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Global Science and Comparative History: Jesuits, Science, and Philology in China and Europe, 1550-1850

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Introduction

In fall 2002, Princeton University was the venue for a one-day workshop on "Global Science and Comparative History," which was sponsored by the History of Science Program in conjunction with the Shelby Cullom Davis Center for Historical Studies. Our aim was to explore in a comparative framework how natural thought, geography, cartography, and science evolved globally after 1600. We invited several scholars working on late imperial China and early modern Europe to present papers on Friday, December 6, 2002. They were asked to focus on "Science and Philology in China and Europe, 1550-1850."

For a number of us, the December sixth workshop built on an earlier exchange of papers that had occurred at the November, 2001, History of Science Society panel held in Denver entitled "Rectifying Names, Identifying Things: Philology and Natural History in Germany and China." Alix Cooper and Denise Phillips presented somewhat different papers at both meetings. Two others, Grace Shen, who organized the History of Science Society session, and Carla Nappi, who presented a paper on Li Shizhen's materia medica, were in China in December and unable to join the Princeton workshop.

Hence, we invited Florence Hsia, Laura Hostetler, and Bruce Rusk to join us and present papers on the French Jesuits in China, the sources for the Renaissance "take" on Chinese writing, and the significance of early modern geographical learning and ethnology in China. Alix Cooper and Denise Phillips also revised their History of Science Society papers on Germany in light of the com-

parative discussions we had in Denver. All the paper-givers have further revised their papers based on discussions at the Princeton workshop.

In addition to ourselves, we asked several scholars from Princeton University and the Institute for Advanced Study to join us as discussants for the morning and afternoon sessions. Liam Brockey, Graham Burnett, Anthony Grafton, Willard Peterson, and Heinrich von Staden all made significant contributions to the discussions, which are reflected in the revised papers that we received in summer 2003. Before the workshop we pre-circulated the five papers. The authors each made a fifteen minute introduction at the meetings, which was followed by a prepared commentary and then forty-five minutes of open discussion.

In our exchanges, all of us addressed the viability and historical appropriateness of comparisons and exchanges between Europe and China, 1550-1850, first in terms of the rigor of comparative history and second in light of the suggestiveness of "global science" as a rubric to balance hitherto Eurocentric narratives of the evolution of modern science after 1600. The Princeton workshop was meant to be directional, interactive, and suggestive rather than prescriptive and limiting. Generally, the organizers felt that the current scholarly fad of "global studies" in the social sciences and humanities, while encouraging, has to date filled the "airwaves" with more rhetoric than substance.

To add substance to that rhetoric, we focused on precise comparisons and case examples that would over time, we hope, accumulate and lead to more nuanced global perspectives. To that end, we have sought group publication of the revised papers in *East Asian Science, Technology, and Medicine* to provide a scholarly setting for wider consideration of the comparative issues raised. Some of the subjects that were discussed included: How did textual knowledge acquired via philology impact natural studies in Germany and China? What was the impact in early eighteenth-century China of the Jesuit expertise in Renaissance *scientia*, which included training in astronomy, mathematics, and global geography? How and why did Chinese writing become a cause celèbre among Jesuits and humanists? Rather than labeling the early modern European tradition in natural studies "science" and dismissing such interests in late imperial China as "magic" or "superstition," we sought to address each on their own terms in light of their overlapping scope and unique content.

Language, Philology, and Science

The papers on German philology display a close linkage between language and science. Alix Cooper's "Latin Words, Vernacular Worlds: Language, Nature, and the 'Indigenous' in the Early Modern German Territories" addresses the interactions between the discourses of the "local" and "global" in her account of early modern German natural history. Her analysis of "science and its languages" begins by examining the case study of Christian Mentzel and his son, whose universal index of plants (1682) aimed to incorporate all known plant names from the

New World and Asia (including Chinese materia medica), which they found in the polyglot botanical works then available in Europe. Cooper then moves from the global to the local, investigating the first book Mentzel published in 1650, which presented local plants growing around Danzig (then a German port in Poland) using both Latin and the vernacular.

Cooper notes how the persistence of Latin as the language of botany for naming and nomenclature in the Danzig collection was complemented by use of the vernacular for indigenous accounts of the local environment and habitat of "native" plants. The multilingualism in Mentzel's German flora collections, which balanced Latin names and vernacular descriptions, carried over to his later "global" index of botanical information from all available languages. Gently tugging at the received scholarship, which assumes that the vernacular simply supplanted Latin during the premodern rise of modern science, Cooper concludes that study of classical Latin offered "crucial stimuli for the investigation of the natural world" in which the "exotic" and the "indigenous" intermingled. Textual discrepancies were reconciled by those whose philological tools and polyglot skills were commensurate with their empiricist observations of actual plant specimens. Cooper thus demonstrates the continued importance of Latin humanism for the investigation of both the local (from popular to learned) and global (from non-European to European) natural world.

Denise Phillips earlier presented a fascinating paper entitled "Natural History and *Bildung* in Germany, 1820-1850" for the November, 2001, History of Science Society panel. At the Princeton workshop, she focused on the experimentalist J. S. C. Schweigger and the Society for the Spread of Natural Knowledge and Higher Truth in her paper entitled "Science, Myth and Eastern Souls". Phillips delineated the continued importance of classical erudition for German natural researchers in both presentations. Her account of the critical role philology played in Schweigger's colonialist fantasies and scientific propaganda points to the continued relevance of classical learning in nineteenth-century German elite education and culture.

Involved with the institutionalization of the exact sciences from 1819 to 1857, Schweigger edited a specialized journal of chemistry and physics while also serving as a professor at the University of Halle. His goal of sending scientifically trained missionaries to China and India to convert the natives to Christianity, for example, was tied to his belief that the ancient astronomy of the Chinese, Indians, and Chaldeans was a remnant of a perfect astronomy lost after the Deluge. If recovered philologically, that ancient astronomy would demonstrate the centrality of "polarity" as the fundamental quality of matter. Schweigger's crystal electrical theory of matter, based on opposing angles of fundamental crystals, was linked to his claim that Indo-European "scientific hieroglyphs" functioned as a qualitative language for the description of electro-magnetic phenomena. Schweigger's vision of the centrality of Asian languages reminds us of earlier Jesuits in China and their "Figurist" views of the Chinese language, which are outlined in Bruce Rusk's paper.

Schweigger's fascination with India and China also points to the romanticism that accompanied the "discovery" of the "Orient" by Schopenhauer, Nietzsche, and many others in the nineteenth century. We also realize from Phillips' paper how problematical and tenuous the triumph of science in Western Europe actually was. Its story was not the seamless rise of modern science from the London Royal Academy, Paris French Academy, and Prussian Berlin Academy to the modern research universities that we normally assume. Chinese in the 1850s and Japanese in the 1860s faced similar problems, and they were not far behind in dealing with the difficulties in popularizing modern science.

Although his paper does not address natural studies directly, Bruce Rusk's "Old Scripts, New Actors: European Encounters with Chinese Writing, 1550-1700" provides us with a revisionist account of how Jesuit understanding of the Chinese written language was mediated by Chinese "primitivist" perceptions of their own language. Chinese accounts of the paleography, pictography, and orthography of their own language in late Ming (1368-1644) times strongly influenced Jesuit accounts of Chinese "hieroglyphs" prepared by Athanasius Kircher (1601-1680), for example, and also persuaded Figurists such as Joachim Bouvet (1656-1730) that Chinese pictographs were an ancient form of writing that originated from hieroglyphic symbols, such as the trigrams of the *Change Classic*. The Figurists saw the trigrams as repositories of ancient celestial knowledge and associated them with a sublime natural philosophy and binary mathematical reasoning concealed in Chinese texts.

Rusk's account of the "ideographic myth" also highlights the role of paleography in classical forgery in Ming times, which by the sixteenth century became a significant feature of the textual brouhahas informing Ming classical studies. He unravels the role of manuscripts and epigraphical texts, many forged by the rogue classicists, for example, during a printing boom empire-wide. The forces of commercialization that had affected all levels of artistic taste in gardens, rare books, paintings, and antiquities are Rusk's entry point into the Ming world of changing literati fashions. We see why some high-brow literati chose to apply their considerable paleographical talents to forging writing that appeared artistically like primitive scripts. Such cultural creations in forged manuscripts countered the social and cultural threat of a shallow *nouveau riches* increasingly entering literati life on the heels of a widespread sixteenth-century book publishing boom.

Jesuits, China, and Science

Our final two papers at the workshop problematized the Jesuit-Chinese interaction during the seventeenth and eighteenth centuries. Laura Hostetler's "Global or Local? Exploring Connections between Chinese and European Geographical Knowledge During the Early Modern Period" looks at the interaction in light of European and Chinese efforts to map the Qing empire and identify its myriad peoples through ethnography. Early in the eighteenth century, the Jesuits and others were commissioned to provide the necessary data that would enable Qing leaders to manage their geographical frontiers. In addition, the new mapping technique of "trigonometric surveying", which the Qing emperors mastered, became part of the political repertoire used by the dynasty in the eighteenth century to take stock of its dominions. The Kangxi emperor, like Louis XIV, mapped his entire empire out of strategic concern. The resulting Kangxi Atlas systematized the Qing dynasty's knowledge of its imperial territories and rationalized its claims vis-à-vis its neighbors.

Jesuit-Chinese interactions in cartography and ethnography not only provided information for the Manchu throne but also source materials for scholars in Europe who were preparing accounts of imperial China. Hostetler highlights Jean Baptiste du Halde's (1674-1743) four volume descriptive history of Manchu China, completed in 1735, as a detailed account of the land, its polity, and the customs of its many peoples. She then compares du Halde's volumes to parallel efforts by Manchus and Chinese to describe their empire and its peoples in provincial gazetteers and by engaging officials to compile imperial illustrations of tributary peoples and prepare albums of the Miao minority in the Southwest. Hostetler concludes that in the eighteenth century China and Europe shared an early modern interest in *scientia* and the natural world.

Florence Hsia's "Rereading Jesuit Contributions to the History of Chinese Science" unfortunately was not revised in time to be included in this group of papers. In her Princeton presentation, she problematized earlier accounts of Jesuit missionary purposes in China, in particular long standing claims made by Joseph Needham and others that the Jesuits prevented an impartial evaluation of Chinese science. To revise such monolithic readings, she reevaluated Jesuit conceptions of Chinese astronomy. In particular, Hsia reconsidered the Jesuit focus on indigenous Chinese traditions of knowledge. Such interests, she maintained, were based on intertwined strands of scientific and humanist concerns that were prominent as the "habits of Western scholarship" during the European Enlightenment.

Hsia described how early mission histories written in the seventeenth century had belittled China and drew attention to late Ming Chinese scientific ignorance. Deeply involved in late Ming and early Qing calendar reform, early Jesuits in China tended to invent a narrative of their own scientific success in the face of Chinese intransigence. In the eighteenth century, however, the French Jesuits in particular readily acknowledged the importance of ancient Chinese astronomical

records for the technical chronologies the Jesuits prepared. Earlier, some Jesuits involved in late Ming calendar reform had already recognized the antiquity of Chinese mathematical astronomy, which embroiled the missionaries in debates about biblical chronology and forced them to expand the number of years from the Creation to the Deluge so that Chinese records could be reconciled with biblical "time". According to Hsia, Jesuit conceptions of Chinese astronomy cannot be reduced to simplistic "positive or negative evaluations of the Chinese scientific tradition". Despite the absence of a coherent, developmental account of Chinese astronomy, some Jesuits nonetheless produced the most detailed historical considerations of Chinese astronomy and chronography available in eighteenth-century Europe.

Final Comments

In his pioneering article "The Abortiveness of Empiricism in Early Ch'ing Thought", which he included in his magnum opus *Confucian China and Its Modern Fate: A Trilogy*,[1] Joseph Levenson contended that the philological turn among Chinese literati scholars in the seventeenth and eighteenth century could not have developed a "scientific temper" on its own without the decisive intrusion of Western industrialism in the nineteenth century. Because the empirical attitudes of early and mid-Qing dynasty (1644-1911) 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.

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"[2] are not as clear cut as Levenson presented them, however. The polemical history of Western humanism

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[1] Joseph Levenson, *Confucian China and Its Modern Fate: A Trilogy*, Berkeley: University of California Press, 1968, pp. 1-14.

[2] See Anthony Grafton, *Defenders of the Text*: *The Traditions of Scholarship in an Age of Science, 1450-1800*, Cambridge, Mass.: Harvard University Press, 1991.

favored by Bacon and Descartes, which Levenson uncritically accepted, has overdetermined the allegedly antagonistic relations between Renaissance philology and early modern science. Levenson, unfortunately, never realized that men like Kepler, as well as Newton, 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.

The five papers from this workshop 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.[3]

Narrative accounts of the history of science worldwide from 1500 to 1800, such as Joseph Levenson's, 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 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".

The comparisons of early modern Europe and late imperial China presented in these five papers suggests 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) 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 these five papers 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 is balderdash.[4]

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 premodern Chinese frames for what we call "natural studies" or "natural history",

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[3] See Benjamin Elman, *From Philosophy to Philology*, Second edition, Los Angeles, CA: UCLA Asia Pacific Monograph, 2001.

[4] See Michel Paty, "Comparative History of Modern Science and the Context of Dependency," *Science, Technology, & Society* 4.2 (1999): 178, 184, 196.

and 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.[5]

To understand pre-modern Chinese frames of knowledge for the natural world, as for early modern Europe, we should first extend our own 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 premodern 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 premodern 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.[6]

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[5] Peter Winch, "Understanding a Primitive Society," in Bryon Wilson (ed.), *Rationality*, Oxford: Basil Blackwell, 1970, pp. 93-102, and Donald Frederick Lach, *Asia in the Making of Europe. Volume II. A Century of Wonder, Book 3: The Scholarly Disciplines*, Chicago: Chicago University Press, 1977, p. 395.

[6] Sheldon Pollock's *The Language of the Gods in the World of Men: Sanskrit, Culture, and Power in Premodern India* (Berkeley: University of California Press, 2006) 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*, Leiden: E. J. Brill, 2004, pp. 349-85.