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Review Article

New Directions in the History of Science in East Asia

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East Asian Science: Tradition and Beyond. Edited by Hashimoto Keizō, Catherine Jami, and Lowell Skar. Papers from the Seventh International Conference on the History of Science in East Asia, Kyoto, 2-7 August 1993. Osaka: Kansai University Press, 1995.

Current Perspectives in the History of Science in East Asia. Edited by Yung Sik KIM and Francesca Bray. Papers from the Eighth International Conference on the History of Science in East Asia, Seoul, 26-31 August 1996. Seoul: Seoul National University Press, 1999.

Beyond Joseph Needham: Science, Technology, and Medicine in East and Southeast Asia. Edited by Morris F. Low. *Osiris*, volume 13, 1998.

From 1995 to 1999, scholars in the field of the history of science, technology, and medicine in East Asia and Southeast Asia published three substantive compilations. Such an unprecedented phenomenon requires a thorough review. Two of these publications came directly out of the seventh and eighth conferences of the original International Conference on the History of Science in China, which in 1990 became the International Society for the History of East Asian Science, Technology, and Medicine. These two conferences — held in Japan in 1993 and in Korea in 1996 — mark the first time this unique series of international meetings published edited volumes based on conference proceedings. Although a volume has been completed for the ninth conference of the International Society, which was held in Singapore in August 1999, it was not available in time for this review. The third compilation was published in 1998 as a special theme issue of *Osiris*, the annual publication of the History of Science Society devoted to a single theme or topic. For the first time the History of Science Society has

sponsored an issue of *Osiris* devoted to the history of science, technology, and medicine in East Asia. It is also the first volume in the *Osiris* series devoted to the history of science anywhere outside of Europe and North America. Times have certainly changed and the tides have shifted.

Together the three published volumes represent both fundamental continuities and important transformations in a discipline that continues to expand its geographic range, deepen basic knowledge, inspire new interpretations, and broaden its academic community. At the most fundamental level, these volumes are simultaneously the products of this broadening academic community and one of the more powerful means by which this community enlarges. This review essay discusses six dimensions of these publications to elucidate the more significant changes in the field over the past decade: 1) a synopsis of the field's history, 2) conceptual architecture, 3) geographic representation, 4) temporal emphases, 5) comparative methodologies and 6) methodological innovations. A short history is now in order.

A Synopsis of *Chinese Science* and the International Society for the History of East Asian Science, Technology, and Medicine since 1990

The most obvious transformations have manifested concretely in the formation of the society that supported these conferences and the subsequent changes in the intellectual mission and title of this very journal. The following synopsis will be redundant for regular readers of this journal, but should be useful to non-specialists interested in the chronology of these changes. Since Ulrich Libbrecht organized the first International Conference on the History of Science in China twenty years ago in 1982 in Louvain, Belgium, other scholars in the field took hold of the baton and organized five more under the same name — first annually and then biennially — during the 1980s. These were held in Hong Kong (1983), Beijing (1984), Sidney (1986), San Diego (1988), and Cambridge, England (1990). During the 1990 conference in Cambridge, participants formed the International Society for the History of East Asian Science, Technology, and Medicine. During the same conference, the society adopted *Chinese Science*, established by Nathan Sivin in May 1975, as the society's journal. The change in the society's name better reflected the broader geographic breadth of an academic community comprised of scholars throughout the world who worked on Chinese, Korean, and Japanese primary sources or artifacts related to "scientists, physicians, and technologists in the Chinese tradition."

Gradually, a change occurred concomitantly over the next decade in the title, subtitles, and mission statements of issues of *Chinese Science* published subsequently under the new editorship of Benjamin Elman for issues 11-15, and continued when Hans Ulrich Vogel took over the editorship in 1999. The cover of issue 11 (1993-1994), for example, stated that it is "an annual journal dedicated to the study of traditional and modern East Asian science, technology, and medicine in the Chinese tradition." Despite the addition of "East Asian" in

the mission statement, however, this issue added the Chinese subtitle *Zhongguo kexueshi* 中國科學史 (History of Chinese Science) and continued the earlier journal policy to encourage submissions using Korean and Japanese sources or artifacts only "if the theme is not exclusively Korean or Japanese."

With issue 13 published in 1996, the journal editor expressed a more explicit commitment to all of East Asia by changing the subtitle to "*Wanwu: Dongya kexueshi*" 萬物: 東亞科學史 (Ten-Thousand Things: History of East Asian Science). Moreover, by 1998 with issue 15 the editor deleted from the mission statement the qualification that articles could use Korean and Japanese primary sources or artifacts only "if the theme is not exclusively Korean or Japanese." In the same vein, to better reflect the name of the newly formed international society as well as the broader social and intellectual changes within the field, the current editor changed the title for issue 16 in 1999 to *East Asian Science, Technology, and Medicine*. The revised mission statement concomitantly opened up the field geographically by considering submissions "on science, technology, and medicine of traditional and contemporary East Asia" that shed "light on the work of scientists, technologists, and physicians in East Asia." Submissions no longer have to lead back to China or refer to the scientific Chinese Diaspora, but may also focus on topics exclusively within Korea, Japan, and other regions bordering East Asia.

The scope of the society's journal has clearly been keeping apace with sociological changes within the broader field itself. These changes are most obviously manifested in the two conference volumes reviewed here. The contributions to the volumes from the 1993 Kyoto and 1996 Seoul conferences, for example, clearly show an increase in the articles Korean and Japanese scholars contributed on both the history of Chinese science and the history of science, technology, and medicine exclusively in Korea and Japan. Long after the meetings have served their main purpose to bring together scholars from around the world, however, what value do the two conference volumes of relatively short articles have beyond the historiography of the field itself?

Conceptual Architecture of the Field

Perhaps most importantly, both the Kyoto and Seoul volumes give a greater social form to an often amorphous and always widely dispersed intellectual community. The conceptual architecture of each publication also creates a visible structure of the field itself. Divided into two parts, for example, the first half of the 1993 Kyoto volume reproduces the opening addresses, public lectures, and plenary panels of the conference. The editors Keizō Hashimoto, Catherine Jami, and Lowell Skar wrote an insightful foreword outlining the overarching rationale of the conference and the new analytic challenges of the field. In honor of the late Professor Yabuuti's considerable contributions to the field in the history of Chinese astronomy as well as his eightieth birthday, the late Professor Yabuuti gave the first opening address. In his own words, he emphasized that the

international conference "has now entered a new epoch at its seventh meeting this year." He referred to the change in name from the history of Chinese science to East Asian science. We see a comparable expansion in geographic scope in the following two addresses by Ho Peng Yoke on "Changing Perspectives in Historical Studies on East Asian Science" and by Yamada Keiji on "The Intellectual Isolation and Opening of Japan and China." Each one of the three public lectures also opened new methodological issues: Nathan Sivin introduced the heuristic tools he has been employing in collaboration with G.E.R. Lloyd to compare the formulation of scientific knowledge in ancient Greece and China; Pierre-Étienne Will presented innovative analytic approaches to help scholars escape the "modernization" and "westernization" traps for the histories of China and Japan; and Jeon Sang-Woon introduced the history of Korean science within an East Asian context.

The four plenary panels brought together scholars doing new work within familiar domains: 1) "Comparisons and Exchanges between East Asian and Western Science" included articles on transmission of scientific knowledge from India to Japan, for example, as well as exchanges and comparisons between Europe, the Arab world, and China; 2) articles in "Science, Technology, and Modernisation" extended the temporal coverage by dealing with modern science and "modernization" processes in East Asian sciences; 3) "The Future of Technology in East Asia" panel continued this temporal commitment with discussions of contemporary scientific and technological issues; and finally, 4) the panel "Ethical Aspects of Chinese Medicine" represented some of the more recent efforts to read medical texts within the social contexts of their production and application.

The second half of this volume grouped the remaining presentations into five related clusters: 1) "Approaches to Non-textual Objects" introduced new scholarship on artifacts and material culture relevant to the history of East Asian science; 2) "Assessments of Traditional Medicine" analyzed Tibetan, Mongolian-Chinese, Daoist, and Japanese medical conceptions ranging from health and nutrition to sickness and death; 3) "Modern and Quantitative Analyses of Traditional Disciplines" explored the theme of quantification in a wide range of disciplines including music, mathematics, astronomy, calendrical sciences, and surveying techniques; 4) "Man, Number, and the Cosmos: Conceptual and Political Approaches" employed conceptual and political interpretations to better understand cosmological, mathematical, astronomical, and meteorological texts; and 5) "China, Japan, and the West: Early Modern Encounters" examined points of contact between North America and Japan as well as between China and Japan, in addition to the already well-researched exchanges between Europe and China.

Instead of following the original structure of the 1996 Seoul conference, the editors of the second conference volume chose to reorganize the best submissions into eight general themes: historiographical considerations, intellectual background, ideas and assumptions, institutions, mathematical sciences, medicine and technology, medical practitioners, and western science and scientific

transmissions. This schema succinctly depicts the supporting pillars of the discipline: intellectual and institutional histories, quantitative and qualitative sciences, textual and contextual approaches, and encounters between cultures and exchanges of scientific knowledge. The editor's preface further reconfirms a commitment to three new trends within the discipline, which the first conference volume had already initiated: spatial expansion from a largely sinocentric focus to an East Asian perspective, temporal extension into the twentieth century and about contemporary sciences, and a methodological shift from internalist to contextual interpretations of people, texts and institutions related to the sciences.

The historiographic essays by Korean, Japanese, Chinese, European and American scholars manifest all three of these trends and set the tone for the rest of the volume. We see this, for example, in the articles on the historiography of science in East Asia (Park Seong-Rae, Nakayama Shigeru, and Xi Zezong) and the future of the field (Sivin). Contributions on current research on the contextual translation of passages from the *Mengxi bitan* 夢溪筆談 (Brush Talks from the Dream Brook) by Shen Gua 沈括 (Martzloff and Fu Daiwie), sociological comparisons between China and Europe in the history of ancient mathematics (Cullen), and the history of mining technology (Golas) furthered these trends. (For more detail, see my review of the volume from the 1996 Korean conference in *JAS* 60.1 (2001):153-155).

In addition to making the conceptual architecture and new trends of the field visible, both conference volumes introduced more Japanese and Korean scholarship in English translation than had been previously available to scholars of the history of East Asian science in other regions of the world. Although these conference volumes are not likely to be distributed much beyond our community, they nevertheless make a strong statement to historians of science in Europe and North America that the history of science, technology and medicine in East Asia continues to be a dynamic and important field.

Turning to the third compilation under review, one may well ask what binds the special issue of *Osiris* together as a contributor to the same academic currents as the two conference volumes, even though it is not a product of the same sequence of meetings. In several ways, the *Osiris* volume titled *Beyond Joseph Needham* does even more with less. The substance, depth and range of the far fewer articles in the *Osiris* volume transcend the conference volumes' unavoidable glimpses into scholars' more in-depth research. Morris Low's introduction on recent trends in science, technology, and medicine in East and Southeast Asia, Francesca Bray's article on the cultural history of technology in China, and Kim Yung Sik's analysis of problems and possibilities in the history of Korean science tighten the intellectual threads that bind this special issue closely to the previous two conference volumes. All three scholars also participated in one or both of the 1993 Kyoto and 1996 Seoul conferences. By casting its net more broadly, *Beyond Joseph Needham* also brings into the fold more historians, methodologies, and perspectives to enrich the field in ways that may well inspire scholars outside the East Asian field to sit up and listen. Being a publication of

the History of Science Society, this volume will certainly, at least, reach more of them.

Geographic Representation

Now turning to the issue of geographic representation, the following general statistics give a quick overview for each volume. The sixty articles published in 1995 from the 1993 Kyoto conference, for example, include twenty-six on China, nine on Japan, three on Korea, and five on East Asia. Judging from the numbers of articles that were selected for publication, the greater number of Japanese (23) than Chinese (17), European (16), North American (5), Korean (3), Australian (2), and Thai (1) scholars indicates for the first time a more significant Japanese participation. Although the geographic distribution for the 1996 Seoul conference published in 1999 seems to have been weighted more toward China — the fifty-three articles include those on China (31), Korea (5), Japan (2), and East Asia (3) — more Korean scholars participated (7) than three years before and many of the Japanese scholars (9) also wrote on Chinese science. There were about as many articles as before by Chinese (19), European (13), North American (6), and Australian (2) scholars. Because of the considerable participation of Japanese and Korean scholars in the 1993 Kyoto and 1996 Seoul conferences, this also gave the academic community situated outside of East Asia greater access to the first-rate scholarship that continues in both of these countries on the history of science in East Asia. This broader representation introduces to scholars within and outside the discipline a sense of the scope, depth and history of the field throughout East Asia. This alone is an important contribution to the field.

Looking beyond the immediate East Asian geographic sphere, two articles in the 1993 Kyoto volume discussed cultures on the margins of East Asia, specifically technology in Thailand (Itti) and classical medicine in Tibet (Cai). In the 1996 Seoul volume, two articles examine medicine in regions along China's frontiers: the first on Tibetan medical Thangkas continues a topic by the same author from the previous conference (Cai) and the second examines twentieth-century changes in the Vietnamese medical system (Guénel).

The *Osiris* volume, on the other hand, both shifts the emphasis and widens the geographic range represented in the previous two volumes. Of the sixteen articles, six are on Japan, five are on China and two are on Korea. In addition to this nearly equal coverage of Japan and China, the volume includes 2 new comparisons within East Asia, the first on Japanese colonial and KMT postcolonial medicine in Taiwan (Chin) and the second on modern-day mariculture in China and in the Philippines (Neushul and Badash). In addition to the comparison between Chinese and Filipino mariculture practices, three articles extend beyond East Asia to Southeast Asia by discussing Indonesian science (Pyenson), Thai herbal medicine (Bamber) and western science in Siam (Hodges).

Temporal Emphasis

The articles of *Osiris* continue the emphasis on extending the temporal scope of the history of science in East Asia through the twentieth century to the present day that the two conference volumes had previously supported. Articles in this category, for example, include a study of engineering training in Tokugawa and Meiji Japan (Gooday and Low), the Meiji railroad industry (Ericson), the Korean Advanced Institute of Science and Technology (Kim Dong-won and Leslie), Japanese Nobel candidates (Bartholomew), the repatriation of atomic bomb victim body parts to Japan (Lindee), and debates over "brain death" in Japan and North America (Lock). Three articles in *Osiris* also cover salient issues in the study of late-imperial Chinese technology (Bray), meteorology (Elvin), and medicine (Hinrichs). Bray's contribution opens up such new perspectives on technology and gender that it is featured in the section below on methodological innovations. Elvin's article on "Who Was Responsible for the Weather?" gives a fine analysis of the moral, political and scientific dimensions of meteorology during the reign of the Yongzheng emperor. Hinrichs' state of the field article, in turn, has become a "must read" for anyone interested in the recent historiography of Chinese medicine. As an ensemble, these 16 contributions give readers a greater sense of twentieth-century science and technology in East Asia and Southeast Asia than the two previous conference volumes.

Comparative Methodologies

With this broader geographic range coupled with a new temporal span from classical periods through to contemporary East Asia, one can also discern changes in comparative methodologies. In the Kyoto volume, for example, four of the eight articles on this theme compare China and Japan from the disciplines of classical mathematics (Kobayashi) and early-modern physics (Wang) to the more contemporary issues of isolationism (Yamada) and modernization (Will). The remaining four articles use different axes of comparison by covering discourses on the natural world in ancient China and Greece (Sivin), the ecliptic in Han and Ptolemaic astronomy (Sun and Kistemaker), algebraic equations in China and the Arabic world (Chemla), and metallurgy in China and India (Mei and Ko). In the Seoul conference volume, at least three of the articles are explicitly comparative — ancient Greek and Chinese proof (Cullen), European and Chinese mining practices (Golas), and modern physics terminology in Japan and China (Wang).

Comparative methodologies also appear in articles on encounters between cultures through the exchange of scientific knowledge. In the 1993 Kyoto volume, two panels were devoted to this theme and twelve articles discussed it using a range of points of contact. Of the six that examined the encounter between China and Europe, three analyzed how Chinese interpreted and utilized scientific knowledge from Europe (Golas, Jami, and Hashimoto) and three dealt

with exchanges between China and Europe (Okamoto, Han Qi, Diény). Other examples of such encounters include accounts of Chinese medicine by two North-American physicians (Cullen), Indian Buddhist influence on Japanese astrology (Yano), and similarities between Chinese and Arabic mathematical knowledge (Chemla). Similarly, contributions to this volume focused on the exchange between China and Japan of mathematics (Kobayashi) and physics (Wang Bing), and the translation of a North-American textbook on natural philosophy into the first Japanese textbook on physics (Okamoto).

Of the six articles on this theme in the 1996 Seoul volume, five discuss the transfer of scientific knowledge from Europe to China (Chu, Wright, Hashimoto and Jami), to Korea (Jun) and to Japan (Macé), and one examines eighteenth-century French opinions of Chinese science (Diény). Several articles change the focus of the direction of knowledge transfer between Europe and East Asia to exchanges between regions within Central Asia and East Asia. The topics in this category include Greek and Islamic influence on Chinese tables of planetary latitude from the late Yuan and early Ming periods (Yano and Dalen), Korean interpretations of Chinese classical medicine (Kim Nam-il), the southwest region of China as a bridge for science and technology from other cultures (Liao and Zhang), and Japanese colonial science in Republican Shanghai (Low).

The *Osiris* volume further expands the possibilities for comparison by including articles not only on technology transfers in both directions between Japanese and European engineers (Gooday and Low), but also on different attitudes toward the Nobel prize in Korea and Europe (Kim Dong-won and Leslie), mariculture in China and the Philippines (Neushul and Badash), U.S. and Japanese views toward the body parts of atomic bomb victims (Lindée), and the contrast in meanings attached to death in both Japan and North America (Lock). The evidence in these three volumes illustrates irrefutably that the field has come a long way since the use of the comparative history of science simply to gauge the progress of civilizations along a teleological path toward "modern," or "western science."

Methodological Innovations

With these refreshing new axes of comparison, one also begins to see in all three publications a new line of thought on intra-East Asian colonial science. Morris Low initiated the discussion of science and empire in his "Beyond Modernization" article for the 1993 Kyoto conference and followed through on his own recommendation by contributing an article for the 1996 Seoul conference on Japanese colonial science at the Shanghai Science Institute. Furthermore, he included articles in his edited volume of *Osiris* that either raised issues regarding the Japanese use of science to expand their empire in Indonesia (Pyenson) and in Korea (Kim Yung Sik) or focused their analyses on Japanese colonial medicine in Taiwan (Chin Hsien-yu) and Japanese racial science during the era of Japan's "Greater East Asia Co-Prosperty Sphere" (Tessa Morris-Suzuki).

In addition to these illuminating approaches to the questions of science and empire, a new line of reasoning concerning gender and science first appears in the section on "Medical Practitioners" of the Seoul volume. This section includes articles on Ming women healers (Furth), female medical practitioners (Zheng Jin-Sheng), and the case records of a famous Ming physician (Grant). In the *Osiris* volume, Hinrichs continues this thread in her review of the considerable scholarship on women, gender, and childcare in Chinese medical history from Charlotte Furth's seminal articles in the mid 1980s to the work of equally insightful scholars on these subjects in the 1990s (pp. 316-319). In her *Osiris* contribution on gender and the cultural history of technology in late imperial China, Francesca Bray accomplishes more than merely a review of the topic for scholars of other disciplines in East Asian history; she opens up exciting new possibilities for all historians of technology and gender.

I single out Bray's essay here because of its persuasive power to make scholars outside our field sit up, listen and rethink their own research methodologies. If historians of technology in Europe, the United States, and other regions of the world, do not take home with them the specifics of Chinese domestic architecture, they will nevertheless be hard pressed to forget Bray's analysis of the Chinese ancestral shrine as a "sociotechnical system." She provides a model to show how material artifacts can and do function as a "socio-technical system" through which political order, social ideology and family relationships are taught, embodied and reinforced. Embedded in this sociological theory is Bray's concept of "gynotechnics," whereby technologies, such as the gender divisions of space in the household, labor in the economy, and reproductive power in the family, simultaneously form female identities and construct the material worlds in which women lived. Within the three volumes reviewed here, Bray presents a new methodological model of the kind of imaginative materialism for which she has successfully argued her case and toward which historians of technology both within and beyond East Asia may well feel compelled to move.

Published within the last five years of the twentieth century, these three publications crystallized in print a watershed in the history of science, technology and medicine in East Asia, and now even include Southeast Asia. They manifest an expansion of the geographic and temporal scope of the field in terms of participants and subjects, show a considerable refinement of contextual and comparative approaches and present methodological challenges to commonly held assumptions that should be of general interest to non-specialist as well as specialist readers. Scholars in our field may well be inspired to continue the momentum these volumes initiated by editing publications of comparable range, depth and vision. These three volumes set the foundation for a more comprehensive synthesis of the history of science, technology and science in East Asia that scholars in this field should consider seriously for the near future.