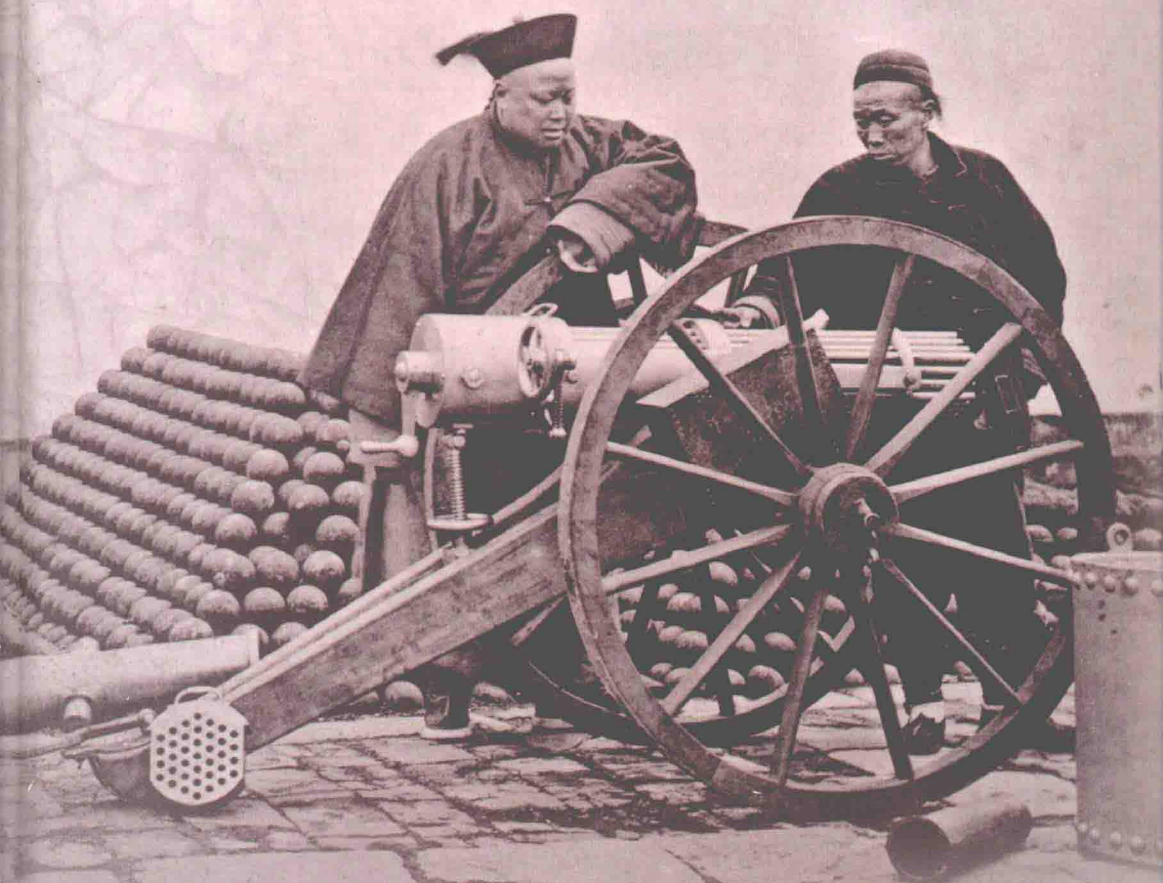


# SCIENCE IN CHINA

## 1800-1900

Essays By Benjamin A. Elman

Editor **Ho Yi Kai**



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**SCIENCE IN CHINA**  
**1600-1900**

Essays By Benjamin A. Elman



## Editor's Note

Editing this book is an honor for young scholars like me, and could only have stayed a dream if Professor Elman had not kindly granted me an audience during his visit to Singapore. He graciously accepted my proposal to put together a selection of revised versions of his lesser known essays on a common theme, and so we have here a solid collection of studies on science in China.

The eight essays are structured in a chronological manner, with the first as an introduction of scientific studies in late imperial China, focusing on Phonology. It is followed by two essays covering the Ming–Qing era, discussing issues of natural studies and Jesuit learning. We then move on from the High Qing to the Late Qing in the following three essays, continuing on the Jesuit roles and Western learning, and venturing further on the promotion of modern science. The last two essays examine China from the late Qing to the 21<sup>st</sup> century. The penultimate essay looks at the “fall of China” in comparison to the “rise of Japan”, with the last essay an apt closing, as the author reflects on traditional Chinese science and medicine in the 20<sup>th</sup> and 21<sup>st</sup> centuries.

Of notable value to the book might be the appendices, consisting of three interviews by the media in China, translated and introduced to English readers for the first time. The interesting flow of issues presented in the interviews captures Professor Elman’s reflective thoughts and a gist of his extensive studies.

I would like to extend my heartfelt gratitude to Professor Elman, to have given me this invaluable opportunity and learning experience. I must also thank our in-house editor Mr. Qi Xiao, for his meticulous effort and extra miles he went to ensure the highest quality of the product. This

notwithstanding, I should still bear the full responsibility for any errors and inadequacies in the book.

Ho Yi Kai  
Assistant Editor-in-Chief  
World Century Publishing Corp.  
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I wish to acknowledge the warm welcome I received from my Japanese and visiting colleagues at the Institute for the Advanced Study of Asia (IASA, 東洋文化研究所) at The University of Tokyo where I was appointed from July 1, 2014, until January 31, 2015, as the *Tōbunken* Visiting Chair Professor (東文研特聘講座教授). I especially want to thank the Director of the Institute at the time, Professor Ōki Yasushi 大木康, for inviting me to join his faculty as a Visiting Professor and to teach a graduate student research seminar in fall 2014, which was cross-listed with my Fall 2014 Princeton graduate seminar. I also very much appreciate the help and support I received from The University of Tokyo Vice-President for the Humanities, Professor Haneda Masashi 羽田正, previously also the Director of the IASA.

This volume was compiled and completed for the World Scientific Publishing Company and World Century Publishing Corporation during my stay at the IASA. Special thanks are due my editor, Dr. Ho Yi Kai, and Mr. Ng Chin Choon for the cover design.

For full citations of Chinese, English, and Japanese sources, see the Bibliography.

Benjamin A. Elman, Princeton University  
Gordon Wu '58 Professor of Chinese Studies  
Professor of East Asian Studies and History  
Tokyo University, January 2015





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## Chapter 1

### **Introduction — From Value to Fact: The Emergence of Phonology as a Precise Discipline in Late Imperial China**

In his pioneering article “The Abortiveness of Empiricism in Early Ch’ing Thought”, which he included in his magnum opus on modern Chinese intellectual history, Joseph Levenson contended that the philological turn among Chinese literati scholars in the 17<sup>th</sup> and 18<sup>th</sup> century could not have developed a “scientific temper” on its own without the decisive intrusion of Western industrialism in the 19<sup>th</sup> century. Because the empirical attitudes of early and mid-Qing dynasty classicists were not scientific in and of themselves, their critique of idealism resembled Abelard’s nominalism more than Francis Bacon’s inductive and empirical science, according to Levenson. The late imperial textual focus celebrated the Chinese classics as repositories of knowledge and thus represented a dead-end from the standpoint of development of science.<sup>1</sup>

Levenson’s influential conclusions were drawn, however, after he had refracted Qing philological scholarship through a “Western” prism that was calibrated according to an idealized development of modern science in Europe. He argued that the use of “scientific” to describe Qing philology was simply a metaphor drawn from the natural sciences. Europeans, he claimed, had proceeded from natural science to thinking scientifically about philological problems. Consequently, we cannot turn this natural development in Europe inside out and expect that the Chinese would have proceeded from sound philology to think philologically about natural science.

The “traditions of scholarship in an age of science” are not as clear cut as Levenson presented them, however. The polemical history of Western humanism favored by Bacon (1561–1626) and Descartes (1596–1650),

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<sup>1</sup> Joseph Levenson, *Confucian China and Its Modern Fate: A Trilogy*, 1–14.

which Levenson uncritically accepted, has over-determined the allegedly antagonistic relations between Renaissance philology and early modern science. Levenson, unfortunately, never realized that men like Kepler (1571–1630), as well as Newton (1642–1727), were both humanists and scientists. They frequently interpreted references to natural phenomena in classical texts and used astronomy to date events in ancient history. Accordingly, humanist scholarship and science were a single pursuit, not the polar opposites that Levenson presented.<sup>2</sup>

The emergence of phonology as a key discipline during the Qing dynasty was closely tied to the triumph of precise empirical techniques of philological analysis championed by participants in the evidential research movement over Song–Ming, 1200–1600, moral philosophy. In phonology, such applications stressed the reconstruction of archaic finals through an examination of ancient rhyme schemes. In the late 18<sup>th</sup> century, significant steps were taken to investigate archaic initials as well. Such pioneering studies established the foundations of modern Chinese linguistics and at the same time provided Western linguists with much of the necessary data and tools needed to refine earlier reconstructions of ancient Chinese phonology.

During the Song and Ming dynasties, the scholarly goal of literati was the cultivation of moral perfection. Their ideal was a life of intense and unrelenting effort, a life they felt would successfully emulate the ancient sages. After the fall of the Ming dynasty in 1644, however, this ideal was taken less and less literally. The Qing dynasty heirs of these fervent groups of Song–Ming literati were members of a secular academic community, which encouraged original and critical scholarship. For the Song–Ming scholars, the classical canon had been the repository of moral truth that transcended time and place. The reaction of Qing textual scholars against the unquestioned authority of the classics was most evident in their precise studies in linguistics, astronomy, mathematics, geography, and epigraphy. Scholars of the 17<sup>th</sup> and 18<sup>th</sup> century applied these fields of research to verify or controvert important elements of the classical legacy. They were dissatisfied with the unverifiable moral ideals that pervaded the Song–Ming vision of antiquity.

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<sup>2</sup> See Anthony Grafton, *Defenders of the Text: The Traditions of Scholarship in an Age of Science, 1450–1800*.

Relying on systematic gathering of materials that they would then critically scrutinize and in certain cases even quantify, Qing scholars combined evidential research methods with data collection and organization. The modern scholar Liang Qichao 梁启超 (1873–1929), for example, has estimated that Qian Daxin 钱大昕 (1728–1804) recorded over one hundred items in his notation book before he attempted to shed new light on the phenomenon of labiodentals recorded in ancient Chinese texts. Qian presented his data within a systematic discussion of ancient pronunciation. Moreover, during the Qing period, there was noticeable progress in *kaozheng* 考证 fields of inquiry. Such progress was possible because evidential scholars, unlike their Song and Ming precursors, stressed research topics that lent themselves to cumulative results. Accompanying this sense of the continuity of academic progress was a quest for originality.

As in the West, the history of linguistics in China presents an interesting analogy to the evolution of empirical methods of verification in the natural sciences. The development of language study and the emergence of historical and comparative linguistics are not uniquely Western achievements. Qing evidential scholars in particular established the foundations of modern Chinese linguistic science. The papers in this volume confirm the limitations in such one-sided accounts of Qing philology and Renaissance humanism. Levenson not only isolated philology from natural studies, which is untenable for both late imperial China and early modern Europe, but he also underestimated how Qing classicists, like their Renaissance counterparts, had integrated mathematics and astronomy in their efforts to reconstruct antiquity and restore its traditions of natural studies.<sup>3</sup>

Narrative accounts of the history of science worldwide from 1500 to 1800, such as that of Joseph Levenson, have been portrayed mainly through European frames of reference, even when comparative themes are stressed. Hence, even though the emergence of “modern science” in industrializing portions of Western Europe is uncontested, the contested nature of the interaction since 1550 between late imperial Chinese and

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<sup>3</sup> Benjamin A. Elman, “From Value to Fact: The Emergence of Phonology as a Precise Discipline in Late Imperial China,” *Journal of the American Oriental Society*, 102, 3 (July–October 1982): 493–500.

early modern Europeans over the meaning and significance of natural studies remains a little-known story. Eurocentric portraits of the rise of modern science, while not monolithic or one-dimensional, usually represent variations of a single-minded historical teleology of Western European scientific “success”, and, by comparison, non-Western “failure”.<sup>4</sup>

Comparisons of early modern Europe and late imperial China suggest a number of ways that the comparative history of science can lead us away from such teleologies. First and foremost, historicizing the Western scientific revolution makes it possible to compare the ongoing role played by classical languages (Latin in Europe, ancient Chinese in China, and Sanskrit in India) as cultural mediums during the transition from natural philosophy to early modern science. Secondly, differential studies that wield appropriate concepts and categories for comparing precise historical situations are mandatory. In particular, the case studies provided in the papers below successfully integrate scientific contents and historical contexts as the key to moving from the local to the global and back again. A global account that is misinformed about local or regional realities will miss the mark.<sup>5</sup>

To paraphrase the views of Peter Winch, we must first acknowledge that as yet we do not have appropriate categories of learning that resemble the pre-modern Chinese frames for what we call “natural studies” or “natural history”, according to which Chinese literati evaluated Jesuit *scientia* during the Ming and Qing dynasties. Moreover, as Donald Lach has pointed out, an analytical ordering of early modern European scholarship, such as the Jesuit *scientia* or Schweigger’s crystal electrical theory of matter, within the framework of modern learning is equally problematic and anachronistic.<sup>6</sup>

To understand pre-modern Chinese frames of knowledge for the natural world, as for early modern Europe, we should first extend our own

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<sup>4</sup>Benjamin A. Elman, *From Philosophy to Philology: Intellectual and Social Aspects of Change in Late Imperial China*.

<sup>5</sup>See Michel Paty, “Comparative History of Modern Science and the Context of Dependency”, *Science, Technology, & Society* 4.2 (1999): 178, 184, 196.

<sup>6</sup>Peter Winch, “Understanding a Primitive Society,” in Bryon Wilson, ed., *Rationality*, 93–102, and Donald F. Lach, *Asia in the Making of Europe. Volume II. A Century of Wonder, Book 3: The Scholarly Disciplines*, 395.

contemporary understanding and make room for them not as a “comedy of errors” but as a plausible set of ideas and beliefs. Placing natural studies in imperial China and pre-modern Europe within their own internal and external contexts allows us to reconstruct their historical communities of interpretation and how those communities — through interaction — constructed science on their own terms. By better understanding early modern European and Chinese interest in nature, technology, and medicine, we are more perceptive about ourselves and the cultural, economic, political, and social values that undergird our contemporary versions of modern science.

For over a century, Europeans have heralded the success of Western science and assumed the failure of science elsewhere. Such views until recently preempted positive narratives about early modern Chinese, Islamic, and Sanskrit exact studies. The rehabilitation of the exact sciences in the pre-modern non-Western world is a long-term precondition for balancing the historiographical playing field. In the decades since Needham, we have increasingly acknowledged that our focus on the “failure” of Chinese science to develop into modern science is heuristically interesting but historiographically misguided. We are now forced to reassess how the history of science globally should be rewritten.<sup>7</sup>

The emergence of phonology as a key discipline during the Qing dynasty was closely tied to the triumph of precise empirical techniques of philological analysis championed by participants in the evidential research movement over Song–Ming moral discourses.

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<sup>7</sup> Sheldon Pollock’s *The Language of the Gods in the World of Men: Sanskrit, Culture, and Power in Premodern India* successfully recaptures the traditions of Sanskrit exact learning that generations of British imperialism disavowed. See also Christopher Minkowski, “Competing Cosmologies in Early Modern Indian Astronomy,” in Charles Burnett, Jan Hogendijk and Kim Plofker, eds., *Ketuprakasa: studies in the history of the exact sciences in honor of David Pingree*, 349–385.



