

A Symposium on the Transfer of Scientific and Technical Knowledge between Europe and China during the Early Modern Period Held at the Sino-German Center for Research Promotion¹

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A symposium on the “Transfer of Scientific and Technical Knowledge between Europe and China during the Early Modern Period” was jointly held by the Eberhard Karls Universität Tübingen in Germany and the Institute for the History of Natural Sciences, Chinese Academy of Sciences (IHNS-CAS), in China, funded by the Sino-German Center for Research Promotion, from March 29 to April 2, 2019. More than fifty scholars from China, Germany, the Netherlands, and other countries and regions attended the symposium and engaged in extensive discussions. Twenty-four of these scholars delivered speeches.



Figure 1: Participants of the symposium.

1 This news report has been copyedited by Charlie Zaharoff.

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In 2018, Professor Hans Ulrich Vogel from the University of Tübingen and his team launched a research project, "Translating Western Science, Technology, and Medicine to Late Ming China: Convergences and Divergences in the Light of the *Kunyu gezhi* and the *Taixi shuifa*," funded by the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG). In order to promote this project, the Sino-German scholars organized this symposium to share their work.

Two panoramic speeches served as a prelude to the symposium. Taking the book *Taixi renshen shuogai* 泰西人身說概 (The Western view of the human body) as an example, Professor Helwig Schmidt-Glintzer from the University of Göttingen discussed science and civilization in China and the West in early modern times. He attributed alterations that occur through knowledge transfer to political and institutional differences between China and Europe. He argued that the illustrations of *Renshen tushuo* 人身圖說 (Illustrations and descriptions of human body) were adopted by the Jesuit missionary Johannes Schreck when he wrote the book *Taixi renshen shuogai*. The Western origin of *Renshen tushuo* was Ambroise Paré's *Anatomie universelle du corps humain*. Professor Thomas Zimmer of Tongji University explored the challenges and mechanisms of scientific transfer between Europe and China during the late Ming and early Qing dynasties and analyzed the occurrence and characteristics of knowledge dissemination.

Hydraulics is the kind of practical knowledge that drew the attention of Xu Guangqi 徐光啟 and other Chinese scholars in the late Ming dynasty. Taking the tidal phenomena described in the *Taixi shuifa* 泰西水法 (Hydromethods of the great West) as an example, Sabine Kink, a PhD candidate of the University of Tübingen, explored how the question of what makes water rise was being discussed at that time. It was difficult for members of traditional Chinese society, with their own deeply entrenched holistic cosmology, to accept the "scientific" terms of the Aristotelian system that explain how to raise water. In this presentation, Kink contextualized and outlined the Jesuit missionary Sabatino de Ursis's approach to this endeavor by analyzing his line of argument and his rhetorical method. Professor Sun Chengsheng 孫承晟 from the IHNS focused on the dissemination of Western essential oil knowledge and distillation techniques in late Ming and early Qing China. He held that Sabatino de Ursis was the first Westerner to introduce essential oil knowledge and distillation technology into China. Professor Albert Koenig from the University of Hong Kong explored the operational principles of the water works built by Jesuits at the European Palaces of Yuanmingyuan. He explicitly examined the challenges faced by the Jesuit Michel Benoist in designing the water works of Yuanmingyuan and discussed how the water lifting devices were designed. Professor Iwo Amelung from the Goethe University Frankfurt discussed the role of Western knowledge in river engineering in late Imperial China, examining how Westerners spread the knowledge of hydraulics and related technologies to China.

The dissemination of mineralogical knowledge was one of the major themes of this symposium. Professor Friedrich Naumann of the Chemnitz University of Technology presented Georgius Agricola's contributions to the establishment of the mining sciences and discussed the content and circulation of the book *De re metallica*. Professor Hans Ulrich Vogel examined the translations of useful and reliable Renaissance knowledge to late Ming China by focusing on the 1639 Chinese version of Agricola's *De re metallica*. He discussed the syntactic and semantic features of Johann Adam Schall von Bell's *Kunyu gezhi* 坤輿格致 (Investigations of the earth's interior) and explored whether Jesuits introduced important books on exploration, mining, and smelting to China, as well as whether *Kunyu gezhi* played a role in producing related devices in China. Dr. Alexander Jost from the Center for European Studies at Peking University investigated the European sources of Schall von Bell's *Kunyu gezhi*. He argued that, in addition to Agricola's *De re metallica*, one should also include Vannoccio Biringuccio's *De la Pirotechnia* (1540), Lazarus Ercker's *Beschreibung der allerfürnemsten Mineralischen Erzt und Bergwerksarten* (1574), and José de Acosta's *Historia natural y moral de las Indias* (1590). Dr. Cao Jin 曹晋 from the University of Tübingen showed that although *Kunyu gezhi* was "lost" shortly after being translated and composed, European mineral knowledge was to some extent still disseminated and applied during the Ming and Qing dynasties.

Johann Adam Schall von Bell also helped Chinese officials preside over calendar reform and artillery manufacturing. Associate Professor Zheng Cheng 郑诚 from the IHNS argued that among the surviving versions of *Huogong qieyao* 火攻挈要 (Essentials of gunnery) written by Johann Adam Schall von Bell, the closest to the original is most likely the manuscript written in the early Qing period, which is now stored at the Hubei Provincial Library. A careful study on this version would yield a better understanding of the dissemination of European military technology to China in the mid-seventeenth century. In fact, European firearms technology was introduced to China as early as the sixteenth century. Professor Yin Xiaodong 尹晓冬 of the Capital Normal University held that the firearms knowledge in He Rubin's 何汝賓 *Bing lu* 兵錄 (Records of military art) came from Collado's *Pratica manuale di artiglieria* and *La obra manual y platica de la artilleria*.

Before Johann Adam Schall von Bell, it was Johannes Schreck who helped Xu Guangqi preside over calendar reform. Professor Claudia von Collani of the University of Würzburg showed that Johannes Schreck once wrote to Galileo Galilei to ask how to calculate the solar eclipse when he was revising the Chongzhen calendar. Von Collani also analyzed Johannes Kepler's reply to Johannes Schreck and his providing the *Tabulae Rudolphinae* to the missionaries in China. Li Liang 李亮, associate professor of the IHNS, introduced the application of Philippe de La Hire's astronomical achievements in early modern China. He analyzed the impact of Hire's *Tabulae astronomicae* on the calculation of planetary motions and eclipses in Chinese astronomy. Professor Hsu

Kuang-Tai 徐光台 from Tsinghua University in Hsinchu, Taiwan, demonstrated the encounter of the Christianized Aristotelian worldview with the traditional Chinese worldview of *tian yuan di fang* 天圓地方 (hemispherical dome cosmology) in the late Ming dynasty. He held that Matteo Ricci's explanation of the term *di fang* 地方 referred to the notion that the earth is fixed rather than to the shape of its physical body. Professor Gong Yingyan 龚缨晏 from Ningbo University made a special analysis of *Kunyu wanguo quantu* 坤輿萬國全圖 (A map of the myriad countries of the world).

Johannes Schreck also cooperated with the Chinese scholar Wang Zheng 王徵 to introduce the knowledge of mechanism to China. Professor Tian Miao 田淼 from the IHNS argued that the European description of machines was reconstructed in *Qiqi tushuo* 奇器圖說 (Illustrations and descriptions of extraordinary devices) by Wang Zheng and Johannes Schreck. By comparing *Qiqi tushuo* and its Western origins with Chinese classics on traditional techniques, Professor Tian showed that the technical expression in traditional Chinese knowledge and the local needs had exerted influence on the syntactic and semantic structure of Volume III of *Qiqi tushuo*. Professor Xiao Yunhong 肖运鸿 from Gannan Normal University emphasized that He Mengyao's 何夢瑤 *Suandi* 算迪 (A guide to mathematics) not only inherits the traditional Chinese problems dealing with steelyard equilibrium but also absorbs the knowledge of the lever introduced from the West. Both of Professor Tian and Professor Xiao's speeches belong to the IHNS-MPIWG joint project.

Professor Thierry Meynard from Sun Yat-sen University examined Giulio Aleni's *Xingxue cushu* 性學彙述 (A brief introduction to the study of human nature) and its Western origins. By listing different translations of the term "the soul" given by Giulio Aleni, he emphasized that there was another important book to be mentioned alongside the *Coimbra commentaries*, one of the often-mentioned Western origins of *Xingxue cushu*. Chen Zhihui 陈志辉, associate professor of Inner Mongolia Normal University, examined the dissemination and acceptance of Aristotle's "four-element theory" in the Qing dynasty. He argued that the "concrete reason" of the "four-element theory" is consistent with the empirical evidence of the late Ming dynasty. Dr. Yang Aidong 杨爱东 from Shandong University tried to explore why the book *Qiongli xue* 窮理學 (Thorough inquiry into principle) failed to be accepted by Chinese officials.

Three speeches were arranged to be delivered to the public on the "Wenjin Forum" in the National Library of China. Professor Zhang Baichun 张柏春 from the IHNS demonstrated the transfer, complementarity, and competition of technological knowledge between China and Europe from the sixteenth to eighteenth centuries, taking firearms, clocks, astronomical equipment, and waterwheels as examples. He argued that both China and Europe had their own traditions and strengths in technological development. They are complemented by and competitive with each

other, each ready to absorb the other's superior technologies. Professor Shi Yunli 石云里 from the University of Science and Technology of China presented a variety of scientific and technical works translated by Jesuits from the late Ming to the mid-Qing era. He held that Chinese scholars absorbed the "useful knowledge" of the West but ignored the natural philosophy behind such knowledge. Professor Karel Davids from the University of Amsterdam discussed the continuities and ruptures in the long-distance circulation of knowledge between 1500 and 1800. By analyzing three cases, he argued that disrupting events, deficient carriers, and institutions in disorder were factors that hindered the flow of knowledge, but the flow of knowledge could be restored through individuals on a micro-level and substitute institutions.

With the help of scholars such as Zhao Daying 赵大莹, Chen Xinyu 陈欣雨, and Wang Yumin 王玉民, participants also visited the Rare Book Department of the National Library of China, the Missionary Cemetery, and the Beijing Ancient Observatory, which enriched their understandings of the presentations and discussions in this symposium.



Figure 2: Participants at the National Library of China.