

PROJECT APPLICATION (JULY 2017)

Translating Western Science, Technology and Medicine to Late Ming China: Convergences and Divergences in the Light of the *Kunyu gezhi* 坤輿格致 (Investigations of the Earth's Interior; 1640) and the *Taixi shuifa* 泰西水法 (Hydromethods of the Great West; 1612)

A ABSTRACT

This project has been prompted by the recent sensational rediscovery of the Chinese version of Georgius Agricola's (1494-1555) *De re metallica* (1556). The Chinese rendering of this famous mining classic, initiated by the Ming official Li Tianjing (1579-1659) and carried out by the famous German Jesuit missionary Johann Adam Schall von Bell (1592-1666), was lost for more than 350 years. One of our aims is to translate this Chinese version, entitled *Kunyu gezhi* (Investigations of the Earth's Interior; 1640), into English, with the inclusion of all relevant historical records. This will elucidate the Jesuits' highly selective and complex approach to the translation, both with regard to passages in the Western reference texts as well as to new mineralogical ideas and concepts, and thus will provide unique insights into the scope and limitations of the transmission of European useful and reliable knowledge to the Middle Kingdom. Moreover, it is important to find out how this translation was received and perceived by Chinese readers and what the fate of this mining and metallurgy treatise was until its recent unexpected rediscovery. Furthermore, for comparative reasons we will investigate another important and largely neglected text, the *Taixi shuifa* (Hydromethods of the Great West; preface 1612), by addressing similar research questions to it. This technological manual, mainly composed by the Italian Jesuit missionary Sabatino de Ursis (1575-1620), contains a systematic discourse on both the theoretical and practical aspects of water and water management, including discussions about the medical benefits of hot spring treatments and distillation methods. Our comprehensive study of these two unique treatises dealing with two different technical and economic fields, but with overlapping especially in water management and natural philosophy, will take fully into account recent research on the history of knowledge transfers from West to East during the period of early globalization. It will also compare these early seventeenth-century events with those of later periods, especially the Protestant missionaries' efforts of the late nineteenth century. Our case studies will also pay due attention to historical contextualisation, i.e. the background of political, social, economic and cultural conditions and developments, and hence highlight convergences and divergences between China and Europe. The ultimate aim of the project will be to make a contribution to the debate about the origin of the "Great Divergence" between Europe and China during the Early Modern Period, and this by combining our micro-historical case studies with the approaches of a macro-historical comparative sociology. This endeavour, carried out under the auspices of the UNESCO Subcommittee on Research and Education, Memory of the World Programme, is of extraordinary importance not only for the history of West-East interactions and exchanges, but also for German cultural history.

B PROJECT DESCRIPTION

The immediate cause for starting this project was the sensational rediscovery of the *Kunyu gezhi* 坤輿格致 (Investigations of the Earth's Interior; 5 chap., 244 pp., 1640; hereafter KYGZ), a Chinese mining treatise based largely on Georgius Agricola's (1494-1555) *De re metallica* (1556). This partial

translation, initiated by the Chinese official Li Tianjing 李天經 (1579-1659) and carried out by the Jesuit missionary Johann Adam Schall von Bell (Tang Ruowang 湯若望; 1592-1666), was lost for more than 350 years. Involving one of the most important protagonists of the German Renaissance and the most influential China-bound German Jesuit missionary, this text is of extraordinary importance not only for the history of East-West relations, but also for German cultural history.

In addition and for comparative reasons, we will investigate another important and largely neglected text, the *Taixi shuifa* 泰西水法 (Hydromethods of the Great West; 6 chap., 208 pp., preface 1612; hereafter TXSF). The TXSF, mainly composed by the Italian Jesuit missionary Sabatino de Ursis (Xiong Sanba 熊三拔; 1575–1620), contains a systematic discourse on both theoretical and practical aspects of water and water management and forays into the medical field. Topically this technological manual differs from the KYGZ by embedding the presented new techniques in a traditional everyday setting, while at the same time sharing commonalities with the KYGZ in the domains of water drainage and natural philosophy.

The targets of this project are systematic, comprehensive as well as paradigmatic. It proceeds like a *crescendo*, starting (甲) from Western texts and their transfer to China, (乙) their selective translation by the Jesuits and their Chinese collaborators, (丙) the terminological and conceptual strategies and choices adopted during this effort, (丁) the reception and perception of the texts on the Chinese side as well as (戊) the political, social, economic, cultural and ideological backgrounds and intentions of the different historical actors, with the final aims of using these case studies (己) to deal with issues of intercivilisational encounters, especially (庚) in the field of useful and reliable knowledge, during (辛) the early history of globalisation, and (壬) to carry out comparisons based on the macro-sociological theory of the “Four Ways of Worldmaking” (*power, wealth, meaning, knowledge*), thus (癸) arriving at novel conclusions with regard to convergences and divergences as well as the Great Divergence between China and Europe. The word “translating” in the project title therefore does not only mean the act of ‘translation from one language into another,’ but in a metaphorical sense encompasses the whole gamut of both conducive and obstructive political, social, economic, intellectual and cultural factors that were in play during this ‘transfer.’ Our presentation of the state of the art and the objectives and methods reflects this holistic approach departing from basic and fundamental micro-historical factors to complex and higher-level macro-historical issues.

The critical translation of our two difficult Chinese key texts into English (see also 2.2.a) is an indispensable part of this project, because it is fundamental for a full understanding of the characteristics, complexities, and conjunctures of the transmission process. Yet, since translation only makes sense within a framework of historical contextualisation, our practical and theoretical approaches to translation do not constitute an isolated part, but are integrated into the “Four Ways of Worldmaking” approach, especially in relation to the domains of *knowledge* and *meaning*.

This project is innovative in several respects, especially the following: (子) It focuses on production techniques and technologies as well as on geological, mineralogical and hydrological theories based on Aristotelian natural philosophy and on medicine,¹ whereas so far sciences, especially astronomy, mathematics and cartography, have been in the centre of research on the Jesuit China mission. (丑) Because of hermeneutical exigencies hybridisation and “on their own terms” approaches are part and parcel of this project, in the sense, however, that we aim at defining as precisely as possible the qualitative and quantitative aspects of partial or total acceptance or

¹ Medicine is included in the project because the TXSF has medical sub-chapters related to water (hot springs and distillation), but mainly because there is a three-year partner project at the University of Macau directed by Prof. Puente-Ballesteros who deals with Johannes Schreck-Terrentius’ (1576-1630) anatomical treatise *Taixi renshen shuo gai* 泰西人身說概 (An Outline of the Human Body from the Great West; edited and published 1643 by Bi Gongchen 畢拱辰).

rejection.² (寅) While building on the “on their own terms” approach³ as a necessary step in taking serious and for fully understanding and explaining the civilisational settings of late Ming China as well as of early modern Europe, our project with its systematic, comprehensive, and comparative approach goes far beyond that concept because it takes direct issue with the “Great Divergence” tenets. So far, California School adherents have concentrated in their comparative investigations on market conditions and developments and on those in the agricultural sector, but have paid much less attention to industrial pursuits, the role of the state as well as the meaning and, especially, knowledge domains thereof. Based on our case studies and our *crescendo* approach to them, our hypothesis is that the Great Divergence started neither in 1750 nor 1800, but had its decisive roots already during the European Renaissance. Hence our project is both a micro-historical study of specific intercivilisational encounters based on a close reading of primary sources in Eastern and Western languages as well as a systematic comparison of mining and water management in China and Europe within the framework of a historical macro-sociological theory.⁴

1 STATE OF THE ART AND OWN PRELIMINARY WORK

STATE OF THE ART

The two texts that are in the centre of this project were composed and translated into Chinese by Jesuit missionaries and their Chinese collaborators during the early 17th century. They constitute two sub-projects, one on the KYGZ, the other on the TXSF. Below we focus on the state of the art with regard to these two texts and their authors or promoters, while under 2.2 (Objectives and Methods) we also give some selected insights into the state of the art of research of a more general and contextual nature.

a) Text of *Kunyu gezhi*

While general accounts of intercultural exchanges between Europe and China often mention the KYGZ, textual research on this work is inexistent, as the text itself has been lost for long. The history of this “Chinese *De re metallica*” has, however, been elucidated to some extent on the basis of information in other primary sources. A pioneer was Prof. Pan Jixing (App. 10, Ill. 1), a leading expert in the history of Chinese science and technology, who was the first to deal systematically with the history of the translation of *De re metallica* (hereafter: DRM) into Chinese. The authoritative version of his research appeared in 1983, and later was translated into English (Pan Jixing (1983), (1991), (1998)). The most comprehensive account of the historical circumstances of the DRM transmission to China, the two different phases of its translation into Chinese by Schall von Bell and his collaborators, its discussion at court against the backdrop of political, economic, social and cultural conditions and especially late Ming mining policy, as well as its disappearance during the cataclysm of the Ming-Qing transition is an article authored by the applicant himself together mainly with Pan Jixing (see Pan, Vogel, et al. (1989)). A further contribution was made by Peter J. Golas, well-known specialist in Chinese mining history, who hypothesized – basically correctly as is borne out by the now available evidence – that only selected parts of Agricola’s difficult mining classic were translated into Chinese (Golas (1995a), (1999b), pp. 39-40). The most recent publications on the KYGZ are those of Han Fengran (2015a) (2015b), Vogel (2015) (App. 15) and Fu Hansi [Vogel] (2016), both authors concentrating on the discovery of the KYGZ manuscript by Han Fengran in the Nanjing Library, the

² Hybridisation per se is not an exclusively intercultural, but also an intracultural phenomenon. In our view, it has no explanatory power unless defined in qualitative and quantitative terms within specific historical contexts.

³ See especially Elman (2005) postulating that the Chinese transformed and integrated new Western knowledge into their own theoretical framework and used it selectively to serve their own practical purposes.

⁴ In our view, our comprehensive civilisational approach with its focus on useful and reliable knowledge for purposes of production differs clearly in several respects from the DFG priority programme “Cultures of Translation in the Early Modern Period” centring on linguistics, literature studies and translation sciences, though there is no doubt about the potential for mutually beneficial collaboration.

importance of this find, and the prospects of future research focusing on a rigorous study of this manuscript as well as its origins and contexts.

b) Authors of *Kunyu gezhi*

Johann Adam Schall von Bell (App. 10, Ill. 2) was the main actor involved in the KYGZ translation. This famous missionary from Cologne was a key figure in the Jesuit China Mission during the Ming-Qing transition and hence numerous studies about various facets of his manifold activities in China exist. Besides the biography of Vāth (1933b), (1991), we have the landmark collection of Schall studies edited by Malek (1998) which contains, e.g., articles on Schall research undertaken in East and West, Schall's biography and the European, Chinese and Japanese sources and testimonies informing about his life and reputation, his religious works and actions as well as the conflict with Yang Guangxian (1597-1669), his achievements in astronomy and in the production of astronomical instruments and fire-weapons, his contemporaries and Christian friends as well as the political, philosophical and religious circumstances during his stay in China. In addition, a number of other articles written by well-known scholars about various aspects of Schall's life and deeds exist in Western and East Asian languages. They can be easily traced in the CCT-Database and also the CAJ Database and therefore need not to be enumerated here.⁵

In contrast to Schall almost no research is available on Li Tianjing, his superior in the Calendar Bureau and initiator of the translation project on the Chinese side. In Western languages, there are mainly the articles of Chen Min-sun (in Malek (1998, pp. 303-309), (2003c)) that deal with Li Tianjing as one of the main protagonists, while in Chinese there is only the biographical study of Fang Hao (1970) and Ru Liangliang's (2011) MA thesis. However, no study at all exists on the Chinese assisting Schall in the translation project, i.e. Yang Zhihua 楊之華 and Huang Hongxian 黃宏憲, well-known participants in similar Jesuit undertakings (cf. CCT-Database). Their position and status were simply too low for having been considered worthy subjects of bibliographical or other studies during their own time.

c) Text of *Taixi shuifa*

In a complementary comparison to the KYGZ, we will deal with another important technical and scientific text, the TXSF of 1612. This work was orally communicated by the Jesuit missionary Sabatino de Ursis, written down in Chinese by the famous scholar-official and Christian convert Xu Guangqi 徐光啓 (1562-1633; App. 10, Ill. 3) and revised by Li Zhizao 李之藻 (1571-1630), another well-known Christian scholar-official. Although the text of the TXSF, in contrast to the KYGZ, survived and is recurrently mentioned in the secondary literature, serious research into the origin, genesis and destiny of this work is very rare. On the Chinese side, Xu Guangtai (e.g. (2006) and (2007)), a Taiwanese expert of the history of West-East encounters in science and technology, has surveyed the systematic and theoretical explanations given in the TXSF for all kinds of water phenomena on the background of the differing correlative concepts of the Aristotelian Four Elements and the Chinese Five Phases. Zhang Baichun (1995b) has outlined the description of the three water-lifting devices introduced to the Chinese public in chapters one and two of the TXSF. In a recent interesting article, Su Yunming and Shi Yunli (2017) have shown in an experimental way that the Archimedean screw was much less effective than the traditional Chinese square-pallet-chain pump in raising water.

As for Western debates, such standard reference works as Needham and Wang (1965), Engelfriet (1996) and Jami, Engelfriet, and Blue (eds.) (2001, e.g. p. 211) do refer to the TXSF, but merely in passing or as but one of various examples of their research on heterogeneous aspects of the Jesuit transmission of Western scientific, technological and medical knowledge to Ming/Qing China. Besides the articles by Cigola (2015), focusing on the illustrations in the TXSF, and Kurtz (2012),

⁵ Due to limited space our application and application bibliography (App. 5) only contains references to the most important works or such of exemplary nature. For a comprehensive coverage of relevant secondary literature cf. App. 12.

who discusses some of the rhetorical strategies used in its prefaces in their function as legitimizing paratexts, so far the only Western research dealing in more detail with the content of the TXSF itself is Vogel (2010). In his contribution discussing concepts about the origin of salt, brine and natural gas he compares the explanations provided by traditional Western and Chinese natural philosophy in general and in the relevant parts of the TXSF in particular, elaborating on the significance of the Aristotelian theory of the Four Elements for the subject matter.

d) Authors of *Taixi shuifa*

Biographical studies about the main authors of the TXSF differ in quantitative and qualitative terms, similar to the case of the KYGZ. What for the survey on Schall is the volume edited by Malek (1998) is for research on Xu Guangqi the volume edited by Jami, Engelfriet and Blue (2001), i.e. a convenient and fundamental summary of investigations on the multifarious aspects of this most important Chinese Christian of the late Ming period. This collective volume comprises studies about Xu Guangqi's administrative career and social position, his role as statesman and statecraft scholar, the nature of his conversion to – and belief in – Christianity, his authorship of Christian treatises and texts, his attitude towards Buddhism, his contribution to the amalgamation of Western and Chinese useful and reliable knowledge⁶ (especially in the fields of astronomy, calendar-making, mathematics (translation of parts of Christopher Clavius' *Euclidis Elementorum* (1574)), and agriculture (*Nongzheng quanshu* 農政全書)), the perception of Xu in Europe, and the political, social and economic contexts in China within which Xu worked and acted.⁷ As in the case of Schall, a substantial number of other earlier and later publications exist which deal with these and other aspects of this first "Christian pillar,"⁸ among which the recent critical study of Hart (2013) deserves special mention.

The second Chinese TXSF protagonist, Li Zhizao, was likewise the subject of study for a number of Chinese and Western researchers. These contributions include older and newer biographical accounts, articles discussing Li's reasons for converting to Christianity, his views about religion, his Confucian-Christian synthesis, his interest and scholarship in mathematics as well as his role as principal collector, editor and publisher of a number of philosophical, ethical, religious, astronomical, mathematical, metrological, geographical and technical treatises composed by the Jesuits, compiled into the *Tianxue chuhan* 天學初函 (First Collectanea of Celestial Studies) of 1626, which included also the TXSF. Of special interest for us is, moreover, Li Zhizao's participation, together with Francisco Furtado S.J. (Fu Fanji 傅汎際; 1589-1653), in the composition of the *Huanyou quan* 寰有詮 (Inquiry into the Universe), a 1628 Chinese rendering of a Coimbra commentary on Aristotle's *De coelo*. Because Aristotelian theory plays a crucial role in the TXSF, and is also present in the KYGZ, we will certainly take a close look at early Jesuit texts introducing Aristotelian natural philosophy into China.⁹

In contrast to Xu Guangqi and Li Zhizao, the European key player in the TXSF episode, the Italian Jesuit Sabatino de Ursis, has barely attracted scholars' attention. Apart from some brief information available in biographical reference works (e.g. Pfister (1971) and Dehergne (1973)), so far only the biographical study of Bertuccioli (1991) can be considered a first short contribution. This scarcity of information also holds true for all the other men involved in the TXSF publication, such as authors of prefaces like Cao Yubian 曹于汴 (1558-1634) or collaborators like Yao Yongji 姚永濟 (*jinshi* of 1598).

⁶ For a definition of useful and reliable knowledge and its subdivision into propositional (i.e. a) "what" and b) "why" questions) and prescriptive knowledge (i.e. "how" questions) see Mokyr (2002), pp. 4ff.

⁷ Apart from Chinese collective volumes dedicated to Xu Guangqi the collection of articles of Giunipero (ed.) (2013) may be mentioned here. It deals with biographical matters, intercultural dimensions and Xu's Christian notions.

⁸ Relevant work can be conveniently traced in the CCT-Database and needs not to be detailed here.

⁹ For Li Zhizao as well as Aristotelian works in seventeenth-century China see the CCT-Database, on the latter topic also the recent overview article by Meynard (2017).

e) Contexts of *Kunyu gezhi* and *Taixi shuifa*

We will mention here a selected number of studies that are especially pertinent for understanding and contextualizing the scientific, technological and medical activities of the Jesuit China Mission especially during the first half of the 17th century. An important starting point is volume 1 of the *Handbook of Christianity* (Standaert (ed.) (2001a)). It contains important state of the art articles with extensive bibliographies of primary and secondary sources written by such authoritative scholars as e.g. Catherine Jami, Hashimoto Keizō, Theodore N. Foss, Giovanni Stary, Peter J. Golas, Georges Métaillé, et al. They cover science and technology in general and astronomy, calendar making, astronomical instruments, star maps and catalogues, ephemerides, solar and lunar tables, mathematics, cartography, medicine, pharmaceuticals, botany, cannons, and clocks in particular, but mining and hydrology are missing. Another, helpful and even more specialized introduction into the scientific endeavours of the China Jesuits is Benjamin A. Elman's (2005) monograph on the history of Chinese science from 1550 to 1900. Both the *Handbook* and Elman's monograph have the advantage of not only dealing with the Jesuits of the Ming (1368-1644), but also with those of the early Qing period (1644-1911), thus highlighting crucial differences between these two eras. Moreover, as an important pre-condition for understanding the scientific, technological and medical activities of the Society of Jesus, they also provide important, though – especially in the case of Elman (2005) – not always uncontroversial insights into the political, social, economic, cultural and religious aspects of the Jesuit China mission's activities from the 16th to the 18th centuries. In addition to these two reference works, the often-quoted study of Peterson (1973) about the introduction of Aristotelian natural philosophy into China during the early 17th century has to be underlined, a seminal work based on a close reading of relevant Chinese texts published by the Jesuits (Peterson (1973), pp. 295, 316). An interesting investigation on the first major European-Chinese encounter in the 17th century was recently published by Hart (2013) who tells the story of this intercivilisational relationship from the Chinese side. He stresses especially the reality of power, i.e. the dominance that the Chinese side exerted over the Jesuits, and the way by which the Chinese made use of Western knowledge for their own political, cultural and ideological agenda.¹⁰

We will certainly also take into account the recently published book of Zhang Qiong (2015) on Chinese encounters with Jesuit science in the late Ming and early Qing period. This is an in-depth exploration of the influence of the concept of a globe-shaped earth introduced by the Jesuits into China. Zhang's study systematically traces the Chinese reception of this idea in the fields of cosmology, cartography, world geography and classical studies and shows how late Ming and early Qing scholars appropriated the idea of a terraquous globe for their own ends in order to constitute China's place in the world and to reconstitute its classical tradition.

Moreover, we will closely study recent research on Wang Zheng 王徵 (1571-1644) and Johannes Schreck-Terrentius' (Deng Yuhan 鄧玉函; 1575-1630) *Qiqi tushuo* 奇器圖說 (Illustrations and Descriptions of Extraordinary Devices; 1627) about the transmission of European mechanics to 17th-century China. This work is especially important for us as – similar to the TXSF – the material for the compilation of this scientific and technical treatise was taken from a wide variety of Western sources. They are all conveniently listed in the work of Zhang Baichun, Tian Miao et al. (2008; vol. 1, pp. 84-153) and need not to be mentioned here in detail. As in the case of the KYGZ and the TXSF, the *Qiqi tushuo* is the result of a collaborative effort between a Jesuit missionary and a Chinese scholar, and it is also richly illustrated. Considering thoroughly the history of this work, the manifold origins of its sources, the nature of Sino-Western collaboration, and the reception, perception and discussion of this treatise by an informed and learned Chinese public will not only provide interesting

¹⁰ For a similar argumentation see Saussy (2001).

parallels, but also opportunities for educated guesses when confronted with missing parallel information on the TXSF and KYGZ.¹¹

Last but not least, the work of Noël Golvers on the history, origin and composition of the Jesuit missionaries' libraries in China has to be taken into account, especially his opus magnum published only recently (Golvers (2012b) (2013) (2015a)). This is insofar crucial as Golvers substantially enlarges the list of the Jesuit library holdings in comparison to the catalogue of Verhaeren (1940) and thus provides us with a much better idea about European Renaissance works available to the China Mission Jesuits for the production of the KYGZ and TXSF.

OWN PRELIMINARY WORK

- *Applicant's previous and present work on China's mining history, experience in dealing with premodern Chinese technical treatises, and research on both the KYGZ and TXSF:* See under 1.1 as well as CV and list of selected publications (App. 2). See also the applicant's translations related to the project "*China's Georgius Agricola? Wu Qijun (1789-1847) and his "Illustrated Account of the Mines and Smelters of Yunnan"*" (to be published with Brill, in progress, ca. 400 pp.) under http://www.projects.sino.uni-tuebingen.de/Depot/Vier_Dokumente.zip
- *Acquiring digital versions of both the KYGZ and TXSF:* When in April 2015 news (Han 2015b; App. 10, Ill. 4) about the rediscovery of the KYGZ in the Nanjing Library (App. 10, Ill. 5) appeared, one project member (Cao Jin) travelled to Nanjing to obtain a limited number of facsimile illustrations and to copy the complete KYGZ manuscript of over 200 pages into her computer so that we are now in the possession of a digitized and carefully checked version (App. 10, Ill. 10). A TXSF digital version is easily available on the web (App. 10, Ill. 11-12).
- *Setting up of a highly qualified core research group with Dr. Cao Jin and Sabine Kink, MA:* Both core collaborators (see CVs in App. 3 & 4) are highly qualified for the project and have a proven track-record in working together with the applicant in the production of top-level scholarly work.¹²
- *Examining in the China National Library in Beijing the DRM version used by Schall von Bell for the translation* (App. 10, Ill. 13-15).
- *Obtaining an overview of the structure and contents of both the KYGZ and the different versions of the TXSF* (App. 6 & 8).
- *Establishing a translation group within and beyond the Tübingen Sinology Section since winter term 2015/16* (see 5.3 and 5.4.1).
- *Beginning to translate* (App. 7 & 9), *and work on* (App. 15), *both the KYGZ and TXSF:* This includes the identification of European source texts.
- *Integrating the research topic into teaching, e.g. the course "History of the Jesuit China Mission, 16th to 18th Centuries."*
- *Announcing the project on a global level* (e.g. Vogel (2015; see App. 15), (Fu Hansi and Cao Jin (2016) and thus achieving the status of a **Collaborating Institution of the UNESCO Subcommittee on Research and Education, Memory of the World Programme** (App. 13).
- *Agreeing on collaborations with institutions and researchers on a national and international level.*
- *Collecting comprehensive bibliographies of primary and secondary sources* (App. 11 and 12).
- *Complementing the holdings of relevant Jesuitica in the Tübingen sinological library.*
- *Ascertaining venues for publication of the research results with Brill in the series "Monies, Markets and Finance in East Asia, 1600-1900" and "Jesuit Studies."*

¹¹ For other secondary literature on the *Qiqi tushuo* see the CCT-Database.

¹² See especially the draft of more than 600 pp. of our *Die Falschmünzerbande vom Alten Rabenhorst in Guizhou (1794) in Texten und Kontexten: Ein Lehrbuch zur chinesischen Dokumentensprache der Qing-Zeit*, to be published in 2017, made accessible to the DFG referees under:

http://www.projects.sino.uni-tuebingen.de/Depot/Muenzfaelscher_Rabenhorst_290.pdf

1.1 LIST OF PROJECT-RELATED PUBLICATIONS OF THE APPLICANT

- Pan Jixing, HUV et al., "Übersetzung und Verbreitung von Georg Agricolas 'De re metallica' im China der späten Ming-Zeit (1368-1644)," *Journal of the Economic and Social History of the Orient*, 32:153-202 (1989).
- HUV, "Georg Agricolas 'De re metallica' in China," *Schriften der Georg-Agricola-Gesellschaft*, 15:41-62 (1989a).
- HUV, "Der Kupferbergbau in der chinesischen Provinz Yunnan vom 18. bis zur Mitte des 19. Jahrhunderts: Produktion, Administration, Finanzierung," *Der Anschnitt*, 41.5:146-158 (1989b).
- HUV and E. Theisen-Vogel, "Kupfererzeugung und -handel in China und Europa, Mitte des 8. bis Mitte des 19. Jahrhunderts: Eine vergleichende Studie," *Bochumer Jahrbuch zur Ostasienforschung 1991*, 15:1-57 (1991).
- HUV, "The Transfer of Mining and Smelting Technology between Asia and Europe in the Sixteenth to Early Nineteenth Centuries," *Journal of the Japan-Netherlands Institute*, 3:74-101 (1991b).
- HUV, "The Mining Industry in Traditional China: Intra- and Intercultural Comparisons," in H. Nowotny (ed.), *Cultures of Technology and the Quest for Innovation*, New York & Oxford, 2006b, pp. 167-188.
- HUV, "Copper Smelting and Fuel Consumption in Yunnan, Eighteenth to Nineteenth Centuries," in T. Hirzel and N. Kim (eds.), *Metals, Monies, and Markets in Early Modern Societies: East Asian and Global Perspectives*, Berlin, 2008, pp. 119-170.
- HUV, "'That which Soaks and Descends becomes Salty': The Concept of Nature in Traditional Chinese Salt Production," in HUV and G. Dux (eds.), *Concepts of Nature: A Chinese-European Cross-Cultural Perspective*, Leiden, 2010, pp. 469-515.
- Fu Hansi (HUV); Cao Jin (Übers.), "*Kunyu gezhi jingxian yu shi: Agelikela De re metallica (Kuangye quanshu) 1640 nian zhongyiben*" (The Sensational Re-appearance of the *Kunyu gezhi* [Investigations of the Earth's Interior]: The 1640 Translation Manuscript of Agricola's *De re metallica*), *Aomen lishi yanjiu* (Macau Historical Studies), 14: 73-87 (2016).
- HUV, "Sensational Rediscovery of a Manuscript: The Chinese Translation of Georgius Agricolas *De re metallica* of 1640," *Academia.edu*, https://www.academia.edu/16465441/Sensational_Rediscovery_of_a_Manuscript_The_Chinese_Translation_of_Georgius_Agricolas_De_re_metallica_of_1640

2 OBJECTIVES AND WORK PROGRAMME

2.1 ANTICIPATED TOTAL DURATION OF THE PROJECT

The anticipated duration of the whole project is 36 + 12 months. The main reason for requesting for an additional 12-month support is that more time is required for the intensive intratextual and intertextual research necessary for the clarification of the at times complex syntactical and semantic problems and the historical contexts of both texts.¹³

2.2 OBJECTIVES AND METHODS

The objectives and methods to be addressed are in substantial parts identical for both Jesuit missionary translation projects, but there also exist some marked differences, which is one of the reasons why their comparison is interesting, significant, and meaningful. As customary in the humanities, a variety of methods and theories is adopted for disentangling the complexity of historical situations and developments and the intentions of actors of different political, social, economic and cultural backgrounds.

a) Importance of text-critical annotated translations and editions

One of the aims of this project is to make available complete translations of both the KYGZ and TXSF according to rigorous historical-philological principles and standards.¹⁴ It cannot be stressed enough that both the KYGZ and the TXSF are highly complex texts, not only because of their difficult technical language written in Classical Chinese, but also because they have passed through selective cut-and-paste procedures and processes of substantial hybridisation that need to be unveiled. Thus, only based on a critical translation and profound philological analysis is it possible to find out, for instance,

¹³ A more popular German translation of the KYGZ without most of the text-critical annotations will be undertaken after the termination of this project.

¹⁴ For historical-philological approaches that will also apply to other project parts, see e.g. Seiffert (1983), vol. 2, pp. 69-104.

which parts of the text and the illustrations of DRM were selected for the KYGZ and which were left out. Moreover, it can also be shown that not all translations were correct, but that ambiguities and even mistakes had crept in.¹⁵ Even more surprising is the fact that, although it is clear that DRM was the main source of information for the KYGZ, also other Western mining literature was made use of.

To be thoroughly familiar with the contents and the semantic and syntactic features of both texts by means of a precise translation is indispensable for embarking on our *crescendo* approach starting from concrete text-related problems and arriving at more abstract and comparative issues. In practice, this will be a cross-fertilizing and organic undertaking in which the progress of translation will have a growing influence on the interpretation and evaluation of the historical processes and their actors and vice versa. Hence, translation of the texts and understanding and explaining the relevant historical events will be carried out in a parallel way¹⁶ in order to make use of these mutually beneficial effects, which paradigmatically we can already amply document in our sample in App. 7.

In the case of the KYGZ the translation has by any means to be closely accompanied by a new text-critical Chinese edition. We have been invited to publish a modern Chinese edition of the KYGZ as part of a complete collection of Chinese treatises in which Schall participated as author or collaborator. Prof. Tang Kaijian, Macau, will be the main editor of this collection and will provide the edition criteria according to time-honoured high Chinese standards and conventions. A more important reason, however, is the fact that because of the many punctuation mistakes and writing errors in the KYGZ manuscript copy we cannot but establish a new text-critical Chinese edition of this text for our translation. This is clearly demonstrated in our sample in App. 7, in which the text of the original KYGZ manuscript copy and our edited version are juxtaposed. We are convinced that due to our unique combination of language skills (especially Chinese, Latin, Italian, German, Italian, English), our expertise in both European and Chinese mining history and source materials and exactly because we are translating the KYGZ into English that we are in a privileged position for carrying out this editorial work – apart from the fact that we are in the possession of a high-quality digital version of the KYGZ and will be always able to cross-check the original in Nanjing for the clarification of final specific problems.

b) Practical organisation of the text-critical annotated translations

Starting in winter 2015 we initiated the seminar “Translating Western Science, Technology and Medicine to Late Ming China,” taking place every week during the teaching period. The participants (see 5.3 and 5.4.1.) include almost all Tübingen staff members doing research on premodern China, joined by a number of PhD candidates and promising BA and MA students. In addition, Prof. Moll-Murata (Bochum) and Prof. Puente-Ballesteros (Macau) also take part in our collaborative translation effort, mostly via Skype. This translation seminar combines the linguistic and thematic expertise of a substantial number of scholars of different formation and nationality (including five Chinese), brings together senior and junior researchers, and ***represents the ideal of integrating research into teaching***. Apart from the translation of large sections of the KYGZ and TXSF undertaken by the core members of the project (Vogel, Cao, Kink) themselves, some passages are also assigned to the other participants for translation. The established procedure is as follows: Whoever is responsible for the translation of a passage has to prepare it in written form with all critical annotations and remarks included. This draft translation is distributed to the other participants a week before the respective session and is then discussed to great detail by all the participants. The assigned translator carries out corrections and revisions directly during the session so that they can be checked by the other participants via projection of the text on a screen. The product of this effort is then always checked

¹⁵ On the interesting topic of intentional misreading by translators see Liu Qingyuan and Zou Juanjuan (2011), and also Zhang Qiong (1999b), pp. 101-102, speaking of mistranslation and conscious (mis)representation.

¹⁶ See under 2.3 the “Detailed Schedule of Work Programme” indicating the progress and interlocking of both the translation and interpretation process.

once more by Mrs. Cao and Mrs. Kink as the project's core members, and eventually and unconditionally by the project applicant himself making the final revisions and decisions. Thus, although the larger translation group might somewhat change in the future, our procedure guarantees that the result will always be a highly reliable, unified and standardized translation which will have passed through different stages of rigorous cross-checking of both the source and target languages.¹⁷ Simultaneously with the translation, we started to dress up a glossary of technical terms used in both our texts which will guide us in making specific decisions concerning consistency, differentiation or ambiguity in our English renderings and can serve as a tool of reference for the investigation of similar texts. Before publication, thorough copy-editing will be carried out by a native English speaker.

c) Theoretical approach to our text-critical annotated translations

The KYGZ and TXSF constitute a specific genre of text containing mainly – though not exclusively – scientific, technological and medical information and aiming at presenting them in a logical, coherent and systematic way, as was usual for similar writings of the China Jesuit missionaries. Therefore, when translating one is confronted with challenges different from those encountered, for instance, in literature, poetry, philosophy or religion.¹⁸ Moreover, literature on industrial pursuits required special justification for writing, publishing and reading in late imperial China,¹⁹ so that conventional research results derived from Confucian, historiographical, and other text genres esteemed by the educated elites are not readily applicable to our two mainly fact-oriented texts. Among the offers made by translation theories, the historicized and contextualized approach as it is, e.g. described by Hart (2013, pp. 68-74) appears to be the most adequate method for our topic. Although we do not share Hart's fundamental scepticism about concepts of 'civilisation' and 'science,' we appreciate his placing translation into a contemporary social and micro-historical context as well as his rejection of fundamental incommensurability between Western and Eastern thought.²⁰ Another useful concept is that of 'thick translation' propagated by Martha P. Y. Cheung (2007), who likewise builds clearly on historical, cultural and linguistic contextualisation and, as a epistemological and practical strategy, adopts a kind of selective 'thick' elucidation of key terms relevant for the research topic under consideration.²¹ Moreover, Cheung's research, especially her anthologies of Chinese discourse on translation (Cheung (2014b), (2016)), provides crucial clues for contextualising the efforts of the Jesuits and their Chinese collaborators in-between the other two large translation waves, i.e. the translation of Buddhist texts from the 2nd to the 12th centuries and the translations of Western texts on science, technology and medicine in the second half of the 19th century. Because of the similarity of the text genre especially the latter wave is interesting for undertaking comparisons pointing out commonalities and differences. This will be facilitated by the availability of solid and ground-breaking research that has been undertaken by, e.g., Wright (1998) (2000) and Lackner et al. (2001) (2004).

d) Comprehensive evaluation of the texts

An adequate method and orientation pattern for this purpose is provided by text linguistics which constitutes textuality by means of seven criteria, i.e. [syntactical] cohesion, [semantic] coherence, [the author's] intention, [the recipient's] acceptability, [the text's] informativity, [the hermeneutical]

¹⁷ For samples see App. 9 from the TXSF and especially App. 7 from the KYGZ.

¹⁸ On the substantial differences in translating fictitious and factual texts especially with regard to polysemy and ambiguity see Koller (1997), pp. 272-300.

¹⁹ See Li Tianjing's explicit apologetic justification in his 1639 memorial, in Pan, Vogel et al. (1989), p. 175.

²⁰ His method implicitly contains elements of the universalistic, hermeneutic, pragmatic, and functional approach to translation. Cf. the description of the DFG priority programme "Cultures of Translation in the Early Modern Period."

²¹ In our choice of an adequate translation theory, we rely on scholars that have carried out themselves English translations of Classical Chinese texts. For a selective list of literature on translation and translation theory see section 12 in App. 12. For a warning against overtheorization and a kind of theory-induced myopia, see Fogel (2001), p. 2.

situationality, and intertextuality [i.e. the relation to other texts].²² This systematic approach, which contains elements that are also addressed below in more detail (see especially f), g), j), k) and m)), will be applied to both texts and will thus not only be instrumental for their translation, but also for our descriptive chapters dealing with text analysis in a broader sense.

e) History of editions

In the case of the KYGZ we so far are only in the possession of a later manuscript copy with a few draft illustrations included and with one chapter missing. Research has shown that another copy was still available in the 18th century (cf. Fu Hansi (2016)), but whether this or other versions can be found in the future is uncertain, though not totally excluded. Nonetheless, the fate of the KYGZ until its recent rediscovery as a manuscript copy is a theme to be investigated. A first exciting and promising finding to be noted in this respect is archival documentation proving that the KYGZ was still known and also discussed by the central government at the very beginning of the Qing period.²³ This is completely new information. Another question is whether the KYGZ was ever printed or not.

In contrast to the KYGZ, the TXSF was published and reprinted and thus enjoyed some degree of publicity not only among Chinese scholar-officials, but also in Korea and Japan. Hence, the reception of this text was more substantial and thus offers in this respect a research perspective different to the KYGZ. By means of printed reference literature and electronic databases we will be in a favourable position to trace the various TXSF editions and to clarify the scope as well as the differences between them. It is significant, for instance, that in some editions the highly theoretical fifth chapter was left out, as well as some or all of the prefaces. At any rate, the TXSF can be found not only within the book holdings of the Jesuits in the capital and the provinces, but also in the libraries of Chinese scholars, which informs us about the appreciation and popularity of this treatise.

f) Authorship and composition

This source-based project will deal with the Western and Chinese authors and compilers of the KYGZ and TXSF, stressing thus the aspect of agency of the historical protagonists and their role as cultural brokers.²⁴ Apart from providing a general biographical account of the primary and secondary actors, we will explicitly concentrate our efforts on finding information that sheds more light on the process of the composition of our two texts. While we will screen all available Chinese historiographical and archival sources that might provide data in this respect, our main hopes are pinned on missionary and church archives, especially in Rome the ARSI and Propaganda fide holdings and in Lisbon the Ajuda collection,²⁵ in search for more detailed information about the history and context of the composition of the TXSF and KYGZ.

g) Origin of Western information

We will elucidate which European texts Jesuits used for the composition of the Chinese renderings. Our starting points are Verhaeren's (1940) catalogue of the Jesuit Beitang holdings as well as work published recently by Golvers (especially id. (2012b) (2013) (2015a)) on the Jesuit libraries in China. In case of the KYGZ we will find out which parts of DRM were selected for the Chinese translation of 1638-1640. Where, how and why contents were altered and changed, which parts were completely left out, and which illustrations were chosen? The Latin edition of DRM used by Schall von Bell as a basis for his translation is now stored in the China National Library in Beijing. It contains marks and

²² For definitions and discussions of these criteria see Vater (2001), pp. 28-54 [referring mainly to De Beaugrande and Dressler (1981)].

²³ On this see a routine memorial of Sept. 1644 (Shunzhi 1/8) in the holdings of Ming-Qing archives of the Institute of History and Philology, Academia Sinica, in Taipei. Cf. App. 10, III. 18-19.

²⁴ Other fashionable, but likewise not always unproblematic terms are „go-betweeners,” „cultural mediators,” or „interlocutors.” In Standaert's (2002) five-fold methodology related to intercultural contacts these are the “transmitters,” the other analytical categories being “receivers,” “means,” “message,” and “observer.”

²⁵ Cf. on these and other holdings Brockey (2007), pp. 423-424, and especially Golvers in Standaert (ed.) (2001a), pp. 161-237.

remarks written in the hand of Schall, thus providing us with precious information on the process of selection and translation. However, our first translations have clearly shown that DRM was not the KYGZ's only source, but also Biringuccio's *De la pirotechnia* (cf. App. 7). Therefore, it would not come as a surprise that further mining and metallurgical treatises then available in China would have been consulted by Schall, such as Lazarus Ercker's (c. 1530-c. 1594) famous *Beschreibung allerfurnemisten mineralischen Erztz unnd Bergwercks* (1580).²⁶ In other words, the KYGZ which first looked like a substantially abridged version of DRM, is much more complex with regard to the origin of materials selected for its composition and rendering into Chinese.

The Western sources used for the composition of the TXSF were heterogeneous from the start. *Le diverse et artificiose machine del Capitano Agostino Ramelli* of 1588 was important, but constituted only one of them. For instance, the depictions of the Ctesibius pump and the Archimedean screw had their origin in editions of Vitruvius' *De architectura* (Cigola (2015)). Other candidates for obtaining information about hydrological phenomena and machinery might have been Jacques Besson (c. 1540-c. 1576), Giuseppe Ceredi (floruit 1567), or Vittorio Zonca (1568-1603). In contrast to the KYGZ, which so far is available only in the form of the Nanjing manuscript copy and which definitely describes industrial activities, the TXSF was re-edited time and again and thus offers us a different perspective on the Jesuit translation of useful and reliable Western knowledge into Chinese, and this, moreover, with a focus on mechanics, domestic and agricultural water management, and medicine.

h) Translation of Western terms

We will pay special attention to the problem of the translation of Western terms and concepts that were hitherto unknown in China. According to the findings of Standaert (2000, pp. 292-293, 315-316), three different approaches were relevant here: a) translation by choosing existing Chinese expressions corresponding to the Western meaning, b) transliteration of Western expressions, and c) creation of new terms (neologisms).²⁷ We may also explore Saussy's (2001) concept of "workshops of equivalences," which in his words reflects on the inevitable mediation of discourses affecting East-West cultural interactions and exchanges, and creating objects of understanding on both sides. All of this is very much facilitated by the availability of databases of digitized Chinese texts, e.g. those provided by the CrossAsia Project of the Berlin State Library.

i) Intercivilisational transmission of complex concepts and systems

We will investigate whether and, if so, to what degree complex traditional and novel Western concepts and systems were contrasted, and thus clashed, with Chinese notions or whether a kind of accommodation or hybridization took place. As to the KYGZ we will, e.g., inquire whether Schall deviated from Agricola's classic and other sources used by him in order to adapt them to the Chinese context and its dominating concepts and notions about mining and the origin of metals. How did the translators deal with Agricola's terminology and his novel concepts and ideas about mining, geology and mineralogy? In other words, what kind of tensions did exist between the innovative geological and mineralogical theories and notions of Agricola (see especially Oldroyd (1974); Halleux (1974); Norris (2006) (2007)), the Aristotelian worldview of the Jesuits, and Chinese traditional natural philosophy (e.g. *yin-yang* and Five Phases concepts)? The confrontation between the Aristotelian theory of the Four Elements and the Chinese Five Phases concept will be a prominent topic of research in the case of the TXSF as well. All this will offer invaluable insights into the Jesuits' strategies and techniques for transmitting to China useful and reliable knowledge for purposes of production.

²⁶ Not listed in Verhaeren (1940), but traced by Noël Golvers (private correspondence, March 3, 2016) in archival documents.

²⁷ For a similar, though somewhat more extended analysis related to the Protestant missionaries' translations of scientific texts in the late 19th century see Wright (1998), pp. 667-671, who offers promising data for comparative purposes.

We are aware of the fact that the introduction of Western mining, smelting and hydrological information to China took place against the backdrop of a hierarchized Renaissance classification of knowledge. This system of classification adopted by the China Jesuits has been clearly worked out in an article of Standaert's (2000), which is instrumental not only due to its clarification of this system, but also because it introduces and explains the relevant Chinese terminology created by the Jesuits which probably will also occur in both our texts. Moreover, it will be interesting to explore in which way Renaissance concepts of translation influenced the transformation of the Western reference texts into the KYGZ and TXSF.²⁸

j) Targets of the Jesuit China Mission

As is well-known, the transmission of selected parts of European science, technology and medicine to China served the higher aim – *ad majorem Dei gloriam* – to secure the Jesuit mission's position at the Chinese court and to convince Chinese rulers and elites – and then in a top-down mode also the population at large – of the superiority of Christian faith. We will therefore pay special attention to messages about Catholic creed and worldview explicitly pronounced or hidden in the KYGZ and TXSF.²⁹ Special attention will be paid to introductions and prefaces, because it is often, though not exclusively, the case that overriding intentions and concerns of the authors can be titrated from such paratexts. Already Ricci stressed the importance of having prefaces written by politically important and eminent personalities (cf. von Collani (2012), p. 49), and other Jesuits and their Chinese supporters used a number of rhetorical strategies for reinforcing legitimacy and usefulness of their works in the eyes of the educated and influential Chinese elite readers. Themes that were addressed for achieving their higher aims were historical precedents, need of integrating new knowledge, compatibility of Chinese and European knowledge, and the value attributable to useful tools and technologies (cf. Kurtz (2012)). An adequate method to be adopted in this regard is deductive or inductive qualitative content analysis, as it has been developed by Mayring (2000) and is explained, e.g. under the term 'qualitative Inhaltsanalyse,' on many social sciences research webpages.

k) Reception and perception on the Chinese side

In the process of translation it is important to explore in a hermeneutical way³⁰ how our two texts were actually read, received and perceived on the Chinese side. What was the state and level of useful and reliable knowledge about mining, geology, mineralogy, smelting as well as hydrology, mechanics and medicine in China in comparison to the contents of the KYGZ and TXSF, and to what degree was this indigenous knowledge systematized and thus constituted a specific body of knowledge? What treatises or texts on mining and hydrology did already exist in China during that period, and did in comparison to them the KYGZ and TXSF offer new approaches and novel methods, e.g., with respect to concrete instructions for actions and technical procedures? It has also to be gauged whether the TXSF was really consulted, read and commented upon, and whether it had any effect water management practices in late imperial China. A viable starting point for discussing these issues is Standaert (2000, p. 313) who points out the differences between Chinese and Jesuit concepts of sciences during the 17th century: 1) Chinese authors distinguish binary categories which despite the higher importance of Neo-Confucian *li* 理 ("principle") disciplines basically supplement each other and form a unity, while Jesuit missionaries arrange different sciences in a systematic order both in their educational system as well as in their Coimbra classification system. 2) There is relatively little "system" in the Chinese classification, whereas in the Jesuit case the order of sciences is graded and forms a unity, with theology at the summit. 3) The principal method in China is reference to the classics (*jing* 經), in the Jesuit case to logic and dialectics. 4) The leading question

²⁸ For this topic and relevant literature cf. the DFG priority programme "Cultures of Translation in the Early Modern Period."

²⁹ Mentioned for the TXSF by von Collani (2012), p. 54.

³⁰ On the importance and predicament of the hermeneutical approach in history research see Seiffert (1983), vol. 2, pp. 104ff. Hermeneutics is also relevant for most of the following paragraphs.

that is asked in China in accordance to the Confucian tradition is “Where is the Way?”, while the Jesuit system under the presupposition of Christian faith ultimately seeks an answer to the question “What is truth?”

1) Jesuit transmissions of other useful and reliable knowledge and their interpretation

We will compare systematically our research results with those obtained by other scholars in other fields of Jesuit knowledge transfer from Europe to China during the early period of globalisation. These cover such sciences and technologies as astronomy, mathematics, cartography, mechanics, clock and instrument making, medicine, surgery, pharmacology, and weaponry, but also architecture, painting, engraving and other forms of illustrations. Authors whose works will be consulted for comparative reasons include, first of all and in alphabetical order, Chu Pingyi, von Collani, Dudink, Elman, Engelfriet, Fung Kam-wing, Golas, Golvers, Halsberghe, Han Qi, Hart, Hashimoto Keizō, Huang Yilong (Huang Yinong), Jami, Kim Yong Sik, Pagani, Peterson, Puente-Ballesteros, Shi Yunli, Sivin, Standaert, Tian Miao, Waley-Cohen, Wardy, Zhang Baichun, and Zhang Qiong. From the point of view of periodisation in the transmission of Renaissance culture and knowledge to the Middle Kingdom the KYGZ and TXSF episodes fall into the flourishing “period of translations (c. 1620-c. 1630s),” in contrast to the preceding time of “spontaneous diffusion (1582-1610)” and an aftermath era of “failed attempt (1678-1683)” (Standaert (2003a)).

On a theoretical level we will link up with explanatory models that have shaped the discussion about the nature of intercivilisational encounters between Jesuit missionaries and rulers and scholar-officials on the Chinese or Manchu side. In global comparative terms, note has to be taken of the concept of ‘controlled intercultural relation’ (*kontrollierte Kulturbeziehung*) that in Bitterli’s (1986) view characterized the relatively weak position of the Europeans in China before 1800. ‘Patronage’ of Western knowledge by Chinese or Manchu power holders is another topic which is frequently discussed in recent research,³¹ going hand in hand with the concept of ‘appropriation’ and ‘monopolisation’ of Western knowledge by Chinese or Manchu rulers, officials and scholars for their own purposes or concepts (“on their own terms”).³² A further key term is ‘accommodation,’ which rather stresses not the receiver, but the giver side, i.e. efforts of the latter to accommodate to a certain extent to the demands and requirements of a new cultural and civilisational environment. For a recent definition of ‘accommodation’ within the framework of the Jesuit China Mission see von Collani (2012, p. 40), which comprises a) mission and proselytising from top down,³³ b) indirect conversion to Christianity by means of “modern” European science, technology and art, c) openness and tolerance with regard to Chinese values as long as they were considered compatible with Christian faith, d) apostolate by means of books in view of the high appreciation of the written word in Chinese elite culture, e) theory and interpretation of ancient Confucianism as a kind of primeval Christian monotheism or “natural religion,” while discarding Neo-Confucianism as a purely secular political philosophy.

Another crucial question is whether the knowledge transmitted by the Jesuits to China was outdated. For contrasting views in this respect for astronomy see Elman (2005, p. 98) whose answer is affirmative, and Peterson (1973, p. 316), who responds in the negative. Elman postulates that “the continued use of the Tychonic system in Ming and Qing China bequeathed disadvantages to the further development of astronomy in China” and that the latter would have been different if the Jesuits had introduced the Copernican system in a timely fashion. Peterson, however, is of the opinion that Jesuits had been unjustly accused of not having publishing current Western ideas in

³¹ See, e.g., Jami (2012) for mathematics and Puente-Ballesteros (2011) for medicine.

³² That the Chinese had their own sciences into which they eventually also integrated domesticated Jesuit scientific knowledge resulting in a unified hybrid construct is a pervasive argument in Elman’s (2005) book.

³³ For a contrary view see Brockey (2007), p. 287ff, who holds that emphasis on conversion from top down is questionable as the overwhelming majority of converted Chinese were of plebeian origin.

China at the beginning of the 17th century, because during that period Copernicism had made little headway in Europe and because education there, both in religious institutions and at universities, was still deeply committed to Aristotelian thought. We intend to contribute to the discussion of this question from the areas of mining, smelting and hydrology and thus from fields outside of astronomy.

m) Political, social, economic, cultural and ideological contexts

The project will pay due attention to the political, social, economic, cultural and ideological contexts in which the transmission of Western useful and reliable knowledge to China took place. This will provide us with a better understanding about the actors and institutions involved both on the European and Chinese side, the climate within which they lived and acted, and their motives and intentions. We are therefore thoroughly familiarizing ourselves not only with research on the late Ming period, but also that on the Jesuit China Mission in general, on which a rich fundus of – partly controversial – secondary literature exists, too extensive to be enumerated here.³⁴ Various authors have stressed, e.g., that favourable preconditions existed in the cultural and intellectual realm for the reception of European knowledge and teachings in late Ming China which enabled the convergence of interests between Eastern and Western actors. These were a) the syncretistic approaches by elite members towards Confucianism, Buddhism and Daoism (*san jiao he yi* 三教合一) (cf. e.g. Mungello (1999), p. 16) and b) the search for practical knowledge (“practical studies” or *shixue* 實學) held instrumental for the solution of crises in many sectors of late Ming state and society (see e.g. Elman (2005), pp. 116). Other relevant topics discussed by the scholarly community are the Jesuits’ role in the development of sciences in general as well as the Society of Jesus’ global missionary aspirations in various parts of the world during the period of early globalisation, sometimes in comparison to their activities in China.

n) Comparison with the Protestant missionaries’ translations of science, technology and medicine

Based on pertinent secondary literature we will carry out a comparison with the wave of translation of Western scientific, technological and medical knowledge to China during the second half of the 19th century. Although taking place under dramatically changed politico-historical circumstances, there are many aspects of this transmission that are suitable for exploring for commonalities and differences with the late Ming events. A convenient introduction into the theme and the secondary literature is provided by the synthesis of Elman (2005). A prominent topic is the coining of new terms in this period which has been well investigated especially by Wright (2000) and Lackner et al. (2001) (2004). Other intensively debated issues are practicalities as well as quality of the translations,³⁵ the use of terms and concepts for political and ideological ends, the evaluation of the effect of this transmission process,³⁶ the formation of modern scientific disciplines, the influence of Japan, to mention only a few.

o) Cross-civilisational comparisons in the history of early globalisation

Last but not least, our investigations into the KYGZ and the TXSF will serve as important case studies for discussions about early modernity and the history of early globalisation. While giving due space to convergences of interests between Eastern and Western actors (see under m)), we will also link up with the debate on the problem of the Great and Little Divergences (cf. Davids (2013)), that is, the question when, why, and how Europe and China drifted apart in their developmental paths (Great Divergence)³⁷ and what was the role of intracivilisational regional disparities within one civilization

³⁴ See, however, our comprehensive classified bibliography in App. 12.

³⁵ See Wright’s (1998), p. 660, interesting remark about the deficient quality of Moncrieffe’s (d. 1857) Euclid translation in comparison to the one published by Ricci.

³⁶ Wright’s (1998), p. 672-673, states that transmission of science via translation between 1840 and 1895 was a failure, but that in the longer term these translations were to feed a slowly accelerating interest in natural science.

³⁷ For one of the most recent contributions to the ongoing vibrant Great Divergence debate see Vries (2015) and the literature discussed and listed therein.

and its societies for the development and spread of technology and useful knowledge (Little Divergences). The concrete global microhistories³⁸ of the events related to our texts will be helpful in discussing and correcting the often very abstract conclusions of the grand narratives about the history of early globalisation, which are frequently based on weak empirical foundations, relying too much just on secondary literature instead, and in the case of China overstressing developments in such sciences and technologies as astronomy, mathematics, and spinning and weaving, as well as in agriculture, while neglecting conditions related to useful and reliable knowledge and practices in other fields, like industrial production. Therefore, one of our inquiries will be why the Chinese version of DRM did not have any impact on the Chinese production sector, especially not with regard to a cognitive or theoretical turn.³⁹ And was there an impact of the techniques and technologies introduced and presented by the TXSF in a novel way. In order to answer this and related comparative questions we will take recourse to a macro-sociological concept based on Árnason's (2003) "Three Ways of Worldmaking," enlarged by the applicant and his colleague George Brian Souza into the concept of the "Four Ways of Worldmaking," that is, *wealth, power, meaning, and knowledge*, which through their interactions constitute reproduction and self-production of a society (Vogel and Souza (2012)). This holistic approach theoretically and conceptually addresses both individual and collective actors and the continual process of their articulation towards the world (Knöbl (2007), pp. 101). A short outline of scope and contents of this concept must suffice here:

Wealth is defined as practices of material allocation, production and distribution of material goods that may develop into different historical systems, such as feudalism, capitalism, or industrial modes of production. Analyses of economic structures are especially fruitful with regard to the generation and utilisation of surplus, the accumulation of wealth and capital, the role of technology in production, the institutionalisation of money, and the nature of commercial networks as well as their range of extension (Árnason (2003), pp. 199-200).

Power, or more specifically, authoritative power as the relation between superiors and inferiors and with its relation to status and decision-making sway, refers to the rise and development of forms of political organisations, such as city-states, kingdoms, national states or empires. In contrast to wealth, meaning and knowledge, power is defined as a more strictly social category, tied to the field of interconnected actions, "and although its social dynamics also translate into control and conquest of the natural environment, this extra-social side can be theorized without making power synonymous with the very capacity to intervene in the course of events" (Árnason (2003), pp. 203). Yet, power, or the political sphere, is not reducible to state power, as centrifugal forces may cause fragmentation of power, wavering typologically between unity and plurality. A central theme for the exertion of political power is the legitimisation of, and recourse to, coercion and violence (see e.g. Árnason (2003), pp. 202, 209-210).

Meaning or symbolic representations are considered as a key to the constitution, self-articulation and internal differentiation of individuals and groups. These representations refer to the creation of images especially in religion, philosophy, literature and art, by which the world is construed and interpreted. This includes the social, economic, political, ideological and religious spheres, which can be defined as the institutionalized patterns of ideas and values that are involved in the structuring of social practices, but are more directly operative at the level of interpretative frameworks. In other words, meaning describes the explanation, abstraction, rationalisation, affirmation, legitimisation, and ideologisation, but – most importantly and creatively - also the criticism or negation of existing social, economic and political conditions (Árnason (2003), pp. 211 and 213).

³⁸ On this concept cf. Bosé (2006), pp. 20-23, and Andrade (2011a), pp. 573-574.

³⁹ On the theoretical turn cf. Davids (2006). It may be reminded here, that the KYGZ survived into the Qing period and was even discussed in the Qing central government just after the Manchu takeover.

Knowledge comprises both useful and reliable knowledge and science. While Árnason subsumes science under meaning and symbolic representations, the motive for this is not obvious. On the one hand, he argues that there is no reason to maintain a strict line of demarcation between ideology and science, because scientific activities and developments are imbedded in world-views or interpretive paradigms relating in turn to broader constellations of ideas. On the other hand, he postulates that the internal dynamics of culture can subvert and transcend ideological frameworks, especially in the case of art, philosophy and science. It is not that these types of knowledge represent culture in a pristine non-ideological state, but that due to their innovative and exploratory aspects they possess a potential for surplus meaning that especially resists closure (Árnason (2003), pp. 211, 213, and also 283). Given knowledge's innovative, order-threatening and revolutionary potential as well as its importance for the whole process of modernisation, it seems justified to us to treat knowledge separately from the category of meaning.

The actor-based concept of the "Four Ways of Worldmaking" will serve us as a basis for comparing similar phenomena in different civilisations in a holistic and comprehensive way. For instance, in the case of the KYGZ, it will help us to understand the substantial differences between the mining and smelting sectors in China and Europe, not only in political, economic, social, "scientific" and technical terms, but also in their cultural and ideological dimensions. In case of the TXSF this approach might elucidate the persistent social and cultural impediments to the introduction of labour-saving methods particularly in agriculture. For this purpose we will rely on a large array of secondary literature on the history of science and technology in Europe and China in general – too numerous to be listed here within the limited framework of this application.⁴⁰ Our hypothesis is that our research will show that a "world of surprising differences" – contrasting sharply with the "world of surprising resemblances" of the California School – existed both in the fields of mining (KYGZ) and hydrology (TXSF), not only in the political, economic and social realms, but also in the areas of meaning and knowledge, and this already long before 1800 or even 1750. This concerns such topics as the low legal and social status of certain crafts and craftsmen (Vogel and Theisen-Vogel (1991)), the phenomenon of "high production – low productivity" (Golas (1999b)), the large gap between those who did the work and those who wrote (Golas (1999b)), and the lack of a cognitive or theoretical turn (cf. Davids (2006)).

In conclusion, from the point of view of methodical and theoretical approaches our research will first of all concentrate on the aspect of intercivilisational encounters, because our themes imply new qualities, intensities and dimensions of exchange between the representatives of different civilisations. It will, at the same time, not shy away from undertaking transcultural comparisons of discrete forms, patterns and structures of social, political, economic and cultural phenomena in different civilisations (cf. Osterhammel (2003b)) in order to arrive at meaningful conclusions that highlight different paths of historical development in China and Europe. Eventually, it has to be particularly stressed that in stark contrast to other comparative approaches much more often than not relying almost exclusively on secondary literature, our research – while not at all neglecting this kind of references – will be firmly based on the study of primary sources originating from both of the civilisations to be compared.

2.3 WORK PROGRAMME

As tentatively outlined below, research agendas and thus chapters of the analytical book publications of the two sub-projects (Vogel/Cao Jin on KYGZ; Kink on TXSF) **are similar, though not identical.**

⁴⁰ See, however, the relevant sections in our comprehensive classified bibliography of secondary literature (App. 12).

- AAA Mining, metallurgy, mineralogy and geology *or* hydrology, water management, and medicine
- BBB KYGZ *or* TXSF
- CCC Schall von Bell *or* Sabatino de Ursis
- DDD Li Tianjing et al. *or* Xu Guangqi, Li Zhizao et al.
- EEE Cao Yubian et al.

Translating Useful and Reliable Western Knowledge in AAA to Late Ming China: The BBB

Foreword

Preface

I. Introduction

1. State of the Art
2. Research Questions
3. Sources
4. Methods and Theories

II. General Context of the Intercivilisational Encounter⁴¹

1. The Jesuit China Mission
 - a. Christianity and Proselytism
 - b. Western Sciences, Technologies and Medicine
 - c. Western Natural Philosophy: Aristotelianism
2. The Chinese Background
 - a. Political, Social and Economic Conditions
 - b. Confucianism, Buddhism and Daoism
 - c. Chinese Natural Philosophy: Cosmological and Correlative Thought

III. The History of the BBB

1. Authors, Promoters and Collaborators
 - a. The Jesuit Missionary CCC: Life, Works and Activities
 - b. Chinese Promoter and Collaborator(s) DDD: Life, Works and Activities
 - c. Chinese Preface Writers: EEE
2. Composition and Edition History
 - a. Composition
 - b. Printing⁴²
 - c. Reprints in China
 - d. Reprints in other Countries
3. Origins of the Sources of Knowledge
 - a. Western Sources
 - i. Holdings in China
 - ii. Selection of Books and Passages
 - b. Chinese Influences
4. Analysis of the Contents
 - a. Systemic Aspects
 - b. Concepts and Theories
 - c. Terminologies
 - d. Encounters
 - e. Harmonies
 - f. Hybridisation

⁴¹ Chap. II provides general background information and might only appear in one of the monographs.

⁴² The KYGZ was probably never printed so that this and the next sub-chapters only pertain to the TXSF.

- g. Clashes
- 5. Reception of BBB in China
 - a. Reception of Knowledge
 - b. Adoption of Practices
- IV. Comparison with Later Periods
 - a. Jesuit Missionaries' Treatises on AAA under the Early Qing⁴³
 - b. Protestant Missionaries' Treatises on AAA during the Late Qing
- V. The "Great Divergence" in the Light of BBB
 - 1. AAA in Europe: Power, Wealth, Knowledge and Meaning
 - 2. AAA in China: Power, Wealth, Knowledge and Meaning
- VI. Conclusions

Bibliography

Index

Detailed Schedule of Analysis and Translation Carried Out Concurrently

2018	Month 1-6	Analysis: complementing secondary literature; search for primary sources; reading secondary literature Translation: revising and finalizing prefaces of TXSF Translation: revising and finalizing prefaces and notes of KYGZ
	Month 7-12	Analysis: reading literature; drafting chap. I Translation: TXSF chap. 1 Translation: KYGZ chap. 1 Workshop Beijing, Chinesisch-Deutsches Zentrum für Wissenschaftsförderung Public relations Agricola-Forschungszentrum, Chemnitz Workshop I in Tübingen
2019	Month 1-6	Analysis: reading literature and sources; drafting chap. II.1 and II.2 Translation: TXSF chap. 2 Translation: KYGZ chap. 2a Workshop in San Francisco, Ricci Institute Sabbatical HUV (March to August)
	Month 7-12	Analysis: reading literature and sources; drafting chap. III.1, III.2 and III.3 Translation: TXSF chap. 3 Translation: KYGZ chap. 2b ICHEAS, Jeongju, Korea (July) ICAS Conference (July)
2020	Month 1-6	Analysis: reading literature; searching for, and reading of, sources; drafting chap. III.4 And III.5 Translation: TXSF chap 4 Translation: KYGZ chap. 3a <i>Studium generale I</i> in Tübingen Poster exhibition in Tübingen Public relations Deutsches Bergbau-Museum, Bochum
	Month 7-12	Analysis: reading literature; searching for, and reading of, sources; drafting chap. IV Translation: TXSF chap. 5 Translation: KYGZ chap. 3a and 3b EACS Conference (August) Public relations Georg-Agricola-Gesellschaft, Freiberg
2021	Month 1-6	Analysis and Synthesis: drafting chap. V and VI Translation: TXSF chap. 5 Translation: KYGZ chap. 3b

⁴³ This will only concern hydrology.

Workshop II in Tübingen
 AAS Conference USA (March)
Studium generale II in Tübingen
 Sabbatical HUV (March to August)
 Month 7-12 Editing: Final revisions of the analytical book manuscripts and the translation manuscripts;
 submitting manuscripts to publisher
 Public relations Deutsches Museum, Munich

2.5 OTHER INFORMATION

This project is of great national importance due to the eminence of two of the historical protagonists, i.e. Georgius Agricola, one of the most prominent scholars of the German Renaissance and considered also as the “father” of mining science, mineralogy and geology, the other Johann Adam Schall von Bell, the most influential German member in the history of the Jesuit China Mission.

....

5.3 COMPOSITION OF THE PROJECT GROUP

Almost all Tübingen staff members doing research on premodern China participate in the project, mostly as collaborators in the translation. They are joined by a number of PhD and MA candidates as well as by other students (not listed here) excelling in Classical Chinese. Our translation sessions take place every Friday, 2 to 4 pm, during the teaching period of the semester.

Staff members: Jun.-Prof. Huang Fei, Dr. Alexander Jost, Prof. Achim Mittag, Dr. Ulrich Theobald, Ailika Schinköthe MA, Anna Strob MA.

Doctoral candidates: Guo Aiting, Sebastian Demuth, Hou Yu, Sabine Kink, Edward Yong Liang.

Postdocs: Dr. Cao Jin

5.4 COOPERATION WITH OTHER RESEARCHERS

5.4.1 Researchers cooperating on this project

We intend to collaborate with numerous individual researchers and/or institutions in Germany and other countries. We distinguish between *Project and Translation Collaborators* and *Associated Researchers*, the first category being scholars who will work closely with us on certain topics related directly to the KYGZ and the TXSF, participate in the translation work and provide us with advice in other matters, the second being colleagues who work on wider contextual topics and themes.

Project and Translation Collaborators

- Prof. **Beatriz Puente-Ballesteros**, Faculty of Social Sciences, Department of History, University of Macau.
 Three-year project: “Translating Western Anatomy to Late Ming China: Convergences and Divergences in the Light of the *Taixi renshuo shuogai* 泰西人身說概 (An Outline of the Human Body from the Occident; 1643).”
- Prof. **Christine Moll-Murata**, Sektion Geschichte & Philosophie Chinas, Fakultät für Ostasienwissenschaften, Ruhr Universität Bochum.

Associated Researchers (preliminary and selective list)

- Prof. **Helmuth Albrecht**: TU Bergakademie Freiberg, Chairman of the Georg-Agricola-Gesellschaft zur Förderung der Geschichte der Naturwissenschaften und der Technik e.V.
- Dr. **Lars Bluma** (to be contacted = tbc), Prof. Dr. **Thomas Stöllner**, Deutsches Bergbau-Museum, Bochum.
- Prof. **Peter J. Golas**, Department of History, University of Denver.
- Dr. **Noël Golvers**, Sinology, Faculty of Arts, University of Leuven, and Ferdinand Verbiest Institute, Leuven.
- Prof. **Roger Hart** (tbc), College of Liberal Arts & Behavioral Sciences, History Faculty, Texas Southern University.
- Prof. **Hsu Kuang-tai** 徐光台 (tbc), History of Science and Technology, National Tsing Hua Uni., Hsinchu, Taiwan.
- Prof. **Kim Yung Sik** (tbc), Department of Asian History, Seoul National University.

- Prof. **Regine Mathias**, Sektion Geschichte Japans, Ostasienwissenschaften, Ruhr-Universität Bochum.
- Prof. **Friedrich Naumann**, Wissenschafts-, Technik- und Hochschulgeschichte, TU Chemnitz, Chairman of Agricola-Forschungszentrums Chemnitz.
- Prof. **Erich Pauer**, ehemals Japan-Zentrum, Philipps-Universität Marburg.
- Prof. **Erhard Rosner**, Sinologie, Ostasiatisches Seminar, Universität Göttingen.
- Prof. **António Vasconcelos de Saldanha**, Department of History, University of Macau.
- Dr. **Matthias Schemmel**, Max Planck Institute for the History of Science, Berlin.
- Prof. **Shi Yunli** 石云里, Department of History of Science and Scientific Archaeology, University of Science and Technology of China, Hefei.
- Prof. **Tang Kaijian** 湯開建, Department of History, University of Macau. We will contribute a critical Chinese KYGZ edition to a complete collection of Schall von Bell's Chinese treatises, edited by Prof. Tang.
- Prof. **Zhang Baichun** 张柏春, Department of History of Science and Technology in the West, Institute for the History of Natural Sciences, Chinese Academy of Sciences, Beijing.
- Prof. **Zhang Qiong** (tbc), Department of History, Wake Forest University, Winston-Salem, North Carolina.

6. APPLICATION BIBLIOGRAPHY OF SECONDARY LITERATURE

- Andrade, Tonio (2011a), "A Chinese Farmer, Two African Boys, and a Warlord: Toward a Global Microhistory," *Journal of World History* 21.4: 573-591.
- Árnason, Jóhann Páll (2003), *Civilizations in dispute: historical questions and theoretical traditions*, Leiden and Boston: Brill (International comparative social studies; 8).
- De Beaugrande, Robert and Wolfgang U. Dressler (1981), *Einführung in die Textlinguistik*, Tübingen: Niemeyer (Konzepte der Sprach- und Literaturwissenschaft; 28).
- Bertuccioli, Giuliano (1991), "Sabatino de Ursis," in Alberto M. Ghisalberti (ed.), *Dizionario Biografico degli Italiani*, vol. 39, Roma: Istituto della Enciclopedia Italiana, pp. 498-500.
- Bitterli, Urs (1986), *Alte Welt, neue Welt: Formen des europäisch-überseeischen Kulturkontakts vom 15. bis zum 18. Jahrhundert*, München: C.H. Beck.
- Bosé, Sugata (2006), *A Hundred Horizons: The Indian Ocean in the Age of Global Empire*, Cambridge Harvard University Press.
- Bray, Francesca and George Métaillé (2001), "Who was the Author of the *Nongzhen quanshu*?" in Catherine Jami et al. (ed.), *Statecraft & Intellectual Renewal in Late Ming China: The Cross-Cultural Synthesis of Xu Guangqi (1562-1633)*, Leiden: Brill, pp. 322-359.
- Brockey, Liam Matthew (2007), *Journey to the East: the Jesuit mission to China, 1579-1724*, Cambridge [Mass.] and London: Belknap Press of Harvard University Press.
- Chen Min-sun [Chen Mingsheng] 陳明生 (1998), "Johann Adam Schall, Hsü Kuang-ch'i, and Li T'ien-ching," in Roman Malek (ed.), *Western learning and Christianity in China: the contribution and impact of Johann Adam Schall von Bell, S.J. (1592-1666)*, Nettetal: Steyler, pp. 303-309.
- (2003c), "Adam Schall, Hsu Kuang-ch'i, and Li T'ien-ching," in his *Mythistory in Sino-Western contacts: Jesuit missionaries and the pillars of Chinese catholic religion*, Thunderbay: Lakehead University Library, pp. 31-36.
- Cheung, Martha P. Y. (2007), "On thick translation as a mode of cultural representation," in Dorothy Kenny and Kyongjoo Ryou (eds.), *Across Boundaries: International Perspectives on Translation Studies*, Newcastle upon Tyne: Cambridge Scholars Publishing, pp. 22-36.
- (ed.) (2014b), *An anthology of Chinese discourse on translation*, vol. 1, *From earliest times to the Buddhist Project*, New York: Routledge.
- (ed.) (2016), *An anthology of Chinese discourse on translation*, vol. 2, *From the late twelfth century to 1800*, London: Routledge.
- Cigola, Michela (2015), "Preliminary study of the work of Xu Guangqi in the technical knowledge in 17th century: from the perspective of drawing and representation," *Proceedings of 2015 IFToMM Workshop on History of Mechanism and Machine Science, May 26-28, 2015, St-Petersburg, Russia*, https://www.academia.edu/12604535/Preliminary_study_of_the_work_of_Xu_Guangqi_in_the_technical_knowledge_in_17th_century_from_the_perspective_of_drawing_and_representation (accessed March 30, 2016).
- von Collani, Claudia (2012), *Von Jesuiten, Kaisern und Kanonen: Europa und China - eine wechselvolle Geschichte*, Darmstadt: Wissenschaftliche Buchgesellschaft.
- Dauids, Karel (2006), "River Control and the Evolution of Knowledge: A Comparison Between Regions in China and Europe, c. 1400-1850," *Journal of Global History* 1: 59-79.

- (2013), *Religion, technology, and the great and little divergences: China and Europe compared, c. 700-1800*, Leiden: Brill (History of Science and Medicine Library; 32 / Knowledge Infrastructure and Knowledge Economy; 2).
- Dehergne, Joseph (1973), *Répertoire des jésuites de Chine de 1552 à 1800*, Roma: Institutum historicum S.I.; Paris: Letouzey & Ané.
- Dudink, Adrian and Nicolas Standaert (2004), "Chinese Christian Texts Database (CCT-Database)," <http://www.arts.kuleuven.be/sinology/cct> (accessed June 15, 2016).
- Elman, Benjamin A. (2005), *On their own terms: science in China, 1550-1900*, Cambridge [Mass.]: Harvard University Press.
- Engelfriet, Peter M. (1996), "Euclid in China: a survey of the historical back ground of the first Chinese translation of Euclid's Elements (Jihe yuanben, Beijing, 1607), an analysis of the translation, and a study of its influence up to 1723," Ph.D. diss., Rijksuniversität, Leiden.
- Fang Hao [Maurus] 方豪 (1970), "Li Tianjing 李天經," in his *Zhongguo tianzhujiao shi: renwu zhuan* 中國天主教史: 人物傳 (The history of Chinese Christianity: Biographies), Hong Kong: Gongjiao zhenli xuehui, pp. 16-23.
- Fogel, Joshua A. (2001), "Like Kissing Through a Handkerchief: Traduttore Traditore," *China Review International* 8.1: 1-15.
- Fu Hansi 傅汉思 [Hans Ulrich Vogel] and Cao Jin 曹晋 (transl.) (2016), "Kunyu gezhi jingxian yu shi: Agelikela *De re metallica* (Kuangye quanshu) 1640 nian zhong yiben" 《坤輿格致》惊现于世: 阿格里科拉《De re metallica》(《矿冶全书》) 1640年中译本 (The Sensational Re-appearance of the Kunyu gezhi [Investigations of the Earth's Interior]: The 1640 Translation Manuscript of Agricola's *De re metallica*), *Aomen lishi yanjiu* 澳門歷史研究 (Macau Historical Studies) 14: 73-87.
- Giunipero, Elisa (ed.) (2013), *Un cristiano alla corte dei Ming: Xu Guangqi e il dialogo interculturale tra Cina e Occidente*, Milano: Guerini e Associati (Contemporanea; 29).
- Golas, Peter J. (1995a), "Agricola in China: a little problem of translation," in Hashimoto Keizō, Catherine Jami and Lowell Skar (eds.), *East Asian science: tradition and beyond; papers from the Seventh International Conference on the History of Science in East Asia, Kyoto, 2-7 August 1993*, Osaka: Kansai University Press, pp. 91-96.
- (1999b), *Science and Civilisation in China*, vol. 5, *Chemistry and Chemical Technology*, part 13, *Mining*, Cambridge: Cambridge University Press.
- Golvers, Noël (2001), "Western Primary Sources," in Nicolas Standaert (ed.), *Handbook of Christianity in China*, vol. 1, 635-1800, Leiden: Brill, pp. 161-237.
- (2012b), *Libraries of Western learning for China: circulation of Western books between Europe and China in the Jesuit Mission (ca. 1650 - ca. 1750)*, vol. 1, *Logistics of book acquisition and circulation*, Leuven: Ferdinand Verbiest Institute K.U. Leuven (Leuven Chinese Studies; 23).
- (2013), *Libraries of Western learning for China: circulation of Western books between Europe and China in the Jesuit Mission (ca. 1650 - ca. 1750)*, vol. 2, *Formation of Jesuit libraries*, Leuven: Ferdinand Verbiest Institute K.U. Leuven (Leuven Chinese Studies; 26).
- (2015a), *Libraries of Western Learning for China: Circulation of Western Books between Europe and China in the Jesuit Mission (ca. 1650 - ca. 1750)*, vol. 3, *Of Books and Readers*, Leuven: F. Verbiest Institute (Leuven Chinese Studies; 30).
- Halleux, Robert (1974), "La nature et la formation des métaux selon Agricola et ses contemporains," *Revue d'histoire des sciences* Armand Colin 27.3: 211-222.
- Han Fengran 韩凤冉 (2015a), "Nantu cang Yan Jie jiaoben - Tang Ruowang *Kunyu gezhi* chukao" 南图藏严杰校本 - 汤若望《坤輿格致》初考 (A manuscript collated by Yan Jie and stored in the Nanjing Library: A first investigation into Adam Schall von Bell's *Kunyu gezhi*), *Zhongguo dianji yu wenhua* 中国典籍与文化 (Chinese classics and culture) 95.4: 58-64.
- (2015b), "Nantu cang Tang Ruowang *Kunyu gezhi* faxian ji" 南图藏汤若望《坤輿格致》发现记 (A note on the discovery of Adam Schall von Bell's *Kunyu gezhi* stored in the Nanjing Library), *Dongfang zaobao* 东方早报 (*Oriental Morning Post*), http://www.cssn.cn/lx/lxkj/201504/t20150426_1602535.shtml (accessed July 18, 2015).
- Hart, Roger (2013), *Imagined Civilizations: China, the West, and their First Encounter*, Baltimore: Johns Hopkins University Press.
- Jami, Catherine (2012), *The emperor's new mathematics: Western learning and imperial authority during the Kangxi Reign (1662-1722)*, Oxford: Oxford University Press.
- Jami, Catherine, Peter M. Engelfriet, and Gregory Blue (eds.) (2001), *Statecraft and intellectual renewal in late Ming China: the cross-cultural synthesis of Xu Guangqi (1562-1633)*, Leiden: Brill (Sinica Leidensia; 50).
- Knöbl, Wolfgang (2007), *Die Kontingenz der Moderne: Wege in Europa, Asien und Amerika*, Frankfurt: Campus Verlag (Theorie und Gesellschaft; 61).

- Koller, Werner (1997), *Einführung in die Übersetzungswissenschaft*, Wiesbaden: Quelle und Meyer (UTB für Wissenschaft; 819).
- Kurtz, Joachim (2012), "Framing European Technology in Seventeenth-Century China: Rhetorical Strategies in Jesuit Paratexts," in Dagmar Schäfer (ed.), *Cultures of Knowledge: Technology in Chinese History Sinica Leidensia*, Leiden: Brill, pp. 209-232.
- Lackner, Michael, Iwo Amelung, and Joachim Kurtz (eds.) (2001), *New terms for new ideas: Western knowledge and lexical change in Late Imperial China*, Leiden: Brill.
- Lackner, Michael and Natascha Vittinghoff (eds.) (2004), *Mapping meanings: the field of new learning in late Qing China; proceedings of the International Conference "Translating Western Knowledge into late Imperial, China," Göttingen University, 1999*, Leiden and Boston: Brill (Sinica Leidensia; 64).
- Liu Qingyuan 刘庆元 and Zou Juanjuan 邹娟娟 (2011), "Mingmo Qingchu keji fanyi 'wudu' xianxiang jiexi" 明末清初科技翻译'误读'现象解析 (A Study on the Misreading in the Translation of Science and Technology Texts during the Late Ming and Early Qing Periods), *Jiaying xueyuan xuebao* 嘉兴学院学报 (Journal of Jiaying University) 23: 77-81.
- Malek, Roman (ed.) (1998), *Western learning and Christianity in China: the contribution and impact of Johann Adam Schall von Bell, S.J. (1592-1666); proceedings of the International Schall Symposium, Sankt Augustin, May 1992*, 2 vols., Nettetal: Steyler (Monumenta Serica Monograph Series; 35).
- Mayring, Philipp (2000), "Qualitative Content Analysis," *Forum: Qualitative Sozial Research (Forum: Qualitative Sozialforschung)* 1. 2, https://www.ph-freiburg.de/fileadmin/dateien/fakultaet3/sozialwissenschaft/Quasus/Volltexte/2-00mayring-d_qualitativinhaltanalyse.pdf (accessed April 17, 2016).
- Meynard, Thierry (2017), "Aristotelian works in seventeenth-century China: An updated survey and new analysis," *Monumenta Serica* 65.1: 61-85.
- Mokyr, Joel (2002), *The gifts of Athena: historical origins of the knowledge economy*, Princeton and Oxford: Princeton University Press.
- Mungello, David E. (1999), *The great encounter of China and the West, 1500-1800*, Lanham: Rowman & Littlefield Publishers.
- Needham, Joseph and Wang Ling (1965), *Science and civilisation in China*, vol. 4, *Physics and Physical Technology*, part 2, *Mechanical Engineering*, Cambridge: Cambridge University Press.
- Norris, John A. (2006), "The mineral exhalation theory of metallogenesis in pre-modern mineral science," *Ambix* 53.1: 43-65.
- (2007), "Early theories of aqueous mineral genesis in the sixteenth century," *Ambix* 54.1: 69-86.
- Oldroyd, David R. (1974), "Some phlogistic mineralogical schemes, illustrative of the evolution of the concept of 'earth' in the 17th and 18th centuries," *Annals of Science* 31: 269-306.
- Osterhammel, Jürgen (2003b), *Geschichtswissenschaft jenseits des Nationalstaats: Studien zu Beziehungsgeschichte und Zivilisationsvergleich*, Göttingen: Vandenhoeck & Ruprecht.
- Pan Jixing 潘吉星 (1981), "Agelikela Kuangye quanshu zai Mingdai Zhongguo de liuchuan" 阿格里柯拉《矿冶全书》在明代中国的流传 (The spread of Agricola's *De re metallica* during the Ming period in China), *Haijiaoshi yanjiu* 海交史研究 (Research in the History of Maritime Exchanges) 3: 23-29.
- (1983), "Agelikela de Kuangye quanshu ji qi zai Mingdai Zhongguo de liuchuan" 阿格里柯拉的《矿冶全书》及其在明代中国的流传 (Agricola's *De re metallica* and its spread in China during the Ming period), *Ziran kexueshi yanjiu* 自然科学史研究 (Studies in the History of Natural Sciences) 2.1: 32-44.
- (1991), "The Spread of Georgius Agricola's *De Re Metallica* in Late Ming China," *T'oung Pao* 77.1/3: 108-118.
- (1998), "Johann Adam Schall von Bell and the spread of Georgius Agricola's *De re metallica* in late Ming China," in Roman Malek (ed.), *Western learning and Christianity in China: The contribution and impact of Johann Adam Schall von Bell, S.J. (1592-1666)* Monumenta Serica monograph series, Sankt Augustin: China-Zentrum and the Monumenta Serica Institute, pp. 675-679.
- Pan Jixing, Hans Ulrich Vogel, and Elisabeth Theisen-Vogel (1989), "Die Übersetzung und Verbreitung von Georgius Agricolae *De re metallica* im China der späten Ming-Zeit (1368-1644)," *Journal of the Economic and Social History of the Orient* 32.2: 153-202.
- Peterson, Willard J. (1973), "Western Natural Philosophy Published in Late Ming China," *Proceedings of the American Philosophical Society* 117.4: 295-322.
- Pfister, Louis (1971), *Notices biographiques et bibliographiques sur les Jésuites de l'ancienne mission de Chine: 1552-1773*, vol. 1, *XVIe & XVIIe siècles*, reprint of the edition Chang-Hai 1932 (Imprimerie de la Mission catholique), Nendeln: Kraus (Variétés sinologiques; 59).
- Puente Ballesteros, Beatriz (2011), "Jesuit Medicine at the Kangxi Court (r. 1662-1722): Imperial Networks and Patronage," *East Asian Science, Technology, and Medicine* (Special issue with Nicolas Standaert as guest editor: Encounters between Jesuits, Manchus and Chinese in Late Imperial China) 34: 86-162.

- Ru Liangliang 茹靛靛 (2011), "Mingmo Qingchu tianzhujiatou Li Tianjing yanjiu" 明末清初天主教徒李天经研究 (A study of the Catholic Li Tianjing during late Ming and early Qing), Master thesis, Ji'nan daxue 暨南大学 (Ji'nan University).
- Saussy, Haun (2001), *Great Walls of Discourse and Other Adventures in Cultural China*, Cambridge [Mass.]: Harvard University Asia Center (Harvard East Asian monographs; 212).
- Seiffert, Helmut (1983), *Einführung in die Wissenschaftstheorie*, vol. 2, *Geisteswissenschaftliche Methoden: Phänomenologie - Hermeneutik und historische Methode - Dialektik*, 8th revised and enlarged edition, München: C. H. Beck.
- Staatsbibliothek zu Berlin (Berlin State Library) (2016), "CrossAsia Database," <http://crossasia.org/> (accessed June 29, 2016).
- Standaert, Nicolas (2000), "The Classification of Sciences and the Jesuit Mission in Late Ming China," in Jan de Meyer and Peter M. Engelfriet (eds.), *Linked faiths: essays on Chinese religions and traditional culture in honor of Kristofer Schipper*, Leiden: Brill, pp. 287-317.
- (ed.) (2001a), *Handbook of Christianity in China*, vol. 1, 635-1800, Leiden: Brill (Handbuch der Orientalistik; Abteilung 4, Band 15).
- (2003a), "The transmission of Renaissance culture in seventeenth-century China," *Renaissance studies* 17.3: 367-391.
- Su Yunmeng 苏云梦 and Shi Yunli 石云里 (2017), "Longweiche ti shui xiaoneng yanjiu — jianlun Ming Qing shiqi Ouzhou longweiche yuanhe weineng qudai Zhongguo longguche" 龙尾车提水效能研究 — 兼论明清时期欧洲龙尾车缘何未能取代中国龙骨车 (A Research on the Water-lifting Efficiency of the Archimedean Screw: Why It Failed to Take the Place of the Traditional Chinese Water-lifting Device in the Ming-Qing Era), *Zhongguo nongshi* 中国农史 (Agricultural History of China) 2: 125-134.
- Tsinghua Tongfang Knowledge Network Technology Co. Ltd. (Beijing) (2014), "China Academic Journals Full-text Database (CAJ)," <http://oversea.cnki.net/kns55/brief/result.aspx?dbPrefix=CJFD> (accessed June 29, 2016).
- Vater, Heinz (2001), *Einführung in die Textlinguistik: Struktur, Thema und Referenz in Texten*, München: W. Fink.
- Väth, Alfons (1933b), *Johann Adam Schall von Bell S.J., Missionar in China, kaiserlicher Astronom und Ratgeber am Hofe von Peking 1592-1666: Ein Lebens- und Zeitbild*, Köln: Bachem (Veröffentlichungen des Rheinischen Museums in Köln; 2).
- (1991), *Johann Adam Schall von Bell S.J.: Missionar in China, kaiserlicher Astronom und Ratgeber am Hofe von Peking, 1592-1666. Ein Lebens- und Zeitbild*, reprint of the 1933 edition with an appendix and index, Nettetal: Steyler (Monumenta serica monograph series; 25).
- Verhaeren, Hubert (1940), *L'ancienne bibliothèque du Pét'ang: conférence donnée le 14 janvier 1940 à l'Université catholique en présence de son Exc. Mgr le Délégué apostolique*, Pékin: Imprimerie des Lazaristes.
- Vogel, Hans Ulrich (1989a), "Georg Agricolas *De re metallica* in China," *Schriften der Georg-Agricola-Gesellschaft* 15: 41-62.
- (2010), "'That which Soaks and Descends becomes Salty': The Concept of Nature in Traditional Chinese Salt Production," in Hans Ulrich Vogel and Günter Dux (with an overview and introduction by Mark Elvin) (eds.), *Concepts of Nature: A Chinese-European Cross-Cultural Perspective*, Leiden and Boston: Brill, pp. 469-515 (Conceptual History and Chinese Linguistics).
- (2015), "Sensational Rediscovery of a Manuscript: The Chinese Translation of Georgius Agricolas *De re metallica* of 1640," *Academia.edu*, https://www.academia.edu/16465441/Sensational_Rediscovery_of_a_Manuscript_The_Chinese_Translation_of_Georgius_Agricolae_De_re_metallica_of_1640 (accessed April 11, 2016).
- Vogel, Hans Ulrich and George Bryan Souza (2012), "The Ways of Worldmaking: New Horizons and Directions in Global History," unpublished work, Tübingen: Department of Chinese and Korean Studies, Section Sinology.
- Vogel, Hans Ulrich and Elisabeth Theisen-Vogel (1991), "Kupfererzeugung und -handel in China und Europa, Mitte des 8. bis Mitte des 19. Jahrhunderts: Eine vergleichende Studie," *Bochumer Jahrbuch zur Ostasienforschung* 15: 1-57.
- Wright, David (1998), "The Translation of Modern Western Science in Nineteenth-Century China, 1840-1895," *Isis* 89: 653-673.
- (2000), *Translating science: the transmission of Western chemistry into Late Imperial China, 1840-1900*, Leiden: Brill (Sinica Leidensia; 48).
- Xu Guangtai 徐光台 (2006), "Mingmo Qingchu xixue dui Zhongguo chuantong zhanxing qi de chongji yu fanying: yi Xiong Mingyu Ze cao, Gezhi cao wei lie" 明末清初西學對中國傳統占星氣的衝擊與反應:以熊明遇《則草》《格致草》為列 (The Encounter of Western Learning with Chinese Traditional Astrological *qi* in late Ming and Early Qing: The Example of Xiong Mingyus *Ze cao* and *Gezhi cao*), *Ji'nan shixue* 暨南史學 (Ji'nan Historical Studies) 4: 284-303.

- (2007), "Four Elements as *Ti* and five Phases as *Yong*: The Historical Development from Shao Yong's *Huangji jingshi* to Matteo Ricci's *Qiankun tiyi*," *East Asian Science, Technology, and Medicine* 27: 13-62.
- Zao Zengyou 曹增友 (1997), "Shouru *Siku quanshu* de waiguoren zhuzuo: Xiong Sanba de *Taixi shuifa*" 收入《四库全书》的外国人著作--熊三拔的《泰西水法》 (Foreigners' Writings Included in the *Siku quanshu*: The *Taixi shuifa* by Xiong Sanba), *Baike zhishi* 百科知识 (Encyclopaedic Knowledge) 12: 57f.
- Zhang Baichun 张柏春 (1995b), "Mingmo *Taixi shuifa* suo jieshao de san zhong xifang tishui jixie" 明末《泰西水法》所介绍的三种西方提水机械 (Three Kinds of Western Water-lifting Devices Introduced in the *Taixi shuifa* at the End of Ming Dynasty), *Nongye kaogu* 农业考古 (Agricultural Archeology) 3: 146-153.
- Zhang Baichun 张柏春, Tian Miao 田淼 et al. (2008), *Chuanbo yu huitong: 'Qiqi tushuo' yanjiu yu jiaozhu* 传播与会通: 《奇器图说》研究与校注 (Transmission and Integration: New Research on and Annotated Edition of the *Qiqi tushuo*), 2 vols., Nanjing: Jiangsu kexue jishu chubanshe.
- Zhang Qiong (1999b), "Demystifying Qi: The Politics of Cultural Translation and Interpretation in the Early Jesuit Mission to China," in Lydia H. Liu (ed.), *Tokens of exchange: the problem of translation in global circulations*, Durham: Duke University Press, pp. 74-106.
- (2015), *Making the New World their own: Chinese encounters with Jesuit science in the Age of Discovery*, Leiden: Brill (Scientific and Learned Cultures and their Institutions; 15).

Appendix 8: Illustrations

**Illustration 1: Photo of Prof. Pan Jixing 潘吉星,
Eminent Expert of the History of Science and Technology in China**



Source: <http://images.google.de/imgres?imgurl=http%3A%2F%2Fwww.paperhistory...> (access by 25 June 2016).

**Illustration 2: Portrait of Johann Adam Schall von Bell (1592-1666)
in the Dress of a Chinese Mandarin, 1665**



Source: Archiv des Erzbistums Köln, see <http://www.rheinische-geschichte.lvr.de/persoenlichkeiten/S/Seiten/JohannAdamSchallvonBell.aspx> (access by 2 Sept. 2015).

Illustration 3: Seventeenth-century Portrait of Xu Guangqi 徐光啓 (1562-1633)



Source: Painting of unknown artist stored in Nanjing Museum, see https://en.wikipedia.org/wiki/Xu_Guangqi (access by 2 Sept. 2015).

Illustration 4: Photo of Han Fengran 韩凤冉, ca. 2014, Discoverer of the *Kunyu gezhi* Manuscript Copy



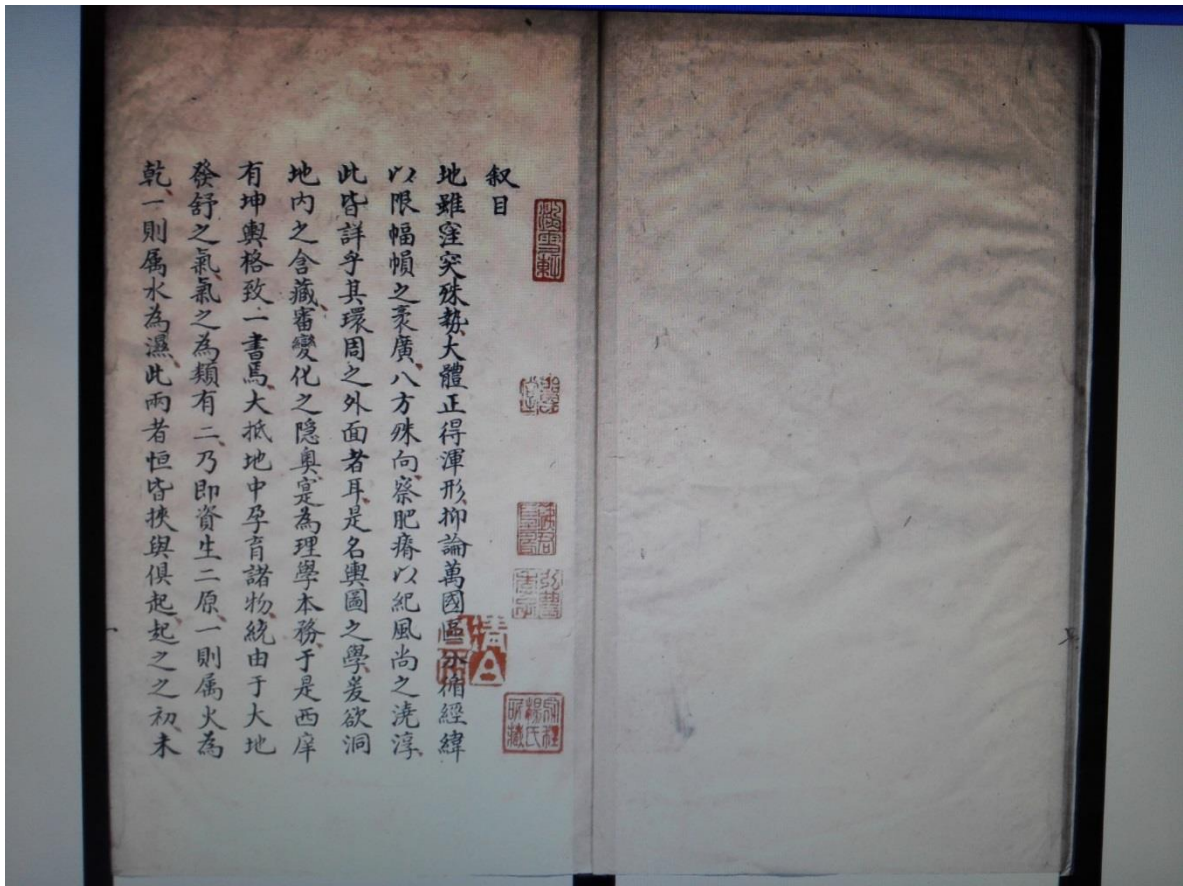
Source: <http://www.bookdao.com/editor/226258/> (access by 2 Sept. 2015).

Illustration 5: Entrance to the Nanjing Library, 2015



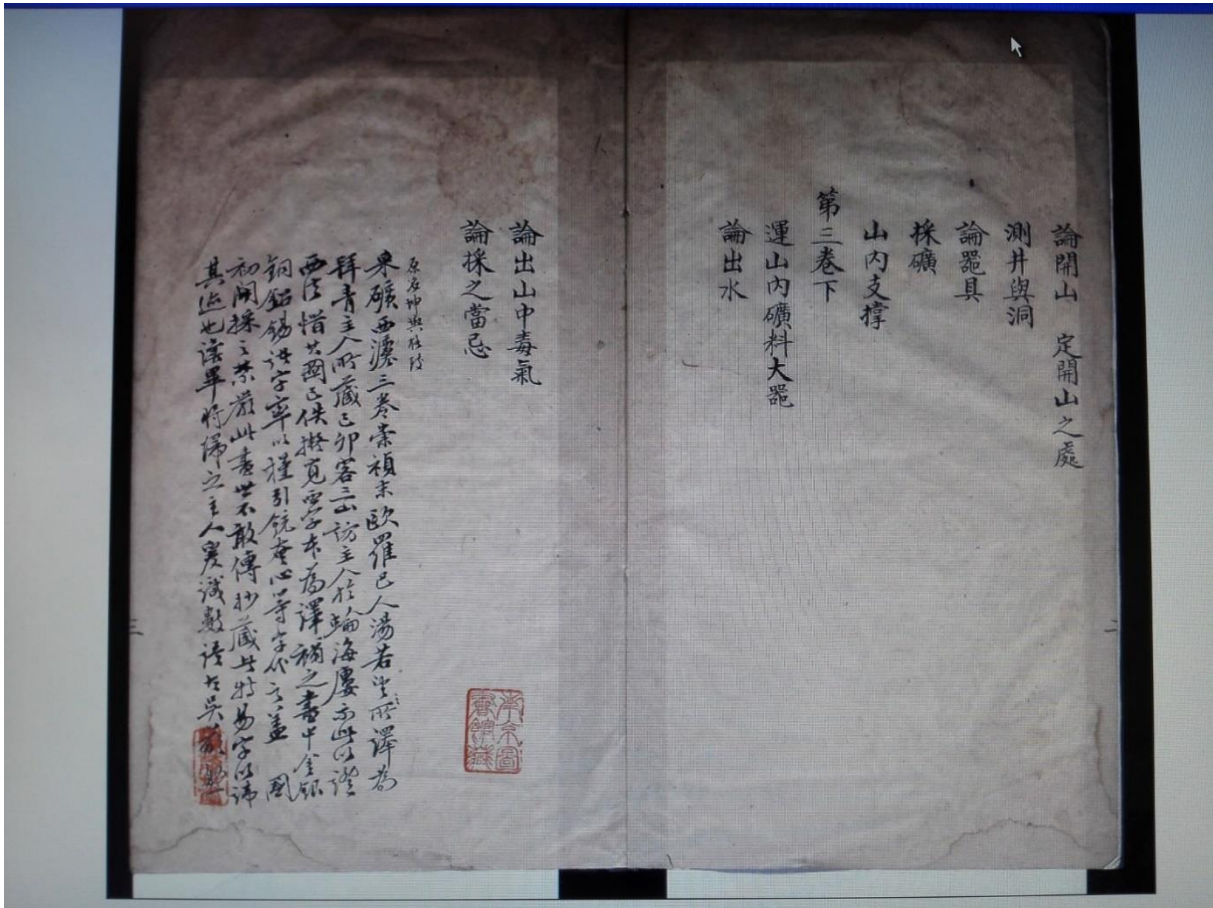
Source: Photography of Cao Jin, June 2015.

Illustration 6: *Kunyu gezhi* 坤輿格致, 1640 – Preface, with Seals of Owners of the Manuscript



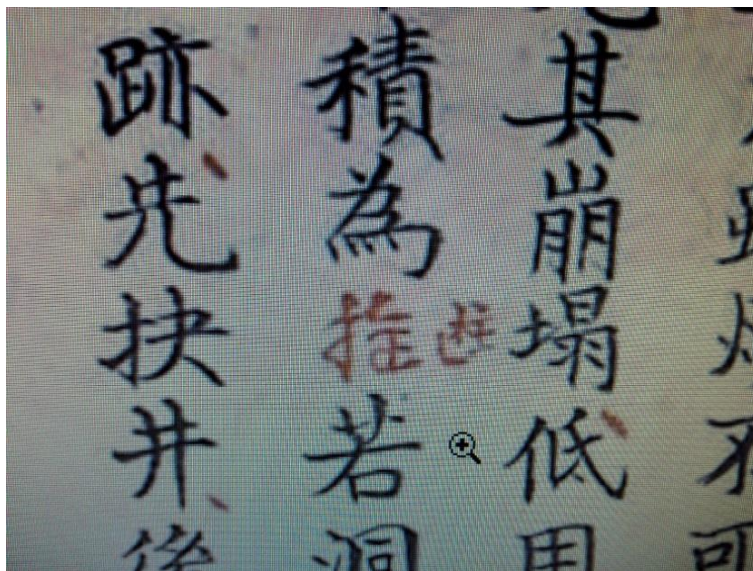
Source: Photography of Cao Jin, June 2015, by courtesy of Nanjing Library.

Illustration 7: *Kunyu gezhi*, 1640 – End of the Table of Contents, Seals, and Note Added by a Later Reader



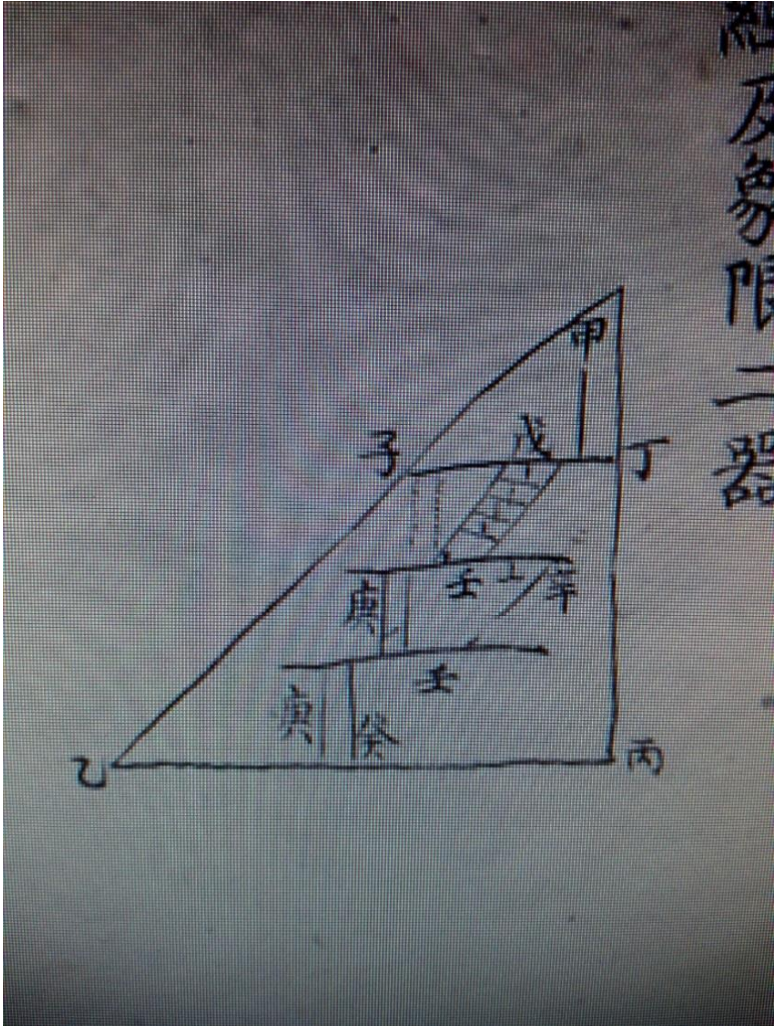
Source: Photography of Cao Jin, June 2015, by courtesy of Nanjing Library.

Illustration 8: *Kunyu gezhi*, 1640 – Detail Showing Yan Jie's 嚴杰 (1763-1843) Punctuations and Corrections Carried out in Red Ink



Source: Photography of Cao Jin, June 2015, by courtesy of Nanjing Library.

Illustration 9: *Kunyu gezhi*, 1640 – Detail Showing Geometrical Drawing Made by Hand



Source: Photography of Cao Jin, June 2015, by courtesy of Nanjing Library.

Illustration 10: Sample of Digitized Text of the *Kunyu gezhi* – Communication of Li Tianjing 李天經 (1579-1659) to the Sacrificial Office of the Ministry of Rites, Dated 1643/1644

<p>恩、已逾一載、故于進書而并及之、 崇禎十三年、六月日、奉 聖旨、這續進坤輿格致書留覽、餘著該部議覆、 回祠司手本 督修歷法李、為欽奉 上傳事、准禮部祠祭清吏手 本、稱奉 上傳李天經所奏坤輿格致一書、著輔臣傳該部、速為 議覆、欽此、移取原奏并書冊等因、到寺、竊炤坤輿格致 一書、向因蒿目時艱、未能仰佐司計一籌、乃值修歷遠 臣湯若望、簡有本國携來此書、誠有裨于國計者、遂爾 翻譯、兩次繪圖繕進、以抒仰承 皇上招徠至意、本寺爰有代獻芻蕘一疏、恭塵 御覽、以聽 聖明採擇耳、然前書譯稿無存、蓋恐好事者、竊取抄傳、 以滋弊竇、僅有西庠原本、悉屬西字、使之重譯、抑又浩 繁、未能合將進書原奏、抄白送閱、庶知開採之梗概、為</p>	<p>五</p>
---	----------

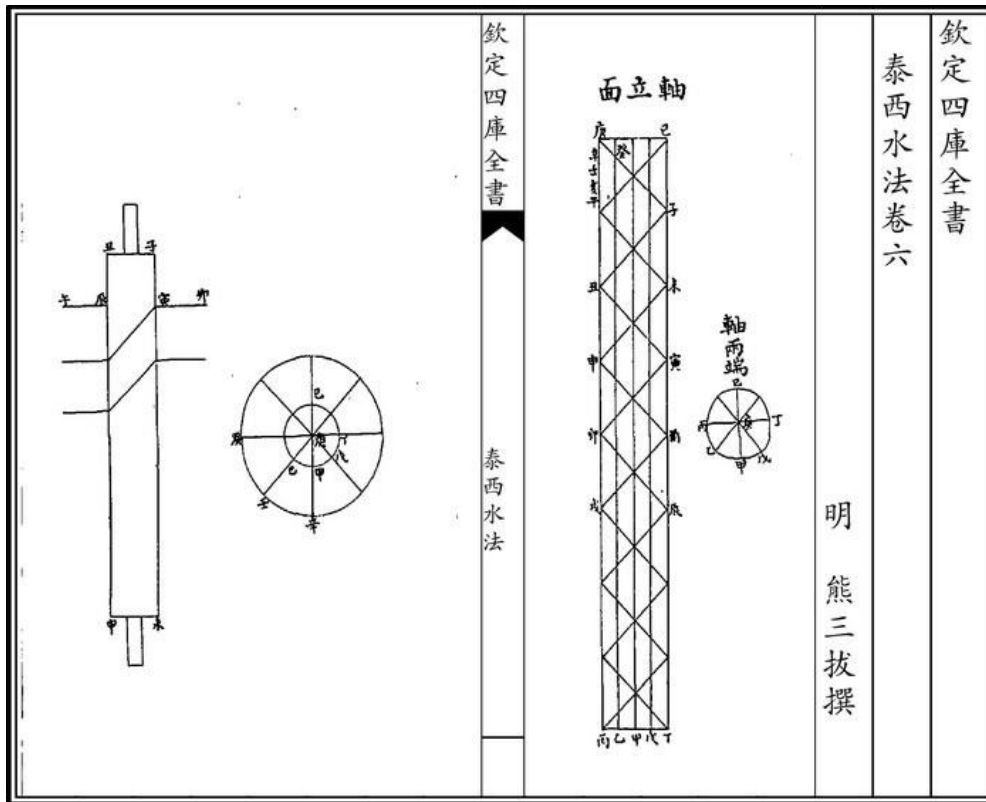
Illustra

tion 11: *Taixi shuifa* 泰西水法, 1612 – Beginning of Chapter 3 Dealing with Water Reservoirs

<p>欽定四庫全書 泰西水法 卷三 用雨雪之水 為法一種 水庫記 水庫者積水之處也澤國下地水之所都平原易野 厥田中中引河鑿井斯足用焉若乃重山複嶺陡澗 迅流乘水之急激而自上廢人用器厥利尤大矣別 有天府金城居高乘險江河溪澗境絕路殊鑿井百 尋盈車載縷時逢亢旱涓滴如珠或乃絕徼孤懸恒 須遠汲長圍久困人馬乏絕若斯之類世多有之臨 渴為謀豈有及哉計莫如恒儲雨雪之水可以御窮 而人情狃近未或先慮及其已至坐槁而已亦有依 山掘地造作塘池以為旱備而彌旬不雨已成龜坼 徒傷挹注之易窮不悟滲漏之實多矣西方諸國因 山為城者其人積水有如積穀穀防紅腐水防漏澗</p>	<p>欽定四庫全書 泰西水法 明 熊三拔 撰</p>
---	------------------------------------

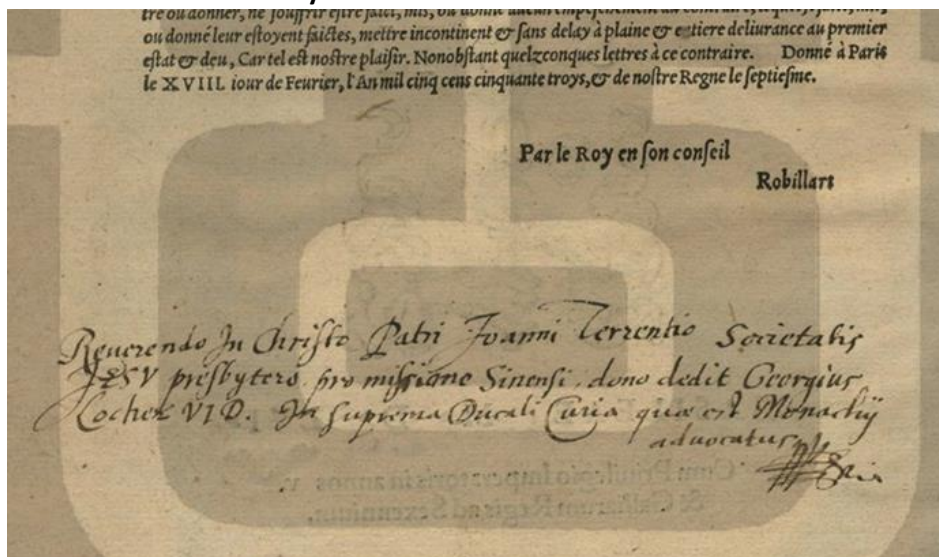
Source: *Qinding siku quanshu* edition of the *Taixi shuifa*. See, e.g., <http://ctext.org/library.pl?if=en&res=5479> (access by 2 Sept. 2015).

Illustration 12: *Taixi shuifa*, 1612 – Chapter 6 with Illustrations Showing the Archimedean Screw



Source: *Qinding siku quanshu* edition of the *Taixi shuifa*. See, e.g., <http://ctext.org/library.pl?if=en&res=5479> (access by 2 Sept. 2015).

Illustration 13: Book Dedication in the Latin *De re metallica Specimen* Used by Schall von Bell for the Translation

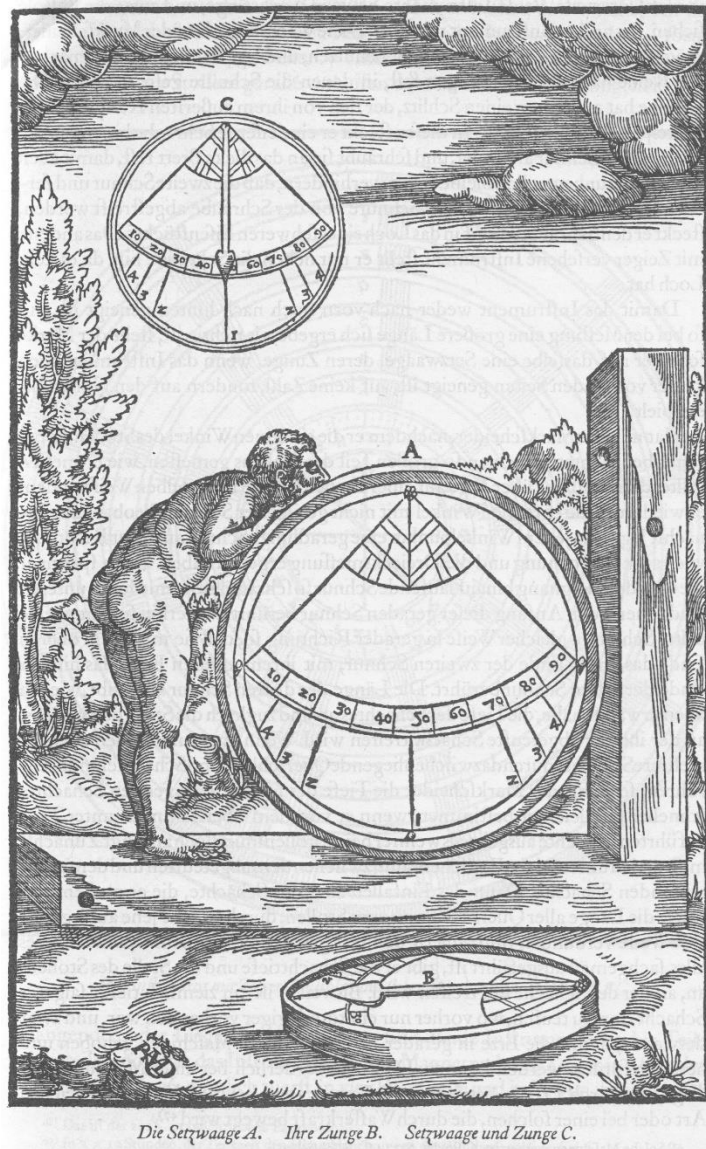


Source: Photo by Alexander Jost and Cao Jin (Sept. 2015), National Library of China.

Please note that there is not yet a copy right for this illustration.

Note: This and another dedication make clear that this specimen once belonged to [Christoph] Michael Mändl from Eissendorff, *propraetor* ("vice city judge") of Munich, who in 1617 donated it to Georgius Locher, *syndacus* ("city clerk") of Munich. Shortly thereafter, Locher presented it as a gift for the Jesuit China mission to Johann Schreck al. Terrenz, who accompanied Nicolas Trigault during his book collection tour in Europe and later, in 1618, followed him to China. Since 1696 this Agricola edition was stored in the Jesuit Beitang Library in Beijing and is now in the possession of the National Library of China.

Illustration 14: Illustration of a Mason's Level (Setzwaage) in the German Edition of *De re metallica*



Source: Georg Agricola, *Zwölf Bücher vom Berg- und Hüttenwesen ...*, edited and translated from the Latin by Carl Schiffner et al., original edition 1556, reprint of the 3rd edition, Düsseldorf: Deutscher Taschenbuch Verlag, 1977, p. 114.

Illustration 15: Illustration of a Mason's Level in the Latin *De re metallica* Specimen Used by Schall von Bell for the Translation



Source: Photo by Alexander Jost and Cao Jin (Sept. 2015), National Library of China.

Please note that there is not yet a copy right for this illustration.

Note: The naked man in the original edition is covered up by painting a trouser! This is not the only place in this specimen where naked parts of the body were reworked.

**Illustration 16: Portrait of Nicolas Trigault (1577-1628) in Chinese Dress,
Painted 1617 by Peter Paul Rubens (1577-1640)**



Source: <https://commons.wikimedia.org/wiki/File:NicolasTrigaultInChineseCostume.jpg?uselang=de> (access by 2 Sept. 2015), referring to *Heilbrunn Timeline of Art History*. New York: The Metropolitan Museum of Art, 2000–; <http://www.metmuseum.org/toah/works-of-art/1999.222> (September 2008).

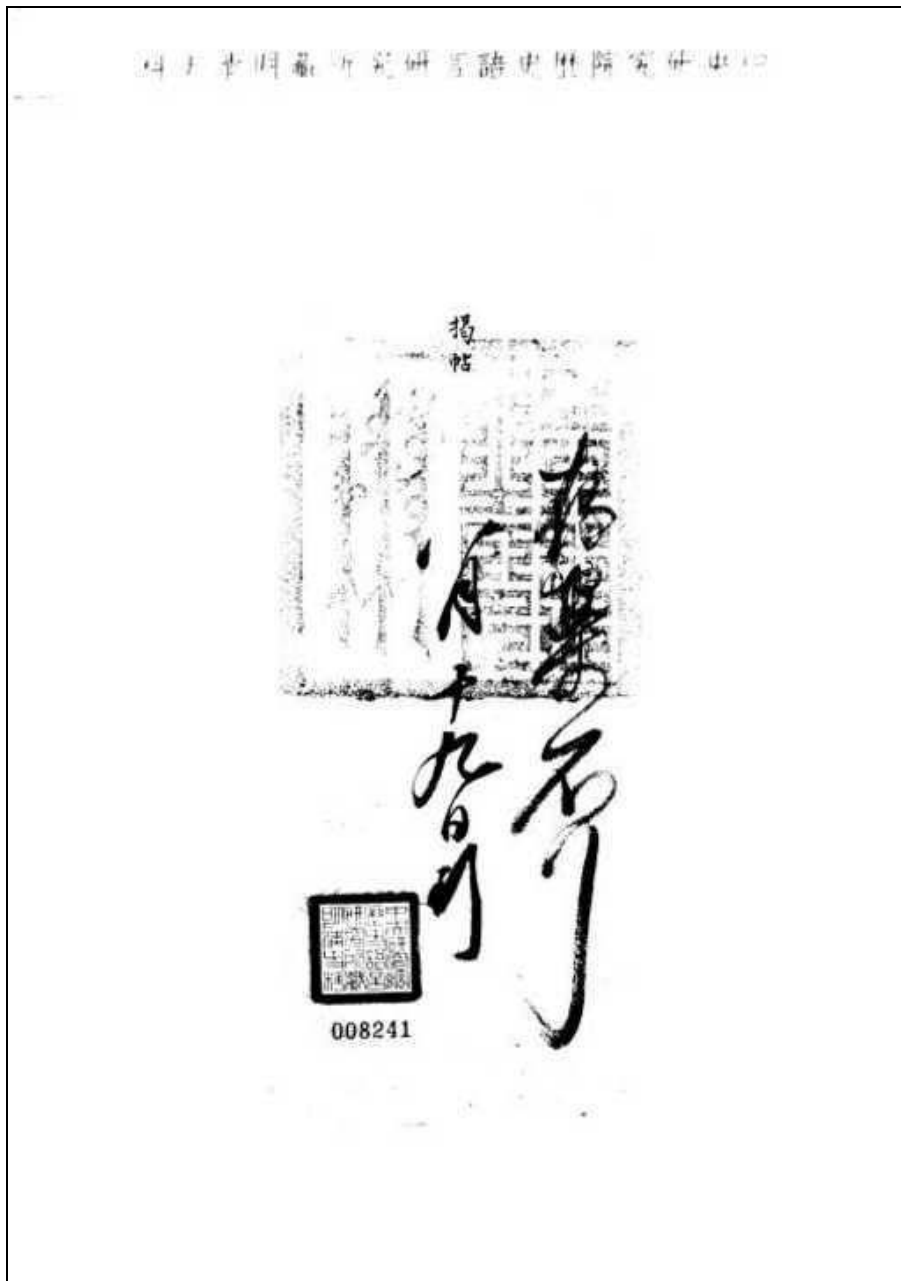
**Illustration 17: Portrait of Johannes Schreck al. Terrenz (1576-1630),
Painted 1617 by Peter Paul Rubens (1577-1640)**



Source:

http://www.schwaebische.de/cms_media/module_img/5847/2923974_1_teaser320x180_B994757346Z.1_20160508182342_000_G4B411DMF.2-0.jpg (access by 26 June 2016)

Illustration 18: Routine Memorial, Sept. 1644 (Shunzhi 1/8) – The Ministry of War on Sending the *Kunyu gezhi*, a Book from the West, to Officials for Trial (1)



Source: Ming-Qing Archives of the Institute of History and Philology, Academia Sinica, Taipei, see <http://catalog.digitalarchives.tw/item/00/26/6d/d0.html> (access by 24 May 2016)

Illustration 19: Routine Memorial, Sept. 1644 (Shunzhi 1/8) – The Ministry of War on Sending the *Kunyu gezhi*, a Book from the West, to Officials for Trial (2)

科史查明獻所究研言語史歷院究研中

兵部為恭報任內未竣之局以充鼓鑄近而不
 勞省而不費以足
 國用事職方清吏司景呈奉本部送兵科抄出成
 政標下採辦軍需都司晉守仁兵部贊畫盧士
 琦徐廉蕭鵬程啓前事本年八月十四日奉
 今旨本內西洋坤輿格致書晉守仁等果否通曉兵
 部送內院面試具答該衙門知道欵此欵遵抄部
 奉批傳送
 內院送司奉此即傳晉守仁等四員到部轉送今
 止有晉守仁盧士琦投見令行先送意呈到部
 擬令執行為此合具揭帖前赴
 內院將晉守仁盧士琦驗試施行須至揭帖者

Source: Ming-Qing Archives of the Institute of History and Philology, Academia Sinica, Taipei, see <http://catalog.digitalarchives.tw/item/00/26/6d/d0.html> (access by 24 May 2016)