Transnational Travels of the Caterpillar Fungus, 1700-1949

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Abstract

This dissertation explores the transformation of Chinese *materia medica* in the 19th- and the first half of the 20th-centuries, especially the Republican period, in a global context. It is based on a microhistory of the caterpillar fungus, a curious object and also a medicinal substance initially used by Tibetans no later than the 15th century and then assimilated into Chinese *materia medica* from the 18th century. This study first traces the transmission of specimens and knowledge of the caterpillar fungus in Chinese society and from China to France, Britain, Russia and Japan by the end of the 19th century; then it investigates the tensions and negotiations between Chinese and newly produced European knowledge about the caterpillar fungus, initially emerging in 18th- and 19th-century Europe but then shifting to communities of scientists, traditional physicians and other intellectuals in Republican China. The overall research question is that why did the caterpillar fungus attract the attention of so many different scientific communities, and how did its transnational travels impact on the making of the 20th-century Chinese *materia medica*? Drawing on Bruno Latour's discourse on the agency of objects and characterisations of modernity, this dissertation demonstrates that the caterpillar fungus stimulated people's curiosity about exotic objects and their pursuit of new medicinal substances, with itself changing from a transformable wonder in China to a scientific wonder in Europe and East Asia in transnational networks of knowledge production; in the meantime the caterpillar fungus also witnessed the powerful rhetoric of modern science. On the basis of a further analysis of changes in knowledge about Chinese medicinal substances represented by the caterpillar fungus in Republican China, I argue that the 'modern' Chinese *materia medica*, characterised by plural knowledge systems related to and in conversation with the new goal of scientification, had never been modern.

To my grandfather Lu Changjin,

who taught me to enjoy the food called the rooster’s egg.

Acknowledgements

More than three years ago I moved from Canterbury to London to study under the supervision of Dr. Vivienne Lo. At that time I encountered a bottleneck in my research, but did not know what it was. Vivienne believed my pure academic motivation, and offered me an exciting opportunity to study with distinguished teachers and students from around the world at University College London. One year later, I confirmed my resolution to be a historian rather than just a historian of science or medicine. Such a change in my mind, benefiting much from Vivienne's teaching and writings, prompted me to proceed with more wisdom and greater insight. Vivienne taught me rigorous scholarship, but also gave me much freedom to explore my academic interests. In our conversations she was quite tolerant of my obstinacies, and allowed me to express premature and sometimes even whimsical opinions. Her words and ideas, though not always comprehensible to me then and there, provided me with much inspiration. Moreover, Vivienne has been concerned with my life in the UK and China. Through Vivienne, a tireless, kind and versatile scholar of many talents, I understand more about *Great* Britain and its academic excellence. I sincerely thank Dr. Vivienne Lo for broadening my academic horizons.

Prof. Dr. Michael Heinrich, a distinguished pharmacognosist, has not only strengthened my ability to analyse historical scientific information, but has also offered me much valuable guidance on the history of European research on medicinal substances. His insightful remarks and questions, quite different from those given by historians, impelled me to think from other perspectives. Besides, at Vivienne's China Centre for Health and Humanity, I was able to learn from a variety of creative scholars including Prof. Dr. Andrew Wear, David Dear, Nancy Holroyde-Downing, Dolly Yang, Penelope Barrett and Takaki Nishiyama. Andrew's professional presentations about European medical history fascinated me. His careful corrections of and constructive comments on a chapter of my dissertation improved the quality of my dissertation. David's brilliant ideas on medicinal substances brought me inspiration. Penelope and Nancy showed me the elegance of the English language, and helped me improve my written English. Penelope gave me many valuable suggestions on my dissertation. Dolly's research and her enthusiasm about ancient therapeutic exercise added to my concerns about vanishing traditions and their marginalised positions in reality. While Takaki's interest in international laws reminded me of issues about legislation in 19th-century China. Dr.

Michael Stanley-Baker's Ph.D dissertation, though not directly related to my research topic, was an important reference for the writing of my own dissertation. Michael's use and analyses of early medieval Chinese sources always compelled my admiration. Besides, Dr. Eleanor Robson of the Department of History at UCL once generously sent me a selected list of references relating to my research. Dr. Helga Satzinger of the Department of History at UCL and Prof. Dr. Volker Scheid of the University of Westminster gave me very insightful comments on my dissertation. I am deeply appreciative of their support and encouragement. My experience at UCL, no doubt, will be one of the most wonderful memories in my life.

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Latin medical text written by a Russian physician. Now I still remember that I went out and bought a burger as soon as I was told it was free of charge. Dr. Li Nan 李楠 and Dr. Wan Fang 萬芳 (China Academy of Chinese Medical Sciences, Beijing) once gave me some key information about a few Republican Chinese articles and societies which was of significance to my research. A few other friends of mine, who wish to remain anonymous, also helped me master modern Chinese history and accurately understand Russian and French words. I owe much to these scholars and talented recluses.

When I stayed in London I often went to the SOAS Library to examine historical sources relating to my research, especially the texts written by the naturalists and missionaries who had been to late Qing and Republican China. Several times I could only find target books with the aid of enthusiastic librarians. When both I and they failed to get the books that I wanted, they would sometimes convince me of their existence in the library, and warmly remind me that they were probably hidden by some readers on other shelves for their own use. I appreciate their help and honesty. While I was in China I usually spent whole days in the Nanjing Library (Nanjing). To facilitate my use of several large collections of publications such as Republican Chinese medical journals, the Library postponed transferring them to compact storage. One of my most exciting experiences was in the Library, as I once inadvertently discovered a catalogue record of an 18th-century Chinese manuscript that I had been looking for for more than a year. Without hesitation I asked a few librarians about the manuscript. They confirmed its existence but gently declined my request for a read of it as they were uncertain if I had a philological background. Then I resorted to the curator of rare and fine ancient Chinese texts, who sympathised with my obsession with old texts and kindly made an exception in my case. I thank her for enabling me to become the first person who did a textual study of the manuscript as well as its record of the caterpillar fungus.

I would like to express my gratitude to my friend Mrs. Chen Lu 陳露 for examining a few important publications at the National Library of China (Beijing) for me. In these years I often exploited my friendship with a few people including Mrs. Chen, but never rewarded them. Hope I will not lost them in the near future. My parents always stand behind me and are proud for me to study in the UK. To allow me to focus on my research, they seldom put me to any trouble. My elder sister chose not to go to university about two decades ago, as then my parents were unable to afford two children's education. But she finally realised her university dream through her own efforts. It was through her that I knew the earthworm was also called earth dragon in Chinese medicine. My parents and sister all have considerable respect for British culture and scholarship. When they asked me what I had learnt in the UK, I often replied that I had just learnt to reflect on ‘so what’. I thank them for their support, tolerance and understanding.

Finally, I would like to thank a group of poor but optimistic children living in a mountainous area of West China. My initial dream was to be a poet, but they contributed to my effort to obtain a doctoral degree and be a real scholar. Nine years ago when I independently volunteered to teach them there, I was very much surprised at their living conditions. Although they delivered a spirit of optimism, I was pessimistic about their future. The early morning when I left the mountains, they asked me if it was because they did something wrong. At that time I did not say more but just told them I had an important thing to do. When I was in London, I often dreamed about the swords and flowers drawn in the margins of their exercise books. Now I hope that in the future I can be a help to them, as well as many others at the bottom of the society in reality and history.

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Chapter 1 Introduction

‘Earlier accounts of the historical construction of
Western science, technology, and medicine in Republican China depended on
specious claims that the Chinese sciences failed during the Ming and Qing dynasties.
The Chinese construction of modern science, medicine, and technology
on their own terms is a remarkable achievement, even if they did not initiate
the internal and external revolutions that provoked that construction.’

—— Benjamin A. Elman[1]

In the last three decades the introduction of new methodologies and perspectives related to the extensive participation of sociologists, historians and anthropologists have substantially added to the vitality of studies in the history of Chinese medicine. Previously, such studies were almost all undertaken by medical authors.[2] However, although there have been numerous studies of the history of a modern Chinese medicine,[3] there has been no critical review that can compare with those of the secondary literature on classical Chinese medicine.[4] Moreover, historians of late-19th- and early-20th-century medicine in China, generally speaking, have given insufficient attention to *materia medica* and the historical studies involved in its making. A ‘modern’ Chinese *materia medica* is often discussed together with, rather than independent of other aspects of traditional medicine in China, the latter taken to refer to the complex of acupuncture, traditional Chinese medical theories and related techniques such as massage, therapeutic movement and dietetics known globally as Traditional Chinese Medicine (TCM). According to He Bian’s recent Ph.D dissertation, medicinal substances gradually obtained their central position in Chinese medicine in late imperial

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[1] Elman 2005, p. 420.

[2] Hinrichs 1998, pp. 287-352; Yu 2003, pp. 158-168.

[3] The widely known series *The Cambridge History of China* defines the year 1800 as the beginning of the modern period in Chinese history, see Twitchett and Fairbank 1978; Twitchett and Fairbank 1980. However, Chinese historians usually prefer to use the year 1840 as the starting point of modern Chinese history, see Jiang 2002, pp. 1-8. In this dissertation, the term ‘modern’ in the Chinese context refers to the period from 1840 to 1949.

[4] Although scholars have written a few reviews involving modern Chinese medicine, they just focus on some facets such as diseases, see, for example, Pi 2006, pp. 251-278. In contrast, there are many reviews of historical studies of Qing and pre-Qing Chinese medicine, see, for example, Hinrichs 1998, pp. 287-352; Zheng 1998, pp. 152-181; Yu 2002, pp. 15-23; Di 2014, pp. 65-72. The term ‘classical’ is frequently used by Marta Hanson in her monograph on diseases in late imperial China, see, for example, Hanson 2011, pp. 11-14. Compared with terms such as ‘pre-modern’, this term gives a sense of the genealogy of Chinese medical knowledge. In this dissertation I am inclined to use the term ‘classical’ to refer to the Chinese medicine/materia medica that had not been profoundly influenced and adapted by biomedicine. But I do not abandon the use of the term ‘pre-modern/modern’ (Chinese medicine and alike) when the emphasis of my narratives is placed on different times.

China.[5] While in the first half of the 20th century, the undoubted efficacy of key Chinese medicinal substances, which embodies all the value of Chinese medicine in the eyes of many influential traditional physician and scholar commentators, has been at the heart of modern controversies between Chinese and Western medicine, and deployed in arguments on both sides of an impassioned debate about whether there is any value in TCM in China.[6] Detractors warn of its potential poisonous effects, while supporters of the use of traditional Chinese substances point to how some, like artemesia, have become modern drugs effective in the battle against high priority infectious diseases in the 21th century. These controversies also accompanied a dramatic transformation in theories about and research into Chinese *materia medica*, which did not happen spontaneously in China alone, but were closely connected to changes in the study of 'nature' in the world. This makes it impossible to study 20th- and 21th-century Chinese *materia medica* as a discrete topic in isolation both from its relationship to pharmacology in pre-modern times and to its emergence in medical practice, and debates about medical practice, abroad. Of course, there were differences between 'nature' in Chinese and European contexts. Georges Métailié's investigation of the concept of 'nature' in 16th- and 17th-century Chinese materia medica indicates that 'in the Chinese context the natural world was acculturated since the origins and presented to mankind with its 'directions for use', when on the opposite in Europe it was an open space to be discovered, its objects named and possibly used for the benefit of mankind.'[7] The concept of 'nature' (the physical world as opposed to humans or human creations) in the European context did not exist in China until it was transmitted to China through translation in the late 19th century.[8] Some historians also point out that there was not a nature generally independent of humans in pre-19th-century China; and the sense of the classical Chinese term '*bo wu* 博物', which was often associated with almost everything ranging from plants and animals to historical tales and celestial beings, did not correspond to that of the term 'natural history' in the European context.[9]

This dissertation mainly examines the transformation of Chinese *materia medica* in the 19th and the first half of the 20th centuries, especially the Republican period (1912-1949). It highlights

5 Bian 2014.
6 Chen 1935c, p. 1; Hao 2006, pp. 83, 88-93. To facilitate expression I am inclined to use the term 'traditional physicians' or 'physicians of classical medicine' rather than 'Chinese physicians' to refer to the '*zhong yi* 中醫' in this dissertation, though some of them might see themselves revolutionary, and some aspects of Chinese medicine have always been changing. See also later discussions on 'Chinese/tradition/traditional' in this chapter.
7 Métailié 2010, pp. 345-367. Cf. Elman 2002, pp. 209-232; Elman 2010, pp. 368-399.
8 Luo 1993, p. 1328; Masini [1993] 1997, pp. 102, 271; Chen 2010, pp. 103-135.
9 Foucault 1966, pp. 140-144; Yu 2015, pp. 79-83; Wu 2016, pp. 11-19; Zhu 2016, pp. 19-24.

the key importance of *materia medica* to the survival and social context of TCM. Drawing inspiration from Clifford M. Foust, Zheng Yangwen and Marta E. Hanson's studies of rhubarb, opium and snakestones, respectively,[10] I present the transformation of modern Chinese *materia medica* in global context through the biography of *dong chong xia cao* 冬蟲夏草 (the caterpillar fungus). This biography, in many ways, functions as a microhistory of the changing status of the Chinese *materia medica* in the late Qing and Republican periods. Compared with authors of previous histories of Chinese *materia medica*, I am more concerned about the origins and flows of foreign knowledge in the modern Chinese *materia medica*. This biography of the caterpillar fungus enables me to closely track specific perceptions and knowledge generated and circulated in different cultures in company with the dissemination of the Chinese medicinal substances themselves. This will throw new light on their roles in the shaping of the Chinese *materia medica*. The overall research question of this dissertation is that why did the caterpillar fungus attract the attention of so many different scientific communities, and how did its global travels impact on the making of the 20th-century Chinese *materia medica?*

To some extent this dissertation responds to Harold Cook's appeal for historical studies of the 'transmissibility' of different kinds of medical knowledge and substances and, as a corollary, it explains how certain qualities predispose a substance to travel.[11] This latter part of the question also locates my dissertation as a response to Latour who has argued that objects themselves have agency in the networks of knowledge creation.[12] The agency of objects is one of the key notions of the influential actor-network-theory (ANT) which was authored in the 1980s through collaborations between Bruno Latour, Michel Callon, and John Law in the social studies of science and technology.[13] ANT breaks down simplistic modern dichotomies between humans and nonhumans, subject and object, society and science, culture and nature, pre-modern and modern; it suggests that both humans and nonhumans can be equal actors in any transformative event. In this case nonhumans such as the caterpillar fungus are no longer passive objects but have agency to 'transform, translate, distort, and modify the meaning or the elements they are supposed to carry' in heterogeneous networks of actors, aligned by their shared interests.[14] This dissertation will reveal how the caterpillar fungus participated in the creation of scientific disciplines by inspiring

[10] Foust 1992; Zheng 2005; Hanson 2007, pp. 1-10.
[11] Cook 2007a, pp. 1-9.
[12] Latour 2005, pp. 63-86.
[13] Wessells 2007, pp. 351-356.
[14] Latour 2005, p. 39. See also Michael 2017, pp. 11-12.

mycologists to establish new categories of fungi, and pharmacologists to explore its reported medicinal efficacy in new terms. To do so it had to intrigue physicians, collectors, merchants, mycologists, entomologists, museum curators and many national institutions with its curious transformations; its secret had to speak clearly to their respective hierarchies in the new transnational commercial, political and scientific worlds with the promise of epistemologically relevant data.

My selection of the caterpillar fungus for the focus of this thesis is mainly based on the following three criteria: first, it has long been used as a medicinal substance in Chinese society. Nowadays it remains very popular, expensive and highly esteemed in and even outside China.[15] Second, it is a representative cross-cultural medicinal substance which continuously reinvents itself. Initially, more than five centuries ago, it was used by Tibetans. Two centuries later it began to be employed by traditional physicians living in central and eastern China around the course and hinterland of the two main rivers, the Yellow River and the Yangtze River, and also in the northeast, particularly Beijing. Thereafter it was then assimilated into the Chinese *materia medica*. People arriving from other places in the world, both from the East and from the West, beyond the geographic and political boundaries of China, obtained the caterpillar fungus and produced new styles of knowledge about it in their own cultures. The ensuing world picture of the history of the caterpillar fungus will help us to get to the international roots of the transformation of Chinese *materia medica*. Third, as a 'natural' object intriguing to different scientific communities concerned with the construction of knowledge and the transformation of traditions, it facilitates a nuanced discussion about the significance of changes in the wider world to the transformation of the Chinese *materia medica*. In this dissertation the caterpillar fungus, and its extraordinary ability to transform itself from one thing to quite another, is also a metaphor for the dynamic mutability of medical systems, as well as the transformation of modern Chinese *materia medica* itself.

Since the mid-20th century there have been articles and books published concerning the history of the caterpillar in China, Japan and the West. The major contribution of the East Asian secondary accounts lies in exploration, rather than interpretation, of related historical sources in different languages. For example, late twentieth-century authors Zhu Zhengang 祝振綱 (1956), Nie San 聶三 (1984) and Chen Shiyu 陳士瑜 (1991 & 1993) have discovered some accounts of the caterpillar fungus in modern and pre-modern Chinese notebooks, and literary, medical and natural history texts.

[15] For the use and sales of the caterpillar fungus in contemporary world, see Steinkraus and Whitfield 1994, pp. 235-239; Hawksworth 2003, p. 259; Tsering 2007, pp. 49-53, 72; Holliday and Cleaver 2008, pp. 219-234.

This is representative of traditional evidential scholarship and adds to those records originally gathered by Zhao Xuemin 趙學敏 (1719-1805) over two centuries ago.[16] But, as I will explain, the quality of their textual research varies.[17] Kobayashi Yoshio 小林義雄 (1986) and Okuzawa Yasumasa 奥沢康正 (2007 & 2012) offer us some finely arranged 18th- and 19th-century Japanese historical sources on the caterpillar fungus.[18] But, for our purposes, the concept of the caterpillar fungus in Okuzawa's publications is broader than that in pre-modern Chinese literature and can create misconceptions about the earlier records (see Chapter 3). In his ethnographic account of modern usage of the caterpillar fungus, Daniel Winkler gives us some historical background. He helpfully introduces and translates a 15th-century Tibetan record of the caterpillar fungus, but makes the mistake of identifying the *Ben cao bei yao* 本草備要 (Essentials of Materia Medica) as the earliest extant Chinese record of the caterpillar fungus.[19] In her study of the exoticism demonstrated in Zhao Xuemin's extension of Li Shizhen's 李時珍 (1518-1593) *materia medica*, Carla Nappi introduces quite a few historical European and Chinese records of the caterpillar fungus, but also introduces some inaccuracies in her narrative.[20] In contrast, Bhushan Shrestha and his colleagues provide a relatively extensive and very accurate survey of historical European scientific records of the caterpillar fungus, but their attention is mainly devoted to the scientific naming of the caterpillar fungus.[21] Overall, with the exception of Nappi's attempts to identify a central Asian origin for the caterpillar fungus, existing historical studies involving the caterpillar fungus largely neglect to investigate the social and cultural contexts of related historical sources; and few efforts have been made to establish correlations among the historical narratives of the caterpillar fungus across different cultures; moreover, many multi-linguistic historical sources about the caterpillar fungus have not yet been unveiled to a modern audience and analysed by historians. Before carrying out this

[16] Zhao [*c*. 1803] 1983, pp. 138-139; Zhu 1956, pp. 43-44; Nie 1984, pp. 42-43; Chen 1991, pp. 45-46; Chen 1993, pp. 7-8. A few authors have also published their histories of the caterpillar fungus despite the lack of new historical sources and opinions, see, for example, Chen 1993, pp. 161-163; Jiang 1993, pp. 29-30.

[17] For example, Zhu Zhengang mistakenly states that the text *Gu wang ting zhi* 姑妄聽之 (Just Listen to It, 1793) contains a record of the caterpillar fungus, Cf. Ji [1789-1798] 1994, pp. 356-469. Chen Shiyu claims that the poems about the caterpillar fungus quoted in his articles were composed in the Ming dynasty. But actually none of them were Ming poems. In contrast, Nie San refutes a false statement that the Ming physician Li Shizhen 李時珍 (1518-1593) had recorded the caterpillar fungus.

[18] Kobayashi 1986, pp. 62-66; Okuzawa 2007, pp. 178-179; Okuzawa 2012, pp. 39-246. In one of Kobayashi's notes to the sources, he mistakes the year '*kyou ho ki yuu* 享保己酉' (i.e. 1729) for 1728.

[19] Winkler 2008a, pp. 1-47; Winkler 2009, pp. 291-316. The caterpillar fungus was not first recorded in the *Ben cao bei yao*, see Chapter 2.

[20] Nappi 2009, pp. 141-148, 201-202. For example, Nappi neglects Dominicus Parennin's (1665-1741) record of the caterpillar fungus but considers Reaumur the first (European) person who mentioned the caterpillar fungus; she dates the *Si chuan tong zhi* [of the Yongzheng reign] to 1731, but actually it was compiled during the period 1733-1735, and printed in 1736; she says that the caterpillar fungus 'was found on snowy mountains in central Asia', but no information about 'central Asia' can be found in Zhao's record, see Chapter 2 & 3.

[21] Shrestha *et al.* 2010, pp. 228-236.

study, it is therefore necessary to survey the historiography of studies of the modernisation of Chinese medicine and *materia medica*, examining relevant theoretical approaches that scholars have taken to the subject, and to the transmission of Euro-American medicine and *materia medica* to 19th- and 20th-century China.

1.1 Historical Studies of Chinese Medicine

Historians of Chinese medicine generally consider Chen Bangxian's 陳邦賢 (1889-1976) monograph *Zhong guo yi xue shi* 中國醫學史 (History of Chinese Medicine), finalised in 1919 and printed the following year, the first general history of Chinese medicine as well as a watershed in the establishment of medical history as a distinct branch of the study of medicine in Republican China.[22] And from 1929 onward some Chinese higher education institutions also began to offer courses on the history of medicine.[23] From Chen's preface, introduction and the content of his monograph, it is clear that he was writing a progressive, positivist history, which would underpin and legitimate his vision of the future of Chinese medicine and the possibility that it could become a part of a scientific modernity. His idea did not change in his revision of the monograph, which was finalised in 1936 and published the following year. Probably due to Japanese encroachment into China before 1936, and the threat of invasion, Chen added explicitly that one of the purposes of his revision was to revive the Chinese nation. Saving Chinese medicine was tantamount to saving China.[24] Throughout the 1920s and 30s histories of Chinese medicine written in Chinese or in foreign languages, from different perspectives and in different styles, came out one after another: German physician Franz Hübotter's *Die Chinesische Medizin zu Beginn des XX. Jahrhunderts und ihr Historischer Entwicklungsgang* (1929), Ryou Atsuhito's 廖温仁 *Shi na chuu sei i gaku shi* 支那中世医学史 (History of Medieval Chinese Medicine, 1931), K. Chimin Wong and Wu Lien-Teh's *History of Chinese Medicine* (1932), and Tao Chisun's 陶熾孫 *Zhong guo yi xue shi* 中國醫學史 (History of

[22] Zhang 2008, pp. 9-18. Chen Bangxian explicitly expressed his idea about history of medicine as an individual branch of medicine, see Chen 1920, p. 3. Some sections of Chen's monograph originated from his twelve articles published in 1914-1915, see Chen 2014, pp. 35-52. There had been books or articles on the history of Chinese medicine printed before 1919, see, for example, Li [1513] 2002; ZGZYYJYZGYSWXYJS 1989, pp. 27-29; Xue 2007, p. 871. But their influence on studies in the history of Chinese medicine since modern times has not been as profound as Chen's monograph.

[23] Zhang 2007, pp. 432-439.

[24] Chen [1920] 1937, p. 1.

Chinese Medicine, 1933).[25] These works, no doubt, enriched existing translations of Chinese medical texts that had begun with the Jesuits. And there is no doubt that various aspects of China's encounter with a new tradition of medicine served to bring about a crisis of self-identification which stimulated most of these publications. They also facilitated the circulation of classical Chinese medical knowledge and ideas throughout different cultures in East Asia and Europe, as well as increasing the potential interactions of Chinese medical with other medical systems and traditions.

In the first half of the 20th century, a variety of professional societies, journals and museums devoted to the history of Chinese medicine significantly promoted related academic research, communication and education. For example, the *Zhong hua yi xue hui yi shi wei yuan hui* 中華醫學會醫史委員會 (Committee on the History of Medicine, Chinese Medical Association), established by Wu Lien-Teh, K. Chimin Wong *et al*. in 1935, was the predecessor of the present *Zhong hua yi xue hui yi shi xue fen hui* 中華醫學會醫史學分會 (Society of Medical History for Chinese Medical Association).[26] It published five Chinese and four English special issues on medical history through the journal *Zhong hua yi xue za zhi* 中華醫學雜誌 (The National Medical Journal of China) in 1936. Furthermore, it also launched the journal *Yi shi za zhi* 醫史雜誌 (The Chinese Journal of Medical History) in March, 1947, which accepted both English and Chinese articles, and eventually evolved into the current journal *Zhong hua yi shi za zhi* 中華醫史雜誌 (Chinese Journal of Medical History).[27] K. Chimin Wong also founded the *Zhong hua yi xue hui yi shi bo wu guan* 中華醫學會醫史博物館 (Museum of Medical History, Chinese Medical Association) with the aid of Wu Lien-Teh and some others in 1938.[28] These activities indicated a rise in attention to the history of Chinese medicine and related research in Republican China. And an important factor that led to this phenomenon was a surge in Chinese scholars' nationalist sentiments in the face of the transformation of the early-20th-century academic world and to the political uncertainties of the time.[29] Many of the authors and participants in these societies were trained in scientific developments of medicine, biology and chemistry, and naturally their writing reflects the priorities they had learnt in that

[25] Hübotter 1929; Ryou 1931; Wong and Wu [1932] 1936; Tao 1933. The original Chinese title for Hübotter's book was '*Zhong hua yi xue* 中華醫學' (literally Chinese medicine).

[26] Li and Deng 1989, pp. 94-96.

[27] Zhu 1996, pp. 137-146; Yang *et al*. 2014, pp. 453-455. There was another Republican journal entitled *Guo yi wen xian* 國醫文獻 (National medical literature). It was established in 1936, and devoted to research on classical Chinese medical literature. But it was discontinued after the publication of two issues, see SHZYXYYSBWG 1965, p. 76. Therefore its influence on the study of the history of Chinese medicine was not comparable to the *Yi shi za zhi*.

[28] Fu 1989, pp. 73-76.

[29] It can be seen from the two histories of Chinese medicine written by Chen Bangxian, and K. Chimin Wong and Wu Lien-Teh. Cf. Chen 2006, pp. 53-55; Wang 2014, pp. 340-342.

process; their work, and especially how they integrated their perceptions of the past with the presentist agenda deserves more detailed analysis.[30] Overall, there were some groundbreaking efforts at that time, although retrospectively they are insufficient in their attention to the deeper social and cultural contexts of history. As historians today we are concerned to achieve a richer historical observation, but equally are interested in how those observations make sense in a postmodern world.

Since the second half of the 20th century, especially from the 1980s, there have been substantial studies of Chinese medical history, which tackle a variety of subjects including changing medical theories, specialties, medical technology, key figures in the development of Chinese medicine, its education, management and policies, Sino-Foreign medical exchange. These have been produced in very specialised studies, for example of the medical content of manuscripts excavated from Han tombs, as well as in diachronic compilations of general histories of a medicine that arguably spans thousands of years.[31] Meanwhile, since the beginning of the 21st century growing attention has been paid to the making of modern Chinese medicine in academic communities around the world, and this has led to the publication of many insightful works. For example, Bridie Minehan examines the scientisation of Chinese medicine in the late Qing and early twentieth century, showing how this process involved great flexibility with both scholars and practitioners adapting their work in response to the practices of missionary medicine, perceptions of modern science and in particular the impact of the Japanese medical reforms.[32] Similarly, Sean Hsiang-Lin Lei demonstrates how scientific knowledge and practice, together with associated discourses of modernity, impacted on the study of traditional pharmacology and ensured its survival into the twentieth century as a credible living tradition.[33] Both these studies challenge the notion that there was a radical break at that time consistent with the coming of a modern medicine, and this observation is a premise that I will carry forward into my analysis. With respect to case studies, Ruth Rogaski focuses on the treaty port of Tianjin and a significant change in the meaning of the classical Chinese term '*wei sheng* 衛生' (guarding life/hygiene) in modern times. She explores the Chinese intellectual elite's reflections on the body, public hygiene and national sovereignty and related social mobilisation in the pursuit of a

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[30] On this point, there has been only one general but preliminary study, see Geng 2015. In contrast, there have been a few case studies relevant to modern Chinese historical research on Chinese medicine, see, for example, Pi 2013, pp. 159-185.
[31] For an outline of Chinese and Western historical studies of Chinese medicine in the 20th century, see Li and Zhang 1996, pp. 129-136; Zhou 2001, pp. 1-12; Unschuld 2003, pp. 1-11.
[32] Minehan 2009, pp. 159-188; Minehan 2014, pp. 69-88.
[33] Lei 2014.

national modernity.[34] Her identification of the importance of institutions in the cross-cultural dissemination of ideas about modernity has trained my attention on universities and schools as a site of significant mediation.

Examining the ensuring decades, John R. Watt pays attention to the Chinese Communist and Nationalist parties' varied efforts at establishing public hygiene and medical care in wartime China, and analyses the key role of political will in the establishment of the modern healthcare system on the basis of biomedicine.[35] At the level of national administration, Zhang Daqing 張大慶 unveils the establishment of a new-style healthcare system, and the revolution in social mechanisms for responding to diseases during the period 1912-1937.[36] While Wen Xiang 文庠, borrowing Yang Nianqun's 楊念群 insight into conflicts that emerged between modern Chinese and Western medicine at the level of the social and political construction of the body, and its healers, also attaches importance to the state administration of Chinese medicine.[37] She finds that even though Chinese medical practitioners were restrained by, and unable to totally adjust to new modern medical administrative systems, they actively sought to acquire equality with doctors trained in the new sciences, and successfully occupied certain influential social spaces.[38] Compared with the above authors, Hu Cheng 胡成 reflects the late twentieth century shift away from studying only the intellectual and political elite towards subaltern studies. Through rich case studies he gives in-depth analyses of the complex and dynamic social conditions of medical services and hygiene, from the bottom up, before the full-scale outbreak of the Sino-Japanese War.[39] Volker Scheid's long-term investigation of the Menghe tradition of medical learning also analyses the efforts made by practitioners to adapt and innovate within their families and social networks in China from late imperial times in order to survive in the face of a powerful challenge from new institutionalisation of medicine and science backed by government.[40] His research represents a continuity in the transmission of ancient and pre-modern medical knowledge into modern China, but does not focus on medicinal substances. These representative studies, whether seen from their theoretical approaches or from their discoveries and interpretation of historical materials, have all been inspirational indeed.

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34 Rogaski 2004.
35 Watt 2013.
36 Zhang 2006.
37 Yang 2006.
38 Wen 2007.
39 Hu 2013.
40 Scheid 2007.

Generally speaking, since the 1990s, the participation of historians and the application of European and American historical theories and approaches have significantly expanded the horizon and depth of studies of Chinese medical history, especially the history of diseases.[41] The historical products stimulated by these new studies were certainly not identical. Scholars from the historical community are relatively more inclined to place emphasis on the sociology, culture or politics of modern or pre-modern Chinese medicine. And sometimes medicine is only treated a means of observing imperial and Republican Chinese societies.[42] Zheng Jinsheng 鄭金生 and Li Jianmin 李建民 characterise these studies as '*wai shi* 外史' (externalist histories), while those focusing on medical knowledge and ideas are defined as '*nei shi* 内史' (internalist histories).[43] A similar binary in related historical writing was popularised first in the field of the history of science, and can be traced to Robert K. Merton's social studies of science of the 1930s. However, by the late 1950s and early 1960s, historical research into both science and medicine became more eclectic; and since the beginning of the 1990s the externalism-internalism binary has been less commonly mentioned by historians of science.[44] Indeed, as stated by the historian of Chinese science, Nathan Sivin, such 'a dichotomy of ideas and social relationships made it impossible to see any historical situation as a whole'.[45] Nevertheless, it is likely that an (eclectic) internalist and externalist approach to histories of Chinese medicine will sustain itself, as future historians of Chinese medicine entertaining different knowledge structures will still tend to focus their work through one or other of the two research paradigms. This dissertation intends to work across the rather artificial externalist-internalist boundary, and to examine the stories of the caterpillar fungus for both their social and intellectual interest.

1.2 Research into the Modern Chinese Materia Medica

Modern Chinese *materia medica* has received relatively less attention from scholars in the field of the history of Chinese medicine.[46] Since the beginning of the 20th century, historians of Chinese *materia medica* have tended to compile rather general histories or to collate and study Chinese

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[41] Yu 2001, pp. 94-98; Lai *et al*. 2002, pp. 108-113; Du 2006, pp. 15-23; Yang 2008a, pp. 116-123; Wang 2011, pp. 100-108; Yu 2012, pp. 3-11.
[42] See, for example, Li 2008; Li 2012.
[43] Zheng and Li 1997, pp. 26-35.
[44] Shapin 1992, pp. 333-369.
[45] Sivin 2000, p. 17.
[46] Zhen 1996, pp. 205-211; Zheng 2002, pp. 249-253; Zhu 2004, pp. 54-59.

classical texts. But since the 1970s-80s studies on diverse subjects such as the history of medicinal substances, modern pharmaceutical businesses and the pharmacologists themselves, as well as excavated materials about medicine or *materia medica* have also gradually become emerged. Monographs dedicated to modern Chinese *materia medica*, however, remain very limited in number and scope. With respect to the general histories of Chinese *materia medica* published before the 1990s, some of their authors, such as Zhang Zanchen 張贊臣 and Yu Shenchu 余慎初, entirely neglect the modern period;[47] others, such as He Shuangmei 何霜梅, Qu Shiguang 渠時光 and Paul U. Unschuld, only give brief summaries of selected facets of modern Chinese *materia medica* deemed representative of their approach.[48] Compared with the above authors, Xue Yu 薛愚 offers a far more informative account of *materia medica* in late Qing and Republican China.[49] But it mainly concerns the introduction of Western *materia medica*, changes in Chinese *materia medica*, scientific research on medicinal substances, the development of the pharmaceutical business, and the publication of journals and books on *materia medica*. Although there are some mistakes about historical sources in this volume, Zheng Jinsheng, a leading historian of Chinese *materia medica*, still considers it the first treatise to systemically examine the history of modern Chinese *materia medica*.[50]

Strictly speaking, the first historical monograph on modern Chinese *materia medica* must be *Zhong guo jin dai yao xue shi* 中國近代藥學史 (A History of Modern Chinese Materia Medica), written by Chen Xinqian 陳新謙 and Zhang Tianlu 張天祿 in 1990 and published in 1992.[51] Chen Xinqian wrote most of the content of this monograph,[52] which partly originated from a series of his articles published in the 1980s.[53] Xue Yu's book provided an important reference for Chen and Zhang. But the latter also enriched some of Xue's accounts and supplemented them with several new topics such as the development of the *Zhong guo yao xue hui* 中國藥學會 (Chinese Pharmaceutical Association).[54] Xue Yu, Chen Xinqian and Zhang Tianlu's books laid a foundation

47 Zhang 1955, pp. 53-85; Yu 1981. Cf. Yu 1987, pp. 132-138.
48 He 1930, pp. 85-97; Qu 1979, pp. 115-134; Qu 1989, pp. 216-242; Unschuld 1986, pp. 261-266.
49 Xue 1984, pp. 315-485.
50 Zheng 1986, pp. 750-752.
51 Chen and Zhang 1992.
52 Chen had received Western pharmacology education before the early 1940s. For his life, see Zhang 1985, pp. 760-761; Lou 1996, pp. 345-351. In the mid-20th century Chen had published one book on phytochemistry and two books on pharmacology, see Qiu and Chen 1949; Chen 1951; Chen 1953.
53 Chen 1982, pp. 34-37; Chen 1984, pp. 47-50; Chen 1984, pp. 70-78; Chen 1985, pp. 620-621; Chen 1985, pp. 437-439; Chen 1985, pp. 756-759; Chen 1986, pp. 170-173; Chen 1986, pp. 46-47; Chen 1986, pp. 15, 48; Chen 1986, pp. 40-41; Chen 1986, pp. 43-44; Chen 1987, pp. 57-64; Chen 1987, pp. 645-651; Chen 1987, pp. 487-490; Chen 1988, pp. 174-179; Chen 1988, pp. 20-36; Zhang and Chen 1986, pp. 182-184.
54 For a contemporary review of Chen and Zhang's monograph, see Cao 1993, pp. 569-570. Chen Xinqian did some

for the writing of many chapters on the modern Chinese *materia medica* in later general histories of Chinese *materia medica*.[55] Overall, the above histories serve to illustrate and outline the late Qing and Republican Chinese *materia medica*, and to dig up many basic historical sources to embellish their accounts. Generally, however, they have a tendency to simplify European and American scholarship in the history of medicine, Euro-American medicine's influences on modern China, and often have little new to say. Some of them lack new historical materials, analyses and opinions. Given the innovative approaches taken by some of the current scholarship in the history of 19th- and 20th-century Chinese medicine and *materia medica*, mentioned above, some narratives and positions taken up in the materia medica studies seem outdated, and need to be further enriched and revised.

Since the 1980s, scholars have made significant progress in analysing the history of the modern Chinese Pharmaceutical Association, in their understanding of traditional prescriptions, and in determining the chemistry of Chinese medicinal substances, etc.[56] For example, in 2008, about two decades after the publication of Xue Yu's book on the history of the Chinese Pharmaceutical Association (founded in 1907 or 1908), a more detailed and comprehensive history of the Association was published.[57] Pi Guoli's 皮國立 focus on advertisements for medicinal substances published in a Taiwan daily newspaper during the Japanese occupation of Taiwan, reveals complex transformations in ideas about the body, diseases, and the use of Chinese and Western medicinal substances among contemporary Taiwanese.[58] Huang Xin 黃鑫 gives a survey of modern innovations in the *materia medica*, and outlines the influence of 'Western' science in the study of classical Chinese prescriptions.[59] Wu Likun 吳立坤 discusses new approaches to the theories, practices, societies, publications and academic research relating to Chinese *materia medica*,[60] while Zhao Jimeng 趙際猛 explores the active influence of 'Western' pharmacology on the scientific study of Chinese medicinal substances mainly from the perspectives of academic institutions and their researchers.[61] Zhang Fengcong 張豐聰 carries out in-depth analyses of modern studies in pharmacognosy, medicinal chemistry and pharmacology, as well as their relationships with classical

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original historical studies of the Chinese Pharmaceutical Association in the 1980s. But before the beginning of the 1990s Xue Yu had also published a book on the history of this Association, which also covers the first half of the 20th century, see Xue 1987, pp. 1-22.

[55] Zhang 1993, pp. 133-152; Chen 1994, pp. 196-277; Xie and Cong 2013, pp. 195-285.
[56] Song 1997, pp. 711-714.
[57] Xue 1987; ZGYXH 2008
[58] Pi 2009.
[59] Huang 2005.
[60] Wu 2005.
[61] Zhao 2012.

Chinese *materia medica* as they are represented in articles on Chinese medicinal substances published in modern Chinese medical journals.[62] These studies enable us to deepen our perceptions of what constitutes a modern Chinese *materia medica*, despite their universal assumption of a unilateral hidden 'impact-response' model that runs from an essentialised all-powerful West towards the East.[63] Notwithstanding these recent new studies, the history of modern Chinese *materia medica* remains at the margin of the field of the history of modern Chinese medicine. This lamentable lacuna is not in keeping with the continued importance of Chinese medicinal substances and *materia medica* in modern Chinese medicine and society. It leaves a gap into which this study will insert a tale about the agency of the caterpillar fungus, as representative of the myriad substances, people and communities that have contributed to the survival of China's materia medica to the 20th and 21st centuries.

1.3 Relevant Theoretical Issues

There are some common issues that pertain to existing studies in the history of modern Chinese medicine and its *materia medica*. Some of them are also closely related to this dissertation. Critically, political factors have not only influenced the development of medicine or *materia medica*,[64] but they have also affected historians' judgments. Influenced by prevailing political histories of China, for example, historians of the late 20th and early 21st centuries have often indicted a Western imperialism for frustrating the modernisation of the Chinese *materia medica*, especially the slow development and even decline of indigenous pharmaceutical enterprises.[65] On occasion, following this political sensibility, Chinese historians have also intentionally paid little attention to the important role of the institutions, research methods and perceptions of modern science and medicine in the transformation of the modern Chinese *materia medica*, preferring to locate the inheritance of change in the relation between a pre-modern and modern Chinese *materia medica*.[66] To some extent

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[62] Zhang 2013.
[63] The 'impact-response' model, advanced by American sinologists represented by John K. Fairbank (1907-1991) in the 1950s, used to be very popular in the field of modern Chinese history from the 1950s to 1960s. Without doubt there were Western impacts and China's responses in modern times. But this model treats interactions between China and the West unilateral, and neglects some changes in modern Chinese society that were irrelevant (or less relevant) to Western impacts, as well as the influence of Chinese traditions. For a thorough critique of this model, see Cohen [1984] 2010, pp. 9-56.
[64] Cao 1999, pp. 298-324.
[65] BJZYXYYJWQNB 1960, pp. 130-148; Xue 1984, pp. 319-348; Chen and Zhang 1992, pp. 72-99; Tang 2001, pp. 130-141, 218-221.
[66] Huang 1955, pp. 351-354; Chen 1983, pp. 16-18; Shen 1983; pp. 496-500.

the two narratives, that tend to identify and/or combine the causes of decline in imperialism and the tradition-modernity binary, both involved nationalist discourses which, when supported by selected historical sources, distorted the history of Chinese *materia medica* in the late Qing and Republican periods. The following sections discuss some other important theoretical issues which are not confined to the field of the history of modern Chinese *materia medica*, but more generally affect the field of Chinese medical history, and even Chinese history itself.

1.3.1 'Chinese' and 'China'

The noun '*zhong guo* 中國' (China/of China) is a geographical and political, rather than an ethnic descriptor.[67] It is common to see the use of this term, or the English translation 'China', in characterising the territorial and political scope of various histories of medicine or *materia medica*. However, what these histories reveal is actually the history of an essentialised 'Han' Chinese medicine or *materia medica*.[68] This phenomenon that equates the concept of China with that of a Han Chinese, consciously or unconsciously, has not been exclusive to the history of medicine or *materia medica*. According to a recent study, the equivalence has generally prevailed in narratives of Chinese history only since modern times.[69] The 'Han' are in fact an essentialised group made up of an enormously diverse population, who often self-identify as the political and historic majority, the 'Han' originally being the designation of the ruling elite of the second empire. This was the government hailed as the cultural and administrative source of a Chinese identity. In English publications on medical history, the term 'Chinese' has the meaning of something uncritically pertaining to the political entity of China. However, it is usually understood and used as (something pertaining to) the imagination of a culturally unified ethnic Chinese who live within the ever-changing imperial boundaries of this territory, and with certain powerful centralising points of identity formation such as the early Empires and the 'High Tang'.[70] So, understanding the use of the term *zhong guo*, China or Chinese not only concerns the political and geographic concepts themselves, but also involves how we understand these narrative frameworks that shape the history

[67] Yu 1986, pp. 75-80; Yang 2006, pp. 1-8; Coughlan 2008, p. xxvii. Of course, in some cases this term can also be translated as 'Chinese'.
[68] See, for example, ZYYJYZYJCBJWYH 1960; Yu 1987.
[69] Jiang 2015, pp. 145-287.
[70] See, for example, Needham and Lu 2000; Hsu 2001; Taylor 2005.

of medicine or the *materia medica* itself. In short, it deals with whether '*zhong guo yi (yao) xue* 中國醫(藥)學' or 'Chinese medicine (materia medica)' should be understood as all the '(different types of) medicine or *materia medica* in China' or those that relate only to an essentialised 'Han Chinese medicine or *materia medica*', without any recourse to the plurality of peoples that have inhabited China since time immemorial. This issue is often obscured in specific case studies, but becomes clear in general histories of medicine or *materia medica*. Chen Xinqian and Zhang Tianlu seemed to have been aware of this issue before they finalised the *Zhong guo jin dai yao xue shi* 中國近代藥學史. They used the term '*zhong guo*' in the book title, and additionally introduced the history of Tibetan and five other 'non-Han' Chinese people's *materia medica*.[71] In this case, the *materia medica* within the meta-framework of *zhong guo* was clearly not exclusive to the 'Han' Chinese. Although the chapter on 'ethnic minority' Chinese *materia medica* only accounts for a very small proportion of the whole book, and is also not well integrated with the other chapters, the book provides a new reference for subsequent similar histories.[72]

Looking into the history of medicine in China post the Opium Wars we find the inheritance of pluralistic medical systems and traditions, including at least a classical Chinese medicine which, to varied extents, had been influenced by medicines that arrived from afar over millennia via the land and maritime routes, indigenous traditions such as the Tibetan or the Huihui (Moslem) traditions, and modern scientific medicine.[73] Such a medical environment challenges the writing of medical histories of late imperial and 20th-century China. Many publications place emphasis on a sudden and drastic change that apparently transformed classical Chinese medicine, but some also contain relatively independent narratives about the development of the plural traditions of medicine that existed in China and of 'Western' medicine in modern China.[74] In K. Chimin Wong and Wu Lien-Teh's English book *History of Chinese Medicine*, the greater part of the content is devoted to the development of a Western medicine in China rather than the classical Chinese medicine.[75] This indicates that the authors treated the development of a Western medicine in China as an integral part of the history of 'Chinese' medicine. That is to say, the English term 'Chinese' in the book title does

[71] Chen and Zhang 1992, pp. 197-207.
[72] See, for example, Xie and Cong 2013, pp. 227-230, 238-241, 250-263, 276-284.
[73] For the transplant of Western medicine in modern China, see Balme 1921; Cadbury and Jones 1935; Bowers 1971; He 2006; Liu 2012. For an analysis of various medical systems in Shanghai in the 1920s and early 1930s, see Lei 2014, pp. 121-140. At present there are also some (general) medical histories of different ethnic groups in China, see, for example, Li and He 1990; Cai 1996; Huang *et al*. 1998; Buell and Anderson 2000; Shan 2004; Ba 2004; Hong 2002.
[74] See, for example, Deng and Cheng 1999, pp. 295-546.
[75] For the chapters on Western medicine in this book, see Wong and Wu [1932] 1936, pp. 257-822.

not refer to an indigenous Chinese medicine, but is more like 'China's' or 'of China'. As for the use of the English term 'China', we can say that Ralph C. Croizier's, albeit out-dated, masterpiece *Traditional Medicine in Modern China* neglects the traditional non-dominant medical traditions that have flourished in China's political territory.[76] The above cases reflect the fact that many authors use the Chinese term '*zhong guo*' or the English term 'Chinese' or 'China' rather randomly to frame their medical histories. In the following chapters of this dissertation, the term 'Chinese' in my narratives, as it refers to 'Chinese medicine/*materia medica*' strictly refers to the dominant and ever-emerging tradition both in its written form and in the ways it was practiced by those communities of physicians living in the changing political territories of China, whether or not it was influenced by elements of 'scientific' medicine arriving from Europe, America and Japan.

1.3.2 Progressive History

The practice of establishing a progressive history for China initially came about with the influence of Europe at the end of the Qing dynasty, and it gradually replaced the classical concept of cyclical history where dynasties were seen as rising and falling with a 'natural' renewal of the political mandate being authorised by a divine entity known as Heaven. It had a profound influence on Chinese intellectual elite.[77] The transmission to, and localisation of modern science in China and the rhetoric of modern science that underpinned the progressive history encouraged many modern Chinese intellectuals to believe that a Western science (especially medicinal chemistry) was the ultimate target of, and only correct methodology for, the future development of classical Chinese medicine and its *materia medica*.[78] Meanwhile, the practice of progressive history makes also invisibly contribution to the differentiation between *new* and *old* knowledge, beliefs, and approaches. Influenced by the idea and the implementation of the New Governance policies at the end of the Qing dynasty, the corresponding titles '*zhong yi* 中醫' (Chinese medicine) and '*xi yi* 西醫' (Western medicine) prevailed in the late Qing period and stressed the distinction between China and

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[76] Croizier 1968.

[77] Wei 2012, pp. 268-285. For example, the noted historian Liang Qichao 梁啟超 (1873-1929) once delivered the idea of progressive history in his book *Xin shi xue* 新史學 (New History), see Liang [1902] 1989, pp. 1-32. For the idea of progressive history and related historical writing in the West, see Crowe 1966, pp. 109-124; Woolf 2014, p. 744.

[78] See, for example, He 1930, pp. 85-97. In He's book the terms '*jin hua* 進化' (evolution) and '*jin bu* 進步' (progress) are often used without differentiation despite of their different meanings. The development of modern European science contributed much to the prevalence of the idea of progressive history. For a detailed account, see Lombardo 2006, pp. 267-422.

the West. These binaries gradually transformed to '*jiu yi* 舊醫' (old medicine) and '*xin yi* 新醫' (new medicine) in the Republican period emphasising their difference in terms of temporal sequence rather than geographical territories.[79] The latter designations reflected a hierarchy, which naturally intensified controversies between people and institutions invested in Chinese and Western medicine as strictly bounded systems.

It is against this background that the titles '*jiu yao* 舊藥' (old materia medica) and '*xin yao* 新藥' (new materia medica) became popular in Republican China.[80] Many current historians treat scientification as the lighthouse that guided the transformation of classical Chinese *materia medica* and that shaped its subsequent development.[81] Such a narrative model, consciously or, often, unconsciously examines classical *materia medica* from the perspective of modern and contemporary science, and produces progressive histories of *materia medica* that embody the generally discredited Whig interpretation in the field of history of science.[82] As a result, it simplifies the history of Chinese *materia medica*, and also reduces attention to the diversity of intellectual processes and activities that have come to bear on the *materia medica*. Here I appreciate Benjamin A. Elman's contextualisation of late imperial Chinese 'natural studies' as set within their social, political and economic contexts.[83] This research methodology is also applicable to my historical study of the caterpillar fungus in this dissertation.

The idea of progressive history not only concerns historians' narratives, but also has a wider impact. Since the nineteenth century people influenced by this idea, whether elite or ordinary folk, engaged in imagining and constructing a progressive society. Situated in such a society, the mainstream standards of new social values might embed with local features, but would not betray the underlying progressive principles.[84] For example, although Chinese medicine obtained political support in the early years of Communist China, its future would still rest on the underlying principles of scientific medicine.[85] Of course, since the late Qing period, there has always been

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79 Yue 1999, pp. 13-52; Taylor 2001, pp. 343-369; Zheng 2012, pp. 338-352.
80 See, for example, Liu 1931, p. 78; Shen 1934, pp. 5-9; Xie 1943.
81 See, for example, Chen and Zhang 1992, pp. 212-218; Xie and Cong 2013, pp. 264-270, 298-309.
82 The British historian Herbert Butterfield (1900-1979) first coined the term 'Whig interpretation', which in his discourse referred to seeing the present as a result of a progressive development in the past, see Butterfield 1931. Butterfield mainly focused on the (political) histories written by Whig historians. But the tendency similar to 'Whig interpretation' was also common in histories of science, as science was particularly progressive to many historians of science, see Bynum *et al*. 1981, pp. 445-446. For discussions on Whig interpretation in the field of history of science, see Jardine 2003, pp. 125-140; Alvargonzález 2013, pp. 85-99.
83 Elman 2005, pp. i-xxxviii; Elman 2015, pp. 251-262.
84 On this point we can refer to the destiny of Kampo medicine in Meiji Japan, see Sugiyama 2004.
85 Taylor 2005, pp. 14-38; Li 2011, pp. 70-77.

controversy about what constitutes the scientification of classical medicine in China or its *materia medica*. Some authors from the community of traditional physicians criticise scientification as a deviation from the Chinese medical traditions and classics,[86] while others still complain that Chinese medicine has still not been thoroughly scientised.[87] However, if supporters of Chinese medicine had ignored any process of scientification and attempted to completely sustain its classical scholarship, it would have flown in the face of the ideals of those many groups advocating a progressive society and soon been faced with a survival crisis. But if Chinese medicine had been scientised without any consideration for its historical identity, it would have simply merged into a universal biomedicine which means that it would have become a misnomer for us to continue to differentiate it as 'Chinese' in any way. In terms of the above two extreme possibilities or propositions (which have not generally come true to date), those concerned with the development of a Chinese medicine are inevitably caught in a dilemma. However, if we shift our attention from theoretical controversy to the real social environment and no longer treat Chinese medicine as a whole or a 'system' which is hard to justify, we will soon find that that 'dilemma' has never wholly emerged.[88] I do not deny the existence of forms of progress in (modern) society. But in many cases it is hard to simply judge whether an idea, event or action was progressive in its motivation or impact when properly described in its social and historical context. In order to approach the complicated history of the caterpillar fungus and Chinese *materia medica*, progressive history has no part in this dissertation except as an object of enquiry.

1.3.3 Dichotomies

From the modern period onward, the corresponding and interdependent terms such as '*zhong yi*' (Chinese medicine) and '*xi yi*' (Western medicine), '*jiu yi*' (old medicine) and '*xin yi*' (new medicine), '*guo yi* 國醫' (national medicine) and '*yang yi* 洋醫' (foreign medicine), '*zhong yao* 中藥' (Chinese materia medica) and '*xi yao* 西藥' (Western materia medica), and '*jiu yao*' (old materia medica) and '*xin yao*' (new materia medica) began to prevail in the Chinese society. This linguistic phenomenon took root in the need for cultural differentiation during the first substantial encounters

[86] See, for example, Liu 2003.
[87] See, for example, Fang 2007.
[88] For example, from 1928 to 1933, the numbers of traditional physicians and drugstores in Shanghai increased from 1800 and 28 to 4780 and 29, see Anonymous 1929, p. 158; GMZFZJCTJJ 1935, p. 395. Obviously such a change cannot be simply associated with dilemma.

between Chinese and Western medicine. However, such simple distinctions inclined writers to treat Chinese medicine as if it were heterogeneous when compared to Western medicine (and vice versa), and to see Chinese and Western medicine as two coherent and definable wholes. With the rise of studies of modern controversies between a Chinese and a Western medicine since the 1980s, this tendency has been reinforced by a variety of historians of medicine.[89] Comparative studies, are inclined to compress representations of Chinese and Western medicine so as to facilitate essentialist analyses.[90] Part of the reason for adopting such an approach lies in a static view of medical history. As early as 1860, the British medical missionary Benjamin Hobson (1816-1873) made a brief comparison between ancient Chinese and Greek medicine in an article on the history of Chinese medicine. He claimed that the state of Chinese medicine in his time was 'what it has been for many centuries past'.[91] Obviously, if one ignores historical innovations throughout history, both modern Chinese and Western medicine would easily be simplified as smoothly having evolved from ancient times, with their fundamental philosophies changed little.

However, although much Chinese medical thought and knowledge has been passed down from early China (e.g. the doctrine of nature and flavour),[92] developments in Chinese medicine have also been accompanied and stimulated by the assimilation of exotic medical knowledge, with criticisms and adaptation of existing medical theories and knowledge, constructing and stimulating medical innovations. For example, traditional physicians' perceptions of causes, mechanisms and therapeutics of externally contracted heat diseases were constantly changing and being reinterpreted throughout Chinese history.[93] And in pre-modern China there were also competing doctrines about whether the spirit in the body was controlled by the heart or the brain (or both), which involve varied perceptions of human consciousness and physiology, and still give rise to much controversy in contemporary China.[94] With respect to 'Western medicine', it has also never been a coherent whole from an epistemological point of view. The development of medicine in different modern European countries and America varied; and even in one modern Western country there were also pluralistic

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[89] Zhao Hongjun 趙洪鈞 is generally considered the first author who has done a relatively systematic study of controversies between Chinese and Western medicine in modern China, see Zhao 1989. For a historiography of the modern controversies, see Su and Zou 2012, pp. 9-15.
[90] See, for example, Huang *et al*. 1993; Feng 2001; Li 2011, Zhang 2012.
[91] Hobson 1860, pp. 400-402, 451-453, 477-478, 632-634.
[92] Liao 1991, pp. 109-152; Liao 2005, pp. 46-64.
[93] Cao 2004; Hanson 2011.
[94] Tang and Chen 1993, pp. 4-6; Chen 2003, pp. 1841-1842; Zhang and Sun 2004, pp. 1985-1986; Wu et al. 2013, pp. 8-9; Yu 2014, pp. 328-330.

medical conceptions and ways of healing.[95] Medicine from different European countries and from America also exerted different influences on the establishment of 'Western' medical systems in modern China.[96] Moreover, the development of the so-called modern 'Western' medicine was actually a global process. Much medical and scientific knowledge was produced in non-European regions, and was actively circulated between those regions and European countries.[97] Indeed, much of the so-called 'Western' medical knowledge circulating in modern China was actually from the East, from Japanese medical texts and their Chinese translations, or introduced through Chinese students studying in Japan.[98] And in the 'Western' medical knowledge arriving from Japan, there was new knowledge produced by Japanese scholars. In this case it is even more improper to use the term 'Western' or 'Western medicine'.

It is necessary to point out that the term 'Western medicine' has become cognate with the 'scientific medicine' or 'biomedicine', and relates to a discourse of regionality that developed after the mid-19th century.[99] According to Andrew Cunningham and Bridie Minehan's analysis of the nature of scientific medicine in terms of its use, origin and structure, 'scientific medicine was a development in the native medicine of modern western Europe, which was then made universal by exportation — by the exporting of it to non-European countries as they became subject to imperialism and colonialism'. As 'a medicine of domination', it is 'inherently imperialist by nature', and 'its subject is power'.[100] The British historian of medicine Harold Balme (1878-1953) used 'scientific medicine' or 'scientific' to describe the medicine transmitted from European countries and America to late Qing China.[101] And Chen Zhiqian 陳志潛 (1903-2000), a public health expert, also used the term 'scientific medicine' in his 1933 article on rural public health in Tianjin.[102] The Chinese scholar Huang Minglong 黃鳴龍 (1898-1979), who obtained his Ph.D in organic medicinal chemistry from the Universität Berlin in 1924, even stated in 1929 that Chinese medicine was not medicine but just '*xie shu* 邪術' (evil arts); and only the so-called 'Western' medicine in China could be treated medicine.[103] Clearly Huang had a prejudice against Chinese medicine. But

[95] Berg and Mol 1998. For the plurality of medicine in modern Europe, see Bynum 1994; Lindemann 2010
[96] Gao 2014, pp. 91-102.
[97] In this respect there have been many scholarly publications. See, for example, Chakrabarti 2004; Ebrahimnejad 2009; Raj 2010; Lightman *et al*. 2013; Renn 2015, pp. 241-252.
[98] He 2006, pp. 131, 221-229, 261-263; Xiong 2011, pp. 508-554.
[99] Bynum 2006, pp. 111-246; Löwy 2011, pp. 116-122; Russell 2014, pp. 6-12. The term 'biomedicine' first appeared in 1923, see Quirke and Gaudillière 2008, pp. 441-452.
[100] Cunningham and Minehan 1997, pp. 1-23.
[101] Balme 1921, pp. 8, 20, 96. For his life, see Anonymous 1953, pp. 511-512.
[102] Ch'en 1933, pp. 97-129. For Chen's memory of his life and medical efforts, see Chen 1989.
[103] Huang 1929, pp. 7-13. For Huang's life and academic achievements, see Huang 1922, pp. 7-11; Wang and Huang

his opinion represents attitudes shared by influential Chinese elites' and their understanding of the nature of 'Western medicine' in his time.

Furthermore, the Chinese terms '*zhong yi* 中醫' and '*xi yi* 西醫' can also be understood as 'doctors of Chinese medicine' and 'doctors of Western medicine' respectively. However, the former group assimilated forms of scientific medicine and the latter group have always appropriated elements of the Chinese medical experience and medicinal substances, so both to blurred the boundary between the two identities in their practice.[104] With respect to the knowledge of Chinese medicinal substances as explored by Chinese scientists, there was a divergence of opinion among modern physicians as to whether or not such knowledge could be a part of traditional *materia medica*.[105] The divergence itself indicates that some physicians did not think all such knowledge was essentially incompatible with a Chinese *materia medica*. '*Zhong yi*' and some other similar modern titles (such as the nationalist '*guo yi*' (state medicine)), highlighted the 'Chinese' nature of the medicine and thus reflected the influence of a distinct and separate conception of scientific medicine. A few scholars suggest that we use 'classical medicine' to denote pre-modern 'Chinese' medicine so as to avoid essentialism and unconsciously presuppose an anachronistic existence of 'Western' medicine.[106] This is a creative suggestion. But if we are to use the term 'classical medicine' it should not exclude the medicine developed and practiced by non-Chinese people in pre-modern China, and thus it cannot completely replace the term 'Chinese medicine' as it changes through time. In this dissertation, I use 'scientific medicine' or 'biomedicine' to denote what most others imagine as a 'Western medicine' prevailing in modern China. My choice avoids characterising modern Japanese medicine transmitted to China as 'Western' medicine. But I do not completely abandon the use of the term 'Western medicine' or 'Chinese medicine' in consideration of the historical narratives themselves and in specific contexts where it is more appropriate to the actor's categories.

1.3.4 Tradition and Modernity

'Traditional Chinese medicine' (TCM, '*chuan tong zhong yi* 傳統中醫' in Chinese) is now a very

2010, pp. 251-256; Han *et al*. 2012, pp. 1229-1235.
[104] Macgowan 1848, pp. 242-247; MYYLBSWYH 1998, pp. 11, 27.
[105] See, for example, Meng [1940] 2013; Zhang [1949] 2013.
[106] Yu and Liang 2013, pp. 93-102.

popular term among people interested in traditional or Chinese medicine as well as in academic publications on Chinese medical culture and history. However, as pointed out by Kim Taylor, this term did not exist in pre-modern China but was actually created as late as 1950s.[107] Similarly, the terms 'traditional Chinese materia medica' ('*chuan tong zhong yao xue* 傳統中藥學' in Chinese) and 'traditional Chinese medicinal substances' ('*chuan tong zhong yao* 傳統中藥' in Chinese) are also popular today despite their relatively late appearance.[108] From a broader perspective, the combinations that involve the use of the term 'traditional' or 'tradition' are absolutely not limited to the field of Chinese medicine or *materia medica*. We have a variety of examples such as '*chuan tong she hui* 傳統社會' (traditional society), '*chuan tong wen hua* 傳統文化' (traditional culture), '*chuan tong ren wu* 傳統人物' (traditional figures), '*chuan tong si xiang* 傳統思想' (traditional thoughts), '*chuan tong zong jiao* 傳統宗教' (traditional religions), '*chuan tong cun luo* 傳統村落' (traditional villages), and '*chuan tong yin shi* 傳統飲食' (traditional foods).[109] However, along with the widely used designation 'traditional' or 'tradition' in histories of Chinese medicine, many authors pay little attention to what the term itself signifies.

What is 'traditional' Chinese medicine or a Chinese medical 'tradition'? As mentioned above, the state of Chinese medicine in history was never static. But many people unconsciously associate different things and practices in contemporary China with the 'long history' of Chinese civilisation and this may be the origin of the emphasis on 'tradition', although this also may be a global phenomenon in response to a marked non-Chinese thirst for all things 'traditional' in China. . But this long history' has been called into question on a number of counts. For example, Bridie Minehan finds that the filiform needles generally used in contemporary Chinese acupuncture were initially invented by the Japanese, and later transmitted to China in the 20th century.[110] Another example is electro-acupuncture, which was introduced to China in the first half of the 20th century but was still seen by some Chinese authors as 'one of precious Chinese national medical legacies'.[111] According to Edward Shils (1910-1995), a belief or practice 'has to last over at least three generations' to become a tradition.[112] That is to say, traditions can form in less than a century. The filiform needles and electro-acupuncture, now interwoven with people's imagination of 'ancient' acupuncture, have

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107 Taylor 2005, pp. 63-86.
108 See, for example, Ding 1991; Bao *et al*. 2004.
109 Zhang 1991; Zhan 1992; Gao 2004; Zhang 2005; Ye 2008; Zhu 2011; Xue 2015.
110 Minehan 2014, p. 198.
111 Zhu 1957, p. 1; Zhou 2010, p. 4.
112 Shils 1981, pp. 15-16.

become what Eric Hobsbawm (1917-2012) referred to in his analysis of 'invented traditions' that support new nationalist movements, albeit not entirely imagined, but rather embellished, in this case.[113] Similar invented or embellished traditions are not rare in modern and contemporary Chinese medicine or culture.[114] Of course, the above examples of invented traditions do not represent the whole face of modern Chinese medicine.

According to Paul U. Unschuld, the collapse of traditional Chinese social structures and ideologies eliminated the legitimising environment for Chinese medicine in the 20th century; as a result, Chinese medicine resembles a tree without roots, which may exist for a long time despite that it is actually dead.[115] That is to say, China's classical medicine as a tradition is now dead rather than being revived or invented in ever emerging social environments. This view can be associated with Hobsbawm's account of 'genuine traditions'. Hobsbawm believed in the existence of 'genuine traditions', and stated that 'where the old ways are alive, [genuine] traditions need be neither revived nor invented'.[116] The 'old ways' are consistent with practices that are connected to the 'root' in Unschuld's account. However, was Chinese medicine a genuine tradition before its death so conceived? And, is Chinese medicine really dead? These issues are closely connected with our understandings of tradition. Volker Scheid questions Hobsbawm's vague distinction between 'genuine' and 'invented' traditions, and provides us with a new perspective for treating tradition as a dynamic process, within which the elements that constitute tradition are open to change.[117] Ideas and practices associated with Chinese medicine, and its practitioners, have been struggling for survival since the modern period, and their efforts to reconstruct themselves have revealed an ability to adapt to social and intellectual changes. Chinese medicine's appropriation of biomedicine also added to the plurality of Chinese medical theories and healing arts. Meanwhile, there ensued issues concerning Chinese medicine's self-identification as well as other-identification.[118] Overall, a modern (and contemporary) Chinese medicine did not entirely cut off its connection with

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[113] Hobsbawm and Ranger 1983, p. 1.

[114] Influenced by Hobsbawm, some authors turn to China and successively unveil more and more invented traditions in modern and contemporary Chinese society. For example, see Zhao 2008, pp. 10-12; Yan 2013, pp. 191-195; Luo 2014, pp. 81-90; Guo 2014, pp. 104-112; Zhao 2014, pp. 62-65.

[115] Unschuld 1992, pp. 44-63.

[116] Hobsbawm and Ranger 1983, p. 8.

[117] Scheid 2007, pp. 5-11. Scheid points out that according to Hobsbawm, Chinese medicine was not a genuine tradition as contemporary historian of medicine consider it reinvented itself from time to time; but if Chinese medicine has always been a genuine tradition (many contemporary practitioners hold this view), it will be difficult for us to describe innovations in Chinese medical history, and to determine the transformation of genuine tradition to invented ones.

[118] Scheid 2002; Obringer 2011, pp. 15-22.

pre-modern Chinese medicine, and also kept a distance from being thoroughly scientised according to any of the definitions given before. Sean Hsiang-lin Lei considers that a modern Chinese medicine, which looked 'neither donkey nor horse', actuated or manifested Chinese medicine as 'a valuable living tradition'.[119] As for the modern Chinese *materia medica*, medicinal substances produced by traditional physicians from both natural products long used for medical purposes in China combined with imported medicinal chemicals,[120] testify to a revival in response to various voices and policies surrounding its future.

A variety of changes occurred in modern societies which have given rise to considerable discussion on the nature of modernisation and its relationship with tradition. The modernisation theory that emerged in the mid-20th century was initially based on the belief in a dichotomy between traditional and modern social systems. It stressed that non-Western societies had to abandon their own cultures so as to embrace modernisation, which was embodied in Western societies.[121] In this theory, tradition was not only simply placed in opposition to modernity, but was also treated as an obstacle on the road to modernisation. However, such a view failed to obtain support from the development of non-Western societies in reality, especially after the Second World War.[122] And from the 1960s the modernisation theory began to be widely criticised.[123] For example, Joseph R. Gusfield (1923-2015) pointed out that tradition and modernity were not necessarily mutually exclusive, but could coexist; modernity would not necessarily undermine tradition; and tradition could both resist and support social changes.[124] With the decline of the modernisation theory, the paradigm of multiple modernities, first formulated by Shmuel N. Eisenstadt (1923-2010) in the early 1990s, has received more and more acclaim.[125] As a result, modernity was no longer necessarily equated with Westernisation despite that Western patterns of modernity provided a basic reference for non-Western societies. Eisenstadt suggested that the best way of understanding the contemporary world was to 'see it as a story of continual constitution and reconstitution of a multiplicity of cultural programs'; and unique expressions of modernity were realised through specific social actors who engaged in ongoing reconstructions of multiple institutional and ideological patterns.[126] The

119 Lei 2014, p. 164.
120 See, for example, Huang 1991, pp. 197-202; Deng *et al.* 1997, pp. 583-585.
121 Galland and Lemel 2008, pp. 153-186.
122 Eisenstadt and Schluchter 1998, pp. 1-18.
123 Tipps 1973, pp. 199-226.
124 Gusfield 1967, pp. 351-362.
125 Eisenstadt 1993, pp. 401-410; Preyer 2013, pp. 187-225.
126 Eisenstadt 2000, pp. 1-29. See also Eisenstadt 2002. From the 1990s some scholars who seem to be unaware of

paradigm of multiple modernities soon became popular in social and historical studies,[127] despite that there are also some cautious criticisms and revisions of the paradigm such as the formulation of the theory of varieties of modernity.[128] Anyway, whether from the perspective of advocators or critics of the paradigm of multiple modernities, modernity is now no longer considered fixed.

China is in an important position for examining theories about modernity. And China's modernity has been extensively explored academically, especially since the 1990s.[129] While some scholars such as Bruno Latour hold a negative attitude towards the very existence of modernity,[130] most historians of modern China, with the exception of Paul A. Cohen and a few others,[131] are keen on exploring the unique expressions of modernity in modern Chinese society. Of course, contemporary scholars' reflections on modernity are one thing. Post the Opium Wars intellectuals' belief in the possibility of a Chinese modernity was quite another. Some of them did believe in the existence of a European modernity, and saw modernity an important goal for personal and social development.[132] In this respect, according to Michel Foucault (1926-1984), modernity might be better understood as 'an attitude rather than as a period of history'.[133] In contrast to the various theoretical discussions on China's modernity, Ruth Rogaski stresses the importance of understanding how modern Chinese elites 'envisioned modernity and sought to transform the nation'.[134] Her study of the modern sense of the Chinese term '*wei sheng*' (hygiene) in the late Qing and Republican periods is actually an example of how specific social groups discovered modernity for themselves in modern China. Yang Xiangyin's analysis of Shanghai medical advertisements published during the decade before 1937 demonstrates how they explicitly related healthy bodies to national prosperity, and delivered their appeal for establishing a nation-state to a wide social audience through the hygienic context.[135] Sean Hsiang-Lin Lei, considering the separation of Chinese medical theory and Chinese medicinal substances, as proposed by modern Chinese figures like Yu Yunxiu (a Chinese

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the paradigm of multiple modernities, such as Samuel P. Huntington, also separate Westernisation from modernisation, see Huntington 1996, pp. 68-78.

[127] Woolcock 2009, pp. 4-9; Sadria 2009; Fischer-Lichte *et al*. 2011; Grenier 2013; Preyer and Sussman 2015.

[128] For example, Volker H. Schmidt criticises that the notions of culture and cultural difference in the paradigm of multiple modernities are vague. He proposes his own theory of varieties of modernity on the basis of the previous theories of varieties of capitalism and modernisation, see Schmidt 2006, pp. 77-97; Schmidt 2010, pp. 511-538.

[129] Yao 2000, pp. 4-13; Valentine 2006, pp. 7-22; Chen 2009, pp. 67-76.

[130] Latour 1993. However, compared with criticisms of modernity, construction of theories on modernity is relatively more active, see Lee 2006, 355-368. With respect to modern China, many historians think that not only did modernity exist, but also there were multiple modernities, see Ip 2003, pp. 490-509.

[131] Cohen 2010, pp. 57-96.

[132] See, for example, Lihu [1934] 1985, pp. 57. See also Zanasi 2004, pp. 113-146.

[133] Foucault 1984, pp. 32-50.

[134] Rogaski 2004, p. 300.

[135] Yang 2008b, pp. 52-59.

doctor of scientific medicine), suggests the former is ‘viewed as a purely cultural construct’, while the latter is ‘characterized as raw material from nature’, and that their analysis reflects a modernist divide between nature and culture.[136] My investigation of modern physicians of classical medicine interacts with this interesting finding of Lei’s. And in my opinion, the distinction made by these physicians between ‘old’ and ‘new’ medicine or medicinal substances in modern China also embodies, according to Latour’s characterisations of modernity, their belief that there was a radical break between the past and the modern world.[137]

Like Rogaski, Liang Qizi 梁其姿 states that the history of medicine provides an effective route to explore the nature of China’s own vision of modernity. She makes a general review of modern Chinese medicine, and its changes, through analysing specific cases (such as the replacement of variolation by cowpox vaccination) and through comparisons between Chinese and Western medicine. In the review she considers that any exploration of Chinese medicine’s modernity must avoid taking Western experience as the standard; and concludes that it is possible to discover an emerging Chinese modernity before the 19th century by investigating local Chinese societies.[138] Certainly, we can revise and even reject European concepts of modernity as relevant to the Chinese case by nuancing our understanding of the changing character of Chinese society and history in the 17th and 18th century. But in my opinion, if we want to seek China’s modernity, we have to analyse how it refers to the European experience, as the concept of modernity itself is derived and borrowed from European discourses. Normally, it is considered that European civilisations began to modernise from the 17th-18th centuries.[139] Jack Goody opines, the English word ‘modernity’ was even a nineteenth-century invention.[140] If we separate China from the rest of the world, and see changes in China’s indigenous medical ideas, techniques, theories and institutions pre-19th-century as representing achievement of the universal character of modernity, just as Liang suggests, then such ‘modernity’ will not only have little relationship with what is usually designated as the modern period (since, for example, Francis Bacon’s technologies that presaged rapid change in Europe, gunpowder, the printing press, and the nautical compass, were already well in place in China by Southern Song China [1127-1279] if not long before[141]), but we will also neglect the role of

[136] Lei 2014, p. 94. Cf. Latour 1993, p. 99.
[137] Latour 1993, p. 48.
[138] Liang 2007, pp. 1-18.
[139] Huntington 1996, p. 69.
[140] Goody 2006, p. 128.
[141] Kuhn 2006, pp. 9-26.

interactions among different Western and non-Western societies in the social construction of modernity.[142] In this dissertation, following Scheid I see the modern Chinese medicine or *materia medica* neither as a genuine tradition nor as an invented tradition, but as a dynamic living tradition. As for modernity, I appreciate Ruth Rogaski's perspective. For historians of modern China it is of critical importance to pay attention to modern intellectuals' narratives and imagination of modernity as an integral feature of their inspired efforts to reshape a failing country. My study of modern Chinese *materia medica* is in part a response to all these medical historians' investigations of China's modernity through the history of Chinese medicine.

1.3.5 Spatial Turn and Global Context

As contacts among different regions of the world became increasingly intense, by the mid-20th century scholars, interested in creating spaces for social action, began to be aware that the utility of the analytical tool afforded by the nation-state, and its hierarchical spatial order deemed to have started to assert itself in the 19th century, was no longer the most appropriate reference frame.[143] From the 1960s scholars such as Henri Lefebvre (1901-1991) and Michel Foucault began to critically reflect on the rigid imagination of space in history and the time-space relationship. They stressed that there was an equal relationship between time and space, and carried out inspiring research on the important role of space in the exercise of power, the generation of knowledge, and the reproduction of social relations, particularly as it related to the expansion of capitalism, etc.[144] With increasing attention being paid to space, the spatial turn as a new paradigm began to prevail in humanities and social sciences from the 1980s. This historiographical moment heralded a departure from conceptions of space as a fixed and inanimate container for historical development, and also moved away from methodological nationalism and centrism. The spatial turn treated space as being constructed, and acknowledged the coexistence of different spatial frameworks, highlighting the central role of historians and historical actors in specifying spatial orders. The spatial turn has had a profound influence on historical studies. It changed historical writing, which in the past placed emphasis on time and neglected or marginalised space; meanwhile, it has also contributed to the rise

[142] As far as I know, none of the modern Chinese intellectuals who believed the existence of modernity talked about modernity in pre-modern Chinese context.
[143] Middell and Naumann 2010, pp. 149-170.
[144] Soja 2009, pp. 11-35. See also Soja 1989.

of research into transnational history, which lays stress on the movements of things, ideas and practices that crossed geographical, social and cultural boundaries.[145]

After the beginning of the 1990s, scientific universalism, that is a belief in the unity of modern science, gradually became unpopular in the academic community. However, historians and sociologists began to pay more attention to the key role of place and space in the production and application of scientific knowledge. For example, the emphasis of research on science in the Enlightenment has now turned from achievements, figures, time and causes to place; and the nation-state framework now also gives place to various spaces (such as museums, meeting rooms, laboratories, ships, textual spaces, and places in the field) which facilitate attention to transnational intellectual exchange and local interactions.[146] In Diarmid A. Finnegan's review of recent studies in the history of life sciences, we find historians of science more concerned with the local, spatial and social characters of scientific enterprise; historians that use different approaches to observe and explore the circulation of scientific knowledge for the purpose of deepening our understanding of the globalisation of science.[147] Meanwhile, as Carla Nappi states, growing attention to local case studies and historiographies of science also causes tension between the local and global, and brings challenges for weaving together global histories of science.[148] In terms of modern Chinese medicine, the spatial turn enables us to study and write its history from a new perspective. Indeed, there have always been interactions between Chinese and exotic medicine despite the ancient indigenous origins of Chinese medicine.[149] However, in the modern period with the substantial opening of China to the more closely linked world, the nature, state and transmission of Chinese medicine has also became much more complicated than ever before. Therefore it is difficult, even impossible, for us to have a deep insight into modern Chinese medicine from a purely indigenous perspective.

There have been few historical studies of modern Chinese medicine or *materia medica* from this spatial perspective. Hao Xianzhong 郝先中 finds that the introduction of the hospital system to modern China gradually transformed the space for medical healthcare from private families to public

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145 Kumin and Usborne 2013, pp. 305-318; Iriye 2013, pp. 1-18. In historical studies 'global history', 'world history' and 'transnational history' are all associated with the transcendence of national boundaries and avoidance of ethnocentric narratives. Relatively speaking, according to a 2006 conversation on distinctions between the three types of histories, transnational history is concerned with movements, flows and circulation across national borders and the construction of historical processes in the movement between different areas, see Bayly *et al*. 2006, pp. 1440-1464.
146 Withers 2009, pp. 637-658.
147 Finnegan 2008, pp. 369-388.
148 Nappi 2013, pp. 102-110.
149 There have been a variety of publications on this point, see Ma *et al*. 1993; Li 1998; Lo and Cullen 2005; Feng 2010; Hinrichs and Barnes 2013.

hospitals.[150] Yang Nianqun is also aware of this phenomenon. But he is more interested in the local and spatial factors involved in conflicts between Chinese and Western medicine, and Western doctors' utilisation of space in integrating themselves into the Chinese society.[151] In terms of the large-scale transnational space, Volker Scheid's survey of the development of the Menghe 孟河 medical current of learning from the late imperial period to the beginning of the 21th century also involves movements of Menghe physicians and their medical knowledge in global networks.[152] Such a perspective places emphasis on circulation and variation of knowledge, but does not aim to make essentialist distinctions. Different from previous historical studies of communications between Chinese and foreign medicine, studies from this perspective no longer need to centre on the imperial or national category of 'China' in contradistinction to an indigenous Chinese medicine. In this respect, Harold J. Cook offers us a good case study, in which he mainly examines the English physician John Floyer (1649-1734) and Jesuits' explorations of the 'pulse' in Chinese medicine in the 17th century. Interestingly, their misunderstandings about the 'pulse' did not result in serious medical consequences but inspired Floyer and others' efforts to explore natural changes in the body.[153] Cook's research is instructive for the study of the history of medicine or *materia medica* in 19th- and 20th-century China.

1.4 Scientific Medicine Travelling to Modern China

What happened in modern Chinese medicine and *materia medica* had a close relationship with the globalisation of modern science. The Europeans and Americans who went to China, especially the Protestant missionaries such as Robert Morrison (1782-1834), played a pivotal role in transmitting European and American knowledge to modern China.[154] The imagination of this modern science and medicine as an effective auxiliary tool for spreading the knowledge of Christ gradually diffused in China.[155] The German missionary Karl F. A. Gützlaff (1803-1851) believed that Western 'useful knowledge and science', 'the handmaids of true religion', was what the 'stationary' Chinese

[150] Hao 2005, pp. 27-33. Hsiang-lin Lei also mentions the American doctor Edward H. Hume's (1876-1957) feelings on families as traditional space for medical healthcare in modern Chinese society, see Lei 2003, pp. 45-96.
[151] Yang 2006, pp. 45-94.
[152] Scheid 2007, pp. 249-265.
[153] Cook 2013, pp. 215-240. For John Floyer's life, see Gibbs 1969, pp. 242-245.
[154] Elman 2005, pp. 283-286. Robert Morrison arrived in Guangzhou on 7 September, 1807, Morrison 1839a, pp. 105, 152-153.
[155] Balme 1921, pp. 60-81.

lacked.[156] When missionaries in China devoted themselves to saving natives' souls and healing the sick, they also advanced the transplantation of Western medicine in this country.[157] The American medical missionary Peter Parker (1804-1888) has been regarded as a pioneer who 'opened the gates of China with a lancet when European cannon could not heave a single bar'.[158] To prosecute the required medical undertakings, Parker and some other missionaries founded the 'Medical Missionary Society in China' in Guangzhou on 21 February, 1838.[159] At the conference held by this society on 14 April of the same year, Parker and the other missionaries reached a consensus that 'the Chinese admit their ignorance of medical science'.[160] Obviously they noticed some differences between Chinese medicine and their own medicine. And the key point of the statement was the absence of their 'science' in Chinese medicine.

The Qing court's strength and control of the country declined after the Opium War (1840-1842).[161] The Treaty of Wanghia (signed on 3 July, 1844) and some later treaties between Qing China and foreign powers legitimised Christian (medical) missionary activities to move away from treaty ports to the interior of China.[162] From the 1840s onward, the transmission of Western medicinal substances and related knowledge through medical practice, commerce, education and publications, still mainly pioneered by missionaries, reached a higher level. From 1877 to 1889, the number of mission hospitals and dispensaries in China increased from sixteen and twenty four to sixty one and forty four.[163] By 1907, the number had surged to 166 and 241 respectively.[164] In 1909, there were more than 800 medical missionaries and about forty trained nurses working at approximately 350 hospitals and dispensaries in China; they treated about two million patients annually.[165] These medical intuitions consumed large amounts of Western medicinal substances. Peter Parker, for example, returned from America to Guangzhou after the Opium War. He continued to use medicinal substances such as copper sulphate, silver nitrate and strychnine to treat eye

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156 Gützlaff 1833, pp. 186-187. Based on such an idea, Gützlaff established a Chinese periodical entitled *Dong xi yang kao mei yue tong ji zhuan* 東西洋考每月統記傳 (Eastern Western Monthly Magazine) in Guangzhou in August, 1833. It oriented itself to be a monthly that focused on 'making the Chinese acquainted with our arts, sciences, and principles'. For Gützlaff's life and activities in China, see Gützlaff 1840; Lutz 2008.

157 Kilborn 1910; Choa 1990. According to the *Gospel of Matthew*, 'heal the sick' was one of Jesus's instructions to the twelve disciples, see Broadus 1886, p. 220.

158 Beadle 1865, p. 22. For Parker's career in China, see Gulick 1973.

159 Colledge 1835, pp. 386-389; Colledge *et al*. 1838a, pp. 32-44.

160 Colledge *et al*. 1838b, p. 18.

161 For the Opium War, see Chang 1964; Hanes and Sanello 2004; Mao 2005.

162 Eber 1999, pp. 13-14; Wang 2001, pp. 7-8. Cf. Tian 1995, pp. 169-185; Zhou and Zeng 2008, pp. 6-13. For a systematic discussion on modern treaties between China and foreign countries, see Hou 2012.

163 Anonymous 1878, p. 486; Anonymous 1890, p. 735.

164 Anonymous 1907, p. 783.

165 Jefferys 1909, pp. 294-299.

diseases in his hospital, and also began to apply ether and chloroform as anesthesia to surgical operations from the second half of the 1840s.[166]

Along with its opening on 17 November, 1843, Shanghai gradually replaced Guangzhou as the largest import and export trade port in China.[167] The supply and production of Western medicinal substances and the popularisation of Western *materia medica* in Shanghai also preceded those in the rest of China. Statistical data indicates that forty one foreign (mainly European and American) companies' which were purveyors of Western medicinal substances were established in Shanghai during the period 1843-1911,[168] while the number of both foreign and Chinese purveyors of Western medicinal substances in Guangzhou in the same period was only twenty seven.[169] Besides, '*Wai guo yao liao* 外國藥料' (foreign medicinal substances) exported to China through ports remained duty free until 1902, at which point a tariff of 5% began to be imposed.[170] This meant that the tariff schedule of Qing China before 1902 was objectively beneficial to the import of Western medicinal substances to China.

The introduction of Western *materia medica* into modern China was closely tied up with the development of education about Western medicine in China. Prior to 1838, European and American medical institutions in Guangzhou had already accepted Chinese children sent by their parents to learn medical knowledge. Western doctors there also placed high expectations on these young Chinese students, hoping that Western medicine could be transmitted in their footsteps to broader areas of China. One of these students was Guan Tao 关韬 (1818-1874), who started to learn from Peter Parker in 1836, and thus became the first modern Chinese doctor of Western medicine.[171] More importantly, in the Pok Tsai Hospital (Guangzhou), the Presbyterian medical missionary John G. Kerr (1824-1901) established the first institution for Western medical education and training in China in 1866, i.e. the Canton Medical School. Once the school opened it attracted some Chinese students, while Kerr himself taught *materia medica* and chemistry.[172] By 1909, China not only had more professional mission medical schools, but also had mission universities that included

166 Gulick 1973, pp. 111, 148-149, 163-165.
167 Yue 1994, pp. 29-38; Sun 2004, pp. 81-85; Nield 2015, p. 197. The port of Guangzhou was opened on 27 July, 1843, see Zhou 2014, pp. 115-120.
168 SHSYYGS *et al*. 1988, pp. 17-35.
169 GZSDFZBZWYH 1998, pp. 462-463.
170 ZHTSHGZCC 1902, p. 12.
171 Song 1994, p. 256; Liu 2000, pp. 98-100.
172 Cadbury and Jones 1935, pp. 101-143, 192-198；SYXBSYXYCBWYH 1935, p. 21. See also Li 2015, pp. 667-670. For John G. Kerr's life, see Selden 1935, pp. 366-376; McCandliss 1996. For indigenous medical education in classical China, see Wong 1919, pp. 106-111.

departments of medicine.[173] The first education institution devoted to Western *materia medica*, i.e. Bo xi yao xue yuan 博習藥學院 (Boxi College of Matera Medica), was also established in Suzhou in 1907.[174] Moreover, Western *materia medica* had been listed as a higher education subject independent of 'medicine' since 15 August 1902, when the Qing court started to implement reforms of the educational system.[175]

A few monographs on Western *materia medica* in the Chinese language, such as *Xi yao lüe shi* 西藥略釋 (Manual of Materia Medica, 1871), *Xi yao da cheng* 西藥大成 (Materia Medica and Therapeutics, 1887) and *Wan guo yao fang* 萬國藥方 (A Manual of Therapeutics and Pharmacy in the Chinese Language, 1890), were compiled by European and American missionaries in the latter part of the 19th century.[176] They popularised knowledge about Western medicinal substances, and found favour with some Chinese intellectual elite. For example, the Viceroy Li Hongzhang 李鴻章 (1823-1901) wrote a preface to *Wan guo yao fang*, which heaped high praise on this book and its author Stephen A. Hunter.[177] In addition to such monographs, many other missionaries' Chinese publications also contain knowledge of Western medicinal substances, as we can see in Benjamin Hobson's (1816-1873) book *Nei ke xin shuo* 內科新說 (New Treatise on Internal Medicine, 1858).[178] The second volume of this book, entitled *Dong xi ben cao lu yao* 東西本草錄要 (Record of Basic Eastern and Western Medicinal Substances), includes both Chinese medicinal substances (e.g. *fu ling* 茯苓 [*Wolfiporia cocos* (Schwein.) Ryvarden & Gilb.]) and Western natural or chemically produced medicinal substances (e.g. *xi yang shen* 西洋參 [*Panax quinquefolius* L.] and *su da* 嘛啲 [sodium carbonate]). Just as is indicated in the volume title, Hobson made an effort to integrate knowledge about Chinese and Western medicinal substances despite his tendency to denigrate Chinese, while elevating Western *materia medica*.[179]

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173 *The China Medical Journal* published a set of articles about more than ten such schools and universities in the 'Original Communications' column in September 1909, see Pott *et al*. 1909, pp. 300-344. The articles just cover part of such schools and universities by 1909, while the actual number of them remains unclear but should be bigger.
174 SZDXFSDYYY 2008, pp. 12-13; Mei 2013, p. 33.
175 Qu and Tang 1991, pp. 236-237, 359-361.
176 Thomson 1887, pp. 115-121; Lu and Zhang 1936, pp. 1108-1120; Chen 1988, pp. 20-36. The English titles for *Xi yao lüe shi* and *Xi yao da cheng* are from Thomson 1887, pp. 115-121. The English title for *Wan guo yao fang* is shown in the book.
177 Li 1890a, pp. 11-14. See also Li 1890b, pp. 24-25. Stephen A. Hunter's book was mainly translated from Peter Squire's *A Companion to the British Pharmacopoeia* (London: J. Churchill & Sons, 1866) and supplemented by American, Indian, and Chinese pharmacopoeias and other sources, see Doleželová-Velingerová and Wagner 2014, p. 450. For a brief overview of Hunter's life, see Moreland 1938, p. 102. For Li's life, see Little 1903; Chu and Liu 1994.
178 Hobson and Guan 1858. For Hobson's life and writings, see Anonymous 1873, pp. 355-356; Wang [1882] 2002, pp. 279-280; Bosmia *et al*. 2014, pp. 154-161.
179 Hobson's varied attitudes to Chinese and Western materia medica is revealed by a recent study of Hobson's original autograph manuscripts of two Chinese medical translations, see Chen *et al*. 2013, pp. 243-293.

Hobson's approach can be seen as a strategy for introducing knowledge of Western medicinal substances in the tradition of the Jesuits. But he did have an interest in Chinese medicinal substances and their efficacies.[180] And there were not a few European and American people, like Hobson, curious about Chinese medicinal substances in 19th-century China. They looked for new effective medicinal substances with the intention of enriching Western medicine,[181] or hunted for effective indigenous substitutes due to factors such as shortages of, or high prices for Western medicinal substances.[182] However, they often criticised Chinese scholarship on medicinal substances for being unscientific. For example, in the influential work *The Middle Kingdom* (1848), the author, American missionary Samuel W. Williams (1812-1884), wrote that 'in all departments of learning, the Chinese are unscientific; ... they have never pursued a single subject in a way calculated to lead them to a right understanding of it'; and the *Ben cao gang mu* (Compendium of Materia Medica, 1578), valued by the Chinese, contains 'a deal of incorrect and useless matter', while 'the use of acids and reagents is unknown [to Chinese physicians], for they imply more knowledge of chemistry than the Chinese possess'.[183] Hobson held a similar view to Williams's. He considered that Chinese *materia medica* lacked the science of chemistry as well as Chinese terminologies for chemicals such as an oxide; it contained the incorrect *yin yang* and *wu xing* theories, and was short of preparations from the Mineral Kingdom, 'which forms so important part of our Pharmacopoeia'.[184] In brief, there might be gross inaccuracies in European and American criticisms of Chinese *materia medica* which centred on its 'unscientific' nature.

The Qing court, defeated by Western powers in two Opium Wars and troubled by the Taiping rebellion (1850-1864), finally determined to support the Foreign Affairs Movement (the so-called 'Self-Strengthening Movement', 1861-1895).[185] Although the movement ended up with the Qing court's military failure in the Sino-Japanese War (1894-1895), it promoted the transmission of Western science, technology and medicine through avenues such as new-style education, translation

[180] For example, Hobson reported in 1854 that he used the 'Chaul moogra' to treat his leprosy patients and achieved significant success. In particular, he even translated a Chinese medical account of this medicinal substance, and wrote down its Chinese name, i.e. *da feng zi* 大风子, see Hobson 1854, pp. 9-10.
[181] See, for example, Morrison 1839b, pp. 20-24.
[182] The British missionary George King, for example, once expressed this intention in his article entitled 'A cheap substitute for Pepsin', see King 1891, pp. 24-25. For King's life, see Houghton 1930.
[183] Williams 1848a, p. 288; Williams 1848b, pp. 186, 192. Nevertheless, in the 1883 revision of *The Middle Kingdom*, Williams still stressed the potential great value of Chinese medicinal substances and prescriptions, and suggest scientific research on them, see Williams [1848] 1883, p. 128.
[184] Hobson 1860, pp. 451-453.
[185] Xia 2010, pp. 26-39.

and Chinese overseas students in late Qing China.[186] For example, Li Hongzhang, leader of the foreign affairs faction, adopted the British medical missionary John K. Mackenzie (1850-1888) and a few other missionaries' suggestion, and precipitated the establishment of modern China's first official school of Western medicine in the Viceroy's Hospital in Tianjin on 15 December, 1881.[187] British and American doctors taught in this school, offering courses on medicinal substances, medicinal properties and medicinal chemistry.[188] Japan's victories in the Sino-Japanese War and the Russo-Japanese War (1904-1905) also significantly changed the Qing court's superior attitude to Japan.[189] Reforms, modelled after the Japanese educational system, were put into practice.[190] The New Governance period (1901-1911) also witnessed an upsurge in both the arrival of Japanese teachers in China and the departure of Chinese students for Japan.[191] It temporarily transformed the situation where Western knowledge, including medical knowledge, had mainly been introduced from Chinese translations of European and American rather than Japanese texts.[192] My perspective on the main historical actors that mediated the transmission of scientific medicine in 19th-century China, i.e. Western missionaries, the state, and voluntary Chinese individuals, is basically consistent with Bridie Minehan's recent account of the making of modern Chinese medicine.[193] But in Chapter 4 my focus is on the first half of the 20th century (especially the Republican period) and is more concerned with a much expanded range of Chinese sources.

From about the 1910s onward, Chinese students studying pharmacology, chemistry and other natural sciences in Japan and the West returned to China in quick succession, giving rise to the formation of native research strengths in scientific medicine. Influenced by indigenous medical culture, some of them naturally drew attention to Chinese medicinal substances and related practical knowledge and historical records. But their research methods were mainly characterised by chemical

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186 For the introduction of Western knowledge in China during the Self-Strengthening Movement, see Leibo 1985; Du *at al*. 1991; Elman 2004, pp. 283-326; Tian and Wang 2004, pp. 56-58; Liu 2008.

187 Bryson 1890, pp. 229-245; Lu 1991, pp. 25-30; Yuan 2010, pp. 63-69. Mackenzie arrived in China in 1875. For Mackenzie's life, see Anderson 1999, pp. 425-426.

188 Specific courses in this school before 1916 remain unknown. Here these courses were extracted from the school regulations in 1916, see Anonymous [1916] 1987, pp. 423-427. See also Lu 1991, pp. 25-30.

189 Ge 2001, pp. 541-544; Zhang *et al*. 2014, pp. 861-900. For the Russo-Japanese War, see Nan 1905; Jukes 2002.

190 Guo 1999, pp. 81-84.

191 For the arrival of Japanese teachers in China in the 1900s and related statistics, see Cui 1996, p. 135; Wang 2014, pp. 70-140, 351-365; Katou 2015, pp. 73-85. For Chinese students in Japan in the 1900s, see Sanetou 1960; Huang 1975. A few statistics on the number of these Chinese students have been published despite of some variances, see Li and Chen 1996, pp. 41-52; Zhou 2008, pp. 104-112; Li 2010, p. 235; Lü 2012, p. 185.

192 Tsien 1954, pp. 305-327; Tsien 2011, pp. 163-190; Wang 2008, pp. 45-63; Xiong 2011, p. 11. There were 958 Chinese translations (books) of Japanese books during the period 1896-1911, including 46 books on medicine and materia medica, see Tan 1980, pp. 41, 47. See also Li and Chen 2008, pp. 117-120. The above statistical data are not so complete, see Zhang 2008, pp. 20-36.

193 Minehan 2014, pp. 51-88.

analyses and biological experiments rather than *yin yang*, *wu xing* and other indigenous historical medical theories.[194] Taken from another angle, Iwo Amelung stresses that what accompanied these Chinese students' adoption of new scientific practices was the voice of national salvation in modern Chinese society.[195] Stacey Bieler's case study of Ren Hongjun (1886-1961), who studied in Japan and America, shows that many Chinese overseas intellectuals cherished the dream of saving their country through science.[196] Geng Xuan's recent Ph.D dissertation also demonstrates that the ideology of saving or serving China through science 'was a central motivation of early twentieth-century Chinese intellectuals' studying in America.[197] These studies help us to understand the main context for the active transmission and localisation of scientific knowledge about Chinese medicinal substances as will be exemplified by the analysis of the caterpillar fungus in modern in Chapter 4.

Scientific medicine maintained its strong position in official discourses, public health and hospital medicine through political interventions in Republican China (1912-1945).[198] It did not, however, obtain any predominance or even make a major contribution to society overall in comparison with indigenous Chinese medicines.[199] In fact, Chinese medicine and *materia medica* were not at all extinct but, as revealed by Sean Hsiang-Lin Lei,[200] survived vividly in different forms in Republican society despite serious top-down challenges.[201] In terms of medical education in the first half of the 20th century, as pointed out by Gao Xi, 'the Ministry of Education lacked basic powers of jurisdiction' over 'government-operated medical schools', not to mention medical schools established by private citizens/organisations, missionary societies, and foreign

[194] Chen and Zhang 1992, pp. 120-132; Niu 2003, pp. 228-243.
[195] Amelung 2014, pp. 39-66.
[196] Bieler 2004, pp. 270-284.
[197] Geng 2015, pp. 1-2.
[198] In the case of medical education, Chinese medicine education in Republican school systems was basically suppressed by the government, see ZHYYXH 2014, pp. 116-118. None of the courses on medicine in the regulations of specialist schools and universities, formulated by the Ministry of Education, was devoted to Chinese medicine, see JYB 1912, pp. 1-19; Pan and Liu 1993, pp. 510-512. Moreover, the Ministry of Public Health also approved a series of proposals including one for forbidding schools of old medicine in February, 1929, see Wen 2007, p. 75. Afterwards, Chinese medicine education and schools of Chinese medicine remained beyond official education system despite that their harsh situation was slightly relieved with protests from the community of traditional physicians, see Deng and Cheng 1999, pp. 226-230-233. Partly for this reason, professional expertise in Chinese medicine and materia medica was still mainly passed down by means of private tutorship, see Chen and Zhang 1992, pp. 110-111.
[199] In most regions of Republican China, Chinese medicine and medicinal substances remained the mainstream of social medical care. For example, two statistics covering 11 provinces in 1929 and 28 cities in 1933 demonstrate that traditional physicians and Chinese drugstores in all these provinces and a majority of these cities were significantly more than doctors of Western medicine and Western dispensaries, see GMZFZJCTJJ 1935, p. 395.
[200] Lei 2014.
[201] For example, according to a preliminary statistics, there were 208 and 197 periodicals of Chinese and Western medicine respectively founded in modern China; and 94.6 % of them were founded in the Republican period, see Yuan and Wang 1997, 50-54. The periodicals of Chinese medicine obviously formed important places for exchange of Chinese medical knowledge. There were also hospitals of Chinese medicine or integrated Chinese and Western medicine throughout the Republican period, see Cao 2006, pp. 18-22.

governments.[202] Although the Republican government in China suppressed the establishment of schools of Chinese medicine, such schools continued to exist throughout the Republican period.[203] The root of the above phenomenon lay in stubborn resistance from proponents of Chinese medicine and the Republican government's lax control of the whole country. This will be discussed in Chapter 4 in connection with the government regulation of medicinal substances. Kim Taylor provides an excellent analysis of the subsequent political utilisation of Chinese medicine in early Communist China, but she is more pessimistic than I about the transmission and inheritance of Chinese medical knowledge in Republican China, probably due to her exclusive focus on political rhetoric rather than the actual circumstances on the ground.[204] On this point I agree with Volker Scheid that there was continuity in the transmission of Chinese medical knowledge, in different ways (such as, for example, mentoring relationships developed within medical *pai* 派 [currents] of learning), throughout Republican and Communist China.[205] In particular, Wen Xiang finds that the Republican central and local governments moderated their negative attitude to Chinese medicine during the Sino-Japanese War, and shifted to a policy of encouraging traditional physicians' active participation in the wartime medical service and even the application of Chinese medicinal substances. No doubt this was important to them and necessary due to the shortage of any medical specialists and medicinal substances.[206] In this dissertation, my examination of knowledge about the caterpillar fungus in Chinese society is also a response to the above scholars' analyses.

1.5 Methodology

My exploration of the transnational history of the caterpillar fungus is a multi-sited and interdisciplinary case study. It is based on analyses of relevant multi-linguistic historical texts printed or written in East Asia, Europe, Russia and America. I place emphasis on medical and natural history texts, but meanwhile also pay attention to other sources including local chronicles, travel notes, letters, literary writings, dictionaries, encyclopedias, advertisements, customs publications, economic surveys and official documents. The use of diverse historical sources enables me to construct a

[202] Gao 2014, pp. 173-211.
[203] The Bei ping guo yi xue yuan 北平國醫學院 (Beijing College of Chinese Medicine, 1930-1944) was an example of such schools, see Gao *et al*. 1992, pp. 61-62.
[204] Taylor 2005, pp. 1-13.
[205] Scheid 2007, pp. 173-318.
[206] Wen 2007, pp. 102-107.

polyvocal history of the caterpillar fungus, and to situate the caterpillar fungus, knowledge and historical actors in intricate social networks. This dissertation does not simply bring them together and produce a chronologically linear history, but makes an effort to contextualise narratives within varied cultural frameworks. By tracking the transmission of specimens of the caterpillar fungus, I draw on Latour's discourse on the agency of objects, and connect the stories of the caterpillar fungus occurring in different places and cultures together, and probing into causes, means, contexts and consequences of flows of specimens and knowledge. This is appropriate to the research question of this dissertation and allows me to make reference to recent scholarship in the transnational history of medicinal substances.[207] Unlike Volker Scheid and Sean Hsiang-Lin Lei, I focus on both material and humans. But I abandon the constructed separation between object and subject, as argued by Bruno Latour,[208] in heterogeneous networks for knowledge production and exchange, and allow material agency to help trace and unveil social connections.

In this dissertation the transnational history of the caterpillar fungus mainly covers the period from the 18th century to the first half of the 20th century. As I see the transformation of Chinese *materia medica* as both a Chinese and global event, considerable attention is given to the study of the caterpillar fungus outside China before the Republican period. This allows us to better examine and evaluate the arrival and influence of knowledge about Chinese medicinal substances from outside China, and also to unveil the interplay of 'natural' knowledge that took place in modern Chinese *materia medica*. An investigation of the caterpillar fungus in pre-modern China is also a kind of microhistory that illustrates dynamically the exploitation, circulation, uses and study of medicinal substances in classical Chinese society. It facilitates a comparative inspection of significant changes in the modern Chinese *materia medica*. My examination of the transformation of Chinese *materia medica* in the Republican period abandons the popular but simplistic narrative framework that concentrates on controversies between Chinese and Western medicine, or progressive scientists and conservative traditional physicians. When moving my attention to Republican China, I give special attention to connections between the localisation and production of modern scientific knowledge about Chinese medicinal substances and traditional physicians' reflections on the survival and future of Chinese *materia medica*.

I collect modern European, American, Chinese and Japanese literature on China and/or the

[207] Foust 1992; Taylor 2006; Jordan *et al*. 2007; Chakrabarti 2010.
[208] Latour 2005, pp. 63-86.

caterpillar fungus mainly according to a series of authoritative catalogues such as Henri Cordier's *Bibliotheca Sinica* (1904-1924), Tung-Li Yuan's *China in Western Literature* (1958), John Lust's *Index Sinicus* (1964), *Zhong guo jin dai qi kan pian mu hui lu* 中國近代期刊篇目彙錄 (Collection of the Titles of Modern Chinese Articles, 1980-1984), *Min guo shi qi zong shu mu* 民國時期總書目 (A General Catalogue of Republican [Chinese] Books, 1986-1995), *Koku sho sou moku roku* 國書總目錄 (A General Catalogue of [Japanese] National Texts, 1963-1976), and *Ko ten seki sou gou moku roku* 古典籍総合目録 (Union Catalogue of Early [Japanese] Texts, 1990). In particular, I refer to *Lettres Édifiantes et Curieuses, Écrites des Missions Étrangères* (vols. 9-14, 1819) to systemically examine European Jesuits' letters about China and/or the caterpillar fungus. Besides, I use some online databases such as WorldCat, JSTOR, Biodiversity Heritage Library, Internet Archive, CiNii, National Diet Library Digital Collections to search for target scientific and medical articles and/or books in different languages. Many primary and secondary sources, together with private communications with scholars and academic institutions around the world and my own reading experiences, also enable me to obtain more Euro-American, Russian, Chinese, Japanese texts relating to the caterpillar fungus. My search strategy is: first looking for secondary publications involving the caterpillar fungus; then gathering records of the caterpillar fungus in Qing and Republican Chinese local chronicles, traditional medical texts, scientific and biomedical publications; then obtaining Euro-American, Russian and Japanese scientific and/or biomedical reports on the caterpillar fungus published before the end of the 19th century; finally collecting multilingual economic records of the caterpillar fungus, as well as other primary and secondary sources for supporting this dissertation. Of course, the quality of the sources that I have gained vary. In primary sources, the geography, production, morphology, medicinal properties and/or other aspects of the caterpillar fungus were described at various levels of detail. While in secondary sources, many descriptions of the history of the caterpillar fungus often do not additionally pay attention to relevant records in exotic cultures, non-scientific reports, or origins of some accounts of the caterpillar fungus. On the basis of predecessor scholars and a relatively abundant collection of multilingual sources, this dissertation endeavours to give a relatively clear history of the caterpillar fungus in a global context.

1.6 Chapter Structure

This dissertation contributes to current scholarship in modern Chinese *materia medica* and transnational history of medicinal substances. The chapters in this dissertation are laid out according to the transmission of specimens and knowledge of the caterpillar fungus in the world. Chapter 2 mainly explores the emergence and spread of the caterpillar fungus as a curious natural product and potent medicinal substance in Chinese society by the end of the Qing dynasty. It first gives a detailed critical analysis of the earliest extant Tibetan and Chinese records of the caterpillar fungus. On this basis it examines Chinese people's growing efforts to locate, disseminate, perceive and use the caterpillar fungus which, in the meantime, seemed to be neglected in Tibetan medicine, and transformed from a Tibetan medicinal substance to a Chinese medicinal substance. In this chapter I argue that the transmission of the caterpillar fungus by means of trade, tribute and other avenues in a Sino-Tibetan context was largely rooted in its marvelous physical transformation.

Chapter 3 turns to the exterior of China during the 18th and 19th centuries. It consists of two parts. The first part tracks the travels of the caterpillar fungus from China to the rest of the world (mainly France, Britain, Russia and Japan), while the second part mainly investigates new perceptions and study of the caterpillar fungus in those countries. In addition, this chapter provides an opportunity to reveal the diversity of the knowledge and approaches that came to bear on the Chinese *materia medica*. It is important to be aware of the plural epistemologies involved in stories of transmission, so as to observe consciously the quality of interactions between knowledge about medicinal substances in different cultures. Special attention is paid to some key actors' motives for disseminating and studying specimens of the caterpillar fungus, European attitudes to Chinese knowledge about the caterpillar fungus, and the influence of European knowledge about the caterpillar fungus in 19th-century Japan. The latter two aspects were closely associated with some significant changes in Chinese knowledge about the caterpillar fungus since the end of the Qing dynasty. In this chapter I argue that the pursuit of new effective medicinal substances and curiosity about exotic natural objects contributed to the journeys of the caterpillar fungus abroad. Meanwhile, European scholars critically assimilated Chinese knowledge about the caterpillar fungus, and produced new knowledge about the caterpillar fungus within their own cultural frameworks. Part of the new (taxonomic) knowledge also coordinated with the pursuit of new medicinal substances. What happened in Europe then gave rise to Japanese scholars' critical reflections on the caterpillar fungus and its relationship to similar species.

Chapter 4 moves back to modern China, and places emphasis on Republican China. It is divided into two parts. The first part looks into the transmission of knowledge about the caterpillar fungus from outside China since the end of the Qing dynasty, as well as the rise of scientific research on the caterpillar fungus in the Republican period. These processes presented challenges to conventional knowledge and ideas. Meanwhile, the Republican government and some Chinese scientists also actively strived to advance scientific research on (Chinese) medicinal substances. The second part is then mainly devoted to traditional physicians' new reflections on the role of Chinese medicinal substances in saving Chinese medicine as they encountered a crisis of survival, their efforts to reconstruct the Chinese *materia medica*, and the actual influence of modern science and politics on the use of the Chinese medicinal substances in practice. The two parts display the pluralistic scholarship on Chinese medicinal substances in modern China, and the transformation of Chinese *materia medica* at a theoretical level. In this chapter I argue that the tensions and negotiations between modern science and indigenous Chinese knowledge about medicinal substances contributed to the formation of a new Chinese *materia medica*; modern science, which certainly stimulated exploration of effective medicinal substances, did not stimulate the radical break in the continuity of Chinese *materia medica* as is often assumed, nor did it necessarily impact the use of Chinese medicinal substances in practice.

Chapter 2 Medicine and Miracles: the Spread of a Sino-Tibetan Marvel

‘The annexation and exploration of new territory by the Qing had
profound repercussions for *bencao* studies.
Naturalists struggled to cope with a pharmacy’s worth of
new and unfamiliar substances, texts, and terms,
as plants, animals, and the drugs made from them traveled into China across land and sea.’
—— Carla Nappi[209]

2.1 Introduction

On 1st January 1925, *Shen bao* 申報 (Shanghai News) published an advertisement (Fig. 1) for a kind of food called *dong chong [xia] cao ya* 冬蟲[夏]草鴨 (winter worm [summer] grass-duck):

> The *bei shi* branch of Guan sheng yuan is selling a newly invented tonic food, which is produced by boiling *dong chong xia cao* and ducks together. It can nourish both *qi* and blood, and is also beneficial to *yin* and *yang* due to the appropriate recipe. And it will act quickly on the body if the soup is drunk by blending it with wine; honestly speaking, it is a good tonic food eaten in winter. Additionally, it tastes quite fresh and delicious, loved by people of all circles and is in great demand. We are producing it everyday, and hence become so busy. (冠生園北市支店售一種新發明食物補品：用(冬蟲夏草)與鴨共燉．因其配合得法，能雙補氣血，互助陰陽；將汁沖酒和飲，其效尤速，誠冬令之良好補品，且味甚爲鮮美，頗受各界歡迎，銷數甚廣；連日趕製，殊形忙云.)[210]

[209] Nappi 2009, p. 141.
[210] Anonymous [1925] 1985, p. 19.


新發明冬蟲草鴨上市
冠生園北市支店、售一種新發明食物補品、用(冬蟲夏草)與鴨共燉、因其配合得法、能[illegible]補氣血、互助陰陽、鴨汁冲酒和飲、其效尤速、誠冬令之良好補品、且味甚為鮮美、頗受各界歡迎、銷數[illegible]廣、連日趕製、殊形忙碌云、

A B

Fig. 1 An advertisement for the food the caterpillar fungus-duck in *Shen bao* (1st Jan., 1925). B shows the content of the advertisement published in the page (A) of *Shen bao*.

Guan sheng yuan is an old and popular food company headquartered in Shanghai. Its history can be traced back to 1915.[211] And Shanghai as a pivotal city in China's modernisation process which walked at the cutting edge of innovation. People from East and West, North and South encountered each other in this city, where different cultures were also well integrated.[212] So many people in this busy city would see this advertisement and be attracted to the nourishment promised by ducks and the caterpillar fungus (also *dong chong xia cao* 冬蟲夏草, literally winter worm summer grass)! Clearly its selling point lay in the caterpillar fungus rather than the duck which as a very common poultry and not quite worth the advertisement. So, what is the caterpillar fungus? How would its combination with the humble duck create an innovative exceptional product?

I am reluctant to describe the modern understanding of the caterpillar fungus' life cycle for fear that it will undermine and subvert subsequent interpretations of historical records, and might indicate that this is a positivist history of the medicinal substance. However, for the purposes of communication with my readers, who are contemporary after all, I will set out here the biological story as it is known now: the fungus (*Cordyceps sinensis*) infects the larvae of the insects belonging to the family Hepialidae (a group of moths) in autumn, and then grows out of their heads and forms fruiting bodies the following spring or summer. As the fruiting bodies mature, they will release

[211] He 2002, pp. 42-43.
[212] Murphey 1953, pp. 1-4; Xiong [1994] 1995, pp. 181-219; Li 2005, pp. 222-237.

spores to the environment in which some of the larvae will then be infected and start the above process. If the larvae are not infected, they will then develop to moths.[213] The infection then kills the larvae. At the point of collection for human consumption the larvae is dead, but the fungus is still alive.

This chapter outlines the transcultural history of the caterpillar fungus to the end of the Qing dynasty, in its Sino-Tibetan context. In particular, it clarifies what made the caterpillar fungus travel down the Tibetan Plateau and surrounding Himalayas to eastern areas of China, and how it changed its identity from a curious and exotic entity to an enduring substance of Chinese *materia medica*. While the overall theme of this thesis engages with discourses about the nature of Chinese *materia medica* as dynamic and ever emerging, this chapter is mainly concerned with reinterpretations of the caterpillar fungus and explorations of new knowledge about the caterpillar fungus within classical Chinese cultural frames. Additional attention is paid to engaging with Latour's discourse on the agency of objects in the context of the transmission of the caterpillar fungus as a living transforming beast, a medicinal substance, and as an inanimate commercial product. I argue that the magical characteristic of the caterpillar fungus apparent both in its living and dead forms was largely responsible for its transformation from a Tibetan to a Chinese medicinal substance; and the arrival of the caterpillar fungus in Chinese *materia medica* also gave rise to a range of medical applications and explorations that deny the popular being static, moribund and unchanging simplified view about classical Chinese *materia medica*.

2.2 The Oldest Extant Sino-Tibetan Records

Despite the celebrity status of the caterpillar fungus today it was never explicitly mentioned before the 15th century. The oldest extant account of the caterpillar fungus was given by the Tibetan physician Zur mkhar mnyam nyid rdo rje ཟུར་མཁར་མཉམ་ཉིད་རྡོ་རྗེ། (Zurkhar Nyamnyi Dorje, 1439-1475) in his medical text *Man ngag bye ba ring bsrel* མན་ངག་བྱེ་བ་རིང་བསྲེལ། (Oral Instructions on a Myriad Medicines; Fig. 2).[214] As founder of one of two important medical schools of 15th-century Tibet, he is said to

[213] Packer *et al*. 2004, pp. 581-584; Liang 2007, pp. 125-126.
[214] Zurkhar Nyamnyi Dorje 1977 [15th century], pp. 347-349. For a collated version of the text, see Zurkhar Nyamnyi Dorje 2005 [15th century], pp. 308-310. For the English translation of the Tibetan record, see Winkler 2008a, pp. 1-47; but in the original text given in the appendix to Winkler's article, the character 'འ' is missed from the line 'དེ་ཡང་དབྱར་རྩ་དགུན་འབུ་ཞེས།'. Luo claimed that the caterpillar fungus was mentioned in the 8th-century Tibetan medical text *SMan dpyad zla ba'i rgyal po* སྨན་དཔྱད་ཟླ་བའི་རྒྱལ་པོ། (The medical investigations of the moon king), see Luo 1986, pp.

have received the great Tibetan physician Yuthok Yonten Gonpo’s (708-833) teaching in dreams, and to have studied medicine and Buddhism with a variety of teachers. Though he wrote a series of significant medical treatises in his short life, there is little biographical information.[215] According to the text, the caterpillar fungus is called ‘'dam bu bur shing 'jag ma rtsa འདམ་བུ་བུར་ཤིང་འཇག་མ་རྩ’, also known as ‘*dbyar rtsa dgun 'bu* དབྱར་རྩ་དགུན་འབུ’ (yartsa gunbu). The latter term, literally ‘summer grass winter worm’,[216] is consistent with the current Tibetan name for *yartsa gunbu*. As described in the text, it is a medicinal substance, ‘a faultless treasure of an ocean of good qualities’,[217] growing on the grass-covered slopes of mountain areas; in the summer it is a blade of a herb on a worm, resembling the leaf of mountain garlic; its flower is similar to sedge; while at the end of autumn its root looks like cumin seed. Zurkhar Nyamnyi Dorje’s description of its external characteristics is basically well-observed, although we now know that the ‘blade of grass’ is the fruiting body of the caterpillar fungus; the ‘flower’ is the mature perithecia which resembles the spadices of some kinds of sedge, e.g. *Acorus calamus*; the shape and colour of the ‘root’ (i.e. the worm) at the end of autumn also does resemble those of the cumin seed to some extent.

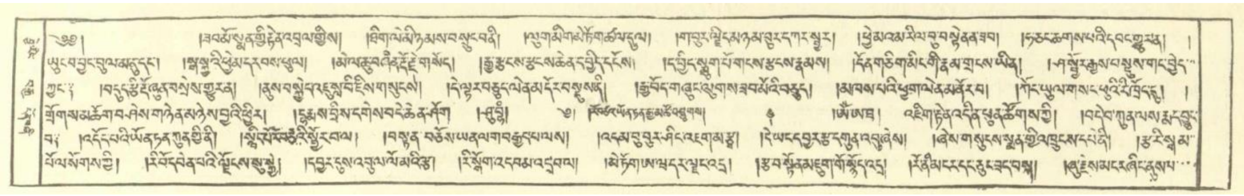

Fig. 2 The folio of the Tibetan text on *yartsa gunbu* in an 18th-century Sde dge redaction of *Man ngag bye ba ring bsrel*.

Zurkhar Nyamnyi Dorje did not give specific place names for the production areas of *yartsa gunbu*, but only depicted the kind of environment where it grew. A knowledge of the substance’s

69-76. However, I did not find records of the caterpillar fungus in this text and a few other earlier Tibetan medical texts such as *Bdud rtsi snying po yan lag brgyad pa gsang ba man ngag gi rgyud ces bya ba bzhugs so* བདུད་རྩི་སྙིང་པོ་ཡན་ལག་བརྒྱད་པ་གསང་བ་མན་ངག་གི་རྒྱུད་ཅེས་བྱ་བ་བཞུགས་སོ། (briefly *rGyud bZhi* རྒྱུད་བཞི་; literally Four Medical Tantras, late 8th century). And no incontrovertible evidence demonstrates that there are records of the caterpillar fungus older than that given by Zurkhar Nyamnyi Dorje, see Kam Chopel 1993, pp. 177-178; Winkler 2008b, pp. 291-305; Boesi and Cardi 2009, pp. 52-61.

215 Cai 1995, pp. 23-26. See also Desi Sangye Gyatso [1686] 1994, pp. 330-345. For the Chinese and English translations of Desi Sangye Gyatso’s narrative of Zurkhar Nyamnyi Dorje, see Wang 1991, pp. 87-88; Desi Sangye Gyatso 2010, pp. 293-309.

216 ‘Grass’ here should be understood as ‘a blade of grass’; and ‘herb’ is probably much better than ‘grass’. Because of the implications in English that grass is simply what grows in lawns etc. But considering that ‘summer grass winter worm’ is now a habitual usage, I do not intend to replace ‘grass’ by ‘a blade of grass’ or ‘a blade of a herb’.

217 Winkler 2008a, pp. 1-47.

usual habitat as well as the precise location in which it has been found is most helpful to herb and root collection. But overall, Tibetan physicians paid less attention to the recording of place names in comparison to Chinese physicians.[218] The record of *yartsa gunbu* at most informs us that it was used by Tibetans of that time, who occupied some places in today's Western Sichuan, e.g. the Sde dge rdzong སྡེ་དགེ་རྫོང (i.e. Dege 德格) county.[219]

Aphrodisiacal effect is the central subject of the record. According to the text, it has a slight warm quality and a sweet but mild astringent taste; it particularly increases *byang sems* བྱང་སེམས (semen), and is most effective in increasing *sbyor ba* སྦྱོར་བ་ (sexual union) so as to help people enjoy sexual pleasure and increase fertility; additionally, it is believed to be able to cure prana and bile diseases without increasing phlegm. These explanations immediately reveal the transcultural Indo-Tibetan-Sino contexts in which the knowledge of *yartsa gunbu* was formed.

Prana is an Indian concept of Vedic origin, relating to 'breath' or the sustainer of life processes.[220] Tibetan physicians themselves are notable for preferring to attribute their sources to an Indian Buddhist origin.[221] However, there had been a flow of information and textual records between the Tibetan plateau and central China for many centuries before this time and some work has been carried out analyzing pre-10th century manuscripts from Dunhuang in the far northeast of China that bear evidence to this.[222] The part of Zurkhar Nyamnyi Dorje's record that is salient to this history is the Tibetan adoption of the ethnically Chinese medical potencies of 'warm quality and a sweet but mild astringent taste'.[223] Flavours and thermostatic potencies were codified in ancient Chinese pharmacopoeia, such as *Shen nong ben cao jing* 神農本草經 (Divine Husbandman's Classic of Materia Medica, finalised in the late 1st or 2nd century).[224] So given that there is very little early evidence for a system of Tibetan medicine before the 11th century at this stage it is most likely that the knowledge transfer about these potencies attributed to *materia medica* was from East to West. The process of preparing and consuming the drug is complicated but can be roughly

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[218] In this respect, we can clearly find the difference through comparing the accounts of medicinal substances in this Tibetan medical text by Zurkhar Nyamnyi Dorje with those in an early 15th-century Chinese medical text by Zhu Su 朱橚 (1361-1425), *Jiu huang ben cao* 救荒本草 (Materia Medica for Relief of Famine), see Zhu [1406] 1986, pp. 609-860.

[219] ZGKXYMZYJSSCSSMZSHLSDCZ 1963, p. 2; Fang 2001, pp. 18-26; JTBYZZJ 1937, p. 612; Wu *et al*. 2009, pp. 53-57, 63. The fame of this small county is largely associated with the Dege Sutra-Printing Academy established in 1729. The Academy also printed many works on medicine, astronomy, mathematics, literature, handicrafts, etc., see Yang 2000, pp. 28-49; Jia and Chen 2010, pp. 624-627.

[220] Mute 1865, pp. 339-391; Jaggi 1981, pp. 4-6; Clifford [1984] 2001, pp. 132-136.

[221] Garrett 2008, pp. 37-56.

[222] Cong 1994, pp. 126-181.

[223] Lo 2005, pp. 163-186.

[224] Cf. Ma 1995, p. 86.

summarised as follows: fill the chest of a sparrow with the powder of *yartsa gunbu* (ground in advance) and yeast, then boil the sparrow in sheep milk until all moisture is evaporated; grind the dry material and some additional ingredients (e.g. black pepper) to a fine powder respectively, and then make them into pills; the pills should be taken with wine at dawn for one month; sexual intercourse is forbidden, and raw foods or spoiled vegetables should be avoided in this month.

Aphrodisiacs had been used in ancient Greek, Roman, Indian, Chinese and Arabic cultures long before the 15th century.[225] And the tradition of using animal products as aphrodisiacs (e.g. sparrow, otter, a kind of black frog, and sheep's testicles) and using sparrows as containers for different medicinal substances in Tibetan medicine can also be traced back to at least the 12th-century Tibetan medical texts.[226] Although we have no idea how the aphrodisiacal effect of *yartsa gunbu* was initially discovered, or whether it may well be related to the modern observation that yaks began estrus after grazing on *yartsa gunbu* on the grasslands, just as the Nepalese observed in the late 20th century.[227] Since Tibetan records demonstrate many different kinds of aphrodisiacs were discovered before Zurkhar Nyamnyi Dorje's record, perhaps this is why *yartsa gunbu* as another candidate was mentioned so late, and why *yartsa gunbu* received little attention by authors of Tibetan medical texts written before the 20th century. Moreover, a lack of additional ancient and modern Tibetan medical records of this substance also indicates that it was not a commonly used medicinal material in the Tibetan medical tradition. The reason why it is so valued now owes more to its function within the Chinese experience than to its Tibetan history.

The Earliest Extant Chinese Record

The circulation of medical knowledge between Tibetan and Chinese medicine, sometimes interwoven with political factors, began at least by the 10th century, and never stopped between the 16th and 17th centuries.[228] But the earliest extant Chinese record of *yartsa gunbu* (mainly written as

[225] Taberner 1985, pp. 21-40; Li 2000, pp. 457-468; Manniche 2002, pp. 103-105; Dalby 2003, p. 14; Mazars 2006, pp. 56-59.

[226] For example, a whole chapter titled 'Ro tsa bar bya ba རོ་ཙ་བར་བྱ་བ།' (literally enhancing sexual performance and pleasure) in the *rGyud bZhi* རྒྱུད་བཞི་ (Four Medical Tantras) is devoted to a number of medicinal substances and prescriptions used to build up men's strength, increase semen, and enhance sexual performance, see Yuthok Yonten Gonpo [12th century] 2005, pp. 1483-1491. This chapter mentions two methods of preparing aphrodisiacs, both using sparrows as containers for different medicinal substances. For identifications and descriptions of a few aphrodisiacs in this chapter, see Pasang Yonten Arya 1998, pp. 109, 121, 172, 254, 283.

[227] Guan and Cao 2010, pp. 102-104.

[228] Pordié 2008, pp. 91-102; Garrett 2014, pp. 178-197.

dong chong xia cao or *xia cao dong chong* 夏草冬蟲 in the Chinese language) first appeared in Chinese literature as late as the early 18th century. A few scholars stated that the first Chinese record of the caterpillar fungus was offered by the physician Wang Ang 汪昂 (1615-*c*. 1700) in his medical text entitled *Ben cao bei yao* 本草備要 (Essentials of Materia Medica).[229] However, the record only exists in some of the extant extended versions of Wang's text.[230] It is clear that Wang completed this text in 1683 and enlarged it in 1694. But the authenticity of the various extant extended versions which claim to be finalised in 1694, has recently been challenged. Some historicans of medicine have found that a few supplements in the versions were actually written by another physician called Wu Yiluo 吳儀洛 (*c*. 1704-*c*. 1766), several decades later than 1694; and the illustrations (more than 400) in the versions were oddly never mentioned by Wang in his preface to the extended version.[231]

In fact, the record of the caterpillar fungus in some of the extant extended versions of Wang's medical text is almost identical to that in Wu Yiluo's *Ben cao cong xin* 本草從新 (Renewed Materia Medica, 1757).[232] Wu wrote the medical text for the purpose of revising and enlarging Wang's text.[233] However, the place name 'Jiading Fu 嘉定府' mentioned in the record began to be officially used in 1734, while during the period from 1376 to 1734 it was called 'Jiading Zhou 嘉定州'.[234] This proves that the record of the caterpillar fungus must have been written in some year after 1734, and therefore could not have been written by Wang Ang as he would have had to have been 119 years old. It is reasonable to consider that later editors added Wu's record of the caterpillar fungus into Wang's medical text, with slight revision, and thus generated the record of the caterpillar fungus in forged (not the original) extended versions of Wang's medical text.[235] Due to the popularity of his medical text, Wu's record enabled the caterpillar fungus to be known as a transformable medicinal substance to more and more Chinese people.[236] His account of the caterpillar fungus was frequently cited or mentioned by later texts.[237] Considering some authors

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229 Li and Tsim 2005, p. 579; Winkler 2008b, pp. 291-305; Winkler 2009, pp. 291-316.

230 See, for example, Wang [1694?] 1996, p. 139; Wang [1694?] 1997, p. 76. For reprints of some of the other enlargement versions which do not mention the caterpillar fungus, see Wang [1694?] 1990; Wang [1694?] 1997; Wang [1694?] 1998.

231 Wang 2006, pp. 41-42; Mao and Liu 2013, pp. 17-19.

232 Wu [1757] 1982, p. 36.

233 Wu [1757] 1982, p. 1.

234 Huang *et al.* [1736] 1983a, pp. 91-92.

235 Some historians of Chinese medicine also thought that the caterpillar fungus appeared in Wu Yiluo's medical text was not previously mentioned by Wang Ang despite that he did not offer any proof, see, for example, Shang 2009, p. 299.

236 Shang 2009, p. 301. For a variety of reprint editions of *Ben cao cong xin*, see Wang 2009, pp. 494-495.

237 For example, *Yi shu* 醫述 (Narrating Medicine, printed in 1826), *Ben cao fen jing* 本草分經 (Herbs for

have attributed the earliest Chinese record of the caterpillar fungus to Wu Yiluo,[238] here it is necessary to point out that Wu was not the first Chinese author to record this medicinal substance.

A Chinese man called Tang Fangyi 唐方沂 (1686-1722) kept the oldest extant Chinese record of the caterpillar fungus. But in the past his name was never associated with the caterpillar fungus, and his life and writings were also seldom examined by historians. According to a few local chronicles and genealogical records, it is known that he was born in Shanghai Xian 上海縣 (today's Minhang district of Shanghai) in 1686, and died in Beijing on 23 September, 1722.[239] In 1714, the second year of his marriage, he went to Beijing, and engaged in the compilation of the encyclopedia *Gu jin tu shu ji cheng* 古今圖書集成 (The Complete Collection of Ancient and Modern Texts). This project was one of the great national compilation projects launched by the Qing court for the purpose of pleasing Han intellectuals and hence consolidating Manchu rule. It started in 1716, and lasted until 1720; but the encyclopedia had not been printed until 1725 due to personnel changes.[240] At that time, a proportion of the students at the *guo zi jian* 國子監 (Imperial Academy) would be selected to transcribe the manuscripts of encyclopedias and large collections of books. They would also be rewarded for their efforts.[241] Tang Fangyi was attracted by the project. He managed to become a student of the Academy by means of donating money to the central government, and thus went to Beijing. In 1720, after being assessed, he was appointed as candidate for magistrate of his hometown. Regretfully, two years later he died in Beijing while waiting to take up office.

Tang Fangyi wrote two books in his life. One of them was entitled *Qing li yu zhao* 青藜餘照 (Excess Candlelight), which is now lost.[242] However, a record of the caterpillar fungus in this book is fortunately quoted in two other books: Tang Bingjun's 唐秉鈞 *Wen fang si kao tu shuo* 文房肆考圖說 (Illustrated Detailed Notes from the Study Room, initially printed in 1778) and Zhao Xuemin's 趙學敏 (1719-1805) *Ben cao gang mu shi yi* 本草綱目拾遺 (A Supplement to the

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Different Veins, printed in 1840), and the *Yao xing qie yong* 藥性切用 (Practical Accounts of Medicinal Properties, printed in 1903) all cited Wu Yiluo's record of the caterpillar fungus despite they did not indicated its origin, see Cheng 1826; Yao [1840] 1989, pp. 19, 71; Xu [1903] 1988, p. 731.

238 See, for example, Chen 1991, pp. 45-46; Jiang 1993, pp. 29-30.

239 Wang *et al.* 1814; Ying *et al.* [1871] 1975, pp. 1536-1537, 1849, 2467; Song *et al*. [1816] 2003, p. 262. For the genealogy of the Tang family, see Tang 1850.

240 Pei 2001, pp. 17-42; Xiang 2013, pp. 254-262.

241 Wen *et al*. [1834] 1998, pp. 216-226; Xi 2008, pp. 142-145.

242 Ying *et al*. [1871] 1975, pp. 1536-1537, 2467. The extant painting '*shang hu fan yue tu* 尚湖泛月圖', drawn by Wang Hui 王翬 (1632-1717) in 1717, contains a seal which reads '*qing li yu zhao* 青藜餘照'. The owner of the seal was probably Tang Fangyi. Weng Tonghe 翁同龢 (1830-1904) mentioned the painting in his diary for 25 December, 1869; but meanwhile he recorded that it had already been bought by Shao Xiaocun 邵小村, who was the Mayor of Shang hai dao 上海道 (a region covered today's Shanghai, Suzhou and Taicang) during the period 1882-1886, see Weng [1904] 1989, p. 733. Cf. Liu [1930] 1988, p. 86; SHTZBZWYH 2005, p. 409; SHJZQJZZ 2001, p.131.

Compendium of Materia Medica, finalised *c*. 1803).[243] To facilitate further analysis I quote and translate the record from both books as follows:

From *Wen fang si kao tu shuo*:

'The official historian Dong Hong ([style name:] Yuwan) incidentally said, the caterpillar fungus was produced in Sichuan; its root resembled a movable hairy silkworm; in the summer a seedling grew out of its head up to several *cun*;[244] while in the winter the seedling became dry and withered, only its root survived, which often crept over the snow-covered land in bitterly cold weather.' (**太史董育萬宏偶談**: 四川產夏草冬蟲, 根如蠶形, 有毛能動; 夏月其頂生苗, 長數寸; 至冬苗槁, 但存其根, 嚴寒積雪中, 往往行於地上.)

From *Ben cao gang mu shi yi*:

'The caterpillar fungus was produced in Sichuan; its root resembled a movable hairy silkworm; in the summer a seedling grew out of its head up to several *cun*; while in the winter the seedling became dry and withered, only its root survived, which often crept over the snow-covered land in bitterly cold weather.' (四川產夏草冬蟲, 根如蠶形, 有毛能動; 夏月其頂生苗, 長數寸; 至冬苗槁, 但存其根, 嚴寒積雪中, 往往行於地上.)

Obviously, the only difference between the above two quotations lies in the seven characters relating to an intellectual called Dong Hong.[245] Dong was the man who delivered the information about the caterpillar fungus to Tang Fangyi. Here it is worth noting that although Tang Bingjun was Tang Fangyi's nephew, he was actually raised by Tang Fangyi and brought up by the latter. Tang Bingjun and his true father were both noted physicians.[246] Therefore, Tang Bingjun must have had privileged access to Tang Fangyi's book, and could quote the passage on the caterpillar fungus describing this strange medicinal substance. Then, who was Dong Hong?

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243 Tang 1778, p. 26; Zhao [*c*. 1803] 1983, p. 138.
244 One *cun* 寸 was approximately 3.2 cm at that time, see Qiu *et al*. 2001, p. 447.
245 The term '*dong yu wan hong* 董育萬宏' is a common manner of recording ancient Chinese people's names: putting one's style name between his family name and given name. 'Yu wan 育萬' is the style name of the man 'Dong Hong 董宏'. For example, in volume 40 of the book *Mei cun jia cang gao* 梅村家藏藁, the author Wu Weiye (1609-1671) recorded the litterateur Su Shi's 蘇軾 (1037-1101) name as 'Su zi zhan shi 蘇子瞻軾', see Wu [*c*. 1670] 1919. 'Su 蘇' and 'shi 軾' are the family name and given name respectively, while 'zi zhan 子瞻' is the style name.
246 Shi 1994, p. 1121; Wu 1997, pp. 413-414.

Dong Hong was born in Qingpu county (today's Qingpu district of Shanghai). In 1712 he became a *jinshi* 進士 (metropolitan graduate) and was soon appointed as a royal historian in the *Han lin yuan* 翰林院 (Academy of the Forest of Brushes, Beijing; aka Hanlin Academy). Thereafter he stayed in Beijing and devoted his life to the country until he died there in 1742. His name was also written as Hu Hong 胡宏, Dong Huhong 董胡宏, or Dong Hong 董洪.[247] Dong Hong and Tang Fangyi both came from Shanghai, and resided in Beijing. It is easy to imagine that the two must have been delighted to know each other in that city which was more than one thousand kilometers away from their hometown; and Dong Hong's words about the caterpillar fungus must have been a small matter in their conversation. In the record Tang Fangyi called Dong Hong *tai shi* 太史 (official historian), which indicates that the record was written after 1712, because official historians were selected from metropolitan graduates and worked at Hanlin Academy (Beijing). Considering Tang Fangyi went to Beijing in 1714, it is certain that the record of the caterpillar fungus and the book *Qing li yu zhao* were written during the period from 1714 to 1722.

The literal meaning of the Chinese term *dong chong xia cao* in Dong Hong's words, i.e. summer grass winter worm, corresponds to that of the Tibetan term *yartsa gunbu*. Dong compared the 'root' of the caterpillar fungus to a silkworm, not only because it resembled the latter, but also because it was believed to be able to move like the latter. However, although the 'root' does not have hairs, it is still possible that Dong Hong had personally observed a specimen. Improper preservation will cause a mildew infection of the 'root', making it look hairy,[248] so it may be that by the time it had reached Beijing it was already mildewed. Following the quotation from *Qing li yu zhao*, Tang Bingjun also additionally pointed out that during the reign of the emperor Kangxi (1661-1722) the caterpillar fungus was already on sale in the drugstores in Beijing; and it then had gradually entered the medicine market in Suzhou in subsequent years.[249]

Further confirmation of the caterpillar fungus's travels to northeast China in the early 18th century will come in Chapter 3 from the French missionary Dominicus Parennin (1665-1741), who went to Beijing in 1698 and died there. It is now known that there were three ways in which raw

[247] The character Hong 洪 in his name was wongly written in the 1877 *Qing pu xian zhi* 青浦縣志, while the correct character should be Hong 宏, see Shen *et al*. 1877; Fang and Du 1941, p. 57; Li [1904] 1969, p. 1740; Zhu and Xie 1979, pp. 2682-2683. Hu 胡 was his surname which he signed in his examination paper. It was also his original surname. However, he changed it to Dong 董 after he passed the national examination and became a metropolitan graduate. The phenomenon that examinee changed their surnames, given names or style names after passing the national examination was common in Qing China, see Jiang 2004, pp. 67-68.

[248] Miao *et al*. 2000, p. 905.

[249] Tang 1778, p. 26.

medicinal substances entered the imperial palace: annual tribute by provincial governments, occasional tribute by officials, and purchase by the royal household. The annual tribute remained a major source, and many of the medicinal purchases were actually multi-ingredient formulations.[250] The caterpillar fungus could be delivered into the hands of royal physicians through any of these three ways.

Dong Hong, therefore, did have a chance to see the caterpillar fungus in Beijing. He knew where it came from, but his narrative of its life cycle and behaviours was rather imaginative. No matter whether the imaginative description was originally his own or from others, it is apparent that this special substance greatly challenged people's cognitive abilities, and inspired their imagination. In particular, Dong lived at a distance from its production areas and therefore lacked first-hand observation. And there must have been a lack of new explanations for its strange formation during the intervening two and a half centuries. Otherwise this senior intellectual and official historian would have related the updated explanations to Tang Fangyi. Here it is worth noting that before quoting Dong Hong's story, Zhao Xuemin recorded a region where the caterpillar fungus was produced, i.e. Hualinping 化林坪, Jiangyou 江油 county, a place located in Northwest Sichuan. Zhao added that the Qiang 羌 people had a custom to collect the caterpillar fungus as a first-class medicinal substance.[251] The Qiang people has a very close cultural relationship with the Tibetan people. And in the Qing dynasty they lived in the area equivalent to today's Northwest Sichuan.[252] Zhao's record indicated that he knew the caterpillar fungus was not initially discovered and used by the Chinese people. However, neither Zhao nor Dong offered the geographical information about the production of the caterpillar fungus in 'central Asia', which is mistakenly attributed to Zhao by Nappi.[253] Overall, the oldest extant Chinese record of the caterpillar fungus mentions nothing about its medicinal properties but only details of its physical transformation and the region where it was produced, which reflects Dong Hong's interest in the strange caterpillar fungus, namely in its miraculous transformation.

2.3 The Product

[250] Guan 2007, pp. 19-26; Guan 2008, pp. 110-139.
[251] Zhao [*c.* 1803] 1983, p. 138.
[252] Olson 1998, pp. 286-287; Wang 2008, pp. 121-126. The Qiang people were still collecting the caterpillar fungus in Northwest Sichuan in 1941, see DXSSQBJFWT [1941] 2010, pp. 494-495.
[253] Nappi 2009, pp. 143-144.

In order to track the caterpillar fungus's travels from the Tibetan highlands to the rest of China we first need to examine evidence about the production areas. Here I mainly draw on local chronicles, in which records of local products were closely linked with commerce and tribute, to unveil Chinese people's effort to locate this medicinal substance. This section lays the foundation for mapping the routes it took and Chinese people's perceptions of this curiosity.

The 21st volume of the *Si chuan tong zhi* 四川通志 (General Chronicle of Sichuan, finalised in 1735), entitled Xiyu 西域 (western regions), is now considered by historians the earliest general chronicle of Tibetan regions albeit from a Chinese perspective. This volume covers the region from Dajianlu 打箭爐 (today's Kangding county, Ganzi Tibetan autonomous prefecture, Sichuan) to Tibetan regions, and introduces their local history, geography, culture, politics, economy, products, etc.[254] The caterpillar fungus is recorded as one of the local products of the Bolanggong 撥浪工 mountain, Litang 裡塘.[255] Bolanggong was the Chinese pronunciation of the Tibetan name for the Mountain. As it was recorded as the highest mountain lying on the border between Yajiang 雅江 county and Litang county, we can determine that it is the snowy mountain west of Sichuan, now called in Chinese Jianziwan 剪子彎 (4 659 meters in height).[256] The American Tibetologist William W. Rockhill (1854-1914) once reached this mountain on 28 September, 1892. He reported that 'this mountain is famous as producing that curious worm-plant known as the *Shar-tsa gong-bu* (*tung-chung hsia-ts'ao* in Chinese), called by botanists *Cordyceps sinensis*.'[257] In the Qing dynasty, starting from Dajianlu, two diverging roads, one in the south and the other in the north, stretched to Tibet. The main road was the southern route, along which Bolanggong was a frequent stopping point.[258]

The 1735 *Sichuan tong zhi* is just one of thousands of extant Chinese local chronicles compiled before 1949, a genre which can be dated to the pre-Qin period (up to 221 BC). Considered a predecessor of the local chronicle, the chapter *Yu gong* 禹貢 (Tribute of Yu, finalised *c*. 5th century BC) in *Shang shu* 尚書 (Historical Classic) records regional products that were part of a mandatory

[254] He 1985a, pp. 80-82; He 1985b, pp. 9-12.
[255] Huang *et al.* [1736] 1983, p. 174. This record was fully quoted in the book entitled *Wei zang tu zhi* 衛藏圖志 (Illustrated chronicle of Weizang, 1792), but the authors of the book did not indicate the information about its origin, see Ma and Sheng [1792] 2003, p. 392. However, the authors' joint friend Lu Huazhu 魯華祝 pointed out that they did excerpted some words from *Si chuan tong zhi*, see He 1985b, p. 30; Chen 2009, pp. 136-137.
[256] Xu [1837] 1918; Yao [1846] 1983, p. 130; Li [1899] 1997, p. 422; Youtai [*c*. 1907] 1992, p. 53; Hu 1928, p. 43; SCSLTXZBZWYH 1996, p. 64; Zhou 2006, p. 47. In some of these texts 'Bolanggong 撥浪工' is also written as 'Bolanggong 波浪工' or 'Bolanggong 博浪工'.
[257] Rockhill 1894, p. 361. Rockhill spelt the mountain as 'Mo-lung gung (Po-lang-kung shan in Chinese)'. For his life, see Churchill 1915, pp. 131-133; Wimmell 2003.
[258] Lan 1989, p. 253.

tribute system to kings in the pre-imperial period.[259] From then on, local chronicles of later periods customarily paid attention to the recording of local products in addition to describing local history, geography, people, and so on. Products formed the basis of people's material and economic life; and so, government officials kept a close eye on them. Apart from being used to satisfy the requirement for royal luxury, regional products were also an important source of central government finance.[260] In this regard, local products of an administrative area were also one means by which imperial power was embodied. When the Qing court embarked on an energetic expansion of its territorial boundaries and strengthened its control of the frontiers and the surrounding areas, especially in the Qianlong reign (1735-1796),[261] a volume on various aspects of the western regions was thus added to the *Si chuan tong zhi*. Because of their function of providing diverse, continual and detailed information of a certain place, local chronicles play an important, even indispensable, role in regional studies, especially studies in historical changes in the distribution, transmission and economy of various regional products.[262]

A local product would have to have been recognised, used, or consumed for some time before it was recorded into local chronicles. For example, as early as 1732 Wang Shirui 王世睿 (1674-1745), the magistrate of Luzhou, Sichuan, was sent to Tibet by royal decree on 27 October. In the chronicle of this journey Wang recorded his observation on the caterpillar fungus as a product of Bolanggong mountain.[263] While in 1720 the Governor of Sichuan and Shaanxi went to Beijing and brought the emperor some curious local products, among which there was the caterpillar fungus as a medicinal substance. The products were routine tribute to the emperor.[264] As mentioned before, tribute was a major source of the raw medicinal substances used in the imperial palace, which was irrelevant to trade.

The Governor had become familiar with the caterpillar fungus, its medicinal properties and methods of preparation earlier than 1720. The fact that he carried it with him a long way to Beijing suggests he valued it and might not have known that it could be obtained there. Meanwhile, he also brought some knowledge about the caterpillar fungus from Sichuan to Beijing. In 1885, a Tibetan leader of Zhaliao 乍了 (today's Chaya county, Changdu, Tibet) requested to meet the Guangxu

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259 Anonymous [*c*. 5th-century BC] 1982, pp. 146-152; Loewe and Shaughnessy 1999, pp. 592, 648-649; Heng 2012, pp. 37-54.
260 Zheng 2000, pp. 251-254.
261 Lattimore [1962] 1989, pp. 231-234; Chen 1993, p. 81; Ma 2002, pp. 1-15; Rowe 2009, pp. 71-121.
262 Li 2011, pp. 26-33.
263 Wang [*c*. 1740] 2002, p. 442.
264 Du Halde *et al.* 1819a, pp. 470-485.

emperor in company with the tribute team from Changdu in the following year. The Governor of Sichuan had an obligation to assist the tribute team to go to Beijing. Ding Baozhen 丁寶楨 (1820-1886), who held the position during the period 1877-1886, then reported his request to the emperor. And the emperor approved it on 25 June, 1885. According to Ding's report, the Tibetan leader prepared some presents for the emperor, including some medicinal substances such as 50 *liang* 兩 of the caterpillar fungus.[265] This incident indicated that there was a continuous supply of the caterpillar fungus to the imperial palace in Beijing in the late Qing dynasty; and the Tibetan leader and his people in Zhaliao must have thought that the caterpillar fungus was valuable enough to be considered a special present. The route taken by the tribute team, at that time must have gone from Tibet to Beijing through Sichuan, Shaanxi and Shanxi.[266]

Some local chronicles compiled before the end of the Qing dynasty record the caterpillar fungus as a local product, and therefore provide much information about its production areas (Appendix 1). We can examine such information together with records of the caterpillar fungus in other types of texts such as *materia medica*, travel notes and contemporary investigations. To facilitate further discussion I classify the production areas into two groups according to today's administrative provinces of China as follows:

Group I Production areas where *Cordyceps sinensis* can be found:

1 Sichuan (Litang, Jiading, Huili);

2 Tibet (including Jiuzu, Jiali, Yanjing and Enda);

Group II Production areas where *Cordyceps sinensis* never grows:

3 Xinjiang (Huijiang and Tianshan);

4 Guangdong (Xinning).

The attributions in the records to regions where *Cordyceps sinensis* did not grow are intriguing. Contemporary authorative works on fungi and Chinese herbs and some 19th-century European identifications of fungi, recognise *Cordyceps sinensis* as the authentic species corresponding to the caterpillar fungus. This species grows in China's high-altitude areas in today's Tibet, Sichuan,

[265] Anonymous [1886] 1983, p. 700; Shixu *et al.* [1927] 1987, pp. 918, 941. For Ding Baozhen's life, see Jia 2004, pp. 90-94.
[266] Li 1991, pp. 70-81. The tribute route to Beijing changed several times, and this route was determined in 1860.

Yunnan, Gansu, and Qinghai.[267] The areas listed in Group I can be seen as old records of some production areas of *Cordyceps sinensis*. But it should be noted that some other similar-looking species of the genus *Cordyceps* also grow in these areas: *Cordyceps liangshanensis* in Sichuan and Yunnan, *Cordyceps gracilis* in Yunnan, Xinjiang and Jiangsu, *Cordyceps aspera* in Tibet, Yunnan, Sichuan and Guangdong.[268] The areas listed in Group II do not produce *Cordyceps sinensis* but may produce other *Cordyceps* species. Of course it is also possible that records from the areas in Group II mistook some exotic products (such as the caterpillar fungus) sold on local markets for local products.

The caterpillar fungus growing in different areas would not be treated or used indiscriminately. The physician Wu Yiluo said, '[The quality of] the caterpillar fungus that grows in Jiading Fu of Sichuan is the best, while [the quality of] the caterpillar fungus that grows in Yunnan and Guizhou is inferior.'[269] A Republican local chronicle also points out the differences in the appearance and quality of the caterpillar fungus growing in Sichuan and Enping (a county in today's Jiangmen city, Guangdong): 'Its stem is slightly bigger [than that of the same production in Sichuan], and it is not as good as that produced in Sichuan, which is slender and small.'[270] The basis on which 'good' was identified was probably potency. No doubt transregional trade enabled people to compare the quality of the caterpillar fungus from different areas. And the trade in the caterpillar fungus not only increasingly attracted people's attention, but also motivated them to find this medicinal and economic curiosity beyond traditional production areas. When people believed they had discovered it elsewhere (e.g. Guangdong), for example, they would then be able to compare it with those disseminated from recognised production areas (e.g. Sichuan). This new level of observation stimulated by trade, as Harold Cook notes for global maritime trade in the 17th century,[271] led to a new and observational style of discourse about the qualities of similar products from different areas.

The Chinese names for the caterpillar fungus in local chronicles also reflect the new dissemination and trade of the 18th-19th centuries. As mentioned before, the caterpillar fungus from Sichuan had already been sold in Beijing during the period 1661-1722. And Parrenin also recorded the caterpillar fungus as '*hia-tsao-tom-chom*' (i.e. *xia cao dong chong*), indicating that the Governor

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[267] Liang 2007, pp. 125-126; XZZZQZYYYWYJS 2002, pp. 147-148.
[268] Liang 2007, pp. 89, 90, 98, 140.
[269] Wu [1757] 1982, p. 36. Wu Yiluo's words were also quoated by the *Gui zhou tong zhi* 貴州通志 (General Chronicle of Guizhou, 1948) as the evidence that proved the caterpillar fungus was a local product of Guizhou, see Liu *et al*. [1948] 2006, p. 167.
[270] Yu *et al*. [1934] 1974, p. 214.
[271] Cook 2007, pp. 304-338.

and natives in Sichuan used this name at that time. However, in the 1735 *Si chuan tong zhi* the caterpillar fungus was recorded as *dong chong xia cao* rather than *xia cao dong chong*. Reasons for this change in word order remain unclear. It was probably caused by an accidental slip of the tongue during oral communication between different ethnic groups and different areas about this medicinal substance. This then led to the spread of the term *dong chong xia cao* so that it was adopted into the 1735 *Si chuan tong zhi*. Besides, since 1891 two abbreviations of the Chinese name appeared in Qing local chronicles: *dong chong cao* 冬蟲草 (winter worm grass) and *chong cao* 蟲草 (worm grass), with the latter being more popular. According to extant records, *chong cao* was first mentioned as the *su cheng* 俗稱 (popular name) for the caterpillar fungus by Li Xinheng 李心衡 in 1790,[272] while *dong chong cao* appeared later. The latter seemed to be first mentioned by the physician Wang Shixiong 王士雄 (1808-1866) in 1838.[273] The abbreviations originated from communications about the caterpillar fungus, but also in turn facilitated communication.

Perhaps what lay behind the abbreviations was an increasing dissemination and consumption of the medicinal caterpillar fungus, mainly driven by medicine trade. Li Xinheng, who had been an official in West Sichuan for more than a decade, explicitly mentioned the anonymous *cai yao zhe* 採藥者 (root gatherers) in Jinchuan as well as their experience of collection. These collectors, at the starting point of the trade chain, are represented in literature well after the trade began no later than the early 18th century. Wang Shixiong was a physician born in Hangzhou, who practised medicine in his hometown and Shanghai (both cities lie in the most Eastern part of China), his knowledge and use of the caterpillar fungus must have resulted from an increased trade in this medicinal substance in the East during his time.

Overall, the appearance of the caterpillar fungus in local chronicles reflects Chinese people's efforts to locate this regional medicinal product. This effort was driven by medical and commercial purposes, and the requirement of tribute. The caterpillar fungus could be used locally, or be disseminated from its production areas through tribute, trade, and other avenues (e.g. interpersonal gifting). In the broad dissemination of the caterpillar fungus tribute was confined to the imperial palace; while trade will have increased the volume of the caterpillar fungus spread in non-production areas beyond the imperial palace. Knowledge of the caterpillar fungus also circulated among the Chinese who came into contact with the caterpillar fungus on its travels. In order to figure out how

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272 Li [1790] 1936, p. 64.
273 Wang [1838] 1999, p. 66.

this happened, it is necessary to carry out a close examination of the nature and characteristics of the caterpillar fungus in historical context.

2.4 The Marvel

Miracles have always been a feature of medical efficacy, and mostly have been studied in relation to religious healing. Recent literature has highlighted the role of miracles in the construction of medical authority and the practices and experiences of efficacy.[274] Miracle medicines also have commercial cache.

Prior to the 15th century, a few Chinese texts on *materia medica* recorded another kind of medicinal substance that looked similar to the caterpillar fungus: *chan hua* 蟬花 (flowers on cicada). It was first mentioned in the *Lei gong pao zhi lun* 雷公炮炙論 (Duke Lei's Treatise on the Preparation of Medicinal Substances, *c*. 5th century),[275] which, however, did not give morphological descriptions. In light of this, the earliest account of the morphological characters of *chan hua* was offered by the *Ben cao tu jing* 本草圖經 (Illustrated Classic on Materia Medica, 1061). The author of this text recorded *chan hua* as a medicinal product in Sichuan.[276] Both the above medical texts are lost and extant in quotations in the *Zheng lei ben cao* 證類本草 (Materia Medica Arranged According to Pattern, *c*. 1108). According to the latter text, *Ben cao tu jing* records *chan hua* as follows:

> Nowadays there is a kind of cicada in Sichuan; a horn extending from the head of its shell resembles the petals of a flower; it is called *chan hua*. Some people from western regions carried it to the capital. Official physicians said, 'it is the most marvelous thing when used as a medicinal substance.' (今蜀中有一種蟬, 其蛻殼頭上有一角, 如花冠狀, 謂之蟬花. 西人有齎至都下者. 醫工云, '入藥最奇.')[277]

[274] Zhan 2009, pp. 91-118.
[275] The dating of *Lei gong pao zhi lun* remains controvertial, see Zhu 1992, pp. 217-221; Zhang and Guan 2000, pp. 179-183. Here I adopt the traditional opinion, see Liao *et al*. 1998, pp. 231-232.
[276] Li 1993, pp. 21-22; Luo and Song 2007, pp. 14-15. The records of *chan hua* in *Lei gong pao zhi lun* and *Ben cao tu jing* can be found in collected versions of the texts, see Lei [*c*. 5th century] 1991, p. 124; Su [1061] 1988, pp. 429-430. However, the authorative *Zhong hua ben cao* 中華本草 (Chinese Herbs, 1999) still considers *Ben cao tu jing* the first text recording *chan hua*, which should be corrected, see ZHBCBWH 1999, p. 499.
[277] Tang [*c*. 1108] 1993, pp. 510-511.

The formation of *chan hua*, like that of the caterpillar fungus, is also related to fungal parasitism: the fungus *Cordyceps sobolifera* (distributed in Anhui and Sichuan) or *Cordyceps cicadae* (distributed in Zhejiang, Guangdong, Fujian and Anhui) parasitises some of the nympha-state insects belonging to the Cicadidae family, such as *Cicada flammata* and *Platypleure kaempferi*, and then grows out of the latter's heads, and forms fruiting bodies which resemble flowers.[278] However, although *chan hua* and the caterpillar fungus look similar, there are still differences in their morphological characteristics: normally, the former's fruiting body resembles a flower, while the latter's resembles a slender stick; the former's insect part reveals its nympha state, while the latter's reveals its larva state.

Both *chan hua* and the caterpillar fungus could be found in Sichuan, but the latter first entered Chinese *materia medica* as late as 1757. And one century later, the physician Tang Zonghai 唐宗海 (1846-1897), a native of Sichuan, was still ignorant of previous related records and claimed that the caterpillar fungus had never been mentioned before.[279] This presents a deficit in his scholarship, but knowledge acquisition then was not as convenient as is today. Anyway, Tang and other Qing recorders of the caterpillar fungus never associated it with *chan hua* despite of their similar appearance. This is quite puzzling. The main reasons probably lay in the following two aspects: first, the explanation of the caterpillar fungus, which was of Tibetan origin and was different from that of *chan hua*, impressed the Chinese people who first got to know it, and therefore would not prompt them to link it with *chan hua*; second, although the caterpillar fungus and *chan hua* look similar, the insect part of the caterpillar fungus is a larva rather than a nymphae. A larva is more likely to inspire people's imagination as the larva greater potential for change transforms to a blade of grass.

Attracting Eastern China

The caterpillar fungus is more marvelous than *chan hua*. In the 23rd chapter of the novel *Ru lin wai shi* 儒林外史 (The Scholars, finalised *c*. 1750), the wealthy salt merchant Wan Xuezhai treated some of his friends to a slap-up lunch in Yangzhou (a city of the coastal Jiangsu), and the first dish was just the caterpillar fungus. To stress its rarity, and his ability to obtain it, he bragged

[278] Xing 1975, pp. 21- 26; Liang 2007, pp. 77-78, 127-128. However, the species *Cordyceps cicadae* was omitted in the 2008 revision of the list of Chinese medicinal fungi, see Dai and Yang 2008, pp. 801-824.
[279] Tang *et al*. [1893] 1991, p. 26.

complainedly that it had to be transported from remote areas and could not be found locally despite that Yangzhou provided a wide variety of products from different regions.[280] The background to the plot of the novel was Yangzhou's impregnable position as the centre of salt trade in 18th-century China.[281] Wan, a fictional character, represented the salt merchant group whose considerable wealth exceeded that accumulated by any other group. Based on economic strength and a relationship with imperial officials, these rich merchants, without official political status themselves pursued a life of luxury, spending money like water.[282] If allowed, they could have bought up the entire Yangzhou city.

In broader perspective, the rise of Yangzhou in the 18th century was one phase in the North to South and West to East shift of the economic and cultural centre of China, a shift that had been happening since the Han Empire. This migration intensified in the Song dynasty (960-1279).[283] Scholars have pointed out that the novel *Ru lin wai shi* is not entirely fictional.[284] A book entitled *Yang zhou hua fang lu* 揚州畫舫錄 (Record of the Painted Boats of Yangzhou, first printed in 1795) records the life and times of an affluent Yangzhou salt merchant. Whenever he and his wife had a meal, they would be served with over ten different dishes; he kept hundreds of horses each of which cost him tens of *liang* in gold everyday; but the elaborately decorated horses were just led out of the city in the morning and led back in the evening in a conspicuous display of wealth.[285] The prosperity of 18th-century Yangzhou, a junction of the Beijing-Hangzhou Grand Canal and the Yangtze River, attracted both people and products from the rest of the empire. Even the emperor Qianlong (1711-1799) would delight in Yangzhou on each of his six extravagant inspections of the regions south of the Yangtze River. Much of his travel expense was funded by the Yangzhou salt merchants.[286]

The author of *Ru lin wai shi,* namely Wu Jingzi 吳敬梓 (1701-1754), had a rough life. He was born in Quanjiao 全椒, Anhui, where most Yangzhou salt merchants came from or congregated. In 1733 Wu migrated to Nanjing, Jiangsu. In the last year of his life, he went to Yangzhou to drink with

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280 Wu [*c*. 1750] 1977, p. 278.
281 Ho 1954, pp. 130-168.
282 Finnane 2004, pp. 109-136, 157-190; Chen 2006, pp. 1-12.
283 Shi 1991, pp. 199-214; Lan 1995, pp. 71-76; Zheng 2003, pp. 12-27. Cf. Lan 2002, pp. 216-222; Lan 2013, pp. 30-41.
284 Chen 2006, pp. 78-267.
285 Li [1795] 1997, pp. 148-149. 1 *liang* was roughly equal to 37 grams in the Qing dynasty, see Qiu *et al*. 2001, pp. 431-432.
286 As one of the major commodity distribution centres in the early and middle Qing dynasty, Yangzhou benefited much from its convenient shipping, see Liao 2009, pp. 103-108. For Qianlong and Yangzhou, see Zhu 1989, pp. 136-140.

his friends, and finally died there. It was not his first time in Yangzhou, and his intimate friends included a salt merchant called Cheng Jinfang 程晉芳 (1718-1784).[287] Therefore we can assume that Wu recorded a vignette about our caterpillar fungus in the background of his knowledge of their lifestyle. And it is reasonable to believe that the caterpillar fungus had already spread to Yangzhou or other wealthy cities of Jiangsu before 1750. The vague term for the production area of the caterpillar fungus, i.e. '*fang wai*' (remote areas), suggests that the caterpillar fungus obtained by Wan Xuezhai had passed through several hands before reaching him, so that the information about its origin ultimately blurred.

Living not far from Yangzhou, Yuan Dong 袁棟 (1697-1761), a litterateur in Wujiang county of Suzhou, Jiangsu, once got some caterpillar fungus from one of his friends coming from far away. In his 1744 book *Shu yin cong shuo* 書隱叢說 (Collected Notes fom the Shuyin House), he wrote:

> A friend of mine once came from far away and presented me with the caterpillar fungus, a thing that grows in the regions bordering Shaanxi. It gets the name because it is grass in summer and turns into a worm in winter. Soak it in wine, and then the wine can be used to remove diseases and prolong life. When I saw it, it was found to be a dead grass-root of which the upper and lower parts differed in figure and colour: the half-green part looked like grass, while the half-black part was slightly bigger and seemed as if it was going to move. I have not found any written records of this substance yet, but I will try to find some later. (昔有友人自遠來餉予一物, 名曰'夏艸冬蟲', 出陝西邊地, 在夏則爲草, 在冬則爲蟲, 故以是名焉. 浸酒服之, 可以卻病延年. 余所見時, 僅草根之枯者, 然前後截形狀, 顏色各別: 半青者, 僅作草形; 半黑者, 略粗大, 具有蠕蠕欲動之意. 不見傳記書之, 以俟後考云.)[288]

West Shaanxi bordered Gansu and Sichuan in the Qing dynasty.[289] From Shanxi to Wujiang, Yuan's friend would have needed to travel over one thousand kilometers. The caterpillar fungus as a present for Yuan not only represented his respect for their friendship, but also reflected his regard for the caterpillar fungus itself. In his eyes, this transformable medicinal substance could 'remove diseases and prolong life'. When he presented it to Yuan Dong, he also shared its marvelous potencies.

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[287] Chen 1990, pp.65-383; Wang 2000, pp. 57-61; Wang 2010, pp. 15-18.

[288] Yuan [1744] 2002, p. 486. The character '*cao* 艸' (grass) is a variant form of '*cao* 草'. For Yuan Dong's life and writings, see Zhao 2013, pp. 1-22.

[289] Tan 1996, pp. 26-29, 39-40.

Suzhou, approximately 160 kilometers straight southwest of Yangzhou, was a flourishing and large city comparable with Yangzhou. Yangzhou began to decline in the 19th century, whereas Suzhou did not stop developing.[290] According to Tang Bingjun's 唐秉鈞 account in his book *Wen fang si kao tu shuo* 文房肆考圖說 (1778), the caterpillar fungus began to appear on the medicine market in Suzhou some years before he wrote down the record.[291] Geographically, Yangzhou and Suzhou lay north and south of the Yangtze River, and goods could be exchanged through the convenient water transportation network. It was not difficult for salt merchants to know and obtain the caterpillar fungus from Suzhou.

Yuan mentioned that the worm part of the caterpillar fungus looked 'half-black'. Normally this part looks yellow or brown. Perhaps the earth adhering to the worm part was not well cleared away; or, the worm part had decayed due to improper storage and the long journey. In fact, the decay of the caterpillar fungus and related colour changes were explicitly mentioned by Parennin in 1723. In terms of the storage problem which was essential to commercial profits, the epigraphist Zhu Feng 朱楓 (1695-?) offered us a solution in his book *Gan yuan xiao zhi* 柑園小識 (Short Notes from Ganyuan, *c*. 1780): 'It would not be eaten by woodworms if stored together with saffron.'[292] Saffron would have made the product yellow and, being very expensive, added to its value.

Zhu Feng was not a merchant. In addition to his identity as an epigraphist, he was also a litterateur and traveler. When his son was appointed the county leader of Liquan, Shanxi in 1751, he also left his hometown Qiantang county of Hangzhou, Zhejiang, and accompanied his son there. Except for two returns to Qiantang in 1756 and 1760 respectively, he remained in Shanxi and Henan until 1780 when his son was dismissed from office. From his notes in *Gan yuan xiao zhi* it is clear that his interests were not confined to epigraphy, but also plants, animals, geography, folklore, etc.[293] The term he used for the caterpillar fungus was *chun chong xia cao* 春蟲夏草 (spring worm summer grass), which was unique among Qing records of the caterpillar fungus. Zhu reported that it grew in Dajianlu 打箭爐, Sichuan and was able to remove pains in the part of the body between the waist and knees, and also to benefit the kidney.

The above potencies need to be understood in context. According to the Chinese medical classic *Huang di nei jing su wen* 黃帝內經素問 (Huang Di's Inner Classic-Basic Questions, *c*. 1st century

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290 Fan 1998, pp. 143-147; Zhang 2002, pp. 25-29.
291 Tang 1778, p. 26.
292 Zhu *c*. 1780, p. 47.
293 Zhu [1745] 1890; Ding [1896] 1990, pp. 34-36; Lu 2014, pp. 88-93.

BC), the kidney is the organ where *jing* 精 originates; and *jing* is the spring of life. The concept of *jing* and its range of meanings embrace sexual potency, which materialises in semen.[294] The benefiting or nourishing of the kidney has been one enduring theme in medicine in China since the beginning of the first millennium. For young and middle-aged people alike, taking care of the kidney largely meant enhancing and maintaining sexual function, which is closely related to disciplining their instinctive pursuit of sexual pleasure, all allied to enhancing procreative potential and, as we shall see, human potential for longevity. Having more offspring was beneficial to various activities such as crop and livestock production.[295] If we remember the Tibetan physician Zurkhar Nyamnyi Dorje's words about *yartsa gunbu*, we should be clear that he did stress the goal of increasing fertilty through boosting libido.

Furthermore, pre-modern Chinese thought also related having offspring to the virtue of *xiao* 孝 (filial piety). Not producing offspring was generally regarded as the most unfilial behaviour, as well as a moral crime.[296] Therefore impotence was always a huge issue. Tang Bingjun offered us the earliest extant medical case recorded of curing male impotence, which also involved the spread of the caterpillar fungus:

> My teacher Kong, whose given name is Jiyuan…told me that his younger brother was impotent and sweated heavily. He was quite afraid of wind, and stayed under the mosquito net in a closed room even when it was summer. He had been sick for three years, and no medicinal substances were found to be effective in curing his illness. At that time a relative quit his official position and retuned from Sichuan, and gave him three *jin* of the caterpillar fungus. He braised it together with meat and vegetables, and ate them every day. Gradually, he made a recovery from his illness. Therefore I learnt from this case that it really could protect the lung and build muscles. Subsequent use of the caterpillar fungus also proved its effectiveness. I believe that the potencies of it is no lower than that of ginseng, so I attach these words here. (孔老師, 諱繼元…述伊弟患怯, 汗大泄, 雖盛暑, 處密室帳中, 猶畏風甚, 病三年, 醫藥不效, 症在不起. 適戚自川解組歸, 遺以夏草冬蟲三斤, 逐日和葷蔬作肴燉食, 漸至全愈. 因信此物之保肺

294 Anonymous [*c*. 1st century BC] 1992, pp. 13, 149. This Han medical text had been revised by Tang and Song editors. For a brief discussion on the dating of this text, see Sivin 1993, pp. 196-215.
295 Zhang 2004, pp. 109-114.
296 Anonymous [*c*. 3rd century BC] 1999, p. 34. See also Meng [*c*. 3rd century BC] 1999, p. 210. The thought of *xiao* is one of the core characters of Chinese culture, see Xiao 2002, pp. 151-154.

氣，實腠理，確有征驗．嗣後用之俱奏效，因信此品功用不下人参，故附志之.)[297]

It was a miracle of healing!

Tang was a native of Shanghai (Shanghai neighbours Suzhou).[298] According to his narrative, Kong Jiyuan was born in the town Wuzhen, Zhejiang; he eventually held the position of director of the Yingkui College, which was located in today's Jiading district of Shanghai.[299] When a relative of Kong Jiyuan, an official rather than a merchant, returned from Sichuan to Wuzhen, he also carried the caterpillar fungus to his hometown. Obviously he knew the potencies of this medicinal substance and the methods of using it. Although the impotent man had tried treatments before, none of them really worked. We can imagine his anguish during those ineffective treatments, as well as his delight with his recovery. The caterpillar fungus proved to be a very effective cure for impotence; meanwhile, its effectiveness earned it a reputation as a medicinal substance comparable with ginseng, a highly esteemed tonic herb generally believed to have marvelous effects.[300]

Kong Jiyuan was surely not the only person who spread the news of the marvel, and Tang Bingjun not the exclusive audience. These men's family, relatives, neighbours and friends would also bear witness to the miracle cure. When Tang wrote down this record, the caterpillar fungus had already been sold in Suzhou drugstores for years, and there was a market demand for this medicinal substance. However, the concept of *jing* was not confined to semen. For old people, whose interest in sexual activity has significantly decreased, caring about their *jing* and the kidney meant maintaining their spirit and body and prolonging their life. This was in line with the nurturing life culture that dated back to at least the Warring States period (475-221 BC).[301] In this capacity, the caterpillar fungus is valued as a tonic rather than an aphrodisiac, despite that the two attributes cannot be clearly separated as they normally go hand-in-hand in remedy books. Yuan Dong's friend told him that the caterpillar fungus was able to prolong life; and Zhu Feng also additionally added that 'someone says it is good for old people if they eat it boiled together with a male duck.'[302]

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297 Tang 1778, pp. 27-28. 1 *jin* 斤 was equal to approximately 595 grams then, see Qiu *et al*. 2001, p. 430.
298 Heshen *et al*. [1784] 1986, pp. 159-160.
299 Ji 1996, pp. 760.
300 For example, the noted work on *materia medica*, *Ben cao gang mu shi yi* (A supplement to the Compendium of Materia Medica, *c*. 1803), states that ginseng can bring a [dying] person back to life, or save incurable and serious petients, see Zhao [*c*. 1803] 1983, p. 61.
301 For the origin and development of the nurturing life culture and its influence on early Chinese medicine, see Lo 1998. Cf. Lo 2001, pp. 19-50.
302 Zhu *c*. 1780, p. 47. The original words are '或云：與雄鴨同煮食，宜老人.' This is an example of self-help in the Chinese Yangsheng culture, see Dear 2012, pp. 1-33.

Whether in terms of physical needs or the moral imperative to procreate, the caterpillar fungus as an aphrodisiacal and tonic substance was a strong lure for people.

Miraculous transformation

The miraculous transformations of the caterpillar fungus, as we shall see, were in themselves fascinating and attracted the attention of physicians and traders alike. An 18th century record spoke of the caterpillar fungus gatherers as ‘groveling on the ground, first to find its sprout and then its root’.[303] Today adults and children still spend hours lying on the grasslands waiting for a caterpillar fungus to surface. Their patience is motivated by commercial gain, but their concentration vividly evokes the value of their quarry which is embodied in its strange shape. That value as it attracted the caterpillar fungus to travel in ever greater numbers to East China is grounded in the ancient Chinese imagination of shape-shifting animals. Roel Sterckx sums this up in his observation that the ability of animals to transform like dragons was used as an epithet for transcendent virtue and sagehood. It led to a variety of imaginative theories, some of which were associated with human morality and sexuality in early China.[304]

Ancient Chinese literature is full of descriptions of animals and legendary beasts enacting supernormal transformations. Sometimes these transformations are markers of time. For example, the earliest extant Chinese calendar *Xia xiao zheng* 夏小正 (Lesser Annuary of the Xia) recorded that the *ying* 鷹 (eagle) and the *jiu* 鳩 (dove) could change from one to the other in the first and fifth months respectively;[305] and the *Li ji* 禮記 (Record of Rites) also stated that the *ying* 螢 (firefly) emerges out of decayed grass.[306] Animals that could cross boundaries in the environment, especially those that crossed the domains of land and air, or land and water, or represented in some way earthly transformations were especially powerful symbols, and so it is not surprising that their flesh and eggs came to be perceived as potent medicinal substances. Snake meat, dragon bones (actually the inscribed turtle shells and cow scapula that were used as divinatory oracles in Shang (17th-11th century BCE) times that were mistaken for dragon bones in later times), rare birds, tortoises, etc. were extensively valuable. During the period that the caterpillar fungus left the Tibetan

303 Li [1790] 1936, p. 64.
304 Sterckx 2002, pp. 165-204.
305 Anonymous [7th-4th century BC] 1981, pp. 12, 45.
306 Anonymous [1st century BC] 1999, pp. 508-509.

highlands *en masse*, physicians like Zhao Xuemin (1719-1805) knew the ancient works on animal metamorphoses and were newly sinicising their transformations. The processes of transformation newly acquired atributions associated with the medical theories of *yin* 陰 and *yang* 陽 theory that explained the physicial changes in the shape and nature of the caterpillar fungus as it cycled seasonally between grass and a worm.[307]

So when we consider the stimuli to the spread and reception of the caterpillar fungus, we have to be aware of the longstanding Chinese culture of aphrodisiacs and its valuing of the magical qualities of animal transformation. A variety of aphrodisiacs and tonics had been used by the Chinese long before the caterpillar fungus became known to them. For example, a group of herbs called *yin yang huo* 淫羊藿 (*Epimedium* spp.), noted for treating *yin lou* 陰瘘 (impotence), was included in the earliest extant Chinese text on *materia medica Shen nong ben cao jing*, and has been used for about 1 800 years.[308] The Daoist physician Tao Hongjing 陶弘景 (456-536) added that *yin yang huo* got its name because goats exhibited estrus after grazing on the leaves of *huo* (*Epimedium* spp.) on the grasslands in northwest Sichuan.[309] Li Shizhen 李時珍 (1518-1593) also cited Tao's observation. He demonstrated the interest traditional physicians of Ming times retained in category transformations. The well-known tonic ginseng, regarded as *tu jing* 土精 (spirit of earth), also had strange animal behaviours. Citing an earlier record, Li told us that it cried every night behind the house; and only when it was dug out, the cries stopped.[310]

As a latecomer from some western areas of China, proven efficacies, no doubt, were a very important factor that propelled the spread of the caterpillar fungus to other areas, as well as the medicine trade in the caterpillar fungus. But here two things mentioned by Dominicus Parennin demand attention. First, the caterpillar fungus was known to, and used by the royal physicians in the imperial palace in Beijing in the early 18th century. Second, the governer of Sichuan and Shanxi had brought it to the emperor. However, we cannot find the caterpillar fungus in any of the over 30 000 thousand royal medical case records written during the period from 26 January, 1652 to 25 October, 1922.[311] In particular, the medicinal substances used to nourish the kidney of the emperor Guangxu (1871-1908), who had been troubled by spermatorrhea for over twenty years, also did not include the

[307] Zhao [*c*. 1803] 1983, p. 139.
[308] For the record of *yin yang huo* in *Shen nong ben cao jing*, see Ma 1995, pp. 214-215. For its production areas and modern uses, see Liang *et al*. 1988, pp. 7-10; Wu 1998, pp. 267-268; Ying and Chen 2001, pp. 266-300; Guo and Xiao 2003, pp. 303-307.
[309] Tao [492] 1994, pp. 301-302.
[310] Li [1578] 1975, pp. 699-700.
[311] For the content of the royal medical case records in the Qing dynasty, see Chen 2009, pp. 17-1085.

caterpillar fungus.[312] Yet the question remains, why was the caterpillar fungus seldom used by the elite physicians in the imperial palace? Of course, it is possible they did not record its use. But I think the major reason was that, based on their experience, they did not think it was irreplaceable or more effective than other alternatives (e.g. *yin yang huo*) with which they were more familar. Even today, some traditional physicians, whether they are Tibetan or Chinese, hold a similar view; and even in Tibetan settlements it is rarely used in treatments.[313] So, there must be a stronger cultural factor that prompted the spread of the caterpillar fungus.

We must remember that the Yangzhou salt merchant Wan Xuezhai once bragged about the production area of his first dish of the caterpillar fungus. At the time he mentioned nothing about its potencies. Indeed, he could show off his great wealth and ability through the conspicuous display of an exotic. Wan would not show off a distant but ordinary substance, e.g. a herb coming from far away but also growing in Yangzhou. Not only did this salt merchant, though fictional, not mention its potencies, but also the official historian Dong Hong in the earliest extant Chinese record of the caterpillar fungus only spoke of its production area and life cycle. Actually, if we only look at the 18th and 19th-century Chinese accounts of its potencies, we will not feel that it is a special medicinal substance. On this point we just need to compare the potencies of the caterpillar fungus with those of *yin yang huo* and ginseng described in the medical text *Ben cao cong xin* (1757).[314] If we shift our gaze to the 18th-century Chinese accounts of its life cycle, just as summarised by the Chinese name *dong chong xia cao* or *xia cao dong chong*, we will find what made it special: marvelous transformation.

In the earliest Chinese medical record of the caterpillar fungus, offered by Wu Yiluo in 1757, its transformation is described as follows:

> In winter it stays in the ground and is able to move, resembling a piliferous old silkworm; while in summer its hair grows out of the ground, and turns into a blade of grass together with the body. If it is not gathered in summer, it will turn into a worm again in the coming winter. (冬在土中，身活如老蠶，有毛，能動；至夏則毛出土上，連身俱化爲草；若不取，至冬則復化爲

[312] Zhou 2009, pp. 1231-1234. For the medical case records about the emperor Guangxu, see Chen 2009a, pp. 760-935.
[313] Li 2007, pp. 15-16; Boesi and Cardi 2009, pp. 52-61.
[314] Wu [1757] 1982, pp. 1-3, 22, 36.

蟲.)[315]

From winter to summer, from a worm to a blade of grass, the transformation of the caterpillar fungus follows the seasons. More amazingly, this transformation is reversible. Such a clear expression of the reversibility of its transformation is quite unusual among Qing records of the caterpillar fungus. In most cases the reversibility was expressed implicitly. We can compare the above account with another one offered by Tan Cui 檀萃 (1724-1801). Tan spent many years in Guizhou and Yunnan as an official after being selected as a metropolitan graduate in 1761. In the book *Qian nang* 黔囊 (Bag of Guizhou, *c*. 1761), he wrote:

> The caterpillar fungus grows in the areas northwest of the Wumeng Mountain [lying on the Yunnan-Guizhou Plateau and extending in a northeast-southwest direction]. The reason why it is given this name is that in summer it is a blade of grass growing out of the ground, while in winter it hibernates in the ground and turns into a worm. (夏草冬蟲者，出烏蒙塞外，暑茁土爲草，冬蟄土爲蟲，故以名.)[316]

Here the life cycle of the caterpillar fungus starts from grass in summer, rather than a worm in winter. The two accounts indicate that there are no clear boundaries between the starting point and ending point of its life cycle. The imagination of its reversibility remained popular to the end of the Qing dynasty. For example, Zheng Guangzu 鄭光祖 (1775-?) assimilated the idea about its reversible transformation in his book *Yi ban lu* 一斑録 (Notes on trivia, 1844) when speaking of the caterpillar fungus produced in Sichuan and Yunnan.[317] And in 1903 the Japanese Buddist monk Kawaguchi Ekai 河口慧海 (1866-1945), who reached the boundary of Tibet via Nepal on 4th July, 1900, and then traveled and studied in Tibet until 15 June, 1902[318], returned to Japan with Tibetan articles as well as plant specimens.[319] He told the Japanese biologist Ito Keisuke 伊藤篤太郎

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315 Wu [1757] 1982, p. 36.
316 Tan [*c*. 1761] 1922-1943, p. 35. For his life and writings, see Song 1996, pp. 77-78.
317 Zheng [1844] 2002, p. 9. Zheng was born in Jiangsu. He once went to Yunnan to see his father (who was holding an official position) in 1790, and returned in 1795, see He 1990, pp. 40-47. But it is difficult to determine if his narrative of the caterpillar fungus originated from his experience of that trip. Zheng did not offer any medical information about the caterpillar fungus.
318 Kawaguchi 1904a, p. 87; Kawaguchi 1904b, pp. 361-362.
319 For the Tibetan articles brought back by him, see Toukyou bijutsu gakkou kouyuu kai 1904. For the plants collected by Kawaguchi, see Ito 1903, pp. 157-159; Kitamura 1953, pp. 37-43; Kitamura 1953, pp. 70-77; Kitamura 1954, pp. 168-172; Tamura 1954, pp. 192-198; Murata 1955, pp. 13-16.

(1866-1941) that natives in Tibet thought the caterpillar fungus reversibly transformed from a worm to grass.[320] Therefore, the reversibility of the caterpillar fungus, which was not clearly stated by Zurkhar Nyamnyi Dorje about five hundred years previously, was actually also of later Tibetan origin.

Crossing the boundaries of plants and animals, the caterpillar fungus inspired a sense of mystery and the supernatural. The litterateur Xu Kun 徐昆 (1715-?) particularly wrote the transformation of the caterpillar fungus into his 1792 collection of mystery stories.[321] And in the winter of 1803, after requesting tens of the specimens from his uncle who returned from Sichuan with some caterpillar fungus produced in Xiaojingchuan, Chen Yong 陈镛 (born in Suzhou) could not wait to show off this curiosity to other people.[322] No wonder a Qing intellectual called Wang Peixun 王培荀 (1783-1859), born in Zichuan, Shandong but holding an official position as the magistrate of a few counties of Sichuan for 14 years (1835-1848), expressed his perplexity in the form of poetry:

Which is the true form of the caterpillar fungus?	何形畢竟是真形?
It keeps on reversibly changing from a blade of grass to a worm.	爲草爲蟲化未停.
How different it is from the elusive fireflies which will finally disappear,	那似流螢終滅沒,
And the grassland which will not be the same green as before in the spring breeze.	春風原上不重青.[323]

It is worth mentioning the scholar Wu Qijun 吳其濬 (1789-1847) who offered a Chinese illustration of the caterpillar fungus (Fig. 3) in his well-known book *Zhi wu ming shi tu kao* 植物名實圖考 (Treatise on Names and Entities of Plants, 1848). During his term of office in Yunnan 1843-1845, he collected hundreds of plants, among which he noticed the *si yi bu ji* 思議不及 (unbelievable) caterpillar fungus.[324] However, Wu Qijun claimed that it could also be found in Guangdong and Guangxi provinces, where its root had a worm-like appearance, and its leaf resembled a blade of young couch grass. Like Wu, Li Zuoxian 李佐賢 (1807-1876) stated that the

[320] Anonymous 1903, pp. 440-444.
[321] Xu [1792] 2006, p. 21. For the dating of the text, as well as his life, see Zhan 2001, pp. 197-202.
[322] Chen [1804] 1864. The original text contains no page numbers.
[323] Wang [1845] 1987, p. 349; Fang 2007, pp. 35-40.
[324] Wu [1848] 1956, p. 242; Qi [1873] 1876. For a brief chronicle of Wu's life, see Zhao *et al*. [1927] 1977, pp. 11633-11634.

caterpillar fungus could also be found in Fujian and Guangdong provinces.[325] But we know it must be other species of the *Cordyceps* genus that grew there, e.g. *Cordyceps gunnii* (Berk.) Berk.[326] Wu's belief reflects the desire to find this marvel in East China, especially in the economically more developed southeastern China where the marvelous qualities of the caterpillar fungus could be easily converted into money. Wu and Li's discoveries illustrated people's efforts to find the caterpillar fungus in non-production areas in the 19th century. The production areas being limited to West China reinforced reliance on the 'West—East' trade in the caterpillar fungus, prompting a search for alternative production areas to break the monopoly or exploit the caterpillar fungus. This is closely related to the identification of variant species of *Cordyceps* in eastern production areas, as regarded in local chronicles. Besides, Wu Qijun added that people in Yangcheng (i.e. today's Guangzhou, Guangdong) treated the caterpillar fungus as a kind of delicious food. For culinary purposes, the Yangcheng caterpillar fungus was not, in fact, a fungus but the root of the plant *cao shi can* 草石蠶 (*Stachys sieboldii* Miq., Fig. 4).[327] The *Cordyceps* themselves do not taste delicious; usually they are added into dishes as a tonic or medical ingredient. But the rhizome of *cao shi can*, which also resembles a worm, has an excellent savory flavour when tossed with white vinegar and served as salad tasting good indeed.

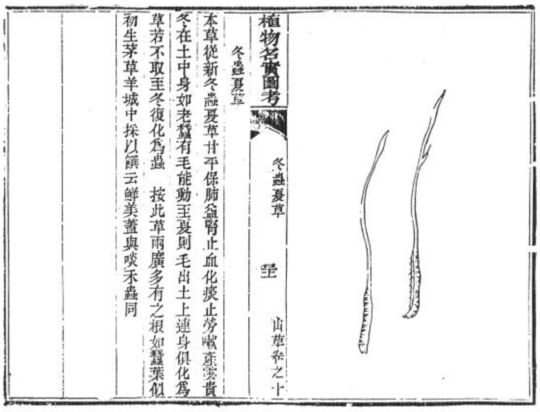
植物名實圖考
冬蟲夏草
山草卷之十
冬蟲夏草
本草從新冬蟲夏草甘平保肺益腎止血化痰止勞嗽產雲貴
冬在土中身如老蠶有毛能動至夏則毛出土上連身俱化為
草若不取至冬復化為蟲　按此草兩廣多有之根如蠶葉似
初生茅草羊城中採以饌云鮮美蓋與啖禾蟲同

Fig. 3 Illustration of the caterpillar fungus in the 1919 reprint of *Zhi wu ming shi tu kao* (1848).

Fig. 4 Photograph of *cao shi can* 草石蠶 (*Stachys sieboldii* Miq.).[328]

325 Li 1875.
326 Liang 2007, p. 92.
327 For a botanical description of *cao shi can*, see Wu and Li 1977, pp. 18-19.
328 This photograph is available at http://www.plantphoto.cn/tu/1111595.

The caterpillar fungus was a romantic marker of continuous transformation which stirred a pre-existing fascination for icons of immortality. To perceive the importance of the account of marvelous transformation in the spread of the caterpillar fungus to other regions through out China, especially East China, we can compare the caterpillar fungus with another Tibetan medicinal substance *ga dur* ག་དུར་ (*Rhodiola wallichiana*). The latter was first recorded in *rGyud bZhi* རྒྱུད་བཞི་ (Four medical tantras, 12th century). In this text it was listed as one of the medicinal substances that were capable of treating acute epidemics. But it never entered Chinese materia medica until the 1970s.[329] Aside from occasionality, another important factor that caused its absence in pre-modern Chinese *materia medica* must have been that, it was not attractive enough for traditional physicians who had explored many medicinal substances and methods to treat acute epidemics long before this time.[330]

Packaging the Miracle and Trade

Trade played an important role in the wide spread and ongoing dissemination of the caterpillar fungus as a marvel. But attempts to map the trade network for the 18th and 19th centuries by using Chinese historical literature are kind of frustrating. The difficulties are closely related to a longstanding negative attitude to commerce in Chinese elite culture. Chinese intellectuals, who were taught to be familiar with Confucian classics, bought in to the social hierarchies of Confucian humanism, and were certainly also influenced by Confucius's appreciation of knowing plants and animals.[331] Because Confucius encouraged his students to acquire knowledge about birds, beasts, herbs and woods from poetry.[332] It is likely that they thought that such a marvel should not be associated with money and profit. Although we have explored some trading information in previous sections, it is necessary to summarise the geographic evidence of the caterpillar fungus. With knowledge of the trading centres, beginning in the early 18th, but mostly from the 19th century, we

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329 Yuthok Yonten Gonpo [12th century] 2005, p. 85. A late 17th-century commentary on its medicinal properties also considered that it was used in the treatment of plague, see Desi Sangye Gyatso [1689] 2005, p. 447. For the identification of *ga dur*, see QHSSWYJS and TRXLWZLS 1972, p. 50; Gu and Chen 2004, pp. 929-930. It is called *hong jing tian* 紅景天 in Chinese, a term referring to a group of species belonging to the *Rhodiola* genus, see ZHBCBWH 1999, pp. 760-765; XZZZQZYYYWYJS 2002, pp. 178-180.

330 A variety of Chinese medical texts containing various treatments or prescriptions for acute epidemics, ranging from approximately the first century BC to the present, can be found in Yang (ed.) 2008[1989], pp. 821-824.

331 For classical Chinese knowledge of flora and medicinal plants, see Métailié 2015.

332 Kong *et al*. [5th century BC] 1999, p. 237. Some contemporary scholars interpret Confucius's edification as his promotion of a harmonious relationship between nature and humans, see Liu 2010, pp. 109-113.

can begin to recontruct the caterpillar fungus's early travels to the rest of Qing China.

Let's begin with Qin Wuyu 秦武域 (1725-?). Qin became acquainted with the caterpillar fungus during his travels through Sichuan. He reported that local people in Jiazhou 嘉州, Dajianlu 打箭爐 and some other places in Sichuan would dry it in the shade and then tied it in bundles; and the bundles would be given to those who were going to travel.[333] Apparently, the caterpillar fungus was a precious product, and it was bundled up for the sake of convenience. These bundles could be used personally, and could also be sold as a commodity. In the late 18th century a Suzhou physician called Long Bai 龍柏 remarked in his book *Mai yao lian zhu* 脈藥聯珠 (Medicines Associated with Mai, 1795) that the caterpillar fungus from Jiazhou was well known and could be bought in Suzhou as drugstores there had sold it for decades.[334]

Fortunately, although we do not know what the bundles in Qin Wuyu's record actually looked like, we can get a general picture from two illustrations by the Mongolian physician 'Jam dpal rdo rje འཇམ་དཔལ་རྡོ་རྗེ (Jampel Dorje, 1792-1855). He was born in today's Zalute Qi of Inner Mongolia, and had been to Qinghai, Tibet, Beijing and Wutai Mountain. His medical book, *Mdzes mtshar mig rgyan* མཛེས་མཚར་མིག་རྒྱན། (Beautiful marvellous eye ornament), contained two illustrations showing a quantity of *yartsa gunbu* bounded together by two strings (Fig. 5).[335] In addition, he also offered the Chinese translation of *dbyar rtsa dgun 'bu* དབྱར་རྩ་དགུན་འབུ (the corresponding Tibetan phonetic notation was given to its left) on the right side of one of the illustrations (Fig. 5A), indicating that he knew the use of *yartsa gunbu* by the Chinese in his time. So it is reasonable to conclude that he had seen *yartsa gunbu* in the form of a commodity. And, considering Jampel Dorje's travels, it was possible that he witnessed the transport of the commodity *yartsa gunbu* via northern land routes from the Western regions. Through these routes the caterpillar fungus was continuously supplied to Beijing and other Northern places. A record offered by the Russian missionary physician Alexander A. Tatarinov (Александр А. Татаринов, 1817-1886), who stayed in China during the period 1840-1850, proved that the caterpillar fungus was still sold in drugstores in mid-19th century Beijing. Tatarinov bought it and another 496 kinds of medicinal substances in Beijing, and then brought them to St. Petersburg

[333] Qin [1783] 1986, p. 153. For Qin's life and activities, see Lai 2005, pp. 222-224.

[334] Long [1795] 1993, p. 686. Elisabeth Hsu interprets 'mai 脈' as 'vessel-pulses'. For her exploration of pulse diagnostics in early Chinese medicine, see Hsu 2001, pp. 51-92.

[335] Jampel Dorje [early 19th century] 1971, p. 168. For Jampel Dorje's life and works, see Bao *et al*. 2004a, pp. 162-165. Some contemporary books on Mongolian *materia medica* include *yartsa gunbu* as a Mongolian medicinal substance, see GJZYYGLJZHBCBWH 2004, pp. 172-174. But such a practice is improper because the original record of *yartsa gunbu* was offered by a Tibetan physician, and Mongolian physicians in later times did not contribute any fresh knowledge about it. Moreover, the majority of the areas where the Mongolian people lived in the 18th and 19th centuries never produced *yartsa gunbu*, see Lu 1990, pp 63-79; Liang 2007, pp. 125-126.

in 1850.[336] Doubtless Tatarinov’s ability to market extensive acquisitions benefited from the medicine trade in Bejing.

A B

Fig. 5 Woodcuts of *yartsa gunbu* in *Mdzes mtshar mig rgyan*’s main text (A) and appendix (B).

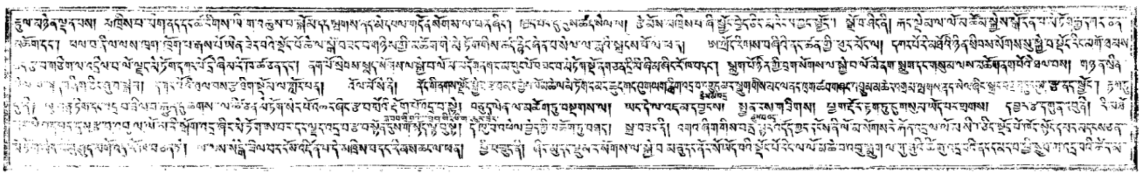

Fig. 6 The folio of the Tibetan text on *yartsa gunbu* by Sumpa Khenpo Yeshe Paljor.

Growth of the medicine trade was often accompanied with explorations of new medicinal properties and innovations in consumption. Mongolian physicians were unlikely to directly engage in the trade in the caterpillar fungus. From their texts we cannot find new knowledge of the caterpillar fungus. In fact, Jampel Dorje’s account of *yartsa gunbu* was extracted from an earlier medical book entitled *Gso dpyad bdud rtsi chu rgyun gyi cha lag gi nang tshan gyi sman so so so'i mngon brjod dang ngos 'dzin shel dkar me long* གསོ་དཔྱད་བདུད་རྩི་ཆུ་རྒྱུན་གྱི་ཆ་ལག་གི་ནང་ཚན་གྱི་སྨན་སོ་སོའི་མངོན་བརྗོད་དང་ངོས་འཛིན་ཤེལ་དཀར་མེ་ལོང། (‘White crystal mirror’ for short; Fig. 6), written by the Mongolian physician Sum pa mkhan po ye shes dpal 'byor སུམ་པ་མཁན་པོ་ཡེ་ཤེས་དཔལ་འབྱོར། (Sumpa Khenpo Yeshe Paljor, 1704-1788) in the second half of the 18th century. Sumpa Khenpo Yeshe Paljor was born in today’s Haiyan county, Qinghai province, and learnt Tibetan medicine during his study in Lhasa. This book by him is the earliest extant Mongolian medical text despite of its Tibetan language. However, even his account of *yartsa gunbu* was just an abridged version of Zurkhar Nyamnyi Dorje’s record, involving the

[336] Tatarinov 1856, p. 45. For his life in China, see Bretschneider 1898, pp. 559-569.

information about *yartsa gunbu*'s habitat, morphological characteristics, and its positive effect on increasing semen.[337] Both the use of the Tibetan language and Tibetan origin of the excerpts reflected the influence of Tibetan medical culture on Mongolian medicine. Mongolian physicians certainly did not lack creativity. In my opinion, the above two Mongolian records of the caterpillar fungus, which did not contain any new knowledge but originated from a Tibetan record, indicated that Mongilian physicians seldom used the caterpillar fungus (and therefore seldom recorded it), so new knowledge surrounding it was hard to generate.

With the opening of a series of treaty ports in late Qing China, from 1859 onward there were successive reports of trade at different ports, compiled and published in English by Western officials working in the Chinese maritime customs. Some of the maritime customs publications were exclusively devoted to the medicine trade. Among them, the *List of Chinese Medicines* (1889) can be used to illustrate a relatively complete picture of the trade in the caterpillar fungus in the mid-1880s. This list comprises two parts. The first part mainly contains statistics on identified Chinese medicinal substances imported from or exported to the ports of Niuzhuang 牛莊, Tianjin 天津, Zhifu 芝罘, Yichang 宜昌, Hankou 漢口, Jiujiang 九江, Wuhu 蕪湖, Zhenjiang 鎮江, Shanghai 上海, Ningbo 寧波, Wenzhou 溫州, Fuzhou 福州, Xiamen 廈門, Shantou 汕頭, Guangzhou 廣州, Qiongzhou 瓊州, Beihai 北海, Danshui 淡水 (Taiwan) and Dagou 打狗 (Taiwan) during the period from 1 November, 1884 to 31 October, 1885 (12 months in total). The second part is a general alphabetical list of 1 575 kinds of Chinese medicinal substances categorised into 8 groups (Roots, Barks and Husks, Twigs and Leaves, Flowers, Seeds and Fruits, Grasses, Insects, and Sundries). The caterpillar fungus was called 'Ch'ung-ts'ao', 'Hia-ts'ao-tung-ch'ung', 'Tung-ch'ung-hsia-ts'ao' or 'Tung-ch'ung-ts'ao' in the List. At different ports it was categorised into the 'Sundries', 'Grasses', or 'Roots' group, indicating that different customs did not share a common perception of the nature of the caterpillar fungus. Besides, it was also identified as '*Cordiceps sinensis*', and noted as 'a fungus which grows on the head of a caterpillar'.[338] The circulation of the caterpillar fungus among the ports is shown in Appendix 2.

It is clear that most of the caterpillar fungus circulating among the ports was produced in Sichuan. And the caterpillar fungus in Sichuan was mainly exported eastward to Shanghai via the

[337] Sumpa Khenpo Yeshe Paljor [18th century] 1975, p. 300. For his life and works, see Jong 1967, pp. 208-216; Zhao *et al.* 2001, pp. 41-42; Bao *et al.* 2004b, pp. 554-557. Its Mongolian translation was published in 1998.
[338] Order of the Inspector General of Customs 1889, p. 442. '*Cordiceps*' was identical to '*Cordyceps*'.

ports of Yichang and Hankou. In the late Qing period, Yichang customs, established in 1877,[339] had been the westernmost maritime customs along the Yangtze River until the establishment of the Chongqing customs on 1 March, 1891.[340] Consignments of the caterpillar fungus from Sichuan converged in Yichang, and then were eventually shipped to Shanghai through the Yangtze River. And from Shanghai, where a significant amount of the caterpillar fungus would be consumed, some of the caterpillar fungus was then disseminated to other coastal ports, such as Ningbo and Fuzhou, and Hong Kong. Although medicine trade at the port of Hong Kong was not independently recorded in the List, and statistics on the export of the caterpillar fungus to Hong Kong were not recorded, Hong Kong actually acted as an important transshipment centre for the caterpillar fungus. From Hong Kong some the caterpillar fungus was returned or dispatched to Shanghai, Danshui, Xiamen, Shantou and Qiongzhou. It is noteworthy that in the List Henan, Hubei and Guangdong were wrongly recorded as production areas of the caterpillar fungus that passed through the Hankou, Xiamen and Shantou customs. This was probably because the customs obtained incomplete information about true origins of the caterpillar fungus. For example, the caterpillar fungus claimed to be produced in Henan was identified as '*Cordiceps Sinensis*', which actually did not grow in Henan.[341] Therefore it is reasonable to consider that the three production areas were actually transshipment places for the caterpillar fungus from Western China.

The List only records Tibet as a production area of the caterpillar fungus once. Some of the caterpillar fungus claimed to be produced in Sichuan was probably from Tibet, as there had been thriving bilateral trade between Tibet and Sichuan for centuries; and Tibetan products had been exported in bulk to central and Eastern China via Sichuan.[342] Moreover, the caterpillar fungus as a Tibetan medicinal product of today's Mangkang 芒康, Jiali 嘉黎, Chaya 察雅, Naqu 那曲, Changdu 昌都 and Leiwuqi 類烏齊 was also mentioned in some local chronicles of Eastern Tibet finalised at the end of the Qing dynasty.[343] The production of the caterpillar fungus in these places must have been earlier than related written records in the chronicles. Overall, Appendix 2 mainly reflects water routes for the inter-port transport of the caterpillar fungus in late Qing China; and the

339 Brunero 2006, p. 11.
340 Wang 2012, pp. 19-24.
341 Order of the Inspector General of Customs 1889, pp. 80-81. The caterpillar fungus claimed to be produced in Hubei and Guangdong was not identified in the List.
342 Zhang 1993, pp. 83-92.
343 Duan [1909] 1995, p. 405; Liu [*c*. 1912] 1995a, p. 62; Liu [*c*. 1912] 1995b, p. 342; Liu [*c*. 1912] 1995c, p. 385; Liu [*c*. 1912] 1995d, p. 515; Liu [*c*. 1912] 1995e, p. 550. For the dating of these chronicles, see Peng 2008, pp. 44-45. According to Duan's record in 1909, the annual yield of the caterpillar fungus in today's Mangkang was not much.

Yangtze River played a key role in connecting the supply of the caterpillar fungus in West China with the demand for the caterpillar fungus in southeastern China. Of course, there must also have been land routes for the trade in the caterpillar fungus, especially those from Sichuan or Tibet to Beijing.

Actor-network-theory can be used to understand the transmission of the caterpillar fungus from a new perspective. According to Latour, humans and non-humans can both be actors and have agency.[344] At the early stage of the transmission in the early 18th century, the caterpillar fungus as a Tibetan medicinal substance was not popular among the Chinese; collectors wanted to earn their living, but the market demand for the caterpillar fungus remained low; merchants aimed to maximise their profits, but supplies and consumptions of the caterpillar fungus were inadequate; travellers from non-production areas saw the esteemed medicinal caterpillar fungus, but it had not been used by their families, friends or relatives in their hometown yet; physicians and patients, who were involved in the use of the potent caterpillar fungus in treatment, could not obtain the caterpillar fungus easily; drugstores contained some common medicinal substances, but lacked the potent and profitable caterpillar fungus. The above actors constituted a heterogeneous actor-network that contributed to the the lasting and wide spread of the caterpillar fungus from western areas to the rest of China. As for the agency of the caterpillar fungus, it largely rested on the caterpillar fungus's marvelous ability to transform, which strengthened the ecomonic value and medical reputation of the caterpillar fungus. Through different human agents the caterpillar fungus was collected, spread, consumed, described, or studied, with new knowledge of the caterpillar fungus generated. Certainly, there are controversies surrounding the agency of non-humans, such as whether there should be a premised distinction between human and non-human, or whether non-humans had agency.[345] Many of the controversies about object agency emerged due to scholars' different ontologies and epistemologies. But a variety of case studies have specified the agency of some non-humans ranging from trees to artefacts, pictures and texts.[346] The transmission of the caterpillar fungus, examined within the theoretical frame of the actor-network-theory, has also revealed the agency of the

[344] Latour 1996, pp. 369-381; Latour 2005, pp. 46, 52-55, 63-86.
[345] Casper 1994, pp. 839-856; Barron 2003, pp. 77-99; Passoth *et al.* 2012, p. 3; Tatnall 2013, p. 203. For example, Geoffrey E. Braswell rejects the notion that both objects and humans have agency, but considers that 'agency exists only in the interaction between subjects, objects, and ideas', see Braswell 2011, pp. 1-14. Ian Russell, however, attempts to transcend the controversies and suggests understanding humans as 'enmeshed media in the world' in consideration of contemporary scientific implications for 'human epistemological relations with modern material culture', see Russell 2007, pp. 71-87.
[346] Knappett and Malafouris 2008.

caterpillar fungus.

In summary, the appearance of the caterpillar fungus in East China in the 18th and 19th centuries was the result of tribute, travelers and traders' joint effort. The aphrodisiacal and tonic properties that the caterpillar fungus had were not strange to Chinese medical culture, as there were a variety of Chinese medicinal substances that had the same, or even stronger properties. The efficacies of the caterpillar fungus proved that it was worth spreading. But I have argued that the basic factor that stimulated and facilitated its early nationwide dissemination must have been its reversible transformation. This character could easily arouse human curiosity and interest in broadcasting its reputation for its marvelous activity. With respect to the medicine trade, the magical qualities of the caterpillar fungus played a key role in promoting its prevalence among the public. Against this background the caterpillar fungus was even reported to grow in non-production areas in 19th-century East China. Trade and traders in the Chinese records of the caterpillar fungus were rarely explicitly mentioned probably due to the ingrained negative attitude to commerce in pre-modern Chinese society. Nevertheless, primary sources for this analysis are to be found in English publications on modern Chinese port trade which were able to illustrate the trade network of the caterpillar fungus, and its reliance on the Yangtse River, in the late 19th century.

2.5 The Medicine

Basically, the caterpillar fungus was a medicinal substance. Evidence of the application of the caterpillar fungus in treatment was recorded here and there in 18th and 19th-century Chinese literary records. In addition to Tang Bingjun, some non-physician authors, such as Shen Weicai 沈維材 (1697-?) and Zhu Delin 祝德麟 (1742-1798), also made notes of medical uses of the caterpillar fungus. The litterateur Shen Weicai once wrote a letter to a man surnamed Cheng, who was recovering from illness. One year previously he had presented the caterpillar fungus as a medicinal substance to Cheng. Shen was a native of Haining, Zhejiang, and spent years living and travelling in Henan, Shaanxi, Hubei, Hunan, and Guangdong.[347] It is unknown when and where he wrote the letter, or any more details about the patient Cheng. But at least we can assume that Shen must have

347 Shen [1749] 2000, p. 225. Shen was born in the *ding chou* 丁丑 year of the Kangxi reign, namely the year 1697, see Shen 2000 [1749], p. 172. For a brief account of his life, see Xu *et al*. [1879] 1970, p. 1553; Shen [1749] 2000, p. 122.

known something about the medicinal properties of the caterpillar fungus, and have thought it was beneficial to Cheng's sick body. As for the poet Zhu Delin, also a native of Haining, Zhejiang, he once went to see one of his friends who loved poetry. His friend, though seriously sick, pointed at an envelope containing the caterpillar fungus on the table, and claimed that it was a wonderful topic for a poem. Unfortunately, the caterpillar fungus did not succeed in saving his life, and he died before Zhu composed the poem dedicated to the caterpillar fungus and his friend: *dong chong xia cao shi* 冬蟲夏草詩 (Poem about the caterpillar fungus). It included the following lines: 'Although medicinal substances were fully stored in medical boxes, they were unable to save my friend from death…what is this striking substance [on the table]? It transforms between an animal and a plant.' (儲藥滿籠中，曾不救一死...咄哉此何物，動植互頂趾).[348] In the two cases we see the market for the caterpillar fungus in practice.

The increasing use of the caterpillar fungus for edible and medicinal purposes not only enriched people's perceptions of the caterpilliar fungus, but also advanced new explorations of its medicinal properties and uses and inspired poetry. Appendix 3 shows how some new medicinal properties were added to those mentioned by the 15th-century Tibetan medical text, e.g. prolonging life, stopping bleeding, good for old people, and removing cardiodynia. According to Zhao Xuemin and Tang Zonghai, Chinese physicians sometimes even separated the 'grass' and the 'worm' apart, and used them in different treatments. For example, some of Zhang Zirun's 張子潤 statements cited by Zhao Xuemin told us that if a woman just took the 'grass' part, she would be *jue yun wu zi* 絕孕無子 (infertile without children). Moreover, Zhao and Tang also attempted to use the old *yin* and *yang* theory to explain the transformation or qualities of the caterpillar fungus through different seasons: *yin* formed the unmovable grass part in summer, while *yang* formed the movable worm part in winter; *yin* and *yang*, or the grass and worm parts, alternate with seasons. It would not have been difficult for them to associate this theory with the caterpillar fungus, because there was a long tradition of applying the *yin* and *yang* theory in the usage of medicinal substances in pre-modern Chinese medicine.[349] In the hands of Chinese physicians, the caterpillar fungus transformed from a Tibetan medicinal substance to a Chinese medicinal substance.

New medicinal properties were explored on the basis of pre-existing Tibetan knowledge of the

[348] Zhu [1790] 2002, pp. 677-678. Cf. Zhang [1819] 2002, p. 3.
[349] For the role of the *yin* and *yang* theory in pre-modern Chinese *materia medica*, see Zheng 2007, pp. 81, 234; Kang 2008, pp. 616-617.

caterpillar fungus. It is found that some of the medicinal properties of the caterpillar fungus mentioned in the Chinese records actually originated from Tibet, such as the warm quality, increasing *jing* (including semen), and enhancing the male sexual organ, even if they were formed by the ideas that had originally used by the Chinese. On the whole, the core of its medicinal properties in the Chinese records is vested in its tonic and aphrodisiacal effects, and the latter was particularly emphasised by Zurkhar Nyamnyi Dorje. When viewed from this perspective, we can actually see the fusion of Tibetan and Chinese medical cultures in the Chinese texts.

The Caterpillar Fungus in Prescriptions

A source which is increasingly utilised in historical studies of Chinese medicine is the *yi an* 醫案 (medicine casebooks).[350] They were dedicated to recording cases seen by physicians themselves, involving descriptions of patients' illness and recoveries, prescriptions and their effectiveness, etc. The history of medicine casebooks can be dated at least to the second century BC, when the physician Chunyu Yi 淳于意 (*c*. 205-?) offered us the earliest extant medical cases.[351] According to Elisabeth Hsu, Chunyu Yi's medical cases had their origin in the legal case records in Qin (and even earlier) times.[352] However, we must be careful not to always read them as true records of practice. Physicians might exaggerate or even invent successful case records in order to enhance their teachers or families' reputation.[353] Here my emphasis is not on the respective authenticity of the cases involving the use of the caterpillar fungus, but the geographical information revealed by the cases. Through examining physicians' birth places and practice locations we can roughly determine some areas where the caterpillar fungus was sold and consumed. Appendix 4 briefly lists the related cases. And from this Appendix we can also see an increase in the cases involving the use of the caterpillar fungus in the 19th century, which to some extent reflected the relative prevelance of the caterpillar fungus as a medicinal substance from afar.

Nevertheless, it is difficult to ascertain whether the caterpillar fungus played a major role in

[350] Medical cases in Chinese histories have been recently discussed by Charlotte Furth, Judith T. Zeitlin and Ping-chen Hsiung in the book entitled *Thinking with Cases: Specialist Knowledge in Chinese Cultural History*, see Furth *et al*. 2007, pp. 125-204. Some Chinese historians of medicine also stress the importance of medicine casebooks in understanding and learning Chinese medicine, see, for example, Zhu and Li 2011, pp. 237-239; Sun 2013, pp. 3-6; Zhong 2013, pp. 12-13.

[351] Needham and Lu 2000, p. 51; Hsu 2010, pp. 49-61.

[352] Hsu 2001, p. 64.

[353] Unschuld and Zheng 2012, pp. 135-138.

treating patients because it was just one ingredient in complex prescriptions. In this respect, there are some traces which could be oriented to some potencies of the caterpillar fungus. For example, in a medical case the physician Zhou Shimi 周士禰 (active *c*. 1778) gave a multi-ingredient prescription containing the caterpillar fungus to treat impotence, spermatorrhea, and a few other symptoms.[354] But we should also be aware that the same prescription also contains other ingredients that were attributed the same potencies, e.g. *shan zhu yu* 山茱萸 (*Cornus officinalis*) and ginseng.[355] In addition to medicine casebooks, some prescription texts also have different prescriptions containing the caterpillar fungus. Their authors include the Zhejiang physician Ding Yaochen 丁堯臣,[356] the Sichuan physician Tang Zonghai (1851-1908) who practiced in places including Shanghai, Beijing and Guangdong,[357] and the Zhejiang physician He Lianchen 何廉臣 (1861-1919).[358]

Most of the above physicians and those listed in Appendix 4 came from southeastern costal regions of China, namely Jiangsu, Zhejiang, Fujian, and Guangdong. Even the two physicians who came from other regions, namely Xinchan 心禪 (a Buddist, whose birth place is unknown) and Tang Zonghai, all had experience of practicing in southeastern cities such as Hangzhou and Shanghai. It was because the caterpillar fungus was sold in these areas that the physicians could easily obtain it and add it into a range of prescriptions. The outline of the inter-port transport of the caterpillar fungus in the mid-1880s, as examined before, also reflected a demand for it in southeastern China. Although the prescriptions and cases involving the caterpillar fungus were (far) less than those involving some other kinds of tonics (e.g. ginseng),[359] they were still significant to Chinese *materia medica* as the exotic caterpillar fungus entered into Chinese medical texts as late as the mid-18th century. Moreover, the ingredients in the presceiptions, preparations, and usage of the prescriptions vary from each other, and also differ from those recorded by Zurkhar Nyamnyi Dorje in the 15th century. The prescriptions, a result of medical practices and the circulation of the

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[354] Zhou [1778] 1990, pp. 206-207.

[355] The Ming physician Li Shizhen (1518-1593) listed ginseng as one of the medicinal subatsnces for spermatorrhea, and *shan zhu yu* for enhancing male sexual function, see Li [1578] 1975, pp. 226, 2094.

[356] Ding [1880] 1992, p. 75.

[357] Tang [1884] 1998, pp. 126, 129.

[358] Dai and He [1911] 2005, pp. 234-235. A prescription in *Chong ding guang wen re lun* 重訂廣溫熱論 contains the caterpillar fungus. According to He's annoatation, this prescription was extracted from the 1718 text entitled *Gu song yuan yi jing* 顧松園醫鏡. However, although the latter text does include the prescription, the prescription itself lacks the caterpillar fungus, see Gu [1718] 1961, pp. 135-136. In addition, the 1675 text *Guang wen yi lun* 廣瘟疫論 also does not mention the caterpillar fungus, see Dai [1675] 1992, pp. 1-81. Therefore the caterpillar fungus as an ingredient was actually added by He in 1911 when he was revising Dai's text.

[359] Chen 2009b, pp. 1422-1423.

caterpillar fungus and related medical knowledge, demonstrated Chinese physicians' creative adoption and adaptation of the caterpillar fungus as a medicinal substance.

2.6 Conclusion

In retrospect, the caterpillar fungus-duck food advertised in *Shanghai News* on 1st January, 1925 was not really 'newly' invented by the food company. Actually, this recipe was known to the Chinese no later than the early 18th century. And its origin can be traced back to the *yartsa gunbu*-sparrow recipe mentioned by Zurkhar Nyamnyi Dorje of 15th-century Tibet.

The history of the caterpillar fungus from the 15th century to the beginning of the 18th century remains a blank due to the absence of written records, despite uninterrupted communication between those involved in Tibetan and Chinese medicine. The caterpillar fungus was disseminated to Beijing by the early 18th century in trade and tribute. From about 1770s onward new centres of the trade in the caterpillar fungus prospered in economically more developed southeastern areas of China. They dominated the 'West—Southeast' direction of this trade, but did not cause the disappearance of the trade centre in Beijing. In addition to trade and tribute, the caterpillar fungus had been also disseminated by sporadic travelers without a commercial purpose. Sichuan and Yunnan were more frequently mentioned as production areas of the caterpillar fungus in post-18th century Chinese literature, but given their strategic positions on trade routes from Tibet, they may also have been transshipment stations for the the caterpillar fungus from Tibet and Qinghai. These production areas blurred the geographical boundaries between the Tibetan and Chinese knowledge of the caterpillar fungus, making 'Tibetan' and 'Chinese' two cultural rather than geographical concepts. As for the dissemination of the caterpillar fungus from western areas to eastern areas of China, it benefited much from the marvelous physical transformation between a worm and a blade of grass, which amazed the Chinese people and inspired their wonder and praise. Gradually, the Chinese associated it with other similar transformations described in ancient Chinese texts, linked it with similar Chinese creatures, and endowed its marvelous reversible transformation with Chinese cultural and moral connotations.

The transmission of the caterpillar fungus in a Sino-Tibetan context provides a vivid example of the updating of Chinese *materia medica* on the basis of appropriating exotic medicinal substances and related information. The medicinal properties of the caterpillar fungus in 15th century Tibetan culture, which centred on aphrodisiacal effects (partly described according to a system inherited earlier from the Chinese), also valued by the Chinese, significantly assisted the dissemination through how the cures and miracles of healing were represented. Though the caterpillar fungus was not an irreplacable medicinal substance to the Chinese, Chinese physicians still gradually explored new medicinal properties, and in particular the tonic effects and more diverse ways of using it. With respect to object agency, the caterpillar fungus as a non-human object could not travel alone. However, as a dead animal nourishing a live fungus it had an extraordinary appearance that fascinated observers. It initially granted agency to the caterpillar fungus, and enabled it to be mediated by its human agents (traders, travellers, physicians, and patients) in company with related changing knowledge in a network, or 'a string of actions' that spread from the Tibetan Plateau to the southeastern coastal regions of China. As a transcultural medicinal substance it is also iconic of the interactions between the agency of humans and objects. During the process of localising the knowledge about the caterpillar fungus in a transcultural context, the caterpillar fungus could be veritably treated as a 'Chinese' medicinal substance, not to mention that it was also discovered in some areas bordering on Tibet in the Chinese political domain.

Chapter 3 Exotic Eyes on the Caterpillar Fungus

‘The search for powerful drugs has caused people and commodities to
move around the globe for many centuries, as it still does,
for it profits both states of bodily well-being and the pocketbook.’
—— Harold J. Cook and Timothy D. Walker[360]

3.1 Introduction: Scientific Practice and Soft Power

With the great Age of Discovery (15th-18th century) the footsteps of traders, missionaries, naturalist-travellers and envoys gradually connected most regions of the world into a global network for the dissemination of knowledge and objects.[361] Not only did the fields of natural history and philosophy in modern Europe benefit from overseas knowledge and ideas,[362] but *materia medica* in modern China also went through a sudden and accelerated process of appropriating natural knowledge from elsewhere. Substances had always travelled by both land and sea routes in and out of the regions that now make up China but this new and truly transnational context saw the arrival of a multitude of new substances such as American ginseng and ammonia water.[363] Significant to this chapter is how the work of recent scholars allows us to deepen our existing understandings of how new epistemologies that arrived with the substances did or did not affect the transformation of Chinese *materia medica* in modern times. New global histories of medicine, as discussed by Harold J. Cook, advocate non-essentialist approaches and focus on the dynamic interplay between different cultures.[364] Cook himself attaches particular importance to the role that global trade played in the worldwide circulation of local natural knowledge and the consequent scientific innovations in Europe in the early 18th century.[365] Clifford M. Foust’s historical study of rhubarb from the 17th to the 19th century, though marginalising China as an important production region, remains one of the few inspirational studies which speak to the transnational history of the caterpillar fungus and other

360 Cook and Walker 2013, pp. 337-351.
361 Arnold 2012, pp. 38-44; Holenstein *et al*. 2013; Attenborough *et al*. 2015.
362 Cooper 2007.
363 Zhao [*c*. 1803] 1983, pp. 6-7; Zhang and Yang 1964, pp. 1-14; Carlson 1986, pp. 233-249.
364 Cook 2007a, pp. 1-9.
365 Cook 2007b; Cook and Walker 2013, pp. 337-351.

Chinese medicinal substances.[366] It is exemplary for how it covers the history of rhubarb from a variety of fascinating angles (from the point of views of trade, political power, medicine and emerging scientific cultures of identification), tracing the transmission and reception of local knowledge and concomitant changes in values, uses, attributions and perceived potencies that occurred in the encounter with Russian and European cultures.

In this way, this chapter draws inspiration from recent research that has examined the close relationship between natural knowledge innovations and the rise of global trade. Along with the traders that opened new territories for commerce came new ways of identifying substances, closer observation, illustration and measuring in different ways that could standardise relative values, advance ordering, and correct delivery around the world. This measurement of the world and its produce went hand-in-hand with collecting for the purposes of natural history and other sciences, and occurred across public and private spheres such as the English East India Company, the Horticutural Society of London, Cambridge University, Kings College, London, the British Museum, and Kew Gardens. As Jessica Ratcliff has observed, the collection-based disciplines and their projects focuses us on the 'material relationship between scientific practice and the imperial political economy'.[367] The power of a material culture analysis permits us to pay added attention to non-commercial factors, and scholarship that highlights the question of the agency of the caterpillar fungus as it played out at the interface of the local and rapidly globalising negotiations within transnational networks of knowledge production.[368]

Such tensions and negotiations surrounding Chinese medicinal substances initially emerged in Europe, but ultimately, resulted in the building of a new and modern Chinese *materia medica* on their [Chinese] own terms, since it retained signficant local characteristics. The particular case study of the caterpillar fungus will demonstrate how it retained its agency and magic within Latourian networks of actants, in the face of the new science, and therefore also in the unique characteristics of scientific modernity in China. This chapter comprises two parts. The first part is devoted to the transmission of the caterpillar fungus as a medicinal substance and wonder of natural history from China to France, Britain, Russia and Japan mainly before the 19th century. This story is intimately wrapped up with the community of Jesuits that were stationed in the Qing court, and who discovered

366 Foust 1992.
367 Ratcliff 2016, pp. 495-517.
368 In this respect Fan Fa-ti's exploration of British naturalists' activities in Qing China, which also reveals a picture of Sino-British trade, is an excellent example, see Fan 2004.

for themselves the caterpillar fungus as part of the culture of their mission and its unique remit which involved acquiring and accommodating themselves to local language and knowledge. Specifically, it is concerned with the material culture of this story and tracks the journeys of specimens of the caterpillar fungus to west Europe (France and Britain), East Asia (Japan), and the geographically intermediate Russia in the historical context of these countries' contacts with China. Special attention is given to the disseminators and causes of transnational transmission. The second part first investigates European perceptions and study of the caterpillar fungus in the 18th and 19th centuries, as well as Europeans' attitudes to Chinese *materia medica* more generally. It then turns to 19th century Japan, and to investigate changes in Japanese perceptions of the caterpillar fungus and their connections with Chinese and European scholarship.

At the heart of this analysis is the way in which we can use the caterpillar fungus to represent larger trends in the formation of a uniquely modern Chinese *materia medica*. One of the essential questions addressed in this thesis must surely be, what came first in the matter of scientific innovation: a compulsive desire to dominate the world through collection and control of its flora and fauna, as a part of the soft power of informal empire, or the purely intellectual practice of a scientific modernity? Or if we, as we suspetct, we cannot divide these aspects of globalisation how did they intersect in the new forms of knowledge production?

3.2 Journeys to the Outside

3.2.1 France

The contact between France and China was first established by Jesuits in the 17th century and they were famously the first European scholars who were to engage in a meaningful way with Chinese thought. But more than three centuries previously, some Frenchmen had already reached northern areas of East Asia. In the mid-13th century King Louis IX (1214-1270) sent embassies to the capital of the Mongol empire (i.e. Ulaanbaatar) in order to spread the gospel and make a military alliance with the Mongols.[369] These aims were not fulfilled. Following the collapse of Mongol rule in China in 1368 and the establishment of the Ming dynasty (1368-1644),[370] European Jesuits began to leave

369 Jackson 2009, pp. 65-71; Aigle 2014, pp. 45-48. For King Louis IX's life, see Labarge 1968; Gaposchkin 2008.
370 Mote and Twitchett 1988, pp. 11-57; Langlois [1981] 2014, pp. 25-55.

for Ming China from the second half of the 16th century. The first of them was the Spanish missionary Franciscus Xavier (1506-1552), who reached the Shangchuan Island (near today's Taishan, Guangdong) in August, 1552.[371] Xavier was also one of the seven original members of the Society of Jesus, founded in Paris on 15 August, 1534 and officially recognised by Pope Paul III on 27 September, 1540.[372]

Against this late sixteenth and seventeenth century background of a new and mutal awareness of political and spiritual power in the administrative centres of Europe and China, there was a remarkable interchange of medical and scientific knowledge. Jesuit, Nicolas Trigault (1577-1629) of Douai, Belgium, arguably the first Frenchman to travel to China (since Douai became French after his death),[373] arrived in Macao and Zhaoqing in 1610, and then Beijing the next December.[374] In 1618 he made a second trip to China, leading a group of 22 Jesuits and bringing with him about 7 000 Western books.[375] These books, which dealt "not only with religion and philosophy but also with the full range of Renaissance science and technology",[376] had been assembled to constitute a basic library for the Jesuits in China as well as a base for the project of translating Western religious and natural knowledge into Chinese.[377] In the early 17th century, the Italian Jesuits Alfonso Vagnone (1566-1640) and Giulio Aleni (1582-1649) had already published Chinese writings that formed a brief introduction to parts of the curriculum of European higher education (including Theologia and Medicina).[378] The Beijing Jesuits, including Trigault, also realised the power of European science, technology and medicine to gain 'their greatest renown among the late Ming literati', spread Christianity, and to defend the mission.[379] King Louis XIV (1638-1715), who had ambitions in Asia, dispatched Jesuits as Mathematicians of the King in 1685 for the purpose of establishing an academic outstation in Beijing.[380] After the Ming-Qing transition (1640s), in 1687,

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371 Pfister 1932, pp. 1-7; Dehergne 1973, pp. 297-299.
372 Campbell 1921, pp. 24-25; O'Malley 2013, pp. 53-70.
373 See, for example, Aldridge 1993, p. 15; Chan 2009, p. 57; Reed and Demattè 2011, p. 10. France occupied Douai in 1667 and it was finally integrated it into the territory of France in 1713, see Townsend 1867, p. 335; Baedeker 1899, pp. 74-75; Blom and Lamberts 1999, pp. 239-240. The Chinese epitaph on Nicolas Trigault, who died in Hangzhou, indicates his nationality as Belgian rather than French, see Ji 1997, pp. 103-109.
374 Pfister 1932, pp. 111-120; Dehergne 1973, pp. 274-275.
375 Blussé and Zurndorfer 1993, pp. 121-122; Lach and Van Kley 1998, p. 180.
376 Golas 1999, p. 39.
377 Golvers 2010, pp. 2013-221. The translation project was never implemented.
378 Vagnone [1632] 1996, pp. 370-384; Aleni [1623] 1995, pp. 630-634. Cf. Meyn 2014, pp. 119-130. For the lives of Vagnone and Aleni, see Pfister 1932, pp. 85-95; Dehergne 1973, p. 278; Lippiello and Malek 1997.
379 Brockey 2007, pp. 52, 75; Hsia 2009, p. 24. For example, the Jesuits had introduced the method of extracting essential oil from fresh medicinal plants, which dated back to ancient Egyptian civilisation, to Chinese intellectuals at the beginning of the 17th century, see Gildemeister 1913, pp. 14-91; De Ursis [1612] 1986, pp. 959-960; Xu [1613] 1963, p. 488. Cf. Chen and Li 2006; Liu 2013, pp. 228-244.
380 Landry-Deron 2001, pp. 423-463; Brockey 2007, pp. 155-157. For Louis XIV's life, see Campbell 2013.

five French Jesuits reached China, and thereafter contributed much to the exchange of natural knowledge between France and China. They were Jean de Fontaney (1643-1710), Joachim Bouvet (1656-1730), Louis le Comte (1655-1728), Jean-François Gerbillon (1654-1707) and Claude de Visdelou (1656-1737).[381] Their arrival in China presaged the Belgian Jesuit Ferdinand Verbiest's (1623-1688) effort to recruit more European Jesuits for missionary work in China.[382] Notably, Verbiest wrote a short text on snakestones in around 1686, which is considered the earliest Chinese treatise on European *materia medica*.[383] In many respects his descriptions are hardly distinguishable from Chinese *materia medica* in their form and structure, and would have been easily acceptable at the Qing court. Even though it represented a different language and tradition there is no radical new scientific paradigm to be found emerging in this period and its transactions. It is therefore appropriate to use the Jesuits as a starting point against which later more transformational interactions can be measured.

The emperor Kangxi (1654-1722) had a strong interest in European science and medicine. Bouvet and Gerbillon were invited by him to teach European mathematics and astronomy in the royal palace, while the others were permitted to undertake missionary work beyond Beijing.[384] Upon Kangxi's request they were also to compile a Manchu text on Western *materia medica* in 1693, which introduced about 40 medicinal substances used in Europe, including cinchona (called 'quinquina' by the Jesuits).[385] In 1693, de Fontaney and de Visdelou went to Beijing with some quinquina samples obtained through another Jesuit in India, and successfully used it to cure Kangxi who was then suffering from a malignant fever.[386] Thirsting for more such French Jesuit, apparently elite, knowledge, Kangxi soon commissioned Joachim Bouvet as his emissary, and sent him to Louis XIV to recruit more Jesuits for the Qing court.[387] In 1698 Bouvet brought eight more French Jesuits

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381 For their lives, see Pfister 1932, pp. 419-457; Dehergne 1973, pp. 33-34, 97-98, 108-109, 146-147, 294-295. Cf. Gatty 1974, pp. 141-162; Von Collani 1985; Anderson 1999, p. 390; De Thomaz de Bossière 1994; Anderson 1999, p. 706.

382 Jami 2012, pp. 102-111. For Ferdinand Verbiest's life, see Witek 1994.

383 Zhen and Zheng 2003, pp. 552-554. The text, which is entitled *Xi du shi yuan you yong fa* 吸毒石原由用法 (Origin and Uses of Snakestone), was later translated into Manchu. For its Chinese version, see Verbiest [*c*. 1686] 2003, pp. 737-738. Hanson considers the text was written in 1686, while some other scholars date the text to 1682-1688, see Hanson 2006, pp. 131-175; Chen 2009, pp. 311-346.

384 Han 1999, pp. 18-19. For Kangxi's life, see Spence 1974.

385 Huang and Qu 1991, pp. 237-238; Li 1999, p. 30; Hanson 2006, pp. 131-175; Watanabe 2012 p. 159. It is entitled '*Si Yang-ni Okto I Bithe*' (Latin transliteration; literally Treatises on Western Medicinal Substances), see Bouvet and Gerbillon [1693] 2001, pp. 289-442. Its content has not been fully examined. For a few related sporadic studies, see Cai 2011, pp. 69-78; Zhuang 2011, pp. 153-224; Liu 2014, pp. 12-22, 148; Cai 2015, pp. 14-17, 22.

386 Duteil 1994, p. 310; Hanson 2007, pp. 1-10. Cinchona was originally used for medicinal purposes in South America. From the mid-17th century it began to be transmitted to Europe and used to treat malaria, see Rinaldi 2006, pp. 39-40.

387 Hsia 1998, p. 49; Mungello 2013, p. 99.

to China, among them Dominicus Parennin (1665-1741). Parennin was to be the first person to send the caterpillar fungus to France, or indeed to Europe.

Dominicus Parennin and the Caterpillar Fungus

Dominicus Parennin arrived in Guangzhou on 4 November, 1698. During Parennin's journey to Beijing, the emperor Kangxi, who was then on a tour of inspection of the empire, summoned Joachim Bouvet and his confrères to Jinshan Island (Zhenjiang, Jiangsu province). At Kangxi's request, Bouvet selected Parennin and four other Jesuits to serve in the royal palace, while the others were permitted to spread the knowledge of Christ elsewhere in China.[388] Parennin stayed in Beijing until his death on 29 September, 1741. He soon mastered the Chinese and Manchu languages, and was then able to teach Kangxi European geometry, botany and medicine.[389] He was a great polymath. On finding errors in provincial maps of China in 1698, for example, he even suggested that Kangxi organise a geographical survey of the whole empire according to European methods.[390] In some of the Qing court's diplomatic interactions with the Russians, he also acted as interpreter and translator.[391] After the death of Kangxi in 1722, Parennin was permitted to spend more time gathering information about China and communicating it to French scholars and academic institutions.

In 1723, Parennin wrote two letters to Bernard Le Bovier de Fontenelle (1657-1757), perpetual secretary to the Académie des Sciences in Paris.[392] The first letter, written in Beijing on 1 May, mainly dealt with his impressions of the Manchu language, and his own theory and practice of translation. Parennin enclosed with the letter some of his Manchu translations on European anatomy, medicine and physics.[393] According to the second letter, written in Beijing on 15 October, Parennin's despatch to the Académie of 1 May also included some 'racines particulières' (particular roots); and the second letter was written to provide some descriptions of them.[394] In the second letter

[388] Du Halde *et al*. 1819a, pp. 229-241.
[389] Du Halde *et al.* 1819c, pp. 322-332.
[390] Harley and Woodward 1987, p. 180; Zhang 2015, p. 265.
[391] Pfister 1932, pp. 501-517; Dehergne 1973, pp. 195-196.
[392] Fontenelle remained perpetual secretary to the Académie des Sciences during the period 1697-1740, see Delon 2013, p. 11. For his life and publications, see McKie 1957a, pp. 193-200; Delorme 1957, pp. 300-309. The Académie des Sciences was founded in 1666 and reconstituted in 1699, see Bertrand 1869, pp. 1-2, 47-48; Hessenbruch 2000, pp. 1-2.
[393] Du Halde *et al.* 1819b, pp. 444-470.
[394] Du Halde *et al.* 1819b, pp. 470-485

he introduces the following five medicinal substances in turn:[395]

'*Hia-tsao-tom-chom*' (i.e. *Xia cao dong chong* 夏草冬蟲; the caterpillar fungus)

'*Sant-si*' (i.e. *San qi* 三七; *Panax notoginseng* (Burkill) F.H.Chen)

'*Tai-hoam*' (i.e. *Da huang* 大黃; *Rheum* spp.)

'*Tam-cou ê*' (i.e. *Dang gui* 當歸; *Angelica sinensis* (Oliv.) Diels)

'*Ngo-kiao*' (i.e. *E Jiao* 阿膠; donkey-hide gelatin)

The caterpillar fungus comes first, indicating Parennin's special attention to this substance. In fact, it was also the only one of the five medicinal substances whose efficacies Parennin had personally experienced. Although Parennin did not explain why he sent the caterpillar fungus to Paris, his experience of being cured by it must have been an important factor that drew his attention to effective Chinese medicinal substances. In the second letter he recorded that in 1720, the Governor of Sichuan and Shaanxi went to see the emperor.[396] The Governor brought with him 'singuliers' (singular) products of his provinces and neighbouring areas, among which was the caterpillar fungus. He also dropped in on Parrenin, who was then extremely feeble and seemed unable to be restored to health by any medicinal substance. He gave Parennin some caterpillar fungus, and told him how to use it: put five 'drachmes' (16.2 grams) of the caterpillar fungus into a duck's belly and simmer them; when the duck is cooked, remove the caterpillar fungus and then eat up the duck in eight to ten days in the morning and evening. Parennin followed these directions; his appetite finally increased, and he also recovered his physical energy. Parennin further developed an interest in this potent but curious 'root'. As he observed, it looked very much like a yellow worm, but little was known about its leaves, flowers and stems; if it was put aside and exposed to the air for a long period, it would decay and thus become black. In order to know more about its medicinal properties, he questioned the royal physicians and was informed that it could restore and increase physical force lost due to overwork or long-term illness. Additionally, Parennin remarked that its efficacies were similar to those of ginseng; but unlike ginseng, the caterpillar fungus would not cause bleeding even if it was taken frequently.

[395] Here I tentatively add current scientific names for some of the medicinal substances according to The Plant List database (http://www.theplantlist.org, accessed on 13 January, 2017) , in case they may provide taxonomic clues for pharmacognosists who are interested in the substances, see Heinrich 2015, pp. 3-9; Lardos 2015, pp. 333-341.

[396] Parennin did not mention the Governor's name. But according to Qing Chinese sources, it was Nian Gengyao, see Qian 1980, pp. 1384-1388. Little is known about how Nian Gengyao knew Parennin. But Nian Gengyao's elder brother Nian Xiyao 年希堯 (1671-1738), who was enthusiastic about European natural knowledge, had contacts with Parennin, see Yi 2000, pp. 155-165; Corsi 2001, pp. 375-418. Probably it was through his elder brother that Nian Gengyao established a relationship with Parennin.

Parennin was clearly enthused with the wonders of the Chinese world, and the spirit of adventure that had characterised the Age of Discovery in the centuries leading up to the Jesuit presence in China. His interest in *materia medica* linked him to communities of scholars working in both secular and religious organisations. These were the same communities who were, within another century or so, to be at the forefront of the creation of a self-consciously distinct and modern science. Nevertheless, apart from his methods of collecting and the new global networks of knowledge distribution, at this point there was little to distinguish Parennin's obervations of Chinese *materia medica* from the empirical observations that Chinese had made of Tibetan *materia medica* of a century before. These we have already encountered in Chapter 2. According to the second letter, Parennin had the French pharmacist Pierre Pomet's (1658-1699) *Histoire Générale des Drogues* (General History of Drugs) to hand,[397] which enabled him to compare European and Chinese accounts of medicinal substances. To collect more information about Chinese *materia medica*, he frequently consulted Chinese physicians, visited drugstores, and wrote down what he heard about Chinese medicinal substances in Beijing. In a broad sense, Parennin had wider interests in medicine than just the *materia medica*. He is noted for his co-authorship of a Manchu anatomy translation (*c.* 1723) based on two late 17th-century European medical texts, which has been studied extensively.[398] Less known is his work on *materia medica*. In the 18th century the Jesuits in China were keen to introduce Chinese (medicinal) plant specimens and seeds to France.[399] This is reflected in a second letter, where Parennin mentions that, some Jesuit "botanistes" (botanists) and "droguistes" (druggists) had journeyed from Paris to Guangzhou in order to collect plants and medicinal substances. But Parennin did not think they would achieve success, as he considered that interesting plants could only be found in southwest China. Moreover, because none of the French missionaries resided in such remote regions, Parennin thought that all that the French Jesuits in China could do was to 'faire quelque version' (make some translation) of the 'l'Herbier Chinois' (Chinese herbal, [i.e. probably

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397 For a brief introduction to this book, see Kebler 1926, pp. 367-371. Cf. Sonnedecker 1997, p. 155.

398 Bretschneider 1882, p. 102; Grover 1980, pp. 83-99. The translation was originally undertaken by Joachim Bouvet, but his translation was discontinued for some reason. Parennin then succeeded Bouvet as translator of the two books. The title of the Manchu translation appears in both Manchu and Chinese titles, i.e. '*Wargi namu oktosilame niyalmai beye giranggi sudala nirugan i gisun*' (Latin transliteration) and '*Xi yi ren ti gu mai tu shuo* 西醫人身骨脈圖說' (Explanations and Illustrations of the Bones and Vessels of the Human Body in Western Medicine). It also has another Manchu title, i.e. '*(Dergici toktobuha) Ge ti ciowan lu bithe*' (Imperially-Commissioned Complete Record on the Body). '*Ge ti ciowan lu*' is the Manchu transliteration of the Chinese phrase '骼体全录' (Complete Record on the Body), see Pang 1997, pp. 33-39; Hanson 2003, pp. 1-32. For Bartholini and Dionis's original texts, see Bartholini 1677; Dionis 1690.

399 For the introduction of Chinese (medicinal) plants to 18th-century France, see Genest 1992, pp. 141-158; Genest 1997, pp. 27-47.

Ben cao gang mu]).[400] Probably this was why Parennin endeavoured additionally to communicate his information about Chinese flora and *materia medica* to the Académie in the second letter. In brief, how his own interests intersected with French exploration of Chinese flora and *materia medica* also prompted his transmission of the caterpillar fungus and the other medicinal substances.

Parennin tried to obtain more caterpillar fungus. However due to its rarity, it was used only when royal physicians made up a prescription, and could not easily be found outside the royal palace in Beijing. After asking the royal physicians about the possible areas where it could be procured, he wrote to a friend in the 'Hou-quam' (i.e. Huguang 湖廣; today's Hunan and Hubei) province, requesting the latter to send some specimens of the caterpillar fungus. His friend duly bought some specimens, at a cost of four times their own weight in silver, and sent them to him in Beijing. Parennin, like other French Jesuits in 18th-century Beijing, was able to send letters and natural objects to France via land (via Russia) or sea routes.[401] From a Latourian perspective, we can see how the caterpillar fungus brought by the Governor exerted its own agency when Parennin was impressed by its 'singular' appearance and efficacies. It was unknown to him and probably also the savants in Paris. In the spirit of exploration and collection of the time, they would no doubt, as did Reamur a few years later, have considered it an interesting contribution to French natural history and *materia medica*.

A synopsis of Parennin's above two letters was published in the 1726 *Histoire de l'Académie Royale des Sciences* (History of the Royal Academy of Sciences).[402] Parennin's specimens of the caterpillar fungus had also arrived at the Académie by 1726. Later, the French Jesuit historian Jean-Baptiste du Halde's (1674-1743), who had never been to China, quoted Parennin's account of the caterpillar fungus (with slight revisions) in his four-volume general history of China published in Paris in 1735.[403] As the editor of the *Lettres Édifiantes et Curieuses, Écrites des Missions Étrangères* (Edifying and Curious Letters, Written from Foreign Missions) during the period 1709-1743,[404] Du Halde was able to read Parennin's letter on Chinese medicinal substances. Du Halde's history became very popular after its publication. In 1736, its English translation was

[400] However, doubtless Chinese medicinal substances could be found beyond southwest regions in China, as exemplified by the French Jesuit Pierre Jartoux's (1669-1720) discovery of ginseng in northeastern China in 1709, see Jartoux 1713, pp. 237-247; Du Halde *et al.* 1819b, pp. 71-81. For Jartoux's life, see Pfister 1932, pp. 584-586; Dehergne 1973, pp. 131-132.

[401] Genest 1997, pp. 27-47.

[402] Anonymous 1726, pp. 17-20.

[403] Du Halde 1735, pp. 607-608. For Du Halde and his general history of China, see Isabelle 2002.

[404] Laflèche 2000, p. 48.

published in London.[405] The second and third editions of this English translation soon came out in 1739 and 1741 respectively following its publication,[406] and this increasing publicity would doubtless advance the transmission of Parennin's account of the caterpillar fungus throughout Britain. Jean-Baptiste du Halde also included Jesuit translations of portions of the Chinese medical text *Ben cao gang mu* (Compendium of Materia Medica, 1578) in his general history of China, which, as Carla Nappi states, 'were frequently studied and cited by Western scholars well into the nineteenth century'.[407] However, most French missionaries in China were officially commanded by the Chinese emperor to leave the mainland due to the Chinese Rites Controversy over Jesus Christ's place, or lack of a place, in the Chinese ritual world, which came to a head in the early 18th century.[408] Thereafter, the Catholic missionary enterprise was officially banned in Qing China for about a century, while the political situation for those French missionaries allowed to stay in Beijing, also seriously deteriorated. This partly explains the interruption of subsequent transmission of the caterpillar fungus to France.

Nevertheless, in about a century and against the religious background of the Jesuit process of missionising with its assimilation of local knowledge, specimens of the caterpillar fungus were transmitted to Paris through a network of heterogeneous actors including the caterpillar fungus itself, Parennin, the Governor, royal physicians, his friend in Huguang, transnational messengers, Bernard Le Bovier de Fontenelle and the Académie des Sciences. In this way they all contributed to the dynamic production of an emergent and globalising knowledge of flora and fauna in the early 18th century.

3.2.2 Britain

Britain's first direct contact with China was established in 1637, more than two decades later than with France. In this year the sea Captain James Weddell (1583-1642), who was then serving in the English East India Company, led a fleet to Macao (June) and Guangzhou (August) under a royal decree on trade issued by King Charles I (1600-1649). Owing to the intervention of Britain's

[405] For the account of the caterpillar fungus in English translation, see Du Halde 1736, pp. 41-42.
[406] Du Halde [1736] 1739; Du Halde [1736] 1741.
[407] Nappi 2009, pp. 144-145. Cf. Han 1999, pp. 129-131.
[408] Minamiki 1985, pp. 183-204; Mungello 1994, pp. 3-12.

European competitors in Southeast Asia (especially the Portuguese in Macao) and communication issues between Weddell and Chinese officials, Weddell did not succeed in his attempt to establish a direct commercial relationship between Britain and China.[409] After the Ming-Qing transition, the English East Indian Company began to trade with the Chinese in Macao, Guangzhou and a few other coastal cities, and finally established a factory with a permanent staff in Guangzhou in 1715. Afterwards, the Qing court confined Sino-European trade to the port of Guangzhou in 1757.[410] From then on, Sino-British trade was carried out in Guangzhou until 1843-1844, when five treaty ports in southeastern China were opened under the Treaty of Nanking (signed on 29 August, 1842), with Hong Kong ceded to Britain.[411] From the second half of the 18th century, when Britain was undergoing an industrial revolution, the centre of gravity of the British empire was also shifting from the Atlantic to the Indian Ocean.[412] In this context, George Macartney (1737-1806) and William P. Amherst (1773-1857) led two British embassies to Beijing in 1793 and 1816 respectively, but they did not accomplish their purpose of expanding Sino-British trade.[413] However, regardless that the Qing government thwarted British imperial ambitions, throughout the 19th century, Hong Kong and Guangzhou were international transshipment centres where people, objects and information from China, Britain and other countries converged.

Trade facilitated the arrival of Western doctors, naturalists and missionaries in China. For example, as early as the 1800s cowpox vaccine had been shipped from Bombay and Manila to Guangzhou and Macao.[414] Alexander Pearson (1780-1874), a British surgeon of the English East India Company, successfully introduced vaccination with cowpox to the latter two cities in 1805 and 1806.[415] John Livingstone (1782?-1829), also a British surgeon of the English East India Company, arrived in Macao in about 1793. Knowing that Livingstone had a great interest in Chinese *materia medica* and its potential contribution to medical care in the West, his missionary friend Robert Morrison (1782-1834) generously bought him 800 volumes about Chinese medicine and an

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[409] Morse 1900, p. 51; Morse [1926] 2000a, pp. 15-30; Needham 1954, p. 144; Wan 2011, pp. 652-677. For Weddell's life, see Lee 1899, p. 130-132. For Charles I's life, see Gregg 1981. The English East India Company was established in 1600, but ceased to exist in 1873, see Goetz *et al*. 1998, p. 329.
[410] Cao *et al*. [1799] 1986, pp. 1023-1024; Wang 2011, pp. 40-45.
[411] Order of the Inspector General of Customs 1917, pp. 351-356; Zhou 2014, pp. 115-120.
[412] Marshall 2001, pp. 487-507.
[413] Staunton 1797, pp. 250-347; Abel 1818, pp. 92-129; Puga 2013, pp. 123-130. For Macartney and Amherst's lives, see Robbins 1908; Stephen 1885, pp. 360-361; Goetz *et al*. 1995, p. 340.
[414] Morse [1926] 2000b, p. 410; Wu 1931, pp. 2-31; Thompson 2015, pp. 30-31.
[415] Pearson 1833, pp. 35-41. Cowpox vaccination was invented by Edward Jenner (1749-1823), who formally reported it in 1798, see Jenner 1798. For Jenner's life, see Baron 2014. Cowpox vaccination gradually replaced the Chinese variolation in the 19th century. For the history of variolation and cowpox vaccination in China, see Liao 1988, pp. 36-44; Leung 2011, pp. 5-12.

assortment of Chinese medicinal substances. Livingstone was also invited to work with a Chinese physician in Morrison's dispensary established in Macao in 1820, and thus was able to observe Chinese medical practice. A few months later, Livingstone reported that in this institution both European and Chinese practice achieved success in treating patients, and 'both they [i.e. the Chinese] and we have much useful information to impart to each other'.[416] Moreover, Livingstone also had an enthusiasm for horticulture, and was elected corresponding member of the Horticultural Society of London in 1817. He published articles about the Chinese knowledge and practice of gardening in the Society's Transactions, and also sent plant specimens and seeds from China to the Society, botanical gardens, and nurseries in Britain.[417] People such as Pearson, Morrison and Livingstone were key actors in linking China and Britain in a key transition that contributed to the globalisation of botanical, zoological and geographical knowledge. Another character working for the East India Company, who was instrumental in advertising the curious characteristics of the caterpillar fungus was John Reeves.

Case I: John Reeves and the Caterpillar Fungus

In the second edition of John O. Westwood's (1805-1893) book *The Natural History of Insects* (1835), the author writes:

> In China is found a geometrical larva, which has a long, rather thick stem, growing from the head; this is about two inches and a quarter long, while the insect itself is not quite one inch and a half in length…On opening the body of a larva, however, we find that the root of the fungus entirely occupies the whole interior portion from the head to the opposite end.[418]

Westwood was an English entomologist, and a founding member of the Entomological Society of

[416] Morrison 1839b, pp. 20-24. For Morrison's life, see Morrison 1839a; Morrison 1839b. For Livingstone's life, see Morse [1926] 2000c, p. 110; Cox 1945, pp. 51-52, 216-218; Fan 2004, pp. 22, 25, 38, 44, 164.

[417] Bretschneider 1898, pp. 266-268. The Horticultural Society of London was founded in 1804, see Foster and Sheppard 2001, p. 361; Elliott 2003, pp. 1-27. Loudon records that Livingstone introduced an American plant to China, see Loudon [1838] 1854, pp. 172-177. But the original source to which he refers indicates that it was a 'Mr Beale' rather than Livingstone, see Reeves 1835, pp. 437-438.

[418] Westwood [1833] 1835, pp. 263-264. These words appear in the second (1835) and subsequent editions of this book, see Westwood 1833; Westwood [1833] 1837, pp. 263-264; Westwood [1833] 1842, pp. 263-264.

London in 1833.[419] Obviously Westwood had already seen and examined specimens of the caterpillar fungus from China before 1835. Although the origin of the specimens is not disclosed in this book, a clue was offered by Westwood at the meeting of the Entomological Society of London held on 1 March, 1841 and chaired by William W. Saunders (1809-1879). At the meeting he exhibited 'dried specimens of a Chinese larva, from the back of the neck of each of which a slender fungus... had been produced'. The caterpillar fungus, as Westwood stressed, was 'esteemed of great efficacy as a drug in China'. He then spoke of a man called 'Mr Reeves', who had forwarded a number of specimens of the caterpillar fungus tied up in bundles (each bundle containing about a dozen individual specimens) from Guangzhou to the Linnean Society of London.[420] Considering Westwood was an elected fellow of the Linnean Society of London as early as 1 May, 1827,[421] the specimens in his possession probably came directly or indirectly from Reeves, who also hold membership in the Linnean Society of London.

The Mr Reeves mentioned by Westwood was the British naturalist John Reeves (1774-1856), who is said to have made 'the greatest contribution to the knowledge of Chinese plants and animals in the early nineteenth century'.[422] In 1808, he entered the English East India Company and served at the office of Inspector of Tea in England. Four years later, he was appointed assistant inspector and sent to the Company's factory in Guangzhou, where he was subsequently promoted to Chief Inspector of tea. Reeves remained in Guangzhou and Macao during the period 1812-1831, except that he left for Britain twice in 1816 and 1824. In 1817 he was elected fellow of the Linnean Society of London,[423] ten years before Westwood became a fellow of the same society. Considering Reeves retired in 1831 and then returned to England,[424] his specimens of the caterpillar fungus must have been transmitted to Britain no later than 1831.

During his years in China, Reeves spent much spare time satisfying his curiosity about the natural world in China. He not only compiled an 'Index to the *Pun Tsaou*',[425] but also entered into correspondence with British naturalists such as John Livingstone (1782?-1829), Joseph Banks

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419 For Westwood's life, see Anonymous 1893, p. 143; Weir 1893, p. 24; Lee 1909a, pp. 1292-1293. For the founding of the Entomological Society of London, see Neave 1933, pp. 1-12.
420 Saunders 1841, pp. 22-26. See also Saunders 1842, pp. 217-220. For Saunders's life, see Lee 1909b, pp. 820-821.
421 Anonymous 1894, pp. 26-27. The Linnean Society of London was established in 1788, see Gage and Stearn 1988, pp. 13-22.
422 Rix 2013, p. 161.
423 Anonymous 1856, pp. 43-45.
424 Bretschneider 1898, pp. 256-263; Cox 1945, pp. 52-56; Whitehead 1969, pp. 191-233; Fan 2004, pp. 43-57.
425 Anonymous 1834, pp. 226-230. The *Pun Tsaou* is presumably an abbreviated and romanised transliteration of the Chinese *Ben cao gang mu* (1578). Morrison's Dictionary assimilated some botanical and other natural history terms from Reeves's Index, see, for example, Morrison 1815, p. 707; Morrison 1819, p. 1063; Morrison 1822, p. vi.

(1743-1820), and John Lindley (1799-1865), and natural history societies, including the Horticultural Society of London.[426] Moreover, he also sent many biological specimens, seeds and living plants that he had collected or cultivated in China to the latter. In his time, as the American missionary Samuel W. Williams (1812-1884) wrote, 'the number of plants shipped to Europe and America yearly is considerable, and the demand is increasing'.[427] From the late 18th century the English East India Company, which expected to realise profits from commercial and medicinal plants and animals, began to support collecting activities by naturalists and its own staff members in the Far East, and to purchase drawings of native plants and animals for identification and collection.[428] The Horticultural Society of London, which requested Reeves to send coloured drawings of Chinese ornamental plants for the purposes of selecting plants for British gardens, even awarded him a medal on 7 July, 1818.[429] Evidently, Reeves took an interest in Chinese medicinal substances, for he published an article on some of them in 1828.[430] The *Pun Tsaou*, the basis for his Index, is also a classical Chinese text on *materia medica* (or its European translations). Considering that Reeves obtained the caterpillar fungus in the commodity form (bundles) in Guangzhou, he must have been told by the seller that it was a medicinal substance. However, it seems that Reeves did not try to trace its geographical origin.

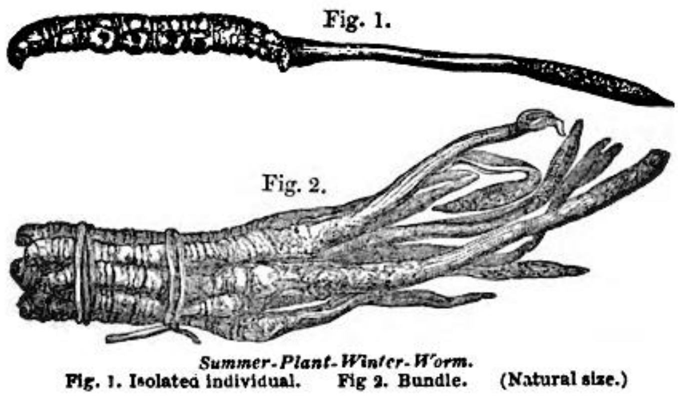

Fig. 7 Jonathan Pereira's illustrations of the specimens of the caterpillar fungus given by John Reeves (1843).

426 For the lives of Joseph Banks and John Lindley, see O'Brian 1997; Stearn 2006.
427 Williams 1834, pp. 83-89. For Williams's life, see Williams 1889.
428 Main 1826, pp. 62-67; Dozier 2010, p. 319; Lightman *et al.* 2013, pp. 159-161.
429 Order of the Council of the Horticultural Society of London, 1820, p. 37; Fritsch, 1953, pp. 42-47. Reeves sent more than two thousand plant and animal drawings to England in total, see Woodward *et al*. 1904, p. 46; Whitehead 1969, pp. 191-233; Rix 2013, p. 161.
430 Reeves 1828, pp. 24-27.

On 1 March, 1843, the English pharmacognosist Jonathan Pereira (1804-1853), an honorary member of the Pharmaceutical Society of Great Britain,[431] published an article in the *Pharmaceutical Journal and Transactions*. It aimed to introduce the caterpillar fungus ‘which is highly valued in China as an article of the Materia Medica, [and] may not be uninteresting to the Members of the Pharmaceutical Society’.[432] Pereira wrote that ‘Mr Reeves, to whom I am indebted for some specimens of it, tells me that it is better known at Canton in the common dialect as *Tong chong ha cho*, which means *winter-worm-summer-plant*. …Mr Reeves states that it is brought to Canton tied up in bundles, each containing about a dozen individuals’. Reeves’s paraphrase of the Chinese name for the caterpillar fungus actually introduced the idea of its transformation to Pereira. Pereira also carefully illustrated a single specimen and a bundle of the caterpillar fungus respectively (Fig. 7). The illustrations can be treated as visual evidence of the actual appearance of the caterpillar fungus as a commodity in early 19th-century China.

A B

Fig. 8 The holotype (A) and isotpye (B) of the caterpillar fungus preserved at Kew Gardens. Photographs provided by Dr Begoña Aguirre-Hudson. Courtesy of Kew Gardens.

Some of Reeves’s specimens of the caterpillar fungus were circulated to the British Museum,

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[431] Pharmaceutical Society of Great Britain 1842, pp. 363-386. This Society was founded in London on 15 April, 1841, see Bell and Redwood 1880, pp. 143-150; Hudson and Boylan 2013, p. 207.

[432] Pereira 1843a, pp. 591-595. This article was republished in *The New York Journal of Medicine* later in the same year, see Pereira 1843b, pp. 128-132. For an abridged German version of this article, see Pereira 1844, pp. 240-241. The *Pharmaceutical Journal and Transactions* was established in July, 1841, see Brake and Demoor 2009, p. 492. For Pereira’s life, see Anonymous 1853, pp. 320-322; Christie *et al*. 1853, pp. 409-417; Turner 2011, pp. 581-585; Hudson and Boylan 2013, pp. 20-21.

and then the Royal Botanic Gardens at Kew (Kew Gardens). Also in 1843, the British mycologist Miles J. Berkeley (1803-1889), founder of the discipline of mycology in Britain,[433] published his taxonomic study of the caterpillar fungus and related fungal species.[434] According to his account, the specimens of the caterpillar fungus that he examined were preserved at the British Museum. 'It is sold in little bundles tied up with silk. I have seen several of these [specimens]', he wrote. But he recorded the locality where the caterpillar fungus was originally collected simply as 'China'. This suggests that the original owner of the specimens, i.e. John Reeves, was unclear about their specific origin. In 1879, the specimens of the caterpillar fungus that had been examined by Berkeley were transferred to Kew Gardens and attached to the herbarium sheet (Fig. 8 A&B), on which the year was printed. Based on the fungal specimens preserved in the herbarium of Kew Gardens, in 1883 the English mycologist Mordecai C. Cooke (1825-1914) published his identification of those belonging to the family Hypocreaceae. In this category, which groups together species of fungi mainly according to similarities in morphological characteristics of fruiting bodies and microscopic structures of fungal perithecia, there was the caterpillar fungus.[435]

In addition to academic societies and institutions, some of Reeves's specimens of the caterpillar fungus were also exchanged privately among professional and amateur naturalists in Britain. In 1850 an Irishman called 'Mr Short' of Stranwillis, near Belfast, published some remarks on the caterpillar fungus. He said that 'the specimen I possess of this rare fungus was brought to England by Mr Reeves'. But Short did not directly acquire the specimen from Reeves. At the end of Short's article, he states that 'I cannot in justice omit to mention that I am indebted to ... the Rev. Gerard Smith, Ashton Hays, Cheshire, for my Chinese specimen'.[436] Here the 'Rev. Gerard Smith' was the botanist Gerard Edwards Smith (1805-1881), who collected plants of Derbyshire and published related botanical studies as early as 1829.[437] It is unknown whether John Reeves had directly given some specimens to Gerard E. Smith. Jessica Ratcliff's recent study of the East India Company's museum in the early 19th century indicates that its extensive exotic collections of the natural history of Asia, which were gathered through the Company's transnational trading networks, contributed much to the

433 Chisholm 1910, p. 781; Sutton 1996, p. 85.
434 Berkeley 1843, pp. 205-211. For Berkeley's life, see Thiselton-Dyer 1897, pp. 4-11; Thiselton-Dyer 1907, pp. 1-9; Thiselton-Dyer 1913, pp. 261-279; Massee 1913, pp. 225-232. The British Museum was established in 1753, see Order of the Trustees 1893, p. 7.
435 Cooke 1883, pp. 77-83. For Cooke's life, see C. 1914, pp. 315-316; Dendy 1914, p. 406; Desmond 1994, p. 166. The Royal Botanic Gardens, Kew was established in 1759, see Bean and Thiselton-Dyer 1908, pp. 11-14.
436 Short 1850, pp. 200-201.
437 Britten 1890, pp. 306-314; B. 1894, pp. 61-62; Reade 1904, p. 260.

flourishing of new scientific societies and diciplines (e.g. paleontology) and the material and visual culture of science in Britain.[438] This background to the rise of medical history facilitates our understanding of the culture of John Reeves's private collection and its display of the caterpillar fungus, and makes it less incomprehensible that such a small organism from China was able to remain attractive and travel among different people, societies and institutions in a strange land. He worked in the Company for over two decades, at the time when there was a rapid British political economic expansion and with it the material culture of science.

In this case, the flow of knowledge and the distribution of John Reeves's specimens in Britain, together with his own interests and narrative account, indicate his awareness of specific practices in the discipline of natural history and their relation to medical value. The transmission of his specimens, ocurred against the background of Sino-British trade, expansion of the British empire and the flourishing of Victorian natural history sciences,[439] and did not directly involve economic concerns on his part. Reeves became a key agent of the caterpillar fungus in its transmission from China to Britain as well as its dispersal around Britain. In Britain, his specimens gradually entered into networks of Victorian scientists, societies and institutions, and found new agents (e.g. Gerard E. Smith and the British Museum). The wide interpersonal and interinstitutional circulation of Reeves's specimens contributed much to the production of new knowledge about the caterpillar fungus in 19th-century Britain, which will be discussed in detail later.

Case II: Henry Frewin and the Caterpillar Fungus

In 1886 the Irish doctor 'E. B. Ivatts' (Medicinae Doctor) of Dublin reported the effects of the caterpillar fungus on his own body. His motive for the self-experiment originated in his reading of an unatributed article on the caterpillar fungus in about 1877. He was attracted by 'its semi-animal and semi-vegetable reputation', and 'had conjectured a theory that most, if not all, parasitic plants might also have a special affinity for the male or female generative system'. Therefore, 'through a friend I got into correspondence with a Mr Frewin, residing in Swatow, China, and he obtained and sent me the specimens'.[440] Here the 'Mr Frewin' was the Englishman Henry Frewin (1830-?). He evidently

438 Ratcliff 2016, pp. 495-517.
439 Brockway 1979, pp. 449-465; Daunton 2005, pp. 61-86; Prance 2010, pp. 501-508; Mitchell 2011, pp. 530-531. For Victorian natural history sciences, see Merrill 1989; Lightman 1997; Lightman 2007.
440 Ivatts 1886, pp. 137-138. E. B. Ivatts's life remains obscure. But he was certainly a medical practitioner, and

led an extraordinary life, but historical sources on his life remain rare. The most detailed account of him is given in a book published in 1908:

> CAPTAIN HY. Frewin is the oldest foreign resident in Swatow, and a pioneer of trade in this district. His career has been varied and interesting. Born in London, in 1830, he went to sea at the age of fourteen, and for many years was trading in the Indian and Chinese seas. As gunner of the frigate *Sesostrio*, he saw a good deal of fighting in the Burmese War, of 1852, 53, and was awarded the silver medal. Now he carries on the business of a marine surveyor, living a quiet and retired life.[441]

A few other publications of the late 19th century record Frewin's identity as a marine surveyor, marine pilot, or merchant; and he had also founded a company called 'Frewin & Co' in Swatow (Shantou, Guangdong province).[442] Probably Frewin began to reside in Shantou after 1860, as the port of Shantou was opened to foreign trade on 1 January, 1860 under the Treaty of Tientsin (1858).[443] Obviously, during his residence in Shantou, Frewin still maintained contacts with his friends in Britain.

The transmission of Frewin's specimens from China to Britain, carried out within transnational trade networks, was basically driven by Ivatts's curiosity about the putative medical properties of the caterpillar fungus. The unattributed article that Ivatts had came across, served as an introduction to the caterpillar fungus, an introduction that had been stimulated by the travels of Reeves's specimens around Britain. At that time John Reeves had been dead for about two decades, and since his self-experiment seemed to require fresh caterpillar fungus from China, Ivatts resorted to calling on Frewin's local expertise to procure a batch. Frewin seems to have had no special interest in natural history, but Ivatts provided him with the necessary information about the caterpillar fungus. In this case, the article about the caterpillar fungus and Ivatts's letter to Frewin were the human and non-human vectors through which Ivatts, as the human intermediary, transformed Frewin into an agent of the caterpillar fungus sold in China. But the primary agency was located in the caterpillar fungus', by now internationally famous; its transformations and reported medical potency ultimately

occasionally published articles on medicinal substances and their efficacies. See, for example, Ivatts 1873, pp. 564-568.

[441] Wright 1908, pp. 835-836.

[442] Anonymous 1874, p. 33; Anonymous 1875, p. 97; Anonymous 1886, p. 513.

[443] Chen 2011, pp. 16-21; Nield 2015, p. 215.

resulted in the arrival of fresh specimens into Ivatts's possession.

We will return later on in this chapter to the nature of the science involved in Ivatt's self-experimentation and his hypothesis that there was a gendered selectivity inherent in the behaviour of parasitic plants. But first it is necessary to track the caterpillar fungus as it fascinated 'the last of the great plant hunters' and his society of collectors, geographers and scientists in the first decade of the twentieth century.

Case III: Frank Kingdon Ward and the Caterpillar Fungus

The English naturalist Frank Kingdon Ward (1885-1958), 'the last of the great plant hunters',[444] developed an interest in exotic flora during his undergraduate years at the University of Cambridge (1904-1906).[445] Unfortunately, Ward had to drop out of university in 1906, as his father Harry M. Ward (1854-1906) died from diabetes in this year, leaving the family in straitened circumstances.[446] On the recommendation of a family friend, Herbert A. Giles (1845-1935), Professor of Chinese at the University of Cambridge, Ward obtained the position of junior master at the Shanghai Public School. He reached Shanghai in 1907 with an ardent desire to see the Asian tropics and, with this ambition in mind, resigned from this post in 1909 due to his dislike of teaching.[447] His arrival in China involved different factors (e.g. life pressures and Giles's help), but the decisive factor was his desire to explore exotic flora.

Ward's career as a plant hunter started in the same year, when Michael R. O. Thomas (1858-1929), curator of mammals at the British Museum, introduced him to the American zoologist Malcolm P. Anderson (1879-1919). At Anderson's invitation, Ward joined his animal hunting expedition to west China during the period 1909-1910.[448] After the expedition, he sent his collection of plant specimens to the herbarium of the University of Cambridge for taxonomic identification.

[444] This is the subtitle of Charles Lyte's biography of Ward (1989). For Ward's life and publications, see Mills 1958, p. 422; Mason 1958, pp. 141-142; Schweinfurth and Schweinfurth-Marby 1975, pp. 15-93; Schilling 1985, pp. 264-269; Lyte 1989; Matthew and Harrison 2004, pp. 292-294. There are a few variant spellings of Ward's name in the historical literature, see Stearn 1960, pp. 11-18. Here I adopt the name 'Frank Kingdon Ward'.
[445] Ward 1960, pp. 20-21.
[446] Lyte 1989, pp. 6-11. Harry M. Ward was a famous English botanist and plant pathologist. For his life, see Thiselton-Dyer 1907, pp. 1-9; Thiselton-Dyer 1913, pp. 261-279; Ainsworth 1994, pp. 21-25.
[447] Ward 1960, pp. 20-22, 25. See also Lyte 1989, pp. 11, 15; SHZJZBZWYH 2001, p. 745. For Giles's life, see Aylmer 1997, pp. 1-90.
[448] Thomas 1911, pp. 687-695; Peile 1913, pp. 872-873. Cf. Ward 1910, p. 141; Ward 1911, pp. 237-255; Ward 1945, p. 58; Ward 1960, pp. 25, 28-29; Lyte 1989, pp. 15-16. For Thomas's life, see Hill 1990, pp. 25-113. For Anderson's life, see Anderson 1919, pp. 115-119; Beolens *et al*. 2009, p. 12. This expedition was funded by Herbrand A. Russell (1858-1940), the 11th Duke of Bedford and also President of the Zoological Society of London (1899-1936). For Russell's life, see Mitchell 1941, pp. 498-502; Beolens *et al*. 2009, p. 34.

Taxonomists from both the University and Kew Gardens between them identified 79 kinds of plants.[449] Given that the University of Cambridge was his alma mater, it seems clear that Ward did not choose an institution at random to receive his specimens. Ward's first independent plant hunting expedition began in 1911. When the Liverpool merchant Arthur K. Bulley (1861-1942) planned to employ a new specialist plant hunter to collect Chinese alpine plants for his nursery business, Ward's father's friend Isaac B. Balfour (1853-1922) linked Ward with Bulley.[450] Bulley had funded some of Ward's plant hunting expeditions since 1911, while Ward had also gradually established extensive networks with different societies and institutions and individuals in Britain, and the rest of the world, such as the Royal Geographical Society,[451] the Linnean Society of London,[452] the India Office, and John Ramsbottom (1885-1974), Keeper of Botany at the Natural History Museum (1930-50).[453] As a result, when the seeds of about 250 species collected by Ward on the Tibetan Plateau during the period 1924-1925 reached England, they were distributed and planted immediately 'at Kew, at Edingburg, at Wisley, and in a hundred other gardens in Britain'; 'seeds were also promptly dispatched to New Zealand, South and East Africa, South and North America, and elsewhere.'[454]

Ward first saw and collected the caterpillar fungus during his third expedition to China. In February 1913 he left England for Yunnan and Eastern Tibet.[455] What attracted him most around his tent in the 'Ka-kar-po' mountain in Deqin, Yunnan was the caterpillar fungus. He noticed that the Chinese regarded it as a high-value medicine and called it '*chung-ts'ao*', namely 'insect plant'. His attendant, a young Chinese man, 'spent all his spare time lying on his belly looking for these little curiosities to sell for a fabulous sum on his return to Tali-fu' (today's Dali, Yunnan). In Ward's eyes, the caterpillar fungus was 'a most grotesque growth, the little black fungus finger above and the shrivelled brown skin, retaining the shape of the dead caterpillar, below.'[456] Probably he knew of its fungal nature but was uncertain about its species. Therefore, he sent some specimens of it to 'Mr F. T. Brooks' of the University of Cambridge. The latter was the Mycologist Frederick T. Brooks (1882-1952), whose position of Demonstrator in Botany at the University then was initially arranged

449 Adamson 1913, pp. 129-131. One of them was Albert C. Seward (1863-1941). For Seward's life, see Thomas 1941, pp. 867-880; Harris 1941, pp. 161-164.
450 Ward 1960, pp. 26-27. See also Cox 1945, pp. 158-159; Lyte 1983, pp. 108, 152; Lyte 1989, pp. 26-28. For Balfour's life, see F. 1923, pp. 335-339; P. 1924, pp. 1-16.
451 Curzon and Beaumont 1912, pp. 84-85; Lyte 1989, pp. 44-45.
452 Ward was elected fellow of the Linnean Society of London in 1920. Thanks to Lynda Brooks, Librarian of the Linnean Society of London, for offering me this information.
453 Ward 1934, pp. 369-394. For Ramsbottom's life, see G. 1975, pp. 1-6.
454 Ward 1926, p. 185. See also Lyte 1989, p. 82.
455 Ward 1923, p. 17.
456 Ward 1923, p. 81.

by Ward's father in 1905.[457] Brooks informed Ward that it was a fungal species of the genus '*Cordiceps*'.[458] Considering the purposes of the expedition (plant hunting and geographical investigation in West China),[459] we can deduce that Ward's interest in the caterpillar fungus derived from his natural curiosity. Through the networks of knowledge that linked Ward in China and Brooks in Britain, and their desire to collect and exchange, the 'natural' world in European perceptions of Asia was also being redefined.

Ward was not the earliest British naturalist to have seen the caterpillar fungus in West China. For example, Antwerp E. Pratt (1852-*c*. 1920) witnessed the export of the medicinal '*Tchöng-tsäo*', 'a most curious plant' from Tibet in Yichang, Hubei in October, 1887. On 16 May, 1890, he met about 50 Chinese collectors, who had gathered the caterpillar fungus and some other medicinal substances, in Sichuan.[460] Another example is Ernest H. Wilson (1876-1930). During his travels from Chengdu to Dajianlu (i.e. Kangding) in 1908, he noticed a medicine market in West Sichuan, which was noted for '*Ch'ung-tsao*' and a few other medicinal substances sold by 'tribesfolk'.[461] Nevertheless, there are no records to prove that the two naturalists had collected specimens of it or sent them to Britain or elsewhere.

On this occasion, Ward entered Yunnan through Burma, which was then a province of British India.[462] Such a route facilitated his expedition as well as the transmission of the caterpillar fungus and his seeds and plant specimens to Britain. The caterpillar fungus was brought to Ward's notice through the Chinese attendant's personal collecting of this rare and costly medicinal substance. As the purveyor of the caterpillar fungus, the attendant interacted with both drug sellers in Dali and with Ward as a foreign naturalist. He successfully drew Ward's attention to the caterpillar fungus, while Ward as a new agent of this organism took an interest in its species rather than its economic value. Through emerging actors in Ward's extensive transnational networks, as analysed above, the caterpillar fungus finally reached the hands of Frederick T. Brooks. Overall, the three cases of the caterpillar fungus's journeys to Britain, though varying from each other, bore no relation to the

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457 Moore 1953, pp. 340-354; Desmond 1994, p. 104.

458 '*Cordiceps*' was a seldom used synonym for '*Cordyceps*', see, for example, Berkeley 1860, p. 66; Berkeley 1875, pp. 1-16; Massee 1895, pp. 1-44. '*Cordiceps*' might be a misspelling of '*Cordyceps*', as it is absent from the 10th edition of the *Ainsworth & Bisby's Dictionary of the Fungi*, see Kirk *et al*. 2008, p. 171.

459 The task of investigating geography was assigned by the Royal Geographical Society, see Lyte 1989, pp. 44-48.

460 Pratt 1892, pp. 16-18, 131, 187-188. For a brief introduction to Pratt's obscure life, see Barton and Dietrich 2009, pp. 201-202.

461 Wilson 1913a, p. 186. Cf. Wilson 1913b, pp. 34-41. For Wilson's life, see Rehder 1936, pp. 602-604; Briggs 1993; Desmond 1994, p. 746.

462 Cannon 2009, p. 104.

Christian mission but embodied the expansion of the British empire in the Far East.

From the three cases we can clearly see British actors' natural curiosity and quest for potential medicinal substances as well as their importance for the transmission of the caterpillar fungus through academic and professional networks from China to Britain. They exemplify the scientific networks as well as those of the commercial and political elite in the emergence of an 'informal empire' in China.[463] The notion of 'informal empire' is usually applied to extra-territorial legal control, particularly in the service of British interests within the jurisdiction of China. While the important loci in this network of people at the forefront of the new natural sciences, such as The British Museum, Royal Geographical Society, and the University of Cambridge cannot be said to have been directly involved in pursuing economic interests, it is abundantly clear that the impact of their activities served to assert various forms of cultural dominance over areas outside of British political control — and this observation is key to how we understand the subsequent growth and influence of a modern science.

3.2.3 Russia

Russia's direct official communication with China can be dated back to 1618. In this year Tsar Mikhail F. Romanov (1596-1645) sent an expedition to China to collect first-hand information about this country. Ivan Petlin (Иван Петлин), leader of the expedition, set out from Tomsk on 9 May, 1618, crossed Mongolia, and reached Beijing on 1 September. Petlin and his fellows received the hospitality of the emperor Wanli (1563-1620); four days later, they set off on the return journey to Russia.[464] Before this expedition, the Russian expansion into Siberia had facilitated Russia's obtaining information about China, especially Chinese geography and products, from the Mongolians.[465] Meanwhile, Russia had declined some European requests for permission to pass through its territory to trade with China and India, and had begun to make its own efforts to establish a trading relationship with China.[466] Petlin's expedition pioneered such efforts. He recorded many medicinal substances and other products on the Chinese market in his expedition report,[467] which

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463 For the concept of 'informal empire', see Fan 2004, pp. 61-90.
464 Myasnikov and Demidova, 1966, pp. 1-86; Quested 2014, p. 28. For Tsar Mikhail F. Romanov's life, see Soloviev 1991. For Wanli's life, see Huang 1981, pp. 1-41.
465 Sladkovskiy 1974, p. 63; Delwig 2012, p. 92.
466 Trusevicha 1882, pp. 1-10; Sladkovskiy 1974, pp. 61-69.
467 Myasnikov and Demidova 1966, p. 60. See also Lin 2012, pp. 146-153.

formed part of the foundation for Russia's subsequent trade with China. However, a formal commercial relationship between Russia and China was not established until 1689, when the Treaty of Nerchinsk was signed by both powers.[468] Subsequently, the Treaty of Kyakhta, signed in 1727, confined Sino-Russian border trade sites to Nerchinsk and Kyakhta.[469] Kyakhta had more geographical advantages and thus remained the most important site of Sino-Russian trade till the mid-19th century. In the sinologist Nikita Y. Bichurin's (Никита Я. Бичурин, 1777-1853) Chinese language textbook for Russian students in Kyakhta, there was even a glossary of Russian terms for Chinese medicines and other goods.[470] From the 1850s, the opening of China to the European powers caused the decline of Kyakhta in Sino-Russian trade,[471] but it remained an important station on the route that connected Russia with China.

The Russians also brought Russian Orthodox Christianity to China. In 1695 the Qing court granted the priest Maxim Leontev (Максим Леонтьев) and the other Russians in Beijing a temple for their religious activities. It was soon transformed into an Orthodox church, and then a base for the Orthodox missionary enterprise in China.[472] Following Leontev's death, the Russian government's plan of sending an Orthodox priest as a successor to Leontev was approved by the Qing court. The first Russian Orthodox mission to China reached Beijing in 1715, while the dispatch of subsequent missions was legitimated by the fifth article of the Treaty of Kyakhta. By 1917 when the Bolshevik Revolution broke out, there had been 18 Russian Orthodox missions to Beijing.[473] These missions had religious, diplomatic and cultural significance for both countries.[474] Besides, as early as the 17th century, some Russian doctors had already accompanied Russian merchants to China. When Kangxi, who recognised European medicine, granted his consent for the first Orthodox mission to Beijing, he also expected Russia to simultaneously send a distinguished doctor.[475] This resulted in the arrival of Thomas Garwin in Beijing.[476] Thereafter seven Russian doctors were sent

468 Trusevicha 1882, pp. 82-118; Sladkovskiy 1974, pp. 95-109; Ding and Wang 2014, pp. 32-35. See also Chen 1966, pp. 86-105; BJSFDXQSYJXZ 1977, pp. 359-381. For the content of the Treaty of Nerchinsk (Chinese version), see Wang 1957, pp. 1-5.

469 Korsak 1857, pp. 20, 51-279; Sladkovskii 2008, pp. 37-74; Wanner 2015, pp. 17-27. For the content of the Treaty of Kyakhta (Chinese version), see Wang 1957, pp. 7-10.

470 Bichurin [1835] 1838, pp. 232-237. Bichurin led the 9th Orthodox mission to Beijing, see Standaert 2001, pp. 193-194.

471 Sladkovskiy 1974, pp. 264-271; Sladkovskii 2008, pp. 75-98.

472 Adoratskiy 1887, pp. 5-46; Norman 2010, pp. 280-290.

473 Standaert 2001, pp. 208-209; Phan 2011, pp. 159-160.

474 Tong 1999, pp. 9-17; Xiao 2008, pp. 37-43.

475 Skachkova 1958, pp. 136-148; Song 1986, pp. 93-96.

476 Barnes 2005, p. 108; Puente-Ballesteros 2011, pp. 86-162. The Scottish Thomas Garwin was a (temporary or permanent) resident in Russia. In Qing official documents he was called 'Ga er fen 噶爾芬', a transliteration of his surname, see, for example, LFY [1717] 1996, p. 1185.

together with missions to Beijing during the period 1719-1857. These Russian doctors not only practised their own medicine in Beijing, but also studied Chinese medicine and collected Chinese medical texts and natural objects.[477] Alexander A. Tatarinov (Александр А. Татаринов, 1817-1886) was the most eminent of them all.[478] He was also the first Russian to bring the caterpillar fungus to Russia.

Tatarinov and the Caterpillar Fungus

Alexander A. Tatarinov was born in Penza in 1817. He enrolled at the Imperial Medico-Surgical Academy (Императорской Медико-Хирургическая Академия), St Petersburg in 1835, and graduated in 1840.[479] Soon, Tatarinov was appointed doctor to the 12th Orthodox mission to Beijing. He passed through Kyakhta on 21 July and arrived in Beijing on 4 October, 1840. During his ten years in Beijing, Tatarinov mastered the Chinese language and studied Chinese medicine. Meanwhile, he also sustained a special interest in exotic plants and animals. Some of the plant specimens he collected in Beijing were sent to Friedrich Ernst Ludwig von Fischer (1782-1854), director of the St Petersburg Botanical Garden (1823-1850),[480] while a set of coloured botanical drawings of 452 kinds of wild Beijing plants, with their Chinese names added, was also produced by a Chinese painter under his supervision.[481] When he returned to Russia in May, 1850, he brought back his collections of Chinese biological specimens and medicinal substances. These collections reached the Medico-Surgical Academy in 1851, and were then examined by scientists including Paul F. Horaninov (Павел Ф. Горянинов, 1796-1865), Otto Bremer (?-1873) and William Grey.[482] In 1857, the Imperial St Petersburg Academy of Sciences bought up Tatarinov's collections and the set of botanical drawings.[483] On this basis, Carl I. Maximovich (Карл И. Максимович, 1827-1891) of the St Petersburg Botanical Garden completed the 'Index Florae Pekinensis' (1859),[484] which gained

477 Guo 2012, pp. 36-40; Li and Churilov 2014, pp. 259-277.
478 Brummitt and Powell 1992, p. 635; Xiao 2014, pp. 60-67.
479 Stepanov 1976, pp. 141-142; Standaert 2001, pp. 198-200. The Imperial Medico-Surgical Academy, St. Petersburg was established in 1808, see Otto 1839, p. 92.
480 Darwin 1999, p. 818; Stubbendieck 2003, p. 463. The St. Petersburg Botanical Garden was founded in 1714, see Shetler 1967, pp. 25-42.
481 Bretschneider 1881a, pp. 123.
482 Bremer and Grey 1853; Bretschneider 1894, pp. 292-299; Shcherbakova 1961, pp. 158-159; Gordh and Headrick 2011, p. 219.
483 Bretschneider 1898, pp. 559-569.
484 Maximovich 1859, pp. 468-479; Mikulinskiĭ *et al.* 1977, pp. 235-237; Darwin 2015, p. 441. The predecessor of the Imperial St. Petersburg Academy of Sciences was the Academy of Arts and Sciences founded in 1724, see Cross 1997, p. 8.

praise from Euro-American botanists such as Henry F. Hance (1827-1886) and Francis B. Forbes (1839-1908).[485] Obviously there existed networks among Tatarinov, his collections, scientific institutions, and scientists in Russia, Europe and America, which facilitated the exchange of natural objects and knowledge.

Tatarinov's interest in Chinese medicine did not conflict with his interest in plants, not only because he himself was a doctor, but also because the study of (medicinal) plants in Russia remained a part of *materia medica* until the mid-18th century when European botany began to take root in European Russia.[486] Most of his publications were devoted to the study of Chinese medicine. In particular, he was actually awarded the degree of Doctor of Medicine in St Petersburg for his essay 'Chinese Medicine' (Китайская Медицина) published in 1853.[487] This and another of his articles on Chinese medicine were even translated into German and published in Berlin in 1858.[488] All of Tatarinov's publications were written in Russian, except one mainly written in Latin. This was the *Catalogus Medicamentorum Sinensium*: *quae Pekini Comparanda et Determinanda Curavit*, printed in St Petersburg on 13 November, 1856. The caterpillar fungus is recorded on the 45th page of this booklet (Fig. 9).[489]

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[485] Hance 1874, pp. 258-263; Bretschneider 1898, p. 722. For Hance's life, see Stephen and Lee 1908, pp. 1156-1157; Desmond 1994, p. 314. For Forbes's life, see Britten 1910, pp. 19-22.
[486] Sokoloff *et al*. 2002, pp. 129-191.
[487] Ministerstvo Zdravookhraneniya 1968, pp. 462-463; Gukov *et al*. 2001, p. 126. For a complete list of his publications, see Walravens 1980, pp. 392-396.
[488] Abel and Mecklenburg 1858, pp. 421-473. The other text was 'Bemerkungen über die Anwendung schmerzstillender Mittel bei Operationen und über die Hydropathie in China', which was originally published in Russian in 1857.
[489] Tatarinov 1856, p. 45.

Fig. 9 The ‘*sia-cao-dun-czun* 夏草冬虫’ recorded in the *Catalogus Medicamentorum Sinensium* (1856). Courtesy of the International Institute of Social History, Amsterdam.

The booklet records 497 Chinese medicinal substances, most of which are medicinal plants. Each of the entries comprises a Chinese name, its Russian and Latin transliterations, and its scientific (Latin) name. All the medicinal substances are arranged alphabetically according to the Russian transliterations. According to the preface by Tatarinov, the medicinal substances were obtained during his time in Beijing, and were then taken back with him on his return to Russia; after he arrived in St. Petersburg in 1851, Professor Horaninov identified most of the medicinal substances. Tatarinov mainly intended the booklet to assist in the determination of Chinese names for displaying Chinese medicinal substances in European museums. This explains why Tatarinov chose to write it mainly in Latin rather than Russian, and paid extra attention to recording the original Chinese characters for the substances’ Chinese names, together with their pronunciations. Despite the fact that Latin was no longer the mainstream academic language in Europe by then, it was still active in the naming of species through binomial nomenclature, i.e. the system of writing scientific names in Latin.[490] The scientific names in this brief catalogue would not have been obstacles to experienced taxonomists. In fact, on the publication of this catalogue, Horaninov sent it to the British botanist and pharmacognosist Daniel Hanbury (1825-1875), who was also collecting

[490] The binomial nomenclature was first introduced by Carl Linnaeus in his *Species Plantarum* (1753), see Heller 1964, pp. 33-70; Gribbin 2003, p. 217.

Chinese medicinal substances through his friends in China. Hanbury then introduced it in the *Pharmaceutical Journal and Transactions* (London) in 1861.[491] In this way, the caterpillar fungus was transmitted via land from Beijing to European Russia; the relationship between its Chinese name and species identity was established in St Petersburg, and then, as Tatarinov anticipated, spread further to Europe.

In the catalogue, the Chinese name for the caterpillar fungus, i.e. '*xia cao dong chong* 夏草冬虫', is transliterated as 'sia-cao-dun-czun'. Such a transliteration cannot be found in modern European and American literature, and it was probably based on Tatarinov's own spelling system. But the Chinese name is consistent with the term used by the Chinese to refer to the caterpillar fungus. Besides, it is identified as 'Sphaeria chinensis'. The term 'chinensis' was used no later than 1753, when Carl Linnaeus adopted it to denote species that belonged to China in his book *Species Plantarum*.[492] Although 'chinensis' was actually synonymous with 'sinensis', the collocation 'Sphaeria chinensis' was far less popular than 'Sphaeria sinensis', coined by Miles J. Berkeley in 1843 (see below). What is important, however, is that the presence of the record of the caterpillar fungus itself in this catalogue indicates that this medicinal substance was still being transported from West China to Beijing in the mid-19th century.

Tatarinov collected the caterpillar fungus and other Chinese medicinal substances not only out of personal interest. His alumnus Porfirij E. Kirilov (Порфирий Е. Кирилов, 1801-1864?), who accompanied the 11th Orthodox mission to Beijing and stayed there during the decade 1831-1840, also brought back collections of plants and 127 Chinese medicinal substances to the Imperial Medico-Surgical Academy, St. Petersburg in 1841.[493] In 1848, Tsar Nicholas I Pavlovich (1796-1855),[494] who was curious about Chinese medicinal substances, commanded Kirilov to test his collection of medicinal substances. This collection did not include the caterpillar fungus. The Imperial Medico-Surgical Academy soon established a committee consisting of Kirilov and some other experts. They selected 38 medicinal substances from the collection, and used them to treat patients in the winter of 1848. But the results, according to their own conclusions, were unsatisfactory due to loss of efficacy in the intervening seven years. At that time Tatarinov was about

[491] Hanbury 1861, pp. 15-18. The journal was established in London in 1841, see Curth 2006, p. 82. For Hanbury's life, see Stephen and Lee 1890, pp. 270-271; Desmond 1994, p. 313. Hanbury's articles on Chinese *materia medica* published in *Pharmaceutical Journal and Transactions* were then printed as a collection in 1862, see Hanbury 1862.
[492] See, for example, Linnaeus1753, p. 273.
[493] For Kirilov's life, see Asmous 1943, pp. 107-117; Skachkov 1977, pp. 145-146.
[494] For Nicholas I Pavlovich's life, see Kapustina 1996, pp. 256-293.

to leave Beijing. Therefore they subsequently listed 89 medicinal substances, offered Tatarinov a grant, and then assigned him the task of buying fresh Chinese medicinal substances from the list. On Tatarinov's arrival in St. Petersburg, they actually received 97 Chinese medicinal substances including, as an addition, the caterpillar fungus.[495] They administered 17 of the fresh substances to 12 patients; moreover, analyses of their chemical ingredients (e.g. inorganic salts, pigments, proteins, and alcoholic extracts) were carried out, which did not proceed further to the exploration of new effective chemical drugs. However, the 17 substances did not include the caterpillar fungus. Finally, the committee concluded that some of the Chinese medicinal substances did have curative effects on, for example, rheumatism, but none of them was irreplaceable by Western medicinal substances (e.g. chloroform, mercurous chloride, strychnine, and *Digitalis purpurea* L.).[496]

Probably influenced by such a conclusion, Emil Bretschneider (1833-1901), a Russian historian of Chinese plants and also physician to the Russian Legation at Beijing (1866-1884), wrote in an 1870 article that, 'our *materia medica* can learn nothing more from the Pên-ts'ao. It is undeniable, that the Chinese possess several very good medicaments, ...but we possess either the same plants, or others of a similar action.'[497] Nevertheless, the above experiments clearly demonstrate the Tsar and some Russians' intention of seeking effective medicinal substances from China. They not only made empirical observations and evaluations, but also employed new scientific methods tailored to identifying active chemical ingredients.

Tatarinov was clearly curious about the taxonomic position of the caterpillar fungus. Soon after he returned to St. Petersburg he offered specimens, together with the other medicinal substances, to Professor Horaninov for taxonomic identification. Moreover, being familiar with Chinese medicine, he was also interested in its medicinal properties. This was why he also presented it to the committee which, however, did not carry out further research on its medical effects. In the context of the new scientific networks, the caterpillar fungus gained a new kind of agency and, indeed, transformed Tatarinov into its own kind of travel agent. From its point of departure in Beijing, the caterpillar's on-going challenge to the classification of substances, inspired Tatarinov to its value as a curiosity in the new science. From there it entered the network that connected Tatarinov to scientific institutions

[495] Li 2013, pp. 423-436. In Tatarinov's manuscript he recorded the weights and prices of all the 97 Chinese medicinal substances except the caterpillar fungus (Ся—цао дунъ—чунъ). This further indicates that the caterpillar fungus was not originally on the list of 89 Chinese medicinal substances but was added by Tatarinov.
[496] Imperatorskoy Mediko-Khirurgicheskaya Akademiya 1852, pp. 21-46.
[497] Bretschneider 1870, pp. 157-163. See also Bretschneider 1871, pp. 2-3. For Bretschneider's life, see Cordier 1901, pp. 192-197; K. 1901, pp. 69-72; Walravens 1983, pp. i-iii.

in Russia, and beyond, that had been established through the desire to collect natural objects to further scientific research. In his time Russia was seeking expansion in East Asia. This also corresponded with his disparate roles as a physican, a sinologist, an interpreter, a diplomat and a Foreign Office official in the 1840s-60s.[498] In a broad sense, the transnational transmission involved scientific, medical, commercial, religious, and political factors. Nevertheless, the assumption about the replaceabilty of Chinese medicinal substances spread among Russians, and thus became a major obstacle for later transmission of the caterpillar fungus to Russia.

3.2.4 Japan

Japan is a close neighbour of China in terms of the geography of East Asia. There is a distance of only 463 nautical miles between Shanghai and Nagasaki.[499] Because of this, some historians speculate that some of the thousands of people sent out into the eastern seas by the first Chinese emperor Ying Zheng (259-210 BC) to the sea to seek celestial beings and the elixir of immortality, who did not return to China, actually settled in Japan.[500] The earliest official contact between Japan and China, however, dates back to 57 AD, when the state of Na sent a mission to the Han court.[501] Two centuries later in 240 AD, an envoy from the Chinese Wei court was dispatched to the state of Wa.[502] The period from the seventh to the ninth century marked the first high tide of circulation of people, commodities, technology, arts and ideas between a unified Japan and Tang China.[503] Prior to the 19th century, Japan consistently maintained much closer cultural, economic, and political relationships with China than with European countries.

Chinese medicine had been transmitted to Japan since the mid-6th century.[504] For example, the Buddhist monk Jian Zhen 鑒真 (688-763), who had a good knowledge of *materia medica*, brought with him some Chinese medicinal substances on his voyage from Yangzhou to Japan in 753.[505]

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[498] Bretschneider 1898, pp. 559-569.
[499] National Geospatial-Intelligence Agency 2001, p. 102.
[500] Sima [*c*. 90 BC] 1999, pp. 176, 186-187, 2348; Sugimura 2007, pp. 323-337; Hao 2007, pp. 8-10. For Ying Zheng's life, see Wood 2007.
[501] Fan [445] 1999, p. 1907; Fogel 2015, pp. 47-64.
[502] Chen [*c*. 285] 1999, pp. 635-636; Brown 1993, pp. 288-289. For the biographies of Japan in Chinese official histories (later Han to Qing), see Wang and Xia 1984; Zhao *et al*. [1927] 1977, pp. 4617-4644.
[503] Wang and Ooba 1996, pp. 101-113; Wang 2005, pp. 86-138; Kawachi 2013. Japan was first unified by the Yamato clan in about the mid-4th century, see Sugimoto and Swain 1989, pp. 3-4.
[504] Fujikawa 1904, pp. 23-35; Liao *et al*. 1998, pp. 447-448.
[505] Mahito [779] 2000, pp. 91-92; Shimizu 1949, pp. 24-35. Cf. Asahina 1955, pp. 13-16; Zhu and He 2007, pp. 16-18, 305-306. For Jian Zhen's life, see Hao 2004.

Subsequently, the Japanisation of Chinese medicine and its encounter with indigenous medicine in Japan gradually gave rise to the formation of Kampo medicine.[506] Tamba Yasuyori's 丹波康頼 (912-995) *I shin pou* 醫心方 (Essence of medical prescriptions, 984) ranks among the earliest extant texts on Kampo medicine.[507] The development of Kampo medicine and its close relationship with Chinese medicine facilitated the circulation of medical knowledge and physicians between China and Japan even in the so-called '*sakoku* 鎖国' (national seclusion, 1633-1853) period.[508] A brisk trade in medicinal substances and (medical) texts was also carried out between Qing China and Tokugawa (徳川) Japan.[509] Overall, close geographical and cultural relations between Japan and China greatly facilitated the exchange of people, knowledge and objects between the two countries.

The Caterpillar Fungus Travels to Japan

In 1775 the Swedish naturalist Carl P. Thunberg (1743-1828), one of Carl Linnaeus's (1707-1778) foremost disciples, travelled to Japan to investigate Japanese flora.[510] After he landed on Dejima island in Nagasaki harbour, the interpreters told Thunberg of a very 'besynnerlig mask' (singular worm), which was a creeping worm in summer but a plant in winter. They added that this little organism was called 'Totsu Kaso'; it was among those medicinal substances brought to Japan by the Chinese, and was considered to possess tonic virtues.[511] 'Totsu Kaso' was a phonetic spelling of the Chinese name *dong chong xia cao*. Attracted by the intriguing appearance of the caterpillar fungus, Thunberg not only made a drawing of it, but also procured some specimens. According to his explanation of its formation, the caterpillar, to resist its change to a chrysalis, apparently burrowed into the earth and then fastened itself to a plant root. In this case, obviously Sino-Japanese trade in medicinal substances and the Japanese appropriation of Chinese medical treasury propelled the transmission of the caterpillar fungus from China to Nagasaki. Chinese traders and medical texts

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[506] Pollack 1983, pp. 359-375; Hempel 1983, pp. 57, 148-149; Mun 2006, pp. 395-406. Cf. Whitney 1885, pp. 245-470; Osodo 2012, pp. 80-85. For Kampo medicine, see Koizumi 1934; Yasuu 1982; Osodo 1999.

[507] For Tamba Yasuyori's life, see Hirano and Seno 2006, p. 633. For the content and English translation of *I shin pou*, see Tamba [984] 2011; Tamba [984] 1997.

[508] Ooba 1995, pp. 40-52; Yan 1992, pp. 3-65; Li and Yoshida 1996, pp. 63-87; Norihito 2003, pp. 108-144. For the Qing Chinese physicians heading for Japan and their activities in Japan, see Guo *et al*. 1999, pp. 115-120; Zhang 2003, pp. 97-100. For the national seclusion policy and its social influence, see Laver 2011.

[509] Ooba 1984, pp. 30-99; Howe 1999, pp. 37-41; Suzuki 2009, pp. 46-47; Fassbender and Peters 2012, p. 728; Warabe 2014, pp. 1-12. For the exchange of medical texts between China and Japan during the period 1601-1912, see Mayanagi 2002, pp. 232-254; Mayanagi 2010, pp. 243-256.

[510] Screech 2005, p. 228. On the basis of his investigation, Thunberg published the *Flora Japonica* in Leipzig in 1784. For Thunberg's travels and his contributions to natural history, see Nordenstam 1994, pp. 161-174; Nordenstam 2013, pp. 11-17; Skuncke 2014.

[511] Thunberg 1791, pp. 77-78.

must also have contributed to the spread of medical knowledge of the caterpillar fungus to Nagasaki. Besides, this case indicates that the arrival of the caterpillar fungus in Japan must predate Thunberg's journey to Japan.

According to an account by the Japanese naturalist and physician Kurimoto Tanshu 栗本丹洲 (1756-1834), on 13 May, 1728, the 'barbarian' Chinese ship owner Yin Xinyi carried *tou chuu ka sou* 冬蟲夏艸 (winter worm summer grass) from Ningbo to Nagasaki. Afterwards, he notes a defence commander in Nagasaki offered it as a gift to *touto bakufu* 東都幕府 (the Shogunal government in Edo). Kurimoto's story was based on a Japanese translation officer's records of exports shipped to Japan during the Kyouhou period (1716-1736). Yin Xinyi was one of those active Chinese traders then travelling to and fro between China and Japan.[512] Kurimoto added a coloured picture of the caterpillar fungus (Fig. 10), and a brief introduction to the fungus. The latter stated that it grew in the mountains more than one thousand *ri* 里 (1 *ri* was approximately 576 metres) west of Shaanxi; its 'grass' part, which resembled a spring onion seedling about two to three *sun* 寸 (1 *sun* was approximately 3.55 cm) in length, sprouted out of the worm's head in summer.[513] The geographical distance given above indicates that the mountains were in Qinghai or Sichuan, where the caterpillar fungus did exist. Probably because the caterpillar fungus as a medicinal export from China was no longer a rarity in Kurimoto's time, he did not explicitly relate it to medicine.

512 Ooba 1984, pp. 476-477.

513 Kurimoto 1879 [1811], p. 36. For Kurimoto's life, see Fukushima 1978, pp. 1-23. A few Japanese publications include some historical sources on the early transmission of the caterpillar fungus to Japan, see Kobayashi 1983, pp. 62-66; Okuzawa 2007, pp. 178-179; Okuzawa 2012, pp. 39-246.

Fig. 10 Illustration of the caterpillar fungus in the 1879 transcription of Kurimoto Tanshu's 栗本丹洲 *Kuri shi sen chuu fu* 栗氏千蟲譜 (1811).

The transmission of the caterpillar fungus to Japan in the Kyouhou period (1716-1736) is supported by a few other Japanese historical sources. The herbalist Niwa Seihaku 丹羽正伯 (1691-1756), who took a strong interest in natural productions, wrote a note on the caterpillar fungus in about 1735. According to his note, in 1729, a Chinese ferry passenger brought *tou chuu ka sou* 冬蟲夏中 as a tribute to the Japanese sovereign; this man also spoke of its magical seasonal transformation. Niwa seems to have observed the caterpillar fungus. He describes it as being six to seven *sun* in length, and as thick as sedge, with a root resembling a silkworm. He goes on to refer to the Chinese medical text *Ben cao gang mu* (Compendium of Materia Medica, 1578), and points out that [the larva of] the insect '*shi can*/*seki san* 石蚕' (*Phryganea japonica* McLachlan), included in this text, is similar to the caterpillar fungus.[514] Probably, the ultimate purpose of the Chinese man's gift to the sovereign was medicine trade. At that time there was trade in the caterpillar fungus between China and Japan. The naturalist Aoki Konyou's 青木昆陽 (1698-1769) recorded that the '*shin shou nin* 清商人' (merchants from Qing China) brought the caterpillar fungus to Japan in the middle of the Kyouhou period, i.e. about 1726.[515] One of the Qing medicine merchants was Yu Meiji, who transported ginseng to Japan in 1726 and went to Japan several times before or after this year.[516] It is reasonable to suppose that the Chinese ferry passenger mentioned by Niwa was probably a medicine merchant like Yu Meiji.

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514 Niwa *c.* 1735, p. 59. For Niwa's life, see Matsushima 1968, pp. 32-67. The year was '*kyou hou ki yuu* 享保己酉', which refers to the year 1729. A few Japanese scholars mistook the year for 1728, see, for example, Shirai [1914] 1925, p. 361; Kobayashi 1983, p. 63. For the record of *shi can* in *Ben cao gang mu*, see Li [1578] 1975, pp. 2257-2258. For the identification of *shi can*, see JSXYXY [1977] 2004, p. 817.

515 Aoki [1766] 1928, p. 243. See also Shirai [1914] 1925, p. 361; Kobayashi 1983, p. 64. For Aoki's life, see Satou 1950a, pp. 18-19; Satou 1950b, pp. 21-23.

516 Ueno 1973, p. 328; Ooba 1984, pp. 484-485.

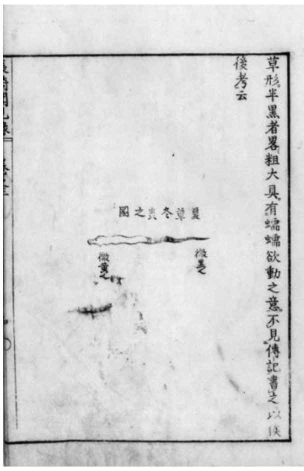

Fig. 11 Illustration of the caterpillar fungus in the 1975 reprint of *Nagasaki bun ken roku* 長崎聞見録 (1800).

Fig. 12 The caterpillar fungus drawn by Yuzuki Tokiwa 柚木常盤 in 1801.

The transmission of the caterpillar fungus was by no means confined to the Kyouhou period. Thunberg's record is an example. Besides, as recorded by the Japanese physician Tamba Genkan 丹波元簡 (1755-1810), in the Kansei period (1789-1801) ships from Wu (Suzhou) still carried the caterpillar fungus to Japan. At that time some Japanese people, who seemed never to have seen the fungus before, consulted Tamba about its medicinal properties. Therefore Tamba subsequently showed them a few relevant records from Chinese texts.[517] The physician Hirokawa Kai 広川獬, author of *Nagasaki bun ken roku* 長崎聞見録 (Notes on the Things Heard and Seen in Nagasaki, 1800), also wrote that the caterpillar fungus had recently been imported by the Chinese to Nagasaki as a kidney-benefiting medicinal substance. Like Tamba, Hirokawa knew of some Chinese accounts of the caterpillar fungus. Furthermore, he added an illustration of the caterpillar fungus to his text (Fig. 11), and made a note of the slight yellow and black colouring of the worm and 'grass' parts of the caterpillar fungus.[518] The physician Yuzuki Tokiwa 柚木常盤 also made a drawing of the '*haku rai* 舶来' (imported) caterpillar fungus in 1801 (Fig. 12).[519] Although he provided no textual information about its importation, it was presumably imported from China, as in the early 19th century the caterpillar fungus continued to be exported by Chinese ships to Japan and sold in

[517] Tamba [1801] 1955, p. 117. For Tanba's life and medical achievements, see Osodo 2003, pp. 759-765. A few scholars mistakenly considered the caterpillar fungus was first transmitted to Japan in the Kansei period, see, for example, Shirai [1914] 1925, pp. 361-362; Zhu 1956, pp. 43-44. For Zhu, he also misidentified Kansei as the period 1460-1465.

[518] Hirokawa [1800] 1975, pp. 10-11. For a brief introduction to Hirokawa's life, see Ueno 1973, p. 436.

[519] Yuzuki 1801, p. 1. For Yuzuki's life, see Shirai [1932?] 1990, p. 140.

Japanese drugstores.[520] Yuzuki's personal collection of drawings, which illustrate both the imported caterpillar fungus and 16 specimens of other similar organisms collected in the mountains near his residence in Goushuu, Japan,[521] stemmed from his own interest in natural curiosities.

The spread and use of the caterpillar fungus in Japan led to the dissemination of related Chinese natural knowledge. Meanwhile, some Japanese physicians or naturalists also sought to discover it in their own country. Yuzuki was such a figure. Another example is offered by the German physician Philipp Franz von Siebold (1796-1866), who arrived in Dejima (Nagasaki) in 1823 and took up residence there. Von Siebold joined a tribute expedition to the court of Edo in 1826, but made his own observations and collections of natural history along the way. He departed Dejima on 15 February, reached Edo on 10 April, and returned to Dejima on 7 July. On 23 February, he visited some of his students and friends in Shimonoseki. They showed him some interesting Japanese specimens, among which there was a 'Wunder der Natur' (wonder of nature), namely 'Kaso totsiu' (summer grass winter worm). Though considered to be a cross between a plant and a worm in Japan, it was, according to von Siebold, formed by 'Keulenschwämmen' (Clavaria), which were the decayed larvae of insects (especially cicadas and caterpillars).[522] This 'wonder of nature' was not the caterpillar fungus exported to Japan from China, but some similar species found in Japan.

To sum up, the transmission of the caterpillar fungus to Japan, initially emerging in the 1720s, relied on the Sino-Japanese trade in medicinal substances. The trade was grounded in the well known close relationship between Chinese medicine and Kampo medicine. It also benefited much from the short geographical distance between China and Japan. The Chinese traders, who sought to profit from the caterpillar fungus, became its powerful agents. After being exported to Japan through trade networks, its intriguing appearance, economic value, medicinal properties and transformational ability endowed it with agency, and enabled it to find new agents among physicians, naturalists, and medicine merchants in Japan. At the same time in Japan, new networks also emerged from Japanese efforts to find the caterpillar fungus locally. But in such new networks the caterpillar fungus from China was soon marginalised.

3.2.5 Summary

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[520] Fujii [1829] 1843, pp. 347-350.
[521] Yuzuki 1801, pp. 2-13.
[522] Von Siebold [1832] 1897, p. 112. For von Siebold's life in Japan and his influence on the Japanese scholarship, see Plutschow 2007; Thiede *et al*. 2000.

So far this chapter has described a variety of people and institutions that acted as agents in the outset of the intercontinental travels of the caterpillar fungus: first to France and Japan in the 1720s, then Britain in about 1831, and then to Russia in 1851. In general, people's curiosity about exotic natural objects and their demand for new, effective medicinal substances, often intertwined, advanced the transmission of the caterpillar fungus from China to the rest of the world. The transmission involved religious, commercial, medical, biological and/or political factors. However, there were uncertainties around its value and attraction among all the different human and non-human actors (missionaries, naturalists, traders, doctors, scientific societies and institutions, articles, etc.) in the transnational networks within which the caterpillar fungus travelled. For example, the discontinuance of its subsequent travels to France and Russia was closely related to the political suppression of religious actors (Jesuits) in Qing China and the belief in the replaceability of Chinese medicinal substances respectively. During its transnational travels, new agents of the caterpillar fungus continued to emerge, and gave rise to new observations that were to be framed as 'objective', and from new ways of looking associated with this new concern for observation without pre-conceptions the production of a new knowledge.

3.3 Great Examination

3.3.1 A Wonder No More?

'If Westerners had been content with trading and conquering, looting and dominating, they would not distinguish themselves radically from other tradespeople and conquerors. But no, they invented science, an activity totally distinct from conquest and trade, politics and morality.'[523]

The rise of objectivity, and the 'gaze' that created a new science, Daston and Galison argue, must be historically conceptualised as having its early origins in the Atlas-making of early eighteenth-century observers of the natural world.[524] Others have noted that new accurately focussed styles of observation arose at an earlier time with the need to describe, order and identify commodities

[523] Latour 1993, p. 97.
[524] Daston and Galison 2007. Cf. Daston and Galison 1992, pp. 81-128.

discovered in exotic places for the purposes of attributing commercial value.[525] Atlases, however, were not so directly driven by commerce, but may have benefitted in this way from global trade. The images, that were at the heart of Atlas-making, were often seeking a metaphysical truth that lay beneath the surface, attempting to capture the essence of the particular object and of its class. This has been styled the 'truth-to-nature' process of knowledge creation.[526]

Atlases were not only about mapping territory, but were also large works on a specialist subject that aimed to be comprehensive in this way and structured the way one looked at that subject. As a feature of informal empire-making at end of the Age of Discovery, those involved in the natural philosophy projects employed communities of drug and specimen collectors (local people around the world), the best artists and illustrators to help them in their project, and sought people financing the projects, transporters, printers, and distributors. These groups of people also set new rules by which knowledge was to be collected. This cultivation of learned recorders of the world, their epistemic virtue, linked the training of the self, the perceiver, with the quality of what was perceived.[527] The images that they created, and those that we will see, followed on from the truth-to-nature process in the mid-19th century. So that, Daston and Galison maintain, the image-making itself created the culture of objective science. They were the science, the illustrations made the science.

Much of Daston *et al.*'s analysis holds true for new descriptions of the caterpillar fungus, and in what follows we will see how European collectors and institutions sponsoring the formation of new styles of knowledge, and their descriptions and image-making form the background to a new powerful rhetoric about the authority of this new science – a rhetoric that bifurcated an East stuck in the fantasies of the past and a West forging progress and modernity. But the question is, how did the caterpillar fungus confound this new world?

When Parennin's specimens of the caterpillar fungus reached the Académie des Sciences in Paris, they presented a challenge to French savants' existing knowledge and imagination. In addition to a synopsis of Parennin's two letters, the same issue (1726) of the *Histoire de l'Académie Royale des Sciences* (H.A.R.S.), also published a research article by René-Antoine Ferchault de Réaumur (1683-1757) on the caterpillar fungus. Réaumur was a distinguished Enlightenment natural philosopher, acclaimed by some of his contemporaries as 'the Pliny of the eighteenth century'.[528]

[525] Cook 2007, pp. 82-377.
[526] Daston and Gallison 2007, pp. 55-114.
[527] Daston and Gallison 2007, pp. 39-41.
[528] Schlager and Lauer 2000, p. 175.

After moving to Paris in 1703, he submitted his first academic paper (on a geometric problem) to the Académie in 1708, and was soon elected a member of the Académie via his mathematics supervisor Pierre Varignon's (1654-1722) nomination in March of the same year. Before Parennin dspatched his letters and specimens in 1723, Réaumur had become sub-director and then director of the Académie in 1713 and 1714.[529] One of Réaumur's contributions to natural history was his entomological research mainly on insect behaviours, represented in his six-volume work *Mémoires Pour Servir à l'Histoire des Insectes* (Memoirs Serving as a Natural History of Insects, 1734-1742).[530] As early as 1710 Réaumur had already published a long article discussing the possibility of using spiders to produce silk.[531] His research on spider silk attracted the attention of Parennin. In Parennin's letter to the Académie (1 May, 1723), he wrote that he had told Kangxi about Réaumur and another French scholar's experiments on spider silk when the emperor spoke of spider webs. With great curiosity Kangxi then requested Parennin to translate the article through which he learnt of Réaumur and spider silk.[532]

In Réaumur's article of 1726, he first briefly introduces Parennin's 'magnifiques présents' (magnificent presents) to the Académie, including some samples of 'drogues' (drugs) and 'racines' (roots) which he considered were able to expand French knowledge of natural history.[533] Réaumur then recounts the story of his fascination with 'un étonnant prodige' (an amazing prodigy), i.e. the caterpillar fungus. Parennin sent approximately 300 specimens of the caterpillar fungus to the Académie; the biggest specimen was about three 'lignes' (*c*. 6.75 mm) in diameter, while the longest specimen was three 'pouces' (*c*. 81.21 mm) in length. Though Réaumur mentions Parennin's account of its transformation,[534] he emphasises that in his time no one is willing to believe in such a wonder. He was, in fact, the first person to refute the idea that metamorphosis occurs within a portion of the root. However, Réaumur did not deny the value of the traditional information about the caterpillar fungus's production areas and medicinal and natural properties recorded by Parennin, and indeed excerpted it in his account. On the basis of the French entomological scholarship of his time,

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[529] McKie 1957b, pp. 619-627. For Reaumur's publications, see Torlais 1958, pp. 1-12. For Varignon's life, see Costabel 1966, pp. 1-10.

[530] Reaumur 1734-1742. Reaumur is considered the founder of ethology, see Egerton 2006, pp. 212-224.

[531] Reaumur 1710, pp. 386-408.

[532] Du Halde *et al*. 1819b, pp. 444-470. The other French scholar was François Xavier Bon de Saint Hilaire (1678-1761), who published his 'Dissertation sur l'Araignée' in 1719, see Bon de Saint Hilaire 1710. See also Barton and Dietrich 2009, pp. 196-197.

[533] Reaumur 1726, pp. 302-306.

[534] However, Parennin's account of the transformation of the caterpillar fungus cannot be found in his letters to the Académie. His letters might have been edited before their publication; or, this information might have been conveyed to the Académie through other avenues.

Réaumur gave his own explanation of the caterpillar fungus' formation: the worm in the ground first targetted the plant root, and then attached its 'queue' (tail) to the end of the root and prepares for metamorphosis; in such a manner that the worm appeared to be an extension of the root. We note that he is entranced by the caterpillar fungus. But, pointing for the first time to the separate and coeval identities of caterpillar and root, he wrote, 'La merveille se réduit sans doute' (the marvel is doubtless diminished). Meanwhile he adds, the caterpillar fungus will remain remarkable in its production areas, as unlike France, there are neither 'physiciens' (physicists) nor 'observateurs' (observers) there. From Réaumur's article we clearly see pride and prejudice, and a significant tension and negotiation between Chinese natural knowledge and European natural history.

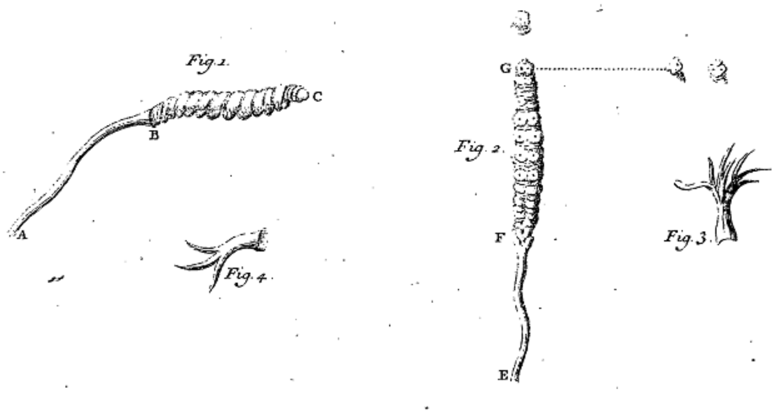

Fig. 13 Réaumur's drawings of the caterpillar fungus (1726).

Réaumur offered a theoretical explanation mainly from the perspective of insect behaviours. In his drawings of the caterpillar fungus (Fig. 13), he particularly illustrated those portions of the root that connected with a worm's tail in order to further his thesis. Probably to further visualise his theory, he even depicted the 'cavité' (cavity) in the root, and annotated that it was able to pull the tip of the worm's tail. To a modern eye, the mature fruiting body of the caterpillar fungus is indeed usually a hollow structure; but it is the worm's head rather than tail that 'attaches' itself to the 'root'. Besides, Réaumur noted that to represent those portions of the root he had first removed the 'fibres ligneuses' (wood fibre) from it. In this connection, he may have discovered what is now called fungal mycelium. Réaumur used simple lines to illustrate the physical appearance of the caterpillar fungus, and also added varying degrees of shading to make the caterpillar fungus look three-dimensional. However, he did not add scale bars to the drawings despite providing some length data in the main text of his article. Therefore the magnified portions (magnification unknown) and whole specimens were shown together in one plate.

Réaumur's new theory about, and depiction of, the formation of the caterpillar fungus as two separate enitites simultaneously, was accepted by some European naturalists. The British mycologist John Ramsbottom (1885-1974) remarked that Carl P. Thunberg's simple note on its formation (see above) was actually derived from Réaumur's article.[535]

Réaumur defined the caterpillar fungus as, in his own words, 'plante ver' (worm plant). This term coined by Réaumur appears twice in his article. In contrast with 'summer grass winter worm', however, it simply denotes a physical combination of a plant and a worm, which had no ability to transform itself. Réaumur's perspective and study embody Daston and Park's argument that wonder was disappearing from 18th-century European natural philosophy, and giving way to the pursuit of 'objective' approaches, observations and facts.[536] To biologists nowadays, Réaumur's theory is outdated and rather unacceptable. But in the early 18th century it was revolutionary and published in the reputable and scholarly journal H.A.R.S. Réaumur's vision was perhaps trained and distorted by his own expertise (in insect behaviours) which regularised his observation to fit theoretical expectations. Critically, he was also working without the microscope since the structures that he was observing were apparently visible to the naked eye. They were also, then, vulnerable to essentialising and idealising according to what Daston and Gallison call the 'truth-to-nature' scientific gaze.

Fougeroux de Bondaroy's Correction

The most important academic response to Réaumur's theory in 18th-century Europe came from the French naturalist Fougeroux de Bondaroy (1732-1789), who published a related review article in the H.A.R.S. in 1769.[537] A few European discoveries, which formed the basis of Bondaroy's discourse, had been made during the period 1726-1769. The Spanish Franciscan friar Joseph Torrubia (1698-1761) found some 'abispas muertas' (dead wasps) with plants growing from them in Havana (today's capital city of Cuba) on 10 February, 1749. According to Torrubia's collection of notes on natural history, published in 1754, they were intact 'esqueletos' (skeletons) with wings; a plant full

[535] Ramsbottom 1941, pp. 223-374. For Ramsbottom's life, see G. 1975, pp. 1-6; Desmond 1994, p. 571.
[536] Daston and Park 1998, pp. 329-264.
[537] Bondaroy 1769, pp. 467-476. For Bondaroy's life, see Dinechin 1990.

of ‘espinas’ (prickles) germinated from the venter of the wasp, and grew up to five palms high; the natives called the plant ‘GIA’.[538] Later, the British naturalist Emanuel Mendes da Costa (1717-1791) informed his friend George Edwards (1694-1773) of Torrubia’s discovery. But Edwards commented in 1764 that ‘the Spaniards have not yet attained to any perfection in natural history, and I believe the good Father might mistake the bunch of protuberant parts from the fungus for dried leaves’.[539] Such a link between plants on dead wasps and fungi contributed to the later study of such organisms. Certainly, by the first half of the 18th century, fungi had already been categorised as a group of plants in Europe, but there had not been a generally accepted essentialised definition of fungi. For example, the Italian botanist Pier Antonio Micheli (1679-1737), who recorded hundreds of fungi and introduced many fungal genus names in his 1729 book *Nova Plantarum Genera* (New Genera of Plants), ‘offered a prima-facie case that fungi were autonomous organisms but this view, though accepted by some, was questioned by many for the next hundred years’, so that mycology as a discipline with its own institutions did not emerge until the 19th century.[540] ‘*Torrubia*’, a fungal genus named in honour of Joseph Torrubia, was described in 1865.[541] Joseph Torrubia’s discovery was made in the transnational networks resulting from Spanish overseas expansion, as Cuba was a colony of Spain during the period 1511-1898.[542]

On 15 November, 1763, the British naturalist William Watson (1715-1787) wrote ‘an account of the insect called the Vegetable Fly’, and sent it to the Royal Society, London.[543] His account starts with a letter from the British doctor John Huxham (1692-1768), which he received at the beginning of October, 1763.[544] Huxham told Watson that he had indirectly witnessed the ‘vegetable fly’ through the agency of ‘Mr Newman’, an officer in the island of Dominica. Huxham also sent Newman’s description of it to Watson. Newman had found the ‘vegetable fly’ in Dominica. It had no wings, but resembled ‘the drone in both size and colour more than any other English insect’. Amazingly, it buried itself in the earth in May; then it started to vegetate until, at the end of July, ‘the

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538 Torrubia 1754, pp. 237-238, Lamina XIV. For Torrubia’s life, see Sequeiros 1998, pp. 287-290.

539 Edwards 1764, pp. 265-266. For da Costa’s life, see Hayward 2003, pp. 101-114. For George Edwards’s life, see James 1933, pp. 486-493. John Ramsbottom thought that the fungus observed by Torrubia was probably ‘*Cordyceps sphecophila*’, see Ramsbottom 1941, pp. 223-374.

540 Micheli 1729, pp. 117-227; Ainsworth 1976, p. 18.

541 Tulasne and Tulasne 1865, pp. 4-5; Massee 1895, pp. 1-44. However, ‘*Torrubia*’ as a genus name was ‘superfluous, as *Cordyceps* [validly published earlier in 1833] could have been used, and *Torrubia* is thus unacceptable (illegitimate)’, see Hawksworth 2001, pp. 171-192. See also below.

542 Krieger 2012, p. 261.

543 Watson 1763, pp. 271-274. For Watson’s life and writings, see Editors of the Literary Magazine 1789, pp. 401-411; Watt 1824, p. 953.

544 For Huxham’s life, see Talbott 1970, pp. 204-205.

tree' (resembling a coral branch) was about three inches high, and produced a few 'little pods'; later, the pods dropped off, and became worms and then flies. Just because Huxham did not believe such a conceptualisation which seemed 'quite repugnant to the usual order of nature', he wrote to Watson for accounts and observations 'set in a full and true light'. Watson, who was acquainted with George Edwards's comments on 'GIA', then consulted the British naturalist John Hill (1714-1775) who had examined some specimens of it.[545] In Hill's reply, he related it to 'a fungus of the Clavaria kind', or specifically 'Clavaria Sobolifera'.[546] The 'seeds' of the Clavaria found a 'proper', fertile, bed on dead insects, and grew. After telling Watson about 'all the fact', Hill stressed that it was still unknown to the 'untaught inhabitants' and also to the author of a related Spanish imaginative drawing (i.e. Joseph Torrubia). Later, some specimens of the 'vegetable fly' were sent to the Royal Society. Watson soon carefully examined the 'extraordinary production' by himself, and agreed with Hill's opinion. The 'seeds' mentioned by John Hill were actually fungal spores. More than four decades previously, for example, Pier Antonio Micheli made a series of experimental observations on fungal 'semina' (seeds) with a primitive microscope in 1718, initially proving that the 'seeds' from a fungus could germinate and produce fruiting bodies of the same fungus.[547] The cases of GIA and the 'vegetable fly' indicated bear testimony to 18th-century European naturalists' pursuit of factual or 'true' natural knowledge about wonders of nature within the transnational networks of informal empire.

From Fougeroux de Bondaroy's article we know that he followed European discussions on the generation of organisms. Although supporters of the spontaneous generation of large animals and plants were decreasing in the 17th and 18th centuries, the invention of microscopes and microscopic observations fostered many people's belief in the spontaneous generation of microorganisms, which seemed to grow out of nothing.[548] Clearly the culture of 'truth-to-nature' continued into microscopic vision for they did not notice, at that time, the way spores germinated in the host organism. The British naturalist John T. Needham (1713-1781), for example, not seeing any seeding process, carried out experiments in support of such a belief.[549] He also endeavoured to prove that microscopic plants were able to generate microscopic animals, a contention which was, however,

[545] For Hill's life, see Desmond 1994, p. 342; Fraser 1994, pp. 43-67.
[546] 'Clavaria' as a genus name was first introduced by Sébastien Vaillant in 1727, and later adopted by Pier Antonio Micheli in 1729, by Carl Linnaeus in 1753, and by a variety of other taxonomists in the 18th century, see Methven 1990, p. 7.
[547] Micheli 1729, pp. 136-139. Cf. Ainsworth 1976, pp. 84-88.
[548] Wayne 2009, pp. 299-300. For a brief historical review of debates on generation, see Magner 2002, pp. 132-176.
[549] Roe 1983, pp. 158-184. For Needham's life and academic contributions, see Stefani 2002.

quickly refuted by some other scholars including the Italian biologist Lazzaro Spallanzani (1729-1799).[550] Fougeroux de Bondaroy's reflections on the caterpillar fungus were, precisely, grounded in the above discoveries, ideas and discussions.

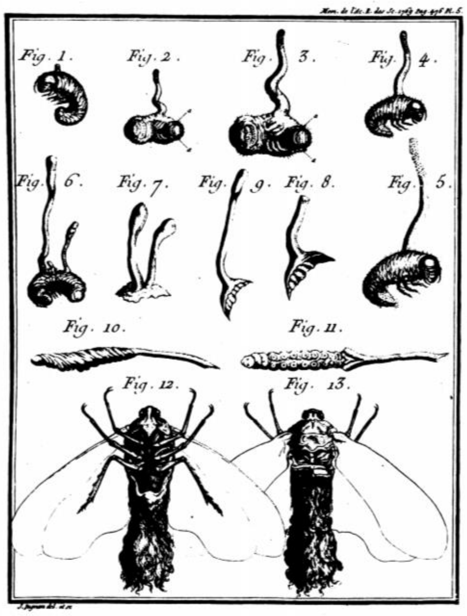


Fig. 14 One of the two plates in Fougeroux de Bondaroy's article (1769).

Notice the two figures of the caterpillar fungus (fig. 10 & 11 in the plate) by Réaumur (1726).

Fougeroux de Bondaroy's article, a critical review of existing scholarship on the insects on which plants grew, began with his claim that 'faits' (facts) about the natural history of such organisms were worthy of unveiling by 'physiciens' (physicists). He expected his article to be able to engage more people (such as educated travellers) in studying such organisms and seeking a 'juste explication' (correct explanation) of their formation. As indicated in the article, Bondaroy's comments were partly based on his own observations on 'plantes-animales' (animal-plants) in natural history collections. Probably inspired by John Hill, he argued that the 'plants' which were evidently growing on insects were Clavaria fungi, and the term 'fungus' appears eleven times in his article. For example, he makes explicit mention of his discovery of a new species of 'fungus' on a cicada from Cayenne, French Guiana. It is clear that Bondaroy, like some of his contemporaries,[551]

[550] Roe 1982, pp. 295-303. See also Spallanzani 1765; Spallanzani and Needham 1769. For Spallanzani's life and academic contributions, see Adams 1927, pp. 528-537; Fusco 2002.
[551] See, for example, Bulliard 1783.

regarded fungi as a group of plants. In this spirit he also uses botanical terms such as 'racine' (root) and 'pédicule' (pedicle) to describe some parts of a fungus. He seems to have examined the specimens of the caterpillar fungus from China, as he notes that the organism on which the plant (identical to fungus in his discourse) grows is a 'ver' (worm) rather than a 'chrysalide' (chrysalis) (Fig. 14). But he disagrees with Réaumur on the formation of this organism, as he claims that it seems to be the plant that attaches itself to the worm, not the worm to the plant.[552] This indicates that he did not adopt John Hill's idea about the 'seeding' of the fungi. However, probably influenced by Réaumur's account, he states that the plant is located on the last ring of the worm, near the anus.

The natural history collections that Bondaroy examined actually consisted of objects gathered by various actors from around the world. Their collecting activities were all part of the discipline of the scientist, and this discipline and learning its rhetoric was all a part of cultiving the scientific self. Bondaroy's interest in the caterpillar fungus therefore lay in his asscocation with the networks of natural history and their professional identities. His text makes no mention of medicinal properties. Moreover like Réaumur, Bondaroy does not treat the caterpillar fungus as a wonder. He criticises the Chinese for ignoring the fact that insects also attach themselves to other parts of the plant (e.g. branches) to undergo metamorphosis; and argues that the insects are absolutely not a transmogrified form of, for example, branches, as the latter clearly produce fruits rather than insects. On this point we see the tension between Chinese and European natural knowledge once more. Bondaroy revised Réaumur's theory about the formation of the caterpillar fungus, and at the same time introduced the concept of a scientific fungi, but without yet giving a clear definition and differentiation of fungi as belonging to a separate domain and category to plants. As a result, for European scientists, the caterpillar fungus was no longer a kind of grass as it would remain in the Chinese natural order for another century; this wonder of nature in Chinese discourse was also deconstructed rhetorically as well as biologically. However, when the caterpillar fungus as a single transformable organism was deconstructed as a physical combination of two organisms belonging to two distinct categories, did such a combination (plant/fungus-animal), as first described by Réaumur, become a new (scientific) wonder? Going by the subsequent flowering of studies on the caterpillar fungus in 19th-century Europe (see below), the answer is yes.

Bondaroy's article, as he anticipated, attracted much attention throughout Europe in later years.

[552] See also Ramsbottom 1953, p. 151.

Summaries of the article, for example, were published with remarks in the British review journals *The Monthly Review* (London) and *Medical and Philosophical Commentaries* (Edinburg) in 1773.[553] The remarks in the former journal said that specimens of the plant-animals had been delineated by Bondaroy 'with more care and accuracy', while previously there was no lack of 'exaggerated and ridiculous descriptions' of the vegetable fly.[554] With the development of European fungal studies and the transmission of the caterpillar fungus to Britain, studies on the caterpillar fungus began to flourish in Britain from the early 19th century. Essentially, however, these new theories were not part of the 'objectivity' revolution so-framed by Daston *et al*. They all contain observations that are predetermined by belief in competing theories, and do not exhibit the kind of 'blind sight' which was to demand that the vision of scientific objects be unimpeded, without prejudice, skill, fantasy or judgement.

3.3.2 New Identifications

In 18th-century Europe, 'the evident vitality of the fungi was a source of wonder for these pioneering investigators [e.g. Pier Antonio Micheli], and there was a great deal of confusion surrounding their affinity with other forms of life.'[555] What was a (species of) fungus? Puzzled by the nature of fungi, Carl Linnaeus (1707-1778), for example, just created a intersectional genus '*Chaos*' under the 'Vermes' (worms) for a few fungi who he saw as 'having a free body, uniform, reviving and with no external joints or sense-organs'.[556] Evidently, Linnaeus was both challenged and excited by the liminal nature of these organisms and could not make sense of them within his existing frameworks. The degree to which they confounded him is obvious by his choice of nomenclature. Changing perceptions of the nature of fungi were correlated with the ordering of fungi. At the turn of the 19th century the naturalist Christiaan H. Persoon (1761-1836) had treated fungi as true plants that merely presented themselves as 'nackte fruchtificationstheile' (naked fruit-producing) organisms'.[557] His choice of language, unlike Linneaus, suggests that fungi had a kind of human plant-like ontology. Initially, he used hierarchical Linnaen binomial nomenclature to establish a

553 Anonymous 1773, p. 549; Anonymous [1773] 1774, pp. 405-409. The two journals were founded in 1749 and 1773 respectively, see Chalmer 2000, pp. 238-243; Gael 2012, pp. 63-89.
554 Anonymous 1773, p. 549.
555 Money 2011, p. 6.
556 Ramsbottom 1941, pp. 223-374.
557 Ramsbottom 1941, pp. 223-374.

relatively comprehensive classification system for fungal species. His effort provided the main basis for modern mycological taxonomy.[558] Though the taxonomy of fungi was based on morphological characteristics of fruiting bodies before the early 19th century, microscopic structures of fungi (e.g. spores and mycelia), which began to be properly analysed from the late 18th century, became more and more important in characterising fungal species. This was the result of an accumulation of knowledge about fungal development and sexuality in the 19th century.[559] Moreover, from the mid-19th century Charles Darwin's (1809-1882) theory of evolution prompted taxonomists to explain and establish affinities among species that were considered descended from a common ancestor.[560] However, Darwin was not in the trace of fungi, so ignored the possibility of an ancestral fungi spirit. Meanwhile, although controversies over notions of species as fixed or evolving arose,[561] taxonomic research on fungi in the field of mycology that was emerging in the 19th-century gained pace. The new identifications of the caterpillar fungus in 19th-century Europe, described below, embodied European efforts to find the positions of its two parts through both macro and microscopic imaging as they became fixed according to hierarchical taxonomic systems; and simultaneously to nuance their relationships with other organisms in those systems.

The Chinese name for the caterpillar fungus and the French term 'plante ver' appeared in dictionaries and encyclopaedias published in Britain by the early 19th century. For example, a revised edition of the French lexicographer Lewis Chambaud's (?-1776) *A New Dictionary English and French and French and English*, published in London in 1815, contains the terms 'HIA-TSAO-TOM-TCHOM' and 'plante ver'. The former term is defined as 'a Chinese plant, the root of which, owing to a caterpillar nicely joined to it, was thought to change into a worm'.[562] The two terms and the definition point to an origin in Réaumur's article. Another example is the Welsh encyclopaedist Abraham Rees's (1743-1825) *The Cyclopædia*, published in London in 1819. It includes the term 'HIASTAOTOMTEHOM', 'a Chinese name' denoting 'a plant, the root of which is said [by the Chinese] to change, at a certain time, into a worm'. However, the emphasis in this entry is laid on Réaumur's discovery of the 'whole truth' of the transformation of the caterpillar

558 Ainsworth 1962, pp. 22-23; Mehrotra and Aneja 1990, p. 68.
559 Drews 2001, pp. 213-227; McDevitt 2014, pp. 6-10.
560 Jeffrey [1968] 1982, pp. 120-121; Ritvo 1995, pp. 47-67; Money 2016, pp. 22-24.
561 Ellis 2011, pp. 343-363.
562 Chambaud 1815, p. 34. Little is known about Chambaud's life, see Jones 1881, p. 107. The dictionary was first published in Paris in 1776. But that edition did not include terms for the caterpillar fungus from China, see Chambaud and Robinet 1776, p. 258.

fungus.[563] Rees was apparently unaware of Bondaroy's article, otherwise he might have been puzzled by whom the 'whole truth' had been discovered, or what that 'whole truth' might be. Although dictionaries and encyclopaedias normally contained less up-to-date natural knowledge than learned scientific journals, they probably played no less important a role in integrating and disseminating global natural knowledge. Active specialists in natural sciences, such as the English entomologist John O. Westwood (1805-1893), also often referred to such publications in order to acquire information about exotics.

As mentioned before, Westwood exhibited some specimens of the caterpillar fungus at the meeting of the Entomological Society of London on 1 March, 1841. He also read out two extracts about the caterpillar fungus from European sources; one was from the 1736 English translation of Du Halde's general history of China, while the other was from Rees's *The Cyclopædia*. In addition, he relayed to the audience some first-hand information about the caterpillar fungus from John Reeves, including 'its proper [Chinese] name', i.e. 'Hea Tsaon Taong Chung'. He added that in Guangzhou it was more frequently called 'Ting Ching Hea Tsam', a version of the former name with the two pairs of characters transposed. One of the reasons why Westwood and his European contemporaries and predecessors paid attention to its original Chinese names was that names for objects mattered for establishing corresponding relationships between European and exotic taxonomic positions of the same organisms, and were necessary in their procurement. Moreover, at the meeting Westwood also tentatively identified its fungal part as '*Clavaria Entomorrhiza*', but did not give details about his identification.[564] Despite being an entomologist, however, he did not identify the species of the larva. On this point the main reason, in my eyes, lay in the difficulty in making an entomological identification of an unknown insect based only on the morphological characters of its larva.[565] Westwood's identification was inspired by some preceding naturalists, especially John Hill, as he mentioned Hill's account in his earlier publications.[566]

Westwood's pursuit of 'the truth' (in his own words), like Bondaroy's want of 'facts' and Rees's mention of the 'whole truth', also prompted him to seek a *true* explanation of its formation. As early as 1835, he speculated that the 'seeds' of the fungus alighted on an underground larva's head, which was exposed to the air; they were then swallowed by the larva; finally they germinated in the larva

563 Rees 1819, p. 768. For Rees's life, see Gilman *et al*. 1911, p. 785. '*STAO*' and '*TEHOM*' in the entry are obviously misspellings.
564 Saunders 1841, pp. 22-26.
565 Dierl 1978, p. 22; Thyssen 2010, pp. 25-42.
566 See, for example, Westwood [1833] 1835, p. 263.

and caused its death.[567] This explanation reflected John Hill's influence, as Hill spoke of the 'seeds' of the Clavaria fungi and proposed a similar but not identical idea in 1763. Westwood also corrected a mistake in previous European accounts, as he pointed out that 'the root of the fungus entirely occupies the whole interior portion [of the larva] from the head to the opposite end'.[568] Obviously he realised that it was the larva's head rather than tail that was connected with the fungus.

Soon afterwards, the English pharmacognosist Jonathan Pereira (1804-1853), who seemed to be unaware of Westwood's identification, made an attempt to determine the species of both the fungus and larva parts that constituted the caterpillar fungus. According to his article published on 1 March, 1843,[569] Pereira regarded the caterpillar fungus as both 'a Chinese article of the materia medica' and 'a remarkable and very interesting natural production'. In addition to the information from John Reeves (such as its Chinese name), Pereira also obtained some Chinese natural and medical knowledge about the caterpillar fungus from Du Halde, Thunberg and Rees's accounts. By that time he had already established that it was 'a caterpillar, out of whose neck grows a vegetable (a fungus or mushroom)'. He observed that each specimen of the caterpillar fungus was about three inches long; one half of the specimen was a light yellowish brown cylindrical caterpillar; the fungus, 'a slender club-shaped body', projected from the back of the caterpillar's neck. He identified the fungus as a species of the genus '*Sphaeria*', which he thought was 'closely allied to the *Sphaeria entomorrhiza*'. Besides, he tentatively identified the caterpillar as a 'lepidopterous' insect (one belonging to the order of Lepidoptera [including butterflies and moths]).

In order to ascertain the species of the caterpillar, Pereira then went to consult the English entomologist Edward Doubleday (1811-1849). Doubleday was an expert in Lepidoptera, who served as an assistant in the Zoological department of the British Museum during the period 1841-1849.[570] After carefully examining 'a very perfect larva', Doubleday formed the opinion that it was a species of the genus '*Agrotis*'.[571] This genus was first described in 1806,[572] while the above genus '*Sphaeria*' was first described in 1768.[573] Doubtless both Pereira and Doubleday's identifications were based on their predecessors' taxonomic research. To identify the fungus part of the caterpillar

567 Westwood [1833] 1835, p. 265.
568 Westwood [1833] 1835, p. 264.
569 Pereira 1843a, pp. 591-595.
570 For Doubleday's life, see Anonymous 1850, pp. 213-214; Waterhouse 1850, pp. 1-2; Westwood 1850, p. 71; Desmond 1994, p. 213.
571 Pereira 1843a, pp. 591-595.
572 Grote 1895, p. 16.
573 Pfeiffer 1874, p. 1218.

fungus, Pereira referred, at least, to Miles J. Berkeley's (1803-1889) *Fungi* (the second part of the fifth volume of *The English Flora*, 1836) and William J. Hooker's (1785-1865) *Icones Plantarum* (volume 1, 1837).[574] Berkeley's *Fungi* seems to have contributed more to his identification, as he only quoted Berkeley's accounts of the genus '*Sphaeria*' as well as the species '*Sphaeria entomorrhiza*' so as to support his own identification. Berkeley attached importance to characteristics of microscopic structures when describing a fungal genus or species. For example, he described the fungi '*Sphaeria*' as having the following minute characteristics: '*Perithecia* rounded, entire, furnished at the apex with a minute orifice. *Asci* converging, at length dissolving'.[575] '*Sphaeria*' in Berkeley's book was a hierarchical genus, subordinate to, and in the ascending family tree of, the macrofungi Pyrenomycetes (Tribe), Gasteromycetes (Suborder), and Cryptogamia fungi.

Pereira was not a specialist in fungus or insect taxonomy. Though he was curious about the caterpillar fungus as a natural production, his main concern, as clearly indicated in his article title, was with its medicinal properties. His colleagues were also enthusiastic about gathering exotic medicinal substances and testing their effects, as exemplified by the Irish doctor William B. O'Shaughnessy (1809-1889). O'Shaughnessy, also mentioned in Pereira's article, once presented specimens of 'Cannabis Indica' (or 'Indian hemp') and the bark of 'Strychnos Nux vomica' from Bengal, together with his observations on their therapeutic effects, to the Pharmaceutical Society in London.[576] The reason why Pereira paid attention to identification, in addition to his natural curiosity, was that identification laid the foundation for collecting global medicinal substances. Pereira's illustration of a single specimen of the caterpillar fungus, showing his observations of its essential features, the fruiting body and the ventral side of the larva (natural size), embodies the epistemic virtue of 'truth-to-nature' in making scientific images (Fig. 7). While his illustration of a bundle of the caterpillar fungus from John Reeves, clearly not drawn for species identification, displays the flow of this exotic commercial medicinal substance (like 'Cannabis Indica') within transnational networks; both commercial utility and scientific knowledge production move together hand-in-hand.

Miles J. Berkeley's Identification and the Discovery of a Species in Mycology as a Discipline

[574] Berkeley 1836; Hooker 1837. For Hooker's life, see Hooker 1903.
[575] Berkeley 1836, pp. 232-233.
[576] Pereira just called him 'Dr O'Shaughnessy' in the article. But according to his mention of O'Shaughnessy's study of medicinal uses of cannabis, it is certain that he was William B. O'Shaughnessy. For O'Shaughnessy's life, see Gorman 1984, pp. 51-64.

The participation of professional mycologists in identifying the fungal species of the caterpillar fungus begins with Miles J. Berkeley, who has been regarded as the founder of mycology in Britain. His book *Fungi* (1836), published as part of a series of British flora, was the first comprehensive list of English fungi as a separate category of the plant world.[577] In it he coined the terms ‘mycology’ and ‘mycologist’,[578] which are still widely in use today. According to Geoffrey C. Ainsworth, with the application of microscopy and pure culture techniques, the scope and depth of European mycological research were significantly expanded from the latter half of the 19th century.[579] Identifications of European and exotic fungi, which formed the basis of mycological taxonomy, were constantly in progress. They not only involved the rectification of scientific (Latin) names for fungal species, but also the establishment of the proximity of relationships among fungi within hierarchical categories (species, genus, family, order, etc.). The expansion of modern European powers and the emerging of transnational networks also resulted in substantial increases in European collections of global natural history specimens.[580] In Britain, Kew Gardens has been a world centre for taxonomic research on fungi since the late 19th century. Based on a collection of about ten thousand fungal specimens donated by Berkeley in 1879,[581] Kew Gardens now holds the world’s largest fungarium, which contains as many as approximately 1.25 million dried specimens of fungi.[582]

In 1843, Berkeley published an article entitled ‘On some Entomogenous Sphaeriae’.[583] The caterpillar fungus, or a ‘celebrated drug in the Chinese Pharmacopoeia’, is one of seven fungal species described in this article. Berkeley first briefly introduces some 18th-century and early 19th-century discoveries of fungi that develop on insects, which ‘excited much attention’. He regards Réaumur as the first European to have noticed such productions. He identifies the caterpillar fungus as ‘*Sphaeria Sinensis*’. The use of ‘Sinensis’ means that Berkeley defines the fungus as a species from China, which is consistent with his record of the fungus’s habitat, i.e. China. Berkeley

577 Ainsworth 1976, p. 227.
578 Berkeley 1836, pp. 7, 8, 219, 281, 326; Ainsworth 1976, p. 2.
579 Ainsworth 1976, pp. 4-11; Ainsworth 1986, pp. 152-153. See also Ravichandra 2013, p. 27. The German mycologist Heinrich Anton de Bary (1831-1888) has been known as the father of modern mycology and plant pathology, see De Bary 1866; Ainsworth 1976, pp. 274-275; Mehrotra and Aneja 1990, pp. 68-72. For De Bary’s life, see Horsfall and Wilhelm 1982, pp. 27-32; De Moura 2002, pp. 337-343. For Ainsworth’s (1905-1998) life, see Webster 1999, pp. 714-719.
580 See, for example, Brockway 1979, pp. 449-465.
581 Ainsworth 1996, pp. 14-15. Kew Gardens was established in 1759. For the history of Kew Gardens and its collections of natural history, see Prance 2010, pp. 501-508; Desmond 2007.
582 Spooner 2010, p.1; Spooner and Cannon 2010, pp. 8-9.
583 Berkeley 1843, pp. 205-211.

also offers detailed observations of its morphological features, and states that 'the specimens figured by Réaumur were imperfect, and therefore their true nature was not recognised'. Additionally, he provided his own drawings of two specimens and their, 'radiating appearance of a fractured stem', and a few microscopic structures ('filaments' and 'oil globules') (Fig. 15). Réaumur's drawings, in contrast, lack microscopic structures which, in the eyes of Berkeley, are the critical visual evidence to show the true nature of the fungus. However, there was a deficiency in the specimens examined by Berkeley. He adds, 'I… have not been able to find any [of Reeves's specimens] in which the perithecia were fully developed'. 'Perithecia' are often flask-shaped fruiting bodies that produce spores. Although he did try to discover ascospores (released from 'asci') and basidiospores (i.e. 'sporidia'), he failed to detect 'perfect asci and sporidia' in the specimens of all the seven fungal species. From the second half of the 19th century, this deficiency became the seed of controversy about whether or not the specimens of the caterpillar fungus examined by Berkeley could be used as type specimens. These are controversies of the truth-to-nature project as it played out between those establishing the ideal types in mycological identifications.

Fig. 15 Berkeley's drawings of '*Sphaeria Sinensis*' (1843).

Berkeley's identification of the caterpillar fungus was soon widely accepted by biologists. For example, when the English botanist John Lindley (1799-1865) mentions the fungus in his 1846 book *The Vegetable Kingdom* and its later editions, he always records it by its Latin name 'Sphaeria sinensis, Berk.'.[584] 'Berk.', an abbreviation of 'Berkeley', was added after the species name in order to indicate Berkeley as the first person who identified the species. However, on 4 November 1856,

[584] Lindley 1846, p. 39; Lindley [1846] 1847, p. 39; Lindley [1846] 1853, p. 39. For Lindley's life, see Boulger 1893, pp. 277-279; Keeble 2010, pp. 164-177.

Berkeley gave an update to his identification in an article also devoted to 'Entomogenous Sphaeriae'.[585] This time Berkeley turned his attention to his collection of nearly five thousand species of fungi from the United States. He identified and described a few new species of 'the most curious and interesting' entomogenous fungi, while additionally listing some entomogenous species that had already been identified. Though the caterpillar fungus, emphasised by him again as a drug used in China, was not the focus of this article, it and the other newly or formerly identified entomogenous species were all cast into the genus '*Cordyceps*' without any explanation.[586] The Latin name for the caterpillar fungus was thus changed from '*Sphaeria Sinensis*' to '*Cordyceps sinensis*'. Berkeley himself soon adopted the latter name in his publications such as *Introduction to Cryptogamic Botany* (1857).[587] But this new name and the article were seldom noticed or cited by biologists or mycological taxonomists before the 1880s. For example, the *Index Fungorum* (1863) and *Medical Lexicon* (1874) still used the old species name to denote the caterpillar fungus.[588] This academic phenomenon added to the difficulty of solving the problem of tracing the authorship of the new species of the caterpillar fungus, which in fact involved the Italian mycologist Pier Andrea Saccardo (1845-1920), in the late 1870s and early 1880s

A further puzzle was posed with the publication of an article by Saccardo in 1878.[589] Saccardo included the caterpillar fungus in the genus '*Cordyceps*', and recorded its Latin name as '*C. sinensis* Berk.', referring to Berkeley's 1843 article. But in that article the fungus is actually named '*Sphaeria Sinensis*'. The name in Saccardo's article might mislead readers into supposing that Berkeley named the fungus '*C. sinensis*' as early as 1843. So had Saccardo ever read Berkeley's 1856 article? If so, why did he not cite it? If not, why did he change the genus name yet still indicate 'Berk.' rather than 'Sacc.' or '(Berk.) Sacc.' in the Latin name? On the whole, it is more likely that Saccardo was not aware of Berkeley's 1856 article. On this point, we can refer to the second volume of his monograph entitled *Sylloge Fungorum Omnium Hucusque Cognitorum* (literally Compendium of All Fungi hitherto Known, 1883). In this book Saccardo modifies the Latin name to '*Cordyceps sinensis* (Berk.) Sacc.', citing his own 1878 article and Berkeley's 1843 article.[590] The use of '(Berk.) Sacc.' could mean either that Saccardo has updated the previous Latin name given by Berkeley, or that the fungus

[585] Berkeley 1857, pp. 157-159.
[586] The genus '*Cordyceps*' was first established in 1818, see Shrestha *et al*. 2014, pp. 93-99.
[587] Berkeley 1857, p. 283.
[588] Hoffmann 1863, p. 128; Dunglison and Dunglison 1874, pp. 968.
[589] Saccardo 1878, pp. 277-325. For Saccardo's life, see Montemartini 1920, pp. 49-50; Kirk *et al*. 2008, p. 610.
[590] Saccardo 1883, p. 577.

has been newly named '*Cordyceps sinensis*' by Saccardo. Then again, the two Latin names in Saccardo's publications may also prompt us to suspect that Saccardo intentionally neglected to cite Berkeley's 1856 article so as to take the credit himself for the new identification. In any case, '*Cordyceps sinensis* (Berk.) Sacc.' gradually became the most widely used formal Latin name for the caterpillar fungus mainly due to the great influence of Saccardo's 1883 monograph.[591] In the important 1895 revision of the genus Cordyceps, for example, the author, the English mycologist George E. Massee (1850-1917), adopted the name '*Cordyceps sinensis*, (Berk.) Sacc.' to denote the caterpillar fungus.[592] From another perspective, we can also say that a series of European experts finally found the taxonomic 'truth' about the caterpillar fungus in the second half of the 19th century in the sense that the Latin name '*Cordyceps sinensis*' is still widely used in and beyond scientific communities today.

Another problem relating to Berkeley's identification concerns the recognition of type specimens. It is well known that type specimens serve as points of reference in determining species of known or unknown organisms.[593] As mentioned before, the specimens identified by Berkeley in 1843, which thus became type specimens, were transferred to Kew Gardens in 1879. However, since Berkeley stated in 1843 that the perithecia in the specimens were not fully developed, could these immature specimens still be recognised as type specimens of the caterpillar fungus? In view of this, the English mycologist Mordecai C. Cooke (1825-1914), who worked at the Herbarium of Kew Gardens during the period 1880-1892, stressed in 1892 that he had successfully observed 'quite mature sporidia, breaking up as usual into truncate joints' during his 1883 re-examination of the specimens.[594] 'Sporidia' (basidiospores), which was what Berkeley wanted to discover, are perhaps the most important feature that determines the validity of type specimens of the caterpillar fungus, or stable anchors for fixing the reference of the taxon name '*Sphaeria (Cordyceps) sinensis*'.[595] But soon after, Massee, who had also re-examined the same specimens in order to revise the genus

[591] In 2007 a group of mycologists suggested putting the caterpillar fungus into the genus '*Ophiocordyceps*' and renaming it '*Ophiocordyceps sinensis* (Berk.) G. H. Sung, J. M. Sung, Hywel-Jones & Spatafora', see Sung *et al*. 2007, pp. 5-59.

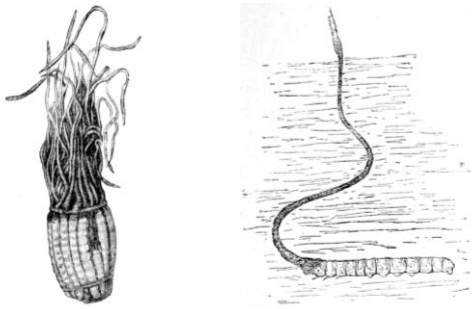
[592] Massee 1895, pp. 1-44. For Massee's life, see Ramsbottom 1917, pp. 469-473; Desmond 1994, p. 474; Kirk *et al*. 2008, p. 405. It is worth noting that influenced by Gray, he also stated that the Chinese caterpillar fungus occurred in Japan. Unlike Cooke, Massee adopted Saccardo's naming of the fungus, i.e. 'Cordyceps sinensis, (Berk.) Sacc.'

[593] Colless 1970, pp. 251-253.

[594] Cooke 1883, pp. 77-83; Cooke 1892, pp. 200-209. For Cooke's life, see English 1987; Kirk *et al*. 2008, p. 169. Though Cooke had consulted Saccardo's 1883 work, he still used the Latin name '*Cordyceps sinensis*, Berk.'. Possibly, he had read Berkeley's 1856 article before.

[595] For the use of type specimens in biological taxonomy in 19th-century Europe, see Witteveen 2015, pp. 569-586; Witteveen 2016, pp. 135-189.

Cordyceps, reported in 1895 that the head of one of the specimens depicted by Berkeley was 'shown to be compressed and inclined to branch at the apex', and 'the flattening appears…to be due to shrinkage, being immature and soft when collected'.[596] Controversy over the type specimens of the caterpillar fungus extended into the 21th century due to different observational results on perithecia and spores.[597] At all events, the controversy not only underlined the importance of type specimens and microscopic structures to identification, the basis for knowing and collecting, but also indicated the pursuit of 'truth-to-nature' in the first stage of Daston and Galison's history of objectivity as exemplified in European biological taxonomy.[598]



A B

Fig. 16 The caterpillar fungus obtained (A) and drawn (B) by Alexander C. Jones (1891).

The popularisation and acceptance of Berkeley or Saccardo's identification of the caterpillar fungus was accompanied by occasional uses of synonyms or irregular spellings of *Cordyceps* or *sinensis*.[599] Examples include Alexander A. Tatarinov's use of '*Sphaeria chinensis*' (1856),[600] Berkeley's use of '*Cordiceps sinensis*' (1860),[601] Cooke's use of '*Torrubia sinensis*' (1866),[602] and Adolphe Gubler's (1821-1879) use of '*Cordiceps chinensis*' (1873).[603] Here it is worth mentioning Alexander C. Jones (1830-1898), who served as American consul in Chin Kiang (i.e. Zhenjiang) from 1886 onwards and finally died there. He sent specimens of the 'Chinese insect-fungus drug' (or

596 Massee 1895, pp. 1-44.
597 Zang and Noriko 1996, pp. 205-208; Liu *et al.* 2003, pp. 51-57, 68.
598 Daston and Galison 2007, p. 111.
599 For synonyms of the '*Cordyceps*' genus in the 18th and 19th centuries, see Shrestha *et al*. 2014, pp. 93-99.
600 Tatarinov 1856, p. 45.
601 Berkeley 1860, p. 66.
602 Cooke 1866, pp. 127-130. See also Cooke 1875, p. 103; Anonymous 1875, p. 500; Ivatts 1886, pp. 137-138; Balfour 1887, p. 62.
603 Gubler 1873, pp. 119-124. The French man Gubler used to be a professor of *materia medica*. For his life, see Anonymous 1879, p. 1056.

‘officinal preparation of the parasitic fungus’) and a letter of explanation from Zhenjiang to the United States Department of Agriculture, Division of Entomology in 1891 (Fig. 16). In the letter, published in the journal of the Division of Entomology (i.e. *Insect Life*), Jones used ‘*Cordyceps chinensis*’ to refer to the caterpillar fungus which was ‘esteemed even more highly than ginseng, as a medicine, ...sold at a high price for medical purposes’.[604] His drawing of the caterpillar fungus growing out of the earth (Fig. 16B) is actually a flight of imagination rather than an attempt at revealing its ‘truth-to-nature’. The above synonyms or spellings were not only less frequently used but also gradually gave way to ‘*Cordyceps sinensis*’ from the late 19th century onward. According to Jack Goody, list-making emerged with early writing systems in Sumerian and other archaic cultures; it created categories, facilitated comparison and classification, and altered both the world and the psyche.[605] From Linnaeus’s times lists of species were not only ‘stable objects of contemplation’, but also dialectically invited ‘manipulation through reordering’ of nature.[606] The above changes in the naming of the caterpillar fungus were often embodied in scientists’ list-making activities.

Identifications of the Caterpillar Part

The caterpillar part of the caterpillar fungus was identified afresh in the second half of the 19th century. The English zoologist George R. Gray (1808-1872), keeper of the ornithological section of the British Museum during the period 1831-1872, probably examined Reeves specimens at the British Museum in the 1850s as Doubleday also had. He disagreed with Doubleday’s identification. In his book on the insects susceptible to fungal infections, which he privately printed in 1858, Gray tentatively identified the caterpillar as a species belonging to the genus ‘*Gortyna*’ of the family ‘*Noctuidae*’ (Fig. 17).[607] Though Gray cited Thunberg’s account of the caterpillar fungus, he mistakenly thought that it was, ‘also stated to be brought *from* Japan’. Such a judgment misled some later mycologists about its production areas.[608] Gray and Doubleday’s identification processes are

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604 Anonymous 1891, pp. 216-218. For Jones’s life, see Eicher and Eicher 2001, p. 602; Krick 2003, p. 174. The place where Jones stationed was actually ‘Chin Kiang’, see Anonymous 1891, pp. 227-244. *Insect Life* was ‘devoted to the economy and life-habits of insects, especially in their relations to agriculture’; part of the proceedings of the American Association of Economic Entomologists (founded in 1889) were also published in this journal, see True 1929, p. 262.
605 Goody 1977, pp. 74-111.
606 Müller-Wille and Charmantier 2012, pp. 743-752.
607 Gray 1858, p. 12. For Gray’s life, see HMC 2003, p. 638; Bragg 2007, pp. 5-9. The genus ‘*Gortyna*’ was first described in 1816, see Grote 1900, pp. 346-357.
608 See, for example, Massee 1895, pp. 1-44.

unknown to us in their detail. Their identifications, though different from each other at the genus level, both considered the caterpillar a species of moth.

Fig. 17 Gray's drawing of the caterpillar fungus (1858).

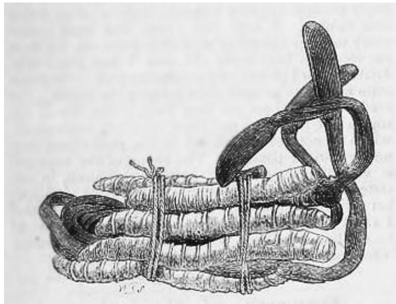

Fig. 18 Moseley's drawing of the caterpillar fungus (1874).

Later, in 1871, the British physician Frederick P. Smith (1833-1888) published an article on 'Chinese blistering flies', in which he characterised the caterpillar fungus as 'a capital sample of a Chinese pet medicine', and identified the caterpillar as a moth of the genus '*Hepialus*'.[609] This genus was first described as early as 1775.[610] But prior to 1871, moths of this genus were associated with some other fungal species of the genus '*Sphaeria*' or '*Cordyceps*'. For example, in 1843 Pereira mentioned the fungus '*Sphaeria Robertsii*' from New Zealand, as well as Doubleday's identification of the insect infected by the fungus, i.e. '*Hepialus virescens*'.[611] Thereafter the caterpillar fungus was always treated as a parasite on *Hepialus* moths, despite that different *Hepialus* species were identified as the host organism.[612] Smith probably drew inspiration from Doubleday's identification of *Hepialus virescens*. After 1871 Smith's identification of the caterpillar gradually replaced previous identifications and obtained recognition from more authors.[613] Nowadays although it is known that the fungus *Cordyceps sinensis* parasitises a group of caterpillars rather than one species of caterpillar, the host caterpillars still mainly fall within the genus *Hepialus*.[614] Interestingly, Frederick P. Smith was a medical missionary sent to Central China by the English Wesleyan Missionary Society, arriving in Hankou on 16 May, 1864.[615] Prior to his mission to China, he was

[609] Smith 1871a, pp. 689-690. For Smith's life, see Humphreys 1897, p. 91; Tatchell 1909, pp. 79-103.
[610] Fabricius 1775, p. 589; Kirby 1897, pp.148-149.
[611] Pereira 1843a, pp. 591-595.
[612] See, for example, Anonymous 1857, pp. 115-116; Museum of the Royal College of Surgeons of England 1860, p. 23.
[613] See, for example, Balfour 1883, p. 812; Gordon 1884, p. 264.
[614] Shrestha *et al.* 2010, pp. 228-236.
[615] Wylie 1867, pp. 270-271. The English Wesleyan Missionary Society was founded in 1813, see Paz 1995, p. 204.

elected a medical associate of King's College, London and a member of the Royal College of Surgeons in 1855.[616] In 1870 he returned to Britain from China due to illness.[617] His account and identification of the caterpillar fungus represent the transnational network of knowledge exchange and production that was operating under the English Wesleyan missionary movement, but had links to academic institutions in Britain.

Here it is worth adding that the British naturalist Henry N. Moseley (1844-1891), who voyaged around the world during the period 1872-1876, was 'astonished' to find the caterpillar fungus as 'a condiment in the sauce of some stewed pigeons' at a Chinese dinner in Hong Kong.[618] Later Moseley sent a letter from Hong Kong, containing some Chinese natural and medical knowledge about the caterpillar fungus, together with a drawing by himself (Fig. 18),[619] to the Royal Horticultural Society on 31 December, 1874.[620] The letter was then read by Berkeley at the meeting of the scientific committee of the Society on 3 March, 1875.[621] Moseley also sent some specimens of the caterpillar fungus (imported from Shanghai) from Hong Kong to Britain.[622] Like Pereira's, his drawing of a bundle of the caterpillar fungus did not serve to identify species of the caterpillar fungus, but displayed the commodification of this medicinal substance. Compared with John Reeves's specimens, however, Moseley's were less well-known in Britain. This was because species of the caterpillar or fungus had already been identified and accepted before 1875; meanwhile some of Reeves's specimens had therefore become type specimens of the caterpillar fungus. This meant that later taxonomists had to refer to Reeves's specimens of the caterpillar fungus rather than others' in case of uncertainty about the specific species of new specimens of the caterpillar fungus or other similar organisms.

The arrival of John Reeves's specimens of the caterpillar fungus in Britain significantly advanced British naturalists' taxonomic research on this exotic organism in the 19th century. Based on a distinct divide between the 'caterpillar' and 'fungus', emerging in 18th-century France and since then widely accepted in Europe, the species of the two constituent parts were identified from time to time and finally determined in the late 19th century. Through European naturalists' lasting

[616] King's College London 1857, p. 298; Royal College of Surgeons 1874, p. 243. King's College, London was founded in 1829, see Groccia *et al*. 2012, p. 241.
[617] Tarrant 2012, p. 56.
[618] Moseley 1879, pp. 415-422. For Moseley's life, see Anonymous 1891, p. 730.
[619] Anonymous 1875, p. 314.
[620] Anonymous 1875, pp. 340-342.
[621] Anonymous 1875, pp. 398-400.
[622] Anonymous 1879, pp. 88-89.

and constant pursuit of facts or truth about natural objects, both parts of the caterpillar fungus obtained a place in the European natural order based on Linnaeus's classification system. This process was accompanied by an increasing emphasis on the importance of miscroscopic structures in characterising fungal species. In the case of the caterpillar fungus, related efforts included Berkeley's observation of fungal 'filaments' and attempt to find spores (1843), and Cooke's discovery of mature 'sporidia' (basidiospores) (1883). The frequently cited Chinese names for the caterpillar fungus allowed identifiers to establish a correspondence between its positions in the European and Chinese natural orders. The significance of such identification and of such relationships lay not only in their role in building the European natural order, but also in favouring the procuring of exotic medicinal substances. This was also why some kinds of knowledge that aided identification, such as geographical information about production areas, was of concern to some identifiers. In fact, the caterpillar fungus was widely known as a medicinal substance among the identifiers, and some of them, like Jonathan Pereira, took a particular interest in its medicinal properties.[623] The identifiers' selective appropriation of some Chinese knowledge about the caterpillar fungus, and their disinterest in other elements, demonstrates tensions and negotiations between Chinese and European natural knowledge in Europe. The images of the caterpillar fungus made by 19th-century identifiers represent their pursuit of the 'truth-to-nature' rather than mechanical objectivity which, according to Daston and Galison, emerged from the mid-19th century but 'did not drive out truth-to-nature' representations which continued to co-exist.[624] In European history, as pointed out by Berkeley and historians of biology,[625] Réaumur was the first European to study parasitic fungi in animals. In this sense we can say that the caterpillar fungus transformed to a European scientific wonder, which advanced European research on such parasitic fungi.

3.3.3 Medical Concerns

Medicinal substances derived from native and exotic natural products (mainly plants) remained in common use in 19th-century Europe despite some significant developments (e.g. animal experimentation) in European *materia medica*.[626] Meanwhile, according to the British doctor

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623 Cf. Principe 2011, pp. 108-112.
624 Daston and Galison 2007, p. 113.
625 Dawes 1952, p. 17.
626 Parker 1915, pp. 829-831; Bynum 1994, pp. 118-122; Porter 2001, pp. 246-277; De Vos 2010, pp. 28-47; Jones

Charles T. Downing (1811-1873) who travelled to China in the 1830s, 'many drugs' were brought from China to Europe, where researchers considered them to possess 'very excellent qualities'. Despite noting that Europeans and the Chinese had different perceptions of the medicinal properties of some substances, Downing stated that they did not differ so much from each other regarding styles of medication and application of natural products as medicinal substances.[627] Among 19th-century European works on *materia medica*, Jonathan Pereira's monograph *The Elements of Materia Medica and Therapeutics*, initially published in 1839, was regarded by a reviewer in 1842 as 'the most comprehensive and complete summary of Materia Medica' ever published in Britain.[628] It included finely classified medicinal substances from around the world, and accounts of their physiological actions and therapeutic uses extracted from copious European publications.[629] The entry on 'Sphaeria Sinensis, *Berk*.' first appears in the third American edition of 1854.[630] It is ranked among the entries of the Sub-order 'Pyrenomycetes', which again shows Pereira's emphasis on taxonomy. The information and illustrations in the entry mainly originate from Pereira's own 1843 article on the caterpillar fungus. But it also incorporates Berkeley's identification and description of the fungus.

Since the mid-19th century, there have always been European medical authors who have made efforts to include the caterpillar fungus into their works on regional or global *materia medica*. For example, the Welsh pharmacist Theophilus Redwood (1806-1892) added the caterpillar fungus to his *A Supplement to the Pharmacopoeia* in 1857. This book was a revision of the English pharmacologist Samuel F. Gray's (1766-1828) *Gray's Supplement to the Pharmacopoeia*, which was first published in London in 1818 with the intention of supplementing the *Pharmacopoeia Londinensis* with new medicinal substances.[631] Aside from Chinese names for the caterpillar fungus, Redwood also briefly describes the caterpillar fungus's 'strengthening and renovating properties' and the method of preparing and eating it with duck. However, he only records 'Thibet' as its production area, and also misspells some of its Latin and Chinese names from related literature.[632] In France,

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2011, pp. 337-344.

[627] Downing 1838, pp. 144-150. Little is known about Downing's life. For a short obituary, see Anonymous 1873, p. 509.

[628] Anonymous 1842, pp. 606-607.

[629] Pereira 1839; Pereira 1842; Pereira [1842] 1843; Porter 2001, p. 260.

[630] Pereira [1842] 1854, pp. 90-91.

[631] Redwood 1857, pp. 565-566. For Redwood's life, see Ince 1892, pp. 763-765. For Gray's Supplement, see Gray 1818. For Gray's life, see Stearn 1989, pp. 23-34; Desmond 1994, p. 293. The *Pharmacopoeia Londinensis* was first published in 1618, see Medicorum Collegium Londinense 1618. For the history of this pharmacopoeia, see Urdang 1944, pp. 1-81.

[632] For example, Redwood misspelt 'Sphaeria' (Berkeley) and 'Tsaon' (Westwood) as 'Sphoeria' and 'Tsaou'.

for example, the pharmacists Jean L. Soubeiran (1827-1892) and Dabry de Thiersant (1826-1898) published their treatise *La Matière Médicale Chez les Chinois* (literally Chinese Materia Medica) in Paris in 1874. They recorded its effects on "jaunisse" (jaundice) and "phthisie" (phthisis), as well as its ability to endow people with "prouesses génésiques les plus grandes" (the greatest reproductive prowess).[633] The French pharmacists Emile Perrot (1867-1951) and Paul Hurrier also published a monograph on Sino-Annamese *materia medica* in Paris in 1907. In addition to some medical knowledge extracted from existing publications, they added that the caterpillar fungus was called 'Trung-thao' in Aannamite, and tasted as delicious as European 'truffes' (truffles).[634] In Germany, the pharmacist Georg Dragendorff (1836-1898), for example, also included the caterpillar fungus, or 'Seidenraupenpilz' (silkworm fungus), in his ambitious work *Die Heilpflanzen der Verschiedenen Völker und Zeiten* (literally The Medicinal Plants of Various Nations and Times, 1898). This work offers very brief and basic information about 12 700 medicinal plants (and fungi) from around the world (probably to save the the book from becoming excessively long). For the caterpillar fungus, he simply recorded some mycological information and its Chinese name,[635] which, however, would also have been helpful for procurement.

An important source of reference for some of the above publications was Frederick P. Smith's *Contributions towards the Materia Medica & Natural History of China* (1871). It was published in Shanghai and London in 1871, with the assistance of the Irishman Robert Hart (1835-1911), who served as Inspector General of the Imperial Chinese Maritime Customs during the period 1863-1911.[636] All the medicinal substances in this book are arranged alphabetically according to the first letters of their Latin names. According to Smith's preface, this book was compiled on the basis of his examination of the best native drugs as well as Euro-American and Chinese texts on Chinese *materia medica* and natural history in his leisure time in Hankou, Hubei province (1864-1870). It was the integration of European and Chinese knowledge that gave rise to the idea that Chinese natural knowledge could make equal 'contributions' with that of the European world, and probably, though this is not explicitly stated, had originally given him the idea of entitling his book '*Contributions towards an Anglo-Chinese Materia Medica*'.[637] Smith hoped that this book would

[633] Soubeiran and de Thiersant 1874, pp. 88-89. For Soubeiran's life, see Anonymous 1893, pp. 111-112; Guignard 1904, pp. 351-352. For de Thiersant's life, see Pouillon 2008, p. 251.
[634] Perrot and Hurrier 1907, pp. 70-71. For Perrot's life, see Mascré 1952, pp. 181-187.
[635] Dragendorff 1898, p. 32. For Dragendorff's life, see Anonymous 1898, pp. 46-47.
[636] For Robert Hart and Chinese maritime customs, see Wright 1950; Zhao 2013; De Ven 2014, pp. 64-102.
[637] See his preface to this book.

‘have some practical value, in suggesting the best available remedies, or substitutes for foreign drugs dictated by necessity or economy.’[638] The target readership of the book also included travellers, soldiers, medical missionaries and Chinese labour inside or outside China. Obviously Smith’s book also reflects the importance of taxonomic identifications to the European procuring of effective exotic medicinal substances, and the skills necessary for the functioning of informal empire.

Probably to assist readers in obtaining the ‘*Cordyceps sinensis*’ (or ‘*Hia-ts‘au-tung-ch‘ung*’) and further using it as a substitute for ‘foreign drugs’, Smith pays special attention to commercial and also geographical information. He not only speaks of its commodity form (bundles), but also points out that ‘the present supply comes from Kia-ting fu [i.e. Jiading] in Sech‘uen [i.e. Sichuan]’ although ‘it is said to be common in southern Thibet’. In the light of Du Halde’s account of its rarity, he stresses that it is no longer so rare. Clearly this was because the natural resource of the caterpillar fungus had been further exploited by his time. Smith records that the caterpillar fungus is used in ‘jaundice, phthisis and in cases of injury of any serious nature’.[639] The use of the caterpillar fungus to treat jaundice and phthisis had not been reported in previous Chinese and Euro-American literature, so it is reasonable to speculate that Smith knew of this through his own medical practice or his contacts with Chinese physicians. In 1911 the American Methodist medical missionary George A. Stuart (1859-1911), who sailed to China in 1886, published a revision of Smith’s book.[640] But it provided no new knowledge about the caterpillar fungus. In general, the above European works on *materia medica* reflect their authors’ efforts to assemble worldwide natural knowledge about the caterpillar fungus and other medicinal substances. Their main purpose was to provide a basis for exploiting global medicinal substances. A new feature of these European works was the integration of European binomial nomenclature and biology and exotic medical knowledge about medicinal substances.

From Frederick P. Smith we can determine the transnational networks within which medicinal substances and natural knowledge were exchanged. The main reason why Smith was able to obtain assistance from Chinese maritime customs (then administered by Robert Hart) was the latter’s own interest in Chinese medicinal substances, as well as the actual need for a comprehensive list of them so as to facilitate the governance of imports and exports. Considering that Smith’s book placed

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638 Smith 1871b, pp. v-vii.
639 Smith 1871b, p. 73.
640 Stuart 1911. For the account of the caterpillar fungus in this revision, see Stuart 1911, pp. 126-127. For Stuart’s life, see Bondfield 1912, pp. 40-41.

emphasis on gathering medical knowledge and thus was not very convenient for practical use in everyday customs regulation, Euro-American medical officers serving in the Chinese maritime customs began to compile their own up-to-date quick and easy directories of Chinese medicinal substances as early as the first decade after 1871.[641] Much detailed information about medicinal uses, Latin names, and other aspects of a large number of such substances was collected and reported by the medical officers to the Chinese maritime customs service. They thought that 'although in China the art of medicine is in decadence, … the art of pharmacy appears to be in a better state'.[642] As a result, the *List of Medicines Exported from Hankow and the Other Yangtze Ports* and its revision were published as individual volumes by the statistical department of the Inspectorate General of Customs in 1888 and 1909 respectively.[643] The *List of Chinese Medicines*, which covered even more ports of China, was also published by the same department in 1889.[644] These customs publications only retain information about Chinese and English (or Latin, if ascertainable) names, production areas, economic value and transportation of Chinese medicinal substances. They all record the caterpillar fungus. To ensure the accuracy of the correspondence between scientific (Latin) and Chinese names for medicinal substances, drafts were sent to some customs employees who were considered to possess authoritative knowledge about biological species in China, such as the Irishman Augustine Henry (1857-1930), for revision before publication.[645] From this we can still see the utilitarian function of scientific names. Actually, in some cases these customs publications, printed in Shanghai but sold both inside and outside China (e.g. Yokohama, Singapore, London, Paris and New York), acted as practical guides for knowing or obtaining Chinese natural or medicinal objects.

With their worldwide circulation, some readers in the West, such as the English naturalist Ernest H. Wilson (1876-1930),[646] was thus able to gain an insight into many contemporary medicinal substances used in diet or the treatment of diseases in China. The Chinese maritime customs also published some English catalogues to promote the export of Chinese products

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641 Braun [1888] 1909, p. 5.
642 Gordon 1884, pp. 226-274.
643 Braun 1888; Braun [1888] 1909.
644 Order of the Inspector General of Customs 1889.
645 Bretschneider 1895, p. 12. Augustine Henry revised the second part of the *List of Chinese Medicines* (1888). He was a medical officer who worked for the Chinese Maritime Customs during the period 1881-1900. For Henry's life and his career in China, see Nelson 1983, pp. 21-38; O'Brien 2011.
646 Wilson went to China four times during the period 1899-1911. A whole chapter in one of his books, which contains his observations on the caterpillar fungus in west China, is devoted to 'Chinese materia medica', see Wilson 1913b, pp. 34-41. In this chapter Wilson also mentions the *List of Chinese Medicines* (1889).

including the caterpillar fungus and other medicinal substances. One of them, for example, was the *China: Port Catalogues of the Chinese Customs' Collection at the Austro-Hungarian Universal Exhibition, Vienna, 1873*, which 'make a very valuable volume, especially with respect to Chinese drugs and vegetable products'.[647] These customs publications no doubt advanced the transnational circulation of the caterpillar fungus as a medicinal substance. Its appearance in 'a Chinese pharmacy' in Denver, America no later than the 1910s,[648] was a result of its export to America.

A Medical Case Offered by Ivatts

The rise in attention given to the caterpillar fungus in 19th-century Europe resulted in new investigations of its medical effects on the human body. In this respect the most impressive example is offered by the Irish doctor E. B. Ivatts. Inspired by an article on '*Torrubia Sinensis*' (i.e. *Cordyceps sinensis*) in about 1877, Ivatts reasoned that since ergot (a parasitic fungus) of rye and mistletoe (a parasitic plant) exerted a specific action on the female reproductive system, most parasitic plants might also have 'a special affinity for the male or female generative system'. In Europe, the effect of ergot on the female reproductive system was first reported no later than the seventh century,[649] while the use of mistletoe in increasing fertility can be traced back at least to the first century.[650] But ergot's fungal nature and parasitism only began to be recognised by European scientists in the 18th century. With the application of microscopy and germination techniques, ergot's scientific name and life cycle were also given and described in the first half of the 19th century.[651] In order to ascertain if the parasitic caterpillar fungus 'had any such action', Ivatts entered into correspondence with Henry Frewin, who then sent Ivatts specimens of the caterpillar fungus at his request some time between 1877 and 1886. On receiving the specimens and assuming that there also be an affect on men as well, Ivatts directly tested them on himself. As we have seen, self-experimentation with medicinal substances was an important and defining feature of *materia medica* in pre-modern China.[652] In 1886 Ivatts read a paper on his physical reactions before the

[647] Order of the Inspector General of Chinese Maritime Customs 1873; Bretschneider 1881b, p. 2. This publication also includes the caterpillar fungus, see, for example, Order of the Inspector General of Chinese Maritime Customs 1873, p. 140.
[648] Lloyd 1918, pp. 766-780.
[649] Dongen *et al*. 1995, pp. 109-116.
[650] Evans 2005, pp. 50-59.
[651] Ainsworth 1976, pp. 186-187; Lee 2009, pp. 179-184.
[652] Pan 2015, pp. 79-82.

Dublin Philosophical Club. He first quoted two accounts of the caterpillar fungus by Frederick P. Smith (1871) and the English mycologist James Britten (1877),[653] and then reported:

> I made up the first centesimal trituration and took the drug twice a day over several days, and found the effects as follows: During the first four days the action upon the generative system produced a most decided aphrodisiac effect, but after the four days the reverse action set in and the generative system became alarmingly depressed, the organ being reduced to the size of a baby's. About the fifth day it produced a dull headache, followed by violent sneezing, and the next day a running from the nose (coryza) came on, which lasted for several days; the mucous membrane inside the nostrils continued dry and inflamed; vesicles came out upon the upper lip, which broke and healed in six days; odd red spots appeared here and there on the body; the teeth and gums were sore for several days; the bowels were constipated, with occasional discharge of single hard pieces, knotted, black, and with a greenish metallic hue, the same hue as observed in the powder of the Torrubia Sinensis under the microscope. The action of the drug on the nasal passages was similar to that of Iodide of Potassium.[654]

Finally, Ivatts added that he also occasionally prescribed the caterpillar fungus to those who suffered from 'ordinary running colds'. From their feedback he thought that it seemed to be able to bring relief and reduce attacks. Besides, he stated that it was probably also useful in 'liver complaints, constipation and impotence'.

Ivatts was clearly acquainted with some Chinese knowledge about the caterpillar fungus through, for example, Frederick P. Smith's 1871 work on *materia medica*. His attention to the aphrodisiac effect of the caterpillar fungus on his body indicates the influence of such knowledge. But in general, his self-experiment, which lasted about ten days, was carried out within European theoretical frameworks. That is not to say that his spirit of self-experimentaiton was any different to Chinese who had made similar experiments on themselves to test prevailing belief about the efficacy of the caterpillar fungus. We might, however see a difference in the precision of the account, or in the way it refrenced contemporary European 'traditions' of medicine such as Homeopathy, rather

[653] Ivatts did not mention the title of James Britten's (1846-1924) publication. According to my examination, it was Britten's *Popular British Fungi* (1877), see Britten 1877, p. 126. For Britten's life, see Vickery 1978, pp. 71-74.
[654] Ivatts 1886, pp. 137-138.

than Chinese medicine. Since Ivatts had observed a number of negative symptoms, why did he still offer it to those who suffered from 'ordinary running colds', 'liver complaints, constipation and impotence'? The 'centesimal trituration' in his narrative indicates the influence of homeopathy. Homeopathy was founded in Germany in the late 18th century, but later spread throughout Europe and other countries in the 19th century.[655] It started to be introduced to Britain in the 1830s, with the British Homeopathic Society and *The British Journal of Homoeopathy* subsequently established in 1843 and 1844.[656] In the late 19th century when Ivatts was active, homeopathic practitioners often produced centesimal triturations (containing 1 per cent of the original substance and normally 99 per cent of milk sugar) and administered them or their derivatives (such as further diluted solutions) to the sick.[657] Ivatts did not indicate the concentration of the trituration of the caterpillar fungus given to those who had colds, constipation and impotence. But it may reasonably be supposed that the concentration was lower than one per cent, because the centesimal trituration was reported to have negative effects on his body; and homeopathy suggested the use of a lower concentration, which homeopathic practitioners believed would relieve or remove the symptoms caused by the same substance.

Ivatts made new observations on complex human physical reactions to the caterpillar fungus. But his way of employing the caterpillar fungus was different from the usual Chinese method which, as mentioned in his quotation from James Britten's account, involved the use of duck in conjunction with the caterpillar fungus. He also drew inspiration from European biological and homeopathic knowledge. Here it is worth asking if Ivatts's self-experimentation was convincing and of universal significance to medical treatment. Since the late 19th century homeopathy has gone out of favour with mainstream medicine and has been critised as lacking scientificity.[658] In his self-experimentation, there was undoubtedly an absence of the kind of controlled conditions required by later trials, and a lack of statistical records.[659] Therefore his observational results and suggestions cannot be any more valid than those derived from pre-19th century European and Chinese medical practice if these positivist (and anachronistic) criteria for establishing value are to be rationally applied. However, Ivatts's exploration of the medicinal properties of the caterpillar fungus was

655 Bodeker *et al*. 2005, p. xiii; Viganò *et al*. 2015, pp. 7-17.
656 Scanlan 2011, pp. 197-199.
657 See, for example, Smith 1882, pp. 721-729; Boericke 1896, pp. 105-108.
658 Solis-Cohen 1893, pp. 618-619; Loudon 2006, pp. 607-610; Gauch 2009, p. 75; Shaw 2010, pp. 130-131; Smith 2012, pp. 508-512.
659 Statistical methods were first applied in medical studies in the 19th century, but they did not become popular in clinical medicine before the mid-20th century, see Bland 2015, p. 1.

consistent with the spirit of empiricism even though the results did not well support his hypothesis. Through Ivatts's reasoning, self-experimentation, observations and propaganda, we can witness the caterpillar fungus, a Chinese wonder of nature claimed to be deconstructed by (taxonomic) scientists, being transformed into a new medical wonder. This is reflected in his promotion of the caterpillar fungus as a cure among his patients, which also built a network for the dissemination of the caterpillar fungus in Britain. There were no microscopy and chemical analyses in Ivatts's own self-experiment. But based on his report, it is certain that he was familiar with the microscope and Iodide of Potassium (a chemically synthesised inorganic medicinal substance), which represented new ways of exploration in late 19th-century European medical sciences but were lacking in 19th-century Chinese medicine. However, little evidence can be found to confirm the prevalance of such a homeopathic use of the caterpillar fungus in 19th-century Europe and America.

To sum up, the appearance of the caterpillar fungus in 19th-century European works on regional or global *materia medica* shows the authors' concerns about procuring and using exotic medicinal substances. They actively assimilated taxonomic, geographical and/or commercial information from Europe and abroad because it helped procurement. Through their efforts some local medical knowledge about medicinal substances including the caterpillar fungus was also transmitted to Europe (and even America). Partly on this basis, the medicinal properties and usages of some of such exotic substances could also be newly explored by European medical practitioners in their own scientific and medical frameworks. The case of Ivatts's self-experiment not only reflected new explorations of exotic medicinal substances, but also highlighted re-evaluations of exotic medical knowledge. The latter indicated a hidden tense relationship between Chinese and European medical knowledge about Chinese medicinal substances exemplified by the caterpillar fungus. This tension is clear in the rhetoric of knowledge formed with the extension of European informal empire of knowledge networks.

3.3.4 Changes in Japan

'By separating the relations of political power from the relations of scientific reasoning while continuing to shore up power with reason and reason with power, the moderns have always had two irons in the fire. They have become invincible.'[660]

The 19th century witnessed a profound transformation in Japanese perceptions of the caterpillar fungus. This is worth investigating in a separate section in consideration of the important role of Japan in transmitting new European (and Japanese) natural knowledge to modern China and serves to bridge the argument into the next chapter. In particular, Benjamin A. Elman points out that Meiji Japan became an East Asian model for Qing China to revive itself by means of assimilating Western learning at the end of the 19th century.[661] Similarly Bridie Minehan finds that the medical reforms in Meiji Japan had a significant influence on the reform of traditional culture and medicine and the appropriation of the rhetoric of Western science in modern China.[662] In the case of the caterpillar fungus, European scientific knowledge about it was initially transmitted to modern China through Chinese translations of Japanese articles from the beginning of the 20th century (see Chapter 4).

During the period 1640-1854, the Netherlands were the only European country allowed to trade with Japan. Meanwhile, Japanese people began to acquaint themselves with some European knowledge through their contacts with Dutch savants who entered Japan on Dutch merchant ships. Some of the European texts exported to Japan were then translated into the Japanese language and greatly informed the Japanese about the scientific norms of European civilisation. In this context *ran gaku* 蘭学 (Dutch learning) prospered among Japanese intellectuals until the decline of Dutch maritime supremacy in the late 18th century and the opening of Japan in the mid-19th century.[663] Historians normally consider that the publication of *Kai tai shin sho* 解体新書 (New Text on Anatomy, 1774) marked the emergence of Dutch learning in Japan,[664] which in turn reflects the important position of European medicine in Dutch learning.[665] European medicine's encounter with Kampo medicine exposed different medical understandings of the human body, diseases, treatment, and so on, and to a large extent undermined confidence in Kampo medicine in Japan. The translation of *Kai tai shin sho*, for example, was actually stimulated by the Japanese translator's (also a physician) strong impression of a greater anatomical precision embodied in the original Dutch text after his observation of a human dissection. European *materia medica* was also disseminated in

660 Latour 1993, p. 38.
661 Elman 2014, pp. 15-38.
662 Minehan 2014, pp. 69-88.
663 Anderson 2013, pp. 283-284. For the history of Dutch learning in Japan and its influence on Japanese scholarship, see Sugita [1815] 1869; Goodman 1986; Bartholomew 1989, pp. 9-48; Li 1991, pp. 108-121; Que 2003, pp. 48-54.
664 Clements 2015, p. 148; Kaji *et al*. 2015, p. 284. *Kai tai shin sho* was a Japanese translation of the 1734 Dutch text *Ontleedkundige Tafelen*, while the latter was actually a Dutch translation of the third edition of the German text *Anatomische Tabellen* (literally Anatomical Tables; first published in 1722), see Ishida 2002, pp. 31-51.
665 Mestler 1957, pp. 1005-1013.

18th- and 19th-century Japan through medical practice and texts such as Noro Genjou's 野呂元丈 *O ran da hon zou wa kai* 阿蘭陀本草和解 (Japanese Interpretation of Dutch Materia Medica, 1750) and Tsuboi Shinryou's 坪井信良 *Shin yaku hyaku hin kou* 新薬百品考 (A Study of One Hundred New Drugs, 1866).[666]

The journey of Dutch learning into Japan did not proceed smoothly. It was suppressed several times by the Tokugawa shogunate before the mid-19th century mainly due to ideological and political issues.[667] On 8 July, 1853 a fleet of warships led by the American commodore Matthew C. Perry (1794-1858) reached Edo bay in Japan, with the professed intention of establishing an official trade relationship between America and Japan. After being declined, Perry left Japan only to return the following year. This time the Tokugawa shogunate, under military pressure, was forced to enter into the Treaty of Kanagawa with Perry on 31 March, 1854.[668] As a result, Japan ended its seclusion and gradually opened its doors to the outside world. Such a change was also accompanied by the decline of Dutch learning in Japan, as the Dutch were no longer the sole medium through which Japan had intercourse with the Western world. The opening of Japan further facilitated the transmission of Western medical knowledge to the country. Meanwhile, the two Opium Wars in which Qing China was defeated by European powers also stimulated the Japanese government to embrace Western science and technology with the intention of solving the national crisis and modernising the country, beginning in the Meiji period.[669] In 1869, the Meiji government started to promote German medicine in Japan.[670] By contrast, Kampo medicine was largely suppressed by the Meiji government especially after 1883, and was thus caught in a real dilemma of survival and legitimacy.[671] The introduction of Western chemical, biological and pharmacological approaches to research on medicinal substances used in Kampo medicine also led to the emergence of a new scholarship on *materia medica* in Japan.[672] This academic transformation, which accompanied the rhetoric of 'scientific' authority aided by military power, later further influenced modern China,[673]

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666 Noro 1750; Tsuboi 1866. For another example, see Koura 1836.
667 Yamashita 2015, pp. 57-77.
668 Tokutomi 1929; Magoc and Bernstein 2015, p. 309. For Perry's life, see Morison 1967. There were several reasons for America's desire to establish commercial and diplomatic relations with Japan. For example, American whaling activities in the North Pacific Ocean actually also had an influence on Perry's expeditions to Japan, see Burcin 2005, pp. 1-73.
669 Menton *et al*. 2003, pp. 25-35.
670 Bowers, 1980, pp. 105-107; Izumi and Isozumi 2001, pp. 91-99.
671 For the status of Kampo medicine in Meiji Japan, see Fujikawa 1904, pp. 926-1027; Fukagawa [1934] 1981; Yasuu 1969, pp. 55-58; Yamata 1996, pp. 505-518; Terasawa 1997, pp. 163-176; Sugiyama 2004, pp. 209-223.
672 Yasuu 1962, pp. 111-119.
673 Hao 2005, pp. 69-72.

and contributed to the transformation of Chinese *materia medica*.

In Search of the 'Japanese' Caterpillar Fungus

Prior to the beginning of the 19th century, the caterpillar fungus as transmitted to Japan was still generally understood by reference to Chinese accounts. However, the flourishing of European natural history sciences in Edo and Meiji Japan significantly boosted Japanese naturalists' new passion for observing, describing and collecting native or exotic natural objects.[674] European botany and the Linnaean classification system, which began to take root in Japan in the early 19th century, also prompted Japanese naturalists to establish correspondences between East Asian and European scientific (Latin) names for indigenous organisms.[675] Some Japanese naturalists and physicians were no longer satisfied with learning about the caterpillar fungus from previous Chinese and Japanese records. By the beginning of the 19th century, they had begun to discover this natural curiosity and medicinal substance in the wild in their own country. Although the caterpillar fungus growing in China had never been truly found in Japan (its natural habitat did not exist in Japan), this movement was coupled with new natural history findings and reflections in the encounter between East Asian and European academic traditions.

Yuzuki Tokiwa, as mentioned before, ranked among those Japanese pioneers. In his 1801 collection of drawings, the caterpillar fungus from China and some other insect-fungi growing in Japan are all called '*ka sou tou chuu* 夏草冬蟲' (summer grass winter worm), although he clearly illustrates their different morphological characteristics and particularly records the former as imported.[676] In this sense, the Japanese term '*ka sou tou chuu* 夏草冬蟲' or its inverted form '*tou chuu ka sou*', which contains the same two pairs of characters in the Chinese term '*xia cao dong chong* 夏草冬蟲' or '*dong chong xia cao*', actually refers to a group of fungal species. Although it is not always certain that the Chinese term in Chinese historical literature exclusively denoted one fungal species, identifications made in Europe and Russia prove that the *xia cao dong chong* sent to those two regions belonged to the same single fungal species. In European and Russian contexts, transliterations of the Chinese term were also specifically used to denote the species *Cordyceps*

674 Nishimura 1999, pp. 129-135; Ito 2012, pp. 59-78.
675 Ito 1888, pp. 177-181; Kitamura 1989, pp. 119-122.
676 Yuzuki 1801, pp. 2-13.

(Sphaeria) sinensis.

Yuzuki's findings received attention from the herbalist Ohara Momohora 小原桃洞 (1746-1825). According to his posthumous manuscript, Ohara had collected some Japanese and Chinese accounts of the origin and medicinal properties of the caterpillar fungus. He agreed with Yuzuki that similar organisms also grew in Japan, as some Japanese publications had reported discoveries of such organisms around ditches and courtyards in 1805, 1808 and 1824. In addition, eleven specimens of such native organisms were illustrated in his manuscript.[677] Both Yuzuki and Ohara were aware of morphological differences between the Chinese caterpillar fungus and native Japanese insect-fungi. However, Ohara had begun to suspect that some of the insect-fungi found in Japan were actually '*semi hana/chan hua* 蟬花' (flowers on cicada), which had long been used as a medicinal substance in China.[678] Afterwards, more and more Japanese naturalists paid attention to such insect-fungi when collecting and making field observations. For example, the herbalist Mizutani Toyofumi 水谷豊文 (1779-1833) produced a collection of drawings of insects and animals in the early 1830s, a few of which, though lacking captions, actually depict eleven specimens of 'flowers on cicada'.[679] The specimens mainly differentiate themselves from each other by the morphological characteristics of their fruiting bodies. Compared with those illustrated by Kurimoto Tanshu in 1811 (see above), they represented bind sight in observation, which characterises scientific objectivity.[680] Throughout the 19th century, discoveries of insect-fungi were constantly being made in Japan, especially Chikugo, Kyushu.[681] The insect-fungi in relevant Japanese publications were still often categorised under the title '*ka sou tou chuu* 夏草冬蟲' or '*tou chuu ka sou*'.[682] This also means that the term was generally used in a broadened sense by Japanese authors despite its Chinese origin.

In order to differentiate the Chinese expression '*xia cao dong chong* 夏草冬蟲' (or '*dong chong xia cao*') from the Japanese homonym '*ka sou tou chuu* 夏草冬蟲' (or '*tou chuu ka sou*'), some Japanese authors began to stress the origins of the organisms in question when they used the terms. For example, Fujii Kansai 藤井咸齋 stated that he had seen both the Chinese caterpillar

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677 Ohara 1833, pp. 29-36. For Ohara's life, see Ueda *et al*. 1976, p. 272.

678 For the use of *chan hua* in Chinese medicine, see Li [1578] 1979, pp. 2309-2310. For modern perceptions of *chan hua*, see Luo and Song 2007, pp. 14-15. The Latin name for *chan hua* is *Cordyceps cicadicola*, see Liang 2007, pp. 144-145.

679 Mizutani c. 1833, pp. 88-90. For Mizutani's life, see Chi ba ken ritsu chuu ou haku butsu kan 2008, p. 244.

680 Daston and Galison 2007, pp. 17-18.

681 Esaki 1929, pp. 221-231.

682 See, for example, Oda 1898, p. 465.

fungus sold in Japanese drugstores and some similar Japanese native organisms. At the beginning of the entry '*tou chuu ka sou* 冬蟲夏草' in his 1829 text on Chinese and Japanese *materia medica*, Fujii explicitly states that there are two kinds of such organisms: one is '*haku rai* 舶來' (imported), while the other is '*kazu san* 和產' (produced in Japan).[683] However, the expression '*haku rai* 舶來' is ambiguous because it does not explicitly indicate where the caterpillar fungus was imported from. Therefore, in the late 19th and early 20th centuries some Japanese scientists began to use a the more specific term '*han san* 漢產' or '*shi na san* 脂那產' (produced in China) to refer to the caterpillar fungus from China, or 'C*ordyceps sinensis*' (or '*Sphaeria sinensis*').[684] The above attempts to seek a 'Japanese' caterpillar fungus were accompanied by reflections on new relationships between names and entities. The discovery of similar Japanese native organisms present new findings on the geographical distribution of insect-fungi. The transformation of '夏草冬蟲' (or '冬蟲夏草') from a Chinese term to a Japanese term and the broadened meaning of its identifications in the Japanese context also indicate a Japanisation of the category for the Chinese caterpillar fungus. This is consistent with Benjamin A. Elman's analysis of the adaptation of Chinese medicine and appropriation of Chinese thoughts and learning before the late 19th century in Japan.[685] The introduction of scientific discoveries of the caterpillar fungus and similar organisms, which will be discussed below, also testify to European influence and a pluralistic understanding of such organisms in 19th-century Japan.

New Perceptions

In a pre-modern Sino-Tibetan context, the caterpillar fungus was able to transform between a worm and a blade of grass. But the Chinese never associated this transformation with the 'flowers on cicada' ('*chan hua*' in Chinese) or any other organisms that resembled the caterpillar fungus. Interestingly, however, even in the late 19th century not only did some Japanese authors still believe the transformation theory, but they also applied the theory to native insect-fungi (e.g. *Cordyceps nutans* Pat.).[686]

[683] Fujii [1829] 1843, pp. 347-350.
[684] Kurita 1889, pp. 29-32; Shirai [1914] 1925, pp. 364-366. At the beginning of the 21th century, the Japanese scholar Okuzawa Yasumasa uses the word '*kou gi* 広義' (broad sense) as an addition to the term '*tou chuu ka sou* 冬蟲夏草', which serves the purpose of disambiguation, see Okuzawa 2007, pp. 178-179.
[685] Elman 2008, pp. 93-121.
[686] Esaki 1929, pp. 221-231.

Since the early 19th century, with the transplantation of European natural history sciences into Japan, some Chinese natural knowledge about the caterpillar fungus had become a target for criticism. In this respect, the earliest critic was probably the Japanese naturalist Masushima Ranzono 増島蘭園 (1769-1839), who mentioned the caterpillar fungus in his book entitled '*Kin shi* 菌史' (History of Fungi, finalised in 1811). Although he misdated the initial arrival of the caterpillar fungus in Japan to the Kansei (1789-1800) period, probably due to his misunderstanding of Tamba Genkan's account, he had carefully observed specimens of it. Unlike authors such as Tamba, Masushima related the 'grass' to '*kin* 菌' (fungi), and emphasised that the formation of the so-called 'winter worm summer grass' was *absolutely* not caused by transformation but by fungal infections of dead insects underground. In his eyes, the transformation theory was *extremely* absurd. Nevertheless, he valued Chinese accounts about the medicinal properties and uses of the caterpillar fungus, and asserted that people should not abandon them together with the fallacious transformation theory. This concern for medical utility was also why he particularly quoted a related medical record by the Chinese physician Wu Yiluo.[687] On the point of the separation of domains of medicine and natural biology, and their relative utility, Masushima did not significantly differ from some of the European naturalists, pharmacognosists or doctors mentioned before.

In the late 19th century, Japanese botanists and entomologists published a few academic articles on the caterpillar fungus and similar organisms. They not only introduced new European natural knowledge, but also sometimes set out to inform Japanese readers of the *true* nature of these organisms. For example, a Japanese man's inquiry about the caterpillar fungus and its transformation stimulated the Japanese botanist Miyoshi Manabu 三好學 (1862-1939) to publish a review article in the *Shoku butsu gaku zatsu shi* 植物學雜誌 (The Botanical Magazine) in 1888.[688] Miyoshi aimed to help him and others abandon their belief in fallacious ideas prevailing in Japan. After quoting Ohara Momohora's account, Miyoshi then turns to English publications. He also treats '*tou chuu ka sou* 冬蟲夏草' as a group of similar organisms, and lists nine species of fungi belonging to the genus *Torrubia* (family Sphaeriaceae, division Ascomyceti[e]s). His references include an account by Mordecai C. Cooke, which, according to my examination, comes from Cooke's book *Fungi: Their Nature and Uses* (1875).[689] Moreover, he paid additional attention to introducing the

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[687] Shirai [1914] 1925, pp. 361-362. For Masushima's life, see Saga 1900, p. 39.
[688] Miyoshi 1888, pp. 36-40. For Miyoshi's life and publications, see Andou 1993, pp. 203-226; Andou and Ochiai 1994, pp. 137-162; Andou 1994, pp. 11-34; Andou 1995, pp. 67-90; Andou 1996, pp. 107-128.
[689] For Cooke's original account, see Cooke 1875, pp. 241-252.

insects on which these fungi grew, such as *Hepialus virescens*. According to his article, 25 kinds of such insects had been discovered; and both the insects and fungi were distributed around the world. With this *assertion*, the insect-fungi not only lost their transformation ability, but also lost rarity value.

A few years later, the botanist Yasuda Atsushi 安田篤 (1868-1924) reported his identifications of two kinds of fungi parasitic on insects in 1894.[690] One was '*Isaria arachnophila*, Ditm.' growing on '*tsuchi gumo* 螲蟷' (trapdoor spider);[691] while the other was '*Torrubia militaris*, Fr.' growing on nympha of some species belonging to the order Lepidoptera. Yasuda discovered them in Japan, and called them '*tou chuu ka sou* 冬蟲夏草'. Like Miyoshi, he criticised the transformation theory as a fallacy. But the emphasis of his articles was on macroscopic and microscopic descriptions of the specimens, given to support his identifications. Because Yasuda perceived the specimens within the frame of European mycology, it was natural for him to use mycological terms of European origin to describe their macroscopic and microscopic structures, such as '*shi jitsu tai* 子實体' (stroma), '*hou shi* 胞子' (spore), '*kin shi* 菌糸' (mycelium) and '*hachi rechi shi* 八裂子' (ascospore).[692] Besides, he also used characters such as '*ka* 科' (family), '*zoku* 屬' (genus) and '*tane* 種' (species) to describe their taxonomic rank. Doubtless the concept of species and taxonomic hierarchy and the application of microscopic observations in identifying species originated from modern European biology. In his articles, the two specimens were formed as follows: fungal spores infected underground insects, then developed into mycelium inside the insects' bodies, and eventually killed them; after the mycelium had occupied the interior of the dead insect bodies, it then grew out of the bodies and gradually formed visible fruiting bodies. Basically, Yasuda's discoveries constituted Japanese efforts to seek out and record native species similar to the caterpillar fungus from China. However, his identifications and theoretical explanations of their formation embodied the tensions between East Asian and European perceptions of nature that were encountered in Japan. In particular, the microscope enabled Japanese biologists to 'see' inaccessible and invisible regions of nature. The power of new scientific instruments (e.g. the microscope and telescope), which were perceived by modern Europeans as 'evidence of the superiority of their age over antiquity',[693] was also adopted into the powerful rhetoric of modern science in Japan.

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690 Yasuda 1894a, pp. 337-340; Yasuda 1894b, pp. 410-411. For Yasuda's life, see Ito 1965, pp. 170-171.
691 For an earlier brief European introduction to this fungus, see Craig 1847, p. 96.
692 The terms 'stroma' and 'ascospore' are not my own translations but are directly cited from Yasuda's articles.
693 Van Helden 1983, pp. 49-84.

Both Miyoshi and Yasuda paid little attention to the caterpillar fungus from China. In contrast, one of the botanist Kurita Manjirou's 栗田萬次郎 (*c*. 1833-1900) articles published in 1889 was primarily devoted to its natural history.[694] Kurita first briefly introduces its fungal nature, its identity as a famous Chinese medicinal substance and its scientific name, by referring to John Lindley's *The Vegetable Kingdom* (1853). He does not directly criticise the popular transformation theory, but the quotation from Lindley actually indirectly reflects his acceptance of modern European understandings of the nature and formation of the caterpillar fungus. He then quotes records of the caterpillar fungus from three *materia medica* texts in the English, Chinese and Japanese languages respectively, i.e. *Contributions towards the Materia Medica & Natural History of China* (1871),[695] *Ben cao gang mu shi yi* 本草綱目拾遺 (1765), and *Zou ho te ban hatsu mou* 増補手板發蒙 (1823). In addition to the above quotations, Kurita's article also contains much natural and medical information of East Asian origin. Like some of his predecessors, Kurita associated the caterpillar fungus with similar Japanese insect-fungi, and still called the latter '*ka sou tou chuu*'. Generally speaking, Kurita tried to avoid acting as a judge of true or fallacious natural knowledge, and endeavoured to tolerate and bring together natural knowledge from different cultures. His efforts were made within transnational networks of knowledge, but we can detect the growing acceptance of a hierarchy of scientific knowledge. The terms 'Sphaeria Sinensis, Berk.' and *kin zoku* '菌屬 (Fungi)' introduced at the beginning of the article indicate the priority of European scholarship in his mind with regard to the caterpillar fungus's natural properties.

Some Japanese naturalists were also keen to popularise modern European mycological knowledge relating to the insect-fungi discovered in Japan in an exoteric way. For example in 1898, the entomologist Oda Zeisuke 小田勢助 (1872-1917) published a short article about the diversity in the species of such native organisms in the magazine *Kon chuu se kai* 昆蟲世界 (Insect World).[696] It does not contain any quotations, but briefly introduces their fungal and insect nature, taxonomic positions, scientific formation theory, and habitat in the field. Oda's article, though entitled '*tou chuu ka sou* 冬蟲夏草', lacks any information about the caterpillar fungus growing in China. From the Meiji period the number of scientific publications involving insect-fungi also

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694 Kurita 1889, pp. 29-32. For Kurita's life, see Hasegawa 1977, pp. 18-19.

695 Kurita recorded the book title and the author as '*Abura na kusuri hin bi kou* 脂那薬品備考' and '*su mi su* スミス'. The latter was actually a Japanese transliteration of the English word 'Smith'. Besides, Kurita added that he referred to the 73rd page of Smith's text. Thus after examining the content of the quotation, it is certain that '*Abura na kusuri hin bi kou* 'is a reference to Frederick P. Smith's 1871 book on *materia medica*.

696 Oda 1898, p. 465. For Oda's life, see Ruu bu ru sha 1922, pp. 160-161.

significantly increased in Japan.[697] This further highlights the expansion of interest in exploring Japanese native species and situating them in the European natural order. In the fields of modern pharmacognosy and pharmacology, some scientific research on natural medicinal substances used both in China and in Japan was also being carried out in Meiji Japan,[698] although the Chinese caterpillar fungus and Japanese insect-fungi had as yet received little attention from either field. However, Yasuo Otsuka reminds us that parallelling studies of 'Chinese and Japanese drugs' by 'using methods of the natural sciences' (e.g. chemical analysis) in 18th- and 19th-century Japan, Kampo practitioners, modern science had little influence on Kampo medical practice since Kampo was severely restricted after the Meiji Restoration.[699]

Overall, the efforts to seek, observe, identify and describe the caterpillar fungus and similar organisms in 19th-century Japan were made in the context of interactions between Chinese and Japanese natural cultures and their encounter with European natural history. From the beginning of the 19th century, new natural knowledge about such organisms was produced in Japan, while tensions between East Asian and European understandings of their nature and formation also emerged. The perceived superiority of the European natural history sciences to East Asian indigenous natural knowledge systems, partly established by the Meiji government, prompted new patterns of perceiving and studying natural objects in Japan. The general application of microscopy, hierarchical Linnaean taxonomy, binomial nomenclature and modern European chemical and pharmacological theories and approaches in 19th-century scientific communities in Japan embodied significant changes in attitudes towards exploring East Asian medicinal substances or natural objects. But this did not simultaneously happen in the community of Kampo practitioners. However, Chinese empirical medical knowledge about the caterpillar fungus, valued by some European authors, had also received relatively positive attention in Japan. This was mainly because such knowledge did not simply contradict or prove itself compatible with European natural history sciences, but would provide an important reference for scientific research on East Asian medicinal substances.

3.4 Conclusion

[697] Esaki 1929, pp. 221-231. See, for example, Shirai 1925 [1914], pp. 361-375.
[698] See, for example, Tamba 1881, pp. 5-8; Shimoyama 1882, pp. 6-12; Wang 1909, pp. 461-472.
[699] Otsuka 1976, pp. 322-340.

The pursuit of new medicinal substances and curiosity about exotic natural objects propelled the transmission of specimens of *materia medica* from China to France, Britain, Russia and Japan in the 18th and 19th centuries. Within this new wave of interest, and under mechanistic scrutiny, the caterpillar fungus remained particularly attractive as a category-crossing phenomenon. With its arrival in Europe, European scholars embarked on research on the caterpillar fungus within the parameters of emerging European academic and scientific networks of knowledge. The research was performed in a new set of pan-European institutions by a new class of professional scientists. These groups established theories of fungal parasitism on animals based on microscopic observations, which led to new classifications. Their research mainly included revelations about its fungal nature, parasitic mechanisms, and identifications of its specific species according to those theories. Chinese natural and medical knowledge about the caterpillar fungus served as an important reference for (and supplement to) European research where, from the early 18th century onward, ideas about spontaneous cross-species transformation were criticised as primitive belief in wonders. But meanwhile, the caterpillar fungus was actually also transformed into a scientific or medical object of wonder, giving rise to a significant change in perceptions of the nature of fungal parasitism on larvae and the development of a new classification. Similar examples were discovered among native insect-fungi in 19th-century Japan. They relate closely to the transformation of Japanese scientific and medical studies, which later profoundly influenced the building of a modern Chinese *materia medica*. There is no doubt that the special features of the caterpillar fungus attracted the attention of scientists around the world, and that it retained its agency throughout its extensive journeys abroad, negotiating its place in the new world, and confronting the challenges of modernity.

The new scientific theories had limited direct impact on medical knowledge and practice. Mainly drawing on pre-modern observations about its aphrodisiac effect, the Irish medic Ivatts associated the caterpillar fungus, now identified as a parasitic fungus, with some parasitic fungi and plants that had effects on the human reproductive system, and thus carried out self-experimentation. The new identification of the mycological category facilitated the hypothesis that others members of the same category might have similar physiological effects, but this method cannot be accounted unique and in many ways represents the ancient and well tried method grounded in correspondence thinking. In a modern context, scientific theories and knowledge were deployed as often rhetoric that served to establish relations between an increasingly powerful and belligerent West and a dangerously enfeebled millennia-old imperial China in its death throes. While Chinese physicians recommended that there should be new experimentation, in actual fact this new research has had little implication for the development and usages of *materia medica*. And this observation pertains to the present day as we will begin to see in the next chapter. The institutions of power and science of the 18th and 19th centuries shaped the beliefs and social dynamics of physicians and scientists, but they did not necessarily change practice in the coming decades of the early twentieth century. And in contemporary Sino-Tibetan cultures, this is ever more the case as the caterpillar fungus enjoys a revival of popular belief in its magical efficacy and its potency in promoting long life and increased sexual competence. Although there were substantial scientific discoveries during the first half of the 20th century, there was also very little effect on the medical. With modern science becoming a discursive power for the deconstruction of Chinese medicine,[700] Chinese empirical knowledge about medicinal substances, valued by both new scientists/doctors and Chinese physicians, became a basis for buffering the impact of modern science on the survival of Chinese medicine and advancing the academic transformation of Chinese *materia medica*.

[700] Lei 2002, pp. 333-364; Lei 2014, pp. 91-96.

Chapter 4 The Caterpillar Fungus Negotiates Science with Chinese Physicians

> 'The adjective 'modern' designates a new regime, an acceleration, a rupture, a revolution in time. When the word 'modern', 'modernization', or 'modernity' appears, we are defining, by contrast, an archaic and stable past… 'Modern' is thus doubly asymmetrical: it designates a break in the regular passage of time, and it designates a combat in which there are victors and vanquished.'
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> —— Bruno Latour[701]

4.1 Introduction

Material exchanges and cross-cultural interactions between Europe and China, and also within East Asia, increasingly intensified from the 17th century. At the same time, the transmission of knowledge about medicinal substances that had already enjoyed a long and dynamic history in China involved an accelerating integration and adaptation into new epistemologically distinctive practices. Existing studies have pointed out that during the encounter of the so-called scientific medicine with Chinese medicine in the modern period, Chinese *materia medica*, now decontextualised from discredited medical themes and theories, was less subject to criticism and misunderstanding than were other aspects of Chinese medicine.[702] Indeed, different epistemologies legitimating the same medicinal substances at the same time had given rise to controversy in the intellectual community about the validity of one kind of knowledge or another. But that the debate continues into the 21st century also indicates that the political interventions described in Chapter 1 on the side of a modern science could never fundamentally unify the central academic and epistemological issues from the top down. How do two, potentially, extreme, positions, one made explicit by creators and disseminators of scientific and biomedical 'truth', the other represented in the practice of traditional physicians, actually figure in the work of early twentieth century scientists and writers? In practice we will see a number of groups contributing to different continuities and ruptures in Chinese and exotic natural knowledge about indigenous medicinal substances. Each engaged in the

[701] Latour 1993, p. 10.
[702] Tao 2010, pp. 60-78; Hu 2012, pp. 571-606; Cai and Wang 2013, pp. 373-376.

transformation of Chinese *materia medica*, leaving a body of knowledge and practice that can neither be said to be truly modern nor traditional, and we will track these observations by following the 19th and early 20th century footsteps of the caterpillar fungus.

This chapter first investigates the transplantation and production of scientific knowledge about the caterpillar fungus through transnational networks of people and institutions in modern China, especially Republican China. This process involved the interposition of modern science in indigenous knowledge of medicinal substances and the establishment of the discursive power of modern scientific knowledge. The second section will focus on a case study of the academic ideology and activities of the traditional physician Chen Cunren 陳存仁 in the 1920s and 1930s. Chen represents mainstream traditional physicians' new understandings of the importance of indigenous medicinal substances, as exemplified by the transformations of the caterpillar fungus in Chinese medicine, as well as their reflections on the prospects for Chinese *materia medica* and responses to modern science. I argue that the advocates of a modern science brought about the emergence of a new Chinese *materia medica*, but that this *materia medica* was, counter intuitively, characterised by plural knowledge systems related to and in conversation with the new goal of scientification. The epistemically distinct practices of the new scientists in China and their rhetoric challenged the nature of indigenous knowledge about Chinese medicinal substances, but they tended to favour the retention of much Chinese empirical medical knowledge as a valuable source for exploring new effective medicinal substances or medicinal substitutes. In modern Chinese societies, however, the new scientific knowledge did not necessarily impact on indigenous ways of using Chinese medicinal substances or the communities involved in their exchange and prescription. We will therefore examine how different communities who were attracted to the ways in which the caterpillar fungus could articulate both new and old positions, and the caterpillar fungus itself, negotiated the future of 'traditional' medicine.

4.2 Locating a 'Scientific' Caterpillar Fungus

The book *Zhi wu xue* 植物學 (Elements of Botany), published by the London Missionary Society Press in Shanghai in March, 1858, was the first introduction to modern European botany in Chinese translation. In the first volume of this book, the caterpillar fungus, which ostensibly transformed from a blade of grass in spring and summer to a worm in winter, was taken as an example of the integration of animals and plants in a discussion of their relative continuities.[703] This example was fraught with the implications of its association with natural theology, and the point it was intended to demonstrate was out of step with the academic European botany of that time. Although *Zhi wu xue* was translated from works by the British botanist John Lindley (1799-1865) and other European authors,[704] the explanation about the caterpillar fungus' transformation is nowhere to be found in Lindley's works.[705] It was probably extracted and interpolated from ancient Chinese records of the caterpillar fungus by one of the translators, Li Shanlan 李善蘭 (1811-1882).[706] In *Zhi wu xue* its identity still hovered between 'animal' and 'plant', and had nothing to do with fungi. However, although some relatively new information about the caterpillar fungus was assimilated into some European texts published in China, due to their expected readership, this hybrid knowledge did not circulate extensively in China. About two decades later, the German missionary Ernest J. Eitel (1838-1908), who arrived in China in 1862, published his work entitled *A Chinese Dictionary in the Cantonese Dialect* (1877) in London and Hong Kong. Eitel included the term '*xia cao dong chong* 夏草冬蟲', and provided its Cantonese pronunciation 'há ts'ò tung ch'ung' as well as the Latin name 'Cordyceps Sinensis'.[707] But because this dictionary was compiled for the use of foreign students of the Cantonese Dialect as a general guide to the written language of China, Eitel's mention of the Latin name for the caterpillar fungus was understandably neglected by publications in the Chinese language. And therefore early influence of the new languages of European science cannot be dated to this time.

4.2.1 New Chinese Eyes on the Caterpillar Fungus Cause a Cognitive Crisis

The caterpillar fungus therefore retained its identity as a magical substance in late 19th-century China. In addition to being diffused and consumed throughout all the levels of Chinese society, a

[703] Williamson *et al*. 1858, p. 4.
[704] There has been no consensus on the original sources of the Chinese translation *Zhi wu xue*, see Wylie 1867, p. 239; Wang 1981, pp. 86-87; Pan 1984, pp. 167-172; Métailié 1993, pp. 241-249; Wang 1988, p. 88; Shen 2000, p. 23; Wright 2000, pp. 29-33; Elman 2005, pp. 327-328. But it is clear that Lindley's works just occupy part of the original sources, see Lu 2015, pp. 1-8.
[705] The accounts of the caterpillar fungus in Lindley's works do not carry natural theological implications, see, for example, Lindley [1846] 1853, pp. 39-40.
[706] The Chinese translation *Zhi wu xue* does contain some indigenous Chinese knowledge, see Lu 2015, pp. 1-8. For Li's life, see Hung 1991; Wang 2000.
[707] Eitel 1877, p. 871. For Eitel's life, see Wong 2000, pp. 73-91.

history I will come back to, it evidently also had much emotional resonance for Chinese literati. For example, Wu Yangxian 吳仰賢 (1821-1887), a native of Jiaxing, Zhejiang, expressed his disappointment at the inconstancy of human society through a comparison with the ever-transforming and thus immortal caterpillar fungus, in a poem entitled 'The Caterpillar Fungus': '*shen shi yan liang wai, ji guan dong zhi zhong; you lai bu si cao, zhi shi ke lian chong* 身世炎涼外, 機關動植中; 由來不死草, 只是可憐蟲' (one's lifetime may be exciting or dull, so cunning are the animals and plants; but the grass that has long been considered immortal, is merely a pitiful worm).[708] Similarly Shen Shourong 沈壽榕 (1823-1884), a native of Haining, Zhejiang who held an official position in Sichuan, eulogised the marvellous transformation and potency of the caterpillar fungus produced in Sichuan as well as the mystery of nature: '*sheng ji wan zhuan bian dong chong, yi yang wu zhi you hua gong* 生機宛轉變冬蟲, 一樣無知有化工' (vigorously transforming to and from a winter worm, it is strange to people but embodies the power of nature).[709] After receiving the fungus as a gift from one of his Sichuan friends, with the advice about its medical and culinary purposes, Yu Yue 俞樾 (1821-1907), a native of Deqing, Zhejiang, praised it as a *ling yao* 靈藥 (magically effective panacea): '*ling yao dong chong huan xia cao, qi hua shi si you gan sheng* 靈藥冬蟲還夏草, 奇花濕死又乾生' (This panacea transforms between a winter worm and a summer grass; it is like a bizarre flower which dies in moist conditions but grows in dry conditions).[710] Chinese literati thus lamented and extolled the virtues of the caterpillar fungus in this way and associated it with their own personal experience and reflections on the potency and immortality of Chinese culture.[711] Through these figures, some of whom, like Yu Yue, had both a local and national reputation, the fame of the caterpillar fungus as a marvel reached an ever greater number of people and areas. However, from the beginning of the 20th century, challenges to previous Chinese narratives of the caterpillar fungus also began to emerge in China.

In August, 1900, the Japanese sinologist Fujita Toyohachi 藤田豐八 (1869-1929) published a Chinese article entitled *Dong chong xia cao* 冬蟲夏草 (winter worm summer grass) in *Nong xue bao* 農學報 (Journal of Agriculture).[712] It was translated from a 1898 Japanese article of the same

[708] Wu [1877] 2002, p. 35.
[709] Shen [1883] 2002, p. 217. Shen noted that 'the caterpillar fungus produced in Sichuan is a good medicinal substance' (蜀產冬蟲夏草, 良藥也).
[710] Yu [1899] 2002, p. 559.
[711] For example, see Zhu [1790] 2002, pp. 677-678; Zhang [1819] 2002, p. 3; Zhang [1842] 2002, p. 270; Binliang [1847] 2002, p. 478; Fan 1910, p. 10.
[712] Fujita 1900, pp. 484-485.

title in the journal *Kon chuu se kai* 昆蟲世界 (Insect World).[713] *Nong xue bao* was a journal established in Shanghai in 1897 against the background of a social movement directed at rejuvenating the country by means of agriculture. It was committed to disseminating agricultural science and technology, with emphasis on both recovering classical Chinese knowledge of agriculture and introducing fresh European, American and Japanese agriculture and applied sciences through translation of foreign works.[714] Fujita was not an author, but was employed in Shanghai until 1919 by Luo Zhenyu 羅振玉 (1866-1940), one of the founders of the journal, to translate Japanese sources for the journal .[715] The case of Fujita represents one important avenue for the transmission of scientific knowledge to China. It came at a time just after the fall of the Qing dynasty, when some famous Chinese academics were sponsoring numerous Chinese translations of Japanese publications.

Aside from the article about the caterpillar fungus, Fujita also translated two other articles in this issue that had originally been published in the same Japanese journal. The other two articles focused on parasitic insects and toads, which were highly relevant to crop protection.[716] In contrast, the article about the caterpillar fungus, which was positioned before the two other articles, had little relationship with agriculture. In this sense Fujita's introduction to the caterpillar fungus in this Chinese journal of agriculture was exceptional. Fujita did not give any account of his intentions in publishing it, but was evidently eager to overturn the long prevailing stories of the magical transformation of the caterpillar fungus. His translation first mentions that a man called Nakazawa 中澤 once saw two specimens of the caterpillar fungus in Japan: one produced two *jing* 莖 (stems) apparently growing out of the head of a *ma tiao* 馬蜩 (cicada),[717] while the other showed one *jing* (stem) growing out of an unknown insect's back. The article then criticises the old view that the caterpillar fungus's stems were transformed from insects and offers a new and disenchanted explanation: the caterpillar fungus belongs to the family *yan jun ke* 簷菌科 (Basidiomycete),[718]

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[713] Oda 1898, p. 465. *Kon chuu se kai* was a professional journal of entomology published during the period 1897-1945, see Anonymous 1897, pp. 452-453; KRKKTSK 1989, p. 19.
[714] Zhang 1985, pp. 82-88; Liu and Yao 2010, pp. 54-59.
[715] For the relationship between Luo Zhenyu and *Nong xue bao*, and Luo's contribution to the improvement in Chinese agriculture, see Luo and Zhang 1996, pp. 21-25; Zhang 2012. Fujita obtained his PhD in Literature in Japan in 1920. For Fujita's life and publications, see Zheng 1933, pp. 1-17; Oyanagi 1982, pp. 193-198; Anonymous 1982, pp. 199-202. For his activities in China, see Yi and Guo 2004, pp. 79-83; Yong 2007, pp. 143-144; Li 2012, pp. 142-149.
[716] Fujita 1900, pp. 485-486.
[717] For the identification of *ma tiao*, see GJZYYGLJZHBCBWH 1999b, p. 165.
[718] '*Yan jun*' in *yan jun ke* 檐菌科 presumably refers to today's *dan zi jun* 擔子菌 (Basidiomycete). Examples as evidence can be found in modern Japanese literature, such as Miyoshi Manabu's 三好學 *Shoku butsu manabu minoru ken sho ho* 植物學實驗初步 (Introduction to Botanical Experiments, 1899) which will be mentioned below.

and its stems actually develop from the *zhong zi* 種子 (seeds) of the *jun lei* 菌類 (fungi) which 'invade' the bodies of dead insects under the ground in autumn and absorb nutrition for their growth. Obviously, 'seeds' here refers to the identification of what were to be known as fungal spores. And the term for caterpillar fungus in the translation does not specifically refer to *Cordyceps sinensis* but to species of the genus *Cordyceps* in a broad sense,[719] especially those growing in Japan. Moreover, both Fujita's translation and the original article neglect to mention the caterpillar fungus' origin in China.

Fig. 19 A specimen of *Cordyceps sinensis* from Tibet (top right corner) identified by Ito Tokutaro in 1903.

Subsequently, a relatively long article entitled *Dong chong xia cao shuo* 冬蟲夏草說 (Speaking of winter worm summer grass) was published in *Nong xue bao* in October, 1903.[720] It was translated from an article originally written by the Japanese botanist Ito Tokutaro 伊藤篤太郎 (1866-1941) and published in the Japanese journal *Shin nou hou* 新農報 (Journal of New Agriculture).[721] The Chinese translation starts with a discussion of more than ten specimens of the caterpillar fungus brought from Tibet to Japan by the Buddhist monk Kawaguchi Ekai 河口慧海 (1866-1945), who then sent them to Ito for identification (Fig. 19).[722] Ito describes the appearance of these specimens, and briefly mentions the historical trade in the caterpillar fungus as a medicinal

However, the caterpillar fungus and other closely related species do not belong to Basidiomycete but Ascomycetes. Besides, the original Japanese article additionally mentions that the caterpillar fungus belong to the '*su be i ri a* スベイリア', which is the Japanese transliteration of the Latin genus name 'Sphaeria'.

719 This judgment is based on the fact that *Cordyceps sinensis* is not distributed in Japan, and does not grow on cicada.

720 Anonymous 1903, pp. 440-444. The translator for this article remains unknown.

721 *Shin nou hou* was established in 1899. For Ito Tokutaro's life, see Iwatsu 2010.

722 Kawaguchi travelled to Tibet twice, and stayed there during July 1900-June, 1902, and January, 1914-April, 1915. For his two journeys, see Kawaguchi 1904; Kawaguchi 1909; Kawaguchi 1966. The specimens mentioned here must have been obtained during his first stay in Tibet. For Kawaguchi's life, see Berry 1989; Kouyama 2011.

substance between China and Nagasaki. He explains its life cycle as an irreversible process of fungal infection, and then briefly reviews the history of European studies of the caterpillar fungus (i.e. *Cordyceps sinensis*). As he refers to European literature, and stresses that 62 species of the caterpillar fungus have been discovered around the world, apparently he too treats the caterpillar fungus as the *Cordyceps* species in a broad sense. Like Fujita, Ito claims that Japan also has native species of the caterpillar fungus.

In fact in December 1902, Kawaguchi had also presented Ito with some plants collected in the vicinity of Darjeeling in Sikkim Himalaya.[723] But Ito seemed to be more interested in the caterpillar fungus, and therefore he wrote an article exclusively on this curious organism. His intention, as is stressed in the article, was to expose the errors of the popular old theory about the formation of the caterpillar fungus, so that, since the scientific theory of its life cycle had become clear in his time, people should not continue to believe the erroneous theory. Compared with the translation by Fujita discussed above, this article is more scholarly since it contains a systematic review of European scholarship on mycology. For Chinese readers, it must have been also more intelligible as it centres on the familiar Chinese caterpillar fungus and contains illustrations of a few different *Cordyceps* species.

Beyond the science and technology journals, we also see the caterpillar fungus active in the popularisation of new knowledge in the domestic sphere. Some Chinese progressive intellectuals of the end of the Qing dynasty considered that female readers should not be excluded from scientific knowledge. In 1905, the journal *Nüzi shu jie* 女子世界 (The Female World), which was dedicated to female education and womens' rights, published an article on the creation of botanic gardens in its '*Ke xue* 科學' (science) column.[724] The article was translated from the last chapter of the Japanese botanist Miyoshi Manabu's 三好學 *Shoku butsu manabu minoru ken sho ho* 植物學實驗初步 (Introduction to Botanical Experiments, 1899).[725] In a prolegomenon to the translation, the Chinese translator first complains that science is a subject that is very rarely studied in China. He then strongly criticises the backwardness of indigenous Chinese knowledge of plants. He further stresses that China has only ornamental gardens and lacks botanic gardens for the scientific study of plants,

723 Ito 1903, pp. 157-159.
724 Zhiqun 1905, pp. 21-26; Zhiqun 1905, pp. 31-46. *Nüzi shu jie* was established in Changshu, Jiangsu in 1904. For the objectives of this journal, see Jin 1904, pp. 1-3.
725 Miyoshi 1899, pp. 134-141. Miyoshi published an article on *tou chuu ka sou* 冬蟲夏草 in 1888, Miyoshi 1888, pp. 36-40.

like those in the West. He therefore suggests that Chinese ladies who are not able to go to school should create botanic gardens at their homes and buy books on botany so as to study plants with their friends. The main body of the translation can be seen as a brief synthetic outline of 19th-century European classification systems of flowering and flowerless and seedless plants. The caterpillar fungus is listed as a representative species of the Ascomycetes fungi. Although the article does not offer specific biological knowledge about the caterpillar fungus, it shows the taxonomic rank of the caterpillar fungus in the natural order established by European scholars and uncritically accepted by both Miyoshi and the Chinese translator.

Overall, both early East Asian scientists, translators working for the new scientific publications, and those involved in the popularisation of European science in China made explicit criticisms that directly rejected Chinese knowledge about the caterpillar fungus and which accompanied the transmission of scientific knowledge translated from Japanese literature in the 1900s. The caterpillar fungus was no longer represented as a unique Sino-Tibetan panacea and tonic, but a member of a new class of biological organisms common in East Asia, and indeed throughout the world. The caterpillar fungus could not magically transform from a blade of grass to a worm and vice versa, but was merely formed through a fungal infection of insects. Such perceptions without doubt challenged most Chinese readers' conventional thinking. And the Chinese translator discussed above obviously ranked among the 'enlightened' figures in modern China who became agents of modern science. Particularly, in the first decade of the 20th century, the Qing court implemented the New Policies reform, which actively promoted the transplantation of Western science to China.[726] In this context, the caterpillar fungus maintained its identity in China as a highly esteemed medicinal substance, but some long-standing understandings surrounding it began to be judged redundant. As scientific knowledge of the caterpillar fungus and some closely related species, such as *Cordyceps aspera*, sparked new interest in the Chinese world of the 1900s, it continued to travel and be updated in a variety of Chinese communities, especially those members of the scientific community in Republican China.

4.2.2 Popularisation of Exoteric Science —— The Caterpillar Fungus Teaches Science to the Public

[726] Elman 2005, pp. 341-342, 396-398; Qu and Li 2010, pp. 104-121. For the New Policies reform, see Reynolds 1993; Zhao 2014.

China has a long tradition of observing plants and animals on its own terms. An abundance of knowledge has been continuously accumulated and passed down since antiquity incrementally, forming an open knowledge system with indigenous characteristics.[727] In the Republican period, however, the rise of modern natural sciences based on new ways of looking at the world, and new categories for labelling it, not only presented far-reaching challenges to indigenous knowledge, but also deconstructed the latter's authority. The noted scholar Hu Shi 胡適 (1891-1962), who had studied at Cornell University and Columbia University in America during 1910-1917, wrote on 9 December, 1923 that 'in the recent three decades, a term has obtained a supreme position in China; one dares not look down upon or sneer at it whether one understands it or not, and whether he is fogyish or revolutionary. That term is 'science'.' Hu pointed out that this 'science' enjoyed near unanimous admiration throughout the country.[728] In such an atmosphere, the knowledge surrounding the caterpillar fungus was undergoing reconstruction under the influence of the style of this 'science' as stressed by Hu Shi.

On 11 May, 1913, a set of short articles by Ya Bo 亞波 (probably a Chinese overseas student in Japan), who studied at the College of Agriculture, Imperial University of Tokyo, were published in the 'Ke xue cong hua 科學叢話' (Collected narratives of science) column of *Da tong zhou bao* 大同週報 (Great Harmony Weekly) in Shanghai. The first of these articles was entitled '*Dong chong xia cao zhi zhen xiang* 冬蟲夏草之真相' (Truth about winter worm summer grass). First of all, Ya Bo refutes general accounts of the magical transformation of the caterpillar fungus (Sichuan production) in historical Chinese medical texts in the name of modern standards of truth. He then writes that ordinary eyes experience difficulty in exploring the true facts about the caterpillar fungus, whereas scientific investigation reveal the mycelia infection of the underground butterfly larvae as the true reason for the formation of the caterpillar fungus. To reinforce the authenticity of the new scientific explanation, Ya Bo urges readers interested in natural history to carry out microscopic observations of the caterpillar fungus cells and to compare them with those of animals and plants. In Ya Bo's time, scientific explanations of natural objects and phenomena had far-reaching impacts on

[727] In this respect, Carla Nappi's analysis of Li Shizhen and his great work *Ben cao gang mu* (Compendium of Materia Medica, 1578) provides a specific example, see Nappi 2009.
[728] Hu [1923] 1998, pp. 151-165. The original words are: '這三十年來，有一個名詞在國內幾乎做到了無上尊嚴的地位；無論懂與不懂的人，無論守舊和維新的人，都不敢公然對他表示輕視或戲侮的態度．那個名詞就是'科學''. For Hu's life and thought, see Grieder 1970; Hu and Tang 1981.

the Chinese intellectual community; in many cases, the mere fact of publication in a scientific journal established authority with an audience who were not in a position to replicate the research themselves. For example, in the first edition of *Ci yuan* 辭源 (Origins of [Chinese] Terms, 1915), which has been regarded as the first modern Chinese comprehensive encyclopaedia, the entry on the caterpillar fungus deals only with fungi, insects and parasitism, totally ignoring classical Chinese accounts.[729] This accords with one of the main principles for its compilation, i.e. scientism in the conceptualisation of natural objects.[730] The illustration in the entry on the caterpillar fungus (Fig. 20) shows the fungus growing out of a mature insect rather than a larva. This means that the caterpillar fungus in both the entry and illustration is not the Chinese caterpillar fungus (*Cordyceps sinensis*) but some other species of the genus *Cordyceps*,[731] which also reflects the influence of Japanese scholarship, as we have mentioned before.

Here it is noteworthy that the dissemination of exotic scientific 'truth' in old China did not go smoothly, since the intellectual environment for its dissemination was not uniformly favourable. In the 1910s, several articles on the caterpillar fungus published in journals like *Tong su jiao yu bao* 通俗教育報 (Journal of Popular Education, Shanghai) and *Xin min bao* 新民報 (Journal of New Citizens, Shanghai) totally neglected to introduce any new scientific knowledge.[732] On 4 April, 1924, an author lamented in an article published in *Shen bao* (Shanghai News) that the caterpillar fungus was still popularly considered among the Chinese to be a magical organism capable of transforming between a blade of grass and a worm.[733] And a few days previously, the Chinese painter Zhu Fengzhu 朱鳳竹 published an article on '*bu ke si yi* 不可思議' (the incredible), in *Hong za zhi* 紅雜誌 (Red Magazine) in Shanghai on 28 March, 1924, promoting the transformation theory of the caterpillar fungus on the basis of his observation of the medicinal wonder from Sichuan. Moreover, Zhu strongly asserted that the caterpillar fungus transcended the categories of animals and plants; and when compared with bats, another similar organism that transcended the categories of birds and beasts, the caterpillar fungus no longer seemed so implausible. To induce readers to accept his point of view, like Ya Bo, he confidently suggested that readers should buy samples from drugstores and

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729 Lu 1915, p. 303.

730 Wang 2001, pp. 94, 130-140; Qiao 2010, pp. 109-116.

731 The entry of the caterpillar fungus also says that the infected insects include *lou gu* 螻蛄 (mole cricket), which *Cordyceps sinensis* actually does not infect. Besides, a Chinese author complained in 1937 that the caterpillar fungus he had seen in Xikang (an area roughly covering Eastern Tibet and Western Sichuan) looked somewhat different from that in the illustration when referring to *Ci yuan*, see Shu 1937, pp. 511-513. A continuation of *Ci yuan* was published in 1931, while the entry of the caterpillar fungus remained the same.

732 Anonymous 1913, p. 1; Chai 1915, pp. 33-34.

733 Li [1924] 1983, p. 68.

examine them with their own eyes, for themselves.[734] Obviously, people's perceptions of the caterpillar fungus differed due to the different epistemological assumptions that they had grown up with. And to a significant extent, both Ya Bo and Zhu Fengzhu's views could claim to be verifiable through observation, because what people saw largely depended on what readers believed in advance, especially since there was no popularly accepted standard for analytic comparison between Ya and Zhu's ideas. Nevertheless, although Zhu considered the caterpillar fungus neither an animal nor a plant, he and his followers did not succeed in seeing its creeping root or magic transformation in the field; in contrast, people following Ya's suggestions were able to repeatedly observe fungal cells and other evidence supporting his contentions through a microscope. But as a rule, people living in east China, where the two articles were published, and even natives of production areas, were not in a position to spend a year or more observing the life cycle of the caterpillar fungus in cold alpine environments. This contributed much to the survival of the transformation theory of the caterpillar fungus in modern China.

Fig. 20 Illustration of the caterpillar fungus in *Ci yuan* 辭源 (1915).

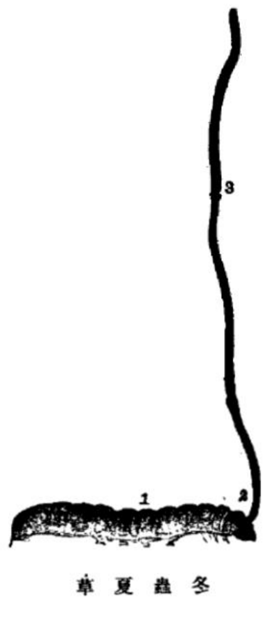

Fig. 21 Illustration of the caterpillar fungus in *Er tong shi jie* 兒童世界 (1928).

From the 1910s onward, many Chinese of different persuasions gradually engaged in the dissemination and production of scientific knowledge of the caterpillar fungus. Those efforts helped

[734] Zhu 1924, pp. 1-6.

enormously in locating such knowledge in the Chinese world. Some Chinese intellectuals placed emphasis on extra-curricular science education for there was a new emphasis on children as the future hope for national rejuvenation. For example, the Shanghai weekly *Er tong shi jie* 兒童世界 (Children's World), established by the writer and historian of literature Zheng Zhenduo 鄭振鐸 (1898-1958) in January, 1922, began to publish popular science writing, in addition to literary fiction, from the first issue of the third volume in 1922.[735] On 6 October, 1928, a popular illustrated science article on the caterpillar fungus (Fig. 21), appeared in the '*Xiao ke xue* 小科學' (Little science) column of this weekly.[736]

Before giving a scientific account of the caterpillar fungus, the author started with the statement that traditional accounts of the worm-grass transformation were disastrously wrong! In addition, he refuted some other popular opinions on similar phenomena, such as the transformation from decayed grass to fireflies, or from spoiled meat to maggots. To convince readers of the fact that one species could by no means change to another species, he suggested that they should cover a piece of meat with a net and then observe if maggots grew on it when it spoiled. Although he drew the readers' attention to the illustration of the caterpillar fungus, he did not describe the three parts marked with three numbers. In fact, if we look carefully at this illustration, we will find that it does not accord with the actual common appearance of the caterpillar fungus, but involves imaginative recreation and artistic licence: both the stroma (denoted by the number 3) and joint (denoted by the number 2) between the worm's head and stroma base are somewhat thinner than they are in reality, whereas the ratio of the stroma's length to the worm's is exaggerated; besides, possibly to facilitate typesetting, the stroma and worm cross almost at a tidy right angle. The author was also probably influenced by Japanese scholarship, even though a larva, rather than the mature insect of the Japanese scientific imagination, is depicted in the illustration. That is to say, the author did not confine himself to the Chinese caterpillar fungus (*Cordyceps sinensis*), which grows out of the larvae of the insects belonging to the Hepialidae family, but also spoke of those growing out of the *lou gu* (mole cricket), *huang chong* 蝗蟲 (locust) and *chan* 蟬 (cicada).

The dissemination of scientific knowledge about the caterpillar fungus through popular print media in eastern China was closely related to its growing popularity as a tonic in that region. Evidently this was an effect of the strong culture of consuming tonics there which prospered as the

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[735] Zheng 1922, pp. 46-47. For Zheng's life, see Chen 1988; Jin and Zhu 1992.
[736] Ren 1928, pp. 33-36.

economy flourished. It was reported in 1934 that the tonic caterpillar fungus, a staple product of Xikang 西康 (an area roughly covering eastern Tibet and western Sichuan), was priced high yet still found much favour with wealthy people in Guangdong, Fujian, Shanghai and Nanjing; and according to the martime customs statistics for Dajianlu (today's Kangding in western Sichuan), the amounts of caterpillar fungus exported from Kangding in 1930, 1931 and 1932 were as high as 24 941, 13 467 and 13 267 *jin*.[737]

Strong consumer demand meant that the caterpillar fungus continued to be exported from production areas to the economically more developed eastern areas of China. This process also stimulated an ever-greater appetite for further knowledge about this curious organism. At the beginning of the 1930s, a Foshan 佛山 author called Pan Jing 潘敬, who had studied in France with financial support from the Qing court and then returned to China before 1911, wrote a note on three famous Sichuan foods, among which was the caterpillar fungus. Representing it as a delicious tonic, he did not offer any criticism, but briefly added some scientific knowledge according to '*jin shi sheng wu xue jia yan jiu jie guo* 近世生物學家研究結果' (recent studies [of the caterpillar fungus] by biologists): the caterpillar fungus was identified as one of the Ascomycetes fungi; it parasitised larvae, and then sprouted from the latter; its nature was the same as that of yeast which was used to brew beer and grape wine; and it was scientifically named 'Cordyceps'.[738] As he associated the caterpillar fungus with yeasts, which also belong to the Ascomycetes fungi, he would have been conflating the fungal nature of both products so that his audience would understand the biological nature of the caterpillar fungus.

Meanwhile in Tianjin, a major coastal port city in north China, lovers of modern science also actively spread scientific knowledge of the caterpillar fungus among the public. Lu Wenyu 陸文鬱 (1888-1974), a painter enthused with microscopic images and their reproduction who worked at the public educational institution Guang zhi guan 廣智館 (Institution for Spreading Wisdom), published a note in the *Guang zhi xing qi bao* 廣智星期報 (Weekly for Spreading Wisdom) in 1932.[739] Lu first speaks of a man who gave some specimens of the caterpillar fungus from Sichuan to the institution, although he does not accept the latter's account of its oddities and narrow

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737 Anonymous 1934, p. 12. See also Anonymous 1936, p. 74. For the establishment of Xikang as a province and changes in its territory, see Huang 2001, pp. 95-100. 1 *jin* was then equal to 500 grams.

738 Pan 1931, p. 131. For Pan Jing's life, see Ou *et al*. [1934] 1987, p.1142; Pan 1931, pp. 19-20; Zhang and Yu 2013, pp. 142, 150.

739 Lu 1932, pp. 4-6. For Lu's life, see Wang 1983, pp. 82-88; Lu 1989, pp. 166-188. Guang zhi guan and *Guang zhi xing qi bao* were established in Tianjin in January, 1925 and January, 1926 respectively, see Liu 1985, pp. 192-196; Lai and Guo 2001, p. 636.

distribution. In order to inform people of some '*chang shi* 常识' (common knowledge) about the caterpillar fungus, he wrote this note, referring to Matsumura Jinzou's 松村任三 (1856-1928) *Shoku butsu mei i* 植物名彙 (Collection of Botanical Terms), Nishimura Suimu's 西村酔夢 (1879-1943) *Semi no ken kyuu* 蝉の研究 (A Study of Cicada) and the German botanist Adolf Engler's (1844-1930) system of plant classification.[740] In addition to the taxonomic position and scientific name (i.e. 'Cordyceps sinensis Sacc.') of the caterpillar fungus, Lu also briefly introduces a few other fungal species of the same genus. At the end of the note, he mentions the medical and culinary uses of the caterpillar fungus in China, and further recalls his brother's experience of eating steamed caterpillar fungus at table in Sichuan, and particularly refers to the caterpillar fungus/duck food recently marketed by the Guan sheng yuan food company. Like Pan Jing, Lu Wenyu obviously acknowledged the authority of scientific knowledge within a popular scientific context. Both Pan and Lu also highlight the role of the caterpillar fungus in the material life of the Chinese.

The above cases of the caterpillar fungus are representative of the phenomenon that understandings of nature were under reconstruction in the wider context of Chinese society through the outreach activities sponsored by scientific institutions. The drive towards reconstruction was partly derived from the dynamic indigenous culture of interest in natural objects, especially foods and medicinal substances. In the 1930s and 1940s, scientific knowledge about the caterpillar fungus continued to be spread among the public. Examples can be found in, but are not confined to, the Beijing daily newspaper *Shi jie ri bao* 世界日報 (World Daily, 1936),[741] the Shanghai monthly journal *Zhi shi hua bao* 知識畫報 (Knowledge Pictorial, 1937),[742] the Shanghai bimonthly journal *Guo xun* 國訊 (National News, 1937),[743] and the Shanghai weekly *Jue qun zhou bao* 覺群週報 (Waken the Public Weekly, 1946).[744] The last was in fact a Buddhist journal. From a geographical perspective, the above popular scientific stories about the caterpillar fungus were produced in the north and eastern coastal China, especially Shanghai.

4.2.3 Rise of Scientific Research —— The Caterpillar Fungus Employs Scientists

[740] Lu did not give specific editions of these literature. Matsumura's *Shoku butsu mei i* was first published in 1895, see Matsumura 1895. Nishimura Suimu's *Semi no ken kyuu* was published in 1909, see Nishimura 1909. For Engler's life and his classification system, see Rehder 1937, pp. 497-500; Lack 2000.
[741] Xiao 2016, p. B6.
[742] Anonymous 1937, pp. 26-27.
[743] Zhu 1937, p. 100.
[744] Zhiren 1946, p. 9.

Mycological Studies

In contrast with popular science articles or notes, serious scientific publications usually communicated more abstruse but also more scholarly and authoritative scientific knowledge; it is here in these articles and books that we can find Chinese records of European mycology introducing the post-Linnean European hierarchies of classification that were based on affinities between species. Both popular and scientific literature made contributions to the promotion of scientific literacy despite their different target audiences. Scientific mycological studies conducted by the Chinese can be traced to this time in the mid-1910s.[745] Chinese mycologists had begun to collect specimens of the caterpillar fungus by the late 1920s. In 1932, Deng Shuqun 鄧叔群 (1902-1970, born in Fuzhou) published a paper on his identifications of some fungi in southeastern areas of China, among which were specimens of 'Cordyceps sinensis (Berk.) Sacc.' obtained from a drugstore in Sichuan in 1928. Deng remarked that at that time the caterpillar fungus sold in most drugstores in China came from Sichuan.[746] The scientific name given by Deng consists of the genus name 'Cordyceps', specific epithet 'sinensis', basionym author 'Berk.', and authority of the new combination, i.e. 'Sacc.'. Here the so-called 'scientific name' is just a synonym for the Latin binomial of a species, and demonstrates the equation of Latin with scientificity. And 'Berk.' and 'Sacc.' refers to the appropriation of the caterpillar fungus by British mycologist Miles J. Berkeley (1803-1889) and the Italian mycologist Pier A. Saccardo (1845-1920) who, as mentioned before, named and renamed the caterpillar fungus. Again, the new biological science gains its authority through its association with the attribution with European *names*, and European scientists, so that whether or not the Chinese readers were fully familiar with, and trained in the scientific methods of mycology, the rhetoric of power was framed as definitively Latin, and in the European tradition, and not Chinese. Given that Deng published his identifications in English, he clearly did so for the reason that he intended to communicate with his international colleagues. Certainly he had the ability and/or motivation to write English research articles, as he had studied at Cornell University from 1923, and pursued a doctorate in plant pathology there during 1925-1928.[747] Deng's English research article and the

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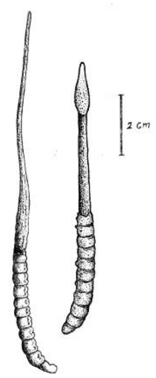
745 Wang 1985, pp. 133-140; ZGZWXH 1994, pp. 325-326.

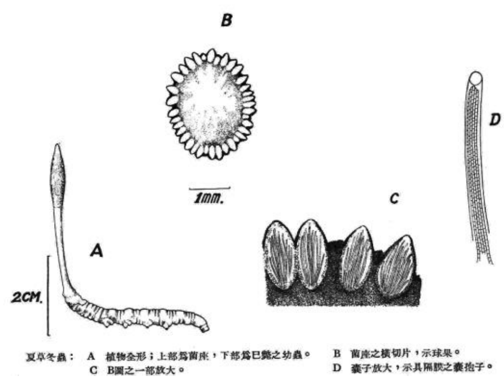
746 Teng 1932, pp. 1-4. This paper was published in the journal *Contributions from the Biological Laboratory of the Science Society of China: Botanical Series*. This journal was established in Nanjing in 1930, see Zhang 2005, p. 219; Ma 2011, p. 286.

747 For Deng's life and publications, see Hong 1992, pp. 463-467; Anonymous 2002, p. 465; Deng 2002, pp. 107-109. Deng completed his Master's thesis on Chinese forest conditions at Cornell University in 1926, see China Institute in

journal *Contributions from the Biological Laboratory of the Science Society of China: Botanical Series* were aimed at professional scientists rather than general readers.

As a pioneer in the investigation of the fungal resources and plant pathogenic fungi of China, Deng Shuqun's research was institutionalised in universities and scientific institutes from when he returned from America to China and began to hold a teaching position at *Ling nan da xue* 嶺南大學 (Lingnan University, Guangzhou) in 1928.[748] In 1934, he published another English article in which he reported his identifications and descriptions of 42 species of fungi, including the caterpillar fungus (Fig. 22).[749] This time he gave more detailed descriptions of its production areas and natural habitat, and also macroscopic and microscopic structural characteristics of its stromata, perithecia and spores, referring to the authority of European scientific publications. Such microscopic descriptions, which could be used by other mycologists to accurately determine whether or not a fungus was the caterpillar fungus, had been absent from his 1932 article. The specimens for his identification of *Cordyceps sinensis* were bought by him from a drugstore. Although he did not show the microscopic characteristics of the spores and mycelium in his illustration of the specimens, he used black-and-white dots and lines to represent the three-dimensional appearance of the fruiting bodies of the specimens. This mode of representation, helpful in showing different shades of grey, had become popular in illustrated scientific publications.[750] To give viewers an impression of the actual sizes of the specimens, Deng added a scale bar to the illustration. For the first time in China we begin to see a concern for measuring the specimens, but otherwise there is no depiction of the microscopic knowledge that he writes of.





America 1927, p. 33.

748 Deng *et al*. 2011, pp. 60-77; Zhang 2013, pp. 28-30.

749 Teng 1934, pp. 269-298. His article was published in *Sinensia: Contributions from the National Research Institute of Biology*, a journal established in Nanjing in 1929, see Ma 2011, p. 286.

750 Wood and McDonnell 1994, pp. 31-46.

Fig. 22 The Chinese caterpillar fungus illustrated by Deng Shuqun (1934).

Fig. 23 The Chinese caterpillar fungus illustrated by Pei Jian (1947).

Deng's identifications and descriptions in the above 1934 article were later revised and integrated into his 1939 English monograph entitled *A Contribution to Our Knowledge of the Higher Fungi of China*.[751] As the first monograph on mycology written by a Chinese scientist, it soon became a key reference for Deng's international colleagues.[752] It was completed during the Japanese invasion of China,[753] with his patriotic sentiments explicitly expressed in his preface. Following the outbreak of the full-scale Sino-Japanese War in 1937, Deng transferred more than 2000 of the collected specimens of Chinese fungi to the National Fungus Collections (BPI) and to Cornell University, both in America for safe and good preservation.[754] His monograph in English and the specimens preserved in America without question facilitated the sharing of Chinese mycologists' knowledge of fungal biodiversity.

Here it is worth noting that, whenever describing the caterpillar fungus, Deng never omitted to mention the connection of his mycological research with the caterpillar fungus's identity as a medicinal substance in classical Chinese *materia medica*. This indicates the subtle influence of indigenous medical culture on Chinese scientists' research. This example is also evidence of the wider observation that the globalisation of modern scientific knowledge has always been infused with considerations based on local history, culture and knowledge hierarchies.[755] Further examples are to be found in two of the earliest scientific studies of fungi by Chinese authors: Wang Huanwen's 王焕文 (1882-?) study of the biology and medicinal chemistry of *fu ling* 茯苓 (*Pachyma cocos*) of 1909 and Wu Bingxin's 吳冰心 treatise on the biology and experimental cultivation of *bai mu er* 白木耳 (snow fungus, *Tremella fuciformis*) of 1914.[756] Both start by discussing the roles of the two kinds of fungi in Chinese medicine and food traditions. The latter were important non-scientific

751 For the caterpillar fungus in this monograph, see Teng 1939, p. 36.
752 Chilton *at al*. 1943, p. 142.
753 For the Japanese invasion of China, see Lei 1932; Hardy 1966; Hsü [1970] 2000, pp.545-618. For a historiographical review of the Sino-Japanese War, see Gordon 2006, pp. 137-182.
754 On 13 April, 2009, Cornell University decided to send back the specimens to the Institute of Microbiology, Chinese Academy of Sciences; and 2278 of them returned to China on 7 November, 2009, see Hodge 2005, p. 3; Anonymous 2009, pp. 11-13.
755 Fan 2007, pp. 524-538; Elshakry 2008, pp. 701-730; Raina 2012, pp. 345-366.
756 Wang 1909, pp. 461-472; Wu 1914, pp. 48-51. Here the scientific names for *fu ling* and *bai mu er* are extracted from the original publications. For Wang's life, see Cao 2002, pp. 394-395. Wu's life remains unclear, but it is known that he was one of the founders of the 'Zhong hua bo wu yan jiu hui 中華博物研究會' (Chinese Society for the Study of Natural History, Shanghai), see Yao *et al*. 2006, pp. 285-291.

factors that motivated Wang and Wu to conduct their research.

In return, fresh scientific knowledge would also feed back into the exoteric science of the time. In 1947, Pei Jian 裴鑑 (1902-1969), a research fellow of the Institute of Botanical Studies, Academia Sinica, pointed out that the caterpillar fungus and snow fungus were often mentioned in tandem when Chinese people spoke of tonics suitable for everyone. For the purpose of introducing up-to-date scientific knowledge of the two tonics, he published a Chinese article in the popular science magazine *Ke xue shi jie* 科學世界 (Scientific World) in Shanghai.[757] In it, he briefly cites a few Qing records about the medicinal properties of the caterpillar fungus, and then refers to Deng Shuqun's 1930s descriptions of specimens, together with his personal knowledge. Moreover, he contributes an illustration of new specimens of this fungus (Fig. 23). But the measurements he gives for different parts of the caterpillar fungus are all ten times larger than in reality, e.g. the length of the stroma is said to be 4 to 11 decimetres, when it should actually be 4 to 11 centimetres. Oddly, the scale bar in the illustration is accurate. In contrast with Deng's illustration which just displays the appearance of entire specimens of the caterpillar fungus, Pei's additionally shows the anatomical and microscopic structures such as the transverse section and asci. Pei's version can therefore be considered an improvement on Deng's illustration even though it was printed in a popular science magazine.

To sum up, whenever Deng Shuqun and Pei Jian wrote in professional and popular publications they ignored any reference to traditional ideas about the caterpillar fungus's transformational ability and its entity as a grass-worm combination, and promoted knowledge about its fungal nature, microscopic characteristics, and position in the hierarchical Linnaean taxonomic system, including data that aspired to accurate measurement. This represented a tentative paradigm shift in the way of observing and describing the caterpillar fungus, reflected in Deng and Pei's image-making. However, the terms and language they employed also embodied the pervasive rhetoric of power about modern science. Nevertheless, they additionally gave certain attention to the fungus's medicinal value or properties recognised by classical Chinese *materia medica*. In this sense we see both rupture and continuity in indigenous knowledge about Chinese medicinal substances in the community of Chinese scientists.

[757] Pei 1947, pp. 102-104. For an introduction to this magazine, see Tao and Luo 2010, pp. 90-93. Pei Jian obtained his PhD in Botany from Stanford University in 1931. For his life, see Lou 1995, pp. 137-147.

With Chinese overseas students of pharmacology and related subjects such as chemistry and biomedicine continuously arriving from Europe, America and Japan from about the 1900s/10s, scientific research surrounding medicinal substances gradually began to prosper in modern China. And to a large extent, such research developed on the basis of reexamining Chinese medicinal substances and related historical indigenous knowledge.[758] Biochemical studies of the caterpillar fungus were conducted in the mid-1940s when the Sino-Japanese War was coming to an end. They emerged somewhat later than those of *fu ling* (*Wolfiporia cocos* (Schwein.) Ryvarden & Gilb.), *bei mu* 貝母 (*Fritillaria* spp.) and some other fungal and plant medicinal substances that had also long been used in China.[759] In 1945 the *Zhongguo yao xue hui hui zhi* 中國藥學會會志 (Bulletin of the Chinese Pharmaceutical Association, Chengdu) published a 'preliminary study' of the caterpillar fungus by Tang Tenghan 湯騰漢 (1900-1988) and two other authors.[760] The expression 'preliminary' also implies that research on this topic in China had hitherto been absent or scarce before. At that time Tang was professor of medicinal chemistry at the *Hua xi xie he da xue* 華西協和大學 (West China Union University, Chengdu); and prior to this, he obtained his PhD in chemistry from the University of Berlin in 1929.[761] Tang and the other authors first determined the content of water (10.84%), fat (8.40%), crude protein (25.32%), crude fibre (18.53%), carbohydrate (28.90%) and ash (4.10%) in the fungus, further analysed the content of unsaturated and saturated fatty acids (13.00% and 82.2%), and then investigated physical and chemical properties of the acicular crystals extracted from the fat, and the amino acids from hydrolysed protein. Obviously, their research on the caterpillar fungus focused on constituent analysis, which laid a foundation for exploring the biological functions of the chemical constituents of the caterpillar fungus.

In 1948, Yang Shoushen 楊守紳 (1900-1984), principal of the *Lu jun shou yi xue xiao* 陸軍獸醫學校 (Military Academy of Veterinary Medicine) in Chengdu, reported his preliminary study of the *dong chong xia cao jun su* 冬蟲夏草菌素 (Cordycepin) in the *Guo fang ke xue jian bao* 國防

758 JYBZGJYNJBSWYH 1934, pp. 16, 18, 86, 132, 134, 137, 143-146; Chen and Zhang 1992, pp. 120-137.
759 Liu 1963, pp. 98-104, 188-190, 460-463, 557-564.
760 Tang *et al*. 1945, pp. 1-4. For the development of the Chinese Pharmaceutical Association and its publications in the first half of the 20th century, see Cao 1991, pp. 689-691; ZGYXH 2008, pp. 1-34.
761 For Tang's life, see Cai and Lu 1981, pp. 43-45; Lou 1995, pp. 118-126; SDSZXWSZLWYH 1998, pp. 233-234. *Hua xi xie he da xue* was a mission university founded in Chengdu in 1910, see Zhang *et al*. 2001, p. 710; Potts 2003, pp. 73-74.

科學簡報 (Bulletin of Defence Science, Nanjing).[762] This study was conducted according to his hypothesis that *Cordyceps sinensis* must have generated some substance that inhibited the growth of other kinds of microorganisms in the larvae responsible for its development into a mature insect. He successfully extracted a fat-soluble light yellow crystal by means of chemical methods from specimens of the caterpillar fungus produced in Lijiang, Yunnan province. The crystal, which was then named 'Cordycepin', melted at 96 ℃. Furthermore, Yang carried out in vitro experiments on Cordycepin to determine its antibacterial properties. As a result, he found that Cordycepin demonstrated different degrees of resistance to streptococcus, *Pseudomonas mallei*, anthrax, haemorrhagic septicaemia, and *Staphylococcus* sp. He went on to inject animals with varied doses of a solution of Cordycepin in water, with two concentrations for rabbits and dogs. The injections did not produce abnormal responses and thus provided preliminary proof of the nontoxicity of Cordycepin. According to Yang's conclusion, he hoped that this study would make a contribution to research on issues relating to bacterial infections in animals rather than humans. At the same time, he also pointed out deficiencies in his study; in particular, the chemical formula for Cordycepin remained unknown, and in vivo antibacterial experiments had not been carried out. In contrast to Tang Tenghan's study, Yang did not place emphasis on constituent analysis but on pharmacology. His practical aim was probably to lay a foundation for solving some veterinary issues that would affect the breeding and supply of domestic animals in armies and/or ordinary people, which were also social issues. Although his theoretical speculation involving fungi and its antibacterial effects was based on modern biological knowledge, we cannot say that the occurrence of the caterpillar fungus in the community of Chinese scientists had no direct or indirect relation to historical or contemporary Chinese medicine and consumer culture.

From the above investigations we can also see that new practices of scientific or biomedical research into Chinese medicinal substances were institutionalised in the Republican period. Some foreign scientists in China also conducted related studies in research and education institutions. Among these people, Dr. Bernard E. Read (1887-1949), who arrived in Beijing in 1909, was an outstanding figure.[763] His most representative studies of Chinese medicinal substances were carried out at Peking Union Medical College in the latter 1920s and early 1930s.[764] He was also one of the

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[762] Yang 1948, pp. 711-717. For Yang's life, see BKBJB 1984, p. 56; ZGXMSYXH 1992, p. 387.
[763] For Bernard E. Read's life and publications, see Schwarz 1950, pp. 216-217; Walravens 2012, pp. 481-516.
[764] For Bernard E. Read's activities in China, see Liang 2012, pp. 370-389; Liang 2014, pp. 108-120. The Peking Union Medical College, established with financial support from the Rockefeller Foundation in 1917, is widely

nine censors of the *Zhong hua yao dian* 中華藥典 (Chinese Pharmacopoeia, 1930), the sole national pharmacopoeia of Republican China, devoted to '*xin yi* 新醫' (new/scientific medicine).[765] As Mary B. Bullock remarks, 'some at PUMC had been active in assessing the chemical properties of traditional Chinese drugs, and perhaps no one person contributed more to their understanding prior to 1950 than Bernard Read, Professor of Pharmacology.'[766] One of Read's best known publications was *Chinese Medicinal Plants from the Pen Ts'ao Kang Mu*.[767] This book deals with hundreds of medicinal plants recorded in the *Ben cao gang mu* (Compendium of Materia Medica, 1578). However, what Read did in this book was not to translate or interpret ancient records as he had done elsewhere, but instead he reconstructed modern knowledge of these plants mainly by listing their species identities, botanical synonyms and chemical constituents on the basis of copious European, American and Asian secondary sources. Read's effort represented the pursuit of new frameworks and approaches dedicated to arranging and exploring natural knowledge about Chinese medicinal substances as they were emerging in leading research and educational institutions in Republican China.

Certainly, the participation of the Chinese themselves was indispensable to rooting modern science in China. In this regard, educational institutions remained important places for creating, exchanging and disseminating scientific or biomedical knowledge of Chinese medicinal substances. According to the first China education yearbook (1934), there were eight medical universities/colleges in Republican China before 1934; in 1918 and 1925, there were ten and nine specialist schools of medicine respectively.[768] Later, the second China education yearbook (1948) reports that at the end of 1947, there were sixteen medical colleges and nine specialist schools of medicine in China.[769] The institutions in these statistics produced by the Ministry of Education were all biomedical rather than Chinese medical educational institutions. Most of them offered courses on

considered the most prominent medical colleges in Republican China, see Choa 1990, p. 225. For the history of the Peking Union Medical College in the Republican period, see Bowers 1971; Bullock 1980.

765 Liu 1931, p. 78. Read's Chinese name 'Yi Boen 伊博恩', together with the other eight Chinese censors' names, were printed on a page before the main text of the Pharmacopoeia. Read also published some scholarly articles related to the Pharmacopoeia, see, for example, Pak and Read 1931, pp. 125-133. For the content and compilation of the Pharmacopoeia, see WSB 1930; Yu *et al*. 1930, pp. 23-36; Meng 1953, pp. 430-431. For a brief introduction to this pharmacopoeia, see Xue 1984, pp. 478-482; Unschuld 1986, pp. 261-266; Chen and Zhang 1992, p. 167.

766 Bullock 1980, pp. 223-224.

767 Read 1936. Information about the first edition of this book is rare. Here I refer to the third edition (1936). The second edition of this book was reportedly published in 1927, see Liang 2012, pp. 370-389.

768 JYBJYNJBSWYH 1934, pp. 16, 18, 86, 132, 134, 137, 143-146. Cf. Ruan 1924, pp. 1843-1848; Anonymous 1925, pp. 126-128.

769 JYBJYNJBZWYH 1948, pp. 89-99.

materia medica, while a few of them were even specialist schools of *materia medica*.[770] Here it is important to mention the Guo li yao xue zhuan ke xue xiao 國立藥學專科學校 (National Specialist School of Materia Medica). As the first and only national school of materia medica in modern China,[771] it was of particular significance to scientific studies of Chinese medicinal substances from the late 1930s onwards.

The National Specialist School of Materia Medica was established through the efforts of Meng Mudi 孟目的 (1897-1983) and others commissioned by the Ministry of Education in July, 1936. Before this, Meng studied at the School of Pharmacy, University of London, during the period 1921-1925, finally obtaining his BSc in pharmacy.[772] He became one of the five editors of the *Zhong hua yao dian* (Chinese Pharmacopoeia) in 1929, principal of the School in 1936, and president of the *Zhongguo yao xue hui* 中國藥學會 (Chinese Pharmaceutical Association), the most influential organisation for scientific studies of medicinal substances in China, in 1948.[773] Due to the Sino-Japanese War, this school had to move from Nanjing to Hankou (October, 1937) and then Chongqing (February, 1938). It remained in Chongqing until July, 1946, when teachers and students started to return to Nanjing.[774] Soon after that, in August, 1947, the new principal Meng Xinru 孟心如 (1903-1947) published an article putting forward four missions for the School:

> First, to explore the effective constituents in special Chinese medicinal substances, extract and refine them, establish their physiological and pathological effects, and then introduce them to the global medical community; second, to reproduce and invent synthetic drugs; third, to publish academic articles and series of popular books on *materia medica* so as to improve our Chinese people's knowledge of *materia medica* and convey general knowledge [of *materia medica*] to people from all walks of life in China; fourth, to establish links with world famous institutions of *materia medica* for the purpose of communicating with each other and interchanging ideas and information. (一，探求我國特產藥材之有效成分，提取，精煉，證定其生理及病理上之效用，介紹於全球醫藥界；二，研究合成藥物之仿製及發明；三，刊行專門論文及通俗藥學智識之叢書，以期提起國人對於藥學之認識，及灌輸一般常識於全

[770] Chen and Zhang 1992, pp. 110-111. For a specific example of such specialist schools, see JYBJYNJBZWYH 1948, p. 301; Yang 1994, pp. 181-182; SXSDFZBZWYH 1996, p. 555.
[771] Dai 1990, pp. 747-750.
[772] For Meng's life, see Yuan and Xie 1981, pp. 22-25; Shou 2011, pp. 2636-2639.
[773] ZGYXH 2008, pp. 32-24, 223-224.
[774] ZGDELSDAG 2000, pp. 307-309

國各界人士; 四, 與世界著名藥學機構取得聯繫, 俾能互相溝通, 求得切磋之功效.)[775]

Meng Xinru entered the University of Berlin in 1920, and later obtained his PhD in chemistry from this university in 1925.[776] The above mission statement shows his global vision and special attention to re-exploring the medical value of Chinese medicinal substances by means of scientific approaches. The regard he shows for both cutting-edge studies and science communication also embodies his dual roles as a medicinal chemist and educator. The school led by Meng had two faculties, i.e. Yao xue zhuan ke 藥學專科 (Faculty of materia medica) and Gao ji yao ji zhi ye ke 高級藥劑職業科 (Faculty of advanced pharmacy for vocational work). Oriented to high school and junior high school graduates respectively, the two faculties laid emphasis on training researchers and senior technicians. From the perspective of the Republican government, the establishment of this national school doubtless reflected the government's advocacy of scientific studies of medicinal substances. Fortunately, this school survived the Chinese Civil War (1945-1949), and became a precursor of today's Zhongguo yao ke da xue 中國藥科大學 (China Pharmaceutical University, 1986-).[777] In a sense, this school is still alive, and continues to make a significant contribution to scientific research on Chinese medicinal substances.

4.2.4 Summary

As we saw in Chapters 1 and 3 Euro-American missionaries had initiated the transplantation of European science into modern China, as well as the criticism of 'unscientific' indigenous Chinese medicine, *materia medica* and even all aspects of Chinese learning. Through the Self-Strengthening Movement and New Governance Reforms, the Chinese state actively promoted the introduction of modern science and technology to late Qing China. At the beginning of the 20th century, scientific knowledge of the caterpillar fungus started to enter the Chinese world through Chinese translations of relatively new Japanese literature. This process, initiated by Japanese translators and their Chinese sponsors, was accompanied by criticisms of indigenous Chinese perceptions of the caterpillar fungus,

775 Meng 1947, pp. 1-4.
776 CZSDFZBZWYH 1995, p. 981. His date of birth was 1903 rather than 1902. This can be confirmed by his epitaph recently discoveredin Nanjing. The historian Meng Sen 孟森 (1868-1938) was his father, see Meng [1937] 2007, p. 481.
777 Ji 1992, pp. 530-534.

especially the worm-grass transformation theory that had long been prevalent in East Asia. The criticisms can be seen as a continuation of the 19th-century missionaries' critique.

Soon after, Chinese intellectuals began to involve themselves in the popularisation of scientific knowledge about the caterpillar fungus; special attention was also paid to female readers and children for the purpose of promoting scientific literacy among the public, and in the growing generation. Against the background of nationalist movements to save what they perceived to be a degenerating Chinese 'race',[778] students trained abroad returned to their homeland enthused with the new scientific enterprise and paid special attention to new analyses of native substances. They promoted mycological studies of the caterpillar fungus (*Cordyceps sinensis*) from the 1930s, and biochemical and pharmacological studies of this fungus from the 1940s. Meanwhile, new scientific knowledge produced in China was published in English, which in turn facilitated its transmission into the wider world. From this case study of the caterpillar fungus it can easily be seen that the scientific knowledge transmitted to and produced in modern China was also engaged, consciously or unconsciously, in the construction of new scholarship on Chinese medicinal substances. This process obtained support from the Nationalist government (1927-1949). As the medicinal value of the caterpillar fungus had never been the focus of criticisms, this practical factor had the potential to increase communication between those working in the fields of modern science and indigenous Chinese *materia medica* rather than exacerbate conflict. In this context we see no rupture between the ancient and the modern, but rather continuity in empirical innovation. For scientists, however, Chinese medicinal substances such as the caterpillar fungus, first of all, were objects from a newly classified 'nature'; their identity as raw medicinal substances and indigenous empirical medical knowledge about them became a cultural legacy (rather than constituents of natural sciences) that was able to motivate the scientific study of nature. Such a hidden conception, still prevailing among scientist-authors in contemporary China,[779] reflected a conceptual divide between an objectified nature in the practice of science and a subjective culture mediated by social norms. But this divide, characteristic of modernity, actually did not really exist in modern scientific practice since, as we have demonstrated, scientists' work was often more or less interwoven with cultural or social factors, and was dependent on historical experience for its hypotheses; and thus as historians we cannot distinguish between such an essentialised subject and object.

[778] Minehan 2014, p. 162.
[779] See, for example, Fang 2007, pp. 1-4.

4.3 The Caterpillar Fungus Engages in Saving Chinese Medicine

On 27 December, 1899, the *Shen bao* (Shanghai News) published a series of examination topics that had been used to test the students at Qiu zhi shu yuan 求志書院 (College of Nurturing Ambitions, Shanghai). To assess their academic performance in the subject of *ci zhang* 詞章 (literature), they were required to write a composition with the title 'Dong chong xia cao ge 冬蟲夏草歌' (Eulogy of the caterpillar fungus).[780] *Shen bao* did not simultaneously provide a writing sample. So, what did the examiner intend the students to praise? To my mind, it is highly unlikely to have been the aphrodisiac or tonic potencies of the fungus, which were probably irrelevant to an examinee nurturing young students' *zhi* 志 'ambitions' within the moral environment of the late nineteeth century. Considering that China was at that time undergoing a painful social and political upheaval, perhaps the caterpillar fungus, as a marvel of transformation, had a heightened significance for intellectuals who did not want their old country to fall into decline or perish altogether. Most probably the examiner had, consciously or unconsciously, been drawn to the caterpillar fungus for the way in which it acted as a metaphor for the immortality of China, and for its ability to model the potential for continuing transformation.

In addition to serving as spiritual ballast, the caterpillar fungus was even used as a pen name by an author who satirised the domestic '*xin sheng huo* 新生活' (new life) under the governance of the Chinese Nationalist Party on the eve of the full-scale outbreak of the Sino-Japanese War.[781] Possibly this pen name implied the writer's hopes for social transformation. Soon after the Sino-Japanese War, another Chinese author subtly mocked the poor performance of the government during the famine of 1946, and wrote that the caterpillar fungus could be a saviour of thirty million hungry people; for although the grass roots in some regions had been eaten up by starving people in spring, the caterpillar fungus could still generate grass for them to eat in the forthcoming summer.[782]

Certainly the caterpillar fungus was attractive for many different reasons, as well as an important commercial product. In modern China, especially Republican China, the latter two identities enabled it to engage in saving patients, the declining fortunes of Chinese medicine, and

[780] Anonymous [1899] 1985, p. 834. The Qiu zhi shu yuan was established in Shanghai in 1876, and closed down in 1905, see Ma *et al*. 1992, p. 342.
[781] DCXC 1936, pp. 9-12.
[782] Hu 1946, pp. 28-30.

even the weakened nation. The dissemination and exploitation of the caterpillar fungus never ceased in the Republican period, but perceptions of it in those parts of society dedicated to renewing the Chinese nation, as suggested before, were changing in complex ways. Compared with scientists and advocates of science or scientific medicine, traditional physicians should receive equal or even more attention in this regard, as their new understandings of Chinese medicinal substances had a direct and profound influence on the prospects of Chinese *materia medica* and medicine.

4.3.1 Domestic Circulation of the Caterpillar Fungus

During the Republican period, the central government promulgated three regulations and one national pharmacopoeia devoted to the regulation of medicinal substances and medicine men in Chinese society.[783] Basically, they were products of the trend toward globally unified standards for medicinal substances and formulae.[784] While the internal cause of the creation of the regulations and pharmacopoeia was the uncontrolled domestic manufacture, sale, and use of medicinal substances, especially during the Nationalist era (1928-1949).[785] However, '*zhong yao* 中藥' (Chinese medicinal substances) or '*jiu yao* 舊藥' (old [Chinese] medicinal substances), as called by makers of the regulations and pharmacopoeia, were marginalised or unequally treated to varying degrees.[786] Compared with the Beiyang government (1912-1927), the Nationalist government imposed more restrictions on Chinese medicinal substances through the above regulations and pharmacopoeia, although it temporarily softened the restrictions during the Sino-Japanese War, mainly due to shortage of medicinal substances and financial crises.[787] However, there was a substantial gap between expectations and realisation in the state regulation of medicinal substances before 1937. The

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783 They were 'Regulations on Drug Merchants' (管理藥商章程, 10 October, 1915), 'Regulations on Medicine Men' (管理藥商規則, 24 Aug., 1929; revised on 16 Feb., 1944), 'Regulations on Non-Prescription Medicinal Substances' (管理成藥規則, 26 Apr., 1930; revised on 8 Dec., 1936 and 16 Feb., 1944), and '*Chinese Pharmacopoeia*' (中華藥典, 1930), see NWB 1915, pp. 40-46; WSB 1929a, p. 5; WSB 1929b, pp. 59-62; WSS 1944b, pp. 4-6; WSB 1930a, pp. 53-54; WSB 1930b, pp. 124-126; WSS 1936, pp. 49-51; WSS 1944c, pp. 3-4; WSS 1944d, p. 2; WSS 1944e, p. 6; WSB 1930. Cf. WSB 1930c, pp. 5-6; GDSZF 1936, pp. 106-107; Zhang and Xian 1990, p. 209. Currently there are just a few brief reviews of some of the regulations, see Deng and Cheng 1999, pp. 342-343; Chen 2011, pp. 76-79; Fan 2012, pp. 61-65. Here my emphasis is placed on common medicinal substances rather than narcotics. For the regulations on narcotics in Republican China, see NWB 1915, pp. 40-46; GMZF 1929, pp. 46-48; WSB 1930d, pp. 129-138; GMZF 1931, pp. 1-3.

784 Anonymous 1881, pp. 326-327; Power 1903a, pp. 1-13; Power 1903b; Buck 1903; Anonymous 1909; Anonymous 1922, pp. 187-239; Gao 1927, p. 1; Anonymous 1931; Anonymous 1939, pp. 1-31; Urdang 1951, pp. 577-603; Atwater 1952, pp. 320-321; Bevans 1968, pp. 568-574; Bewley-Taylor 1999, pp. 16-53.

785 WSB 1929c, p. 63; WSB 1929d, pp. 49-50. Cf. Zhang 1976, p. 605; Zhang 2011, pp. 145-154; Pi 2013, pp. 149-164; Zhang 2014, pp. 189-247.

786 Lu 2017, pp. 142-152. Cf. ZGYCGS 1995, p. 6; GJZYYGLJZHBCBWH 1999a, p. 2; NJZYYDX 2006, p. 1.

787 Wen 2007, pp. 102-108. For the state of national finance in Republican China, see Yang 1999, pp. 90-105.

reasons for this phenomenon mainly included the resistance of medicine merchants, the Ministry of Health's unwillingness to compromise, and local governments' dereliction of duty.[788] After that year, the whole country was engaged in resisting a full-scale Japanese invasion. The Nationalist government was also unable to impose a more effective control of the manufacture, sale and use of medicinal substances in wartime China.[789] These circumstances actually created a certain space for the ongoing use of Chinese medicinal substances in society at large.[790] In particular, as in many cases a Chinese medicinal substance (like the caterpillar fungus) could also be used as a food or culinary ingredient, its use and sale could thus also circumvent the state regulation of medicinal substances, just as it does today in contemporary Europe.

Explicit records of the caterpillar fungus being produced in today's Tibet remain rare before the end of the 19th century. But from the beginning of the 20th century onward, the caterpillar fungus in Tibet began to be briefly recorded as a medicinal product in local chronicles.[791] Appendix 5 lists such records in Republican local chronicles,[792] which can be seen as a result of a growing local attention to its medicinal or/and commercial value. From a geographical perspective, the caterpillar fungus in these records was almost all produced in today's Eastern Tibet; when it was transported eastward, it had to first pass through Sichuan, Yunnan and Qinghai provinces. In contrast, explicit records of production areas of the caterpillar fungus in Qinghai first appeared as late as the early Republican period. For example, according to an investigation of Yushu 玉樹, Qinghai in 1919, the caterpillar fungus was a special export product of some places (e.g. Zhawu 紮武) in Yushu; at that time many people were collecting the fungus there and trading with Chinese merchants; the collection activities there even bred discontent among local headmen, who thought that the 'pulse' of the land was thus being broken by the impact of medical consumerism, and many flocks and herds were dying in consequence.[793] It is clear that a significant percentage of the Chinese merchants came from Shaanxi.[794] The records indicate that trade in the caterpillar fungus contributed much to the local economy in Yushu despite tension between local headmen and merchants. Production of the caterpillar fungus in today's Tibet and Qinghai was being actively and profitably exploited in the

788 Anonymous [1923] 1983, p. 199; GDSZF 1936, pp. 106-107; Ma 1937, pp. 106-107. Cf. WSB 1930e, pp. 63-64; ZJSMZT 1930, pp. 291-293; Anonymous 1930, pp. 9-10.
789 Cf. Watt 2013, pp. 115-158.
790 For example, medicinal substances prepared according to ancient Chinese prescriptions were even publicly advertised in the newspaper *Shanghai News*, see SHGYCJS [1930] 1984, p. 62; Chen [1933] 1985, p. 590.
791 Duan [1909] 1995, p. 405.
792 Cf. Weng [1930] 2010, p. 256; Mei 1934, pp. 206, 212; Li 1941, pp. 390-392.
793 Zhou [1919] 1968, pp. 149-150, 180. Cf. Deng and Ji [1928] 1938; Chen and Liu 1985, pp. 28-29.
794 Ma 1947, pp. 374-375, 386-388.

Republican period. But in comparison with the two regions, Sichuan and Yunnan were more widely known than as production areas of the caterpillar fungus.

An extensive investigation of products in postal areas of China, conducted by the General Post Office of the Ministry of Communications during the period from the spring of 1934 to February, 1936, enables a general overview of the production and nationwide dissemination of the caterpillar fungus in the mid-1930s. With the investigation came a published book in 1937, wherein the prefaces indicated that its aim was to give a general idea of Chinese products so as to facilitate their procurement; underlying the investigation was the belief that the flourishing of local commodities on the national market would be both beneficial to rescuing the war beleaguered national economy from shortages and crises while simultaneously improving the postal services.[795] Indeed, northeastern China had been under Japanese occupation since 1931,[796] while the growth of the Chinese Communist Party from 1921 onward often set the central government's nerves on edge.[797] Moreover, China was also undergoing a profound transition from an imperial economy to a capitalist economy, coupled with uncertainties such as inflation and disorder in the monetary systems.[798] In this context, the production and consumption of products took on a special significance.

A B C

Fig. 24 Photographs of the caterpillar fungus produced in Maogong (A, right) and Kangding (B, left), Sichuan province, and Lijiang (C), Yunnan province in the mid-1930s.

The caterpillar fungus produced in Maogong (Sichuan), Kangding (Sichuan) and Lijiang

795 JTBYZZJ 1937, pp. 5-6.
796 Fairbank and Feuerwerker 1986, pp. 492-518.
797 Hsü [1970] 2000, pp. 514-518, 553-563.
798 Lu and Fang 1991, pp. 13-17; Guo 1994, pp. 2-6; Rong 2010.

(Yunnan) was photographed for the investigation (Fig. 24).[799] As photographs were only used to show a few representative products of a province, the photographs of the caterpillar fungus themselves indicated the fame of this fungus as a local product in the above three places. As the results of the investigation show, the caterpillar fungus was mainly produced in today's Sichuan and then Yunnan provinces (Appendix 6).[800] In the mid-1930s, Sichuan was noted for its abundance of medicinal products;[801] and a Sichuan government publication did list the caterpillar fungus as one of the approximately 30 kinds of highest-yielding native medicinal products.[802] From Appendix 6 we can see one of the main routes for transporting the caterpillar fungus through the Yangtze River, which connected the production areas and southeastern China. Hankou, a city located in the middle reaches of the Yangtze River, was an important transshipment station for the caterpillar fungus.

Although this investigation contained omissions (e.g. no coverage of today's Western Tibet), it was still careful and relatively comprehensive. The reported production places of the caterpillar fungus in West China can be confirmed by a variety of other investigations or records of the 1930s-40s[803] pertaining to how the caterpillar fungus from Sichuan and Yunnan sold well in Shanghai, Hong Kong and some other cities in southeastern China.[804] In 1947, it was reported that the export volume and prices of medicinal products from Chongqing (then, as now, a part of Sichuan) had recently significantly increased; and some merchants trading between Guangdong province and Chongqing, who were keen to make money from profitable medicinal products, were even willing to spend about twice as much money as they had before for the caterpillar fungus.[805]

Overall, the investigation by the General Post Office in the mid-1930s provides evidence of the west-east trend in the transport of the caterpillar fungus from its production areas to economically more developed areas. Driven by economic interests, more production areas of the caterpillar fungus were exploited in the Republican period. We can chart the growing Chinese commercial interests over the decades leading up to the Communist victory, so that in November, 1948, the governor of Changdu (a city in today's eastern Tibet) issued a proclamation, in which the first demand was to open up the mountains, previously forbidden by local lamaseries, and allow people to collect natural

799 JTBYZZJ 1937, pp. 7 (Sichuan Section), 3 (Xikang Section), 3 (Yunnan Section). Cf. SSBZSKKK 1941, p. 383.
800 JTBYZZJ 1937, pp. 9-23 (Sichuan Section), 1 (Xikang Section), 7-17 (Yunnan Section), 9 (Gansu Section).
801 Anonymous [1935] 2010, p. 59.
802 SCSZF 1936, p. 15.
803 For example, see Deng 1936, pp. 133-139; Zhuang 1937, pp. 127-128; Feng [1930?] 2010, p. 239; DXSSQBJFWT [1941] 2010, pp. 494-495.
804 Anonymous 1936, p. 74; Long [1944] 2007, pp. 126-129.
805 LHZXS 1947, p. 7.

products (including the caterpillar fungus) there.[806] Doubtless the announcement aimed to boost production of the caterpillar fungus and thus promote the growth of local economy.

Consumption of the Caterpillar Fungus in East China

Data for the production and sales of medicinal products in mid-20th century China provides evidence of the lively consumer demand for medicinal products in Chinese society, a culture that was by no means confined to medical care for curative purposes. In many cases, there was an indistinct boundary between medicinal products and food and tonics for improving health, rather than treating illness, were embedded throughout the region, sold in drugstores, dispensaries, food companies and restaurants.[807] When the caterpillar fungus was used by traditional physicians for medical treatments in southeastern areas of late Qing China,[808] Chinese drug merchants were also enthusiastic about exploring its commercial value by developing new products.[809] In the Republican period, the caterpillar fungus continued to be sold as a medicinal substance in drugstores in Suzhou and other areas.[810] But in prosperous Shanghai, the commercial capital of China,[811] the value of the caterpillar fungus as a way of celebrating the tonic culture was greatly exploited. As mentioned in chapter 2, the food company Guan sheng yuan published an advertisement for its new tonic food called the caterpillar fungus-duck on New Year's Day, 1925. In the catering industry, some smart restaurants such as the Nan yuan jiu jia 南園酒家 (South Park Restaurant) also served tonic dishes involving the use of the caterpillar fungus, such as '*chong cao ru ge* 蟲草乳鴿' (caterpillar fungus-young pigeon).[812] These dishes were actually variations on the caterpillar fungus-duck combination. As the recipes for these dishes were not so complex, some gourmets actively introduced them to the public through periodicals like *Chang shou* 長壽 (Longevity, Shanghai).[813]

Because the caterpillar fungus was a profitable and popular substance, some speculative merchants began to sell it even though it was beyond the scope their original business. For example, a snow fungus company in Shanghai published an advertisement on 4 January, 1928, stating that it

806 Anonymous [1948] 1985, p. 348.
807 Fan 2012, pp. 14-36.
808 For example, see Wang [1862] 1999, p. 173; Zhang [1897] 1963, pp. 128-129; Zhou [1905] 1990, pp. 22-23.
809 See, for example, LYTZR [1881] 1983, p. 687; LYTGS [1884] 1983, p. 741.
810 See, for example, Lloyd 1918, pp. 766-780.
811 Hauser 1940, p. 198.
812 Anonymous [1928] 1983a, p. 169; Anonymous [1929] 1984b, p. 624; Anonymous [1929] 1984c, p. 25.
813 Shen 1935, p. 350.

sold not only the snow fungus (a tonic suitable for everyone, see Pei Jian above) but also the tonic caterpillar fungus. At that time, medicinal products sold in Shanghai had two main complementary sources of supply: the stores dotted along the Yangtze River and in inland areas, and the stores located in Tianjin, Hankou, and other port cities in Guangzhou, Fujian, etc.[814] Consumers of the caterpillar fungus in Shanghai did not need to worry unduly about sources of supply. It is reasonable to assume that those who consumed the above dishes and food did so expecting to be nourished by a tonic rather than treated with medication. Accordingly, merchants also actively tailored propaganda about the caterpillar fungus so as to satisfy consumers' expectations.

Exhibitions were also important platforms for the promotion of medicinal products. From the 1910s onward, national product 'movements' prospered in China, giving rise to hundreds of big or small exhibitions of '*guo huo* 國貨' (national products).[815] The 'movements' were infused with a culture of propaganda about how the products would further national economic interests, and delivered in highly nationalistic and anti-imperialist tones.[816] National salvation could be achieved through economic means. Medicinal products constituted an important part of the 'national products' on show. For example, during the period from 1 November, 1928 to 3 January, 1929, the largest national products exhibition ever yet held in modern China, was held in Shanghai for the purpose of promoting domestic products as well as industries and commerce.[817] It successfully brought together in Shanghai more than ten thousand products from different provinces. At the end of December, 1928, Li Kuian 李奎安 and Dong Shaoshu 董紹舒, two official representatives of Sichuan and Yunnan, proudly presented products of their own provinces to visitors. Both of them mentioned the caterpillar fungus as one of their most prized local medicinal products.[818] More than ten thousand invited guests and fifty thousand tourist visitors visited the exhibition over the two months. The propaganda would wield wide and positive influence on the sale of the caterpillar fungus produced in Sichuan and Yunnan. Certainly, the consumer market for the caterpillar fungus was not confined to China. Probably to expand its overseas market in Southeast Asia and/or America, a Chinese company even commissioned the Consulting Institute for International Trade (Shanghai) to advertise its caterpillar fungus stocks and futures in the latter's weekly on 20 June, 1946.[819]

[814] Anonymous [1927] 1983a, p. 375; Anonymous [1927] 1983b, p. 313; Anonymous [1927] 1983c, p. 897.
[815] Ma and Hong 2009, pp. 69-83.
[816] Gerth 1998, pp. 119-142; Pan 1998, pp. 1-19.
[817] Hong 2006, pp. 83-88.
[818] Li [1928] 1983, p. 835; Dong [1928] 1983, pp. 753-754.
[819] GJMYZXS 1946, p. 1.

By this time, the caterpillar fungus was a popular but still relatively expensive medicinal product. If we look at the prices of medicinal products from Kangding and Lijiang in the mid-1930s (Appendix 7), we can clearly see that it was significantly more expensive than most or all of the other medicinal plants and fungi. It was, however, cheaper than medicinal animal products (e.g. bear bile, mainly used for brightening eyes and soothing the liver). In about 1935, the caterpillar fungus sold in a noted drugstore in Shanghai was priced at 44.24 *yuan*/*jin* (元/斤).[820] So, the price of the caterpillar fungus in Shanghai was about 7.37-4.92 times the prices in Kangding, i.e. 6.00-9.00 *yuan*/*jin*. Common strains of rice sold in Shanghai in 1935, for example, were priced at a fraction of the price at around 0.067-0.080 *yuan*/*jin*.[821] An increase in the prices was consistent with the flow of the caterpillar fungus from production areas to places of consumption. The above domestic circulation of the esteemed caterpillar fungus was an epitome of the dynamic production and consumption of many kinds of Chinese medicinal substances in the Republican period. Against this background, the caterpillar fungus ignored the sarcasm of modern science, and continued to obtain favour with many people from local mountain traders in eastern Tibet, west Sichuan, northwest Yunan and south Qinghai, through Chinese merchants, and consumers in East China, Hong Kong and probably South East Asia, not to forget the restaurateurs and their clients and physicians and patients in all these places. As a scientific wonder, however, it meanwhile engaged traditional physicians' attention to an interest in medicinal substances shared by Chinese physicians and scientists or doctors representing the new scientific medicine.

4.3.2 Integration, Scientification, and Medicinal Substances of Growing Importance

The modern Chinese public's deep-seated belief in Chinese medicine was shaken in the encounter of Chinese medicine and scientific medicine. There were those who apparently supported what they understood as the latter wholeheartedly, and even those who proposed to abolish Chinese medicine altogether. These included many educated Chinese people who were trained in or simply believed the rehetoric of a scientific medicine and accordingly deprecated Chinese medicine;[822] there were also other intellectuals who suggested integrating Chinese medicine and scientific medicine was the

820 Hu 1935, p. 40.
821 ZGKXYSHJJYJS and SHSHKXYJJYJS 1958, p. 217.
822 Feng 2007, pp. 121-129.

path to a future on China's own terms;[823] some still recommended the abolition of Chinese medicine but while retaining the use of Chinese medicinal substances.[824] In some cases, the root causes behind such varied views of medicine lay in individuals' personal experiences of medical care, or that of their family members. For example, the Confucian scholar Yu Yue's 俞樾 (1821-1907) proposal for the abolition of Chinese medicine was grounded in the tragic death of his sick relatives whom traditional physicians had failed to cure.[825] Yu Yue's attitude to Chinese medicine also underwent a transformation from calling for the abolition of Chinese medicine to separating *materia medica* from Chinese medicine and advocating the use of Chinese medicinal substances. Another similar example is that of Lu Xun 魯迅 (1881-1936), one of the most important literary writers in 20th-century China. Though he received training in scientific medicine in Japan during the period 1904-1906, Lu Xun's antagonism to Chinese medicine had its roots in his youth at the end of the 19th century, when he witnessed his father's death despite treatments offered by traditional physicians.[826] But after his marriage, Lu Xun also bought or used Chinese medicinal substances to treat his sick family members,[827] which indicated an ambiguous position. His literary antagonism to traditional medicine famous in *Kuang ren ri ji* 狂人日記 (A Madman's Diary) and *Yao* 藥 (Medicines) was also part of the larger rhetorical position in *Na han* 吶喊, litrerally the 'Call to Arms' against 'feudalism' in the pursuit of a revolutionary modernity.[828] In fact he was not absolutely opposed to the use of Chinese medicinal substances in practice.

In the face of scientific medicine and its impact on the social conditions of medical care, modern Chinese medicine and its proponents were also seeking self-transformation. Gradually, the integration of Chinese medicine and scientific medicine evolved into a mainstream ideology among the community of traditional physicians. Historians of medicine generally consider that this idea was first explicitly expressed by the viceroy Li Hongzhang in 1890, who recommended. '*he zhong xi zhi shuo er hui qi tong* 合中西之說而會其通' (integrating Chinese and Western doctrines and reaching confluence).[829] Soon after, the physician Tang Zonghai 唐宗海 (1851-1897) began to use the expression '*zhong xi hui tong* 中西匯通' (integrating Chinese and Western [medical knowledge]) in

823 Li 2001, pp. 21-24; Yang 2009, pp. 299-340.
824 Hao 2004, pp. 4-6.
825 Zhao 1989, pp. 52-54; Liu 2001, pp. 171-174; Zhang 2014, pp. 168-173.
826 Pi 2012, pp. 353-376.
827 Zhou 2001, p. 24; Zhou 2008, p. 12.
828 Lu [1923] 2005, pp. 444-456, 463-472.
829 Li 1890a, pp. 11-14. Cf. Zhao 1989, pp. 61-62; Scheid 2007, p. 204.

the titles of his medical texts from 1892.[830] Tang was not the first Chinese person who made efforts to integrate Chinese medicine and scientific medicine in practice.[831] But his identity as a famous traditional physician and his explicit proposition in his writings heavily promoted the rise of the idea of integrating Chinese medicine and scientific medicine among traditional physicians, especially those in Shanghai, where he practised and published.[832] Although there was not always a consensus of specific opinions, or of practices, traditional physicians of the integration school basically placed emphasis on Chinese medicine, while recognising the possibility of constructive communication between Chinese medicine and scientific medicine.[833]

The idea of *ke xue hua* 科學化 (scientification) appeared and rapidly developed in this trend for integrating Chinese medicine and scientific medicine. Scientification, as an extremely influential methodology for adapting Chinese medicine, was embraced by more and more traditional physicians from the end of the Qing dynasty onwards. The following paragraphs will unveil the basis on which these physicians understood *ke xue hua* and the scientification of Chinese *materia medica* in the first half of the 20th century. Key elements of this movement include chemical analysis of ingredients in Chinese medicinal substances, the laboratory, new image-making and biomedical experimentation. This combined and collective practice undeniably represents a methodological change in exploring and evaluating the effectiveness of Chinese medicinal substances. But we cannot simply treat it as a 'paradigm shift', as some 'old' Chinese medical ideas and empirical knowledge actually continued to inspire new scientific research on Chinese medicinal substances. Ding Fubao 丁福保 (1874-1952), a influential but also controversial figure in modern Chinese academic history, pioneered the spread of the idea of scientification among traditional physicians.[834] In 1899, Ding began to buy and read an extensive range of '*zhong xi yi shu* 中西醫書' (Chinese and Western medical books) because of his own health problems.[835] However, Ding's acquisition of 'Western medical knowledge' actually came from the East, since it was based on Japanese rather than Western literature.[836] His book *Hua xue shi yan xin ben cao* 化學實驗新本草 (New Materia Medica Based on Chemical Experiments),

830 Chen 1983, pp. 58-61, 80-81; Pi 2008, pp. 37-53, 419-420.
831 Zhang 2008, pp. 92-95.
832 Ma 1983, pp. 376-379; Bi *et al.* 2014, pp. 41-45.
833 Wang 2002, pp. 122-124. See, for example, Zhang and Tang [1893] 1991, pp. 2-5, 26, 16-18, 155; Zhang [1924] 1985, pp. 141-165, 181.
834 Zhao 1989, p. 180.
835 Ding [1921] 1999, pp. 59-77; Ding [1948] 2012, p. 488.
836 Ding [1948] 2012, p. 497.

finalised in 1908, was basically translated from a Japanese text on pharmacognosy.[837] His preface to this book mentions some of his contemporaries' contempt for Chinese medicinal substances after the arrival of Western medicine, probably from the East, in China. He stresses that:

> Chinese medicine has degenerated to an extreme degree, but [Chinese] medicinal substances may not be useless. …Because Japanese and Western pharmacologists carry out chemical analyses of their constituents and further experiments [on the constituents], they are able to unveil the essence [of Chinese medicinal substances], and therefore reduce the prevalence of fallacies [about Chinese medicinal substances]. If people exercising the profession of Chinese medicine refer to those pharmacologists' methods and fruits of their medical practice, and further connect them with old [Chinese] prescriptions, the day will surely come when Chinese and Western [medical] knowledge have been integrated. (吾國之醫雖退化至於極點，而藥物未嘗不可用．…蓋東西洋之藥物學家以化學分析其成分而實驗之，故能窮源竟委，力闢流傳虛妄之習．而吾國業醫者，苟由是而治病，由是而上合古方，必有中西匯通之一日.)[838]

In the above passage, Ding Fubao explicitly expressed his disappointment with Chinese medicine, yet still pinned his hopes on Chinese medicinal substances. However, the future of Chinese medicinal substances needed to be based on chemical analyses and pharmacological experiments, which were, precisely, Ding's expected approaches to integrating Chinese and Western medical knowledge. In his later years, Ding still firmly believed in the effectiveness of Chinese medicinal substances, but complained that Chinese medicine lacked the new medical and scientific intelligence represented by Western scientific medicine.[839] Stimulated by the Japanese medical revolution in the Meiji period, Ding Fubao reached the conclusion that Chinese medicine was not only unscientific, but also deviated from the international progressive trend in medicine towards a laboratory based 'scientification':

> I have carefully examined the most serious shortcomings of Chinese medicine. Chinese medicine lacks elementary medical intelligence involving anatomy, physiology, histology,

[837] Mayanagi 2010, pp. 151-159.
[838] Ding 1909, pp. 1-2.
[839] Ding 1948, pp. 18-19.

embryology, bacteriology and pathology, as well as international new knowledge of epidemiology and internal medicine. Therefore Chinese physicians were unable to attend medical conferences held by governments or international conferences on the prevention of epidemic disease. When Chinese physicians and Western doctors were seeing patients in the latter's homes together, Chinese physicians' narratives of etiological factors, symptoms and pathological mechanisms do not coincide with scientific principles and go against the international progressing trends in medicine. (詳細調查國醫最大之缺點，在於無解剖學，生理學，組織學，胎生學，細菌學，病理學等基礎醫學之智識，又無傳染病及內科學等之世界新智識．故政府開醫學大會或國際開防疫大會等，國醫皆不克列席．甚至與西醫在病家會診，凡論說病原，症候，病理等，皆不合於科學之原則，而且昧於各國醫學日新之趨勢.)[840]

At the same time, he did not totally negate the value of Chinese medicine, but had considerable confidence in the potential of effective empirical knowledge and material from Chinese medical history, especially potent Chinese medicinal substances. Ding himself developed two new kinds of pills made from Chinese medicinal substances (*jing zhi bu xue wan* 精製補血丸 [the refined pill for supplementing blood] and *ban xia xiao tan wan* 半夏消痰丸 [the banxia, or *Pinellia ternata*, pill for eliminating phlegm]), which won him the top prize at a commodity exposition held in Nanjing in 1909.[841] The reason why Ding recognised empirical Chinese medical knowledge but also criticised it as unscientific was that he essentially treated modern science as the sole correct epistemology in the field of medicine. Whether Ding was insufficiently trained in the new science, or he was just using effective terminology for communicating with his customers, we have to note at this point, that his new 'scientific' pills are not very 'scientific' and are aimed at unambiguously ancient Chinese bodies when they aim to 'supplement the blood' and 'eliminate phlegm'.

The idea of scientising Chinese medicine or *materia medica* undobubtedly also had marketing traction with the public, and was quite popular among urban elites of China in the 1920s-30s.[842] Its influence was by no means confined to the community of traditional physicians, as those who had received a scientific or biomedical education also became involved in the movement for the

840 Ding 1948, pp. 18-19.
841 Ding [1921] 1999, p. 94. For the commodity exposition, see Qiao 2003, pp. 103-108; Hong 2007, pp. 204-210.
842 He 1930, pp. 85-97; Gu and Li 1989, pp. 50-53.

scientification of Chinese medicine. For example, Yu Yunxiu 余雲岫 (1879-1954, aka Yu Yan 余巖), who had studied scientific medicine in Japan and then started his career as a doctor in 1916, published two critical articles on Chinese medicine in 1920.[843] In those articles he advocated separating the wealth of historical empirical knowledge of using medicinal substances from medical theories rooted in *yin yang*, *wu xing*, and other 'fallacious doctrines';[844] more importantly, he made an appeal that scientific studies of Chinese medicinal substances, begin with taxonomic identification and include chemical analysis and physiological experimentation, 'following their Western pharmacological methods' (照他們西洋藥物學研究的法兒). Although Yu Yunxiu was a key and representative figure in proposals that the government should abolish Chinese medicine at the end of the 1920s, he valued the effectiveness of Chinese medicinal substances and also used them in medical practice. Furthermore, in 1928 he further proposed selecting some target medicinal substances from classical Chinese medical records in order to conduct chemical studies of them.[845] Like Yu Yunxiu, some Chinese doctors of scientific medicine would also make direct use of Chinese medicinal substances in treatment especially when there was a shortage of chemical medicinal substances.[846] So even in the community of doctors of scientific medicine there were people valuing Chinese medicinal substances, but they suggested different methods to explore and evaluate the effectiveness of the substances.

Yu Yunxiu valued historical empirical knowledge about the use of Chinese medicinal substances because such knowledge was helpful in the search for new effective medicinal substances by means of scientific approaches. This was consistent with Yu's tripartite division of Chinese medicine into 'theory, Chinese drugs, and experience', as analysed by Sean Lei.[847] Lei points out that, Yu Yunxiu, influenced by the Japanese 'ancient formula current' which attached importance to practice and empirical knowledge rather than theoretical frameworks, drew on the concept of experience to reassemble an 'empirical' subtradition of Chinese medicine. And inspired by Japanese pharmacology, Yu Yunxiu also 'actively promoted the study of Chinese drugs', which, according to Lei, embodied the 'valorization of Chinese drugs as promising objects for scientific research' in

843 Yu 1920, pp. 1-8; Yu 1920, pp. 1-10. For Yu's life, see Hao 2004, pp. 72-76.
844 For accounts of *wu xing* (five elements) in ancient Chinese medical texts, see, for example, Anonymous 1992 [*c*. 1st century BC], pp. 83-90.
845 Yu 1928, pp. 296-307.
846 See for example, Liu 1937, pp. 89-94. Cf. Zhao [*c*. 1803] 1983, pp. 140-142.
847 Lei 2014, p. 94.

modern East Asia.[848]

Ding Fubao and Yu Yunxiu's ideas became very popular amongst the community of physicians of classical medicine, and were advocated by a variety of influential figures in the modernising of Chinese medicine like Lu Yuanlei 陸淵雷 (1894-1955). The next section is devoted to examining the background of another influential figure, Chen Cunren 陳存仁 (1908-1990), who as a physician of classical medicine found himself in direct ideological conflict with Yu's proposal for abolishing Chinese medicine but actually accepted Yu's appeal for carrying out scientific research on Chinese medicinal substances. Chen acknowledged Ding as his teacher, and also shared Ding's idea about the importance of scientification. Chen had gone to Nanjing with four other representatives of all the physicians of classical medicine in the country to protest against the government's proposals to abolish Chinese medicine, and at this stage his position was diametrically opposed to that of Yu. I will first examine his path to becoming a traditional physician and the compilation of his highly influential work *Zhongguo yao xue da ci dian* 中國藥學大辭典 (Great Dictionary of Chinese Materia Medica). Then, on this basis, I will investigate his reflections on the future of Chinese *materia medica*, the potential for it to have new significance within the new scientific paradigms promoted at this time, through the case study of his analysis of the entry on the caterpillar fungus in this dictionary.

4.3.3 The New Face of Chinese Materia Medica —— A Case Study of Chen Cunren's Medical Thought and Efforts

Chen Cunren was born into a merchant family which carried on the silk business in Shanghai.[849] Following his graduation from middle school, he proceeded to Nan yang yi ke da xue 南洋醫科大學 (Nanyang University of Medicine, Shanghai). The university offered courses in scientific medicine.[850] A year after the beginning of his undergraduate study, Chen unfortunately reported that he suffered from '*shang han* 傷寒' (cold damage) during his summer vacation.[851] After being cured by Ding Ganren 丁甘仁 (1865-1926), a famous physician or classical medicine of the Menghe

848 Lei 2002, pp. 333-364; Lei 2014, pp. 91-96.
849 Zhang 1947, p. 47; Chen [1973] 2000, p. 504.
850 NSQDFZBZWYH 1997, p. 846.
851 *Shang han* is an important conceptual disease category formed in the late Eastern Han dynasty (25-220 AD), see Zhang [*c*. 200] 1991, pp. 19-20; Ye 1995, pp. 4-29. It is often translated as cold damage and understoodd as a group of infectious febrile diseases in English sources, see Needham and Lu 2000, p. 26; Hinrichs and Barnes 2013, p. 156.

school,[852] he terminated his study at Nanyang University, and enrolled in Shanghai zhong yi zhuan men xue xiao 上海中醫專門學校 (Shanghai Specialised School of Chinese Medicine) in 1923.[853] At this school Chen Cunren formally started a life of studying and practising Chinese medicine. He graduated from this school in the autumn of 1927,[854] the year when the Nationalist Government was established in Najiing.

The Shanghai Specialised School of Chinese Medicine was a self-funded educational institution, established by Ding Ganrenand some other traditional physicians in 1915.[855] It had a great nationwide influence on Chinese medicine education.[856] Though concerned about the future development of Chinese medical schools and medical education, Ding and his colleagues did not uncritically reject or denigrate scientific medicine, but treated Chinese medicine and scientific medicine as equals. They stated that medicine was a humanitarian art, and people should learn good medical knowledge regardless of its origin. They not only acknowledged the benefits of scientific medicine (especially surgery), but also planned to employ teachers with relevant expertise.[857] From its opening in 1916, the school of Chinese medicine also offered courses in Western physiology, hygiene and anatomy, although these subjects accounted for less than 10% of all the courses.[858] Therefore, the Chinese medical education that Chen Cunren received at this school was doubtless intermingled with a certain amount of scientific medical knowledge.

In around 1928, Chen Cunren embarked on his career as an independent traditional physician.[859] He soon became very active in the community of traditional physicians in Shanghai thanks to his teachers' reputation and his own diligence and enthusiasm for social interaction. Prior to his migration from Shanghai to Hong Kong in 1949, his activities, which centred on Chinese medicine, significantly expanded his fame from Shanghai to the whole country. According to his own words in 1947, he had constantly aimed to serve the community of traditional physicians, to strive for the equal status of Chinese medicine, and to seek improvement in Chinese medicine.[860] Sean Hsiang-Lin Lei, in his monograph on the struggle of Chinese medicine in late Qing and

852 For Ding Ganren's life and the Menghe learning, see Scheid 2004, pp. 10-68; Scheid 2005, pp. 79-130; Yang 2008.
853 Chen [1973] 2000, pp. 7-16; Yang and Wang 1994, pp. 729-734.
854 Chen [1973] 2000, pp. 14-39; Qin [1992] 2001, pp. 158-166.
855 Yang and Lou 1998, p. 225.
856 The first new-style school of Chinese medicine founded in 1885, see Lin 1980, pp. 90-92; Lin 2014, pp. 66-67.
857 MYYLBSWYH 1998, pp. 151-157; Yang and Lou 1997, pp. 37-40. Cf. Deng 1999, pp. 271-274.
858 MYYLBSWYH 1998, pp. 11, 27.
859 Chen [1976] 2007, pp. 5-8.
860 Chen 1947, p. 8.

Republican China considers his work the most outstanding example of orienting Chinese medicine to modern science, but does not give a detailed analysis of his contributions to this transnational history.[861] In the modern history of Chinese *materia medica*, Chen Cunren was a key figure who still remains largely neglected. I therefore include him here as his life and his influential publications, particularly his dictionary of medical substances, embody the 20th century transformation of Chinese *materia medica*.

Compilation of the Great Dictionary of Chinese Materia Medica (1935)

The Chinese term '*ci dian* 辭典' (dictionary) was coined no later than the 6th century, but its modern sense was actually imported from Japan.[862] Indeed, the rudiments of Chinese dictionaries can be traced back to the *Er Ya* 爾雅 (Literary Expositor), a text of the 2nd century BC;[863] but the compilation styles and principles of modern Chinese dictionaries were profoundly influenced by foreign cultures of dictionary-making, especially Japanese, British, and American styles, and bore only a distant relationship with ancient Chinese textual traditions.[864] Situated in a dramatically transforming society, Chinese intellectuals were also actively rethinking and reconstructing their own knowledge system when assimilating new knowledge from the rest of the world and this is nowhere more evident than in the ways in which they translated or newly compiled dictionaries.[865]

The content of modern Chinese dictionaries of *materia medica* reveals the compilers' views of classical Chinese *materia medica* as it negotiated with this modern science, as well as their reflections on the future of Chinese *materia medica*. The first modern comprehensive dictionary of Chinese medicine was compiled by Chen's teacher Xie Guan 謝觀 (1880-1950) in 1921.[866] Xie was strongly in favour of dictionaries as a form of organising and popularising Chinese medical knowledge. He wrote that dictionaries were the most appropriate means of simplifying complexity and presenting essential information.[867] Although his dictionary is not a specialist dictionary of Chinese *materia medica*, dictionaries of Chinese *materia medica* followed, including the one

861 Lei 1999, pp. 323-358. Cf. Lei 2008, pp. 331-372.
862 Pan 2008, pp. 1-12.
863 Yong 2004, pp. 14-21.
864 Pan 2008, pp. 249-256.
865 For general reviews of Chinese dictionaries compiled in the late Qing period, see Zhong 1996, pp. 49-87; Doleželová-Velingerová 2014, pp. 289-328.
866 Zhang 2015, p. 8.
867 Xie 1921, p. 1.

published by Chen Cunren in 1935.[868] Chen's dictionary was the most influential dictionary of Chinese *materia medica* in modern and early Communist China, even though it incurred criticism as well as positive comments.[869] However, published studies of Chen's dictionary remain few,[870] and those that there are pay little attention to its original sources or its integration of local and global knowledge about Chinese medicinal substances.

Chen Cunren was offered the opportunity to compile the dictionary by his teacher Xie Guan. The Commercial Press in Shanghai invited Xie to compile a dictionary of Chinese *materia medica* in 1929.[871] But Xie recommended Chen Cunren, who accepted the task and had soon drafted an outline and some sample entries. He then accompanied Xie to the Commercial Press to meet the director of the compilation department and sign the publishing contract. Unfortunately, about half a year later, the Commercial Press broke all existing contracts due to a series of strike actions at the press.

Nevertheless, with Ding Fubao's encouragement and help, Chen Cunren continued to compile his dictionary. He employed four sub-editors, four copyists, two illustrators, two photographers, and four students. In addition to text editing, he also delegated students to collect Chinese medicinal substances from medicine markets and in different regions. Chen himself collected over 500 specimens of medicinal substances in Qichun, Hubei province, and Guangdong province.[872] The dictionary was finalised in June, 1933.[873] It contained about 3 200 000 characters, 14 000 entries,[874] 800 colour illustrations, and some additional black-and-white pictures and pen drawings. Chen submitted the manuscript of this dictionary to the Shi jie shu ju 世界書局 (World Press) in Shanghai, expecting the latter to publish the manuscript as a single book. But when it was finally published in April, 1935, the World Press turned out to have re-edited it, without consulting the author, as two separate books, one containing the text, and the other the pictures (colour illustrations and black-and-white pictures). Moreover, the latter book, entitled *Zhongguo yao wu biao ben tu ying* 中國藥物標本圖影 (Pictures of Specimens of Chinese Medicinal Substances), did not include all the pictures, but just a portion of them, covering about 450 kinds of medicinal substances. Though Chen was dissatisfied with the publisher's autonomous actions, the dictionary was frequently

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868 For a brief review of modern dictionaries of Chinese *materia medica* in the Chinese language, see Chen 1988, pp. 20-36; Li and Wan 2013, pp. 586-588, 594.
869 Ye 1955, pp. 70-73; Huang 1956, pp. 16-18; Li *et al*. 2014, pp. 307-308.
870 See, for example, Qiu 2002, p. 1549; Li *et al*. 2014, pp. 307-308.
871 Chen [1973] 2000, pp. 229-230; Wang [1973] 2008, pp. 274-275; Zhang and Liu 2011, p. 847.
872 Chen [1973] 2000, pp. 240-241. Cf. Chen 1935d, pp. 8-9.
873 Chen 1935c, p. 1.
874 Anonymous [1935] 1985, p. 212; Chen [1973] 2000, p. 262.

reprinted and remained very popular. Soon after, the World Press cut about three fifths of its content, and published the abridged edition of the dictionary in April, 1937.[875] According to the Press's sales records and Chen's reference to various legal or illegal reprint editions in different regions, the abridgement was also widely welcomed, and bought by traditional physicians in almost all counties of every province in China.[876] As late as 1956, due to its wealth of sources and significant practical value, a revised edition of Chen's dictionary was republished in mainland China.[877]

To compile this dictionary, Chen extracted a great deal of information from hundreds of Chinese and Japanese books and articles relating to medicines from China. According to the reference list, the sources of the dictionary comprised 222 Chinese books, 40 Japanese books, 159 Chinese articles, and three Japanese articles. Among the Chinese books, Qing and pre-Qing works account for 76.6% of total references. The Japanese books, though accounting for only 9.4%, provide much of the new scientific knowledge about Chinese medicinal substances, mainly concerning the Linnaean taxonomic system, plant and animal anatomy, chemical constituents and human physiology. Chen Cunren assimilated this knowledge into his dictionary. When the manuscript of the dictionary was already in proof, Chen obtained a report by the Japanese pharmacognosist *Nakao Manzou* 中尾万三 (1882-1936), detailing the chemical constituents of 142 Chinese medicinal substances. He considered the report to have great value, but was no longer in time to add the chemical information to individual entries. He therefore included the report as an appendix.[878] A noted traditional physician in his own right, Chen Cunren, unlike his teacher Xie Guan, did not reject '*xin xue shuo* 新學說' (new doctrines) when compiling his dictionary.[879] Although he fought against doctors of scientific medicine (like Yu Yunxiu) when it came to the abolition of Chinese medicine, he actually also stood with the latter in view of his proposal for reforming Chinese *materia medica* by adopting scientific approaches such as chemical analysis. His efforts in this regard will be examined below.

The Caterpillar Fungus, Materia Medica, and Academic Expectation

Chen Cunren's preface to the dictionary clearly shows that he was among those physicians of

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875 Chen 1937.
876 Chen [1973] 2000, pp. 227-265; Chen [1976] 2007, pp. 127-143.
877 Chen [1935] 1956. See the editor's note to the revised edition.
878 Chen 1935c, pp. 1-28. For Nakao's life, see Nakano and Suzuki 1999.
879 Cf. Xie 1921, pp. 1-2.

classical medicine who advocated its scientification. He was deeply dissatisfied with classical Chinese *materia medica*. For example, he criticised *Ben cao gang mu* (Compendium of Materia Medica, 1578) for its inclusion of excessive numbers of medicinal substances and prescriptions, indifference to specific doses of medicinal substances, lack of attention to morphological characteristics and identifications of medicinal plants and animals, etc. Moreover, he considered the *yin yang* and *wu xing* theories to be 'imaginary vacuous theories' (意象空論), which 'led the scholarship of Chinese medicine to catastrophe, and caused it to be denounced by modern scientists' (中醫學術上大受浩劫，而為近世科學家所詬病). In addition to the aim of producing a great reference book, Chen also intended his dictionary to be able to arouse scientists and biomedical experts' interest in Chinese medicinal substances, and 'then [stimulate them to] carry out real work on the scientification of Chinese medicinal substances' (進而做中藥科學化之真實工作).[880] This intention is also consistent with the sentiments that he expresses in his introduction to *Nakao Manzou*'s report:

> The information about the chemical constuents of 142 Chinese medicinal substances, recently gathered together in the report by the Japanese doctor of medicine *Nakao Manzou*, was all formally published in journals of [scientific] medicine or *materia medica*. It is indeed a great harvest of scholarship on Chinese medicinal substances. Shouldn't we Chinese people wake up to it? I wish Chinese physicians not to be obsessed with old doctrines and vacuous theories, and defend them with meaningless arguments. [We Chinese physicians] should know that the only precious thing in Chinese medicine is those Chinese medicinal substances that have validatable special efficacies. From now on, [Chinese physicians] should make an effort to study literature on Chinese medicinal substances, distinguish genuine [Chinese medicinal substances] from unrecognised ones, improve preparation and cultivation of [Chinese medicinal substances], do chemical analyses of constituents [of Chinese medicinal substances], and determine effective doses of [Chinese medicinal Substances]. Research on these subjects will lay a solid foundation for Chinese medicine forever. It will be the correct way of scientising Chinese medicine. Furthermore, I also wish domestic scientists and experts in Western medicine and *materia medica* to change their objects of study [to Chinese medicinal substances], and thus engage in

[880] Chen 1935d, pp. 1, 7-8.

[scientific studies of] the national treasure now dominated by foreign people. The above are the reasons why I have compiled this work. (近由日本醫學博士中尾萬三集得中藥一百四十二種之成分報告，均系正式發表於醫藥雜誌者，誠皆中國藥學上之重大收穫. 國人對此能不憬然警惕? 吾願國醫同志，勿再泥于舊說學派之空論，作無謂之自訟. 當知國醫之唯一寶物，即在效驗卓特之中國藥物. 今後當盡力於研求國藥文獻，辨別地道真偽，改進泡[炮]制種植，化驗成分性質，判定藥效度量，此數端即為國醫造成萬世不滅之根基，亦為國醫科學化之正確途徑. 又願國內科學專家，西醫藥家轉易研究目標，勿使國傳瓌寶坐讓於人. 是本書之所由作也.)[881]

The above passage clearly shows Chen Cunren's opinion on Chinese medicinal substances and their importance to the future of Chinese medicine. In his eyes, indigenous scholarship on Chinese medicinal substances before and in his time was not only out of date, but also was conducted in 'incorrect' (i.e. unscientific) ways. Of course, the chemical analysis of the constituents of Chinese medicinal substances, highly valued by Chen, did not exist in classical Chinese medicine. And neither did unified standards for drug dosages. In short, Chen delivered us the constituents of a Chinese medical modernity, i.e. placing emphasis on medicinal substances and related literature, identifying true medicinal species or substances, and standardising usage on the basis of chemical analysis.

Chen's confidence was not without foundation, as some foreign experts such as *Nakao Manzou* had already embarked on the kind of research that he was advocating to traditional physicians, scientists and biomedical experts. When Chen Cunren wrote his memoirs in Hong Kong in the early 1970s, he recorded the satisfaction that he still continued to feel with his own procedure in compiling the dictionary, i.e. discarding old Chinese medical theories:

Previously some books on [Chinese] medicinal substances resorted to *wu xing* and *liu qi* 六氣 (six climatic factors) theories when they were unable to explain medicinal substances' primary effects. I thought that such theories were unscientific, therefore none of the 3 200 000 characters in the whole book [i.e. Chen's dictionary] is devoted to *wu xing* and *liu qi*. This was a revolutionary approach, which more or less brought about a reform in [subsequent] Chinese

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[881] Chen 1935c, p. 1.

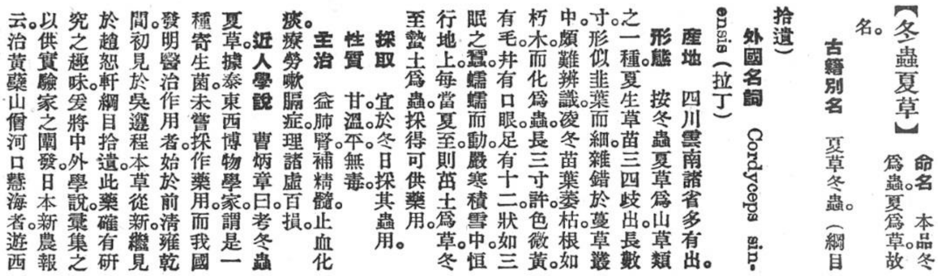
medical books. (從前有一部分本草書，講不出藥物主治作用時，就用五行六氣來解釋. 我對這點認為不科學，所以全書三百二十萬字，五行六氣是矢口不提的. 這是一種革新的精神，也算對中國醫藥書籍掀起了一種革命.)[882]

In his collection of notes on early Chinese medical history, Chen never disguised his conviction in the efficacies and latent scientificity of Chinese medicinal substances. He treated some classical treatments involving the use of Chinese medicinal substances as 'neglected inventions' (被忽視的發明), because they could be satisfactorily explained by scientific knowledge, yet were used in practice before the rise of modern science.[883] Chen's enthusiasm for modern science was not generated out of nothing. The city of Shanghai, where he lived, walked in the forefront of modernisation and remained the centre of debates between people who essentialised themselves as traditionalists or in favour of the modern scientific medicine in the Republican period.[884] From the turn of the 1920s–30s onward, criticisms of unscientific Chinese medical theories and proposals for adapting Chinese medicine by using biomedical approaches and knowledge spread like wildfire even among traditional physicians.[885] Ding Fubao, who had a close relationship with Chen Cunren, was a powerful advocate of integrating Chinese medicine and scientific medicine on the basis of scientising Chinese medicine.[886] And Chen Cunren did not refuse to study scientific medicine, since integration had already become a marker of identity among those literate physicians of classical medicine publishing in the new professional journals.[887] He employed a doctor of scientific medicine to tutor him on internal medicine for approximately two years before he left for Hong Kong in 1949.[888] His contribution to the 'reform' of Chinese *materia medica* can be specifically investigated through the entry on the caterpillar fungus in his representative work *Great Dictionary of Chinese Materia Medica*.

Chen Cunren's dictionary was completed by means of 'scientific methods' (科學方法); and 'all the material for scientific research in old [Chinese] *materia medica* and new modern theories developed through chemical analysis were adopted, as far as possible, and were compiled in the

882 Chen [1973] 2000, p. 262.
883 Chen [1970?] 2008, pp. 11-78.
884 Xi 2005, pp. 46-48; Xi 2005, pp. 44-46.
885 Liu 2008, pp. 35-41.
886 SHSZYWXG and SHZYYDXYSBWG 2008, pp. 257-264.
887 In the Republican period, most of the periodicals devoted to Chinese *materia medica* attempted to assimilate scientific knowledge, see Lu 2016, pp. 147-172.
888 Chen [1973] 2000, pp. 218, 502-503.

form of a dictionary’ (所有舊有藥學上之科學材料及近世化驗發明之新學說，儘量采入，而以辭典之方式編纂而成).[889] Clearly Chen thought that there were both unscientific and latent scientific knowledge in old Chinese *materia medica*. And it is certain that the sense of the term ‘*yao xue* 藥學’ (materia medica) in the dictionary title must be situated in the scientific or biomedical rather than the *ben cao* 本草 (herbal) context. To stress that there was material for scientific research in old Chinese medicine, Chen particularly spoke of scientific studies of Chinese medicinal substances in Germany, Britain, Japan and America. In turn, these international examples also lent support to Chen’s propaganda for his reform of Chinese *materia medica*. Here we can refer to the entry and illustration of the caterpillar fungus (Fig. 25) in the dictionary so as to examine how he put his ideas into practice.[890]


【冬蟲夏草】 命名 本品冬
爲蟲。夏爲草。故
名。
古籍別名 夏草冬蟲。(綱目
拾遺)
外國名詞 Cordyceps sin-
ensis (拉丁)
產地 四川雲南諸省多有出。
形態 按冬蟲夏草爲山草類
之一種。夏生草苗三四歧出。長數
寸。形似韭葉而細。雜錯於蔓草叢
中。頗難辨識。逡冬苗葉萎枯。根如
朽木。而化爲蟲。長三寸許。色微黃。
有毛。并有口眼。足有十二。狀如三
眠之蠶。蠕蠕而動。嚴寒積雪中。恒
行地上。每當夏至。則茁土爲草。冬
至蟄土爲蟲。採得可供藥用。
採取 宜於冬日採其蟲用。
性質 甘。溫。平。無毒。
主治 益肺腎。補精髓。止血化
痰。瘵勞嗽膈症。理諸虛百損。
近人學說 曹炳章曰。考冬蟲
夏草。據泰東西博物學家。謂是一
種寄生菌。未嘗採作藥用。而我國
發明醫治作用者。始於前清雍乾
間。初見於吳遵程本草從新。繼見
於趙恕軒綱目拾遺。此藥確有研
究之趣味。爰將中外學說。彙集之
以供實驗家之闡發。日本新農報
云。治黃蘗山僧河口慧海者。遊西

A

B

Fig. 25 The entry (A, part) and illustration (B) of the caterpillar fungus in Chen

[889] Chen 1935e, p. 1.
[890] For the entry on and illustration of the caterpillar fungus, see Chen 1935a, pp. 303-306; Chen 1935, p. 24.

Cunren's dictionary (1935).

The entry on the caterpillar fungus consists of nine sections: '*ming ming* 命名' (naming), 'other ancient names' (古籍別名), 'foreign names' (外國名詞), 'production areas' (產地), 'morphological characteristics' (形態), 'collection' (採取), '[medicinal] properties' (性質), 'main efficacies' (主治), and 'recent doctrines' (近人學說). The number of specific sections in individual entries varies due to different amounts of available references.[891] Scientific knowledge about the caterpillar fungus in the entry is located in the 'foreign names' and 'recent doctrines' sections, whereas the knowledge in the other sections is actually all extracted from Zhao Xuemin's (1719-1805) *Ben cao gang mu shi yi* (A Supplement to the Compendium of Materia Medica, *c*. 1803).[892] The 'foreign names' section only gives the Latin name for the caterpillar fungus, '*Cordyceps sinensis*'. The Latin name is also what Chen refers to as '*xue ming* 學名' (scientific name) in his instructions on the principles of compilation. The 'recent doctrines' section was actually extracted from Cao Bingzhang's 曹炳章 (1877-1956) 1917 article on the caterpillar fungus.[893]

In Cao's original article and also the 'recent docrtines' section in Chen's dictionary, Cao starts with the statement that Japanese and Western naturalists have already found the caterpillar fungus to be 'a kind of parasitic fungus ' (一種寄生菌); then he introduces some modern scientific knowledge (about, for example, the germination of spores in larvae) from the Japanese journals *Shin nou hou* 新農報 (Journal of New Agriculture) and *Kon chuu se kai* 昆蟲世界 (Insect World), and the Chinese journal *Bo wu xue za zhi* 博物學雜誌 (Journal of Natural History),[894] and then presents some pre-modern Chinese natural knowledge from the primary work of Zhao Xuemin and other authors. Cao did not consult the original Japanese texts, but just read Chinese translations of two articles published in the Japanese journals. Because the Chinese translations had been published in 1900 and 1903 respectively (see above), and many of Cao's words were identical to the translated versions. Cao's accounts of the morphological characteristics, life cycle, taxonomic classification and scientific names relating to the caterpillar fungus in the European context were largely taken verbatim from the two translations. That is to say, although these accounts originated from modern European natural knowledge, they were actually indirectly derived through (Chinese translations of)

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891 See , for example, Chen 1935a, pp. 1115-1118.
892 Cf. Zhao [*c*. 1803] 1983, pp. 138-139.
893 Cao 1917, pp. 25-33. An illustration of the caterpillar fungus in Cao's article was not simultaneously used by Chen Cunren. For Cao's life, see Shen *et al*. 1996, pp. 567-573.
894 For the original article published in the Chinese journal, see Wu 1914, p. 100.

Japanese literature.

In the 'naming' section, however, Chen Cunren still explains that the caterpillar fungus got its name because of its transformation from a worm in winter to a blade of grass in summer. This might be understood for its antiquarian value of preserving a traditional explanation in the historical section. But in the 'morphological characteristics' section, Chen again uses the popular theory about the seasonal transformation of the caterpillar fungus to explain its appearance and life cycle; and in the 'recent doctrines' section, Chen quotes Cao's remark that 'Doubtless the caterpillar fungus transforms between a worm and a fungus. And scientists' identification of the caterpillar fungus as a parasitic fungus is probably incorrect, because they drew the conclusion by just observing specimens of it (其為蟲菌遞變，已無疑義. 而科學家但就其標本觀之，謂為寄生菌，恐非確論). From these words, it seemed that Cao, and probably also Chen, then accepted the idea that the 'grass' part of the caterpillar fungus was actually a kind of fungus, but he still believed in the caterpillar fungus's transformational ability. Such statements in the entry make one doubtful of Chen's own scientific literacy and adherence to his compilation principles. Moreover in the 'main efficacies' section, there are also expressions such as '*wen* 溫' (warm) and '*ping* 平' (balance) in the '[medicinal] properties' section, and '*li zhu xu bai sun* 理諸虛百損' (treating all kinds of deficiencies and impairments) [terminology from the conceptual system of classical Chinese medicine]. Probably Chen treated these categories as material for scientific studies of old Chinese *materia medica*, but there are no direct matches for them in scientific terminology.

Besides, Chen's classification of organisms is not consistent with modern biological classification.[895] Chen classified Chinese medicinal substances into the following 28 groups:

jin yu lei	*shi lei*	*shan cao lei*	*fang cao lei*
金玉類	石類	山草類	芳草類
(metal and minerals)	(stone)	(mountain herbs)	(fragrant herbs)
shi cao lei	*du cao lei*	*man cao lei*	*shui cao lei*
濕草類	毒草類	蔓草類	水草類
(marshy herbs)	(toxic herbs)	(creeping herbs)	(aquatic herbs)
shi cao lei	*gu lei*	*cai lei*	*wu guo lei*

895 Biological classification had been transmitted to China through textbooks and other avenues before Chen compiled his dictionary, see Chen 1924, pp. 127-134.

石草類	穀類	菜類	五果類
(rocky herbs)	(grains)	(vegetables)	(five fruits)
shan guo lei	*yi guo lei*	*wei guo lei*	*luo guo lei*
山果類	夷果類	味果類	蓏果類
(mountain fruits)	(exotic fruits)	(flavourful fruits)	(melons)
shui guo lei	*xiang mu lei*	*qiao mu lei*	*guan mu lei*
水果類	香木類	喬木類	灌木類
(aquatic fruits)	(fragrant woods)	(tall woods)	(watery woods)
yu mu lei	*bao mu lei*	*chong lei*	*lin lei*
寓木類	苞木類	蟲類	鱗類
(parasitic woods)	(luxuriant woods)	(insects)	(scaly animals)
jie lei	*qin lei*	*shou lei*	*tu lei*
介類	禽類	獸類	土類
(armoured animals)	(birds)	(beasts)	(earths)

These categories were not devised by Chen, but were established in Chinese medical texts, such as *Ben cao gang mu* (Compendium of Materia Medica, 1578) and *Ben cao cong xin* (Renewed Herbal Classic, 1757), centuries before. But the binomial nomenclature in Latin, evolutionary species concept-based classification, and microscope-based observation and description added to the rhetoric of power, which maked these categories traditional and unscientific and the Linnaean taxonomic system modern and scientific.

Chen Cunren attached much importance to illustrations. According to his own instructions about the compilation principles, common and important medicinal substances were illustrated in colour; secondary medicinal substances and those requiring three-dimensional representations were photographed and rendered in black-and-white drypoint etchings; rare and seldom used medicinal substances were illustrated with pen drawings. The illustration of the caterpillar fungus (Fig. 24B) vividly displays the appearance and colours of eight specimens. Given that it is illustrated in colour, in Chen's own view, this meant the caterpillar fungus belonged to the group of 'common and important medicinal substances'. The illustration shows the dorsal, ventral and lateral sides of the caterpillar fungus by means of different specimens. In addition to revealing general features of the caterpillar fungus (e.g. the worm-fungus structure), it also realistically depicts differences between specimens (e.g. different ratios of the fungus part to the worm part); probably to intensify the three-dimensional effect, it even retains the projected shadows of the specimens.

The earliest extant illustrations of medicinal substances in classical Chinese medical texts are the ink and brush drawings preserved in the text *Ben cao tu jing* 本草圖經 (Illustrated Classic on Materia Medica, 1061), which make a concerted attempt at '*xie shi* 寫實' (representing actual appearance).[896] However, the printed or hand-drawn ink pictures or coloured illustrations of medicinal substances in Ming and Qing dynasty texts gradually developed general problems of over-simplification, distortion and artistic licence, although some of these illustrations were still drawn from life.[897] Wu Qijun's (1789-1847) *Zhi wu ming shi tu kao* 植物名實圖考 (Treatise on Names and Entities of Plants, 1848), which won praise from later botanists due to its fine illustrations,[898] also contains an ink drawing of the caterpillar fungus.[899] It depicts two specimens of the caterpillar fungus outlined with clean black lines, showing the dorsal oblique and ventral oblique views. However, it does not use shading show to render a three-dimensional view; and detailed characteristics of the caterpillar fungus (e.g. the appearance of the fungus part) are also largely absent, although to a significant extent Wu's textual description supplements the deficiencies in the illustration. Of course, from the perspective of biological identification, the illustrations of the caterpillar fungus in Chen Cunren and Wu Qijun's books both lack scale bars and images of microscopic structures (e.g. perithecia and spores). But they were drawn by employed illustrators rather than scientists; the shadow and the inclusion of different sizes of specimens is also an indication of a blind sight of nature, or, according to Daston and Galison, 'seeing without inference, interpretation, or intelligence',[900] which embodied scientific objectivity.

Through the entries in Chen Cunren's dictionary, exemplified by the entry on the caterpillar fungus, we can see Chen's effort to introduce what he understood to be scientific knowledge about Chinese medicinal substances through Japanese literature and Chinese translations. Such knowledge often relates to binomial nomenclature in Latin, Linnaean taxonomic system, European biological terminology for morphological characteristics, microscopic descriptions, chemical constituents

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[896] Zheng 2007, p. 5.
[897] Zheng 2007, pp. 83-89.
[898] The Russian botanist and sinologist Emil Bretschneider considered Wu's book 'incomparably the best pictorial work of the Chinese of this class', see Bretschneider 1871, p. 6.
[899] Wu [1848] 1956, p. 242.
[900] Daston and Galison 2007, p. 17.

and/or their physiological functions as to biomedicine. But at the same time, the dictionary also retains (even more) classical Chinese knowledge about medicinal substances, including ancient names, production areas, appearance, medicinal properties, preparations, prescriptions, etc. Knowledge from disparate sources partially overlaps in the sections that constitute an entry. However, in many (not all) cases, the integration of classical Chinese and scientific knowledge is largely mechanical rather than organic complementary, which is shown in Chen's comment on the scientific explanation of the caterpillar fungus's nature and formation (see above). The entry on the caterpillar fungus is more or less emblematic of the plurality of the knowledge about medicinal substances in Chen's dictionary. Chen Cunren himself, no doubt, aspired to compile a dictionary that reflected the scientific spirit, as he understood it. But because of his poor scientific literacy and inability to read scientific publications in European languages, he was sometimes unable to identify opinions that clearly deviated from standard scientific explanations. On the other hand, Chen's belief in the latent scientificity of parts of classical Chinese medical knowledge also enabled him to retain large amounts of 'old' material in the dictionary without feeling there was any epistemological conflict. He was also one of the few authors who used the character '*xue* 學' (-ology) in the titles of Republican dictionaries of Chinese medicinal substances, i.e. '*Zhongguo yao xue da ci dian* 中國藥學大辭典 (Great Dictionary of Chinese Materia Medica)'. This indicates his ambition to update that branch of learning and contribute to the 'field' of Chinese medical studies.

From the above analyses we are able to see the Japanese influence on Ding Fubao, Yu Yunxiu and Chen Cunren, who held similar opinions on Chinese medicinal substances and related empirical Chinese knowledge. Both Chen and Yu repudiated what they regarded as erroneous Chinese medical theories. Chen's medical idea reflected Yu's tripartition of Chinese medicine into 'theory, Chinese drugs, and experience' (see above).[901] And his proposal for scientising Chinese *materia medica* engaged with Yu's empirical world of Chinese medicine. But his was rather a discursive practice that produced a divide between nature (represented by, for example, Chinese medicinal substances as objects for scientific research) and culture (represented by, for example, Chinese medical theories), and a distinction between a pre-modern and an emerging modern Chinese *materia medica*. Such a divide actually obscures the reality of Chen's organisation of knowledge in the entries of his dictionary.

[901] Lei 2014, p. 94.

The *Great Dictionary of Chinese Materia Medica* soon became an important reference for those who wanted to know something about Chinese medicinal substances. For example, in an article published in a Shanghai literary journal on 25 March, 1937, the author Shushan 曙山 writes that he once received a big pack of a '*ming yao* 名藥' (a famous medicinal substance; i.e. the caterpillar fungus) from a friend of his, and was informed of the method of consuming it in a dish of a boiled duck. Having no knowledge of the caterpillar fungus, he referred to the *Ci yuan* (Origins of [Chinese] Terms) but was dissatisfied with the definition and illustration in the relevant entry. In particular, he considered the illustration looked different from what he saw in front of him. However, his puzzle was *completely* solved after consulting Chen's dictionary. Much delighted, he even excerpted a passage from the entry on the caterpillar fungus in the dictionary.[902] Moreover, when replying to curious readers' enquiries about the caterpillar fungus, various authors, like the traditional physician Zhu Peiran 朱沛然, also referred to Chen's dictionary.[903] In 1945, the entry for the caterpillar fungus in Chen's dictionary was even extracted and republished as an article under a pen name in the medical journal *Xian dai yi yao za zhi* 現代醫藥雜誌 (Journal of Modern Medicine and Materia Medica, Guiyang).[904] Chen Cunren's dictionary gradually became a source of 'standard' knowledge about Chinese medicinal substances in circulation among the public. The knowledge about the caterpillar fungus in the dictionary also profoundly shaped its readers' views on the true nature of this noted medicinal substance.

4.3.4 Between Scholarship and Practice

Chen Cunren presented his positive attitude to scientification of Chinese *materia medica* in his dictionary, and thus included scientific knowledge to the best of his ability. Nevertheless, the emphasis of the dictionary was still on indigenous medical knowledge. The prefaces and afterwords written by celebrated traditional physicians, a humanities scholar and a politician all give lavish praise to the quality of Chen's dictionary.[905] The popularity of the dictionary enables us to suppose

902 Shu 1937, pp. 511-513.
903 Zhu 1937, p. 100. Zhu was a traditional physician who advocated scientification of classical Chinese medicine. For Zhu's idea and life, see Zhu 1936, pp. 460-461; Zhu 1936, pp. 483-485; Anonymous 1947, p. 18; Yang and Tang 1991, pp. 3-10, 55-60.
904 Chengren 1945, pp. 15-18.
905 Authors of the prefaces to Chen's dictionary include Zhang Taiyan 章太炎 (humanities scholar), Jiao Yitang 焦易堂 (politician), Xiao Fangjun 蕭方駿 (traditional physician), and Chen Cunren himself. Authors of the afterwords include Ding Zhongying 丁仲英 (traditional physician), Wang Zhongqi 王仲奇 (traditional physician),

that traditional physicians confronted with this thick and informative reference book would have considered it a useful, practical tool; and despite its scientific shortcomings, doctors of scientific medicine, would not have rejected it out of hand due to the embedded idea of scientification and Chen's optimistic expectations of scientists and experts in scientific medicine.[906] In fact, the dictionary succeeded in gaining support from doctors of scientific medicine and even politicians partly by means of Chen's sophisticated social networking skills. Those who wrote congratulations to Chen Cunren include:

> Niu Huisheng 牛惠生 (PhD in medicine from Harvard University, 1892-1937);
> Lü Zhegong 呂哲公 (President of Association of Chinese Physicians in Hong Kong);
> Yu Yunxiu 余雲岫 (BSc in medicine from Osaka i ka dai gaku 大阪医科大学 [Osaka Medical College], 1879-1954);
> Li Ting'an 李廷安 (PhD in public health from Harvard University, 1898-1948);
> Xu Xiangren 徐相任 (traditional physician, 1881-1959);
> Lu Zhong'an 陸仲安 (traditional physician, 1882-1949);
> Chen Lifu 陳立夫 (Politician, 1900-2001);
> Chu Minyi 褚民誼 (PhD in medicine from University of Strasbourg, also politician, 1884-1946);
> Yan Fuqing 顔福慶 (PhD in medicine from Yale University, 1882-1970).[907]

Over half of the above people were doctors of scientific medicine, including the very same Yu Yunxiu who once strongly advocated the abolition of Chinese medicine. Yu's congratulations show his approval of Chen's dictionary and advocacy of scientific studies of Chinese medicinal substances. Obtaining Yu's support can also be seen as part of Chen's strategy for popularising the dictionary. In this respect, the role of Chu Minyi's congratulatory message was similar to that of Yu's. Chu ranked

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Lü Zhegong 呂哲公 (traditional physician), Xia Shaoting 夏紹庭 (traditional physician), Cao Bingzhang 曹炳章 (traditional physician), Yun Tieqiao 惲鐵樵 (traditional physician), and Xie Liheng 謝利恒 (traditional physician).

[906] Among over ten Republican dictionaries of Chinese *materia medica* published before 1936, Chen's dictionary was one of the two (the other, compiled by Wu Weier, will be mentioned below) referred to by the pharmacologist Bernard E. Read in his *Chinese Medicinal Plants from the Pen Ts'ao Kang Mu*, see Read 1936, p. xiii.

[907] For Niu's life, see Ma *et al*. 1992, p. 168. For Yu's life, see Hao 2004, pp. 72-76. For Li's life, see ZSSRMZFDFZBGS 2012, p. 175. For Xu's life, see Xiong 2005, pp. 226-227. For Lu's life, see Li *et al*. 1995, p. 840. For Chen's life, see Zhang 2006. For Chu's life, see Liu and Zhang 1991, pp. 424-425. For Yan's life, see Qian and Yan 2007. Lü Zhegong was born in Xinhui, Guangdong province, see Lü 1936, p. 280. However, his life remains obscured. Here his identity is indicated in his congratulatory message to Chen on the dictionary.

among the influential figures who attended the Nationalist government's conference on public health in February, 1929, at which proposals for abolishing Chinese medicine were accepted. Soon after the conference, Chen wrote a letter of protest to Chu, defending the value of Chinese medicine.[908] Nonetheless when his dictionary came to be published, he still turned to Chu to ask for the latter's support in a display of remarkable tolerance. Chen's social network not only contributed to his personal success, but also effectively expanded the influence of his dictionary and the project of the scientification of Chinese *materia medica*.

From Dictionaries to Textbooks

Republican dictionaries of Chinese medicinal substances were almost all published in Shanghai, the publishing centre of Republican China.[909] A few had already appeared in print before Chen Cunren's dictionary was published, but compared with Chen's dictionary, they had fewer pages and they did not pay special attention to scientific sources.[910] However, *Zhong hua xin yao wu xue da ci dian* 中華新藥物學大辭典 (Great Dictionary of Chinese New Materia Medica) by the doctor of scientific medicine Wu Weier 吳衛爾, published in Tianjin in 1934, was an outstanding example to the contrary. Although the entries are all Chinese medicinal substances, Wu's selection and organisation of knowledge are much more radical than Chen's. As is signalled by the character *xin* 新 (new) in the title, Wu despised '*jiu yao xue* 舊藥學' (old [Chinese] materia medica). In particular, he called his readers' attention to the fact that the medicinal substances in his dictionary were classified according to the Western biological classification system, while information about the chemical constituents, efficacies and recommended dosages of the medicinal substances was all obtained through chemical analysis and animal experiments.[911] Such a statement embodied Wu's rupture with old Chinese *materia medica*, and simultaneously indicated his acknowledgement of the authenticity and authority of scientific and biomedical knowledge. Wu's procedure resonated with Yu Yunxiu's appeal for scientific studies of Chinese medicinal substances. But unlike Chen Cunren, Wu totally abandoned the attempt to integrate a Chinese medical knowledge system with scientific

[908] Chen 1929, pp. 15-16. Chen Cunren had contact with Chu Minyi in his daily life. But according to Chen's memoirs, his impressions of Chu were not very positive, sometimes even negative, see Chen [1979] 2001, pp. 56-76.
[909] Reed 2004, pp. 203-256; Yuan 2011, pp. 201-213.
[910] For examples of such dictionaries, see Chen 1930; WSBGBJB 1930; Jiang 1931; Wu 1933; Zhang 1934.
[911] Wu 1934, pp. 1-2. Wu Weier's life remains obscure. However, a traditional physician once studied scientific medicine under Wu in Tianjin during the period 1925-1927, see Ma 2009, p. 261.

knowledge. Yet despite this, Wu's dictionary was far less popular than Chen's in Republican and even Communist China. To some extent this is not so inexplicable as it might appear at first sight if we consider that Wu's dictionary does not include the Western medicinal substances preferred by doctors of scientific medicine, while the scientific and biomedical knowledge that permeates it would not have been intelligible to traditional physicians who, in most cases, had not received an extensive education in science or scientific medicine.

From around the mid-1930s, dictionaries of Chinese *materia medica* began to consciously or unconsciously assimilate scientific knowledge to varying degrees in addition to classical Chinese medical accounts.[912] For example, the entry of the caterpillar fungus in the *Zhongguo yao wu xue ji cheng* 中國藥物學集成 (Collection of Chinese Materia Medica; Shanghai, 1935) describes the formation of the caterpillar fungus as follows:

> It is a fungus, parasitic on underground dead bodies of mole cricket and so on; [its] mycelia grow out in winter, and become a mature fruiting body in summer; [during the period between winter and summer] the dead bodies of the insects decaying, providing the fungus with nutrients. The fungus is four or five *cun* in length, lacks a cap, has a thick lower portion and a thin upper portion, is blackish brown in colour, and can be used for medical purposes. The quality of the fungus produced in Sichuan is the best. (屬菌類，寄生於土中螻蛄等之死體；冬時發生菌絲，至夏則菌長成，蟲體腐爛爲其養料．菌長四，五寸，無傘，下粗上細，黑褐色，可入藥．用以四川產者爲最佳.)[913]

This book has been neglected in recent statistics on modern dictionaries of Chinese *materia medica*.[914] It includes a few instructions on the use of medicinal substances and entries on more than 400 Chinese medicinal substances. Jiang Yubo 蔣玉伯 (1891-1965), author of the Collection, was a practitioner of Chinese medicine, and Dean of Studies and professor of *materia medica* at the Hu bei guo yi zhuan ke xue xiao 湖北國醫專科學校 (Specialist School of Chinese Medicine in Hubei). He also valued modern science and scientific medicine.[915] In the above description, the caterpillar fungus loses its marvellous transformational ability, while the *yin yang* theory also vanishes. What

912 For example, see Hu 1935; Pan 1935.
913 Jiang 1935, p. 489.
914 Li and Wan 2013, pp. 586-588, 594; Li 2014, p. 48.
915 Hu 1987, pp. 55-56; Zhou *et al*. 1987, pp. 36-38.

Jiang offers us is a biological explanation despite a minor inaccuracy (i.e. the fungus parasitises living insects rather than their dead bodies). Like the entries in Chen Cunren's dictionary, however, Jiang's accounts of the medicinal properties and efficacies of the caterpillar fungus in this entry are excerpted from classical Chinese medical texts. As this trend continued and grew in the second half of the 20th century, scientific knowledge thus became common in dictionaries of Chinese *materia medica* or medicinal substances.[916] This phenomenon accorded with popular practice among traditional physicians, who actively engaged in studying scientific medicine. For example, the traditional physician Zhang Ruoxia 張若霞 (1885-1957) published an article on the caterpillar fungus in the 'Guo yao jiang zuo 國藥講座' (Lectures on Chinese medicinal substances) column of a Shanghai journal in 1948. In it he introduces the production of the caterpillar fungus in China, and then quotes some historical Chinese accounts of the caterpillar fungus from *Ben cao gang mu shi yi* (A Supplement to the Compendium of Materia Medica, *c*. 1803); furthermore, he also excerpts much mycological knowledge and an illustration (with slight adaptations) from the translated article '*Dong chong xia cao shuo*' (Speaking of winter worm summer grass, 1903).[917] Although Zhang was a traditional physician, he did not hesitate to reject the long prevailing worm-grass transformation theory at the beginning of his article.

Certainly not all traditional physicians were highly sensitive to scientific knowledge. Some physicians remained preoccupied with the knowledge about medicinal substances recorded in classical Chinese medical texts. For example, the articles published in the *Yao wu xue* 藥物學 (Materia Medica) column of *Zhong yi za zhi* 中醫雜誌 (Journal of Chinese Medicine, Shanghai) indicate that their authors were still obsessed about classical Chinese medical theories and knowledge.[918] In this journal, an author called Hu Fangxi 胡仿西 even published several dozen old-style poems on Chinese medicinal substances, with his own annotations, in this column in 1925. One of them was devoted to the caterpillar fungus:

冬蟲夏草(山草)[919] **The Caterpillar Fungus** (*mountain grass*)

[916] See, for example, JSXYXY 1977; JSXYXY [1977] 1986; JSXYXY [1977] 2004; NJZYYDX 2006.
[917] Zhang 1948, pp. 7-8. For Zhang Ruoxia's life, see Zhu 2012, pp. 99-100.
[918] This was a quarterly journal established in Shanghai in December, 1921, and discontinued in September, 1930, see Shen 2012, p. 130.
[919] Hu 1925, p. 7. His own annotations are shown in brackets.

冬蟲夏草性平甘	The caterpillar fungus is balanced and sweet.
‘補’肺金兮且化痰	It ‘nourishes’ the lungs as *jin* 金 (metal) and disperses phlegm.
益腎止紅(血也)已勞嗽	It benefits the kidneys, stops bleeding (*hong* 紅, *i.e. blood*), and eliminates phthisical cough.
最佳嘉定次雲南(四川嘉定府所產最佳, 雲南貴州所出者次之)	Jiading is the best, while Yunnan is inferior (*The best caterpillar fungus is produced in Jiading, Sichuan, while the inferior is produced in Yunnan and Guizhou*).

The annotations in the poem prove that Hu’s source was *Ben cao cong xin* (Renewed Herbal Classic, 1757), andnd his poem was actually a condensed version of the relevant entry in the Qing text. The only addition to the original record was the character *jin* 金 (metal), one of the five elements or phases in the *wu xing* theory depreciated by Chen Cunren. Clearly, Hu Fangxi associated the lungs with *jin* (metal), which accords with the classic system of correlations between the five organs (i.e. *xin* 心 [heart], *gan* 肝 [liver], *pi* 脾 [spleen], *fei* 肺 [lungs], and *shen* 肾 [kidneys]) and five elements (*huo* 火 [fire], *mu* 木 [wood], *tu* 土 [earth], *jin* 金 [metal], and *shui* 水 [water]).[920] Another example is offered by Yang Baicheng 楊百城 (1861-1928) and the *Yi xue za zhi* 醫學雜誌 (Journal of [Chinese] Medicine, Taiyuan). Yang Baicheng was a traditional physician who highly valued Western science, while this journal also focused on the integration of Chinese medicine and scientific medicine. However, Yang’s article on the caterpillar fungus, published in this journal in 1926, relies on a few sources from the Qing.[921]

Some traditional physicians also acted as teachers of Chinese *materia medica* at schools of Chinese medicine/*materia medica*. They had different responses to scientific knowledge, which would then have had a direct influence on their students. For example, Zhang Cigong 章次公 (1903-1959), a teacher who lectured at a variety of such schools from the 1930s onward, published a book entitled *Yao wu xue* 藥物學 ([Chinese] Materia Medica), based on his teaching handouts, in Shanghai in 1949.[922] In it we can clearly see both historical indigenous Chinese medical knowledge

[920] For early accounts of the correlations between the five organs and five elements, see Anonymous 1992 [*c*. 1st century BC], pp. 83-90.
[921] Yang 1926, pp. 90-92. Cf. Zhu *et al*. 2010, pp. 926-927, 972; Chen 1993, p. 265; Wang *et al*. 1994, p. 390.
[922] Zhang [1949] 2013. For Zhang’s life and his medical thought, see Ye and Tang 2004, pp. 37-39; She 2011, p. 333.

and scientific or biomedical knowledge (mainly involving modern biological classification and morphology, chemical constituents, and pharmacological and physiological effects) of 95 Chinese medicinal substances. The latter kind of knowledge was especially plentiful in the book, and was mainly extracted from Chinese translations of Japanese literature. In contrast, Meng Zhongsan 孟仲三, who taught at the Bei ping guo yi xue yuan 北平國醫學院 (Beijing College of Chinese Medicine) in the 1930s, strongly argued against mixing classical Chinese *materia medica* with scientific or biomedical knowledge. His textbook on Chinese *materia medica*, finalised in 1932 and published in 1940, was written by consulting 'high-quality texts by ancient famous [Chinese] physicians' (古名醫大家之善本) and 'the best of ancient [Chinese] people's doctrines' (古人論理之精當者).[923] In 1926, a set of articles written by students from the Hu bei zhong yi zhuan men xue xiao 湖北中醫專門學校 (Hubei Specialist School of Chinese Medicine) were published as model essays in the *Yi xue za zhi* 醫學雜誌 (Journal of [Chinese] Medicine, Wuchang). One of them was a textual study of the caterpillar fungus.[924] It focused on Qing Chinese sources, and claimed that the transformation of the caterpillar fungus, driven by *yin* and *yang*, could not readily be explained by modern science.

More commonly, however, scientific or biomedical knowledge was more or less thoroughly embedded in textbooks by teachers of Chinese *materia medica*. In this regard, Zhang Cigong's book, outlined above, is a fine example. But there were also some textbooks of this kind that paid attention to Western taxonomic knowledge alongside classical Chinese knowledge about medicinal substances, exemplified by Yang Shucheng's 楊叔澄 (*c*. 1896-?) *Zhongguo yao wu xue* 中國藥物學 (Chinese Materia medica) and *Zhongguo zhi yao xue da gang* 中國製藥學大綱 (A General Outline of the Preparation of Chinese Medicinal Substances).[925] Both of those works were set texts for students studying at the Beiping zhong yao jiang xi suo 北平中藥講習所 (Beijing Training Institute of Chinese Medicinal Substances). Notwithstanding, the Western taxonomic knowledge in the two books was helpful in identifying raw medicinal substances.

Consequences of Scientification

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923 Meng [1940] 2013, pp. 5, 14.
924 Ming 1926, pp. 76-78.
925 Yang [1940?] 2012a; Yang [1940?] 2012b. For Yang's life, see ZGZYYJYZGYSWXYJS 1988, p. 204.

The scientification of Chinese medicinal substances led to two main consequences, both of which can be seen in China today: one was the use of Chinese medicinal substances with special reference to scientific or biomedical explanations, while the other was the attempt to isolate effective medicinal substances from the chemical constituents of Chinese medicinal substances. With regard to the former, scientific or biomedical explanations sometimes influenced traditional physicians' preparations of Chinese medicinal substances in Republican China, and more commonly, provided a legal framework for the use of Chinese medicinal substances in the society where the government promoted *new* scientific medicine rather than *old* Chinese medicine. Appendix 8 lists some Republican traditional physicians' use of the caterpillar fungus together with other Chinese medicinal substances in treating patients in Eastern China. In these medical cases, all the terminology in the physicians' records of their observations, diagnoses and prescriptions has its origins in classical Chinese medicine. The physicians also seem to have neglected biomedical knowledge in their practical use of Chinese medicinal substances. Some other records of their medical practice indicate that a few of them occasionally invoked biomedical knowledge. For example, Zhang Cigong (1903-1959) once recorded that a female patient's disease was caused by bacterial invasion of lymph.[926] However, Zhang seems simply to have been concerned to establish a relationship between diseases in Chinese medicine and biomedicine. This did not change his use of Chinese medicinal substances according to indigenous knowledge about diseases and medicinal substances. On this point, Zhang Cigong and the other traditional physicians listed in Appendix 8 were not different from each other.

In particular, scientific or biomedical knowledge about the effects of Chinese medicinal substances was usually oriented towards single natural substances and even their individual constituents, while the drugs that traditional physicians commonly used in practice were compounds of natural medicinal substances. In light of this, scientific medicine did not necessarily have a direct or substantial impact on traditional physicians' use of medicinal compounds. On the contrary, scientific or biomedical explanations served to reinforce some traditional physicians' belief in Chinese ways of using these substances. Sherman Cochran's case study of Xu Guanqun's (1899-1972) New Asia Medical Materials Plant in the 1930s-40s indicates that scientific discourse could be employed as a business strategy for promoting medicinal products.[927] Here I give another

[926] Zhang [1940?] 1980, p. 361.
[927] Cochran 2006, pp. 105-115.

similar example. 'Science' or 'scientific' remained the major selling point of the Chinese medicinal products sold by the Shanghai Buddhist Mercy Medicine Factory (established in 1929). When this factory even started to sell some Chinese medicinal products claimed to contain electricity, Lu Xun published a short article in the *Shanghai News* in 1933, which satirised the seller's overuse of the vocabulary of science and its scientific illiteracy.[928] Also in 1933, a doctor of scientific medicine commented in an article published in the *Shanghai News* that, 'legal research on medicinal substances is a very slow process. It is absolutely unlike what is being done by cunning drug sellers. They feel free to lay claim to producing scientific Chinese medicinal substances, and think that it is sufficient merely to label something as scientific.'[929] His comment was probably made with special respect to the above factory. Doubtless this factory utilised the public belief in the power of science to increase its profits.

As for research seeking to isolate medicinal chemicals from Chinese medicinal substances, historians of medicine have often taken delight in talking about Chen Kehui 陳克恢 (1898-1988) and ephedrine.[930] Ephedrine, a bioactive chemical extracted from the medicinal plant *ma huang* 麻黃 (*Ephedra vulgaris* Rich. var helvetica Hook. et Thomp.) was first reported by the Japanese scientist Nagai Nagayoshi 長井長義 (1845-1929) in 1887. But Nagai focused on its mydriatic effect.[931] During the period 1923-1925 when Chen was working at Peking Union Medical College, he collaborated with Carl F. Schmidt (1893-1988) on researching new pharmacological effects of ephedrine through chemical methods and animal experimentation. After he moved to America in 1926, ephedrine 'was submitted to the Council of Pharmacy and Chemistry of the American Medical Association', as a new drug for asthma, hypotension and some other symptoms and was subsequently given approval.[932] The significance of Chen's case, as Sean Hsiang-Lin Lei writes, was that 'even those who had originally held conflicting attitudes towards Chinese medicine and had been its biggest critics consequently began to share the opinion that Chinese drugs, unlike other

928 Lu [1933] 2005, pp. 29-30.

929 Pang [1933] 1985, p. 348. The original words are '藥物的合法研究，是一樁很緩慢的事．絕非像奸滑藥商，隨便自稱科學國藥，把無論什麼東西帶上科學帽子，就算了事.' For Pang's life, see NJTSG 2011, p. 685.

930 Chen Kehui obtained his PhD in Physiology from University of Wisconsin in 1922, and a further PhD in Medicine from Johns Hopkins University in 1927. For his life and achievements, see Lou 1995, pp. 88-97; Welland 2006, pp. 159-166, 200-210, 236-238, 268-269.

931 Nagai 1887, p. 700. See also Nagai 1892, pp. 109-114. For Nagai's life, see Kanao 1960. An early Chinese record of *ma huang* can be found in the *Shen nong ben cao jing* (Divine Husbandman's Classic of Materia Medica, finalised in the late 1st or 2nd century), see Ma 1995, pp. 200-202.

932 Chen and Schmidt 1930, pp. 4-7. For Schmidt's life, see Koelle 1995, pp. 273-288.

aspects of Chinese medicine, were worthy of serious scientific research'.[933]

However, what many historians of medicine neglect to say is that the story of ephedrine was a very special case. In the whole of the Republican period, more than 400 kinds of Chinese medicinal substances were studied by scientists around the world,[934] while Chinese scientists studied about 114.[935] Nevertheless, few new drugs were successfully developed from the chemical constituents of these substances, not to mention a wide range of subsequent clinical trials.[936] In Republican China there were insufficient human and financial resources for isolating and testing new medicinal chemicals from medicinal plants or fungi. Meanwhile, China's weak pharmaceutical industrial basis, its reliance on imported medicinal chemicals, and the shortage of medicinal chemicals and biological preparations caused by the Sino-Japanese War in the 1930s and the first half of the 1940s all prompted some Chinese scientists to turn their attention to Chinese medicinal substances.[937] Whether seeking effective substitutes or researching new medicinal chemicals, they had to first study classical Chinese *materia medica*.[938] This helped to spread empirical knowledge about Chinese medicinal substances among scientists.

From the above analysis it is clear that there was a significant distance between traditional physicians' academic orientation and practical applications of the caterpillar fungus and other Chinese medicinal substances in Republican China. Contemporary Chinese 'doctors of Chinese medicine', as Volker Scheid finds, 'routinely make biomedical diagnoses, prescribe biomedical drugs, and even perform surgery'.[939] This phenomenon can be traced back to early Communist China (1945-1963). Kim Taylor argues that 'without its deliberate promotion by the Chinese Communist Party, Chinese medicine would exist very differently from how it does today'.[940] In Republican China, the phenomenon witnessed by Volker Scheid was far from universal. The scientification of Chinese medicinal substances basically remained at a level of academic discourse

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933 Lei 2014, pp. 90-91.
934 *Zhong yao wen xian yan jiu zhai yao (1820-1961)* 中藥文獻研究摘要 (Abstracts of Research Literature on Chinese Medicinal Substances, 1820-1961) (Beijing: Ke xue chu ban she, 1963) provides sources for this statistics.
935 Zhang 2010, pp. 31-34.
936 For example, dichroine B (or 'febrifugine'), an anti-malarial chemical extracted from the medicinal plant *Chang shan* 常山 (*Dichroa febrifuga* Lour.) by Chinese scientists in the 1940s, did not succeed in becoming a new medicine due to its serious side effects, see Lei 1999, pp. 323-358; Rao 2013, pp. 263-270.
937 Zhang 1949a, pp. 99-116. See also Zhang 1949b, pp. 303-310; Zhang 1949c, pp. 353-365. For the history of the pharmaceutical industry in modern China, see Zhang 1935a, pp. 1-2; Zhang 1935b, pp. 1-2; Xiao 1943, pp. 9-23; Li 1943, pp. 10-13; Jiang 1944, pp. 10-12; Lin 1944, pp. 1-4; Anonymous 1947, pp. 118-120; Chen 1948, p. 6; Liu 1995, pp. 105-112.
938 Li and Wan 2015, pp. 147-149.
939 Scheid 2002, p. 17. This phenomenon is very common in contemporary urban hospitals and colleges of Chinese medicine. But it does not always occur in some rural areas of China.
940 Taylor 2005, p. 1.

and did not significantly influence indigenous ways of using Chinese medicinal substances. The 'scientific' use of Chinese medicinal substances, premised on effective and safe chemicals being discovered from the substances, barely existed among Republican traditional physicians and even among scientists due to a lack of such chemicals. However, the pursuit of medicinal substitutes or new medicinal chemicals by doctors of scientific medicine or scientists lent continuity to the transformation of Chinese *materia medica*.

4.4 Conclusion

The transmission of modern science to China through the medium of key individuals and the state entailed tensions and negotiations with indigenous knowledge about Chinese medicinal substances, exemplified by our account of the caterpillar fungus. In modern China, especially Republican China, Chinese *materia medica* began to dramatically transform under the discursive power of science. Across a number of domains we have now tracked how indigenous knowledge about Chinese medicinal substances was positioned as inferior to scientific knowledge, but may not have been entirely replaced by it; while much indigenous empirical medical knowledge, valued by both traditional physicians and scientists, was retained in the newly emerging Chinese *materia medica* due to its value in the search for medicinal substitutes or new effective medicinal chemicals. The new Chinese *materia medica* was thus actually reconstructed from plural knowledge systems. The power of science and scientific rhetoric did not necessarily change practical uses of Chinese medicinal substances, but was sometimes even used to legitimate such usages or even to promote Chinese medicinal commodities. The continuous circulation of the caterpillar fungus and many other Chinese medicinal substances in China, for various purposes, also facilitated the spread and continuation of related Chinese empirical and cultural knowledge, and thus preserved a certain continuity in the 20th century process through which the indigenous *materia medica* transformed into a seemingly modern, yet distinctively national Chinese, *materia medica*. But the non-existent divide between nature and culture in Republican traditional physicians' practical efforts, which embodied Latour's criticism of modernity, indicated that Chinese *materia medica* had changed to some extent but had never been 'modern'. Anyway, Chinese medicinal substances and the empirical medical knowledge attached to them became a bridge of communication and a key tool for

Republican traditional physicians to save the legacy of classical medicine in China as it survived a profound and life-threatening existential crisis.

Conclusion

The caterpillar fungus is a curious object and also a potent medicinal substance. Both identities, seldom separated from each other, played important roles in attracting human actors to aid in the spread of the caterpillar fungus. From the early 18th century the caterpillar fungus travelled down from the Tibetan Plateau and surrounding Himalayas to Central and East China, and from there to the rest of the world. For 15th-century Tibetan observers the most fascinating aspect of its curious appearance was the evidence of its apparently marvellous transformation between a worm in winter and a blade of grass in summer. Reports of this miracle were fundamental to the early transmission of the caterpillar fungus in the Sino-Tibetan context. From the early 18th century it undoubtedly gained traction with a Chinese audience because of the deep-seated belief in such wonders of nature that was already embedded in the Chinese imagination from pre-imperial times. Once knowledge of the caterpillar fungus spread throughout China, Chinese literary, medical and culinary audiences gradually endowed its marvelous transformation with Chinese cultural and moral connotations, exploiting the economic value of its miraculous power and endowing it with medicinal potency within pre-established Chinese medical frameworks, thereby transforming it from an exotic Tibetan medicinal substance to an esteemed Chinese medicinal substance. With this new identity it gained favour in the royal palace in Beijing, and on the medicine markets of Suzhou and other regions of China. However, the initial voyage of the caterpillar fungus, with the transmission of specimens and knowledge between the Tibetan plateau and Central and East China, did not result in any significant tensions in their respective natural knowledge systems.

After Chinese travellers, as agents of the caterpillar fungus introduced it to Chinese society in the early 18th century, this intriguing organism caught the attention of travellers from outside of China. Exotic objects and the pursuit of new effective medicinal substances were not only an obsession for people in pre-modern China. The caterpillar fungus' extraordinary boundary-crossing status continued to stimulate the transmission of specimens from China to France and Japan in the 1720s, to Britain in about 1831, Russia in 1851, and North America in 1891. Complex and interwoven religious, commercial, medical, biological and political interests spurred on the travels of the caterpillar fungus within dynamic, but sometimes also fragile, transnational networks. Obstacles to the transnational travels of the caterpillar fungus included the political suppression of Jesuit missionaries in Qing China due to the Chinese Rites Controversy, and the belief that Chinese medicinal substances were replaceable with local and European products for Russians. These factors served to interrupt the caterpillar fungus's subsequent travels to France and Russia.

Nevertheless, the caterpillar fungus defied these obstacles to its progress and attracted much attention from those at the forefront of the fields of natural history and *materia medica* in 18th- and 19th-century Europe. It initiated European research on fungal parasitism on animals, and created new positions in the European natural order. Though this transformable Chinese wonder of nature was deconstructed into a fungus and a larva, using new European scientific theories and more penetrating ways of looking with the microscope in various academic institutions, and that it no longer had the power of species transformation, its extraordinary material mutability was an epistemologically transferable characteristic; it remained a scientific or medical wonder that fascinated growing networks of taxonomists, pharmacognosists and doctors. European taxonomic re-identifications of the caterpillar fungus, useful for their more accurate descriptions that aided the procuring of this medicinal substance, were necessary to coordinate the European *materia medica* enterprise. Now there were significant epistemological tensions between Chinese and European perceptions about the natural categories and properties of the caterpillar fungus. However, Chinese medical descriptions, terminology for, and geographical and commercial information about the caterpillar fungus were still valued in Europe for their utilitarian functions, due to their potential contribution to procuring and using this sought-after medicinal substance. In 18th- and 19th-century Europe, a re-examination of the caterpillar fungus as an object for display in public-private collections of the global natural world, and simultaneously under the microscope, meant it, along with all the other newly defined species of the world, took on the role of materialising the divide between culture (society) and nature (science) which, according to Bruno Latour, was a cornerstone of the very notion of modernity.[941] This not only made the caterpillar fungus in Chinese and European worlds demonstrably pre-modern or modern respectively, but also granted the 'modern' human voice the discourse of power to define 'an archaic and stable past'.[942] Such a strangely unnatural, 'natural' divide was absent in China before the late 19th century, as the European concept of 'nature' (the physical world opposed to humans or human creations) did not exist there at the time.

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941 Latour 1993, pp. 10-11.
942 Latour 1993, p. 10.

With the subsequent globalisation of a European scientific enterprise, the tensions and negotiations between traditional Chinese and European knowledge about Chinese medicinal substances, as exemplified in the travels of the caterpillar fungus, extended from Europe to 19th-century Japan and then China. With political and intellectual investment in the study of nature and medicine in the community of scientists in Meiji Japan, coupled with the representation of a scientific modernity as the ultimate goal in the new discourses of power, European and Japanese scientific institutions, their new styles of education and research methods, became a model for reform-minded Chinese. Significant changes in perceptions and the styles in which Chinese medicinal substances were studied in the first half of the 20th century are evident in the records of the caterpillar fungus from that time. Japanese translations of knowledge about its biological characteristics and taxonomic position in the new scientific hierarchies were read by Chinese intellectuals who had been trained in the new institutions, often in Japan, Europe and America, from the beginning of the 20th century. From the 1930s onwards, Chinese scientists' mycological, biomedical and pharmacological studies on the caterpillar fungus made a significant contribution to the construction of the new scholarship of Chinese medicinal substances, discovering, in particular, the chemical constituents and active ingredients that could have an affect on living organisms. As Chinese medicinal substances and related indigenous empirical medical knowledge proved useful for scientific explorations of medicinal substitutes and new effective medicinal chemicals, the value of the traditional *materia medica* was tacitly acknowledged, and this utilitarian function ensured its survival throughout the Republican period.

Stimulated by the power of the scientific rhetoric, some revolutionary traditional physicians such as Chen Cunren made efforts to modernise the so-called old Chinese *materia medica*. This therefore intensified perceptions that there was a division between medicinal substances in the Chinese *materia medica*, which was to be an object of scientific observation enquiry, and long-standing empirical medical knowledge about the efficacy of those substances. In theory Chen Cunren's project was to replace Chinese medical and cultural theories with scientific concepts and descriptions, in a transition mirroring that of 18th- and 19th-century Europe and among Republican Chinese scientists. But in practice he could not sustain that project, because that empirical knowledge was exactly what he needed for his new scientific enquiries; the knowledge about efficacy was essential to forming hypotheses for modern experimentation. The newly emerging

Chinese *materia medica* was thus characterised by plural knowledge systems and a certain continuity of Chinese medical knowledge in Republican China. The modernity of such a Chinese materia medica centred on transitions to the Linnaean taxonomic system, binomial nomenclature in Latin, microscopic observation and description, chemical analysis, and biomedical explanation. However, this modernity basically stayed at a theoretical and textual level and added to the rhetoric of power, but could not be generally observed in the practical use and study of Chinese medicinal substances among traditional physicians. From a Latourian perspective, there was no real divide between nature and culture in Republican traditional physicians' scholarship, as they, represented by Chen Cunren, had limited or bare scientific literacy, and thus could not perform scientific studies and radically decontextualise Chinese medicinal substances from traditional (medical) culture. In this sense, the changing Chinese *materia medica* had never been 'modern' in Republican China.

Chinese medicinal substances were continuously and widely used throughout the ensuing periods of the 20th century. Indeed, as 21st-century Chinese national policies focus on the invention of a uniquely Chinese modernity, and the reinvention of ancient traditions for a globally successful post-socialist Chinese world, the discourses of power are in rapid transition. These are happy times for Chinese medicine, and for the caterpillar fungus who takes pride of place in the marketplace, outdoing Korean ginseng and bird's nests at an average of somewhere between £44-66 and sometimes even £116 a gram in Lhasa tourist shops and at all China's international airports.[943] The underlying irony is that with all the noise about paradigm shifts, the discourses of modern science have hardly changed the use of indigenous medicinal substances in practice, and perhaps their greatest impact has been on its legal status, which in the case of Europe has had a radical and limiting effect on its potential for worldwide travel. Taken in broad perspective and through this microhistory of the caterpillar fungus, we have seen that the transformation of the modern Chinese *materia medica* has played a major part in the globalisation of natural knowledge. It has also engaged modern Chinese scientists in the construction of a new global science, an on-going process that is more inclusive than many like to imagine, and wherein we can predict that we will find the caterpillar fungus on the next leg of its journey. Fungi now also serve as a potential source of eco-friendly materials for packing, interior design, and even house construction.[944] On 8 April, 2016 an American cargo spacecraft even carried some biological samples of fungi to the International

[943] Dong *et al*. 2016, pp. 1-15.
[944] Bone 2011, pp. 276-277; Peters 2013, p. 54; Travaglini *et al*. 2014, pp. 222-236.

Space Station (ISS) for the purpose of exploring new drugs from fungal secondary metabolites. These events mark the start of a new era of fungal travels that 'boldly go where no man has gone before'.[945] But these contemporary stories are for future research initiatives, and lie outside of the small contribution to scholarship made in this dissertation. For the moment it is enough to conclude that the material mutability of the caterpillar fungus, as an amazing scientific object in itself, gave it all the agency it ever needed to travel among humans and nonhumans, to engage in the adaptation of Chinese *materia medica* and the expansion of scientific enterprise, and also to tease about the imagination on modernity!

[945] These words are extracted from Star Trek series (1966-1969) script, see Terrace 2011, p. 1011.

Appendice

Appendix 1 Records of the Caterpillar Fungus in Qing Local Chronicles

Year	Local Chronicle	Name	Nature	Production Area	Description
1735	*Si chuan tong zhi* 四川通志	DCXC	N/A	Bolanggong Shan, Litang 撥浪工山,裡塘	It has never been mentioned by herbals; it has a warm quality and increases semen and bone marrow. (本草不載;性溫煖,補精,益髓.)
1746	*Xi zang jian wen lu* 西藏見聞錄[946]	DCXC	N/A	Litang 裡塘	N/A
1777	*Xi yu wen jian lu* 西域聞見錄[947]	XCDC		Huijiang 回疆	It grows in snowy mountains. In summer its leaf, which resembles the leek, grows out, and its root looks like a piece of dead wood; in winter the leaf dries, while the root moves and turns into a worm. As a medicine, it has an extreme hot quality. (生雪山中,夏則葉岐出,類韭,根如朽木,淩冬葉幹,則根蠕動,化爲蟲,入藥極熱.)
1792	*Wei zang tu zhi* 衛藏圖志[948]	DCXC	N/A	Bolanggong Shan, Litang 撥浪工山,裡塘	[An extract from the 1735 *Si chuan tong zhi*.]
c. 1806	*San zhou ji lue* 三州輯略[949]	XCDC	N/A	Tianshan 天山	There is a kind of grass in snowy mountains; its leaf resembles the leek and grows out in summer; in winter its leaf withers, while its root turns into worms. (雪山中有草,葉如韭,夏生冬枯,根蠕動,化爲蟲.)
1816	*Si chuan tong zhi* 四川通志[950]	DCXC	N/A	Jiading Fu 嘉定府	N/A
1874	*Hui li zhou zhi* 會理州志[951]	DCXC	MM	Huili Zhou 會理州	N/A
1891	*Xu xiu xin ning xian zhi* 續修新甯縣志[952]	DCC	MM	Xinning Xian 新甯縣	N/A
c. 1912	*Jiu zu xian zhi* 九族縣志[953]	CC	MM	Jiuzu Xian 九族縣	N/A
c. 1912	*Jia li xian tu zhi* 嘉黎縣圖志[954]	CC	MM	Jiali Xian 嘉黎縣	N/A
c. 1912	*Yan jing xian zhi* 鹽井縣志[955]	CC	MM	Yanjing Xian 鹽井縣	N/A
c. 1912	*En da xian tu zhi*	CC	MM	Enda Xian	N/A

946 Xiao [1746] 2003, p. 81.
947 Qi 1777, p. 200.
948 Ma and Sheng [1792] 2003, p. 392
949 He [*c*. 1806] 1968, p. 297. The information about the caterpillar fungus was from *Tian shan fu* 天山賦 and related annotations by its author Ouyang Yi 歐陽鎰. According to a recent study, the real author of *Tian shan fu* should be Wang Dashu 王大樞 (1731-1816; born in Taihu, Anhui), see Shi 2013, pp. 56-59. Wang Dashu's life and writings were recorded in two local chronicles of Taihu compiled in the Qing and Republican periods respectively. In the chronicles, *Tian shan fu* was included as one of Wang's writings despite that the description of the caterpillar fungus was slightly different: '雪山中有草, 夏出葉如韭, 至冬草枯, 根蠕蠕, 化爲蟲, 名夏草冬蟲.' See Fu *et al*. 1872; Gao *et al*. [1922] 1998, p. 479.
950 Chang *et al*. [1816] 1984, p. 2434. The main text of the *Wu chan* 物產 section of this chronicle recorded the caterpillar fungus but did not offer a description, whereas the appendix to this section, entitled '*Jiu zhi dong zhi pu* 舊志動植譜', quoted a record of the caterpillar fungus from *Jin chuan suo ji* 金川瑣記, see Chang *et al*. [1816] 1984, p. 2467; Li [1790] 1936, p. 64.
951 Deng *et al*. [1874] 1976, p. 1052.
952 He *et al*. 1891.
953 Liu [*c*. 1912] 1961, p. 17. This chronicle had never been published in the author's life, and the specific date when it was finalised remains unclear. But the most recent content in this manuscript can be dated no later than the beginning of the Republican period, see Peng 2008, pp. 44-45.
954 Liu [*c*. 1912] 1960, p. 9.
955 Liu [*c*. 1912] 1995, p. 385.

	恩達縣圖志[956]			恩達縣	

Notes on Abbreviations: DCXC=*dong chong xia cao* 冬蟲夏草; XCDC=*xia cao dong chong* 夏草冬蟲; DCC=*dong chong cao* 冬蟲草; CC=*chong cao* 蟲草; N/A= not applicable; MM=medicinal material.

Appendix 2 Port Trade in the Caterpillar Fungus during 1 Nov., 1884 — 31 Oct., 1885[957]

Port	Production Area	Inwards			Outwards		
		From	Quantity(I)	Value(II)	To	Quantity	Value
Yichang 宜昌	Sichuan 四川	——(III)	——	——	Hankou 漢口	29.93	2 097
Hankou 漢口	Sichuan, Henan 四川，河南	Yichang 宜昌	31.70	2 222	Shanghai 上海	56.41	3 217
Shanghai 上海	——	Hankou, Hong Kong 漢口，香港	46.68	3 258	——	——	——
Ningbo 寧波	Sichuan 四川	Shanghai 上海	2.28	423	——	——	——
Fuzhou 福州	Sichuan 四川	Shanghai 上海	0.0 405	11.12	——	——	——
Danshui 淡水	Sichuan 四川	Hong Kong 香港	0.26	77	——	——	——
Xiamen 廈門	Hubei 湖北	Hong Kong 香港	0.29	50	Taiwan 臺灣	0.010125	2.066
Shantou 汕頭	Guangdong 廣東	Shanghai, Hong Kong 上海，香港	1.52	152	——	——	——
Guangzhou 廣州	Sichuan, Tibet 四川，西藏	——	——	——	Shanghai, Hankou 上海，漢口	12	2 421.25
Qiongzhou 瓊州	Sichuan 四川	Hong Kong 香港	0.45	106	——	——	——

Notes: (I) Unit: Piculs (1 Picul=100 Catties); (II) Unit: Hong Kong Taels [of Silver] (Hk. Tls.); (III) '——': no data.

Appendix 3 Medicinal Properties of the Caterpillar Fungus Recorded in Some Qing Texts[958]

Year	Source	Quality and Potency
1736[959]	*Sichuan tong zhi* 四川通志	It has a warm quality and increases *jing* and bone marrow. (性溫煖,補精,益髓.)
1744[960]	*Shu yin cong shuo* 書隱叢說	Soak it in wine, and then the wine can be used to remove diseases and prolong life. (浸酒服之,可以卻病延年.)
1757[961]	*Ben cao cong xin* 本草從新	It (used to nourish the lung and the kidney) is sweet and balanced. It protects the lung, benefits the kidney, stops bleeding, disperses phlegm, and eliminates phthisical cough. ((補肺腎)甘,平,保肺,益腎,止血,化痰,已勞嗽.)
c. 1761[962]	*Qian nang* 黔囊	The disease *li* [digestive diseases] can be cured by eating it. (食之已𤸪.)
1777[963]	*Xi yu wen jian lu* 西域聞見錄	It has an extreme hot quality. (入藥極熱.)
1778[964]	*Wen fang si kao tu shuo*	It has positive *qi* and a warm quality…it is proved to be able to protect the

956 Liu [*c*. 1912] 1962, p. 10.
957 Order of the Inspector General of Customs 1889, pp. 64-65, 80-81, 170-171, 204-205, 238-239, 254-255, 282-283, 332-333, 390-391, 406-407.
958 The texts that only quoted predecessors' records of the caterpillar fungus are not shown in this Table.
959 Huang *et al*. [1736] 1983, p. 174.
960 Yuan [1744] 2002, p. 486.
961 Wu [1757] 1982, p. 36.
962 Tan [*c*. 1761] 1922-1943, p. 35. The character *li* 𤸪 used by Tan to denote a disease has been farily uncommon. I failed to find it in a variety of ancient and modern Chinese dictionaries. I suspect that it refers to the disease called *ge* 膈 (digestive diseases) in pre-modern Chinese medicine. According to the character outline, it was a disease relevant to *li* 鬲. In pre-modern Chinese medicine, sometimes *li* 鬲 was identical to *ge* 膈, see ZYDCDBJWYH 1987, p. 56, 276, 399, 407. For an interpretation of this disease, see Zhou 2003, pp. 223-224.
963 Qi 1777, p. 200.

	文房肆考圖說	lung and build muscles…The function of it is no lower than that of ginseng. (其氣陽性溫…此物之保肺氣,實腠理,確有征驗…此品功用不下人參.)
c. 1780[965]	*Gan yuan xiao zhi* 柑園小識	Immerse a few pieces of it in wine, and then eat them; they can remove pains in the part of the body between waist and knees, and benefit the kidney…Someone says that it is good for old people if they eat it with a male duck after boiling them together. (以酒浸數枚,啖之,治腰膝間痛楚,有益腎之功…或云:與雄鴨同煮食,宜老人.)
1783[966]	*Wen jian ban xiang lu* 聞見瓣香錄	It is a great tonic that has a hot quality. (其性熱,大滋補.)
1790[967]	*Jin chuan suo ji* 金川瑣記	It is sweet and balanced. Boil it and a duck together, and people will benefit from eating them after dropping the residue. (味甘,平.同鴨煮,去渣食,益人.)
1792[968]	*Liu ya wai bian* 柳崖外編	The body will be greatly nourished by eating the duck meat boiled together with the caterpillar fungus. (和鴨肉燉食之,大補.)
1795[969]	*Mai yao lian zhu* 脈藥聯珠	It is sweet and has a warm quality. It promotes the storage of semen, benefits *qi*, and specifically nourishes *ming men* [the kidney]. (味甘性溫,秘精益氣,專補命門.)
c. 1803[970]	*Ben cao gang mu shi yi* 本草綱目拾遺	The function of it is equal to that of ginseng…this grass (i.e. the fungal fruiting body) can enhance *yang* [male sexual organ], indicating that it acts on the kidney…taking the summer grass part can cause female infertility and sterileness…it has a warm quality, and treats abdominal distension…each duck [boiled together with the caterpillar fungus] eaten by weak patients is as effective as beneficial as one *liang* of ginseng. (功與人參同…此草性更能興陽,則入腎可知…若取其夏草服之,能絕孕無子…性溫,治蠱脹…凡病後虛損人,每服一鴨,可抵人參一兩.)
1804[971]	*Chu san xuan cong tan* 樗散轩叢谈	It greatly nourishes the kidney. It can also be used together with tonic medicines. It is more suitable for old people…someone says, 'the caterpillar fungus soup was quite effective in quickly and thoroughly removing pains in the heart.' (大補腎水.亦可配合補藥.老年人食之更宜...或曰,'人患心頭痛,以此蟲煎湯食之,立愈,永遠不發.')
1893[972]	*Ben cao wen da* 本草問答	It has a pure *yang* quality…Use the roots (i.e. dead worms) to nourish the kidney, and use the grass to benefit the lung and heart. (氣性純陽…補下焦之陽則用根,若益上焦之陰則兼用苗.)

Appendix 4 Prescriptions Containing the Caterpillar Fungus in Qing Medicine Casebooks

Year	Physician	Hometown	Practice location	Uses
1778[973]	Zhou Shimi 周士禰	Fuzhou 福州	Locally?	Impotence (陽痿), involuntary ejaculation of semen during sleep (夢交脫精), etc.
1831[974]	Miao Zunyi 繆遵義	Suzhou 蘇州	Suzhou 蘇州	Discomfort in the stomach (脘中不爽).
1838-1862[975]	Wang Shixiong 王士雄	Hangzhou 杭州	Hangzhou, Shanghai 杭州，上海	Phlegm accumulation in the upper jiao (上焦痰滯), menses stop and muscle weakness (汛斷肌消), lumps in the abdomen (少腹聚瘕), upward adverse flow of *qi* to the chest, and the pain in the chest (氣沖胸下,絞痛難堪), sleepless when lying down (臥不能眠), unable to eat when hungry (饑不能食), dry

964 Tang 1778, pp. 27-28.
965 Zhu [late 18th century].
966 Qin [1783] 1986, p. 153.
967 Li [1790] 1936, p. 64.
968 Xu [1792] 2006, p. 21.
969 Long [1795] 1993, p. 686.
970 Zhao [*c.* 1803] 1983, pp. 138-139.
971 Chen [1804] 1864.
972 Zhang *et al.* [1893] 1991, p. 26.
973 Zhou [1778] 1990, pp. 206-207.
974 Miao *et al.* [1831] 1990, pp. 35-36.
975 Wang [1838] 1999, pp. 66-67, 77, 86; Wang [*c.* 1850] 1957, pp. 113, 114, 151-154, 159-161, 171, 172; Wei [*c.* 1770] 1997, pp. 191, 1184; Wang [1862] 1999, p. 173. The case of damp fever was also mentioned by the medical text *Chong ding guang wen re lun* 重訂廣溫熱論, see Dai and He [1911] 2005, p. 258.

				mouth and dark red tongue (口幹舌絳), five types of heat and no urination (五熱溺無), head and neck sweating (頭項汗頻), low voice and pale complexion (音低色奪), fire stagnation (火鬱), abdominal pain and distention (腹之疼脹), limb oedema (肢腫), vomiting, diarrhea and spasm (吐瀉轉筋), depletion of *qi* and fluid in the body (氣液兩亡), etc.
1865[976]	Pan Mingxiong 潘名熊	Panyu 番禺	Guangzhou 廣州	Chronic cough (長咳嗽) and vomiting of blood (吐血).
c. 1893[977]	Ling Huan 凌奐	Huzhou 湖州	Huzhou 湖州	Lung wilt (肺蔞), pain in the pharynx and throat obstruction (咽痛喉痹), fatigue (體疲), thin and weak (羸瘦), etc.
1889[978]	Xinchan 心禪	Hangzhou 杭州	Hangzhou 杭州	Weakening cough (虛喘), cough without phlegm (咳逆無痰), gasping and lacking strength when moving (動喘乏力), feeble pulse and spontaneous sweating (脈虛自汗), and deficiency of both the lung and spleen (肺脾兩虛).
1897[979]	Zhang Naixiu 張乃修	Wuxi 無錫	Wuxi, Shanghai 無錫, 上海	Deficiency and injury (虛損), chronic cough after childbirth (產後久咳), vomiting of blood (吐血), deficiency of the lung and kidney (肺腎皆虛), internal injuries and serious illness (內傷重症), etc.
1905[980]	Zhou Xuehai 周學海	Jiande 建德	Locally?	Instability of primordial *qi* (元氣之不固).

Appendix 5 Records of the Caterpillar Fungus Produced in Tibet in Republican Local Chronicles

Date	Category	Production Area (Today)	Source
c. 1917	Medicinal Product	Leiwuqi 類烏齊, Tibet	*Ding qing xian tu zhi* 定青縣圖誌[981]
c. 1918	Medicinal Product	Changdu 昌都, Tibet	*Chang du xian zhi* 昌都縣誌[982]
c. 1918	Medicinal Product	Gongjue 貢覺, Tibet	*Gong xian zhi* 貢縣誌[983]
c. 1918	Medicinal Product	Jiangda 江達, Tibet	*Tong pu xian zhi* 同普縣誌[984]
c. 1921	Medicinal Product	Gongjue 貢覺, Tibet and part of Baiyu 白玉, Sichuan	*Wu cheng xian zhi* 武城縣誌[985]
c. 1930	Medicinal Product	Mangkang 芒康, Tibet	*Ning jing xian zhi* 寧靜縣誌[986]
c. 1935	Medicinal Product	Chayu 察隅, Tibet	*Cha yu xian tu zhi* 察隅縣圖誌[987]
c. 1939	Medicinal Product	Chayu 察隅, Tibet	*Ke mai xian zhi* 科麥縣誌[988]

976 Pan [1865] 1990, p. 12.
977 Ling [*c*. 1893] 1998, p. 436.
978 Xinchan [1889] 1999, p. 833.
979 Zhang [1897] 1963, pp. 128, 129, 135, 136, 196, 197, 209.
980 Zhou [1905] 1990, pp. 22-23.
981 Liu [*c*. 1917] 1995, p. 573. This and below chronicles compiled by Liu Zanting 劉贊廷 (1888-1958) had never been published in his life, while specific dates when they were finalised remain unclear. For the dating of these chronicles, see Peng 2008, pp. 44-45. For a brief introduction to Liu's life and his valuable chronicles, see Yang 2006, pp. 34-42; Wang 2010, pp. 60-63; Yuan and Zhang 2011, pp. 55-59.
982 Liu [*c*. 1918] 1995a, p. 95.
983 Liu [*c*. 1918] 1995b, p. 123.
984 Liu [*c*. 1918] 1995c, p. 292.
985 Liu [*c*. 1921] 1995, p. 150.
986 Liu [*c*. 1930] 1995, p. 618.
987 Liu [*c*. 1935] 1995, p. 201.
988 Liu [*c*. 1939] 1995, p. 267.

Appendix 6 Production and Sales of the Caterpillar Fungus in the Mid-1930s

Production Place		Annual Sales (*jin*)	Destination(s)
I	Chengdu 成都	approx. 500	Shanghai 上海
	Maoxian 茂縣	200	Hankou 漢口
	Lifan 理番	800	N/A
	Maogong 懋功	140	Guanxian 灌縣, Baxian 巴縣
	Baoxing 寶興	N/A	N/A
	Hanyuan 漢源	400 000 *gen*	Yazhou 雅州, Jiading 嘉定
	Kangding 康定	970 000	Shanghai 上海
	Luding 瀘定	1 200	Shanghai 上海
	Yajiang 雅江	5 000	Kangding 康定
	Daofu 道孚	500	Kangding 康定
	Danba 丹巴	180	*guo nei* 國內 (domestic [consumption])
	Lihua 理化	5 000	Kangding 康定
	Dege 德格	20-50 *tuo*	Kangding 康定
	Jiulong 九龍	200	Kangding 康定
	Luhuo 爐霍	1 000	Shanghai 上海, Sichuan 四川
II	Baxian 巴縣	7 083 *dan*	Guangdong 廣東, Nanyang 南洋, Hong Kong 香港
III	Fengyi 鳳儀	200	Hankou 漢口, Shanghai 上海, Hong Kong 香港
	Fengyi (Xiaguan 下關)	100	Hankou 漢口, Shanghai 上海, Hong Kong 香港
	Lijiang 麗江	6 000	Kunming 昆明, Shanghai 上海, Hong Kong 香港
	Weixi 維西	700	Lijiang 麗江, Xiaguan 下關
	Zhongdian 中甸	5 000	Lijiang 麗江, Xiaguan 下關
	Yongsheng 永勝	2 000	Kunming 昆明
IV	Wenxian 文縣	40	*dang di* 當地 (local [consumption])

Notes: The data in this table is extracted from *Zhong guo tong you di fang wu chan zhi* (Record of the Products in Postal Areas of China, 1937). I-IV refer to today's three provinces and one municipality: I=Sichuan 四川; II=Chongqing 重慶; III=Yunnan 雲南; IV=Gansu 甘肅. Jin=斤 (1 *jin*=500 grams); gen=根 (sticks); tuo=馱 (loads of goods carried by animals such as horses; it was not a formal unit).

Appendix 7 Prices of the Medicinal Products of Kangding and Lijiang in the Mid-1930s[989]

Kangding			**Lijiang**	
Medicinal Product	Prices (*yuan*/*jin*)		Medicinal Product	Prices (*yuan*/*jin*)(I)
The caterpillar fungus	**6.00-9.00**		**The caterpillar fungus**	**16.00-25.00**
da huang 大黃 (rhubarb)	0.005-0.10		*da huang* 大黃 (rhubarb)	0.10-0.15
qin jiao 秦艽 (*Gentiana macrophylla*)	0.009-0.20		*qin jiao* 秦艽 (*Gentiana macrophylla*)	0.80-0.90
zhi mu 知母 (*Anemarrhena asphodeloides*)	1.00-2.00		*zhi mu* 知母 (*Anemarrhena asphodeloides*)	1.60-1.80
bei mu 貝母 (*Fritillaria* spp.)	4.00-6.00		*bei mu* 貝母 (*Fritillaria* spp.)	6.00-8.00
she xiang 麝香 (musk)	280-440		*she xiang* 麝香 (musk)	400-500
qing guo 青菓 (*Canarium album*)	1.20-2.00		*gui tou* 歸頭 (*Angelica sinensis*)	0.60-0.80
hong hua 紅花 (*Carthamus tinctorius*)	20.00-32.00		*fu ling* 茯苓 (*Wolfiporia cocos*)	0.80-0.90
lu rong 鹿茸 (deer horns)	60-120		*zhu zi shen* 珠子参 (*Panax pseudoginseng*)	0.80-1.00
			huang lian 黃蓮 (*Coptis chinensis*)	3.00-4.00
			xiong dan 熊膽 (bear bile)	50-70

Note: (I): The 'yuan' here particularly referred to *dian bi* 滇幣 (bank notes issued in Yunnan).

[989] JTBYZZJ 1937, pp. 1 (Xikang Section), 14 (Yunnan Section).

Appendix 8 Some Republican Medical Cases Involving the Use of the Caterpillar Fungus Together with Other Chinese Medicinal Substances[990]

Date	Physician	Hometown	Practice Location	Patient's Symptoms
1913[991]	Lu Jinsui 陸錦燧	Suzhou 蘇州	Shanghai 上海	Cough (咳症), interruption of menses (經斷), vomiting blood (吐血), and difficult defecation (大便艱).
c. 1914[992]	Fei Shengfu 費繩甫	Wujin 武進	Wujin, Shanghai 武進，上海	Coughing up blood (咳兼血) and vomiting blood (吐血).
c. 1922[993]	Shao Lansun 邵蘭蓀	Shaoxing 紹興	Xiaoshan 蕭山	Deficiency and fatigue (虛勞), sudden cough (嗆咳), cold body (形寒), night sweat (盜汗), thick phlegm with blood (咳痰膿厚帶紅).
1927[994]	Ding Ganren 丁甘仁	Wujin 武進	Shanghai 上海	Miscellaneous internal injuries (內傷雜病) and wasting-thirst (消渴).
1930[995]	Ma Peizhi 馬培之	Wujin 武進	Wujin, Beijing 武進，北京	Cough (咳嗽), aversion to cold (惡寒), obstruction *qi* in the liver (肝氣拂鬱), pain in abdomen (肚腹作痛), pain in the pharynx (咽痛), an increase in phlegm (痰多), and anal leakage (肛漏).
1934[996]	Wu Keqian 吳克潛	Haining 海寧	Shanghai 上海	Cough (咳嗽) and an increase in phlegm (痰多).
c. 1940[997]	Zhang Cigong 章次公	Zhenjiang 鎮江	Shanghai 上海	Injury and deficiency (損怯) caused by sabre-beadstring scrofulae (馬刀挾癭).
c. 1945[998]	Wang Jinjie 王金傑	Shexian 歙縣	Shexian, Shanghai 歙縣，上海	Cough (咳嗽), rapid breathing (喘急), soreness of waist and thin body (腰酸形瘦), night sweat (寐覺汗泄), interruption of menses (經停), sloppy defecation (大便溏泄), chronic infectious disease (勞瘵), deficiency in *qi* and energy (氣力虛乏), and weak *qi* and energy in the kidney (腎臟氣力微弱).

990 This is not a selected list of related medical cases used to support my idea; in this table I list all the Republican medical cases that I can find at present, despite they must only occupy a portion of the total. The dates of some of these medical cases were not clear, therefore I use the dates of the publications instead.
991 Lu [1913] 1999, p. 1382. For Lu's (1864-1935) life, see Zhang and Chen 2005, pp. 400-401.
992 Fei [*c*. 1914] 2004, pp. 24, 37. For Fei's (1851-1914) life, see JSSWJXXZBZWYH 1988, p. 947.
993 Shao [*c*. 1922] 1990, pp. 25-26. For Shao's (1864-1922) life and writings, see Hu 1985, pp. 37-39; Lu 1987, p. 233.
994 Ding [1927] 1965, pp. 106, 165-166.
995 Ma [1930] 2008, pp. 36-37. For Ma's (1820-1903) life and writings, see She 2011, p. 312.
996 Wu [1934] 1994, p. 616. For Wu's (1898-1991) life and writings, see Zhang and Chen 2005, pp. 260-261.
997 Zhang [1940?] 1980, pp. 355-356. Most of Zhang's records of medical cases in this text were written down around 1940, see Chen *et al*. 2007, p. 1097.
998 Wang [*c*. 1945] 2004, pp. 8, 22, 29, 43-44. For Wang's (1881-1945) life and writing, see Chen 2001, p. 16.

List of Abbreviations

BJSFDXQSYJXZ: Bei jing shi fan da xue qing shi yan jiu xiao zu 北京師範大學清史研究小組
BJZYXYYJWQNB: Bei jing zhong yi xue yuan yi jiu wu qi nian ban 北京中醫學院一九五七年班
BKBJB: Ben kan bian ji bu 本刊編輯部
CZSDFZBZWYH: Chang zhou shi di fang zhi bian zuan wei yuan hui 常州市地方誌編纂委員會
DCXC: Dong chong xia cao 冬蟲夏草
DXSSQBJFWT: Da xue sheng shu qi bian jiang fu wu tuan 大學生暑期邊疆服務團
GDSZF: Guang dong sheng zheng fu 廣東省政府
GJMYZXS: Guo ji mao yi zi xun suo 國際貿易諮詢所
GJZYYGLJZHBCBWH: Guo jia zhong yi yao guan li ju zhong hua ben cao bian wei hui 國家中醫藥管理局《中華本草》編委會
GMZF: Guo min zheng fu 國民政府
GMZFZJCTJJ: Guo min zheng fu zhu ji chu tong ji ju 國民政府主計處統計局
GZSDFZBZWYH: Guang zhou shi di fang zhi bian zuan wei yuan hui 廣州市地方誌編纂委員會
JSXYXY: Jiang su xin yi xue yuan 江蘇新醫學院
JTBYZZJ: Jiao tong bu you zheng zong ju 交通部郵政總局
JYB: Jia yu bu 教育部
JYBJYNJBZWYH: Jiao yu bu jiao yu nian jian bian zuan wei yuan hui 教育部教育年鑒編纂委員會
JYBZGJYNJBSWYH: Jiao yu bu zhong guo jiao yu nian jian bian shen wei yuan hui 教育部中國教育年鑒編審委員會
LFY: Li fan yuan 理藩院
LHZXS: Lian he zheng xin suo 聯合征信所
LYTGS: Liu yu tang gu shi 留余堂顧氏
LYTZR: Liu yu tang zhu ren 留余堂主人
MYYLBSWYH: Ming yi yao lan bian shen wei yuan hui 名醫搖籃編審委員會
NHKTSKK: Ni hon kou tei sho kyou kai 日本公定書協会
NJSJYQDFZBZWYH: Nan jing shi jian ye qu di fang zhi bian zuan wei yuan hui 南京市建鄴區地方誌編纂委員會
NJTSG: Nan jing tu shu guan 南京圖書館
NJZYYDX: Nan jing zhong yi yao da xue 南京中醫藥大學
NSQDFZBZWYH: Nan shi qu di fang zhi bian zuan wei yuan hui 南市區地方誌編纂委員會
NWB: Nei wu bu 內務部
QHSSWYJS: Qing hai sheng sheng wu yan jiu suo 青海省生物研究所
SBJTJZSLB: Shi ba ji tuan jun zong si ling bu 十八集團軍總司令部
SCSD: Si chuan shang dian 四川商店
SCSLTXZBZWYH: Si chuan Sheng li tang xian zhi bian zuan wei yuan hui 四川省理塘縣志編纂委員會
SCSZF: Si chuan sheng zheng fu 四川省政府
SDSZXWSZLWYH: Shan dong sheng zheng xie wen shi zi liao wei yuan hui 山東省政協文史資料委員會
SHFCDYC: Shang hai fo ci da yao chang 上海佛慈大藥廠
SHGYCJS: Shang hai ge yan cong ji she 上海格言叢輯社
SHJZQJZZ: Shang hai jiu zheng quan jian zhi zhi bian zuan wei yuan hui 《上海舊政權建置志》編纂委員會
SHSBSQDFZBZWYH: Shang hai shi bao shan qu di fang zhi bian zuan wei yuan hui 上海市寶山區地方誌編纂委員會
SHSHKXYJJYJS: Shang hai she hui ke xue yuan jing ji yan jiu suo 上海社會科學院經濟研究所編
SHSYYGS: Shang hai shi yi yao gong si 上海市醫藥公司
SHSZYWXG: Shang hai shi zhong yi wen xian guan 上海市中醫文獻館

SHTZBZWYH: Shang hai tong zhi bian zuan wei yuan hui 上海通志編纂委員會
SHZJZBZWYH: Shang hai zu jie zhi bian zuan wei yuan hui 《上海租界志》編纂委員會
SHZYXYYSBWG: Shang hai zhong yi xue yuan yi shi bo wu guan 上海中醫學院醫史博物館
SHZYYDXYSBWG: Shang hai zhong yi yao da xue yi shi bo wu guan 上海中醫藥大學醫史博物館
SSBZSKKK: Shina shou betsu zen shi kan kou kai 支那省別全誌刊行會
SXSDFZBZWYH: Shan xi sheng di fang zhi bian zuan wei yuan hui 陝西省地方誌編纂委員會
SYXBSYXYCBWYH: Sun yi xian bo shi yi xue yuan chou bei wei yuan hui 孫逸仙博士醫學院籌備委員會
TRXLWZLS: Tong ren xian long wu zhen liao suo 同仁縣隆務診療所
WSB: Wei sheng bu 衛生部
WSBGBJB: Wei sheng bao guan bian ji bu 衛生報館編輯部
WSS: Wei sheng shu 衛生署
ZGDELSDAG: Zhong guo di er li shi dang an guan 中國第二歷史檔案館
ZGKXYMZYJSSCSSMZSHLSDCZ: Zhong guo ke xue yuan min zu yan jiu suo si chuan shao shu min zu she hui li shi diao cha zu 中國科學院民族研究所四川少數民族社會歷史調查組
ZGKXYSHJJYJS: Zhong guo ke xue yuan shang hai jing ji yan jiu suo 中國科學院上海經濟研究所
ZGXMSYXH: Zhong guo xu mu shou yi xue hui 中國畜牧獸醫學會
ZGYCGS: Zhong guo yao cai gong si 中國藥材公司
ZGYXH: Zhong guo yao xue hui 中國藥學會
ZGZWXH: Zhong guo zhi wu xue hui 中國植物學會
ZGZYYJYZGYSWXYJS: Zhong guo zhong yi yan jiu yuan zhong guo yi shi wen xian yan jiu shi 中國中醫研究院中國醫史文獻研究室
ZGZYYJYZGYSWXYJS: Zhong guo zhong yi yan jiu yuan zhong guo yi shi yan jiu suo 中國中醫研究院中國醫史文獻研究所
ZHTSHGZCC: Zhu hu tong shang hai guan zao ce chu 駐滬通商海關造冊處
ZHZYYXH: Zhong hua zhong yi yao xue hui 中華中醫藥學會
ZJSMZT: Zhe jiang sheng min zheng ting 浙江省民政廳
ZSSRMZFDFZBGS: Zhong shan shi ren min zheng fu di fang zhi ban gong shi 中山市人民政府地方誌辦公室
ZWMRYJZX: Zhong wai ming ren yan jiu zhong xin 中外名人研究中心
ZYDCDBJWYH: Zhong yi da ci dian bian ji wei yuan hui 《中醫大辭典》編輯委員會
ZYYJYZYJCBJWYH: Zhong yi yan jiu yuan zhong yi jiao cao bian ji wei yuan hui 中醫研究院中醫教材編輯委員會

Bibliography

Primary Sources

(A) Sources in European and Russian Languages

Abel, Carl and F. A. Mecklenburg (eds.) 1858, *Arbeiten der Kaiserlich Russischen Gesandtschaft zu Peking, über China (vol. 2)*, Berlin: F. Heinicke

Abel, Clarke 1818, *Narrative of a Journey in the Interior of China, and of a Voyage to and from that Country, in the Years 1816 and 1817*, London: Longman, Hurst, Rees, Orme, and Brown

Adamson, R. S. 1913, 'Plants from Western China', *The Journal of Botany: British and Foreign*, 51: 129-131

Anderson, Melville B. 1919, 'Malcolm Playfair Anderson', *The Condor*, 21(3): 115-119

Anonymous [1773] 1774, 'Commentaries: XI', *Medical and Philosophical Commentaries*, 1: 405-409

Anonymous 1726, 'Diverses observations de physique generale', *Histoire de l'Académie Royale des Sciences*, (1): 17-20

Anonymous 1773, 'Art. IX: General physics', *The Monthly Review*, 48: 549

Anonymous 1834, 'Chinese botany', *The Chinese Repository*, 2(5): 226-230

Anonymous 1842, 'Review of The Elements of Materia Medica and Therapeutics', *Pharmaceutical Journal and Transactions*, 1: 606-607

Anonymous 1850, 'Obituary: Edward Doubleday', *The Gentleman's Magazine*, 33: 213-214

Anonymous 1853, 'Obituary: Jonathan Pereira', *The Gentleman's Magazine*, 39: 320-322

Anonymous 1856, 'John Reeves, Esq., F.R.S.', *Proceedings of the Linnean Society of London*, 68(1): 43-45

Anonymous 1857, 'The querist', *The Naturalist*, 7: 115-116

Anonymous 1873, 'Deaths', *The Medical Times and Gazette*, 1: 509

Anonymous 1873, 'Obituary: Benjamin Hobson, M.B., M.R.C.P.', *The British Medical Journal*, 1(639): 355-356

Anonymous 1874, *The China Directory for 1874*, Hongkong: The 'China Mail' Office

Anonymous 1875, 'Linnean Society,' *Nature*, 11(286): 500

Anonymous 1875, 'Societies and academies, London', *Nature*, 11: 398-400

Anonymous 1875, 'The annual meeting of the Royal Horticultural Society', *The Gardeners' Chronicle*, 3: 340-342

Anonymous 1875, *The Chronicle & Directory for China, Japan, & the Philippines, for the Year 1875*, Hongkong: The 'Daily Press' Office

Anonymous 1878, *Records of the General Conference of the Protestant Missionaries of China, Held at Shanghai, May 10-24, 1877*, Shanghai: Presbyterian Mission Press

Anonymous 1879, 'Answers to correspondents', *The Gardeners' Chronicle*, 11: 88-89

Anonymous 1879, 'Death of Professor Gubler of Paris', *Edinburgh Medical Journal*, 24(2): 1056

Anonymous 1881, 'The International Pharmacopoeia', *The British Medical Journal*, 2(1077): 326-327

Anonymous 1886, *The Hongkong Directory and Hong List for the Far East, for 1886*, Hongkong: The Office of the 'Hongkong Telegraph'

Anonymous 1890, *Records of the General Conference of the Protestant Missionaries of China, Held at Shanghai, May 7-20, 1890*, Shanghai: Presbyterian Mission Press

Anonymous 1891, 'Consulates-General, Consulates', In: *The Miscellaneous Documents of the Senate of the United States for the Second Session of the Fifty-First Congress*, Washington: Government Printing Office

Anonymous 1891, 'Obituary: Henry Nottidge Moseley', *Proceedings of the Royal Geographical Society and Monthly Record of Geography*, 13(12): 730

Anonymous 1891, 'The Chinese insect-fungus drug', *Insect Life*, 4: 216-218

Anonymous 1893, 'Obituary: Professor Jean Léon Soubeiran', *The American Journal of Pharmacy*, 65: 111-112

Anonymous 1893, 'Obituary: Professor John O. Westwood, M. A., F.L.S., &c.', *The Geological Magazine*, 10: 143

Anonymous 1894, 'Obituary notices', *The Journal of the Linnean Society: Zoology*, 24: 26-27

Anonymous 1898, 'Professor Dr. Georg Dragendorff', *Proceedings of the American Pharmaceutical Association at the Annual Meeting*, 46: 46-47

Anonymous 1907, *Records, China Centenary Missionary Conference, Held at Shanghai, April 25 to May 8, 1907*, Shanghai: Centenary Conference Committee
Anonymous 1909, *Report of the International Opium Commission Shanghai, China February 1 to February 26, 1909*, Shanghai: The North-China Daily News & Herald Ltd.
Anonymous 1922, 'International Opium Convention Signed at the Hague January 23, 1912', *League of Nations Treaty Series*, 8: 187-239
Anonymous 1931, *International Conference on the Unification of Pharmacopoeial Formulas for Potent Drugs, 2nd, Brussels, 1925*, London: H. M. S. O.
Anonymous 1939, 'International Agreement revising the Agreement of 1906 Respecting the Unification of Pharmacopoeial Formulas for Potent Drugs, Brussels, August 20, 1929', *Treaty Series*, (47): 1-31
Anonymous 1953, 'Harold Balme, O.B.E., M.D., F.R.C.S.', *The British Medical Journal*, 1(4808): 511-512
Authority of the United States Pharmacopoeial Convention 1916, *The Pharmacopoeia of the United States of America*, Philadelphia: P. Blakiston's Son & Company
Authority of the United States Pharmacopoeial Convention 1926, *The Pharmacopoeia of the United States of America*, Philadelphia: J. B. Lippincott Company
B., J. P. 1895, 'A Derbyshire botanist', *The Notts. and Derbyshire Notes and Queries*, 3: 61-62
Balfour, Edward 1885, *The Cyclopædia of India and of Eastern and Southern Asia: Commercial, Industrial, and Scientific; Products of the Mineral, Vegetable, and Animal Kingdoms, Useful Arts and Manufactures (vol. 1)*, London: Bernard Quaritch
Balfour, Edward 1887, *The Agricultural Pests of India, and of Eastern and Southern Asia, Vegetable and Animal*, London: Bernard Quaritch
Balme, Harold 1921, *China and Modern Medicine, a Study in Medical Mission Development*, London: United Council for Missionary Education
Bartholini, Thomae 1677, *Anatome Quartum Renovata*, Lugduni: Sumpt. Joan. Ant. Huguetan, & Soc.
Beadle, Elias R. 1865, *The Sacredness of the Medical Profession*, Philadelphia: James S. Claxton
Bean, William J. and William Thiselton-Dyer 1908, *The Royal Botanic Gardens, Kew: Historical and Descriptive*, London: Cassell and Company, Ltd.
Bell, Jacob and Theophilus Redwood 1880, *Historical Sketch of the Progress of Pharmacy in Great Britain*, London: The Pharmaceutical Society of Great Britain
Berkeley, Miles J. 1836, *The English Flora (vol. 5, part 2): Fungi*, London: Longman, Rees, Orme, Brown, Green & Longman
Berkeley, Miles J. 1843, 'On some Entomogenous Sphaeriae', *The London Journal of Botany*, 2: 205-211
Berkeley, Miles J. 1857, 'On some Entomogenous Sphaeriae', *Journal of the Proceedings of the Linnean Society of London: Botany*, 1: 157-159
Berkeley, Miles J. 1857, *Introduction to Cryptogamic Botany*, London: H. Bailliere
Berkeley, Miles J. 1860, *Outlines of British Fungology*, London: Lovell Reeve
Berkeley, Miles J. 1875, 'Notices of American Fungi', *Grevillea*, 4(29): 1-16
Boericke, William 1896, *A Compend of the Principles of Homoeopathy as Taught by Hahnemann, and Verified by a Century of Clinical Application*, San Francisco: Boericke & Runyon
Bon de Saint Hilaire, François Xavier 1710, *Dissertation sur l'Araignée*, Paris: Chez Joseph Saugrain
Bondaroy, Fougeroux de 1769, 'Sur des insectes sur lesquels on trouve des plantes', *Histoire de l'Académie Royale des Sciences*, (1): 467-476
Bondfield, G. H. (ed.) 1912, *The China Christian Year Book (Appendices)*, Shanghai: Christian Literature Society for China
Boulger, George S. 1893, 'Lindley, John', In: *Dictionary of National Biography* (vol. 33), Sidney Lee (ed.), New York: Macmillan and Co.
Braun, R. [1888] 1909, *List of Medicines Exported from Hankow and the Other Yangtze Ports*, James A. Tipp (ed.), Shanghai: Statistical Department of the Inspectorate General of Customs
Braun, R. 1888, *List of Medicines Exported from Hankow and the Other Yangtze Ports*, Shanghai: Statistical Department of the Inspectorate General of Customs
Bremer, Otto and William Grey 1853, *Beiträge zur Schmetterlings-fauna des Nordlichen China's*, St. Petersburg: [Press Unknown]
Bretschneider, Emil 1870, 'The study and value of Chinese botanical works (to be continued)', *The Chinese Recorder and Missionary Journal*, 3(6): 157-163

Bretschneider, Emil 1871, *On the Study and Values of Chinese Botanical Works with Notes on the History of Plants and Geographical Botany from Chinese Sources*, Foochow: Rozario, Marcal & Co.
Bretschneider, Emil 1881a, 'Botanicon sinicum: Notes on Chinese botany from native and Western sources', *Journal of the North-China Branch of the Royal Asiatic Society*, 16: 123
Bretschneider, Emil 1881b, *Notes on Some Botanical Questions Connected with the Export Trade of China*, Shanghai: North-China Herald
Bretschneider, Emil 1882, *Botanicon Sinicum: Notes on Chinese Botany from Native and Western Sources* (vol. 1), London: Trübner & Co.
Bretschneider, Emil 1894, 'On some old collections of Chinese plants', *The Journal of Botany: British and Foreign*, 32(382): 292-299
Bretschneider, Emil 1895, *Botanicon Sinicum: Notes on Chinese Botany from Native and Western Sources* (vol. 3). Shanghai: Kelly and Walsh
Bretschneider, Emil 1898, *History of European Botanical Discoveries in China*, London: Sampson Low, Marston and Co.
Britten, James 1877, *Popular British Fungi*, London: The Bazaar
Britten, James 1890, 'Biographical index of British and Irish botanists', *The Journal of Botany: British and Foreign*, 28: 306-314
Britten, James 1910, 'Francis Blackwell Forbes (1839-1908)', *Journal of Botany: British and Foreign*, 48(565): 19-22
Broadus, John A. 1886, *Commentary on the Gospel of Matthew*, Philadelphia: American Baptist Publication Society.
Bryson, Mary F. 1890, *John Kenneth Mackenzie, Medical Missionary to China*, New York: Fleming H. Revell Company
Buck, Albert H. (ed.) 1903, *A Reference Handbook of the Medical Science (vol. 6)*, New York: William Wood and Company
Bulliard, Jean Baptiste François Pierre 1783, *Dictionnaire Elémentaire de Botanique*, Paris: Chez l'Auteur
Butterfield, Herbert 1931, *The Whig Interpretation of History*, London: G. Bell and Sons
C., A. D. 1914, 'Dr. M. C. Cooke', *Nature*, 94(2351): 315-316
Cadbury, William W. and Mary H. Jones 1935, *At the Point of a Lancet: One Hundred Years of the Canton Hospital, 1835-1935*, Shanghai: Kelly and Walsh, Ltd.
Ch'en, Chih-ch'ien 1933, 'Scientific medicine as applied in Ting Hsien: third annual report of the rural public health experiment in China', *The Milbank Memorial Fund Quarterly Bulletin*, 11(2): 97-129
Chambaud, Lewis 1815, *A New Dictionary English and French and French and English (vol. 2, part 2)*, London: Printed for Cadell and Davies
Chambaud, Lewis and J. B. Robinet 1776, *A New Dictionary English and French, and French and English (vol. 2)*, Paris: Printed for C. Panckoucke
Chen, K. K. and Carl F. Schmidt 1930, 'Ephedrine and related substances', *Medicine*, 9: 1-117
Chilton, John Poindexter *et al*. 1943, *Fungi Reported on Species of Medicago, Melilotus, and Trifolium*, Washington: United States Government Printing Office
China Institute in America 1927, *Theses and Dissertations by Chinese Students in America*, New York: China Institute in America
Chisholm, Hugh (ed.) 1910, *The Encyclopaedia Britannica (vol. 3)*, Cambridge: Cambridge University Press
Christie, Thos. B. *et al*. 1853, 'Memoir of the life of the late Jonathan Pereira', *The Pharmaceutical Journal*, 12(9): 409-417
Churchill, William 1915, 'Memoir of William W. Rockhill', *Annals of the Association of American Geographers*, 5: 131-133
Colledge, Thomas R. 1835, 'Suggestions with regard to employing medical practitioners as missionaries to China', *The Chinese Repository*, 4(8): 386-389
Colledge, Thomas R., Peter Parker and Elijah C. Bridgman 1838a, 'Medical missionary society: regulations and resolutions, adopted at a public meeting held at Canton on the 21st of February, 1838', *The Chinese Repository*, 7(1): 32-44
Colledge, Thomas R., Peter Parker and Elijah C. Bridgman 1838b, *The Medical Missionary Society in China: Address, with Minutes of Proceedings*, Canton: Printed at the Office of the Chinese Repository
Cooke, Mordecai C. 1866, 'Insect fungi', *Science-Gossip*, 2: 127-130

Cooke, Mordecai C. 1875, *Fungi: Their Nature and Uses*, New York: D. Appleton and Company
Cooke, Mordecai C. 1883, ‘Notes on Hypocreaceae’, *Grevillea*, 12: 77-83
Cooke, Mordecai C. 1892, *Vegetable Wasps and Plant Worms*, London: Society for Promoting Christian Knowledge
Cordier, Henri 1901, ‘Le Docteur Emile Vasilievitch Bretschneider’, *T’oung Pao*, 2(3): 192-197
Craig, John 1847, *A New Universal Etymological and Pronouncing Dictionary of the English Language (vol. 1)*, London: James Gilbert
Curzon, George and Lewis Beaumont 1912, ‘Meetings of the Royal Geographical Society, Session 1911-1912’, *The Geographical Journal*, 39(1): 84-85
Davis, J. J. 1920, ‘Pier Andrea Saccardo’, *Botanical Gazette*, 70(2): 156-157
De Bary, Heinrich Anton 1866, *Morphologie und Physiologie der Pilze, Flechten und Myxomyceten*, Leipzig: Verlag von Wilhelm Engelmann
Dendy, Arthur 1914, ‘Quekett Microscopical Club’, *English Mechanic and World of Science*, (2593): 406
Dionis, Pierre 1690, *L’anatomie de l’homme, Suivant la Circulation du Sang, & les Nouvelles Découvertes*, Paris: Laurent d’Houry
Downing, Charles T. 1838, *The Fan-Qui in China, in 1836-7 (vol. 2)*, London: Henry Colburn, Publisher
Dragendorff, Georg 1898, *Die Heilpflanzen der Verschiedenen Völker und Zeiten*, Stuttgart: Verlag von Ferdinand Enke
Du Halde, Jean-Baptiste 1735, *Description Géographique, Historique, Chronologique, Politique, et Physique de l’empire de la Chine et de la Tartarie Chinoise, Enrichie des Cartes Générales et Particulieres de Ces Pays, de la Carte Générale et des Cartes Particulieres du Thibet, & de la Corée; & ornée d'un Grand Nombre de Gigures & de Vignettes Gravées en Taille-douce (vol. 3)*, Paris: Chez P. G. Le Mercier, Imprimeur-Libraire, rue Saint Jacques, au Livre d’Or
Du Halde, Jean-Baptiste 1736, *The General History of China: Containing a Geographical, Historical, Chronological, Political and Physical Description of the Empire of China, Chinese-Tartary, Corea, and Thibet, Including an Exact and Particular Account of Their Customs, Manners, Ceremonies, Religion, Arts and Sciences (vol. 4)*, Richard Brookes (trans.), London: J. Watts
Du Halde, Jean-Baptiste [1736] 1739, *The General History of China: Containing a Geographical, Historical, Chronological, Political and Physical Description of the Empire of China, Chinese-Tartary, Corea, and Thibet, Including an Exact and Particular Account of Their Customs, Manners, Ceremonies, Religion, Arts and Sciences*, Richard Brookes (trans.), London: J. Watts
Du Halde, Jean-Baptiste [1736] 1741, *The General History of China: Containing a Geographical, Historical, Chronological, Political and Physical Description of the Empire of China, Chinese-Tartary, Corea, and Thibet, Including an Exact and Particular Account of Their Customs, Manners, Ceremonies, Religion, Arts and Sciences*, Richard Brookes (trans.), London: J. Watts
Du Halde, Jean-Baptiste *et al.* (eds.) 1819a, *Lettres Édifiantes et Curieuses, Écrites des Missions Étrangères* (vol. 9), Lyon: J. Vernarel
Du Halde, Jean-Baptiste *et al.* (eds.) 1819b, *Lettres Édifiantes et Curieuses, Écrites des Missions Étrangères* (vol. 10), Lyon: J. Vernarel.
Du Halde, Jean-Baptiste *et al.* (eds.) 1819c, *Lettres Édifiantes et Curieuses, Écrites des Missions Étrangères* (vol. 12), Lyon: J. Vernarel.
Dunglison, Robley and Richard J. Dunglison 1874, *Medical Lexicon: A Dictionary of Medical Science*, Philadelphia: Henry C. Lea
Editors of the Literary Magazine 1789, ‘Life of Sir William Watson, M.D. F.R.S.’, *The Literary Magazine and British Review*, 3: 401-411
Edwards, George 1764, *Gleanings of Natural History (part 3)*, London: Printed for the Autor, at the Royal College of Physicians
Eitel, Ernest J. 1877, *A Chinese Dictionary in the Cantonese Dialect*, London and Hongkong: Trübner and Co., and Lane, Crawford & Co.
F., J. B. 1923, ‘Isaac Bayley Balfour, K.B.E.; D.Sc., M.D., LL.D., F.R.S’, *Annals of Botany*, 37(146): 335-339
Fabricius, Johann C. 1775, *Systema Entomologiae*, Flensburgi et Lipsia: Officina Libraria Kortii
General Council of Medical Education and Registration of the United Kingdom 1914, *The British Pharmacopoeia*, London: General Medical Council

Gildemeister, Eduard 1913, *The Volatile Oils (vol. 1)*, Edward Kremers (trans.), New York: John Wiley and Sons
Gilman, Daniel C. *et al*. 1911, *The New International Encyclopædia (vol. 16)*, New York: Dodd, Mead and Company
Gordon, Charles A. 1884, *An Epitome of the Reports of the Medical Officers to the Chinese Imperial Maritime Customs Service, from 1871 to 1882*, London: Baillière, Tindal, and Cox
Gray, George R. 1858, *Notices of Insects That Are Known to Form the Bases of Fungoid Parasites*, Hampstead: Privately Printed
Gray, Samuel F. 1818, *A Supplement to the Pharmacopoeias*, London: Underwood
Grote, Augustus R. 1895, *List of North American Eupterotidae, Ptilodontae, Thyatiridae, Apatelidae and Agrotidae*, Bremen: Press Unknown
Grote, Augustus R. 1900, 'Historical sketch of Gortyna and allied genera', *Proceedings of the American Philosophical Society*, 39(162): 346-357
Gubler, Adolphe 1873, 'Report of M. Gubler upon the materia medica of the Chinese', *The China Review*, 3: 119-124
Guignard, Léon 1904, *Centenaire de l'École Supérieure de Pharmacie de l'Université de Paris (1803-1903)*, Paris: A. Joanin et Cie
Gützlaff, Charles 1833, 'A monthly periodical in the Chinese language', *The Chinese Repository*, (4): 186-187
Gützlaff, Charles 1840, *Journal of Three Voyages along the Coast of China, in 1831, 1832 & 1833, with Notices of Siam, Corea, & the Loo-Choo Islands*, London: Thomas Ward and Co.
Hanbury, Daniel 1861, 'Notes on Chinese Materia Medica', *Pharmaceutical Journal and Transactions*, 2(1): 15-18
Hanbury, Daniel 1862, *Notes on Chinese Materia Medica*, London: John E. Taylor
Hance, H. F. 1874, 'On a small collection of plants from Kiukiang', *Journal of Botany: British and Foreign*, 3: 258-263
Harris, T. M. 1941, 'Obituary: Sir Albert Charles Seward, F.R.S., 1863-1941', *The New Phytologist*, 40(3): 161-164
Hauser, Ernest O. 1940, *Shanghai, City for Sale*, Shanghai: The Chinese-American Publishing Company
Hobson, Benjamin 1854, *Report of the Hospital at Canton, for 1853-54*, Canton: Press of S. Wells Williams
Hobson, Benjamin 1860, 'The history and present state of medicine in China', *The Medical Times and Gazette*, 2: 400-402, 451-453, 477-478, 632-634
Hobson, Benjamin 1860, 'The history and present state of medicine in China', *The Medical Times and Gazette*, 2: 451-453
Hoffmann, Hermann 1863, *Index Fungorum*, Lipsiae: Sumptibus A. Forstneri
Hooker, Joseph D. 1875, 'Fungus growing from the body of a caterpillar', *The Gardeners' Chronicle*, 3: 314
Hooker, Joseph D. 1903, *A Sketch of the Life and Labours of Sir William Jackson Hooker*, Oxford: Clarendon Press
Hooker, William J. 1837, *Icones Plantarum*, London: Longman, Rees, Orme, Brown, Green, & Longman
Houghton, Frank 1930, *George King, Medical Evangelist*, London: China Inland Mission
Hübotter, Franz 1929, *Die Chinesische Medizin zu Beginn des XX. Jahrhunderts und ihr historischer Entwicklungsgang*, Leipzig: Verlag der "Asia Major"
Humphreys, Arthur L. 1897, *The Somerset Roll: An Experimental List of Worthies, Unworthies and Villains Born in the County*, London: Strangeways
Ince, Jeseph 1892, 'Obituary: Emeritus Professor Redwood', *The Pharmaceutical Journal and Transactions*, 22: 763-765
Ito, Tokutaro 1903, 'Notes on some Himalayan plants collected by the Rev. Keikai Kawaguchi in 1902', *The Botanical Magazine* 17(200): 157-159
Ivatts, E. B. 1873, 'Provings of new remedies', *The American Observer*, 10: 564-568
Ivatts, E. B. 1886, 'Torrubia Sinensis', *The New York Medical Times*, 14(1): 137-138
Jartoux, Pierre 1713, 'The description of a Tartarian plant, Call'd Gin-Seng; with an account of its virtues in a letter from Father Jartoux, to the procurator general of the missions of India and China. Taken from the Tenth Volume of Letters to the Missionary Jesuits, printed at Paris in Octavo, 1713,' *Philosophical Transactions*, 28: 237-247
Jefferys, W. H. 1909, 'A Review of Medical Education in China', *The Chinese Medical Missionary*

Journal, 23(5): 294-299
Jenner, Edward 1798, *An Inquiry into the Causes and Effects of the Variolæ Vaccinæ*, London: Printed, for the Author, by Sampson Low
Jones, Stephen 1811, *A New Biographical Dictionary*, London: Printed for Longman, Hurst, Rees, Orme, and Brown
K., T. W. 1901, 'Obituary: Dr. Emile Vasilievitch Bretschneider', *Journal of the China Branch of the Royal Asiatic Society*, 33(3): 69-72
Kawaguchi, Ekai 1909, *Three Years in Tibet*, London: Theosophical Publishing Society
Kebler, L. F. 1926, 'Pierre Pomet, a seventeenth century worker for pure drugs, spices and foods', *Journal of the American Pharmaceutical Association*, 15(5): 367-371
Kilborn, Omar L. 1910, *Heal the Sick: An Appeal for Medical Missions in China*, Toronto: Missionary Society of the Methodist Church
King, George 1891, 'A cheap stustitute for Pepsin', *The China Medical Missionary Journal*, 5(1): 24-25
King's College London 1857, *The Calendar of King's College, London, for 1857-58*, London: R. Clay, Printer
Kirby, William F. 1897, *A Hand-book to the Order Lepidoptera (vol. 4)*, London: Edward Lloyd, Ltd.
Kitamura, Siro 1953, 'Tibetan plants collected by E. Kawaguchi I', *Acta phytotaxonomica et geobotanica* 15(2): 37-43
Kitamura, Siro 1953, 'Tibetan plants collected by E. Kawaguchi II', *Acta phytotaxonomica et geobotanica* 15(3): 70-77
Kitamura, Siro 1954, 'Tibetan plants collected by E. Kawaguchi III', *Acta phytotaxonomica et geobotanica* 15(6): 168-172
Lei, K. N. 1932, *Information and Opinion Concerning the Japanese Invasion of Manchuria and Shanghai from Sources Other than Chinese*, Shanghai: The Shanghai Bar Association
Lindley, John 1846, *The Vegetable Kingdom*, London: Bradbury & Evans
Lindley, John [1846] 1847, *The Vegetable Kingdom*, London: Bradbury & Evans
Lindley, John [1846] 1853, *The Vegetable Kingdom*, London: Bradbury & Evans
Linnaei, Caroli 1753, *Species Plantarum* (vol. 1), Holmiae: Impensis Laurentii Salvii
Lloyd, Curtis G. 1918, 'Cordyceps sinensis, from N. Gist Gee, China', *Mycological Notes*, (54): 766-780
Loudon, John C. [1838] 1854, *Arboretum et Fruticetum Britannicum (vol. 1)*, London: Henry G. Bohn, York Street, Covent Garden
Macgowan, Daniel J. 1848, 'Extracts from the Report of the Medical Missionary Society in China for the year 1847; Reports of the Hospitals at Ningpo and Hongkong and of the Dispensary at Amoy', *The Chinese Repository*, 19(5): 242-247
Main, James 1826, 'Reminiscences of a voyage to and from China', *The Horticultural Register*, 5: 62-67
Mascré, Marcel 1952, 'Le Professeur Emile Perrot (1867-1951)', *Bulletin de la Société Botanique de France*, 99: 181-187
Massee, George 1895, 'A revision of the genus Cordyceps', *Annals of Botany*, 9(33): 1-44
Massee, George 1913, 'Miles Joseph Berkeley 1803-1889', In: *Makers of British Botany*, F. W. Oliver (ed.), Cambridge: Cambridge University Press
Maximovich, Carl I. 1859, *Primitiae Florae Amurensis*, St. Petersburg: Buchdruckerei der Kaiserlichen Akademie der wissenschaften
Medicorum Collegii Londinensis 1618, *Pharmacopoeia Londinensis*, London: Printed for John Marriot
Micheli, Pier A. 1729, *Nova Plantarum Genera: Iuxta Tournefortii Methodum Disposita*, Florentiae: Typis Bernardi Parerinii
Mills, J. P. 1958, 'Obituary: Frank Kingdon-Ward', *The Geographical Journal*, 124(3): 422
Mitchell, P. Chalmers 1941, 'Herbrand Arthur Russell, Duke of Bedford. 1858-1940', *Obituary Notices of Fellows of the Royal Society*, 3(9): 498-502
Montemartini, Luigi 1920, 'Pier Andrea Saccardo', *Rivista di Patologia Vegetale*, 10(4-5): 49-50
Moore, W. C. 1953, 'Frederick Tom Brooks. 1882-1952', *Obituary Notices of Fellows of the Royal Society*, 8(22): 340-354
Moreland, James R. 1938, *The First Presbyterian Church of Morgantown, West Virginia: With Short Biographical Sketches of Its Pastors, Missionaries, Ministers and Lay Leaders*, Morgantown: First Presbyterian Church of Morgantown

Morrison, Eliza A. 1839a, *Memoirs of the Life and Labours of Robert Morrison (vol.1)*, London: Longman, Orme, Brown, Green, and Longmans
Morrison, Eliza A. 1839b, *Memoirs of the Life and Labours of Robert Morrison (vol. 2)*, London: Longman, Orme, Brown, Green, and Longmans
Morrison, Robert 1815, *A Dictionary of the Chinese Language* (part 1, vol. 1), Macao: The Honorable East India Company's Press
Morrison, Robert 1819, *A Dictionary of the Chinese Language* (part 2, vol. 1), Macao: The Honorable East India Company's Press
Morrison, Robert 1822, *A Dictionary of the Chinese Language* (part 3), Macao: The Honorable East India Company's Press
Morse, Hosea B. [1926] 2000a, *The Chronicles of the East India Company Trading to China (vol. 1)*, London: Routledge
Morse, Hosea B. [1926] 2000b, *The Chronicles of the East India Company Trading to China (vol. 2)*, London: Routledge
Morse, Hosea B. [1926] 2000c, *The Chronicles of the East India Company Trading to China (vol. 4)*, London: Routledge
Morse, Hosea B. 1900, *The International Relations of the Chinese Empire (vol. 1)*, New York : Paragon Book Gallery
Moseley, Henry N. 1879, *Notes by A Naturalist on the "Challenger", Being An Account of Various Observations Made during the Voyage of H.M.S. "Challenger" around the World, in the Years 1872-1876*, London: Macmillan and Co.
Murata, Gen 1955, 'Tibetan plants collected by E. Kawaguchi', *Acta phytotaxonomica et geobotanica* 16(1): 13-16
Museum of the Royal College of Surgeons of England 1860, *Catalogue of the Contents of the Museum of the Royal College of Surgeons of England (Part 1)*, London: Taylor and Francis
Nagai Nagayoshi 1887, 'Ephedrine', *Pharmazeutische Zeitung-Nachrichten*, 32(98): 700
Neave, Sheffield A. 1933, *The History of the Entomological Society of London, 1833-1933*, London: R. Clay & Sons
Order of the Council of the Horticultural Society of London 1820, 'Appendix: List of medals presented by Order of the Council of the Horticultural Society of London, from May 1, 1818, to May 1, 1819', *Transactions of the Horticultural Society of London*, 3: 37
Order of the Inspector General of Chinese Maritime Customs 1873, *China: Port Catalogues of the Chinese Customs' Collection at the Austro-Hungarian Universal Exhibition, Vienna, 1873*, Shanghai: The Imperial Maritime Customs Press
Order of the Inspector General of Customs 1889, *List of Chinese Medicines*, Shanghai: Statistical Department of the Inspectorate General of Customs
Order of the Inspector General of Customs 1917, *Treaties, Conventions, etc., between China and Foreign States (vol. 1)*, Shanghai: Statistical Department of the Inspectorate General of Customs
Order of the Trustees 1893, *A General Guide to the British Museum (Natural History)*, London: William Clowes and Sons, Ltd.
Otto, Friedrich 1839, *The History of Russian Literature*, George Cox (trans.), Oxford: D. A. Talboys
P., D. 1924, 'Obituary Notices of Fellows Deceased', *Proceedings of the Royal Society of London B*, 96(679): 1-16
Pak, Chubyung and Bernard E. Read 1931, 'Pharmacological standards for the Hormone preparations of the Chinese Pharmacopoeia', *The China Medical Journal*, 45(2): 125-133
Parker, Linette A. 1915, 'A brief history of materia medica (continued)', *The American Journal of Nursing*, 15(10): 829-831
Pearson, Alexander 1833, 'Vaccination', *The Chinese Repository*, 2(1): 35-41
Peile, John 1913, *Biographical Register of Christ's College, 1505–1905 (vol. 2)*, Cambridge: Cambridge University Press
Pereira, Jonathan [1842] 1843, *The Elements of Materia Medica and Therapeutics*, Philadelphia: Lea & Blanchard
Pereira, Jonathan [1842] 1854, *The Elements of Materia Medica and Therapeutics (vol. 2)*, Philadelphia: Blanchard and Lea
Pereira, Jonathan 1839, *The Elements of Materia Medica*, London: Longman, Orme, Brown, Green, and Longmans
Pereira, Jonathan 1842, *The Elements of Materia Medica and Therapeutics*, London: Longman, Orme, Brown, Green, and Longmans

Pereira, Jonathan 1843a, 'Notice of a Chinese article of the Materia Medica, called 'summer-plant-winter-worm'', *Pharmaceutical Journal and Transactions*, 2(9): 591-595
Pereira, Jonathan 1843b, 'Summer-Plant-Winter-Worm', *The New York Journal of Medicine*, 1(1): 128-132
Pereira, Jonathan 1844, 'Leistungen im Gebiete der Pharmakognosie und Pharmazie', *Jahresbericht über die Fortschritte der Pharmacie in allen Ländern*, 1: 240-241
Perrot, Emile and Paul Hurrier 1907, *Matière Médicale et Pharmacopée Sino-Annamites*, Paris: Vigot Frères
Pfeiffer, Ludovicus 1874, *Nomenclator Botanicus: Nominum ad Finem anni 1858 Publici Juris Factorum, Classes, Ordines, Tribus, Familias, Divisiones, Genera, Subgenera vel Sectiones Designatium Enumeratio Alphabetica (vol. 2)*, Cassellis: Sumptibus Theodori Fischeri
Pfister, Louis 1932, *Notices Biographiques et Bibliographiques sur les Jésuites de l'ancienne Mission de Chine, 1552-1773*, Chang-hai: Imprimerie de la Mission Catholique
Pharmaceutical Society of Great Britain 1842, 'List of the founders of the Pharmaceutical Society of Great Britain', *Pharmaceutical Journal and Transactions*, 1(7): 363-386
Pott, F. L. H. *et al*. 1909, 'Medical education in China [...] Union school for nurses, Peking', *The China Medical Journal*, 23(5): 300-344
Power, Frederick B. 1903a, 'The International Conference for the Unification of the Formulae of Potent Medicaments', *The American Journal of Pharmacy*, 75: 1-13
Power, Frederick B. 1903b, *The International Conference for the Unification of the Formulae of Potent Medicaments*, London: The Wellcome Chemical Research Laboratories
Pratt, Antwerp E. 1892, *To the Snows of Tibet through China*, London: Longmans, Green, and Co.
Ramsbottom, John 1917, 'George Edward Massee (1850-1917)', *Transactions of the British Mycological Society*, 5: 469-473
Ramsbottom, John 1941, 'Presidential address: The expanding knowledge of mycology since Linnaeus', *Proceedings of the Linnean Society of London*, 151(4): 223-374
Ramsbottom, John 1953, *Mushrooms & Toadstools: A Study of the Activities of Fungi*, London: Collins
Read, Bernard E. 1936, *Chinese Medicinal Plants from the Pen Ts'ao Kang Mu*, Peking: Peking Natural History Bulletin
Reade, Compton 1904, *The Smith Family*, London: Elliot Stock
Reaumur, René-Antoine Ferchault de 1710, 'Examen de la soye des Araignées', *Histoire de l'Académie Royale des Sciences*, (1): 386-408
Reaumur, René-Antoine Ferchault de 1726, 'Remarques sur la plante appellée à la Chine Hia tsao tom tchom, ou plante ver', *Histoire de l'Académie Royale des Sciences*, (1): 302-306
Reaumur, René-Antoine Ferchault de 1734-1742, *Mémoires Pour Servir à l'Histoire des Insectes*, Paris: De l'Imprimerie Royale
Redwood, Theophilus 1857, *A Supplement to the Pharmacopoeia*, London: Longman and Co.
Rees, Abraham 1819, *The Cyclopædia; or, Universal Dictionary of Arts, Sciences, and Literature (vol. 17)*, London: Longman, Hurst, Rees, Orme & Brown
Reeves, John 1828, 'Account of some of the articles of the Materia Medica employed by the Chinese', *Transactions of the Medico-Botanical Society of London*, 1: 24-27
Reeves, John 1835, 'American Magnolias in China', *The Gardener's Magazine*, 1(new series): 437-438
Rehder, Alfred 1936, 'Ernest Henry Wilson (1876-1930)', *Proceedings of the American Academy of Arts and Sciences*, 70(10): 602-604
Rehder, Alfred 1937, 'Adolf Engler (1844-1930)', *Proceedings of the American Academy of Arts and Sciences*, 71(10): 497-500
Reichsministerium des Innern (ed.) 1926, *Deutsches Arzneibuch*, Berlin: Decker
Ricci, Matteo 1615, *De Christiana Expeditione apud Sinas Suscepta ab Societate Jesu*, Nicolas Trigault (ed.), Augsburg
Robbins, Helen H. 1908, *Our First Ambassador to China: An Account of the Life of George, Earl of Macartney*, New York: E. P. Dutton and Company
Rockhill, William W. 1894, *Diary of A Journey through Mongolia and Tibet in 1891 and 1892*, Washington: The Smithsonian Institution
Royal College of Surgeons 1874, *Calendar of the Royal College of Surgeons of England*, London: Taylor and Francis
Saccardo, Pier A. 1878, 'Enumeratio pyrenomycetum hypocreaceorum hucusque congitorum systemate carpologico dispositorum', *Michelia*, 1(3): 277-325

Saccardo, Pier A. 1883, *Sylloge Fungorum Omnium Hucusque Cognitorum (vol. 2)*, Patavii: Sumptibus Auctoris
Saunders, William W. 1841, 'March 1st.-W. W. Saunders, Esq., F.L.S., President, in the Chair', *Journal of Proceedings of the Entomological Society of London*, 1: 22-26
Saunders, William W. 1842, 'Proceedings of learned societies: Entomological Society', *The Annals and Magazine of Natural History*, 8(50): 217-220
Schwarz, Kurt L. 1950, 'Bernard Emms Read May 17, 1887-June 13, 1949', *Journal of the History of Medicine and Allied Sciences*, 5(2): 216-217
Selden, Charles C. 1935, 'The life of John G. Kerr: Forty-three years superintendent of the Canton Hospital', *Chinese Medical Journal*, 49(4): 366-376
Short 1850, 'Remarks on Sphaeria robertsi and S. sinensis', *The Floricultural Cabinet, and Florists' Magazine*, 18: 200-201
Smith, Frederick P. 1871a, 'Chinese blistering flies', *The Medical Times and Gazette*, 1: 689-690
Smith, Frederick P. 1871b, *Contributions towards the Materia Medica & Natural History of China*, Shanghai and London: American Presbyterian Mission Press
Smith, J. Edwards 1882, 'Remarks and suggestions concerning homoeopathic triturations', *The Monthly Homeopathic Review*, 26: 721-729
Solis-Cohen, Solomon 1893, 'The dissimilarity between physicians and Homoeopathists', *The Journal of the American Medical Association*, 21: 618-619
Soubeiran, Jean L. and Dabry de Thiersant 1874, *La Matière Médicale Chez les Chinois*, Paris: G. Masson
Spallanzani, Lazzaro 1765, *Saggio di Osservazioni Microscopiche Concernenti il Sistema Della Generazione de' Signori di Needham e Buffon*, Modena: Per gli Eredi di Bartolomeo Soliani Stamp
Spallanzani, Lazzaro and John T. Needham 1769, *Nouvelles Recherches sur Les Découvertes Microscopiques, et La Génération des Corps Organisés*, Londres & à Paris: Chez Lacombe
Squire, Peter 1866, *A Companion to the British Pharmacopoeia*, London: J. Churchill & Sons
Staunton, George 1797, *An Authentic Account of an Embassy from the King of Great Britain to the Emperor of China (vol. 2)*, London: W. Bulmer and Co.
Stuart, George A. 1911, *Chinese Materia Medica*, Shanghai: American Presbyterian Mission Press
Tamba, Yasuyori [984] 1997, *The Essentials of Medicine in Ancient China and Japan: Yasuyori Tamba's Shimpo*, Hsia, E. C. H. *et al*. (trans.), Leiden: Brill
Tamura, Michio 1954, 'Tibetan plants collected by E. Kawaguchi', *Acta phytotaxonomica et geobotanica* 15(6): 192-198
Tatarinov, Alexander 1856, *Catalogus Medicamentorum Sinensium, quae Pekini Comparanda et Determinanda Curavit*, Petropoli: [Press Unknown]
Tatchell, William A. 1909, *Medical Missions in China in Connexion with the Wesleyan Methodist Church*, London: Robert Culley
Teng, Shu Chun 1932, 'Additional Fungi from Southwestern China', *Contributions from the Biological Laboratory of the Science Society of China: Botanical Series*, 8(1): 1-4
Teng, Shu Chun 1934, 'Notes on Hypocreales from China', *Sinensia*, 4(10): 269-298
Teng, Shu Chun 1939, *A Contribution to Our Knowledge of the Higher Fungi of China*, [Place of Publication Unknown]: National Institute of Zoology & Botany, Academia Sinica
Thiselton-Dyer, William T. 1897, 'Miles Joseph Berkeley Born 1803. Died 1889.', *Annals of Botany*, 11(44): 4-11
Thiselton-Dyer, William T. 1907, 'Harry Marshall Ward', *The New Phytologist*, 6(1): 1-9
Thiselton-Dyer, William T. 1913, 'Harry Marshall Ward, 1854-1906', In: *Makers of British Botany*, F. W. Oliver (ed.), Cambridge: Cambridge University Press
Thomas, H. Hamshaw 1941, 'Albert Charles Seward. 1863-1941', *Obituary Notices of Fellows of the Royal Society*, 3(10): 867-880
Thomas, Oldfield 1911, 'The Duke of Bedford's Zoological Exploration of Eastern Asia.—XIV. On Mammals from Southern Shen-si, Central China', *Proceedings of the General Meetings for Scientific Business of the Zoological Society of London*, (3-4): 687-695
Thomson, J. C. 1887, 'Medical publications in Chinese: by foreign authors', *The China Medical Missionary Journal*, 1(3): 115-121
Thunberg, Carl P. 1784, *Flora Japonica*, Lipsiae: In Bibliopolio I. G. Mülleriano
Thunberg, Carl P. 1791, *Resa uti Europa, Africa, Asia (vol. 3): Resan til och uti kejsaredömet Japan åren 1775 och 1776*, Upsala: Joh. Edman
Torrubia, Joseph 1754, *Aparato Para La Historia Natural Española*, Madrid: Imprenta de los

Herederos de Don Agustin de Gordejuela Y Sierra
Townsend, George H. 1867, *The Manual of Dates a Dictionary of Reference to All the Most Important Events in the History of Mankind to be found in Authentic Records*, London: Woodfall and Kinder
Tulasne, Ludovicus-Renatus and Tulasne, Carolus 1865, *Selecta Fungorum Carpologia (Vol. 3),* Parisiis: Imperatoris Jussu, In Imperiali Typographeo Excudebatur
Walravens, Hartmut 1983, *Emil Bretschneider, russischer Gesandtschaftsarzt, Geograph und Erforscher der chinesischen Botanik: Eine Bibliographie,* Hamburg: C. Bell Verlag
Ward, Frank K. 1910, *On the Road to Tibet,* Shanghai: Shanghai Mercury
Ward, Frank K. 1911, 'The Big Game of Western China', In: *Wild Life in China, or, Chats on Chinese Birds and Beasts*, George Lanning (ed.), Shanghai: 'The National Review' Office
Ward, Frank K. 1923, *The Mystery Rivers of Tibet*, London: Seeley Service & Co.
Ward, Frank K. 1926, *The Riddle of the Tsangpo Gorges,* London: Edward Arnold & Co.
Ward, Frank K. 1934, 'The Himalaya East of the Tsangpo', *The Geographical Journal*, 84(5): 369-394
Ward, Frank K. 1934, *A Plant Hunter in Tibet*, London: Jonathan Cape
Ward, Frank K. 1945, *Modern Exploration*, London: Jonathan Cape Ltd.
Ward, Frank K. 1960, *Pilgrimage for Plants*, London: George G. Harrap & Co. Ltd
Von Haller, Albrecht 1768, 'Sphaeria', *Historia Stirpium Indigenarum Helvetiae*, 3: 120-123
Von Siebold, Philipp Franz [1832] 1897, *Nippon: Archiv zur Beschreibung von Japan*, Würzburg: Woerl
Waterhouse, G. R. 1850, 'Proceedings of the Entomological Society of London', *Transactions of the Royal Entomological Society of London,* 1: 1-2
Watson, William 1763, 'An account of the insect called the Vegetable Fly', *Philosophical Transactions,* 53: 271-274.
Watt, Robert 1824, *Bibliotheca Britannica; or A General Index to British and Foreign Literature (vol. 2),* Edinburgh: Archibald Constable and Company
Weir, J. J. 1893, 'Obituary', *The Entomologist's Record and Journal of Variation*, 4(1): 24
Westwood, John O. [1833] 1835, *The Natural History of Insects (vol. 2),* New York: Harper & Brothers
Westwood, John O. [1833] 1837, *The Natural History of Insects (vol. 2),* New York: Harper & Brothers
Westwood, John O. [1833] 1842, *The Natural History of Insects (vol. 2),* New York: Harper & Brothers
Westwood, John O. 1833, *The Natural History of Insects (vol. 2)*, New York: J. & J. Harper
Westwood, John O. 1850, 'Obituary of Mr. Edward Doubleday', *The Gardeners' Chronicle and Agricultural Gazette*, 10: 71
Whitney, Willis N. 1885, 'Notes on the history of medical progress in Japan', *Transactions of the Asiatic Society of Japan,* 12: 245-470
Williams, Frederick W. 1889, *The Life and Letters of Samuel Wells Williams, LL.D., Missionary, Diplomatist, Sinologue*, New York: G.P. Putnam's Sons
Williams, Samuel W. 1834, 'Natural history of China', *The Chinese Repository*, 3(2): 83-89
Williams, Samuel W. 1848a, *The Middle Kingdom (vol. 1),* New York: Wiley and Putnam
Williams, Samuel W. 1848b, *The Middle Kingdom (vol. 2),* New York: Wiley and Putnam
Williams, Samuel W. [1848] 1883, *The Middle Kingdom (vol. 2)*, London: W. H. Allen & Co.
Wilson, Ernest H. 1913a, *A Naturalist in Western China (vol. 1)*, London, Methuen & Co.
Wilson, Ernest H. 1913b, *A Naturalist in Western China (vol. 2)*, London, Methuen & Co.
Wong, K. C. 1919, 'Chinese Medical Schools and State Examinations', *The National Medical Journal of China*, 5(1): 106-111
Wong, K. Chimin and Wu Lien-Teh [1932] 1936, *History of Chinese Medicine*, Shanghai: National Quarantine Service
Woodward, B. B. *et al*. 1904, *The History of the Collections Contained in the Natural History Departments of the British Museum (vol. 1),* London: Order of the Trustees of the British Museum
Wright, Arnold (ed.) 1908, T*wentieth Century Impressions of Hongkong, Shanghai, and Other Treaty Ports of China*, London: Lloyd's Greater Britain Publishing Company
Wu, Lien-Teh 1931, 'The Early days of Western medicine in China', *Journal of the North China Branch of the Royal Asiatic Society,* 62: 2-31
Wylie, Alexander 1867, *Memorials of Protestant Missionaries to the Chinese: Giving a List of Their*

Publications, and Obituary Notices of the Deceased, Shanghae: American Presbyterian Mission Press

Adoratskiy Адоратский, Николай 1887, *Православная Миссия в Китае за 200 Лет ее Существования*, Казань: Типография Императ1орского Университета

Bichurin Бичурин, Н. Я. [1835] 1838, *Китайская Грамматика*, Санкт-Петербургъ: Литография Гемильяна

Imperatorskoy Mediko-Khirurgicheskoy Akademii Императорской Медико-Хирургической Академии 1852, ‘Отчет о действии китайских лекарств, испытанном по Высочайшему повелению особенной комиссией, составленной при Императорской медико-хирургической Академии’, *Военно-Медицинский Журнал*, 60: 21-46

Korsak Корсак, А. 1857, *Историко-Статистическое Обозрение Морговых Сношений России с Китаем*, Казань: Издание Книгопродавца Ивана Дубровина

Trusevicha Трусевича, Соч. Х. 1882, *Посольские и Морговые Сношения России с Китаем*, Москва: Типография Т. Малинского

(B) Sources in Tibetan Language

Desi Sangye Gyatso སྡེ་སྲིད་སངས་རྒྱས་རྒྱ་མཚོ། (Sde srid sangs rgyas rgya mtsho) [1686] 1994, *Dpal ldan gso ba rig pa'i khog 'bugs legs bshad bai durya'i me long drang srong dgyes pa'i dga' ston* དཔལ་ལྡན་གསོ་བ་རིག་པའི་ཁོག་འབུགས་ལེགས་བཤད་བེ་ཌཱུརྱའི་མེ་ལོང་དྲང་སྲོང་དགྱེས་པའི་དགའ་སྟོན།, Dharamsala: Bod gzhung sman rtsis khang བོད་གཞུང་སྨན་རྩིས་ཁང་།

'Jam dpal rdo rje འཇམ་དཔལ་རྡོ་རྗེ (Jampel Dorje) [early 19th century] 1971, *Mdzes mtshar mig rgyan* མཛེས་མཚར་མིག་རྒྱན།, edited by Lokesh Chandra, New delhi: International Academy of Indian Culture

Kam Chopel ཀཱམ་ཆོས་འཕེལ། (Kam chos 'phel) 1993, *Bdud rtsi sman gyi 'khrungs dpe legs bshad nor bu'i phreng mdzes* བདུད་རྩི་སྨན་གྱི་འཁྲུངས་དཔེ་ལེགས་བཤད་ནོར་བུའི་ཕྲེང་མཛེས།, Lhasa ལྷ་ས།: Bod ljongs mi dmangs dpe skrun khang བོད་ལྗོངས་མི་དམངས་དཔེ་སྐྲུན་ཁང་།

Sde srid sangs rgyas rgya mtsho སྡེ་སྲིད་སངས་རྒྱས་རྒྱ་མཚོ་ (Desi Sangye Gyatso) [1689] 2005, *rgyud bzhi'i gsal byed baiDUrya sngon po* རྒྱུད་བཞིའི་གསལ་བྱེད་བེ་ཌཱུརྱ་སྔོན་པོ།, Pecin པེ་ཅིན།: Mi rigs dpe skrun khang མི་རིགས་དཔེ་སྐྲུན་ཁང།

Sum pa mkhan po ye shes dpal 'byor སུམ་པ་མཁན་པོ་ཡེ་ཤེས་དཔལ་འབྱོར། (Sumpa Khenpo Yeshe Paljor) [18th century] 1975, Gso dpyad bdud rtsi chu rgyun gyi cha lag gi nang tshan gyi sman so so so'i mngon brjod dang ngos 'dzin shel dkar me long གསོ་དཔྱད་བདུད་རྩི་ཆུ་རྒྱུན་གྱི་ཆ་ལག་གི་ནང་ཚན་གྱི་སྨན་སོ་སོའི་མངོན་བརྗོད་དང་ངོས་འཛིན་ཤེལ་དཀར་མེ་ལོང་།, In: *Sum pa mkhan po ye shes dpal 'byor gyi gsung 'bum* སུམ་པ་མཁན་པོ་ཡེ་ཤེས་དཔལ་འབྱོར་གྱི་གསུང་འབུམ།, New Delhi: International Academy of Indian Culture

Yuthok Yonten Gonpo གཡུ་ཐོག་ཡོན་ཏན་མགོན་པོ། (Gyu thog yon tan mgon po) [12th century] 2005, *Bdud rtsi snying po yan lag brgyad pa gsang ba man ngag gi rgyud ces bya ba bzhugs so* བདུད་རྩི་སྙིང་པོ་ཡན་ལག་བརྒྱད་པ་གསང་བ་མན་ངག་གི་རྒྱུད་ཅེས་བྱ་བ་བཞུགས་སོ།, Pecin པེ་ཅིན།: Mi rigs dpe skrun khang མི་རིགས་དཔེ་སྐྲུན་ཁང།

Zurkhar Nyamnyi Dorje ཟུར་མཁར་མཉམ་ཉིད་རྡོ་རྗེ། (Zur mkhar mnyam nyid rdo rje) [15th century] 1977, *Man ngag bye ba ring bsrel* མན་ངག་བྱེ་བ་རིང་བསྲེལ། (vol. 1), Gangtok: Sherab gyaltsen lama

Zurkhar Nyamnyi Dorje ཟུར་མཁར་མཉམ་ཉིད་རྡོ་རྗེ། (Zur mkhar mnyam nyid rdo rje) [15th century] 2005, *Man ngag bye ba ring bsrel* མན་ངག་བྱེ་བ་རིང་བསྲེལ།, Pecin པེ་ཅིན།: Mi rigs dpe skrun khang མི་རིགས་དཔེ་སྐྲུན་ཁང་།

(C) Sources in Japanese Language

Aoki Konyou 青木昆陽 [1766] 1928, *Zoku kon you man roku ho* 續昆陽漫錄補, In: Ni hon zui hitsu tai sei 日本随筆大成 (vol. 20), Toukyou 東京: Yoshi sen kou mon yakata 吉川弘文館

Asahina Yasuhiko 朝比奈泰彦 (ed.) 1955, *Shou sou in yaku butsu* 正倉院薬物, Ousaka 大阪: Shoku butsu bun ken kan kou kai 植物文献刊行会

Esaki Teiso 江崎悌三 1929, ‘Fuku oka ken ya me gun san natsu chuu tou sou ni tsui te 福岡縣八女郡産夏蟲冬草に就て’, *Kyuu shuu tei koku dai gaku nou gaku be gaku gei zatsu shi* 九州帝國大學農學部學藝雜誌, 3(3): 221-231

Fujii Kansai 藤井咸齋 [1829] 1843, *Zou ho te ita hatsu mou* 增補手板發蒙, Edo 江戸: Yama shiro ya sa hei mamoru 山城屋佐兵衛

Hirokawa Kai 広川獬 [1800] 1975, *Nagasaki bun ken roku* 長崎聞見録 (vol. 3), In: Nagasaki

bun ken sou sho 長崎文献叢書 (no. 1, vol. 5), Nagasaki 長崎: Nagasaki bun ken sha 長崎文献社
Ito Keisuke 伊藤篤太郎 1888, 'Tou you shoku butsu mana no ichi dai kai kaku won a sa ru be ka ra zu 東洋植物學ノ一大改革ヲナサヾル可カラズ', *Shoku butsu gaku zatsu shi* 植物學雜誌, (19): 177-181
Kawaguchi Ekai 河口慧海 1904a, *Nishikura ryokou ki* 西蔵旅行記 (vol. 1), Toukyou 東京: Hirobumi kan 博文館
Kawaguchi Ekai 河口慧海 1904b, *Nishikura ryokou ki* 西蔵旅行記 (vol. 2), Toukyou 東京: Hirobumi kan 博文館
Kawaguchi Ekai 河口慧海 1966, *Dai ni kai chi be tto ryo kou ki* 第二回チベット旅行記, Toukyou 東京: Kawa guchi e kai no kai 河口慧海の會
Kurimoto Tanshu 栗本丹洲 [1811] 1879, *Kuri shi sen chuu fu* 栗氏千蟲譜 (book 7), Toukyou 東京: The manuscript preserved at Japan's National Diet Library
Kurita Manjirou 栗田萬次郎 1889, 'Zoku shi na haku butsu i kou (shou zen) 續支那博物彙攻(承前)', *Tou kyou chi manabu kyou kai hou koku* 東京地學協會報告, 11(9): 29-32
Matsumura Jinzou 松村任三 1895, *Shoku butsu mei i* 植物名彙, Toukyou 東京: Maru zen 丸善
Miyoshi Manabu 三好學 1888, 'Tou chuu ka sou no ben 冬蟲夏草ノ辨', *Shoku butsu gaku zatsu shi* 植物學雜誌, 2(13): 36-40
Miyoshi Manabu 三好學 1899, *Shoku butsu manabu minoru ken sho ho* 植物學實驗初歩, Toukyou 東京: Kei gyou sha 敬業社
Mizutani Toyofumi 水谷豊文 *c*. 1833, *Mushi mujina sha shin* 虫豸写真, Toukyou 東京: The manuscript preserved at Japan's National Diet Library
Nagai Nagayoshi 長井長義 (ed.) 1920, *Ni hon yaku kyoku hou* 日本薬局方, Toukyou 東京: Asa hi kai 朝陽会
Nagai Nagayoshi 長井長義 1892, 'Kan kusuri ma ou sei bun ken kyuu sei seki 漢藥麻黄成分研究成績', *Kusuri manabu zatsu shi* 藥學雜誌, (120): 109-114
Nan Kotobukiaki 何壽明 1905, *Nichi niwaka sen ji ki you* 日俄戦時紀要, Toukyou 東京: Kamei tadakazu 亀井忠一
Nishimura Suimu 西村酔夢 1909, *Semi no ken kyuu* 蝉の研究, Toukyou 東京: Hiro bumi kan 博文館
Niwa Seihaku 丹羽正伯 *c*. 1735, *Ni wa sei haku bu ssan ni kki* 丹羽正伯物産日記, Toukyou 東京: The manuscript preserved at Japan's National Diet Library
Noro Genjou 野呂元丈 1750, *O ran da hon zou wa kai* 阿蘭陀本草和解, Toukyou 東京: The manuscript preserved at Japan's National Diet Library
Oda Zeisuke 小田勢助 1898, 'Tou chuu ka sou 冬蟲夏草', *Kon chuu se kai* 昆蟲世界, 2(16): 465
Ohara Momohora 小原桃洞 1833, *Momo hora i hitsu* 桃洞遺筆 (vol. 3), Wakayama 若山: Saka moto ya ki ichi rou 阪本屋喜一郎
Shimoyama Junichirou 下山順一郎 1882, 'Hom pou san kusa utou no ken sa 本邦産草烏頭ノ検查', *Kusuri gaku zou shi* 藥學雜志, (2): 6-12
Shina shou betsu zen shi kan kou kai [SSBZSKKK] 支那省別全誌刊行會 1941, *Shin osamu shina shou betsu zen shi* 新修支那省別全誌 (vol. 2), Toukyou 東京: Higashi ajia dou bun kai 東亞同文會
Shirai Mitsutarou 白井光太郎 [1914] 1925, *Shoku butsu you i kou* 植物妖異考, Toukyou 東京: Oka sho in 岡書院
Shirai Mitsutarou 白井光太郎 [1932?] 1990, *Hon zou hyaku ka den・so no ta* 本草百家伝・その他, Kimura Youjirou 木村陽二郎 (ed.), Toukyou 東京: Ka gaku sho in 科学書院
Sugita Genpaku 杉田玄白 [1815] 1869, *Ran manabu koto hajime* 蘭學事始, Tokyou 東京: Ten shin rou 天真樓
Tamba Genkan 丹波元簡 [1801] 1955, *Yi sheng* 醫賸 (vol. 3), Beijing 北京: Ren min wei Sheng chu ban she 人民衛生出版社
Tamba Keizou 丹波敬三 1881, 'Buku ryou 茯苓', *Kusuri gaku zou shi* 藥學雜志, (1): 5-8
Tamba Yasuyori 丹波康頼 [984] 2011, *I Shin Pou* 医心方, Gao Wenzhu 高文柱 (ed.), Beijing

北京: Hua xia chu ban she 华夏出版社
Tokudomi Sohou 徳富蘇峰 1929, *Kan na gawa jou yaku tei ketsu hen* 神奈川条約締結篇, Toukyou 東京: Min tomo sha 民友社
Toukyou bijutsu gakkou kouyuu kai 東京美術学校校友会 1904, *Kawaguchi Ekai shi shourai nishikura hin zuroku* 河口慧海師将来西蔵品図録, Touykou 東京: Ga hou sha 画報社
Tsuboi Shinryou 坪井信良 1866, *Shin yaku hyaku hin kou* 新薬百品考, Toukyou 東京: Shima mura ri suke 島村利助
Wang Huanwen 王焕文 1909, 'Buku ryou no sei bun ni tsui te 茯苓の成分に就て', *Kusuri manabu zatsu shi* 藥學雜誌, (327): 461-472
Yasuda Atsushi 安田篤 1894a, 'Tsuchi gumo ni ki sei su ru tou chuu ka sou nit sui te 螲蟷ニ寄生スル冬虫夏草ニ就テ', *Shoku butsu gaku zatsu shi* 植物學雜誌, 8(90): 337-340
Yasuda Atsushi 安田篤 1894b, '「Ki sa na gi ta ke」(Tou chuu ka sou ni ichi shu) Torrubia militaris, Fr. 「きさなぎたけ」(冬虫夏草ノ一種) Torrubia militaris, Fr.', *Shoku butsu gaku zatsu shi* 植物學雜誌, 8(92): 410-411
Yuzuki Tokiwa 柚木常盤 1801, *Haku rai ka sou tou chuu to* 舶來夏草冬蟲圖, Toukyou 東京: The Manuscript Preserved at Japan's National Diet Library

(D) Sources in Chinese Language

Aleni, Giulio [1623] 1995, *Xi xue fan* 西學凡, In: Si ku quan shu cun mu cong shu (Zi bu, book 93) 四庫全書存目叢書 (子部第 93 冊), Jinan 濟南: Qi lu shu she 齊魯書社
Anonymous (trans.) 1923, *Mei guo xi yao pu* 美國西藥譜, Shanghai 上海: Zhong hua shu ju 中華書局
Anonymous [1859] 2001, *Returns of the Import and Export Trade, Shanghae 1859*, In: Zhong guo jiu hai guan shi liao 中國舊海關史料 (book 1), Beijing 北京: Jing hua chu ban she 京華出版社
Anonymous [1886] 1983, 'Guang xu shi er nian si yue chu yi ri jing bao quan lu 光緒十二年四月初一日京報全錄', *Shan bao (ying yin ben) (book 28)* 申報(影印本) (第 28 冊), Shanghai 上海: Shang hai shu dian 上海書店
Anonymous [1899] 1985, 'Qiu zhi shu yuan ji hai dong ji ke ti 求志書院已亥冬季課題', *Shen bao (ying yin ben) (book 63)* 申報 (影印本) (book 63), Shanghai 上海: Shang hai shu dian 上海書店
Anonymous [1916] 1987, 'Hai jun yi xue xiao gui ze 海軍醫學校規則', In: *Zhong hua min guo hai jun shi liao* 中華民國海軍史料, Yang Zhiben 楊志本 (ed.), Beijing 北京: Hai yang chu ban she 海洋出版社
Anonymous [1923] 1983, 'Zong shang hui fan dui zhong yao zhu ce zhang cheng 總商會反對中藥註冊章程', In: *Shen bao (ying yin ben) (book 197)* 申報(影印本)(第 197 冊), Shanghai 上海: Shang hai shu dian 上海書店
Anonymous [1925] 1983, 'Xin fa ming dong chong cao ya shang shi 新發明冬蟲草鴨上市', In: *Shen bao (ying yin ben) (book 63)* 申報(影印本)(第 63 冊), Shanghai 上海: Shang hai shu dian 上海書店
Anonymous [1925] 1985, 'Xin fa ming dong chong cao ya shang shi 新發明冬蟲草鴨上市', In: *Shen bao (ying yin ben) (book 63)* 申報 (影印本) (book 63), Shanghai 上海: Shang hai shu dian 上海書店
Anonymous [1927] 1983a, 'Chuan han yao cai zan qu ping wen 川漢藥材暫趨平穩', In: *Shen bao (ying yin ben) (book 231)* 申報(影印本)(第 231 冊), Shanghai 上海: Shang hai shu dian 上海書店
Anonymous [1927] 1983b, 'Yao cai za huo fan chang de ju mian 藥材雜貨業反常的局面', In: *Shen bao (ying yin ben) (book 231)* 申報(影印本)(第 231 冊), Shanghai 上海: Shang hai shu dian 上海書店
Anonymous [1927] 1983c, 'Yi nian lai chuan han yao cai zhi bian qian 一年來川漢藥材之變遷', In: *Shen bao (ying yin ben) (book 231)* 申報(影印本)(第 231 冊), Shanghai 上海: Shang hai shu dian 上海書店

Anonymous [1928] 1983a, 'Nan yuan jiu jia 南園酒家', In: *Shen bao (ying yin ben) (book 252)* 申報(影印本)(第 252 冊), Shanghai 上海: Shang hai shu dian 上海書店
Anonymous [1928] 1983b, 'Shu tong sen yin er zhuang jian jia zhan qi 蜀通森銀耳莊減價展期', In: *Shen bao (ying yin ben) (book 262)* 申報(影印本)(第 262 冊), Shanghai 上海: Shang hai shu dian 上海書店
Anonymous [1929] 1984a, 'Quan xiang yao ye dai biao da hui 全湘藥業代表大會', In: *Shen bao (ying yin ben) (book 264)* 申報(影印本)(第 264 冊), Shanghai 上海: Shang hai shu dian 上海書店
Anonymous [1929] 1984b, 'Wei ya jiu lou xin feng ji shang shi 味雅酒樓信豐雞上市', In: *Shen bao (ying yin ben) (book 262)* 申報(影印本)(第 262 冊), Shanghai 上海: Shang hai shu dian 上海書店
Anonymous [1929] 1984c, 'Yan hua lou jiu jia zhi zi bu dun pin 燕華樓酒家之滋補墩品', In: *Shen bao (ying yin ben) (book 264)* 申報(影印本)(第 264 冊), Shanghai 上海: Shang hai shu dian 上海書店
Anonymous [1935] 1985, 'Zhong guo yao xue da ci dian guang gao 中國藥學大辭典廣告', In: *Shen bao (ying yin ben) (book 325)* 申報(影印本)(第 209 冊), Shanghai 上海: Shang hai shu dian 上海書店
Anonymous [1935] 2010, *Si chuan kao cha bao gao shu* 四川考察報告書, In: Zhong guo bian jiang she hui diao cha bao gao ji cheng (collection 1, book 5) 中國邊疆社會調查報告集成(第 1 輯第 5 冊), Guilin 桂林: Guang xi shi fan da xue chu ban she 廣西師範大學出版社
Anonymous [1948] 1985, 'Chang du ge lun la lu gao shi xiao chu zang kang liang zu jie xian 昌都噶倫拉魯告示消除藏康兩族界限', *Shen bao (ying yin ben) (book 399)* 申報(影印本)(第 399 冊), Shanghai 上海: Shang hai shu dian 上海書店
Anonymous [1st century BC] 1999, *Li ji zheng yi* 禮記正義, Zheng Xuan 鄭玄 and Kong Yingda 孔穎達 (eds.), Beijing 北京: Bei jing da xue chu ban she 北京大學出版社
Anonymous [7th-4th century BC] 1981, *Xia xiao zheng jing wen jiao shi* 夏小正經文校釋, Xia Weiying 夏衛瑛 (ed.), Beijing 北京: Nong ye chu ban she 農業出版社
Anonymous [*c*. 1st century BC] 1992, *Huang di nei jing su wen jiao zhu* 黃帝內經素問校注, Guo Aichun 郭靄春 (ed.), Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社
Anonymous [*c*. 3rd century BC] 1999, *Xiao jing zhu shu* 孝經注疏, Li Longji 李隆基 and Xing Bing 邢昺 (eds.), Beijing 北京: Bei jing da xue chu ban she 北京大學出版社
Anonymous [*c*. 5th-century BC] 1982, *Shang shu* 尚書, In: Shi san jing zhu shu 十三經註疏, Beijing 北京: Zhong hua shu ju 中華書局
Anonymous 1903, 'Dong chong xiao cao shuo 冬蟲夏草說', *Nong xue bao* 農學報, (231): 440-444
Anonymous 1913, 'Dong chong xia cao 冬蟲夏草', *Tong su jiao yu bao* 通俗教育報, (1): 1
Anonymous 1925, 'Quan guo zhi ye da xue xiao ji zhuan men xue xiao yi lan 全國職業大學校及專門學校一覽', *Xue sheng za zhi* 學生雜誌, 12(8): 126-128
Anonymous 1929, 'Shi qi nian shi er yue di yi qian ge di cheng bao yi yao diao cha tong ji biao 十七年十二月底以前各地呈報醫藥調查統計表', *Wei sheng gong bao* 衛生公報, 1(4): 158
Anonymous 1930, 'Xin yao ye cheng qing xiu zheng yao shang guan li gui ze 新藥業呈請修正藥商管理規則', *Gong shang ban yue kan* 工商半月刊, 2(17): 9-10
Anonymous 1934, 'Xi kang 'chong cao' chu kou ju shu 西康'蟲草'出口巨數', *Fang zhou* 方舟, (12): 12
Anonymous 1936, 'Jin san nian xi kang she xiang chong cao chu kou tong ji 近三年西康麝香蟲草出口統計', *Guo ji mao yi qing bao* 國際貿易情報, 1(44): 74
Anonymous 1937, 'Dong chong xia cao 冬蟲夏草', *Zhi shi hua bao* 知識畫報, (4): 26-27
Anonymous 1947, 'Wo guo zhi yao gong ye zhi yan zhong wei ji 我國製藥工業之嚴重危機', *Jing ji tong xun* 經濟通訊, 2(4): 118-120
Anonymous 1947, 'Zhu pei ran yi shi yan jiu yi yao zhi xin shou huo 朱沛然醫師研究醫藥之新收穫', *Yi yao yan jiu* 醫藥研究, 1(2): 18
Binliang 斌良 [1847] 2002, *Bao chong zhai shi ji* 抱冲齋詩集, In: Xu xiu si ku quan shu 續修四

庫全書 (book 1508), Shanghai 上海: Shang hai gu ji chu ban she 上海古籍出版社
Bouvet, Joachim and Jean-François Gerbillon [1693] 2001, *Xi yang yao shu* 西洋藥書, In: Gu gong zhen ben cong kan (book 727) 故宮珍本叢刊(第 727 冊), Haikou 海口: Hai nan chu ban she 海南出版社
Cao Bingzhang 曹炳章 1917, 'Tao lun dong chong xia cao zhi zhong lei ji xiao yong 討論冬蟲夏草之種類及效用', *Shao xing yi yao xue bao* 紹興醫藥學報, 7(3): 25-33
Cao Zhenyong 曹振鏞 *et al*. [1799] 1986, *Qing shi lu* 清實錄 (book 15, vol. 550), Beijing 北京: Zhong hua shu ju 中華書局
Chai Zifang 柴紫芳 1915, 'Dong chong xia cao 冬蟲夏草', *Xin min bao* 新民報, 2(11): 33-34
Chang Ming 常明 *et al*. [1816] 1984, *Jia qing si chuan tong zhi* 嘉慶四川通志, Chengdu 成都: Ba shu shu she 巴蜀書社
Chen Bangxian 陳邦賢 [1920] 1937, *Zhong guo yi xue shi* 中國醫學史, Shanghai 上海: Shang wu yin shu guan 商務印書館
Chen Bangxian 陳邦賢 1920, *Zhong guo yi xue shi* 中國醫學史, Shanghai 上海: Yi xue shu ju 醫學書局
Chen Cunren 陳存仁 (ed.) [1935] 1956, *Zhong guo yao xue da ci dian* 中國藥學大辭典, Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社
Chen Cunren 陳存仁 (ed.) 1935, *Zhong guo yao wu biao ben tu ying* 中國藥物標本圖影, Shanghai 上海: Shi jie shu ju 世界書局
Chen Cunren 陳存仁 (ed.) 1935a, *Zhong guo yao xue da ci dian* 中國藥學大辭典, Shanghai 上海: Shi jie shu ju 世界書局
Chen Cunren 陳存仁 (ed.) 1935b, *Zhong guo yao xue da ci dian (ben shu can kao shu mu)* 中國藥學大辭典(本書參考書目), Shanghai 上海: Shi jie shu ju 世界書局
Chen Cunren 陳存仁 (ed.) 1935c, *Zhong guo yao xue da ci dian (bian ji hou ji)* 中國藥學大辭典(編輯後記), Shanghai 上海: Shi jie shu ju 世界書局
Chen Cunren 陳存仁 (ed.) 1935d, *Zhong guo yao xue da ci dian (zi xu)* 中國藥學大辭典(自序), Shanghai 上海: Shi jie shu ju 世界書局
Chen Cunren 陳存仁 (ed.) 1935e, *Zhong guo yao xue da ci dian (bian ji li yan)* 中國藥學大辭典(編輯例言), Shanghai 上海: Shi jie shu ju 世界書局
Chen Cunren 陳存仁 (ed.) 1936, *Huang han yi xue cong shu (73 books)* 皇漢醫學叢書(共 73 種), Shanghai 上海: Shi jie shu ju 世界書局
Chen Cunren 陳存仁 (ed.) 1937, *Zhong guo yao xue da ci dian (jian ming ben)* 中國藥學大辭典(簡明本), Shanghai 上海: Shi jie shu ju 世界書局
Chen Cunren 陳存仁 [1970?] 2008, *Bei hu shi de fa ming: Zhong guo zao qi yi yao shi hua* 被忽視的發明: 中國早期醫藥史話, Guilin 桂林: Guang xi shi fan da xue chu ban she 廣西師範大學出版社
Chen Cunren 陳存仁 [1973] 2000, *Yin yuan shi dai sheng huo shi* 銀元時代生活史, Shanghai 上海: Shang hai ren min chu ban she 上海人民出版社
Chen Cunren 陳存仁 [1976] 2007, *Wo de yi wu sheng ya* 我的醫務生涯, Guilin 桂林: Guang xi shi fan da xue chu ban she 廣西師範大學出版社
Chen Cunren 陳存仁 [1979] 2001, *Kang zhan shi dai sheng huo shi* 抗戰時代生活史, Shanghai 上海: Shang hai ren min chu ban she 上海人民出版社
Chen Cunren 陳存仁 1929, 'Chen cun ren zhi chu min yi han 陳存仁致褚民誼函', *Xing lin yi xue yue bao* 杏林醫學月報, (3): 15-16
Chen Cunren 陳存仁 1947, 'Chen cun ren zhi jing xuan xuan yan 陳存仁之競選宣言', *Zhong yi yao qing bao* 中醫藥情報, (6): 8
Chen Cunren 陳存仁 1954, 'Guo yi qi su xie li heng xian sheng zhuan ji 國醫耆宿謝利恒先生傳記', In: *Zhong guo li dai yi xue shi lue* 中國歷代醫學史略, Shanghai 上海: Qian qing tang shu ju 千頃堂書局
Chen Cunren 陳存仁 1956, *Shi wen shang han shou ce* 濕溫傷寒手冊, Shanghai 上海: Shang hai wei sheng chu ban she 上海衛生出版社
Chen Cunren 陳存仁 2008, *Yue shi ping ren lu: Zhang tai yan jia shu ji qi ta* 閱世品人錄: 章太炎

家書及其他, Guilin 桂林: Guang xi shi fan da xue chu ban she 廣西師範大學出版社
Chen Fangzhi 陳方之 [1933] 1985, 'Zhen yu sui bi 診餘隨筆', In: *Shen bao (ying yin ben) (book 307)* 申報(影印本)(第 307 冊), Shanghai 上海: Shang hai shu dian 上海書店
Chen Jingqi 陳景岐 1930, *Guo yao zi dian* 國藥字典, Shanghai 上海: Zhong xi shu ju 中西書局
Chen Keji 陳可冀 2009a, *Qing gong yi an ji cheng* (*Shang ce*) 清宮醫案集成 (上冊), Beijing 北京: Ke xue chu ban she 科學出版社
Chen Shou 陳壽 [*c*. 285] 1999, *San guo zhi* 三國志, Beijing 北京: Zhong hua shu ju 中華書局
Chen Pu 陳璞 1948, 'Zhi yao gong ye ying ru he fa zhan 製藥工業應如何發展', *Xi nan yi xue za zhi* 西南醫學雜誌, 6(3): 6
Chen Yong 陈镛 [1804] 1864, *Chu san xuan cong tan* 樗散軒叢談, Qing tong zhi san nian kan ben 清同治三年刊本
Chen Zhen 陳楨 1924, *Pu tong sheng wu xue* 普通生物學, Shanghai 上海: Shang wu yin shu guan 商務印書館
Cheng Hanzhang 程瀚章 (ed.) 1935, *Xin yi yao ci dian* 新醫藥辭典, Shanghai 上海: Shi jie shu ju 世界書局
Cheng Wenyou 程文囿 1826, *Yi shu* 醫述, Qing dao guang bing xu ke ben 清道光丙戌刻本
Chengren 成仁 1945, 'Dong chong xia cao 冬蟲夏草', *Xian dai yi yao za zhi* 現代醫藥雜誌, 1(3-4): 15-18
Da xue sheng shu qi bian jiang fu wu tuan [DXSSQBJFWT] 大學生暑期邊疆服務團 [1941] 2010, *Chuan xi diao cha ji* 川西調查記, In: Zhong guo bian jiang she hui diao cha bao gao ji cheng (collection 1, book 5) 中國邊疆社會調查報告集成(第 1 輯第 5 冊), Guilin 桂林: Guang xi shi fan da xue chu ban she 廣西師範大學出版社
Dai Tianzhang 戴天章 [1675] 1992, *Guang wen yi lun* 廣瘟疫論, Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社
Dai Tianzhang 戴天章 and He Lianchen 何廉臣 [1911] 2005, *Chong ding guang wen re lun* 重訂廣溫熱論, Fuzhou 福州: Fu jian ke xue ji shu chu ban she 福建科學技術出版社
De Ursis, Sabatino [1612] 1986, Tai xi shui fa 泰西水法, In: *Wen yuan ge si ku quan shu (book 731)* 文淵閣四庫全書 (第 731 冊), Taipei 臺北: Tai wan shang wu yin shu guan 臺灣商務印書館
Deng Chengwei 鄧承偉 and Ji Shenglan 基生蘭 [1928] 1938, *Xi ning fu xu zhi (vol. 10)* 西寧府續志(卷十), Min guo er shi qi nian qian yin ben 民國二十七年鉛印本
Deng Renyuan 鄧仁垣 *et al*. [1874] 1976, *Tong zhi hui li zhou zhi* 同治會理州志, In: Zhong guo fang zhi cong shu (Hua Zhong di fang di 367 hao) 中國方志叢書 (華中地方第 367 號), Taibei 臺北: Cheng wen chu ban she 成文出版社
Deng Xihou 鄧錫侯 1936, *Si chuan song li mao mao wen tun zheng ji yao* 四川松理懋茂汶屯區屯政紀要, Press unknown
Ding Bing 丁丙 [1896] 1990, *Wu lin fang xiang zhi* 武林坊巷志, Hangzhou 杭州: Zhe jiang ren min chu ban she 浙江人民出版社
Ding Fubao 丁福保 [1921] 1999, *Chou yin ju shi zi ding nian pu* 疇隱居士自訂年譜, In: Bei jing tu shu guan cang zhen ben nian pu cong kan (book 197) 北京圖書館藏珍本年譜叢刊(第 197 冊), Beijing 北京: Bei jing tu shu guan chu ban she 北京圖書館出版社
Ding Fubao 丁福保 [1948] 2012, *Chou yin ju shi qi shi zi xu* 疇隱居士七十自敘, Xi jian shang hai shi zhi zi liao cong shu (book 3) 稀見上海史志資料叢書(第 3 冊), Shanghai 上海: Shang hai shu dian 上海書店
Ding Fubao 丁福保 1909, *Hua xue shi yan xin ben cao (xu)* 化學實驗新本草(序), Shanghai 上海: Wen ming shu ju 文明書局
Ding Fubao 丁福保 1930, *Xin ben cao gang mu* 新本草綱目, Shanghai 上海: Yi xue shu ju 醫學書局
Ding Fubao 丁福保 1948, *Chou yin ju shi zi zhuan* 疇隱居士自傳, Shanghai 上海: Gu lin jing she chu ban bu 詁林精舍出版部
Ding Fubao 丁福保 1949, *Chou yin ju shi xue shu shi* 疇隱居士學術史, Shanghai 上海: Gul in jing she chu ban she 詁林精舍出版社
Ding Ganren 丁甘仁 [1927] 1965, *Ding gan ren yi an* 丁甘仁醫案, Shanghai 上海: Shang hai ke

xue ji shu chu ban she 上海科學技術出版社
Ding Yaochen 丁堯臣 [1880] 1992, *Qi xiao jian bian liang fang* 奇效簡便良方, Beijing 北京: Zhong yi gu ji chu ban she 中醫古籍出版社
Dong chong xia cao [DCXC] 冬蟲夏草 1936, 'Cong bei ping dao shan tou 從北平到汕頭', *Yan da zhou kan* 燕大週刊, 7(13): 9-12
Dong Shaoshu 董紹舒 [1928] 1983, 'Zhong hua guo huo zhan lan hui bao gao 中華國貨展覽會報告', In: *Shen bao (ying yin ben) (book 253)* 申報(影印本)(第 253 冊), Shanghai 上海: Shang hai shu dian 上海書店
Duan Pengrui 段鵬瑞 [1909] 1995, *Yan jing xiang tu zhi* 鹽井鄉土志, In: Zhong guo di fang zhi ji cheng (Xi zang fu xian zhi ji) 中國地方誌集成(西藏府縣誌輯), Chengdu 成都: Ba shu shu she 巴蜀書社
Fan Xinghuan 樊星環 1910, 'Cao fu gu dong chong xia cao shi 曹扶谷冬蟲夏草詩', *Shao xing yi yao xue bao* 紹興醫藥學報, (32): 9
Fan Ye 范曄 [445] 1999, *Hou han shu* 後漢書, Beijing 北京: Zhong hua shu ju 中華書局
Fei Shengfu 費繩甫 [*c*. 1914] 2004, *Fei sheng fu xian Sheng yi an* 費繩甫先生醫案, In: Zhong yi gu ji zhen xi chao ben jing xuan 中醫古籍珍稀抄本精選, Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社.
Feng Keshu 馮克書 [1930?] 2010, *Li fan xian shi chan shu yao* 理番縣視察述要, In: Zhong guo xi jian di fang shi liao ji cheng (book 43) 中國稀見地方史料集成(第 43 冊), Beijing 北京: Xue yuan chu ban she 學苑出版社
Fu Zhaopeng 符兆鵬 *et al*. 1872, *Tong zhi tai hu xian zhi* 同治太湖縣志, Qing tong zhi shi yi nian kan ben 清同治十一年刊本
Fujita Toyohachi 藤田豐八 (trans.) 1900, 'Dong chong xiao 冬蟲夏草', *Nong xue bao* 農學報, (114): 484-485
Gao Jinglang 高鏡朗 (trans.) 1927, *Ying guo yao zhi* 英國藥制, Shanghai 上海: Lun dun shang hui & shang hai ying shang hui 倫敦商會和上海英商會
Gao Shouheng 高壽恒 *et al*. [1922] 1998, *Min guo xu xiu tai hu xian zhi* 民國續修太湖縣志, In: Zhong guo di fang zhi ji cheng (An hui fu xian zhi ji, book 16) 中國地方志集成 (安徽府縣志輯第 16 冊), Nanjing 南京: Jiang su gu ji chu ban she 江蘇古籍出版社 1998 年版
Gu Jingyuan 顧靖遠 [1718] 1961, *Gu song yuan yi jing* 顧松園醫鏡, Zhengzhou 鄭州: He nan ren min chu ban she 河南人民出版社
Guang dong sheng zheng fu [GDSZF] 廣東省政府 1936, 'Zhuan ling yan li zhi xing guan li yao shang ji cheng yao liang zhong gui ze 轉令嚴厲執行管理藥商及成藥兩種規則', *Guang dong sheng zheng fu gong bao* 廣東省政府公報, (327): 106-107
Guo ji mao yi zi xun suo [GJMYZXS] 國際貿易諮詢所 1946, 'Chu kou xiao xi 出口消息', *Jin chu kou mao yi xiao xi* 進出口貿易消息, (122): 1
Guo min zheng fu [GMZF] 國民政府 1929, 'Xiu ma zui yao pin guan li tiao li 修麻醉藥品管理條例', *Si fa gong bao* 司法公報, (47): 46-48
Guo min zheng fu [GMZF] 國民政府 1931, 'Xiu zheng ma zui yao pin guan li tiao li 修正麻醉藥品管理條例', *Si fa gong bao* 司法公報, (149): 1-3
Guo min zheng fu [GMZF] 國民政府 1937, 'Du liang heng fa 度量衡法', In: *Zhong hua min guo fa gui da quan* 中華民國法規大全, Shanghai 上海: Shang wu yin shu guan 商務印書館
Guo min zheng fu zhu ji chu tong ji ju [GMZFZJCTJJ] 國民政府主計處統計局 (ed.) 1935, *Zhong hua min guo tong ji ti yao* 中華民國統計提要, Nanjing 南京: Zhu ji chu tong ji ju 主計處統計局
He Fuhai 何福海 *et al*. 1891, *Guang xu xu xiu xin ning xian zhi* 光緒續修新甯縣志, Qing guang xu shi jiu nian kan ben 清光緒十九年刊本
He Shuangmei 何霜梅 1930, *Zhong guo yao wu xue shi gang* 中國藥物學史綱, Shanghai 上海: Shang hai zhong yi shu ju 上海中醫書局
He Ying 和瑛 [*c*. 1806] 1968, *San zhou ji lue* 三州輯略, In: Zhong guo fang zhi cong shu (Xi bu di fang, book 11) 中國方志叢書 (西部地方第 11 號), Taibei 臺北: Cheng wen chu ban she 成文出版社

Heshen 和珅 *et al*. [1784] 1986, *Da qing yi tong zhi* 大清一統志, In: Wen yuan ge si ku quan shu 文淵閣四庫全書 (book 475), Taibei 臺北: Tai wan shang wu yin shu guan 臺灣商務印書館
Hobson, Benjamin and Guan Maocai 管茂材 1858, *Nei ke xin shuo (vol. 2)* 內科新說, Shanghai 上海: Ren ji yi guan 仁濟醫館
Hu Anbang 胡安邦 1935, *Shi yong yao xing ci dian* 實用藥性辭典, Shanghai 上海: Zhong yang shu dian 中央書店
Hu Fangxi 胡仿西 1925, 'Zeng bu ben cao shi: Dong chong xia cao 增補本草詩: 冬蟲夏草', *Zhong yi za zhi* 中醫雜誌, (16): 7
Hu Jilu 胡吉廬 1928, *Xi kang jiang yu su gu lu* 西康疆域溯古錄, In: Ya zhou min zu kao gu cong kan (Collection 4) 亞洲民族考古叢刊(第四輯), Shanghai 上海: Shang wu yin shu guan 商務印書館
Hu Mingshu 胡明樹 1946, 'Huang nian bei wang lu (di yi hao) 荒年備忘錄(第一號)', *Guo min* 國民, (5): 28-30
Hu Shi 胡適 [1923] 1998, '*Ke xue yu ren sheng guan* xu 《科學與人生觀》序', In: *Hu shi wen ji (book 3)* 胡適文集(第 3 冊), Beijing 北京: Bei jing da xue chu ban she 北京大學出版社
Huang Minglong 黃鳴龍 1922, 'Shu bo lin da xue yao xue yan jiu yuan 述柏林大學藥學研究院', *Tong de yi xue* 同德醫學, 3(3): 7-11
Huang Minglong 黃鳴龍 1929, 'Zhong xi yi ming chen shang de wen ti 中西醫名稱上的問題', *Yi yao xue* 醫藥學, 6(6): 7-13
Huang Sufeng 黃素封 and Ping Zuyin 平祖蔭 (eds.) 1935, Shi yong you ji hua xue 實用有機化學, Shanghai 上海: Kai ming shu dian 開明書店
Huang Tinggui 黃庭桂 *et al.* [1735] 1983, *Si chuan tong zhi* 四川通志, In: Wen yuan ge si ku quan shu 文淵閣四庫全書 (book 560), Taibei 臺北: Tai wan shang wu yin shu guan 臺灣商務印書館
Ji Yun 紀昀 [1789-1798] 1994, *Yue wei cao tang bi ji* 閱微草堂筆記, Tianjin 天津: Tian jin gu ji chu ban she 天津古籍出版社
Jia yu bu [JYB] 教育部 1912, 'Jiao yu bu gong bu da xue gui cheng ling 教育部公佈大學規程令', *Jiao yu za zhi* 教育雜誌, 5(1): 1-19
Jiang Daqu 姜達衢 1944, 'Ru he jiu ji mu qian zhi yao gong ye de shuai luo 如何救濟目前製藥工業的衰落', *She hui wei sheng* 社會衛生, 1(3): 10-12
Jiang Ren'an 江忍庵 1931, *Zhong guo yao wu xin zi dian* 中國藥物新字典, Shanghai 上海: Zhong guo yi yao yan jiu hui 中國醫藥研究會
Jiang Yubo 蔣玉伯 1935, *Zhong guo yao wu xue ji cheng* 中國藥物學集成, Shanghai 上海: Shang hai zhi xin shu ju 上海知新書局
Jiao tong bu you zheng zong ju [JTBYZZJ] 交通部郵政總局 1937, *Zhong guo tong you di fang wu chan zhi* 中國通郵地方物產志, Shanghai 上海: Shang wu yin shu guan 商務印書館
Jiao yu bu jiao yu nian jian bian zuan wei yuan hui [JYBJYNJBZWYH] 教育部教育年鑒編纂委員會 (ed.) 1948, *Di er ci zhong guo jiao yu nian jian: Di wu bian* 第二次中國教育年鑒: 第五編, Shanghai 上海: Shang wu yin shu guan 商務印書館
Jiao yu bu zhong guo jiao yu nian jian bian shen wei yuan hui [JYBZGJYNJBSWYH] 教育部中國教育年鑒編審委員會 1934, *Di yi ci zhong guo jiao yu nian jian (bing bian)* 第一次中國教育年鑒(丙編), Shanghai 上海: Kai ming shu dian 開明書店
Jin Songcen 金松岑 1904, 'Nü zi shi jie fa kan ci 女子世界發刊詞', *Nü zi shi jie* 女子世界, (1): 1-3
Kong Qiu 孔丘 *et al*. [5th century BC] 1999, *Lun yu zhu shu* 論語註疏, He Yan 何晏 and Xing Bing 邢昺 (eds.), Beijing 北京: Bei jing da xue chu ban she 北京大學出版社
Lei Xiao 雷斅 [*c*. 5th century] 1991, *Lei gong pao zhi lun* 雷公炮炙論, Shang Zhijun 尚志鈞 (ed.), Hefei 合肥: An hui ke xue ji shu chu ban she 安徽科學技術出版社
Li Cheng 李誠 [1899] 1997, *Wan shan gang mu* 萬山綱目, In: Si ku wei shou shu ji kan 四庫未收書輯刊 (collection 9, book 6), Beijing 北京: Bei jing chu ban she 北京出版社
Li Chenghu 李承祜 *et al*. 1943, 'Guan yu chong bian zhong hua yao dian sheng yao fang mian zhi ji dian yi jian 關於重編中華藥典生藥方面之幾點意見', *Yao xue ji kan* 藥學季刊, (4):

184-189
Li Dou 李斗 [1795] 1997, *Yang zhou hua fang lu* 揚州畫舫錄, Beijing 北京: Zhong hua shu ju 中華書局
Li fan yuan [LFY] 理藩院 [1717] 1996, '理藩院奏派圖理琛送俄羅斯大夫噶爾芬回國摺', In: *Kang xi chao man wen zhu pi zou zhe quan yi* 康熙朝滿文朱批奏摺全譯, Beijing 北京: Zhong guo she hui ke xue yuan chu ban she 中國社會科學院出版社
Li Hongzhang 李鴻章 1890a, 'Wan guo yao fang xu 萬國藥方序', In: *Wan guo yao fang* 萬國藥方, Shanghai 上海: Mei hua shu guan 美華書館
Li Hongzhang 李鴻章 1890b, 'Jing lu li shao quan bo xiang wan guo yao fang xu 敬錄李少荃伯相萬國藥方序', *Wang guo gong bao* 萬國公報, 2(23): 24-25
Li Kuian 李奎安 [1928] 1983, 'Zhong hua guo huo zhan hui bao gao 中華國貨展覽會報告', In: *Shen bao (ying yin ben) (book 253)* 申報(影印本)(第 253 冊), Shanghai 上海: Shang hai shu dian 上海書店
Li Lian 李濂 [1513] 2002, *Yi shi* 醫史, In: Xu xiu si ku quan shu 續修四庫全書 (book 1030), Shanghai 上海: Shang hai gu ji chu ban she 上海古籍出版社
Li Shizhen 李時珍 [1578] 1975, *Ben cao gang mu* 本草綱目, Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社
Li Xinheng 李心衡 [1790] 1936, *Jin chuan suo ji* 金川瑣記, Shanghai 上海: Shang wu yin shu guan 商務印書館
Li Yingchuan 李穎川 1943, 'Zhong guo zhi yao gong ye bu fa da zhi yuan yin ji zhan shi zhi kun nan 中國製藥工業不發達之原因及戰時之困難', *Xi nan shi ye tong xun* 西南實業通訊, 7(5): 10-13
Li Yingwu 李穎吾 1930a, 'Yao dian nei tong zhi shang que 藥典內容之商榷', *Yi yao ping lun* 醫藥評論, (33): 1-8
Li Yingwu 李穎吾 1930b, 'Guan yu zhong hua yao dian zhi shang que 關於中華藥典之商榷', *Tong ren yi xue* 同仁醫學, 3(6): 29-38
Li Yiren 李亦人 1941, *Xi kang zong lan* 西康綜覽, Chongqing 重慶: Zheng zhong shu ju 正中書局
Li Zhouwang 李周望 [1904] 1969, *Ming qing li ke jin shi ti ming bei lu* 明清曆科進士題名碑錄, Taibei 臺北: Hua wen shu ju 華文書局
Li Zuoxian 李佐賢 1875, *Wu lu bi tan* 吾廬筆談, In: Shi quan shu wu quan ji 石泉書屋全集, Li shi cang ban qing guang xi yi hai kan ben 李氏藏版清光緒乙亥刊本
Li 理 [1924] 1983, 'Ji bu chong cao 記捕蟲草', *Shen bao (ying yin ben) (book 201)* 申報(影印本)(第 201 冊), Shanghai 上海: Shang hai shu dian 上海書店
Lian he zheng xin suo [LHZXS] 聯合征信所 1947, 'Ben shi guo yao zhang chao fan lan 本市國藥漲潮泛濫', *Zheng xin xin wen* 征信新聞, (646): 7
Liang Qichao 梁啟超 [1902] 1989, 'Xin shi xue 新史學', *Yin bing shi he ji (book 1)* 飲冰室合集(第 1 冊), Beijing 北京: 中華書局
Lihu 梨瑚 [1934] 1985, 'Wo ye lai tan yi tan "xian mu liang qi" zhi 我也來談一談"賢母良妻"制', In: *Shen bao* (*ying yin ben*) *(book 320)* 申報(影印本)(第 320 冊), Shanghai 上海: Shang hai shu dian 上海書店
Lin Yi 林易 1944, 'Zhong guo hua xue zhi yao gong ye zhi zhan wang 中國化學製藥工業之展望', *Zhong guo jing ji* 中國經濟, 2(6-7): 1-4
Ling Huan 淩奐 [*c.* 1893] 1998, *Ling lin ling fang* 淩臨靈方, In: San san yi shu 三三醫書, Beijing 北京: Zhong guo zhong yi yao chu ban she 中國中醫藥出版社
Liu Ruiheng 劉瑞恒 1930, 'Wei sheng bu cheng di qi ling hao wei zhong hua yao dian bian zuan gao cheng qing zhuan cheng guo min zheng fu gong bu yi zhao zheng zhong 衛生部呈第七〇號呈為中華藥典編纂告成請轉呈國民政府公佈以昭鄭重', *Wei sheng gong bao* 衛生公報, 2(5): 154-155
Liu Ruiheng 劉瑞恒 1931, 'Zhong hua yao dian xu 中華藥典敘', *Yi yao xue* 醫藥學, 8(9): 78
Liu Tizhi 劉體智 [1930] 1988, *Yi ci lu* 異辭錄, Beijing 北京: Zhong hua shu ju 中華書局
Liu Wentai 劉文泰 [1505] 1982, *Ben cao ping hui jing yao* 本草品彙精要, Beijing 北京: Ren

min wei sheng chu ban she 人民衛生出版社
Liu Xiaoliang 劉效良 1937, 'Ya dan zi——Yi zhong xin de a mi ba li ji te xiao yao 鴉膽子——一種新的阿米巴痢疾特效藥', *The Chinese Medical Journal*, 52(1): 89-94
Liu yu tang gu shi [LYTGS] 留余堂顧氏 [1884] 1983, 'Shen qi chong cao gao 參漆蟲草膏', In: *Shen bao (ying yin ben) (book 25)* 申報(影印本)(第 25 冊), Shanghai 上海: Shang hai shu dian 上海書店
Liu yu tang zhu ren [LYTZR] 留余堂主人 [1881] 1983, 'Ji shou chong cao gao 寄售蟲草膏', In: *Shen bao (ying yin ben) (book 19)* 申報(影印本)(第 19 冊), Shanghai 上海: Shang hai shu dian 上海書店
Liu Zanting 劉贊廷 [*c*. 1912] 1995a, *Jia li xian zhi* 嘉黎縣志, In: Zhong guo di fang zhi ji cheng (Xi zang fu xian zhi ji) 中國地方誌集成(西藏府縣誌輯), Chengdu 成都: Ba shu shu she 巴蜀書社
Liu Zanting 劉贊廷 [*c*. 1912] 1995b, *Cha ya xian tu zhi* 察雅縣圖志, In: Zhong guo di fang zhi ji cheng (Xi zang fu xian zhi ji) 中國地方誌集成(西藏府縣誌輯), Chengdu 成都: Ba shu shu she 巴蜀書社
Liu Zanting 劉贊廷 [*c*. 1912] 1995c, *Yan jing xian zhi* 鹽井縣志, In: Zhong guo di fang zhi ji cheng (Xi zang fu xian zhi ji) 中國地方誌集成(西藏府縣誌輯), Chengdu 成都: Ba shu shu she 巴蜀書社
Liu Zanting 劉贊廷 [*c*. 1912] 1995d, *Jiu zu xian zhi* 九族縣志, In: Zhong guo di fang zhi ji cheng (Xi zang fu xian zhi ji) 中國地方誌集成(西藏府縣誌輯), Chengdu 成都: Ba shu shu she 巴蜀書社
Liu Zanting 劉贊廷 [*c*. 1912] 1995e, *En da xian zhi* 恩達縣志, In: Zhong guo di fang zhi ji cheng (Xi zang fu xian zhi ji) 中國地方誌集成(西藏府縣誌輯), Chengdu 成都: Ba shu shu she 巴蜀書社
Liu Zanting 劉贊廷 [*c*. 1917] 1995, *Ding qing xian tu zhi* 定青縣圖志, In: Zhong guo di fang zhi ji cheng (Xi zang fu xian zhi ji) 中國地方誌集成(西藏府縣誌輯), Chengdu 成都: Ba shu shu she 巴蜀書社
Liu Zanting 劉贊廷 [*c*. 1918] 1995a, *Chang du xian zhi* 昌都縣誌, In: Zhong guo di fang zhi ji cheng (Xi zang fu xian zhi ji) 中國地方誌集成(西藏府縣誌輯), Chengdu 成都: Ba shu shu she 巴蜀書社
Liu Zanting 劉贊廷 [*c*. 1918] 1995b, *Gong xian zhi* 貢縣誌, In: Zhong guo di fang zhi ji cheng (Xi zang fu xian zhi ji) 中國地方誌集成(西藏府縣誌輯), Chengdu 成都: Ba shu shu she 巴蜀書社
Liu Zanting 劉贊廷 [*c*. 1918] 1995c, *Tong pu xian zhi* 同普縣誌, In: Zhong guo di fang zhi ji cheng (Xi zang fu xian zhi ji) 中國地方誌集成(西藏府縣誌輯), Chengdu 成都: Ba shu shu she 巴蜀書社
Liu Zanting 劉贊廷 [*c*. 1921] 1995, *Wu cheng xian zhi* 武城縣誌, In: Zhong guo di fang zhi ji cheng (Xi zang fu xian zhi ji) 中國地方誌集成(西藏府縣誌輯), Chengdu 成都: Ba shu shu she 巴蜀書社
Liu Zanting 劉贊廷 [*c*. 1930] 1995, *Ning jing xian zhi* 寧靜縣誌, In: Zhong guo di fang zhi ji cheng (Xi zang fu xian zhi ji) 中國地方誌集成(西藏府縣誌輯), Chengdu 成都: Ba shu shu she 巴蜀書社
Liu Zanting 劉贊廷 [*c*. 1935] 1995, *Cha yu xian tu zhi* 察隅縣圖志, In: Zhong guo di fang zhi ji cheng (Xi zang fu xian zhi ji) 中國地方誌集成(西藏府縣誌輯), Chengdu 成都: Ba shu shu she 巴蜀書社
Liu Zanting 劉贊廷 [*c*. 1939] 1995, *Ke mai xian zhi* 科麥縣誌, In: Zhong guo di fang zhi ji cheng (Xi zang fu xian zhi ji) 中國地方誌集成(西藏府縣誌輯), Chengdu 成都: Ba shu shu she 巴蜀書社
Long Bai 龍柏 [1795] 1993, *Mai yao lian zhu* 脈藥聯珠, In: Wu zhong yi ji (Fang yao lei) 吳中醫集 (方藥類), Nanjing 南京: Jiang su ke ji chu ban she 江蘇科技出版社
Long Yun 龍雲 [1944] 2007, *Xin zuan yun nan tong zhi (book 4)* 新纂雲南通志 (第 4 冊), Kunming 昆明: Yun nan ren min chu ban she 雲南人民出版社

Lu Dexin 魯德馨 and Zhang Yangwu 張錫五 1936, ‘Xin yi lai hua hou zhi yi xue wen xian 新醫來華後之醫學文獻’, *Zhong hua yi xue za zhi* 中華醫學雜誌, 22(11): 1108-1120

Lu Erkui 陸爾奎 *et al*. 1915, *Ci yuan* 辭源, Shanghai 上海: Shang wu yin shu guan 商務印書館

Lu Jinsui 陸錦燧 [1913] 1999, *Jing jing yi hua* 景景醫話, In: Zhong guo li dai ming yi yi hua da guan 中國歷代名醫醫話大觀, Taiyuan 太原: Shan xi ke xue ji shu chu ban she 山西科學技術出版社

Lu Wenyu 陸文鬱 1932, ‘Xin nong jian wen sui bi 辛農見聞隨筆’, *Guang zhi xing qi bao* 廣智星期報, (154): 4-6

Lu Xun 魯迅 [1923] 2005, ‘Na han 吶喊’, In: *Lu xun quan ji* 魯迅全集 (vol. 1), Beijing 北京: Ren min wen xue chu ban she 人民文學出版社

Lu Xun 魯迅 [1933] 2005, ‘Du zhou 賭咒’, In: *Lu xun quan ji* 魯迅全集 (vol. 5), Beijing 北京: Ren min wen xue chu ban she 人民文學出版社

Lu Yuanlei 陸淵雷 [1930?] 2010, *Lu yuan lei yi an* 陸淵雷醫案, Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社

Lü Zhegong 吕哲公 1936, ‘Yi hai chun san yue nian qi ri wei si shi ba sui mu nan zhi chen gan zhan er zhang 乙亥春三月念七日爲四十八歲母難之辰感占二章’, *Nan she xiang ji* 南社湘集, (6): 280

Ma Chaojun 馬超俊 1937, ‘Zhuan zhi xiu zheng guan li cheng yao gui ze di shi er tiao yi yi jie shi an 轉知修正管理成藥規則第十二條疑義解釋案’, *Nan jing shi zheng fu gong bao* 南京市政府公報, (173): 106-107

Ma Hetian 馬鶴天 1947, *Gan qing zang bian qu kao cha ji* 甘青藏邊區考察記, Shanghai 上海: Shang wu yin shu guan 商務印書館

Ma Jie 馬揭 and Sheng Shenzu 盛繩祖 [1792] 2003, *Wei zang tu zhi* 衛藏圖志, In: Zhong guo xi zang jig an qing chuan dian zang qu fang zhi hui bian 中國西藏及甘青川滇藏區方志彙編 (book 1), Beijing 北京: Xue yuan chu ban she 學苑出版社

Ma Jixing 馬繼興 1995, *Shen nong ben cao jing ji zhu* 神農本草經輯注, Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社

Ma Wenzhi 馬文植 [1930] 2008, *Ma pei zhi wai ke yi an* 馬培之外科醫案, Fan Fengyuan 范鳳源 (ed.), Beijing 北京: Ren min wei Sheng chu ban she 人民衛生出版社

Mei Xinru 梅心如 1934, *Xi kang* 西康, Nanjing 南京: Zheng zhong shu ju 正中書局

Meng Ke 孟轲 [*c*. 3rd century BC] 1999, *Meng zi zhu shu* 孟子注疏, Zhao Qi 赵歧 and Sun Shi 孙奭 (eds.), Beijing 北京: Bei jing da xue chu ban she 北京大學出版社

Meng Mudi 孟目的 1953, ‘Wo can jia san ci yao dian bian zuan gong zuo de gan xiang 我參加三次藥典編纂工作的感想’, *Yao xue tong bao* 藥學通報, 1(11): 430-431

Meng Sen 孟森 [1937] 2007, *Meng sen jiang qing shi* 孟森講清史, Beijing 北京: Dong fang chu ban she 東方出版社

Meng Xinru 孟心如 1947, ‘Yao wu ke xue zhi guo qu ji guo li yao xue zhuan ke xue xiao zhi shi ming 藥物科學之過去及國立藥學專科學校之使命’, *Yao xun qi kan* 藥訊期刊, (5): 1-4

Meng Zhongsan 孟仲三 [1940] 2013, *Yao wu xue* 藥物學, Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社

Miao Zunyi 繆遵義 *et al*. [1831] 1990, *San jia yi an he ke* 三家醫案合刻, In: Zhong guo yi xue da cheng 中國醫學大成 (book 36), Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社

Ming Zhongwei 明仲威 1926, ‘Dong chong xia cao kao 冬蟲夏草考’, *Yi xue za zhi* 醫學雜誌, (10): 76-78

Nei wu bu [NWB] 內務部 1915, ‘Ni ding guan li yao shang ji xian zhi yao yong ya pian ma fei deng ping zhang cheng cheng bing pi ling 擬定管理藥商及限制藥用鴉片嗎啡等品章程呈並批令’, *Si fa gong bao* 司法公報, (44): 40-46

Ou Jialian 歐家廉 *et al*. [1934] 1987, *Qing shi lu: Xuan tong zheng ji* 清實錄: 宣統政紀, Beijing 北京: Zhong hua shu ju 中華書局

Pan Jing 潘敬 1931, *Qiao shan za zhu* 樵山雜著, [Press unknown]

Pan Mingxiong 潘名熊 [1865] 1990, *Ping qin shu wu yi lue* 評琴書屋醫略, In: Li dai zhong yi

zhen ben ji cheng 歷代中醫珍本集成, Shanghai 上海: San lian shu dian 三聯書店
Pan Xingchu 潘杏初 1935, *Biao zhun yao xing da zi dian* 標準藥性大字典, Shanghai 上海: Shang hai shu ju 上海書局
Pang Jingzhou 龐京周 [1933] 1985, 'Shang hai shi jin shi nian lai yi yao niao kan 上海市近十年來醫藥鳥瞰', In: *Shen bao (ying yin ben) (book 308)* 申報(影印本)(第 308 冊), Shanghai 上海: Shang hai shu dian 上海書店
Pan Maoyuan 潘懋元 and Liu Haifeng 劉海峰 (eds.) 1993, *Zhong guo jin dai jiao yu shi zi liao hui bian: Gao deng jiao yu* 中國近代教育史資料彙編: 高等教育, Shanghai 上海: Shang hai jiao yu chu ban she 上海教育出版社
Pei Jian 裴鑑 1947, 'Yin er he xia cao dong chong 銀耳和夏草冬蟲', *Ke xue shi jie* 科學世界, 16(3): 102-104
Qi Shiyi 七十一 1777, *Xi yu wen jian lu* 西域聞見錄, Qian long si shi er nian kan ben 乾隆四十二年刊本
Qi Xueqiu 齊學裘 [1873] 1876, *Jian wen xu bi* 見聞續筆, Qing guang xu er nian ke ben 清光緒二年刻本
Qin Shouou 秦瘦鷗 [1992] 2001, 'Zhong yi chen cun ren de fa ji shi 中醫陳存仁的發跡史', In: *Hai shang ming ren* 海上名人, Shanghai 上海: Han yu da ci dian chu ban she 漢語大詞典出版社
Qin Wuyu 秦武域 [1783] 1986, *Wen jian ban xiang lu* 聞見瓣香錄, In: Shan you cong shu chu bian 山右叢書初編 (book 10), Taiyuan 太原: Shan xi ren min chu ban she 山西人民出版社
Qiu Chenbo 丘晨波 and Chen Xinxian 陳新謙 (eds.) 1949, *Zhi wu hua xue cheng fen ti lian fa* 植物化學成分提煉法, Guangzhou 廣州: Qiu chen bo yao shi shi wu suo 丘晨波藥師事務所
Qu Xingui 璩鑫圭 and Tang Liangyan 唐良炎 (eds.) 1991, *Zhong guo jin dai jiao yu shi zi liao hui bian: Xue zhi yan bian* 中國近代教育史資料彙編: 學制演變, Shanghai 上海: Shang hai jiao yu chu ban she 上海教育出版社
Ren Shou 仁壽 1928, 'Dong chong xia cao 冬蟲夏草', *Er tong shi jie* 兒童世界, 22(14): 33-36
Ruan Xiang 阮湘 (ed.) 1924, *Di yi hui zhong guo nian jian* 第一回中國年鑒, Shanghai 上海: Shang wu yin shu guan 商務印書館
Shang hai fo ci da yao chang [SHFCDYC] 上海佛慈大藥廠 [1933] 1985, 'Niu shen sheng shi yu ren shen jie shi 牛腎生石與人腎結石', In: *Shen bao* (*ying yin ben*) (book 300) 申報(影印本)(第 300 冊), Shanghai 上海: Shang hai shu dian 上海書店
Shang hai ge yan cong ji she [SHGYCJS] 上海格言叢輯社 [1930] 1984, 'Lai han 來函', In: *Shen bao* (*ying yin ben*) (book 273) 申報(影印本)(第 273 冊), Shanghai 上海: Shang hai shu dian 上海書店
Shao Lansun 邵蘭蓀 [*c*. 1922] 1990, *Shao lan sun yi an* 邵蘭蓀醫案, collected by Cao Bingzhang 曹炳章, In: Zhong guo yi xue da cheng 中國醫學大成 (book 37), Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社.
Shen Chengtao 沈诚焘 *et al*. 1877, *Guang xu qing pu xian zhi* 光緒青浦县志, Qing guang xu wu nian zun jing g eke ben 清光绪五年尊经阁刻本
Shen Jichuan 沈濟川 1934, 'Yi nian lai wu guo xin yao ye 一年來吾國新藥業', *Wu zhou* 五洲, 1(1): 5-9
Shen Shourong 沈壽榕 [1883] 2002, *Yu Sheng lou shi lu* 玉笙樓詩録, In: Xu xiu si ku quan shu 續修四庫全書 (book 1557), Shanghai 上海: Shang hai gu ji chu ban she 上海古籍出版社
Shen Weicai 沈維材 [1749] 2000, *Chu zhuang wen gao* 樗莊文稿, In: Si ku wei shou shu ji kan 四庫未收書輯刊 (collection 10, book 21), Beijing 北京: Bei jing chu ban she 北京出版社
Shen Xi 沈希 1935, 'Dong chong xia cao wei ya 冬蟲夏草煨鴨', *Chang shou* 長壽, (144): 350
Shi ba ji tuan jun zong si ling bu [SBJTJZSLB] 十八集團軍總司令部 1945, *Yao ji xue* 藥劑學, [Place Unknown]: Shi ba ji tuan jun zong si ling bu yin 十八集團軍總司令部印
Shixu 世續 *et al*. [1927] 1987, *Qing shi lu (book 54)* 清實錄 (第 54 冊), Beijing 北京: Zhong hua shu ju 中華書局

Shu Shan 曙山 1937, ''Chong cao' ji qi ta——Lüe tan xi chui de miao yao '蟲草'及其他——略談西陲的妙藥', *Tan feng* 談風, (11): 511-513
Si chuan shang dian [SCSD] 四川商店 [1928] 1983, 'Si chuan shang dian (yi zhou ji nian) yin er da jian jia 四川商店(一周紀念)銀耳大減價', In: *Shen bao (ying yin ben) (book 250)* 申報(影印本)(第 250 冊), Shanghai 上海: Shang hai shu dian 上海書店
Si chuan Sheng li tang xian zhi bian zuan wei yuan hui [SCSLTXZBZWYH] 四川省理塘縣志編纂委員會 1996, *Li tang xian zhi* 理塘縣志, Chengdu 成都: Si chuan ren min chu ban she 四川人民出版社
Si chuan sheng zheng fu [SCSZF] 四川省政府 1936, *Si chuan sheng gai kuang* 四川省概況, Chengdu 成都: Si chuan sheng zheng fu mi shu chu 四川省政府秘書處
Sima Qian 司馬遷 [*c*. 90 BC] 1999, *Shi ji* 史記, Beijing 北京: Zhong hua shu ju 中華書局
Song Rulin 宋如林 *et al*. [1816] 2003, *Jia qing song jiang fu zhi* 嘉慶松江府志, In Xu xiu si ku quan shu (book 689) 續修四庫全書(第 689 冊), Shanghai 上海: Shang hai gu ji chu ban she 上海古籍出版社
Su Song 蘇頌 [1061] 1988, *Tu jing ban cao* 圖經本草, Hu Naichang 胡乃長 and Wang Zhipu 王致譜 (eds.), Fuzhou 福州: Fu jian ke xue ji shu chu ban she 福建科學技術出版社
Su Song 蘇頌 [1061] 1994, *Ben cao tu jing* 本草圖經, Shang Zhijun 尚志鈞 (ed.), Hefei 合肥: An hui ke xue ji shu chu ban she 安徽科學技術出版社
Tan Cui 檀萃 [*c*. 1761] 1922-1943, *Qian nang* 黔囊, In: Qian nan cong shu 黔南叢書(vol. 5, book 2), Guiyang 貴陽: Gui yang wen tong shu ju 貴陽文通書局
Tang Bingjun 唐秉鈞 1778, *Wen fang si kao tu shuo* 文房肆考圖說 (vol. 7), Shanghai 上海: Qian long si shi san nian kan ben 乾隆四十三年刊本
Tang Guohai 唐國海 1850, *Shang hai tang shi zu pu* 上海唐氏族譜 (vol. 3), Shanghai: Qing dao guang shi san nian ke ben 清道光十三年刻本
Tang Shenwei 唐慎微 [*c*. 1108] 1993, *Zheng lei ben cao* 證類本草, Beijing 北京: Hua xia chu ban she 華夏出版社
Tang Song 唐宋 and Chen Ming 陳明 1993, ''Nao zhu shen ming' bian xi "腦主神明"辨析', *He nan zhong yi* 河南中醫, 13(1): 4-6
Tang Tenghan 湯騰漢, Wang Zhaowu 汪昭武 and Chen Xuhuang 陳勖瑝 1945, 'Dong chong xia cao (chong cao) zhi chu bu yan jiu 冬蟲夏草(蟲草)之初步研究', *Zhong guo yao xue hui hui zhi* 中國藥學會會志, 3(1): 1-4
Tang Zonghai 唐宗海 [1884] 1998, *Xie zheng lun* 血證論, In: Tang rong chuan yi xue quan shu 唐容川醫學全書, Beijing 北京: Zhong guo zhong yi yao chu ban she 中國中醫藥出版社
Tang Zonghai 唐宗海 *et al*. [1893] 1991, *Ben cao wen da ping zhu* 本草問答評注 (vol. 3), Taiyuan 太原: Shan xi ke xue jiao yu chu ban she 山西科學教育出版社
Tao Hongjing 陶弘景 [492] 1994, *Ben cao jing ji zhu* 本草經集註, Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社
Vagnone, Alfonso [1632] 1996, *Tong you jiao yu* 童幼教育, In: Xu jia hui cang shu lou ming qing tian zhu jiao wen xian 徐家匯藏書樓明清天主教文獻 (book 1), Taipei 臺北: Fang ji chu ban 方濟出版
Verbiest, Ferdinand [*c*. 1686] 2003, *Xi du shi yuan you yong fa* 吸毒石原由用法, In: Hai wai hui gui zhong yi shan ben gu ji cong shu (book 10) 海外回歸中醫善本古籍叢書 (第 10 冊), Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社
Wang Ang 汪昂 [1694?] 1990, *Ben cao bei yao* 本草備要, Hefei 合肥: An hui ke xue ji shu chu ban she 安徽科學技術出版社
Wang Ang 汪昂 [1694?] 1996, *Ben cao bei yao* 本草備要, Chongqing 重慶: Chong qing da xue chu ban she 重慶大學出版社
Wang Ang 汪昂 [1694?] 1997, *Ben cao bei yao* 本草備要, In: Zhong hua yi shu ji cheng 中華醫書集成 (book 5), Beijing 北京: Zhong yi gu ji chu ban she 中醫古籍出版社
Wang Ang 汪昂 [1694?] 1997, *Ben cao bei yao* 本草備要, Shenyang 瀋陽: Liao ning ke xue ji shu chu ban she 遼寧科學技術出版社
Wang Ang 汪昂 [1694?] 1998, *Ben cao bei yao* 本草備要, Beijing 北京: Zhong guo zhong yi yao

chu ban she 中國中醫藥出版社
Wang Datong 王大同 *et al.* 1814, *Jia qing shang hai xian zhi* 嘉慶上海縣志 (vol. 11), Shanghai 上海: Qing jia qing shi jiu nian ke ben 清嘉慶十九年刻本
Wang Jinjie 王金傑 [*c.* 1945] 2004, *Wang zhong qi yi an* 王仲奇醫案, In: Zhong yi gu ji zhen xi chao ben jing xuan 中醫古籍珍稀抄本精選, Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社.
Wang Peixun 王培荀 [1845] 1987, *Ting yu lou sui bi* 聽雨樓隨筆, Chengdu 成都: Ba shu shu she 巴蜀書社
Wang Shirui 王世睿 [*c.* 1740] 2002, *Jin zang ji cheng* 進藏紀程, In: Xu xiu si ku quan shu 續修四庫全書 (book 737), Shanghai 上海: Shang hai gu ji chu ban she 上海古籍出版社
Wang Shixiong 王士雄 [1838] 1999, *Gui yan lu* 歸硯錄, In: Wang meng ying yi shu quan ji 王孟英醫書全集, Beijing 北京: Zhong guo zhong yi yao chu ban she 中國中醫藥出版社
Wang Shixiong 王士雄 [1862] 1999, *Sui xi ju chong ding huo luan lun* 隨息居重訂霍亂論, In: Wang meng ying yi xue quan shu 王孟英醫學全書, Beijing 北京: Zhong guo Zhong yi yao chu ban she 中國中醫藥出版社
Wang Shixiong 王士雄 [*c.* 1850] 1957, *Wang shi yi an yi zhu* 王氏醫案繹注, annotated by Shi Nianzu 石念祖, Shanghai 上海: Shang wu yin shu guan 商務印書館
Wang Tao 王韜 [1882] 2002, *Tao yuan wen lu wai bian* 弢園文錄外編, Shanghai 上海: Shang hai shu dian chu ban she 上海書店出版社
Wang Tieya 王鐵崖 (ed.) 1957, *Zhong wai jiu yue zhang hui bian (book 1)* 中外舊約章彙編 (第 1 冊), Beijing 北京: Sheng huo ·Du shu ·Xin zhi san lian shu dian 生活 讀書 新知三聯書店
Wang Xiangrong 汪向榮 and Xia Yingyuan 夏應元 1984, *Zhong ri guan xi shi zi liao hui bian* 中日關係史資料彙編, Beijing 北京: Zhong hua shu ju 中華書局
Wei sheng bao guan bian ji bu [WSBGBJB] 衛生報館編輯部 (ed.) 1930, *Zhong yao da ci dian* 中藥大辭典, Shanghai 上海: Wei sheng bao guan 衛生報館
Wei sheng bu [WSB] 衛生部 (ed.) 1930, *Zhong hua yao dian* 中華藥典, Nanjing 南京: Nei zheng bu wei sheng shu fa xing 內政部衛生署發行
Wei sheng bu [WSB] 衛生部 1929a, 'Bu ling zi zhi ding guan li yao shang gui ze gong bu zhi ci ling 部令 茲制定管理藥商規則公佈之此令', *Wei sheng gong bao* 衛生公報, 1(9): 5
Wei sheng bu [WSB] 衛生部 1929b, 'Guan li yao shang gui ze 管理藥商規則', *Wei sheng gong bao* 衛生公報, 1(9): 59-62
Wei sheng bu [WSB] 衛生部 1929c, 'Cheng xing zheng yuan cheng song guan li yao shang gui ze cao an qing jian he ling zun wen (ba yue lou ri) 呈行政院呈送管理藥商規則草案請鑒核令遵文(八月六日)', *Wei sheng gong bao* 衛生公報, (9): 63
Wei sheng bu [WSB] 衛生部 1929d, 'Cheng xing zheng yuan cheng song ni ding guan li cheng yao gui ze cao an qing jian he ling zhun you (jiu yue san ri) 呈行政院呈送擬訂管理成藥規則草案請鑒核令遵由(九月三日)', *Wei sheng gong bao* 衛生公報, (10): 49-50
Wei sheng bu [WSB] 衛生部 1930a, 'Ling ge sheng min zheng ting, te bie shi wei sheng jü, zhi xia ji guan ling fa guan li cheng yao gui ze yang chi shu zun zhao you 令各省民政廳、特別市衛生局、直轄機關 令發管理成藥規則仰飭屬遵照由', *Wei sheng gong bao* 衛生公報, 2(5): 53-54
Wei sheng bu [WSB] 衛生部 1930b, 'Guan li cheng yao gui ze 管理成藥規則', *Wei sheng gong bao* 衛生公報, 2(5): 124-126
Wei sheng bu [WSB] 衛生部 1930c, 'Zhan huan guan li cheng yao gui ze di wu tiao xian qi 展緩管理成藥規則第五條限期', *Jiang su sheng zheng fu gong bao* 江蘇省政府公報, (567): 5-6
Wei sheng bu [WSB] 衛生部 1930d, 'Ma zui yao pin, du yao, ju yao 麻醉藥品、毒藥、劇藥', Wei sheng gong bao 衛生公報, 2(5): 129-138
Wei sheng bu [WSB] 衛生部 1930e, 'Pi shang hai ma zhong ru ju cheng song yao pin fang dan xi zun gu fang pei zhi bu zai guan li cheng yao gui ze fan wei yi nei suo qing bei an fa ji zheng ming shu ying wu yong yi you 批上海馬仲如 據呈送藥品方單系遵古方配製不在管理成藥規則範圍以內所請備案發給證明書應毋庸議由', *Wei sheng gong bao* 衛生公報, 2(10): 63-64

Wei sheng shu [WSS] 衛生署 1936, ‘Xiu zheng guan li cheng yao gui ze 修正管理成藥規則’, *Nan jing shi zheng fu gong bao* 南京市政府公報, (172): 49-51
Wei sheng shu [WSS] 衛生署 1944a, ‘Cheng yao hua yan shou fei gui ze 成藥化驗收費規則’, *Guo min zheng fu gong bao* 國民政府公報, (672): 2
Wei sheng shu [WSS] 衛生署 1944b, ‘Guan li yao shang gui ze 管理藥商規則’, *Guo min zheng fu gong bao* 國民政府公報, (603): 4-6
Wei sheng shu [WSS] 衛生署 1944c, ‘Guan li cheng yao gui ze 管理成藥規則’, *Guo min zheng fu gong bao* 國民政府公報, (603): 3-4
Wei sheng shu [WSS] 衛生署 1944d, ‘Xiu zheng guan li cheng yao gui ze di san tiao tiao wen 修正管理成藥規則第三條條文’, *Guo min zheng fu gong bao* 國民政府公報, (741): 2
Wei sheng shu [WSS] 衛生署 1944e, ‘Wei sheng shu ling xiu zheng guan li cheng yao gui ze di san tiao tiao wen 衛生署令 修正管理成藥規則第三條條文’, *Guo min zheng fu gong bao* 國民政府公報, (741): 6
Wei Zhixiu 魏之琇 [*c*. 1770] 1997, *Xu ming yi lei an* 續名醫類案, Beijing 北京: Ren min wei Sheng chu ban she 人民衛生出版社
Weng Tonghe 翁同龢 [1904] 1989, *Weng tong he ri ji* 翁同龢日記, Beijing 北京: Zhong hua shu ju 中華書局
Weng Zhicang 翁之藏 [1930] 2010, *Xi kang zhi shi kuang* 西康之實況, In: Zhong guo bian jiang she hui diao cha bao gao ji cheng (collection 1, book 6) 中國邊疆社會調查報告集成(第 1 輯第 6 冊), Guilin 桂林: Guang xi shi fan da xue chu ban she 廣西師範大學出版社
Williamson, Alexander *et al*. 1858, *Zhi wu xue* 植物學, Shanghai 上海: Mo hai shu guan 墨海書館
Wu Bingxin 吳冰心 1914, ‘Dong chong xia cao 冬蟲夏草’, *Bo wu xue za zhi* 博物學雜誌, (1): 100
Wu Bingxin 吳冰心 1914, ‘Zi yang ping bai mu er zhi yan jiu 滋養品白木耳之研究’, *Bo wu xue za zhi* 博物學雜誌, 1(1): 48-51
Wu Jingzi 吳敬梓 [*c*. 1750] 1977, *Ru lin wai shi* 儒林外史, Beijing 北京: Ren min wen xue chu ban she 人民文學出版社
Wu Keqian 吳克潛 [1934] 1994, *Er ke yao lue* 兒科要略, In: Jin dai Zhong yi zhen ben ji (Er ke fen ce) 近代中醫珍本集 (兒科分冊), Hangzhou 杭州: Zhe jiang ke xue ji shu chu ban she 浙江科學技術出版社
Wu Keqian 吳克潛 1933, *Yao xing zi dian* 藥性字典, Shanghai 上海: Da zhong shu ju 大眾書局
Wu Qijun 吳其濬 [1848] 1956, *Zhi wu ming shi tu kao* 植物名實圖考, Shanghai 上海: Shang wu yin shu guan 商務印書館
Wu Tingfang 伍廷芳 *et al*. (eds.) [1904] 1987, *Qin ding da qing shang lü* 欽定大清商律, In: Jin dai zhong guo shi liao cong kan (Collection 3) 近代中國史料叢刊(三編), Taipai 台北: Wen hai chu ban she 文海出版社
Wu Weier 吳衛爾 1934, *Zhong hua xin yao wu xue da ci dian (fan li)* 中華新藥物學大辭典(凡例), Tianjin 天津: Zhong hua xin yi xue yan jiu hui 中華新醫學研究會
Wu Yangxian 吳仰賢 [1877] 2002, *Xiao pao an shi cun* 小匏庵詩存, In: Xu xiu si ku quan shu 續修四庫全書 (book 1548), Shanghai 上海: Shang hai gu ji chu ban she 上海古籍出版社
Wu Yiluo 吳儀洛 [1757] 1982, *Ben cao cong xin* 本草從新, Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社
Xiao Tenglin 蕭騰麟 [1746] 2003, *Xi zang jian wen lu* 西藏見聞錄, In: Zhong guo xi zang jig an qing chuan dian zang qu fang zhi hui bian 中國西藏及甘青川滇藏區方志彙編 (book 2), Beijing 北京: Xue yuan chu ban she 學苑出版社
Xie Enzeng 謝恩增 1943, *Xin yao ben cao* 新藥本草, Beiping 北平: Hua an yao fang 華安藥房
Xie Guan 謝觀 (ed.) 1921, *Zhong guo yi xue da ci dian (xu yan)* 中國醫學大辭典(序言), Shanghai 上海: Shang wu yin shu guan 商務印書館
Xinchan 心禪 [1889] 1999, *Yi de ji* 一得集, In: Zhen ben yi shu ji cheng 珍本醫書集成 (book 4), Beijing 北京: Zhong guo zhong yi yao chu ban she 中國中醫藥出版社
Xu Dachun 徐大椿 [1903] 1988, *Yao xing qie yong* 藥性切用, In: Xu da chun yi shu quan ji

(shang ce) 徐大椿醫書全集 (上冊), Beijing 北京: Ren min wei Sheng chu ban she 人民衛生出版社
Xu Guangqi 徐光啟 [1613] 1963, *Xu guang qi ji* 徐光啟集, Wang Chongmin 王重民 (ed.), Beijing 北京: Zhong hua shu ju 中華書局
Xu Hongpan 許鴻磐 [1837] 1918, *Fang yu kao zheng* 方輿考證, Pan shi hua jian ge ben 潘氏華鑒閣本
Xu Kun 徐昆 [1792] 2006, *Liu ya wai bian* 柳崖外編, Beijing 北京: Jing hua chu ban she 京華出版社
Xu Yaoguang 許瑤光 *et al*. [1879] 1970, *Jia xing fu zhi* 嘉興府志, In: Zhong guo fang zhi cong shu 中國方志叢書, Taibei 台北: Cheng wen chu ban she 成文出版社
Ya Bo 亞波 (trans.) 1913, 'Dong chong xia cao zhi zhen xiang 冬蟲夏草之真相', *Da tong zhou bao* 大同週報, (2): 1
Yang Baicheng 楊百城 1926, 'Dong chong xia cao kao 冬蟲夏草考', *Yi xue za zhi* 醫學雜誌, (31): 90-92
Yang Shoushen 楊守紳 1948, 'Dong chong xia cao jun su (Cordycepin) zhi chu bu yan jiu bao gao 冬蟲夏草菌素(Cordycepin)之初步研究報告', *Guo fang ke xue jian bao* 國防科學簡報, 2(9): 711-717
Yang Shucheng 楊叔澄 [1940?] 2012a, *Zhong yao da yi* 中藥大義, Xiao Hongyan 肖紅豔 (ed.), Beijing 北京: Xue yuan chu ban she 學苑出版社
Yang Shucheng 楊叔澄 [1940?] 2012b, *Zhi yao da gang* 製藥大綱, Yang Dongfang 楊東方 *et al.* (eds.), Beijing 北京: Xue yuan chu ban she 學苑出版社
Yao Lan 姚瀾 [1840] 1989, *Ben cao fen jing* 本草分經, Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社
Yao Ying 姚瑩 [1846] 1983, *Kang you ji xing* 康輶紀行, In: Bi ji xiao shuo da guan 筆記小說大觀 (book 24), Yangzhou 揚州: Guang ling shu she 廣陵書社
Ying Baoshi 應寶石 *et al.* [1871] 1975, *Tong zhi shang hai xian zhi* 同治上海縣志, In: Zhong guo fang zhi cong shu 中國方志叢書, Taibei 臺北: Cheng wen chu ban she 成文出版社
Youtai 有泰 [*c*. 1907] 1992, *You tai zhu zang ri ji* 有泰駐藏日記, In: Xi zang xue han wen wen xian hui ke (Collection 2) 西藏學漢文文獻彙刻 (第二輯), Beijing 北京: Quan guo tu shu guan wen xian suo wei fu zhi zhong xin 全國圖書館文獻縮微複製中心
Yu Yue 俞樾 [1899] 2002, *Chun zai tang shi bian* 春在堂詩編, In: Xu xiu si ku quan shu 續修四庫全書 (book 1551), Shanghai 上海: Shang hai gu ji chu ban she 上海古籍出版社
Yu Yunxiu 余雲岫 1920, 'Ke xue de guo chan yao wu yan jiu zhi di yi bu 科學的國產藥物研究之第一步', *Xue yi* 學藝, 2(4): 1-8
Yu Yunxiu 余雲岫 1920, 'Ke xue de guo chan yao wu yan jiu zhi di yi bu (xu qian) 科學的國產藥物研究之第一步(續前)', *Xue yi* 學藝, 2(5): 1-10
Yu Yunxiu 余雲岫 1928, 'Yan jiu guo chan yao wu chu yi 研究國產藥物芻議', *Xin yao yu she hui hui kan* 新藥與社會彙刊, 1: 296-307
Yuan Dong 袁棟 [1744] 2002, *Shu yin cong shuo* 書隱叢說, In: Xu xiu si ku quan shu 續修四庫全書 (book 1137), Shanghai 上海: Shang hai gu ji chu ban she 上海古籍出版社
Zhang Bolong 張伯龍 and Tang Zhonghai 唐宗海 [1893] 1991, *Ben cao wen da ping zhu* 本草問答評注, Huang Jiexi 黃傑熙 (ed.), Taiyuan 太原: Shan xi ke xue jiao yu chu ban she 山西科學教育出版社
Zhang Changshao 張昌紹 1949a, 'San shi nian lai zhong yao zhi ke xue yan jiu 三十年來中藥之科學研究', *Ke Xue* 科學, 31(4): 99-116
Zhang Changshao 張昌紹 1949b, 'San shi nian lai zhong yao zhi ke xue yan jiu 三十年來中藥之科學研究', *Zhong hua yi xue za zhi* 中華醫學雜誌, 35(7): 303-310
Zhang Changshao 張昌紹 1949c, 'San shi nian lai zhong yao zhi ke xue yan jiu (xu) 三十年來中藥之科學研究(續)', *Zhong hua yi xue za zhi* 中華醫學雜誌, 35(8): 353-365
Zhang Cigong 章次公 [1940?] 1980, *Zhang ci gong yi an* 章次公醫案, Zhu Liangchun 朱良春 (ed.), Nanjing 南京: Jiang su ke xue ji shu chu ban she 江蘇科學技術出版社
Zhang Cigong 章次公 [1949] 2013, *Yao wu xue* 藥物學, Shanghai 上海: Shang hai ke xue ji shu

chu ban she 上海科學技術出版社
Zhang Guangzu 鄭光祖 [1844] 2002, *Yi ban lu* 一斑録, In: Xu xiu si ku quan shu 續修四庫全書 (book 1140), Shanghai 上海: Shang hai gu ji chu ban she 上海古籍出版社
Zhang Ji 張機 [*c*. 200] 1991, *Shang han lun jiao zhu* 傷寒論校注, Liu Duzhou 劉渡舟 (ed.), Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社
Zhang Juying 章巨膺 1934, *Ying yong yao wu ci dian* 應用藥物詞典, Shanghai 上海: Min you yin shua suo 民友印刷所
Zhang Naixiu 張乃修 [1897] 1963, *Zhang yu qing yi an* 張聿青醫案, Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社
Zhang Ruoxia 張若霞 1948, 'Dong chong xia cao 冬蟲夏草', *Zhong yao zhi gong yue kan* 中藥職工月刊', (1-2): 7-8
Zhang Ruwei 張汝偉 1947, 'Jie shao guo da hou xuan ren chen cun ren jun xiao shi 介紹國大候選人陳存仁君小史', *Xian dai yi yao za zhi* 現代醫藥雜誌, 2(23-24): 47
Zhang Shibin 章詩賓 1935a, 'Xin yi ji ying ti chang guo zhi xi yao 新醫亟應提倡國制西藥', *Yi yao dao bao* 醫藥導報, 1(11): 1-2
Zhang Shibin 章詩賓 1935b, 'Zai lun xin yi ji ying ti chang guo zhi xi yao 再論新醫亟應提倡國制西藥', *Yi yao dao bao* 醫藥導報, 1(12): 1-2
Zhang Shu 張澍 [1842] 2002, *Su yang tang shi ji* 養素堂詩集, In: Xu xiu si ku quan shu 續修四庫全書 (book 1506), Shanghai 上海: Shang hai gu ji chu ban she 上海古籍出版社
Zhang Weiping 張維屏 [1819] 2002, *Guo chaos hi ren zheng lue* 國朝詩人徵略, In: Xu xiu si ku quan shu 續修四庫全書 (book 1713), Shanghai 上海: Shang hai gu ji chu ban she 上海古籍出版社
Zhang Xichun 張錫純 [1924] 1985, *Yi xue zhong zhong can xi lu (book 2)* 醫學衷中參西錄(中冊), Shijiazhuang 石家莊: He bei ke xue ji shu chu ban she 河北科學技術出版社
Zhang Yuqing 張聿青 [1897] 1963, *Zhang yu qing yi an* 張聿青醫案, Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社
Zhang Zhongjing 張仲景 [*c*. 205] 1990, *Jin gui yao lue* 金匱要略, He Ren 何任 (ed.), Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社
Zhang Zaitong 張在同 and Xian Rijin 咸日金 (eds.) 1990, *Min guo yi yao wei sheng fa gui xuan bian (1912-1948)* 民國醫藥衛生法規選編(1912-1948), Jinan 濟南: Shan dong da xue chu ban she 山東大學出版社
Zhao Erxun 趙爾巽 *et al*. [1927] 1977, *Qing shi gao* 清史稿, Beijing 北京: Zhong hua shu ju 中華書局
Zhao Xuemin 趙學敏 [*c*. 1803] 1983, *Ben cao gang mu shi yi* 本草綱目拾遺, Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社.
Zhe jiang sheng min zheng ting [ZJSMZT] 浙江省民政廳 1930, 'Cheng wen di qi qi ling hao (ju qing cheng qing xiu zheng bu ban guan li yao shang gui ze) 呈文第七七〇號(據情呈請修正部頒管理藥商規則)', *Zhe jiang min zheng yue kan* 浙江民政月刊, (26): 291-293
Zheng Guangzu 鄭光祖 [1844] 2002, *Yi ban lu* 一斑録, In: Xu xiu si ku quan shu 續修四庫全書 (book 1140), Shanghai 上海: Shang hai gu ji chu ban she 上海古籍出版社
Zheng Shixu 鄭師許 1933, 'Jiao tong shi zhuan jia teng tian feng b abo shi ji qi suo zhu shu mu biao 交通史專家藤田豐八博士及其所著書目表', *Ren wen yue kan* 人文月刊, 4(6): 1-17
Zheng Zhenduo 鄭振鐸 1922, 'Di san juan de ben zhi 第三卷的本志', *Er tong shi jie* 兒童世界, 2(13): 46-47
Zhiqun 志群 (trans.) 1905, 'Zhi wu yuan gou she fa 植物園構設法', *Nüzi shi jie* 女子世界, (3): 21-26
Zhiqun 志群 (trans.) 1905, 'Zhi wu yuan gou she fa (continued) 植物園構設法(續)', *Nüzi shi jie* 女子世界, (6): 31-46
Zhiren 治人 1946, 'Dong chong xia cao: Dong wu hu, zhi wu hu 冬蟲夏草: 動物乎, 植物乎', *Jue qun zhou bao* 覺群週報, (3): 9
Zhong guo di er li shi dang an guan [ZGDELSDAG] 中國第二歷史檔案館 (ed.) 2000, *Zhong hua min guo shi dang an zi liao hui bian dian ·di wu ji di san bian: Jiao yu* 中華民國史檔案資料

彙編 第五輯第三編: 教育, Nanjing 南京: Feng huang chu ban she 鳳凰出版社
Zhong guo ke xue yuan shang hai jing ji yan jiu suo [ZGKXYSHJJYJS] 中國科學院上海經濟研究所 and Shang hai she hui ke xue yuan jing ji yan jiu suo [SHSHKXYJJYJS] 上海社會科學院經濟研究所編 (eds.) 1958, *Shanghai jie fang qian hou wu jia zi liao hui bian (1921-1957)* 上海解放前後物價資料彙編 (1921-1957), Shanghai 上海: Shang hai ren min chu ban she 上海人民出版社
Zhou Shimi 周士禰 [1778] 1990, *Ying er lun* 嬰兒論, In: Ming qing zhong yi zhen shan gu ben jing xuan 明清中醫珍善孤本精選, Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社
Zhou Xiwu 周希武 [1919] 1968, Yu shu diao cha ji 玉樹調查記, In: Zhong guo fang zhi cong shu (Xi bei bu fen, book 37) 中國方志叢書(西北部分第 37 冊), Taibei 臺北: Cheng wen chu ban she 成文出版社
Zhou Xuehai 周學海 [1905] 1990, *Shang hai bu li* 傷寒補例, In: Zhong guo yi xue da cheng (book 6) 中國醫學大成(第 6 冊), Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社
Zhu Delin 祝德麟 [1790] 2002, *Yue qin lou shi ji* 悦親樓詩集, In: Xu xiu si ku quan shu 續修四庫全書 (book 1462), Shanghai 上海: Shang hai gu ji chu ban she 上海古籍出版社
Zhu Feng 朱楓 [1745] 1890, *Gu jin dai wen lu* 古金待問錄, Chang shu bao shi hou zhi bu zu zhai ke ben 常熟鮑氏後知不足齋刻本
Zhu Feng 朱楓 *c*. 1780, *Gan yuan xiao zhi* 柑園小識, Qing Manuscript Preserved at Nanjing Library
Zhu Fengzhu 朱鳳竹 1924, 'Bu ke si yi zhi chong lei 不可思議之蟲類', *Hong za zhi* 紅雜誌, 2(34): 1-6
Zhu Hengbi 朱恒璧 and He Jianqing 何鑒清 1932, 'Dui yu zhong hua yao dian nei yi ri ji liang zhi pi ping 對於中華藥典內一日劑量之批評', *Zhong hua yao xue za zhi* 中華藥學雜誌, 18(4): 644-646
Zhu hu tong shang hai guan zao ce chu [ZHTSHGZCC] 駐滬通商海關造冊處 (trans.) 1902, *Tong shang jin kou shui ze* 通商進口稅則, Shanghai 上海: Zhu hu tong shang hai guan zao ce chu 駐滬通商海關造冊處
Zhu Peiran 朱沛然 1936, 'Zhong yi ke xue hua (wei wan) 中醫科學化(未完)', *Guo xun* 國訊, (129): 460-461
Zhu Peiran 朱沛然 1936, 'Zhong yi ke xue hua (xu wan) 中醫科學化(續完)', *Guo xun* 國訊, (130): 483-485
Zhu Peiran 朱沛然 1937, 'Dong chong xia cao yu mao yan 冬蟲夏草與毛燕', *Guo xun* 國訊, (156): 100
Zhu Su 朱橚 [1406] 1986, *Jiu huang ben cao* 救荒本草, In: Wen yuan ge si ku quan shu 文淵閣四庫全書 (book 730), Taibei 台北: Tai wan shang wu yin shu guan 臺灣商務印書館
Zhuang Xueben 莊學本 1937, *Qiang rong kao cha ji* 羌戎考察記, Shanghai 上海: Liang you tu shu yin shua gong si 良友圖書印刷公司

Secondary Sources

(A) Sources in European and Russian Languages

Adams, Amy E. 1927, 'Lazzaro Spallanzani (1729-1799)', *The Scientific Monthly*, 29(6): 528-537
Aigle, Denise 2014, *The Mongol Empire between Myth and Reality: Studies in Anthropological History*, Leiden: Brill
Ainsworth, Geoffrey C. 1962, 'Christiaan Hendrik Persoon (1761-1836)', *Nature*, 193(4810): 22-23
Ainsworth, Geoffrey C. 1976, *Introduction to the History of Mycology*, Cambridge: Cambridge University Press
Ainsworth, Geoffrey C. 1986, *Introduction to the History of Medical and Veterinary Mycology*, Cambridge: Cambridge University Press
Ainsworth, Geoffrey C. 1994, 'Harry Marshall Ward, 1854-1906', *Annual Review of Phytopathology*, 32: 21-25

Ainsworth, Geoffrey C. 1996, *Brief Biographies of British Mycologists*, Stourbridge: British Mycological Society
Aldridge, Alfred O. 1993, *The Dragon and the Eagle: The Presence of China in the American Enlightenment*, Detroit: Wayne State University Press
Alvargonzález, David 2013, 'Is the history of science essentially Whiggish?', *History of Science*, 51(170): 85-99
Amelung, Iwo 2014, 'Historiography of science and technology in China: the first phase', In: *Science and Technology in Modern China, 1880s-1940s*, Jing Tsu and Benjamin A. Elman (eds.), Leiden: Brill
Anderson, Gerald H. (ed.) 1999, *Biographical Dictionary of Christian Missions*, New York: Macmillan Reference
Anderson, James 2013, *Daily Life through Trade: Buying and Selling in World History*, Santa Barbara: The Greenwood Press
Arnold, David 2012, *The Age of Discovery, 1400-1600*, London: Routledge
Asmous, Vladimir C. 1943, 'Karelin (1801-1872) and Kirilov (1821-1842), explorers of Siberia and Middle Asia', *Journal of the Arnold Arboretum*, 24(1): 107-117
Attenborough, David *et al*. 2015, *Amazing Rare Things: The Art of Natural History in the Age of Discovery*, New Haven: Yale University Press
Atwater, Reginald M. 1952, 'Pharmacopoea Internationalis', *American Journal of Public Health and the Nation's Health*, 42(3): 320-321
Aylmer, Charles 1997, 'The Memoirs of H. A. Giles', *East Asian History*, (13-14): 1-90
Baedeker, Karl 1899, *Northern France: From Belgium and the English Channel to the Loire Excluding Paris and Its Environs*, Leipsic: Karl Baedeker, Publisher
Barnes, Linda L. 2005, *Needles, Herbs, Gods, and Ghosts: China, Healing, and the West to 1848*, Cambridge: Harvard University Press
Baron, John 2014, *The Life of Edward Jenner M.D.*, Cambridge: Cambridge University Press
Barron, Colin (ed.) 2003, 'A strong distinction between humans and non-humans is no longer required for research purposes: a debate between Bruno Latour and Steve Fuller', *History of the Human Sciences*, 16(2): 77-99
Bartholomew, James R. 1989, The Formation of Science in Japan: Building a Research Tradition, New Haven: Yale University Press
Barton, Gerry and Stefan Dietrich 2009, *This Ingenious and Singular Apparatus*, Heidelberg: Herstellung und Verlag
Bayly, C. A. *et al*. 2006, 'AHR conversation: on transnational history', *American Historical Review*, 111(5): 1440-1464
Beolens, Bo *et al*. 2009, *The Eponym Dictionary of Mammals*, Baltimore: The Johns Hopkins University Press
Berg, Marc and Annemarie Mol (eds.) 1998, *Differences in Medicine: Unraveling Practices, Techniques, and Bodies*, Durham: Duke University Press
Berry, Scott 1989, *A Stranger in Tibet: The Adventures of a Wandering Zen Monk*, Tokyo: Kodansha International
Bertrand, Joseph 1869, *L'Académie Des Sciences et Les Académiciens de 1666 a 1793*, Paris: J. Hetzel, Libraire-Éditeur
Bevans, Charles I. (ed.) 1968, *Treaties and Other International Agreements of the United States of America, 1776-1949 (Vol. 1: Multilateral, 1776-1917)*, Washington: Department of State Publication
Bewley-Taylor, David R. 1999, *The United States and International Drug Control, 1909-1997*, London: Pinter
Bian, He 2014, *Assembling the Cure: Materia Medica and the Culture of Healing in Late Imperial China (Ph.D Dissertation)*, Cambridge: Harvard University
Bieler, Stacey 2004, *"Patriots" or "Traitors": A History of American-Educated Chinese Students*, New York: M. E. Sharpe
Bland, Martin 2015, *An Introduction to Medical Statistics*, Oxford: Oxford University Press
Blom, J. C. H. and E. Lamberts (ed.) 1999, *History of the Low Countries*, James C. Kennedy (trans.), New York: Berghahn Books
Blussé, Leonard and Harriet T. Zurndorfer (eds.) 1993, *Conflict and Accommodation in Early Modern East Asia*, Leiden: Brill
Bodeker, G. *et al*. 2005, *WHO Global Atlas of Traditional, Complementary and Alternative Medicine*, Kobe: World Health Organization

Boesi, Alessandro, Francesca Cardi 2009, 'Cordyceps sinensis Medicinal Fungus: Traditional Use among Tibetan People, Harvesting Techniques, and Modern Uses', *HerbalGram*, (83): 52-61
Boorman, Howard L. (ed.) 1968, *Biographical Dictionary of Republican China* (vol. 2), New York: Columbia University Press
Bosmia, Anand N. *et al*. 2014, 'Benjamin Hobson (1816-1873): His Work as a medical missionary and influence on the practice of medicine and knowledge of anatomy in China and Japan', *Clinical Anatomy*, 27(2): 154-161
Bowers, John Z. 1971, *Western Medicine in a Chinese Palace: Peking Union Medical College, 1917-1951*, New York: The Josiah Macy, Jr. Foundation
Bowers, John Z. 1980, *When the Twain Meet: The Rise of Western Medicine in Japan*, Baltimore: Johns Hopkins University Press
Bragg, P. E. 2007, 'Biographies of Phasmatologists—2. George Robert Gray', *Phasmid Studies*, 15(1-2): 5-9
Brake, Laurel and Marysa Demoor (eds.) 2009, *Dictionary of Nineteenth-century Journalism in Great Britain and Ireland*, London: The British Library
Braswell, Geoffrey E. 2011, 'The technology of ancient Maya civilization', In: *The Technology of Maya Civilization: Political Economy and Beyond in Lithic Studies*, Zachary X. Hruby *et al*. (eds.), London: Routledge
Briggs, Roy W. 1993, *"Chinese" Wilson: a Life of Ernest H. Wilson, 1876-1930*, London: H. M. S. O.
Brockey, Liam M. 2007, *Journey to the East: The Jesuit Mission to China, 1579-1724*, Cambridge: Harvard University Press
Brockway, Lucile H. 1979, 'Science and colonial expansion: the role of the British Royal Botanic Gardens', *American Ethnologist*, 6: 449-465
Brown, Delmer M. (ed.) 1993, *The Cambridge History of Japan (vol. 1)*, Cambridge: Cambridge: Cambridge University Press
Brummitt, Richard K. and C. E. Powell (eds.) 1992, *Authors of Plant Names*, Kew: Royal Botanic Gardens, Kew
Brunero, Donna 2006, *Britain's Imperial Cornerstone in China: The Chinese Maritime Customs Service, 1854-1949*, London: Routledge
Buell, Paul D. and Eugene N. Anderson 2000, *A Soup for the Qan: Chinese Dietary Medicine of the Mongol Era as Seen in Hu Szu-hui's Yin-shan Cheng-yao*, London: Kegan Paul International
Bullock, Mary B. 1980, *An American Transplant. The Rockefeller Foundation and Peking Union Medical College*, Berkeley: University of California Press
Burcin, Terry 2005, *Commodore Perry's 1853 Japanese Expedition: How Whaling Influenced the Event that Revolutionized Japan (MA Thesis)*, Blacksburg: Virginia Polytechnic Institute and State University
Bynum, William F. 1994, *Science and the Practice of Medicine in the Nineteenth Century*, Cambridge: Cambridge University Press
Bynum, William F. 2006, 'The rise of science in medicine, 1850-1913', In: *The Western Medical Tradition 1800 to 2000*, William F. Bynum *et al*. (eds.), Cambridge: Cambridge University Press
Bynum, William F. *et al*. (eds.) 1981, *Dictionary of the History of Science*, Princeton: Princeton University Press
Campbell, Peter R. 2013, *Louis XIV, 1661-1715*, London: Routledge
Campbell, Thomas J. 1921, *The Jesuits, 1534-1921: A History of the Society of Jesus from Its Foundation to the Present Time (vol. 1)*, New York: The Encyclopedia Press
Cannon, John (ed.) 2009, *A Dictionary of British History*, Oxford: Oxford University Press
Cao, Cong 1999, 'The changing dynamic between science and politics: evolution of the highest academic honor in China, 1949-1998', *Isis*, 90(2): 298-324
Carlson, Alvar W. 1986, 'Ginseng: America's botanical drug connection to the Orient', *Economic Botany*, 40(2): 233-249
Casper, Monica J. 1994, 'Reframing and grounding nonhuman agency: what makes a fetus an agent', *American Behavioral Scientist*, 37(6): 839-856
Chakrabarti, Pratik 2004, *Western Science in Modern India: Metropolitan Methods, Colonial Practices*, New Delhi: Permanent Black
Chakrabarti, Pratik 2010, *Materials and Medicine: Trade, Conquest and Therapeutics in the Eighteenth Century*, Manchester: Manchester University Press
Chalmer, Iain 2000, 'Helping physicians to keep abreast of the medical literature: Medical and

Philosophical Commentaries, 1773-1795', *Annals of Internal Medicine*, 133(3): 238-243
Chan, Sin-wai 2009, *A Chronology of Translation in China and the West: From the Legendary Period to 2004*, Hong Kong: The Chinese University Press
Chang, Hsin-pao 1964, *Commissioner Lin and the Opium War*, Cambridge: Harvard University Press
Chen, C. C. 1989, *Medicine in Rural China: A Personal Account*, Berkeley: University of California Press
Chen, Vincent 1966, *Sino-Russian Relations in the Seventeenth Century*, Hague: Martinus Nijhoff
Choa, Gerald H. 1990, *'Heal the Sick' was Their Motto: the Protestant Medical Missionaries in China*, Hong Kong: The Chinese University Press
Chu, Samuel C. and Kwang-Ching Liu (eds.) 1994, *Li Hung-Chang and China's Early Modernization*, London: Routledge
Clements, Rebekah 2015, *A Cultural History of Translation in Early Modern Japan*, Cambridge: Cambridge University Press
Clifford, Terry [1984] 2001, *Tibetan Buddhist medicine and psychiatry: The diamond healing*, Delhi: Jainendra prakash jain at shri jainendra press
Cochran, Sherman 2006, *Chinese Medicine Men: Consumer Culture in China and Southeast Asia*, Cambridge: Harvard University Press
Cohen, Paul A. [1984] 2010, *Discovering History in China: American Historical Writing on the Recent Chinese Past*, New York: Columbia University Press
Colless, Donald H. 1970, 'Type-Specimens: Their status and use', *Systematic Biology*, 19(3): 251-253
Cook, Harold J. 2007b, *Matters of Exchange: Commerce, Medicine, and Science in the Dutch Golden Age*, New Haven: Yale University Press
Cook, Harold J. 2013, 'Creative misunderstanding: Chinese medicine in seventeenth-century Europe', In: *Cultures in Motion*, Daniel T. Rogers and Helmut Reimitz (eds.), Princeton: Princeton University Press
Cook, Harold J. and Timothy D. Walker 2013, 'Circulation of medicine in the early modern Atlantic world', *Social History of Medicine*, 26(3): 337-351
Cooper, Alix 2007, *Inventing the Indigenous: Local Knowledge and Natural History in Early Modern Europe*, Cambridge: Cambridge University Press
Corsi, Elisabetta 2001, 'Perspectiva iluminadora e iluminación de la perspectiva. La versión del arte occidental de la perspectiva, de Nian Xiyao (1671-1738) en los prólogos a la "Ciencia de la vision"', *Estudios de Asia y Africa*, 36(3): 375-418
Costabel, Pierre 1966, *Pierre Varignon (1654-1722) et la Diffusion en France du Calcul Différentiel et Intégral*, Paris: Palais de la Découverte
Coughlan, Chia-Mei Jane 2008, *The Study of China in Universities: A Comparative Case Study of Australia and the United Kingdom*, New York: Cambria Press
Cox, Euan H. M. 1945, *Plant Hunting in China*, London: Collins
Croizier, Ralph C. 1968, *Traditional Medicine in Modern China: Science, Nationalism, and the Tensions of Cultural Change*, Cambridge: Harvard University Press
Croizier, Ralph C. 1977, 'The ideology of medical revivalism in modern China', In: *Asian Medical Systems: A Comparative Study*, Charles M. Leslie (ed.), Berkeley: University of California Press
Cross, Jack L. 1997, *A Guide to the Russian Academy of Sciences*, Austin: Cross Associates
Crowe, Charles 1966, 'The emergence of progressive history', *Journal of the History of Ideas*, 27(1): 109-124
Cunningham, Andrew and Bridie Minehan (eds.) 1997, *Western Medicine as Contested Knowledge*, Manchester: Manchester University Press
Curth, Louise H. (ed.) 2006, *From Physick to Pharmacology: Five Hundred Years of British Drug Retailing*, Aldershot: Ashgate Publishing Ltd.
Dalby, Andrew 2003, *Food in the Ancient World from A to Z*, London: Routledge
Darwin, Charles 1999, *The Correspondence of Charles Darwin (vol. 11 1863)*, Frederick Burkhardt *et al*. (eds.), Cambridge: Cambridge University Press
Darwin, Charles 2015, *The Correspondence of Charles Darwin (vol. 23 1875)*, Frederick Burkhardt et al. (eds.), Cambridge: Cambridge University Press
Daston, Lorraine and Katharine Park 1998, *Wonders and the Order of Nature 1150-1750*, New York: Zone Books
Daston, Lorraine and Peter Galison 1992, 'The Image of Objectivity', *Representations*, (40): 81-128

Daston, Lorraine and Peter Galison 2007, *Objectivity*, New York: Zone Books

Daunton, Martin (ed.) 2005, *The Organisation of Knowledge in Victorian Britain*, Oxford: Oxford University Press

Dawes, Ben 1952, *A Hundred Years of Biology*, London: Gerald Duckworth & Co. Ltd.

De Moura, Romero M. 2002, 'Relembrando Anton de Bary e sua obra fitopatológica', *Fitopatologia Brasileira*, 27(4): 337-343

De Thomaz de Bossière, Yves 1994, *Jean-François Gerbillon, S.J. (1654-1707): Mathématicien de Louis XIV, premier Supérieur général de la Mission française de Chine*, Leuven: Ferdinand Verbiest Foundation

De Ven, Hans van 2014, *Breaking with the Past: The Maritime Customs Service and the Global Origins of Modernity in China*, New York: Columbia University Press

De Vos, Paula 2010, 'European Materia Medica in historical texts: longevity of a tradition and implications for future use', *Journal of Ethnopharmacology*, 132(1): 28-47

Dear, David 2012, 'Chinese yangsheng: Self-help and self-image', *Asian Medicine*, 7(1): 1-33

Dehergne, Joseph 1973, *Répertoire des Jésuites de Chine de 1552 à 1800*, Rome: Institutum Historicum S. I.; Paris: Letouzey & Ané

Delon, Michel (ed.) 2013, *Encyclopedia of the Enlightenment (vol. 1)*, London: Routledge

Delorme, Suzanne 1957, 'Contribution à la bibliographie de Fontenelle', *Revue d'Histoire des Sciences et de Leurs Applications*, 10(4): 300-309

Delwig, Axel 2012, *Life in Moscow: Communism and Now*, London: Lulu

Desi Sangye Gyatso 2010, *Mirror of Beryl: A historical introduction to Tibetan medicine*, translated by Gavin Kilty, Somerville: Wisdom Publications

Desmond, Ray 1994, *Dictionary of British & Irish Botantists and Horticulturalists*, London: Taylor & Francis and The Natural History Museum

Desmond, Ray 2007, *The History of the Royal Botanic Gardens Kew*, Richmond: Kew Publishing

Dierl, Wolfgang 1978, *British and European Insects*, London: Chatto & Windus

Dinechin, B. de 1990, *Auguste-Denis Fougeroux de Bondaroy: Agronome et Académicien, 1732-1790*, Pithiviers: Université du 3e âge de Pithiviers

Doleželová-Velingerová, Milena 2014, 'Modern Chinese encyclopaedic dictionaries: Novel concepts and new terminology (1903-1911)', In: *Chinese Encyclopaedias of New Global Knowledge (1870-1930): Changing Ways of Thought*, Milena Doleželová-Velingerová and Rudolf G. Wagner (eds.), Berlin: Springer

Doleželová-Velingerová, Milena and Rudolf G. Wagner (eds.) 2014, *Chinese Encyclopaedias of New Global Knowledge (1870-1930): Changing Ways of Thought*, Berlin: Springer

Dongen, Pieter W. J. van *et al*. 1995, 'History of ergot alkaloids from ergotism to ergometrine', *European Journal of Obstetrics & Gynecology*, 60: 109-116

Dozier, Laura (ed.) 2010, *Natural History Drawings: The Complete William Farquhar Collection, Malay Peninsula 1803-1818*, Singapore: Tien Wah Press

Drews, Gerhart 2001, 'The developmental biology of fungi—A new concept introduced by Anton de Bary', *Advances in Applied Microbiology*, 48: 213-227

Duteil, Jean-Pierre 1994, *Le Mandat du Ciel. Le rôle des Jésuites en Chine, de la mort de François-Xavier à la dissolution de la Compagnie de Jésus (1552-1774)*, Paris: Arguments

Eber, Irene 1999, *The Jewish Bishop and the Chinese Bible: S.I.J. Schereschewsky (1831-1906)*, Leiden: Brill

Ebrahimnejad, Hormoz (ed.) 2009, *The Development of Modern Medicine in Non-Western Countries: Historical Perspectives*, New York: Routledge

Egerton, Frank N. 2006, 'A history of the ecological sciences, part 21: Réaumur and his history of insects', *Bulletin of the Ecological Society of America*, 87(3): 212-224

Eicher, John H. and David J. Eicher 2001, *Civil War High Commands*, Stanford: Stanford University Press

Eisenstadt, Shmuel N. (ed.) 2002, *Multiple Modernities*, New Brunswick: Transaction Publishers

Eisenstadt, Shmuel N. 1993, 'Globalization, civilizational traditions and multiple modernities', In: *Regime Transformation and Global Realignments*, Kanta Ahuja *et al*. (eds.), London: Sage Publications

Eisenstadt, Shmuel N. 2000, 'Multiple modernities', *Daedalus*, 129(1): 1-29

Eisenstadt, Shmuel N. and Wolfgang Schluchter 1998, 'Introduction: paths to early modernities: a comparative view', *Daedalus*, 127(3): 1-18

Elliott, Brent 2003, *The Royal Horticultural Society: A History, 1804-2004*, Chichester: Phillimore and Company Ltd.

Ellis, Mark W. 2011, 'The problem with the species problem', *History and Philosophy of the Life Sciences*, 33(3): 343-363
Elman, Benjamin A. 2002, 'Jesuit Scientia and natural studies in late imperial China, 1600-1800', *Journal of Early Modern History*, 6(3): 209-232
Elman, Benjamin A. 2004, 'Naval warfare and the refraction of China's Self-Strengthening Reforms into scientific and technological failure, 1865-1895', *Modern Asian Studies*, 38(2): 283-326
Elman, Benjamin A. 2005, *On Their Own Terms: Science in China, 1550-1900*, Cambridge: Harvard University Press
Elman, Benjamin A. 2008, 'Sinophiles and sinophobes in Tokugawa Japan: Politics, classicism, and medicine during the eighteenth century', *East Asian Science, Technology and Society*, 2: 93-121
Elman, Benjamin A. 2010, 'The investigation of things (Gewu 格物), natural studies (Gezhixue 格致學), and evidental studies (kaozhengxue 考證學) in late imperial China, 1600-1800', In: *Concepts of Nature: A Chinese-European Cross-Cultural Perspective*, Hans Ulrich Vogel and Günter Dux (eds.), Leiden: Brill
Elman, Benjamin A. 2014, 'Toward a history of modern science in Republican China', In: S*cience and Technology in Modern China, 1880s-1940s*, Jing Tsu and Benjamin A. Elman (eds.), Leiden: Brill
Elman, Benjamin A. 2015, *Science in China, 1600-1900: Essays by Benjamin A. Elman*, Ko Y. Kai (ed.), Singapore: World Century Publishing Crop.
Elshakry, Marwa S. 2008, 'Knowledge in motion: The cultural politics of modern science translations in Arabic', *Isis*, 99(4): 701-730
English, Mary P. 1987, *Mordecai Cubitt Cooke: Victorian Naturalist, Mycologist, Teacher & Eccentric*, Bristol: Biopress
Evans, Juanita 2005, 'Mistletoe: good for more than free kisses', *HerbalGram*, (68): 50-59
Fairbank, John K. and Albert Feuerwerker (eds.) 1986, *The Cambridge History of China (vol. 13): Republican China 1912-1949 (Part 2)*, Cambridge: Cambridge University Press
Fan, Fa-ti 2004, *British Naturalists in Qing China*, Cambridge: Harvard University Press
Fan, Fa-ti 2007, 'Redrawing the map: Science in twentieth-century China', *Isis*, 98(3): 524-538
Fassbender, Bardo and Anne Peters (eds.) 2012, *The Oxford Handbook of the History of International Law*, Oxford: Oxford University Press
Finnane, Antonia 2004, *Speaking of Yangzhou: A Chinese City, 1550-1850*, Cambridge: Harvard University Press
Finnegan, Diarmid A. 2008, 'The spatial turn: geographical approaches in the history of science', *Journal of the History of Biology*, 41(2): 369-388
Fischer-Lichte, Erika *et al*. (eds.) 2011, *Global Ibsen: Performing Multiple Modernities*, London: Routledge
Fogel, Joshua A. 2015, *Between China and Japan: The Writings of Joshua Fogel*, Leiden: Brill
Foster, Janet and Julia Sheppard (eds.) 2001, *British Archives: A Guide to Archive Resources in the United Kingdom*, New York: Palgrave Macmillan
Foucault, Michel 1966, *Les Mots et Les Choses: Un Archeologie des Sciences Humaine*, Paris: Gallimard
Foucault, Michel 1984, 'What is enlightenment?', In: *The Foucault Reader*, Paul Rabinow (ed.), New York: Pantheon Books
Foust, Clifford M. 1992, *Rhubarb: the Wondrous Drug*, Princeton: Princeton University Press
Fraser, Kevin J. 1994, 'John Hill and the Royal Society in the eighteenth century', *Notes and Records of the Royal Society of London*, 48(1): 43-67
Fritsch, F. E. 1953, 'President's reception', *Proceedings of the Linnean Society of London*, 164(1): 42-47
Furth, Charlotte *et al*. (eds.) 2007, *Thinking with Cases: Specialist Knowledge in Chinese Cultural History*, Honolulu: University of Hawai'i Press
Fusco, Nadia 2002, *Lazzaro Spallanzani: La Geografia, Le Scienze Della Natura, I Viaggi*, Roma: Società Geografica Italiana
G., P. H. 1975, 'John Ramsbottom 1885-1974', *Transactions of the British Mycological Society*, 65(1): 1-6
Gael, Patricia 2012, 'The Origins of the Book Review in England, 1663-1749', *The Library: The Transactions of the Bibliographical Society*, 13(1): 63-89
Gage, Andrew T. and William T. Stearn 1988, *A Bicentenary History of the Linnean Society of*

London, London: Academic Press
Galland, Olivier and Yannick Lemel 2008, ‘Tradition vs. modernity: the continuing dichotomy of values in European society’, *Revue Française de Sociologie*, 49(5): 153-186
Gao, Xi 2014, ‘Foreign models of medicine in Twentieth-century China’, In: *Medical Transitions in Twentieth-Century China*, Bridie Minehan and Mary B. Bullock (eds.), Bloomington: Indiana University Press
Gaposchkin, M. Cecilia 2008, *The Making of Saint Louis: Kingship, Sanctity, and Crusade in the Later Middle Ages*, Ithaca: Cornell University Press
Garrett, Frances 2008, *Religion, Medicine and the Human Embryo in Tibet*, Abingdon: Routledge
Garrett, Frances 2014, ‘The making of medical history, twelfth to seventeenth century’, In: *Bodies in Balance: The Art of Tibetan Medicine*, Theresia Hofer (ed.), Washington: University of Washington Press, pp. 178-197
Gatty, Janette 1974, ‘Les Recherches de Joachim Bouvet(1656-1730)’, In: *Actes du Colloque international de Sinologie*, Paris: Les Belles Lettres
Gauch, Ronald R. 2009, *It’s Great! Oops, No It Isn’t: Why Clinical Research Can’t Guarantee the Right Medical Answers*, New York: Springer
Genest, Marie-Pierre 1992, ‘Note sur les plantes chinoises dans les jardins français du XVIIIe siècle. De l’expérimentation à la diffusion’, *Études Chinoises*, 11(2): 141-158
Genest, Marie-Pierre 1997, ‘Les plantes chinoises en France au XVIIIe siècle: médiation et transmission’, *Journal d’Agriculture Traditionnelle et de Botanique Appliquée*, 39(1): 27-47
Geng, Xuan 2015, *Serving China through Agricultural Science: American-Trained Chinese Scholars and “Scientific Nationalism” in Decentralized China (1911-1945) (Ph.D Dissertation)*, Minneapolis: University of Minnesota
Gerth, Karl 1998, ‘Consumption as resistance: The national products movement and anti-Japanese boycotts in modern China’, In: *The Japanese Empire in East Asia and its Postwar Legacy*, Harald Fuess (ed.), Munich: Iudicium
Gibbs, D. D. 1969, ‘Sir John Floyer, M.D. (1649-1734)’, *British Medical Journal*, 1(5638): 242-245
Goetz, Philip W. *et al*. (eds.) 1995, *The New Encyclopaedia Britannica (vol. 1)*, Chicago: Encyclopaedia Britannica, Inc.
Goetz, Philip W. *et al*. (eds.) 1998, *The New Encyclopaedia Britannica (vol. 4)*, Chicago: Encyclopaedia Britannica, Inc.
Golas, Peter J. 1999, *Science and Civilisation in China (vol. 5, part 13)*, Cambridge: Cambridge University Press
Golvers, Noël 2010, ‘From Propertius’s Laudes Italiae (Romae) to 17th-century Jesuit ‘Laus Sinarum’. A new aspect of Propertius’s reception’’, *Humanistica Lovaniensia*, 59: 213-221
Goodman, Grant R. 1986, *Japan: The Dutch Experience*, London: The Athlone Press
Goody, Jack 1977, *The Domestication of the Savage Mind*, Cambridge: Cambridge University Press
Goody, Jack 2006, *The Theft of History*, Cambridge: Cambridge University Press
Gordh, Gordon and David H. Headrick 2011, *A Dictionary of Entomology*, New York: CABI Publishing
Gordon, David M. 2006, ‘The China-Japan War, 1931-1945’, *The Journal of Military History*, 70(1): 137-182
Gorman, Mel 1984, ‘Sir William Brooke O’Shaughnessy, F.R.S. (1809-1889), Anglo-Indian forensic chemist’, *Notes and Records of the Royal Society of London*, 39(1): 51-64
Gregg, Pauline 1981, *King Charles I*, Berkeley: University of California Press
Grenier, Catherine 2013, *Modernités Plurielles 1905-1970*, Paris: Centre Pompidou
Gribbin, John 2003, *Science: A History*, London: Penguin Books
Grieder, Jerome B. 1970, *Hu Shih and the Chinese Renaissance: Liberalism in the Chinese Revolution, 1917-1937*, Cambridge: Harvard University Press
Groccia, James E. *et al*. (eds.) 2012, *Handbook of College and University Teaching: A Global Perspective*, London: SAGE Publications
Grover, Yvonne 1980, ‘La correspondance scientifique du Père Dominique Parrenin, 1665-1741’, In: *Actes du IIe Colloque International de Sinologie*, Paris: Belles Lettres
Gulick, Edward V. 1973, *Peter Parker and the Opening of China*, Cambridge: Harvard University Press
Gusfield, Joseph R. 1967, ‘Tradition and modernity: misplaced polarities in the study of social change’, *American Journal of Sociology*, 72(4): 351-362
Hanes, W. Travis and Frank Sanello 2004, *The Opium Wars: The Addiction of One Empire and the Corruption of Another*, Naperville: Sourcebooks

Hanson, Marta E. 2003, ‘On Manchu medical manuscripts and blockprints: An essay and bibliographic survey’, *Saksaha*, (8): 1-32
Hanson, Marta E. 2007, ‘Jesuits and medicine in the Kangxi court (1662-1722)’, *Pacific Rim Report*, (43): 1-10
Hanson, Marta E. 2011, *Speaking of Epidemics in Chinese Medicine*, New York: Routledge
Hanson, Martha E. 2006, ‘The significance of Manchu medical sources in the Qing’, *Proceedings of the First North American Conference on Manchu Studies*, 1: 131-175
Hardy, Linda Kay 1966, *The Japanese Invasion of Manchuria: A Case Study of Imperialism*, Mount Vernon: Cornell College
Harley, J. B. and David Woodward (eds.) 1987, *The History of Cartography (vol. 2, book 1): Cartography in the traditional East and Southeast Asian Societies*, Chicago: University of Chicago Press
Hawksworth, David L. 2001, ‘The naming of fungi’, In: *The Mycota: Systematics and Evolution (Part B)*, McLaughlin, D. J. *et al*. (eds.), New York: Springer-Verlag
Hawksworth, David L. 2003, ‘*Cordyceps Sinensis* and *Ganoderma Lucidum* amongst top ‘herbal’ medicines’, *Mycological Research*, 107(3): 259
Hayward, Rhodri 2003, ‘Emmanuel Mendes da Costa (1717-1791): A case study in scientific reputation’, In: *Travels of Learning: A Geography of Science in Europe*, Ana Simões *et al*. (eds.), Dordrecht: Springer
Heinrich, Michael 2015, ‘Ethnopharmacology: a short history of a multidisciplinary field of research’, In: *Ethnopharmacology,* Michael Heinrich and Anna K. Jäger (eds.), Chichester: John Wiley & Sons Ltd.
Heller, John L. 1964, ‘The early history of binomial nomenclature’, *Huntia*, 1: 33-70
Hempel, Rose 1983, *The Heian Civilization of Japan*, Oxford: Phaidon Press
Hessenbruch, Arne (ed.) 2000, *Reader's Guide to the History of Science*, London: Fitzroy Dearborn Publishers
Hill, J. E. 1990, ‘A memoir and bibliography of Michael Rogers Oldfield Thomas, F.R.S.’, *Bulletin of the British Museum (Natural History): Historical Series*, 18(1): 25-113
Hinrichs, T. J. 1998, ‘New geographies of Chinese medicine’, *Osiris*, 13: 287-352
Hinrichs, T. J. and Linda L. Barnes (eds.) 2013, *Chinese Medicine and Healing: An Illustrated History*, Cambridge: The Belknap Press of Harvard University Press
Ho, Ping-ti 1954, ‘The salt merchants of Yang-Chou: A study of commercial capitalism in eighteenth-century China’, *Harvard Journal of Asiatic Studies*, 17 (1-2): 130-168
Hobsbawm, Eric and Terence Ranger (eds.) 1983, *The Invention of Tradition*, Cambridge: Cambridge University Press
Hodge, Kathie T. 2005, ‘Cornell’s Fungi of China Collection has had an interesting journey...’, *Alumni Newsletter*, 48: 3
Holenstein, André *et al*. (eds.) 2013, *Scholars in Action: The Practice of Knowledge and the Figure of the Savant in the 18th Century*, Leiden: Brill
Holliday, John and Matt Cleaver 2008, ‘Medicinal value of the caterpillar fungi species of the genus *Cordyceps* (Fr.) Link (Ascomycetes). A review’, *International Journal of Medicinal Mushrooms*, 10(3): 219-234
Horsfall, James G. and Stephen Wilhelm 1982, ‘Heinrich Anton De Bary: Nach Einhundertfünfzig Jahren’, *Annual Review of Phytopathology*, 20: 27-32
Houghton Mifflin Company (HMC) 2003, *The Houghton Mifflin Dictionary of Biography*, Boston: Houghton Mifflin Company
Howe, Christopher 1999, *The origins of Japanese trade supremacy: Development and technology in Asia from 1540 to the Pacific War*, Chicago: University Of Chicago Press
Hsia, Adrian 1998, Chinesia: The European Construction of China in the Literature of the 17th and 18th Centries, Tübingen: Niemeyer
Hsia, Florence C. 2009, *Sojourners in a Strange Land: Jesuits and Their Scientific Missions in Late Imperial China*, Chicago: University of Chicago Press
Hsu, Elisabeth (ed.) 2001, *Innovation in Chinese Medicine*, Cambridge: Cambridge University Press
Hsu, Elisabeth 2010, *Pulse Diagnosis in Early Chinese Medicine: The Telling Touch*, Cambridge: Cambridge University Press
Hsü, Immanuel C. Y. [1970] 2000, *The Rise of Modern China*, Oxford: Oxford University Press
Huang, Ray 1981, *1587, a Year of No Significance*, New Haven: Yale University Press
Hudson, Briony and Maureen Boylan 2013, *The School of Pharmacy, University of London: Medicines, Science and Society, 1842-2012*, Amsterdam: Academic Press

Hung, Wann-Sheng 1991, *Li Shanlan, The Impact of Western Mathematics in China during the Late 19th Century* (Ph.D Dissertation), New York: City University of New York
Huntington, Samuel P. 1996, *The Clash of Civilizations and the Remaking of World Order*, New York: Simon & Schuster
Ip, Hung-Yok *et al*. 2003, 'The plurality of Chinese modernity: a review of recent scholarship on the May Fourth movement', *Modern China*, 29(4): 490-509
Iriye, Akira 2013, *Global and Transnational History: The Past, Present, and Future*, Basingstoke: Palgrave Macmillan
Isabelle, Landry-Deron 2002, *La Preuve par la Chine. La « Description » de J.-B. Du Halde, Jésuite, 1735*, Paris: Editions de l'École des Hautes Études en Sciences Sociales
Izumi, Yoshio and Kazuo Isozumi 2001, 'Modern Japanese medical history and the European influence', *The Keio Journal of Medicine*, 50(2): 91-99
Jackson, Peter 2009, *The Seventh Crusade, 1244-1254: Sources and Documents*, Farnham: Ashgate Publishing Ltd.
Jaggi, Om Prakash 1981, *Āyurveda: Indian system of medicine*, Dehli: Atma Ram & Sons
James, T. E. 1933, 'George Edwards, F.R.S. (1694-1773), an eighteenth-century naturalist', *Science Progress in the Twentieth Century*, 27(107): 486-493
Jami, Catherine 2012, *The Emperor's New Mathematics: Western Learning and Imperial Authority during the Kangxi Reign (1662-1722)*, Oxford: Oxford University Press
Jardine, Nick 2003, 'Whigs and stories: Herbert Butterfield and the historiography of science', *History of Science*, 41(132): 125-140
Jeffrey, Charles [1968] 1982, *An Introduction to Plant Taxonomy*, Cambridge: Cambridge University Press
Jones, Alan W. 2011, 'Early drug discovery and the rise of pharmaceutical chemistry', *Drug Test Analysis*, 3(6): 337-344
Jong, De J. W. 1967, 'Sum-pa mkhan-po (1704-1788) and his works', *Harvard Journal of Asiatic Studies* 27: 208-216
Jordan Goodman *et al.* (eds.) 2007, *Consuming Habits: Global and Historical Perspectives on How Cultures Define Drugs*, New York: Routledge
Jukes, Geoffrey 2002, *The Russo-Japanese War 1904-1905*, London: Osprey Pubilishing
Kaji, Masanori *et al*. (eds.) 2015, *Early Responses to the Periodic System*, Oxford: Oxford University Press
Kapustina, Tatiana A. 1996, 'Emperor Nicholas I, 1825-1855', In: *The Emperors and Empresses of Russia: Reconsidering the Romanovs*, London: Routledge
Keeble, Frederick 2010, 'John Lindley: 1799-1865', In: *Makers of British Botany: A Collection of Biographies by Living Botanists*, F. W. Oliver (ed.), Cambridge: Cambridge University Press, 2010
Kirk, Paul M. *et al*. (eds.) 2008, *Ainsworth & Bisby's Dictionary of the Fungi*, Wallingford: CAB International
Kitamura, Siro 1989, 'The Japanese studies on the Chinese plants', *Acta Phytotaxonomica et Geobotanica*, (1-4): 119-122
Knappett, Carl and Lambros Malafouris (eds.) 2008, *Material Agency: Towards a Non-Anthropocentric Approach*, New York: Springer
Koelle, George B. 1995, 'Carl Frederic Schmidt, 1893-1988', In: *Biographical Memoir*, Washington: National Academies Press
Krick, Robert E. L. 2003, *Staff Officers in Gray: A Biographical Register of the Staff Officers in the Army of Northern Virginia*, Chapel Hill: The University of North Carolina Press
Krieger, Joel (ed.) 2012, *The Oxford Companion to Comparative Politics (vol. 1)*, Oxford: Oxford University Press
Kuhn, Dieter 2006, 'Reflections on the current state and significance of the history of East Asian techonology', *East Asian Science, Technology, and Medicine*, 25: 9-26
Kumin, Beat and Cornelie Usborne 2013, 'At home and in the workplace: a historical introduction to the 'spatial turn'', *History and Theory*, 52(3): 305-318
Labarge, Margaret W. 1968, *Saint Louis: Louis IX, Most Christian King of France*, Boston: Little, Brown
Lach, Donald F. and Edwin J. Van Kley 1998, *Asia in the Making of Europe (vol. 3, book 1)*, Chicago: The University of Chicago Press
Lack, Hans W. 2000, *Adolf Engler—Die Welt in einem Garten*, München: Prestel
Laflèche, Guy 2000, *Bibliographie Littéraire de la Nouvelle-France*, Laval: Singulier

Landry-Deron, Isabelle 2001, 'Les Mathématiciens envoyés en Chine par Louis XIV en 1685', *Archive for History of Exact Sciences*, 55(5): 423-463
Langlois, John D. (ed.) [1981] 2014, *China under Mongol Rule*, Princeton: Princeton University Press
Lardos, Andreas 2015, 'Historical approaches in Ethnopharmacology', In: *Ethnopharmacology*, Michael Heinrich and Anna K. Jäger (eds.), Chichester: John Wiley & Sons Ltd.
Latour, Bruno 1993, *We Have Never Been Modern*, Catherine Porter (trans.), Cambridge: Harvard University Press
Latour, Bruno 1996, 'On actor-network theory: A few clarifications', *Soziale Welt*, 47: 369-381
Latour, Bruno 2005, *Reassembling the Social: An Introduction to Actor-Network-Theory*, Oxford: Oxford University Press
Laver, Michael S. 2011, *The Sakoku Edicts and the Politics of Tokugawa Hegemony*, New York: Cambria Press
Lee, M. R. 2009, 'The history of ergot of rye (Claviceps purpurea) I: From antiquity to 1900', *The Journal of the Royal College of Physicians of Edinburgh*, 39: 179-184
Lee, Raymond L. M. 2006, 'Reinventing modernity: reflexive modernization vs liquid modernity vs multiple modernities', *European Journal of Social Theory*, 9(3): 355-368
Lee, Sidney (ed.) 1899, *Dictionary of National Biography (vol. 60)*, London: Smith, Elder, & Co.
Lee, Sidney (ed.) 1909a, *Dictionary of National Biography (vol. 20)*, London: Smith, Elder, & Co.
Lee, Sidney (ed.) 1909b, *Dictionary of National Biography (vol. 17)*, London: Smith, Elder, & Co.
Lei, Sean Hsiang-Lin 1999, 'From Changshan to a new anti-malarial drug: Re-networking Chinese drugs and excluding traditional doctors', *Social Studies of Science*, 29(3): 323-358
Lei, Sean Hsiang-Lin 2002, 'How did Chinese medicine become experiential? The political epistemology of Jingyan', *Positions*, 10(2): 333-364
Lei, Sean Hsiang-Lin 2014, *Neither Donkey nor Horse: Medicine in the Struggle over China's Modernity*, Chicago: University of Chicago Press
Leibo, Steven A. 1985, *Transferring Technology to China: Prosper Giquel and the Self-strengthening Movement*, Berkeley: Institute of East Asian Studies, University of California, Berkeley
Leung, Angela Ki Che 2011, 'Variolation' and vaccination in late imperial China, ca 1570-1911', In: *History of Vaccine Development*, Stanley A. Plotkin (ed.), New York: Springer
Li, Shaoping and Karl W. K. Tsim 2005, 'The Biological and pharmacological properties of *Cordyceps sinensis*, a traditional Chinese medicine that has broad clinical applications', In: *Herbal and traditional medicine: Molecular aspects of health*, Lester Packer *et al*. (eds), Boca Raton: CRC Press
Li, Tao 2011, 'Philosophic perspective: a comparative study of traditional Chinese medicine and Western medicine', *Asian Social Science*, 7(2): 198-201
Lightman, Bernard (ed.) 1997, *Victorian Science in Context*, Chicago: University of Chicago Press
Lightman, Bernard 2007, *Victorian Popularizers of Science: Designing Nature for New Audiences*, Chicago: University of Chicago Press
Lightman, Bernard *at al*. (eds.) 2013, *The Circulation of Knowledge Between Britain, India and China*, Leiden: Brill
Lindemann, Mary 2010, *Medicine and Society in Early Modern Europe*, Cambridge: Cambridge University Press
Lippiello, Tiziana and Roman Malek (eds.) 1997, *Scholar from the West: Giulio Aleni S.J. (1582-1649) and the Dialogue between Christianity and China*, Brescia: Monumenta Serica Institute
Little, Archibald 1903, *Li Hung-Chang: His Life and Times*, London: Cassell & Company, Ltd.
Liu, Yanchi 1988, *The Essential Book of Traditional Chinese Medicine (vol. 1)*, Fang Tingyu and Chen Laidi (trans.), New York: Columbia University Press
Liu, Yu 2013, 'The Complexities of a New Faith: Xu Guangqi's Acceptance of Christianity', *Journal of Religious History*, 37(2): 228-244
Lo, Vivienne 1998, *The Influence of yangsheng Culture on Early Chinese Medical Theory* (PhD Dissertation), London: University of London
Lo, Vivienne 2001, 'The influence of nurturing life culture on the development of Western Han acumoxa therapy', In: *Innovation in Chinese Medicine*, Elisabbeth Hsu (ed.), Cambridge: Cambridge University Press
Lo, Vivienne 2005, 'Pleasure, prohibition and pain: food and medicine in China', In: *Of Tripod and Palate*, Roel Sterckx (ed.), London: Palgrave Macmillan

Lo, Vivienne and Christopher Cullen (eds.) 2005, *Medieval Chinese medicine: the Dunhuang medical manuscripts*, London: RoutledgeCurzon
Loewe, Michael and Edward L. Shaughnessy (eds.) 1999, *The Cambridge history of ancient China: from the origins of civilization to 221 B.C.*, Cambridge: Cambridge University Press
Lombardo, Thomas 2006, *The Evolution of Future Consciousness: The Nature and Historical Development of the Human Capacity to Think about the Future*, Bloomington: AuthorHouse
Loudon, Irvine 2006, 'A brief history of homeopathy', *Journal of the Royal Society of Medicine*, 99(12): 607-610
Löwy, Ilana 2011, 'Historiography of biomedicine: 'Bio,' 'Medicine,' and in between', *Isis*, 102(1): 116-122
Lutz, Jessie Gregory 2008, *Opening China: Karl F. A. Gützlaff and Sino-Western Relations, 1827-1852*, Cambridge: William B. Eerdmans Publishing Company
Lyte, Charles 1983, *The Plant Hunters*, London: Orbis Publishing
Lyte, Charles 1989, *Frank Kingdon-Ward: The Last of the Great Plant Hunters*, London: John Murray
Magner, Lois N. 2002, *A History of the Life Sciences*, New York: Marcel Dekker
Magoc, Chris J. and David Bernstein (eds.) 2015, *Imperialism and Expansionism in American History*, Santa Barbara: ABC-CLIO
Manniche, Lise 2002, *Sexual Life in Ancient Egypt*, London: Kegan Paul Ltd
Marshall, P. J. (ed.) 2001, *The Oxford History of the British Empire: The Eighteenth Century (vol. 2)*, Oxford: Oxford University Press
Mason, Kenneth 1958, 'Frank Kingdon-Ward', *The Himalayan Journal*, 21: 141-142
Matthew, C. G. and Brian Harrison (eds.) 2004, *Oxford Dictionary of National Biography (vol. 57)*, Oxford: Oxford University Press
Mazars, Guy 2006, *A Concise Introduction to Indian Medicine*, Delhi: Presses Universitaires De France
McCandliss, Carolyn 1996, *Of No Small Account: the Life of John Glasgow Kerr, M.D. L.L.D.*, St. Louis: Wanshang Press
McKie, Douglas 1957a, 'Bernard le Bovier de Fontenelle, F.R.S. 1657-1757', *Notes and Records of the Royal Society of London*, 12(2): 193-200
McKie, Douglas 1957b, 'René-Antoine Ferchault de Réaumur (1683-1757): The Pliny of the eighteenth century', *Science Progress*, 45(180): 619-627
McDevitt, Jeannette 2014, 'Fungi, a puzzle in the golden age of botany: Illustrated mushroom books, part 2', *Bulletin of the Hunt Institute for Botanical Documentation*, 26(1): 6-10
Mehrotra, R. S. and K. R. Aneja 1990, *An Introduction to Mycology*, New Delhi: New Age International Ltd.
Menton, Linda K. *et al*. 2003, *The Rise of Modern Japan*, Honolulu: University of Hawai'i Press
Merrill, Lynn L. 1989, *The Romance of Victorian Natural History*, Oxford: Oxford University Press
Mestler, Gordon E. 1957, 'Introduction to Western Influences in Pre-Meiji Japanese Medicine', *Proceedings of the Royal Society Medicine*, 50(12): 1005-1013
Métailié, Georges 1993, 'Sources for modern botany in China during Qing dynasty', *Japan Review*, (4): 241-249
Métailié, Georges 2010, 'Concepts of nature in traditional Chinese materia medica and botany (sixteenth to seventeenth century)', In: *Concepts of Nature: A Chinese-European Cross-Cultural Perspective*, Hans Ulrich Vogel and Günter Dux (eds.), Leiden: Brill
Métailié, Georges 2015, *Science and Civilisation in China (Vol. 6, Part 4: Traditional Botany: An Ethnobotanical Approach)*, Cambridge: Cambridge University Press
Methven, Andrew S. 1990, *The Genus Clavariadelphus in North America*, Berlin: J. Cramer
Middell, Matthias and Katja Naumann 2010, 'Global history and the spatial turn: from the impact of area studies to the study of critical junctures of globalization', *Journal of Global History*, 5: 149-170
Michael, Mike 2017, *Actor-Network Theory: Trials, Trails and Translations*, London: SAGE Publications
Mikulinskiĭ, S. R. *et al*. 1977, *USSR Academy of Sciences: Scientific Relations with Great Britain*, Moscow: Nauka Publishing House, Central Department of Oriental Literature
Minamiki, George 1985, *The Chinese Rites Controversy: From Its Beginnings to Modern Times*, Chicago: Loyola University Press
Minehan, Bridie 2014, *The Making of Modern Chinese Medicine, 1850-1960*, Vancouver: University of British Columbia Press

Mitchell, Sally (ed.) 2011, *Victorian Britain: An Encyclopedia*, London: Routledge
Money, Nicholas P. 2011, *Mushroom*, Oxford: Oxford University Press
Money, Nicholas P. 2016, *Fungi: A Very Short Introduction*, Oxford: Oxford University Press
Morison, Samuel E. 1967, *"Old Bruin": Commodore Matthew C. Perry 1794-1858*, Boston: Little, Brown and Co.
Mote, Frederick W. and Denis Twitchett (eds.) 1988, *The Cambridge History of China: The Ming Dynasty, 1368-1644 (Part 1)*, Cambridge: Cambridge University Press
Müller-Wille, Staffan and Isabelle Charmantier 2012, 'Lists as research technologies', *Isis*, 103(4): 743-752
Mun, Chanju (ed.) 2006, *Buddhism and Peace: Theory and Practice*, Honolulu: Blue Pine
Mungello, David E. (ed.) 1994, *The Chinese Rites Controversy: Its History and Meaning*, Nettetal: Steyler Verlag
Mungello, David E. 2013, *The Great Encounter of China and the West, 1500-1800*, Lanham: Rowman & Littlefield Publishers
Murphey, Rhoads 1953, *Shanghai, Key to Modern China*, Cambridge: Harvard University Press
Nappi, Carla 2009, *The Monkey and the Inkpot: Natural History and Its Transformations in Early Modern China*, Cambridge: Harvard University Press
Nappi, Carla 2013, 'The global and beyond: adventures in the local historiographies of science', *Isis*, 104(1): 102-110
National Geospatial-Intelligence Agency 2001, *Distances between Ports*, Washington: The United States Government
Needham, Joseph 1954, 'Introductory Orientations', In: *Science and Civilisation in China (vol. 1)*, Cambridge: Cambridge University Press
Needham, Joseph and Lu Gwei-Djen 2000, *Science and Civilisation in China (vol. 6 part 6: Medicine)*, Cambridge: Cambridge University Press
Needham, Joseph *et al*. 1986, 'Biology and biological technology: Part I: Botany', In: *Science and Civilisation in China (vol. 6, part 1)*, Cambridge: Cambridge University Press
Nelson, E. Charles 1983, 'Augustine Henry and the exploration of the Chinese flora', *Arnoldia*, 43(1): 21-38
Nield, Robert 2015, *China's Foreign Places: The Foreign Presence in China in the Treaty Port Era, 1840-1943*, Hong Kong: Hong Kong University Press
Noll, Ray R. (ed.) 1992, *100 Roman Documents Concerning the Chinese Rites Controversy (1645-1941)*, Donald F. Sure (trans.), San Francisco: Ricci Institute for Chinese-Western Cultural History
Nordenstam, Bertil 1994, 'Carl Peter Thunberg (1743-1828)', *Transactions of the Royal Society of South Africa*, 49(2): 161-174
Nordenstam, Bertil 2013, 'Carl Peter Thunberg and Japanese natural history', *Asian Journal of Natural & Applied Sciences*, 2(2): 11-17
Norihito, Mizuno 2003, 'China in Tokugawa foreign relations: The Tokugawa Bakufu's perception of and attitudes toward Ming-Qing China', *Sino-Japanese Studies*, 15: 108-144
Norman, Jeremias 2010, 'Eastern Chriatianity in China', In: *The Blackwell Companion to Eastern Christianity*, Ken Parry (ed.), Chichester: Wiley-Blackwell
O'Brian, Patrick 1997, *Joseph Banks: A Life*, Chicago: The University of Chicago Press
O'Brien, Seamus 2011, *In the Footsteps of Augustine Henry*, Woodbridge: Garden Art Press
O'Malley, John W. 2013, *Saints or Devils Incarnate? Studies in Jesuit History*, Leiden: Brill
Obringer, Frédéric 2011, 'Chinese medicine and the enticement of heritage status', N. Jayaram (trans.), *China Perspectives*, (3): 15-22
Olson, J. Stuart 1998, *An Ethnohistorical Dictionary of China*, Westport: Greenwood Press
Ooba, Osamu 1995, 'Sino-Japanese relations in the Edo period: Part one. Forgotten Sino-Japanese contacts', Joshua A. Fogel (trans.), *Sino-Japanese Studies*, 8(1): 40-52
Otsuka, Yasuo 1976, 'Chinese traditional medicine in Japan', In: *Asian Medical Systems: A Comparative Study*, Charles M. Leslie (ed.), Berkeley: University of California Press
Packer, Lester *et al*. (eds.) 2004, *Herbal and traditional medicine: molecular aspects of health*, New York: Marcel Dekker
Pang, T. A. 1997, 'Manchu Collections in Paris', *Manuscripta Orientalia*, 3(1): 33-39
Pasang Yonten Arya 1998, *Dictionary of Tibetan materia medica*, Delhi: Motilal Banarsidass
Passoth, Jan-Hendrik *et al*. (eds.) 2012, *Agency Without Actors?: New Approaches to Collective Action*, London: Routledge
Paz, Denis G. (ed.) 1995, *Nineteenth-century English Religious Traditions: Retrospect and Prospect*,

London: Greenwood Press
Phan, Peter C. (ed.) 2011, *Christianities in Asia*, Chichester: Wiley-Blackwell
Plutschow, Herbert E. 2007, *Philipp Franz Von Siebold and the Opening of Japan: A Re-evaluationon*, Folkestone: Global Oriental
Pollack, David 1983, 'The Informing image. 'China' in Genji Monogatari', *Monumenta Nipponica*, 38(4): 359-375
Pordié, Laurent (ed.) 2008, *Tibetan Medicine in the Contemporary World: Global Politics of Medical Knowledge and Practice*, London: Routledge
Porter, Roy (ed.) 2001, *The Cambridge Illustrated History of Medicine*, Cambridge: Cambridge University Press
Potts, Patricia 2003, *Modernising Education in Britain and China: Comparative Perspectives on Excellence and Social Inclusion*, London: RoutledgeFalmer
Pouillon, François (ed) 2008, *Dictionnaire des Orientalistes de Langue Française*, Paris: IISMM & Karthala
Prance, Ghillean T. 2010, 'A brief history of conservation at the Royal Botanic Gardens, Kew', *Kew Bulletin*, 65: 501-508
Preyer, Gerhard 2013, 'The perspective of multiple modernities. on Shmuel Eisenstadt's sociology', *Theory and Society: Journal of Political and Moral Theory*, 30: 187-225
Preyer, Gerhard and Michael Sussman (eds.) 2015, *Varieties of Multiple Modernities*, Leiden: Brill
Principe, Lawrence M. 2011, *Scientific Revolution: A Very Short Introduction*, Oxford: Oxford University Press
Puente-Ballesteros, Beatriz 2011, 'Jesuit medicine in the Kangxi Court (1662-1722): Imperial networks and patronage', *East Asian Science, Technology, and Medicine*, (34): 86-162
Puga, R. Miguel 2013, *The British Presence in Macau, 1635-1793*, Monica Andrade (trans.), Hong Kong: Hong Kong University Press
Quested, Rosemary K. I. 2014, *Sino-Russian Relations: A Short History*, London: Routledge
Quirke, Viviane and Jean-Paul Gaudillière 2008, 'The era of biomedicine: science, medicine, and public health in Britain and France after the Second World War', *Medical History*, 52(4): 441-452
Raina, Dhruv 2012, 'The naturalization of modern science in South Asia: a historical overview of the processes of domestication and globalization', In: *The Globalization of Knowledge in History*, Jürgen Renn (ed.), Berlin: Max Planck Institute
Raj, Kapil 2010, *Relocating Modern Science: Circulation and the Construction of Knowledge in South Asia and Europe, 1650-1900*, New York: Palgrave Macmillan
Ratcliff, Jessica 2016, 'The East India Company, the Company's Museum, and the political economy of natural history in the early nineteenth century', *Isis*, 107(3): 495-517
Ravichandra, N. G. 2013, *Fundamentals of Plant Pathology*, Delhi: PHI Learning Private Ltd.
Reed, Christopher A. 2004, *Gutenberg in Shanghai: Chinese Print Capitalism, 1876-1937*, Vancouver: The University of British Columbia Press
Reed, Marcia and Paola Demattè (eds.) 2011, *China on Paper: European and Chinese Works from the Late Sixteenth to the Early Nineteenth Century*, Los Angeles: Getty Research Institute
Renn, Jürgen 2015, 'The history of science and the globalization of knowledge', In: *Relocating the History of Science: Essays in Honor of Kostas Gavroglu*, Theodore Arabatzis *et al*. (eds.), London: Springer
Reynolds, Douglas 1993, *China, 1898-1912: The Xinzheng Revolution and Japan*, Cambridge: Harvard University Asia Center
Rinaldi, Bianca M. 2006, *The "Chinese Garden in Good Taste": Jesuits and Europe's Knowledge of Chinese Flora and Art of the Garden in the 17th and 18th Centuries*, München: Meidenbauer
Ritvo, Harriet 1995, 'Classification and continuity in The Origin of Species', In: *Charles Darwin's the Origin of Species: New Interdisciplinary Essays*, David Amigoni and Jeff Wallace (eds.), Manchester: Manchester University Press
Rix, Martyn 2013, *The Golden Age of Botanical Art*, Chicago: The University of Chicago Press
Roe, Shirley A. 1982, 'Needham's controversy with Spallanzani: Can animals be produced from plants?', In: Lazzaro Spallanzani e la Biologia del Settecento: Teorie, Esperimenti, Istituzioni Scientifiche, G. Montalenti and P. Rossi (eds.), Florence: Leo S. Olschki
Roe, Shirley A. 1983, 'John Turberville Needham and the generation of living organisms', *Isis*, 74(2): 158-184
Rogaski, Ruth 2004, *Hygienic Modernity: Meanings of Health and Disease in Treaty-Port China*, Berkeley: University of California Press

Rowe, William T. 2009, *China's Last Empire: The Great Qing*, Cambridge: The Belknap Press of Harvard University Press
Russell, Ian 2007, 'Objects and agency: some obstacles and opportunities of modernity', *Journal of Iberian Archaeology*, 9/10: 71-87
Russell, Lani 2014, *Sociology for Health Professionals*, London: SAGE Publications
Sadria, Modjtaba (ed.) 2009, *Multiple Modernities in Muslim Societies*, London: I. B. Tauris Publishers
Scanlan, Nancy 2011, *Complementary Medicine for Veterinary Technicians and Nurses*, Oxford: Wiley-Blackwell
Scheid, Volker 2002, *Chinese Medicine in Contemporary China: Plurality and Synthesis*, Durham: Duke University Press
Scheid, Volker 2004, 'Restructuring the field of Chinese medicine: A study of the Menghe and Ding scholarly currents, 1600-2000 (part 1)', *East Asian Science, Technology, and Medicine*, (22): 10-68
Scheid, Volker 2005, 'Restructuring the field of Chinese medicine: A study of the Menghe and Ding scholarly currents, 1600-2000 (part 2)', *East Asian Science, Technology, and Medicine*, (23): 79-130
Scheid, Volker 2007, *Currents of Tradition in Chinese Medicine, 1626-2006*, Seattle: Eastland Press
Schilling, Tony 1985, 'Frank Kingdon-Ward (1885-1958)', *The Garden*, 110(6): 264-269
Schlager, Neil and Josh Lauer (eds.) 2000, *Science and Its Times: Understanding the Social Significance of Scientific Discovery*, Detroit: The Gale Group
Schmidt, Volker H. 2006, 'Multiple Modernities or Varieties of Modernity?', *Current Sociology*, 54(1): 77-97
Schmidt, Volker H. 2010, 'Modernity and diversity: reflections on the controversy between modernization theory and multiple modernists', *Social Science Information*, 49(4): 511-538
Schweinfurth, Ulrich and Heidrun Schweinfurth-Marby 1975, *Exploration in the Eastern Himalayas and the River Gorge Country of Southeastern Tibet: Francis (Frank) Kingdon Ward (1885-1958): An Annotated Bibliography with A Map of the Area of His Expeditions*, Wiesbaden: Franz Steiner Verlag
Screech, Timon 2005, *Japan Extolled and Decried: Carl Peter Thunberg and the Shogun's Realm, 1775-1776*, London: Routledge
Sequeiros, Leandro 1998, 'Tercer Centenaria del nacimiento de José Torrubia (1698-1761): viajero, naturalista y paleontólogo', *Boletín de la Comisión de Historia de la Geología en España*, (10): 287-290
Shapin, Steven 1992, 'Discipline and bounding: the history and sociology of science as seen through the externalism-internalism debate', *History of Science*, 30: 333-369
Shaw, David M. 2010, 'Homeopathy is where the harm is: five unethical effects of funding unscientific 'remedies'', *Journal of Medical Ethics*, 36(3): 130-131
Shen, Mei-ling 1983, 'The contribution of traditional Chinese medicine to modern pharmacology', *Trends in Pharmacological Sciences*, 4: 496-500
Shetler, Stanwyn G. 1967, *The Komarov Botanical Institute: 250 Years of Russian Research*, Washington: Smithsonian Institution Press
Shils, Edward 1981, *Tradition*, London: Faber and Faber
Shrestha, Bhushan *et al.* 2010, 'What is the Chinese caterpillar fungus *Ophiocordyceps sinensis* (Ophiocordycipitaceae)?', *Mycology: An International Journal on Fungal Biology*, 1(4): 228-236
Shrestha, Bhushan *et al.* 2014, 'A brief chronicle of the genus Cordyceps fr., the oldest valid genus in Cordycipitaceae (Hypocreales, Ascomycota)', *Mycobiology*, 42(2): 93-99
Sivin, Nathan 1993, 'Huang ti nei ching', In: *Early Chinese Texts: a Bibliographical Guide*, Michael Loewe (ed.), Berkeley: The Society for the Study of Early China and The Institute of East Asian Studies, University of California
Sivin, Nathan 2000, 'Editor's introduction', In: *Science and Civilisation in China (vol. 6 part 6: Medicine)*, Cambridge: Cambridge University Press
Skuncke, Marie-Christine 2014, *Carl Peter Thunberg: Botanist and Physician: Career-Building Across the Oceans in the Eighteenth Century*, Uppsala: Swedish Collegium for Advanced Study
Sladkovskii, M. Iosifovich 2008, *History of Economic Relations between Russia and China*, New Brunswick: Transaction Publishers
Smith, Kevin 2012, 'Homeopathy is unscientific and unethical', *Bioethics*, 26(9): 508-512
Soja, Edward W. 1989, *Postmodern Geographies: The Reassertion of Space in Critical Social*

Theory, London: Verso
Soja, Edward W. 2009, 'Taking space personally', In: *The Spatial Turn: Interdisciplinary Perspectives*, Barney Warf and Santa Arias (eds.), London: Routledge
Sokoloff, Dmitry D. *et al*. 2002, 'The history of botany in Moscow and Russia in the 18th and early 19th centuries in the context of the Linnaean Collection at Moscow University (MW)', *Huntia: A Journal of Botanical History*, 11(2): 129-191
Soloviev, Sergei M. 1991, *The First Romanov: Tsar Michael, 1613-1634*, G. Edward Orchard (trans.), Gulf Breeze: Academic International Press
Sonnedecker, Glenn 1997, 'P. Pomet—Harbinger of modern medical botany', *Pharmacy in History*, 39(4): 155
Spence, Jonathan D. 1974, *Emperor of China: Self Portrait of K'ang Hsi*, New York: Vintage Books
Spooner, Brian 2010, 'Largest fungarium in the world', *Kew Scientist*, (37): 1
Spooner, Brian and Paul Cannon 2010, 'World's largest collection of fungi held at Kew Gardens', *Mycologist News*, (1): 8-9
Standaert, Nicolas (ed.) 2001, *Handbook of Christianity in China* (vol. 2), Leiden: Brill
Stearn, William T. 1960, 'Biographical Introduction', In: *Pilgrimage for Plants*, Jean Kingdon-Ward (ed.), London: George G. Harrap & Co. Ltd
Stearn, William T. 1989, 'S. F. Gray's "Natural Arrangement of British Plants" (1821)', *Plant Systematics and Evolution*, 167(1-2): 23-34
Stearn, William T. 2006, *John Lindley, 1799-1865*, Woodbridge: Antique Collectors' Club in Association with the Royal Horticultural Society
Stefani, Marta 2002, *Corruzione e Generazione: John T. Needham e l'Origine del Vivente*, Firenze: Leo S. Olschi
Steinkraus, Donald C. and J. B. Whitfield 1994, 'Chinese caterpillar fungus and world record runners', *American Entomologist*, 40(4): 235-239
Stephen, Leslie (ed.) 1885, *Dictionary of National Biography (vol. 1)*, London: Smith, Elder, & Co.
Stephen, Leslie and Sidney Lee (eds.) 1890, *Dictionary of National Biography (vol. 24)*, London: Smith, Elder, & Co.
Stephen, Leslie and Sidney Lee (eds.) 1908, *Dictionary of National Biography (vol. 8)*, London: Smith, Elder, & Co.
Sterckx, Roel 2002, *The Animal and the Daemon in Early China*, Albany: State University of New York Press
Stubbendieck, James L. *et al*. (eds.) 2003, *North American Wildland Plants: A Field Guide*, Lincoln: University of Nebraska Press
Sugimoto, Masayoshi and David L. Swain 1989, *Science and Culture in Traditional Japan*, Rutland: Charles E. Tuttle Co.
Sugiyama, Shigeo 2004, 'Traditional Kampo medicine: Unauthenticated in the Meiji era', *Historia Scientiarum*, 13(3): 209-223
Sung, Gi-Ho *et al*. 2007, 'Phylogenetic classification of Cordyceps and the clavicipitaceous fungi', *Studies in Mycology*, 57: 5-59
Sutton, Brian (ed.) 1996, *A Century of Mycology*, Cambridge: Cambridge University Press
Suzuki, Shogo 2009, *Civilization and Empire: China and Japan's Encounter with European International society*, London: Routledge
Taberner, Peter V. 1985, *Aphrodisiacs: The Science and the Myth*, Philadelphia: University of Pennsylvania Press
Talbott, John H. 1970, *A Biographical History of Medicine*, New York: Grune & Stratton
Tarrant, Emily 2012, *SOAS Special Collections Guides: Archival Sources on Medicine & Health*, London: SOAS Library
Tatnall, Arthur (ed.) 2013, *Social and Professional Applications of Actor-Network Theory for Technology Development*, Hershey: IGI Global
Taylor, David A. 2006, *Ginseng, the Divine Root: the Curious history of the Plant that Captivated the World*, Chapel Hill: Algonquin Books of Chapel Hill
Taylor, Kim 2001, 'A new, scientific, and unified medicine: civil war in China and the new acumoxa, 1945-49', In: *Innovation in Chinese Medicine*, Elisabeth Hsu (ed.), Cambridge: Cambridge University Press
Taylor, Kim 2005, *Chinese Medicine in Early Communist China, 1945-1963: A Medicine of Revolution*, London: RoutledgeCurzon
Terrace, Vincent 2011, *Encyclopedia of Television Shows, 1925 through 2010 (vol. 1)*, Jefferson: McFarland & Company

Thiede, Arnulf *et al.* (eds.) 2000, *Philipp Franz von Siebold and His Era: Prerequisites, Developments, Consequences and Perspectives*, Berlin: Springer-Verlag
Thompson, C. Michele 2015, *Vietnamese Traditional Medicine: A Social History*, Singapore: National University of Singapore Press
Thyssen, Patricia J. 2010, 'Keys for identification of immature insects', In: *Current Concepts in Forensic Entomology*, Jens Amendt *et al.* (eds.), Dordrecht: Springer
Tipps, Dean C. 1973, 'Modernization theory and the comparative study of societies: a critical perspective', *Comparative Studies in Society and History*, 15(2): 199-226
Torlais, Jean 1958, 'Chronologie de la vie et des œuvres de René-Antoine Ferchault de Réaumur', *Revue d'Histoire des Sciences et de Leurs Applications*, 11(1): 1-12
True, Alfred C. 1929, *A History of Agricultural Education in the United States: 1785-1925*, Washington: United States Government Printing Office
Tsering, Kunga 2007, *Crowded Mountains, Empty Towns: Commodification and Contestation in Cordyceps Harvesting in Eastern Tibet (MA Thesis)*, Boulder: University of Colorado
Tsien, Tsuen-hsuin 1954, 'Western impact on China through translation', *The Far Eastern Quarterly*, 13(3): 305-327
Tsien, Tsuen-hsuin 2011, 'Western impact on China through translation', In: *Collected Writings on Chinese Culture*, Hong Kong: Chinese University Press
Turner, I. M. 2011, 'The contribution of Jonathan Pereira (1804-1853) to plant taxonomy', *Kew Bulletin*, 66(4): 581-585
Twitchett, Denis and John K. Fairbank (eds.) 1978, *The Cambridge History of China (vol. 10): Late Ch'ing, 1800-1911, Part 1*, Cambridge: Cambridge University Press
Twitchett, Denis and John K. Fairbank (eds.) 1980, *The Cambridge History of China (vol. 11): Late Ch'ing, 1800-1911, Part 2*, Cambridge: Cambridge University Press
Unschuld, Paul U. 1986, *Medicine in China: A History of Pharmaceutics*, Berkeley: University of California Press
Unschuld, Paul U. 1992, 'Epistemological issues and changing legitimation: traditional Chinese medicine in the twentieth century', In: *Paths to Asian Medical Knowledge*, Charles Leslie and Allan Young (eds.), London: University of California Press
Unschuld, Paul U. and Zheng Jinsheng 2012, *Chinese Traditional Healing* (vol. 1), Leiden: Brill
Urdang, George 1944, 'The history of the Pharmacopoeia Londinensis', In: *Pharmacopoeia Londinensis of 1618*, Madison: State historical society of Wisconsin
Urdang, George 1946, 'Pharmacopoeias as witnesses of world history', *Journal of the History of Medicine and Allied Sciences*, 1(1): 46-70
Urdang, George 1951, 'The development of pharmacopoeias: A review with special reference to the Pharmacopoeia Internationalis', *Bulletin of the World Health Organization*, 4(4): 577-603
Valentine, Seán G. 2006, 'The modernisation of China and the Chinese critique of modernity', *Orientats*, 4: 7-22
Van Helden, Albert 1983, 'The birth of the modern scientific instrument, 1550-1770', In: *The Uses of Science in the Age of Newton*, John G. Burke (ed.), Berkeley: University of California Press
Vickery, A. R. 1978, 'James Britten: A Founder Member of the Folklore Society', *Folklore*, 89(1): 71-74
Viganò, Giulio *et al.* 2015, 'Homeopathy: from tradition to science?', *Journal of Medicine and the Person*, 13: 7-17
Von Collani, Claudia 1985, *P. Joachim Bouvet S.J.: Sein Leben und Sein Werk*, Nettetal: Steyler Verlag
Walravens, Hartmut 1980, 'Alexander Tatarinov (1817-1886)—russischer Arzt und Sinologe: Eine biobibliographische Skizze', *Sudhoffs Archiv*, 64(4): 392-396
Walravens, Hartmut 2012, 'Bernard Emms Read (1887-1949), a list of his publications', *Monumenta Serica*, 60(1): 481-516
Wang, Yun-chang 1985, 'Mycology in China with emphasis on review of the ancient literature', *Acta Mycologica Sinica*, 4(3): 133-140
Wang, Zhenping 2005, *Ambassadors from the Islands of Immortals: China-Japan Relations in the Han-Tang Period*, Honolulu: University of Hawaii Press
Wang, Zuoyue 2002, 'Saving China through science: The Science Society of China, scientific nationalism, and civil society in Republican China', *Osiris*, 17: 291-322
Wang, Zuoyue 2007, 'Science and the State in modern China', *Isis*, 98(3): 558-570
Wanner, Michal 2015, 'Russian-Chinese trade in Kyakhta—Trade development and volume indicators 1727-1861', *Prague Papers on the History of International Relations*, 1: 17-27

Watt, John R. 2013, *Saving Lives in Wartime China: How Medical Reformers Built Modern Healthcare Systems amid War and Epidemics*, 1928-1945, Leiden: Brill

Wayne, Randy O. 2009, *Plant Cell Biology: From Astronomy to Zoology*, London: Academic Press

Webster, John 1999, 'Geoffrey Clough Ainsworth, 1905-1998', *Mycologia*, 91(4): 714-719

Welland, Sasha Su-Ling 2006, *A Thousand Miles of Dreams: The Journeys of Two Chinese Sisters*, Lanham: Rowman & Littlefield Publishers

Wessells, Anne T. 2007, 'A Review of: Reassembling the Social: An Introduction to Actor-Network-Theory by Bruno Latour', *International Public Management Journal*, 10(3): 351-356

Whitehead, P. J. P. 1969, 'The Reeves collection of Chinese fish drawings', *Bulletin of the British Museum (Natural History): Historical Series*, 3(7): 191-233

Wimmell, Kenneth 2003, *William Woodville Rockhill: Scholar-Diplomat of the Tibetan Highlands*, Bangkok: Orchid Press

Winkler, Daniel 2008a, 'The mushrooming fungi market in Tibet exemplified by *Cordyceps sinensis* and *Tricholoma matsutake*', *Journal of the International Association of Tibetan Studies*, (4): 1-47

Winkler, Daniel 2008b, '*Yartsa Gunbu* (*Cordyceps sinensis*) and the fungal commodification of Tibet's rural economy', *Economic Botany*, 63(2): 291-305

Winkler, Daniel 2009, 'Caterpillar fungus (*Ophiocordyceps sinensis*) poduction and sustainability on the Tibetan Plateau and in the Himalayas', *Asian Medicine: Tradition and Modernity*, 5: 291-316

Witek, John W. (ed.) 1994, *Ferdinand Verbiest (1623-1688): Jesuit Missionary, Scientist, Engineer and Diplomat*, Nettetal: Steyler Verlag

Withers, Charles W. J. 2009, 'Place and the 'spatial turn' in geography and in history', *Journal of the History of Ideas*, 70(4): 637-658

Witteveen, Joeri 2015, 'Naming and contingency: the type method of biological taxonomy', *Biology & Philosophy*, 30(4): 569-586

Witteveen, Joeri 2016, 'Suppressing synonymy with a homonym: The emergence of the nomenclatural type concept in nineteenth century natural history', *Journal of the History of Biology*, 49(1): 135-189

Wong, Timothy M. K. 2000, 'The limits of ambiguity in the German identity in nineteenth century Hong Kong: With special reference to Ernest John Eitel (1838-1908)', In: *Sino-German Relations Since 1800: Multidisciplinary Explorations*, K. S. Mak Ricardo and Danny S. L. Paau (eds.), New York: P. Lang

Wood, Frances 2007, *The First Emperor of China*, London: Profile Books

Wood, Phyllis and Patrick McDonnell 1994, *Scientific Illustration: A Guide to Biological, Zoological, and Medical Rendering Techniques, Design, Printing, and Display*, New York: John Wiley & Sons

Woolcock, Michael 2009, 'The next 10 years in development studies: From modernization to multiple modernities, in theory and practice', *European Journal of Development Research*, 21: 4-9

Woolf, Daniel R. (ed.) 2014, *A Global Encyclopedia of Historical Writing*, London: Routledge

Wright, David 2000, *Translating Science: The Transmission of Western Chemistry into Late Imperial China, 1840-1900*, Leiden: Brill

Wright, Stanley F. 1950, *Hart and the Chinese Customs*, Belfast: Wm. Mullan and Son

Yue, Mei 1999, 'Hybrid science versus modernity: the practice of the Jiangnan Arsenal, 1864-1897', *East Asian Science, Technology, and Medicine*, (16): 13-52

Zanasi, Margherita 2004, 'Far from the treaty ports: Fang Xianting and the idea of rural modernity in 1930s China', *Modern China*, 30(1): 113-146

Zhan, Mei 2009, *Other-Worldly: Making Chinese medicine through transnational frames*, Durham: Duke University Press

Zhang, Qiong 2015, *Making the New World Their Own: Chinese Encounters with Jesuit Science in the Age of Discovery*, Leiden: Brill

Zhao, Changtian 2013, *An Irishman in China: Robert Hart, Inspector General of the Chinese Imperial Maritime Customs*, Shanghai: Shanghai Press

Zheng, Yangwen 2005, *The Social Life of Opium in China*, Cambridge: Cambridge University Press

Gukov Гуков, Г. Викторович *et al.* 2001, *Чье Имя Мы Носишь, Растение?: Сто Пятьдесят Кратких Биографий: Из Истории Ботанических Исследований на Дальнем Востоке*, Владивосток: Дальнаука

Li Ли, Минь and Л. П. Churilov Чурилов 2014, ‘Китайские рукописи и старопечатные книги по медицине в фондах Восточного отдела научной библиотеки имени М. Горького Санкт-Петербургского государственного университета’, *Вестник Санкт-Петербургского Университета*, 2(11): 259-277
Ministerstvo Zdravookhraneniya Министерство Здравоохранения 1968, *Советское Здравоохранение*, Москва: Гос. Изд-во Медицинской Литературы
Myasnikov Мясников, В. Степанович and Наталья Ф. Demidova Демидова 1966, *Первые Русские Дипломаты в Китае*, Москва: Издательство «Наука»
Skachkov Скачков, П. Е. 1958, ‘Русские врачи при российской духовной миссии в Пекине’, *Советское Китаеведение*, (4): 136-148
Skachkov Скачков, П. Е. 1977, *Очерки Истории Русского Китаеведения*, Москва: Наука
Sladkovskiy Сладковский, Михаил И. 1974, *История Моргово-Экономических Отношений Народов России с Китаем (до 1917 г.)*, Москва: Издательство «Наука»
Stepanov Степанов, А. И. 1976, *Русский Берег. Истории Географических Названии*, Владивосток: Дальневосточное Книжное Издательство
Shcherbakova Щербакова, Антонина А. 1961, *История Цитологии Растений в России в XIX Веке*, Москва: Академия Наук СССР

(B) Sources in Japanese Language

Andou Yutaka 安藤裕 1993, ‘Shoku butsu manabu mono mi yoshi manabu ken kyuu shi ryou I 植物學者三好學研究資料 I’, *Kiyo izumi jo manabu in tan ki oh manabu ken kyuu ki you* 清泉女學院短期大學研究紀要, (11): 203-226
Andou Yutaka 安藤裕 1994, ‘Shoku butsu manabu mono mi yoshi manabu ken kyuu shi ryou III 植物學者三好學研究資料 III’, *Kiyo izumi jo manabu in tan ki oh manabu ken kyuu ki you* 清泉女學院短期大學研究紀要, (12): 11-34
Andou Yutaka 安藤裕 1995, ‘Shoku butsu manabu mono mi yoshi manabu ken kyuu shi ryou IV 植物學者三好學研究資料 IV’, *Kiyo izumi jo manabu in tan ki oh manabu ken kyuu ki you* 清泉女學院短期大學研究紀要, (13): 67-90
Andou Yutaka 安藤裕 1996, ‘Shoku butsu manabu mono mi yoshi manabu ken kyuu shi ryou V 植物學者三好學研究資料 V’, *Ue da jo shi tan ki dai gaku ki you* 上田女子短期大学紀要, (19): 107-128
Andou Yutaka 安藤裕 and Ochiai Teruo 落合照雄 1994, ‘Shoku butsu manabu mono mi yoshi manabu ken kyuu shi ryou II 植物學者三好學研究資料 II’, *Kiyo izumi jo manabu in tan ki oh manabu ken kyuu ki you* 清泉女學院短期大學研究紀要, (12): 137-162
Anonymous 1982, ‘Fujita (Toyohachi) haku shi cho saku moku roku 藤田(豊八)博士著作目録’, *Higashi gata manabu* 東方學, (63): 199-202
Chi ba ken ritsu chuu ou haku butsu kan 千葉県立中央博物館 (ed.) 2008, *Ri n ne to haku butsu gaku: Shi zen shi ka gaku no gen ryuu* リンネと博物学: 自然誌科学の源流, Toukyou 東京: Bun ichi sou gou shu pan 文一総合出版
Cui Shufen 崔淑芬 1996, *Kin dai naka kuni ni o ke ru shi han kyouiku no ten kai: Kiyo sue ka ra nen ma de wo chuu shin to shi te* 近代中國における師範教育の展開：清末から 1948 年までを中心として, Fukuoka 福岡: Jou zhou da xue wen xue yan jiu ke dong yang shi bo shi hou qi ke cheng 九州大學文學研究科東洋史博士後期課程
Fujikawa Yuu 富士川游 1904, *Ni hon i gaku hitoshi* 日本醫學史, Toukyou 東京: Mo hana bou 裳華房
Fukagawa Shindou 深川晨堂 [1934] 1981, *Kara you i manabu tou sou ji* 漢洋医学闘争史, Toukyou 東京: I satoshi sha 医聖社
Fukushima Yoshikazu 福島好和 1978, ‘Kurimoto Tanshuu to gyo fu (ichi): Tan shuu no shou gai to so no ken kyuu 栗本丹洲と魚譜(一): 丹洲の生涯とその研究’, *Jin bun ron kyuu* 人文論究, 28(3): 1-23
Hasegawa Jin 長谷川仁 1977, ‘Kurita Man ji rou kai gai chou sa no ko to 栗田万次郎海外調査のこと’, *Shi zen* 自然, 32(2): 18-19
Hirano Kunio 平野邦雄 and Seno Seiichirou 瀬野精一郎 (eds.) 2006, *Ni hon ko dai chuu sei jin*

mei ji ten 日本古代中世人名辞典, Toukyou 東京: Yoshi kawa kou bun kan 吉川弘文館
Ishida Sumio 石田純郎 2002, ‘『Kai tai shin sho』 no gen cho sha ku ru mu su ni tsu i te no ken kyuu 『解体新書』の原著者クルムスについての研究’, *Ni pon i shi gaku za shi* 日本医史学雑誌, 48(1): 31-51
Ishikawa Tsunekazu 石川恒和 (ed.) 1886, *Ni hon yaku kyoku hou* 日本薬局方, Toukyou 東京: Chuu ai sha 忠愛社
Ito Kazou 伊藤一雄 1965, ‘Ni hon ni o ke ru ki byou gaku hatta tsu no tem bou: ni hon ki byou gku shi (II) 日本における樹病学発達の展望: 日本樹病学史 (II)’, *Ring you shi ken jou ken kyuu hou koku* 林業試験場研究報告, (181): 1-196
Ito Mamiko 伊藤真実子 2012, ’19 sei ki ni hon no shi no chou ryuu edo kou ki～mei ji sho ki no hyaku ka ji ten, haku butsu gaku, haru ran kai 19 世紀日本の知の潮流: 江戸後期～明治初期の百科事典、博物学、博覧会’, *19 sei ki gaku ken kyuu* 19 世紀学研究, (6): 59-78
Iwatsu Tomareyuu 岩津都希雄 2010, *Ito Tokutaro: Haji me te shoku butsu ni manabu mei wo atae ta ni hon jin* 伊藤篤太郎: 初めて植物に學名を與えた日本人, Toukyou 東京: Ya saka sho bou 八阪書房
Kanao Seizou 金尾清造 1960, *Na gai naga yoshi tsutou* 長井長義傳, Toukyou 東京: Ni hon gusuri gak kai 日本薬学会
Katou, Kyouko 加藤恭子 2015, ‘20 sei ki sho tou ni o ke ru ni hon jin jo shi kyou in no juu kuni ha ken 20 世紀初頭における日本人女子教員の中國派遣’, *Ji e n da ken kyuu* ジェンダー研究, (18): 73-85
Kawachi Haruto 河内春人 2013, *Higashi a ji a kou ryuu shi no na ka no ken tou shi* 東アジア交流史のなかの遣唐使, Toukyou 東京: Kyuu ko sho in 汲古書院
Kenjou Teiji 見城悌治 2014, ‘Chi ba i gaku se mmon gak kou chi ba i ka dai gaku ji dai no tome manabu umare wo me gu ru sho shi ryou ni tsu i te 千葉医学専門学校・千葉医科大学時代の留學生をめぐる諸史料について’, *Kuni giwa kyou iku* 國際教育, 7: 85-117
Koizumi Eijirou 小泉榮次郎 1934, *Ni hon kam pou i yaku hen sen shi* 日本漢方医薬変遷史, Ousaka 大阪: Fuji sawa Tomo kichi shou ten 藤沢友吉商店
Kobayashi Yoshio 小林義雄 1983, *Ni pon chuu goku kin rui reki shi to min zoku gaku* 日本中国菌類歴史と民俗学, Toukyou 東京: Hiro kawa sho ten 廣川書店
Koku ritsu koku kai to sho kan [KRKKTSK] 国立国会図書館 1989, *Shi zen wo mi ru manako haku butsu shi no tou zai kou ryuu ten ji kai me roku* 自然をみる眼: 博物誌の東西交流展示会目錄, Toukyou 東京: Koku ritsu koku kai to sho kan 国立国会図書館
Koura Sai 高良斎 1836, *Ran hou nai you yaku nou shiki* 蘭法内用薬能識, [Place Unknown]: Shou en dou 照渕堂
Kouyama Ryuuzou 高山龍三 2011, *Kawa guchi e kai he no tabi: Sha ka sei tan chi ni megu rei shi ta to bi to* 河口慧海への旅: 釈迦生誕地に巡禮した人びと, Toukyou 東京: Masaru makoto shu ppan 勉誠出版
Mahito Motokai 真人元開 [779] 2000, *Tang da he shang dong zheng zhuan* 唐大和上東征傳, Wang Xiangrong 汪向榮 (ed.), Beijing 北京: Zhong hua shu ju 中華書局
Matsushima Hiroshi 松島博 1968, ‘Hon zou gaku sha ni wa sei haku no ken kyuu 本草学者丹羽正伯の研究’, *Mi e ken ritsu dai gaku ken kyuu nem pou* 三重県立大学研究年報, 6(1): 32-67
Mayanagi Makoto 真柳誠 2010, ‘Nichi kan etsu no i manabu to chuu kuni i sho 日韓越の醫學と中國醫書’, *Ni hon manabu i shi za sshi* 日本醫史學雜誌, 56(2): 151-159
Nakano Takashi 中野卓 and Suzuki ikuo 鈴木郁生 1999, *Nakao Manzou san den: naka kuni furu tou ji to hon zou manabu no sen ku mono* 中尾萬三伝: 中國古陶磁と本草學の先駆者, Toukyou 東京: Gatana sui sho fusa 刀水書房
Ni hon kou tei sho kyou kai [NHKTSKK] 日本公定書協会 (ed.) 2001, *Ni hon yaku kyoku hou* 日本薬局方, Toukyou 東京: Ji ho u じほう
Nishimura Saburo 西村三郎 1999, *Bum mei no na ka no haku butsu gaku: sei ou to ni hon* 文明のなかの博物学: 西欧と日本 (vol. 1), Toukyou 東京: Kino i kuni ya sho ten 紀伊國屋書店
Okuzawa Yasumasa 奥沢康正 2007, ‘Tou chuu ka sou (kougi) torai no reki shi to yaku butsu to shi te no ju you 冬虫夏草(広義)渡来の歴史と薬物としての受容’, *Ni pon i shi gaku za shi* 日

本医史学雑誌, 53(1): 178-179
Okuzawa Yasumasa 奥沢康正 2012, *Tou chuu ka sou no bun ka shi* 冬虫夏草の文化誌, Kyouto 京都: Ishi da tai sei sha 石田大成社
Ooba Osamu 大庭脩 1984, *Edo ji dai ni o ke ru chuu goku bun ka ju you no ken kyuu* 江戸時代における中国文化受容の研究, Kyouto 京都: Dou hou sha 同朋舎
Osodo Hiroshi 小曽戸洋 1999, *Kam pou no reki shi* 漢方の歴史, Toukyou 東京: Tai shuu kan sho ten 大修館書店
Osodo Hiroshi 小曽戸洋 2003, 'Ta ki gen kan・Moto ken no kou seki 多紀元簡・元堅の功績', *Kan pou no rin shou* 漢方の臨床, 50(5): 759-765
Oyanagi Tsukasakifutoshi 小柳司気太 1982, 'Fujita Toyohachi haku shi ryaku den 藤田豊八博士略伝', *Higashi gata manabu* 東方學, (63): 193-198
Ruu bu ru sha ルーブル社 1922, Dai ni hon jin butsu mei kan 大日本人物名鑑 (vol. 4), Toukyou 東京: Ruu bu ru sha shu pan bu ルーブル社出版部
Ryou Atsuhito 廖温仁 1931, *Shi na chuu sei i gaku shi* 支那中世医学史, Kyouto 京都: Naka hara shuu ji 中原脩司
Saga Shousaku 嵯峨正作 (ed.) 1900, *Dai ni hon jim mei ji sho* 大日本人名辞書, Toukyou 東京: Kyou zai zatsu shi sha 經濟雜誌社
Sanetou, Keishuu 実藤恵秀 1960, *Chuu kuni hito ni hon tome manabu shi* 中國人日本留學史, Toukyou 東京: Ku ro shi o shu ppan くろしお出版
Satou Kouji 佐藤恒二 1950a, 'Aoki Konyou sen sei no ji seki (jou) 青木昆陽先生の事跡(上)', *Kou dou* 弘道, 59(657): 18-19
Satou Kouji 佐藤恒二 1950b, 'Aoki Konyou sen sei no ji seki (ge) 青木昆陽先生の事跡(下)', *Kou dou* 弘道, 59(658): 21-23
Shen Guowei 沈國威 2000, *Ue manabu satoru hara to shoku butsu manabu no goi: Kin dai nichi naka shoku butsu manabu you go no kei sei to kou ryuu* 植學啓原と植物學の語彙: 近代日中植物學用語の形成と交流, Fukeda 吹田: Kan sai dai manabu shu ppan bu
Shimizu Toutarou 清水藤太郎 1949, *Ni hon yaku gaku shi* 日本薬学史, Toukyou 東京: Nan zan dou 南山堂
Sugimura Shinji 杉村伸二 2007, 'Jo Fukuwatari-bi setsuwa no seiritsu——Gensetsu to shite no Jofuku kara miru Nitchuu bunka kouryuu no kiseki 徐福渡日説話の成立——言説としての徐福からみる日中文化交流の軌跡', *Ajia bunka kouryuu kenkyuu* アジア文化交流研究, (2): 323-337
Terasawa Katsutoshi 寺澤捷年 1997, 'Kam pou i gaku: ka ko・gen zai・mi rai 漢方医学: 過去・現在・未来', *Ni hon tou you i gaku zatsu shi* 日本東洋医学雑誌, 48(2): 163-176
Ueda Masaki 上田正昭 *et al*. (eds.) 1976, *Ko n sa i su jim mei ji ten: Ni hon hen* コンサイス人名事典: 日本編, Toukyou 東京: San sei dou 三省堂
Ueno Masuzou 上野益三 1973, *Ni hon haku butsu gaku shi* 日本博物学史, Toukyou 東京: Hei bon sha 平凡社
Warabe Tokukoto 童徳琴 2014, '17-19 sei ki nichi chuu yaku shu bou eki shi no gen jou to tem bou 17-19 世紀日中薬種貿易史の現状と展望', *Kyuu shuu dai gaku tou you shi ron shuu* 九州大学東洋史論集, (42): 1-12
Watanabe Junsei 渡辺純成 2012, 'Man su go sei you yaku kin ma ni yu a ru sei you gusuri sho ni tsu i te 満洲語西洋薬品マニュアル『西洋薬書』について', *Ni hon i shi gaku za sshi* 日本医史学雑誌, (2): 159
Yamashita Noboru 山下龍 2015, 'Ran gaku no reki shi to hatu ten no gai you 蘭学の歴史と発展の概要', *Naga saki dai gaku gen go kyou iku ken kyuu se n ta ki you* 長崎大学言語教育研究センター紀要, 3: 57-77
Yamata Kouin 山田光胤 1996, 'Ni hon kam pou i gaku no den shou to kei fu 日本漢方医学の伝承と系譜', *Ni hon tou you i gaku zatsu shi* 日本東洋医学雑誌, 46(4): 505-518
Yasuu Michiaki 矢数道明 1962, 'Mei ji ji dai ni o ke ru kan yaku no ya kuri gaku teki ken kyuu gyou seki to so no shi teki kou satsu: shu to shi te i nook kichi jin shi no kan yaku ken kyuu wo me gu tte 明治時代における漢薬の薬理学的研究業績とその史的考察: 主として猪子吉

人氏の漢薬研究をめぐって', *Ni hon tou you i gaku zatsu shi* 日本東洋医学雜誌, 13(3): 111-119
Yasuu Michiaki 矢数道明 1969, 'Mei ji i kuo kan you ryou i gaku no tai ritsu to kou ryou no hen sen ni tsu i te 明治以降漢洋両医学の対立と交流の変遷について', *Ni hon tou you i gaku kai shi* 日本東洋医学会誌, 20(2): 55-58
Yasuu Michiaki 矢数道明 1982, *Kin sei kam pou i gaku shi* 近世漢方医学史, Toukyou 東京: Mei cho shu ppan 名著出版

(C) Sources in Chinese Language

Anonymous 2002, 'Deng shu qun (S. C. Teng) xian sheng sheng ping 鄧叔群(S. C. Teng)先生生平', *Jun wu xi tong* 菌物系統, 21(4): 465
Anonymous 2009, 'Kang nai er da xue zhong guo jun wu biao ben fan gui gu li 康奈爾大學中國菌物標本返歸故里', *Zhong guo jun wu xue hui hui kan* 中國菌物學會會刊, 7(2): 11-13
Ba Jigemude 巴•吉格木德 2004, *Meng gu zu yi xue shi* 蒙古族醫學史, Shenyang 瀋陽: Liao ning min zu chu ban she 遼寧民族出版社
Bao Xuesheng 包雪聲 *et al*. (ed.) 2004, *Zhong guo ming gui, chuan tong zhong yao yu bao jian yin pin: Feng dou* 中國名貴, 傳統中藥與保健飲品: 楓鬥, Shanghai 上海: Shang hai ke xue ji shu wen xian chu ban she 上海科學技術文獻出版社
Bao Yintu 寶音圖 *et al*. 2004a, 'Zhu ming meng yao xue jia zhan bu la dao er ji sheng ping xin kao 著名蒙藥學家占布拉道爾吉生平新考', *Zhong hua yi shi za zhi* 中華醫史雜志, 34(3): 162-165
Bao Yintu 寶音圖 *et al*. 2004b, 'Zhu ming meng yi yao xue jia yi xi ba la zhu er ji qi xue shu cheng guo shu ping 著名蒙醫藥學家伊希巴拉珠爾及其學術成果述評', *Mei meng gu min zu da xue xue bao* 內蒙古民族大學學報, 19(5): 554-557
Bei jing shi fan da xue qing shi yan jiu xiao zu [BJSFDXQSYJXZ] 北京師範大學清史研究小組 (ed.) 1977, *1689 nian de zhong e ni bu chu tiao yue* 1689 年的中俄尼布楚條約, Beijing 北京: Ren min chu ban she 人民出版社
Bei jing zhong yi xue yuan yi jiu wu qi nian ban [BJZYXYYJWQNB] 北京中醫學院一九五七年班 (ed.) 1960, *Zhong yao jian shi* 中藥簡史, Beijing 北京: Ke xue ji shu chu ban she 科學技術出版社
Ben kan bian ji bu [BKBJB] 本刊編輯部 1984, 'Shou yi xue jia yang shou shen zai mei shi shi 獸醫學家楊守紳教授在美逝世', *Zhong guo shou yi za zhi* 中國獸醫雜誌, (3): 56
Bi Lijuan 畢麗娟 *et al*. 2014, 'Jin dai shang hai zhong xi yi hui tong yun dong de fa zhan ji qi yi yi 近代上海中西醫匯通運動的發展及其意義', *Zhong guo zhong yi yao tu shu qing bao za zhi* 中國中醫藥圖書情報雜誌, 38(5): 41-45
Cai Dingguo 蔡定國 and Lu Yongquan 盧湧泉 1981, 'Wo guo zhu ming yao wu hua xue jia tang teng han jiao shou 我國著名藥物化學家湯騰漢教授', *Yao xue tong bao* 藥學通報, 16(9): 43-45
Cai Hongxin 蔡鴻新 and Wang Zunwang 王尊旺 2013, 'Jin dai lai hua xi fang ren zhong yi wen hua guan chu tan 近代來華西方人中醫文化觀初探', In: *Zhong hua zhong yi yao xue hui di shi wu ci zhong yi yi shi wen xian xue shu nian hui lun wen ji* 中華中醫藥學會第十五次中醫醫史文獻學術年會論文集, Beijing 北京: Zhong hua zhong yi yao xue hui 中華中醫藥學會
Cai Jingfeng 蔡景峰 (ed.) 1996, *Zhong guo zang yi xue* 中國藏醫學, Beijing 北京: Ke xue chu ban she 科學出版社
Cai Jingfeng 蔡景峰 1995, *Zhong guo zang yi xue* 中國藏醫學, Beijing 北京: Ke xue chu ban she 科學出版社
Cai Mingzhe 蔡名哲 2011, 'Xi yang yao shu qu du yao you yi zhu 《西洋藥書》《祛毒藥油》譯注', *Zhong guo bian zheng* 中國邊政, (187): 69-78
Cai Mingzhe 蔡名哲 2015, 'Man wen Xi yang yao shu di er zhi di liu yao fang ji xiang guan wen ti 滿文《西洋藥書》第二至第六藥方及相關問題', *Ji lin shi fan da xue xue bao (Ren wen she hui ke xue ban)* 吉林師範大學學報(人文社會科學版), (4): 14-17, 22
Cao Dongyi 曹東義 2004, *Zhong yi wai gan re bing xue shi* 中醫外感熱病學史, Beijing 北京:

Zhong yi gu ji chu ban she 中醫古籍出版社
Cao Hui 曹暉 1991, 'Guan yu zhong guo yao xue hui cheng li nian fen de chu bu kao cha 關於中國藥學會成立年份的初步考察', *Zhong guo yao xue za zhi* 中國藥學雜誌, 26(11): 689-691
Cao Hui 曹暉 1993, 'Xi du *Zhong guo jin dai yao xue shi* 喜讀《中國近代藥學史》', *Zhong guo yao xue za zhi* 中國藥學雜誌, 28(9): 569-570
Cao Hui 曹暉 2002, 'Zhong guo yao xue hui chuang shi ren ji shou ren hui zhang——Wang huan wen xian sheng sheng ping jian lue 中國藥學會創始人及首任會長——王煥文先生生平簡略', *Zhong guo yao xue za zhi* 中國藥學雜誌, 37(5): 394-395
Cao Hui 曹暉 2003, 'Zhong guo yao xue hui chuang shi hui yuan sheng ping shi liao kao lue 中國藥學會創始會員生平史料考略', *Zhong guo yao xue za zhi* 中國藥學雜誌, 38(2): 149-152
Cao Lijuan 曹麗娟 2006, 'Min guo shi qi zhong yi yi yuan lei xing yan jiu 民國時期中醫醫院類型研究', *Zhong hua yi shi za zhi* 中華醫史雜誌, 36(1): 18-22
Chang zhou shi di fang zhi bian zuan wei yuan hui [CZSDFZBZWYH] 常州市地方誌編纂委員會 (ed.) 1995, *Chang zhou shi zhi (Di san ce)* 常州市志(第 3 册), Beijing 北京: Zhong guo she hui ke xue chu ban she 中國社會科學出版社
Chen Chao 陳超 and Liu Yuqing 劉玉清 1985, *Qing hai di fang zhi shu jie shao* 青海地方誌書介紹, Changchun 長春: Ji lin sheng di fang zhi bian zuan wei yuan hui 吉林省地方誌編纂委員會
Chen Dinghong 陳定閎 2014, 'Chen bang xian xian sheng nian pu 陳邦賢先生年譜', In: *"Yi shi yan jiu hui" bai nian ji nian wen ji* "醫史研究會"百年紀念文集, Taiyuan 太原: Zhong hua yi xue hui yi shi xue fen hui 中華醫學會醫史學分會
Chen Fukang 陳福康 1988, *Zheng zhen duo nian pu* 鄭振鐸年譜, Beijing 北京: Shu mu wen xian chu ban she 書目文獻出版社
Chen Jiaming 陳嘉明 2009, '"Xian dai xing" yan jiu de hui wang yu fan si "現代性"研究的回望與反思', *Yun nan da xue xue bao (she hui ke xue ban)* 雲南大學學報(社會科學版), 8(1): 67-76
Chen Jinhuai 陳荊淮 2011, 'Shan tou kai bu shi jian zhuan lun 汕頭開埠時間專論', *Shan tou da xue xue bao (Ren wen she hui ke xue ban)* 汕頭大學學報(人文社會科學版), 27(2): 16-21
Chen Keji 陳可冀 2009b, 'Qing dai nei ting zhong ren sheng de guang fan shi yong 清代內廷中人參的廣泛應用', In: *Qing gong yi an ji cheng* (*Xia ce*) 清宮醫案集成 (下冊), Chen Keji 陳可冀 (ed.), Beijing 北京: Ke xue chu ban she 科學出版社
Chen Lei 陳雷 2003, ''Xin zhu shen' yu 'nao zhu shen' bian xi "心主神"與"腦主神"辨析', *Zhong yi yao xue kan* 中醫藥學刊, 21(11): 1841-1842
Chen Lijuan 陳麗娟 and Wang Chuanchao 王傳超 2012, '20 shiji 30 nian dai de fo ci yao chang yu zhong yao xi zhi 20 世紀 30 年代的佛慈藥廠與中藥西制', *Zhong guo ke ji shi za zhi* 中國科技史雜誌, 33(1): 56-66
Chen Meilin 陳美林 1990, *Wu jing zi ping zhuan* 吳敬梓評傳, Nanjing 南京: Nan jing da xue chu ban she 南京大學出版社
Chen Meilin 陳美林 2006, *Ru lin wais hi yan jiu shi* 《儒林外史》研究史, Fuzhou 福州: Hai xia wen yi chu ban she 海峽文藝出版社
Chen Ming 陳明 2009, ''Xi du shi' yu 'qing xin wan'——Yan xing shi yu chuan jiao shi de yao wu jiao liu "吸毒石"與"清心丸"——燕行使與傳教士的藥物交流', *Zhong hua wen shi lun cong* 中華文史論叢, (1): 311-346
Chen Qi 陳琦 2006, 'Wang ji min, Wu lian de de *Zhong guo yi shi* ji qi zhong yi ben 王吉民、伍連德的《中國醫史》及其中譯本', *Yi xue yu zhe xue* 醫學與哲學, 27(1): 53-55
Chen Rong 陳榮 *et al*. (eds.) 2007, *Zhong yi wen xian* 中醫文獻, Beijing 北京: Zhong yi gu ji chu ban she 中醫古籍出版社
Chen Shisong 陳世松 1993, *Si chuan tong shi* 四川通史 (book 5), Chengdu 成都: Si chuan da xue chu ban she 四川大學出版社
Chen Shiyu 陳士瑜 1991, 'Dong chong xia cao shi hua 冬蟲夏草詩話', *Shi yong jun* 食用菌, (6): 45-46
Chen Shiyu 陳士瑜 1993, 'Ming qing bi ji xiao shuo zhong de dong chong xia cao 明清筆記小說

中的冬蟲夏草', *Zhong guo shi yong jun* 中國食用菌, 12(4): 7-8

Chen Shouchang 陳守常 1993, 'Chong cao kao zheng 蟲草考證', *Nong ye kao gu* 農業考古, (1): 161-163

Chen Wancheng 陳萬成 *et al*. 2013, 'Wan qing xi yi xue de yi shu: Yi Xi yi lue lun Fu ying xin shuo liang ge gao ben wei li 晚清西醫學的譯述：以<西醫略論>、<婦嬰新說>兩個稿本為例', *Zhong guo wen hua yan jiu suo xue bao* 中國文化研究所學報, (56): 243-293

Chen Weifen 陳瑋芬 2010, 'Ri ben 'zi ran' gai nian kao bian 日本「自然」概念考辨', *Zhong guo wen zhe yan jiu ji kan* 中國文哲研究集刊, (36): 103-135

Chen Weiping 陳衛平 and Li Chun 李春 2006, *Xu guang qi ping zhuan* 徐光啟評傳, Nanjing 南京: Nan jing da xue chu ban she 南京大學出版社

Chen Xianfu 陳先賦 1983, 'Tang zong hai sheng xu zhu shu kao 唐宗海生卒著述考', Cheng du zhong yi xue yuan xue bao 成都中醫學院學報, (2): 58-61, 80-81

Chen Xinqian 陳新謙 (ed.) 1951, *Xin bian yao wu xue* 新編藥物學, Shanghai 上海: Hua dong yi wu sheng huo she 華東醫務生活社

Chen Xinqian 陳新謙 (ed.) 1953, *Yao wu xue* 藥物學, Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社

Chen Xinqian 陳新謙 1982, 'Wo guo yao xue qi kan jian shi 我國藥學期刊簡史', *Yao xue tong bao* 藥學通報, 17(10): 34-37

Chen Xinqian 陳新謙 1983, 'Cong *Ben cao gang mu* dao xian dai zhong yao xue 從《本草綱目》到現代中藥學', *Zhong yao tong bao* 中藥通報, 8(6): 16-18

Chen Xinqian 陳新謙 1984, 'Xin zhong guo cheng li yi qian de zhong guo yao xue hui 新中國成立以前的中國藥學會', *Yao xue tong bao* 藥學通報, 19(4): 47-50

Chen Xinqian 陳新謙 1984, 'Zhong guo yao xue hui jian shi 中國藥學會簡史', *Zhong guo ke ji shi liao* 中國科技史料, 5(3): 70-78

Chen Xinqian 陳新謙 1985, 'Tai ping tian guo yao shi shi ling 太平天國藥史拾零', *Yao xue tong bao* 藥學通報, 20(10): 620-621

Chen Xinqian 陳新謙 1985, 'Wo guo jin xian dai yao xue shi wen xian gai shu 我國近現代藥學史文獻概述', *Yao xue tong bao* 藥學通報, 20(7): 437-439

Chen Xinqian 陳新謙 1985, 'Zhong guo jin dai yao xue da shi ji 中國近代藥學大事記', *Yao xue tong bao* 藥學通報, 20(12): 756-759

Chen Xinqian 陳新謙 1986, 'Jian ji jie fang qian shang hai ji nei di de zhi yao ye 簡記解放前上海及內地的製藥業', *Yao xue tong bao* 藥學通報, 21(3): 170-173

Chen Xinqian 陳新謙 1986, 'Wo guo jin dai dui zhong yao de ke xue yan jiu 我國近代對中藥的科學研究', *Zhong yao cai* 中藥材, (3): 46-47

Chen Xinqian 陳新謙 1986, 'Wo guo jin dai dui zhong yao de ke xue yan jiu (xu) 我國近代對中藥的科學研究(續)', *Zhong yao cai* 中藥材, (4): 15, 48

Chen Xinqian 陳新謙 1986, 'Wo guo jin dai dui zhong yao de ke xue yan jiu (xu) 我國近代對中藥的科學研究(續)', *Zhong yao cai* 中藥材, (5): 40-41

Chen Xinqian 陳新謙 1986, 'Wo guo jin dai dui zhong yao de ke xue yan jiu (xu wan) 我國近代對中藥的科學研究(續完)', *Zhong yao cai* 中藥材, (6): 43-44

Chen Xinqian 陳新謙 1987, 'Zhong guo jin dai yao xue da shi nian biao (1984-1949) 中國近代藥學大事年表(1840-1949)', *Zhong guo ke ji shi liao* 中國科技史料, 8(2): 57-64

Chen Xinqian 陳新謙 1987, 'Zhong guo yao xue hui ba shi nian ji yao (1907-1986) 中國藥學會八十年紀要(1907-1986)', *Yao xue tong bao* 藥學通報, 22(11): 645-651

Chen Xinqian 陳新謙 1987, 'Zhong yao jie zai jiu zhong guo shou dao de po hai ji qi kang zheng 中藥界在舊中國受到的迫害及其抗爭', *Yao xue tong bao* 藥學通報, 22(8): 487-490

Chen Xinqian 陳新謙 1988, 'Yi ben zui zao jie shao xi fang yao xue de zhu zuo——Nei ke xin shuo xia juan 一本最早介紹西方藥學的著作——<內科新說>下卷', *Yao xue tong bao* 藥學通報, 23(3): 174-179

Chen Xinqian 陳新謙 1988, 'Zhong guo jin dai yao xue shu kan de chu ban gong zuo 中國近代藥學書刊的出版工作', *Zhong guo ke ji shi liao* 中國科技史料, 9(1): 20-36

Chen Xinqian 陳新謙 1994, *Zhong hua yao shi ji nian* 中華藥史紀年, Beijing 北京: Zhong guo

yi yao ke ji chu ban she 中國醫藥科技出版社
Chen Xinqian 陳新謙 and Zhang Tianlu 張天祿 1992, *Zhong guo jin dai yao xue shi* 中國近代藥學史, Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社
Chen Yutang 陳玉堂 (ed.) 1993, *Zhong guo jin xian dai ren wu ming hao da ci dian* 中國近現代人物名號大辭典, Hangzhou 杭州: Zhe jiang gu ji chu ban she 浙江古籍出版社
Chen Yutang 陳玉堂 (ed.) 2001, *Zhong guo jin xian dai ren wu ming hao da ci dian: Xu bian* 中國近現代人物名號大辭典: 續編, Hangzhou 杭州: Zhe jiang gu ji chu ban she 浙江古籍出版社
Chen Zhenyu 陳振宇 2011, *Min chu nei wu bu yan jiu——Yi wei sheng shi ye wei zhong xin* 民初內務部研究——以衛生事業為中心 (MA Thesis), Xi’an 西安: Shan xi shi fan da xue zhong guo jin xian dai shi fang xiang shuo shi xue wei lun wen 陝西師範大學中國近現代史方向碩士學位論文
Chen Ziren 陳自仁 2009, *Zhen gui fang zhi ti yao* 珍貴方志提要, Lanzhou 蘭州: Gan su ren min mei shu chu ban she 甘肅人民美術出版社
Cong Chunyu 叢春雨 1994, *Dun huang zhong yi yao quan shu* 敦煌中醫藥全書, Beijing 北京: Zhong yi gu ji chu ban she 中醫古籍出版社
Cook, Harold J. 2007a, ‘Quan qiu yi xue shi hui shi shen me yang zi 全球醫學史會是什麼樣子?’, Zhou Xun 周遜 (trans.), In: *Xing xiang zhong yi——Zhong yi li shi tu xiang yan jiu* 形象中醫——中醫歷史圖像研究, Wang Shumin 王淑民 and Vivienne Lo (eds.), Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社
Dai Lichun 戴立春 1990, ‘Zhong guo di yi suo du li gao deng yao ke xue xiao——Guo li yao xue zhuan ke xue xiao 中國第一所獨立高等藥科學校——國立藥學專科學校’, *Zhong guo yao xue za zhi* 中國藥學雜誌, 25(12): 747-750
Dai Yucheng 戴玉成 and Yang Zhuliang 楊祝良 2008, ‘Zhong guo yao yong zhen jun ming lu ji bu fen ming cheng de xiu ding 中國藥用真菌名錄及部分名稱的修訂’, *Jun wu xue bao* 菌物學報, 27(6): 801-824
Deng Duanben 鄧端本 *et al*. 1997, *Ling nan zhang gu* 嶺南掌故, Guangzhou 廣州: Guang dong lv you chu ban she 廣東旅遊出版社
Deng Gang 鄧鋼 2002, ‘Deng shu qun yuan shi lun zhu mu lu 鄧叔群院士論著目錄’, *Zhong guo ke ji shi liao* 中國科技史料, 23(2): 107-109
Deng Tietao 鄧鐵濤 (ed.) 1999, *Zhong yi jin dai shi* 中醫近代史, Guangzhou 廣州: Guang dong gao deng jiao yu chu ban she 廣東高等教育出版社
Deng Tietao 鄧鐵濤 and Cheng Zhifan 程之範 (ed.) 1999, *Zhong guo yi xue tong shi: Jin dai juan* 中國醫學通史: 近代卷, Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社
Deng Yong 鄧泳 *et al*. 2011, ‘Yi ge da xie de ren——Huai nian fu qin deng shu qun 一個大寫的人——懷念父親鄧叔群’, In: *Zhong guan cun hui yi* 中關村回憶, Shanghai 上海: Shang hai jiao tong da xue chu ban she 上海交通大學出版社
Di Hongxu 狄鴻旭 2014, ‘Jin bai nian qing dai yi liao shi yan jiu shu ping 近百年清代醫療史研究述評’, In: *Zhong hua yi xue hui yi shi xue fen hui di shi si jie yi ci xue shu nian hui lun wen ji* 中華醫學會醫史學分會第十四屆一次學術年會論文集, Taiyuan 太原: Zhong hua yi xue hui yi shi xue fen hui 中華醫學會醫史學分會
Ding Guoming 丁國明 (ed.) 1991, *Chuan tong zhong yao xue* 傳統中藥學, Haikou 海口: Nan hai chu ban she 南海出版社
Ding Zhaoping 丁兆平 and Wang Zhenguo 王振國 2014, ‘San bu han yi e wen wen xian ji zai de zhong e yao cai mao yi 3 部漢譯俄文文獻記載的中俄藥材貿易’, *Zhong hua yi shi za zhi* 中華醫史雜誌, 44(1): 32-35
Dong Caihong 董彩虹 *et al.* 2016, ‘Wo guo chong cao chan ye fa zhan xian zhuang, wen ti ji zhan wang——Chong cao chan ye fa zhan jin hu xuan yan 我國蟲草產業發展現狀、問題及展望——蟲草產業發展金湖宣言’, *Jun wu xue bao* 菌物學報, 35(1): 1-15
Du Shiran 杜石然 *et al*. 1991, Yang wu yun dong yu zhong guo jin dai ke ji 洋務運動與中國近代科技, Shenyang 瀋陽: Liao ning jiao yu chu ban she 遼寧教育出版社
Du Zhizhang 杜志章 2006, ‘Guan yu yi xue she hui shi de li lun si kao 關於醫學社會史的理論思

考', *Shi xue yue kan* 史學月刊, (2): 15-23

Fan Bo 樊波 2012, *Min guo wei sheng fa zhi yan jiu* 民國衛生法制研究 (Ph.D Dissertation), Beijing 北京: Zhong guo zhong yi ke xue yuan zhong guo yi zheng shi fang xiang bo shi xue wei lun wen 中國中醫科學院中國醫政史方向博士學位論文

Fan Jinmin 范金民 1998, *Ming qing jiang nan shang ye de fa zhan* 明清江南商業的發展, Nanjing 南京: Nan jing da xue chu ban she 南京大學出版社

Fan Yajun 范雅君 2012, *Zi bu yu jian kang:《Shen bao》bu yao guang gao de she hui wen hua shi yan jiu (1873-1945)* 滋補與健康:《申報》補藥廣告的社會文化史研究(1873-1945), Nanjing 南京: Nan jing da xue zhong guo jin xian dai shi fang xiang shuo shi xue wei lun wen 南京大學中國近現代史方向碩士學位論文

Fang Jianchang 房建昌 2001, 'Ming dai xi zang xing zheng qu hua kao 明代西藏行政區劃考', *Xi zang min zu xue yuan xue bao* (*zhe xue she hui ke xue ban*) 西藏民族學院學報(哲學社會科學版), 22(4): 18-26

Fang Rui 房銳 2007, '*Ting yu lou sui bi* yu xiang ru wen jun wen hua yan jiu 《聽雨樓隨筆》與相如、文君文化研究', *Si chuan shi fan da xue xue bao* (*She hui ke xue ban*) 四川師範大學學報(社會科學版), 34(5): 35-40

Fang Zhaoying 房兆楹 and Du Lianzhe 杜聯喆 1941, *Zeng jiao qing chao jin shi ti ming bei lu* 增校清朝進士題名碑錄, Beiping 北平: Ha fu yan jing xue she 哈佛燕京學社

Fang Zhouzi 方舟子 2007, *Pi ping zhong yi* 批評中醫, Beijing 北京: Zhong guo xie he yi ke da xue chu ban she 中國協和醫科大學出版社

Feng Erkang 馮爾康 2007, 'Wan qing xue zhe wu ru lun de xi yi guan 晚清學者吳汝綸的西醫觀——兼論文化反思的方法論', *Tian jin she hui ke xue* 天津社會科學, (3): 121-129

Feng Lijun 馮立軍 2010, *Gu dai zhong guo yu dong nan ya zhong yi yao jiao liu yan jiu* 古代中國與東南亞中醫藥交流研究, Kunming 昆明: Yun nan mei shu chu ban she 雲南美術出版社

Feng Zeyong 馮澤永 (ed.) 2001, *Zhong xi yi xue bi jiao* 中西醫學比較, Beijing 北京: Ke xue chu ban she 科學出版社

Fu Weikang 傅維康 1989, 'Wo guo di yi zuo yi shi bo wu guan 我國第一座醫史博物館', *Zhong guo ke ji shi liao* 中國科技史料, 10(2): 73-76

Gao Xi 高晞 2014, 'Wei sheng zhi dao yu wei sheng zheng zhi hua——20 shi ji zhong guo xi yi ti xi de que li yu yan bian (1900-1949) 衛生之道與衛生政治化——20 世紀中國西醫體系的確立與演變(1900-1949)', *Shi lin* 史林, (5): 91-102

Gao Yimin 高益民 *et al*. 1992, 'Min guo shi qi bei ping guo yi xue yuan ping jia 民國時期北平國醫學院評介', *Bei jing zhong yi za zhi* 北京中醫雜誌, (1): 61-62

Gao Yongan 高勇安 2004, *Chuan tong yin shi de wu qu* 傳統飲食的誤區, Beijing 北京: Zhong guo san xia chu ban she 中國三峽出版社

Ge Zhaoguang 葛兆光 2001, Zhong guo si xiang shi (vol. 2) 中國思想史(第 2 卷), Shanghai 上海: Fu dan da xue chu ban she 復旦大學出版社

Geng Chan 耿嬋 2015, *Jin dai zhong guo de yi xue shi yan jiu* 近代中國的醫學史研究 (MA Thesis), Shanghai 上海: Dong hua da xue ke xue ji shu zhe xue xi shuo shi xue wei lun wen 東華大學科學技術哲學系碩士學位論文

Gu Yanli 谷燕莉 and Chen Yuting 陳玉婷 2004, 'Yao yong hong jing tian chu kao——Jian yu *Zhong guo yao dian* shang que 藥用紅景天初考——兼與《中國藥典》商榷', *Zhong guo zhong yao za zhi* 中國中藥雜志 29(9): 929-930

Gu Zhishan 顧植山 and Li Rong 李榮 1989, 'Jin dai yi xue shi shang de 'zhong yi ke xue hua' yun dong 近代醫學史上的'中醫科學化'運動', *Nan jing zhong yi xue yuan xue bao* 南京中醫學院學報, (2): 50-53

Guan Peisheng 關培生 and Cao Jiye 曹繼業 2010, *Xun shi: Da xing zhen jun wen hua shi* 蕈史: 大型真菌文化史, edited by Jiang Runxiang 江潤祥, Hongkong 香港: Hui zhi chu ban you xian gong si 匯智出版有限公司

Guan Xueling 關雪玲 2007, 'Qing gong yi yao lai yuan kao suo 清宮醫藥來源考索', *Ha er bin gong ye da xue xue bao* (*She hui ke xue ban*) 哈爾濱工業大學學報(社會科學版) 9(4): 19-26

Guan Xueling 關雪玲 2008, *Qing dai gong ting yi xue yu yi xue wen wu* 清代宮廷醫學與醫學文

物, Beijing 北京: Zi jing cheng chu ban she 紫禁城出版社
Guang zhou shi di fang zhi bian zuan wei yuan hui [GZSDFZBZWYH] 廣州市地方誌編纂委員會 1998, *Guang zhou shi zhi (vol. 5)* 廣州市志》(卷 5), Guangzhou 廣州: Guang zhou chu ban she 廣州出版社
Guo Baolin 郭寶林 and Xiao Peigen 肖培根 2003, 'Zhong yao yin yang huo zhu yao Zhong lei ping shu 中藥淫羊藿主要種類評述', *Zhong guo zhong yao za zhi* 中國中藥雜志 28(4): 303-307
Guo Feiping 郭飛平 1994, *Zhong guo min guo jing ji shi* 中國民國經濟史, Beijing 北京: Ren min chu ban she 人民出版社
Guo Hui 郭輝 2014, 'Chuan tong de fa ming: Kang zhan shi qi kong zi dan chen ji nian ri yan jiu 傳統的發明: 抗戰時期孔子誕辰紀念日研究', *Xue shu yan jiu* 學術研究, (7): 104-112
Guo jia zhong yi yao guan li ju zhong hua ben cao bian wei hui [GJZYYGLJZHBCBWH] 國家中醫藥管理局《中華本草》編委會 1999, *Zhong hua ben cao (Book 1, Vol. 3)* 中華本草 (第 1 冊第 3 卷), Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社
Guo jia zhong yi yao guan li ju zhong hua ben cao bian wei hui [GJZYYGLJZHBCBWH] 國家中醫藥管理局《中華本草》編委會 1999a, *Zhong hua ben cao (di yi ce: qian yan)* 中華本草(第 1 册: 前言), Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社
Guo jia zhong yi yao guan li ju zhong hua ben cao bian wei hui [GJZYYGLJZHBCBWH] 國家中醫藥管理局《中華本草》編委會 1999b, *Zhong hua ben cao (book 9)* 中華本草(第 9 冊), Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社
Guo jia zhong yi yao guan li ju zhong hua ben cao bian wei hui [GJZYYGLJZHBCBWH] 國家中醫藥管理局《中華本草》編委會 2004, *Zhong hua ben cao* (*Meng yao juan*) 中華本草(蒙藥卷), Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社
Guo Sanjuan 郭三娟 1999, 'Shu ping qing mo min chu xin xue zhi dui ri ben xue zhi de mo fang 述評清末民初新學制對日本學制的模仿', *Shan xi da xue xue bao (She hui ke xue ban)* 山西大學學報(哲學社會科學版), (2): 81-84
Guo Wenshen 郭文深 2012, 'E guo dong zheng jiao zhu bei jing chuan jiao shi tuan yi sheng kao lüe 俄國東正教駐北京傳教士團醫生考略', *Shi jie zong jiao wen hua* 世界宗教文化, (6): 36-40
Guo Xiumei 郭秀梅 *et al*. 1999, 'Qing dai yi shi lu ri shi gou chen 清代醫師旅日史鉤沉', *Zhong hua yi shi za zhi* 中華醫史雜誌, 29(2): 115-120
Han Guangdian 韓廣甸 *et al*. 2012, '黃鳴龍——我國有機化學的一位元先驅', *Hua xue jin zhan* 化學進展, 24(7): 1229-1235
Han Qi 韩琦 1999, *Zhong guo ke xue ji shu de xi chuan ji qi ying xiang (1582-1793)* 中國科學技術的西傳及其影響(1582-1793), Shijiazhuang 石家莊: He bei ren min chu ban she 河北人民出版社
Hao Runhua 郝潤華 2004, *Jian zhen ping zhuan* 鑒真評傳, Nanjing 南京: Nan jing da xue chu ban she 南京大學出版社
Hao Xiangman 郝祥滿 2007, *Chao gong ti xi de jian gou yu jie gou: Ling yan xiang kan zhong ri guan xi shi* 朝貢體系的建構與解構: 另眼相看中日關係史, Wuhan 武漢: Hu bei ren min chu ban she 湖北人民出版社
Hao Xianzhong 郝先中 2004, 'Fei zhi zhong yi pai de ling xiu——Yu yun xiu qi ren qi shi 廢止中醫派的領袖——余雲岫其人其事', *Zi ran bian zheng fa tong xun* 自然辯證法通訊, 26(6): 72-76
Hao Xianzhong 郝先中 2004, 'Yu yue 'fei yi cun yao' lun ji qi li shi ying xiang 俞樾'廢醫存藥'論及其歷史影響', *Zhong yi wen xian za zhi* 中醫文獻雜誌, (3): 4-6
Hao Xianzhong 郝先中 2005, 'Ri ben fei chu han yi dui zhong guo jin dai yi xue de ying xiang 日本廢除漢醫對中國近代醫學的影響', *Wan xi xue yuan xue bao* 皖西學院學報, 21(6): 69-72
Hao Xianzhong 郝先中 2005, 'Xi yi dong jian yu zhong guo jin dai yi liao wei sheng shi ye de zha shi 西醫東漸與中國近代醫療衛生事業的肇始', *Hua dong shi fan da xue xue bao (Zhe xue she hui ke xue ban)* 華東師範大學學報(哲學社會科學版), 37(1): 27-33
Hao Xianzhong 郝先中 2006, 'Zhong yi yuan he fei er bu zhi——Jin dai 'fei zhi zhong yi an' po

chan gen yuan fen xi 中醫緣何廢而不止——近代“廢止中醫案”破產根源分析’, Zi ran bian zheng fa tong xun 自然辯證法通訊, 28(5): 83, 88-93

He Jinwen 何金文 1985a, *Si chuan fang zhi kao* 四川方志考, Changchun 長春: Ji lin sheng di fang zhi bian zuan wei yuan hui 吉林省地方志編纂委員會, Ji lin Sheng tu shu guan xue hui 吉林省圖書館學會

He Jinwen 何金文 1985b, *Xi zang zhi shu shu lue* 西藏志書述略, Changchun 長春: Ji lin sheng di fang zhi bian zuan wei yuan hui 吉林省地方志編纂委員會, Ji lin Sheng tu shu guan xue hui 吉林省圖書館學會

He Xianji 賀賢稷 2002, ‘Guan sheng yuan ba shi nian 冠生園八十年’, *Shang hai gong ye* 上海工業, (3): 42-43

He Xiaolian 何小蓮 2006, *Xi yi dong jian yu wen hua tiao shi* 西醫東漸與文化調適, Shanghai 上海: Shang hai gu ji chu ban she 上海古籍出版社

He Zhenqiu 何振球 1990, ‘*Yi ban lu* zhong de jing ji shi liao 《一斑錄》中的經濟史料’, *Qing shi yan jiu* 清史研究, (1): 40-47

Heng Zhongqing 衡中青 2012, *Di fang zhi zhi shi zu zhi ji nei rong wa jue yan jiu——yi Fang zhi wu chan • guang dong wei li* 地方誌知識組織及內容挖掘研究——以《方志物產•廣東》爲例, Wuhu 蕪湖: An hui shi fan da xue chu ban she 安徽師範大學出版社

Hong Junhua 洪俊華 1992, ‘Deng shu qun 鄧叔群’, In: *Zhong guo xian dai ke xue jia zhuan ji (di san ji)* 中國現代科學家傳記(第 3 集), Beijing 北京: Ke xue chu ban she 科學出版社

Hong Wuli 洪武娌 (ed.) 2002, *Zhong guo shao shu min zu ke xue ji shu shi cong shu: Yi xue juan* 中國少數民族科學技術史叢書: 醫學卷, Nanning 南寧: Guang xi ke xue ji shu chu ban she 廣西科學技術出版社

Hong Zhenqiang 洪振強 2006, ‘1928 nian zhong hua guo huo zhan lan hui lun shu 1928 年中華國貨展覽會論述’, *Hua zhong shi fan da xue xue bao (ren wen she hui ke xue ban)* 華中師範大學學報(人文社會科學版), 45(3): 83-88

Hong Zhenqiang 洪振強 2007, ‘Nan yang quan ye hui yu wan qung she hui fa zhan 南洋勸業會與晚清社會發展’, *Jiang su she hui ke xue* 江蘇社會科學, (4): 204-210

Hou Zhongjun 侯中軍 2009, ‘Jin dai zhong guo bu ping deng tiao yue ji qi ping pan biao zhun de tan tao 近代中國不平等條約及其評判標準的探討’, *Li shi yan jiu* 歷史研究, (1): 64-84

Hou Zhongjun 侯中軍 2012, *Jin dai zhong guo de bu ping deng tiao yue* 近代中國的不平等條約——關於評判標準的討論, Shanghai 上海: Shang hai shu dian chu ban she 上海書店出版社

Hu Aiping 胡愛萍 1987, ‘Zhong guo yao wu xue ji cheng《中國藥物學集成》初評’, *Hu bei zhong yi za zhi* 湖北中醫雜誌, (4): 55-56

Hu Bin 胡濱 1985, ‘Shao lan sun sheng ping ji qi yi an kao lue 邵蘭蓀生平及其醫案考略’, *Zhe jiang zhong yi xue yuan xue bao* 浙江中醫學院學報, 9(1): 37-39

Hu Cheng 胡成 2012, ‘Xi yang yi sheng yu hua ren yi yao——Yi zai hua ji du jiao yi liao chuan jiao shi wei zhong xin (1825-1916) 西洋醫生與華人醫藥——以在華基督教醫療傳教士為中心(1825-1916)’, *Zhong yang yan jiu yuan li shi yu yan yan jiu suo ji kan* 中央研究院歷史語言研究所集刊, 83(3): 571-606

Hu Cheng 胡成 2013, *Yi liao, wei sheng yu shi jie zhi zhong guo (1820-1937)* 醫療, 衛生與世界之中國(1820-1937), Beijing 北京: Ke xue chu ban she 科學出版社

Hu Shi 胡適 and Tang Degang 唐德剛 1981, *Hu shi kou shu zi zhuan* 胡適口述自傳, Taipei 臺北: Zhuan ji wen xue chu ban she 傳記文學出版社

Huang Biqin 黄碧琴 1991, ‘Ai guo yi wei xian bei liang pei ji 愛國醫衛先輩梁培基’, In: *Guang zhou ming ren zhuan* 廣州名人傳, Guangzhou 廣州: Ji nan da xue chu ban she 暨南大學出版社

Huang Fuqing 黄福慶 1975, *Qing mo liu ri xue sheng* 清末留日學生, Taibei 臺北: Zhong yang yan jiu yuan jin dai shi yan jiu suo 中央研究院近代史研究所

Huang Hanru 黄漢儒 *et al*. 1998, *Zhuang zu yi xue shi* 壯族醫學史, Nanning 南寧: Guang xi ke xue ji shu chu ban she 廣西科學技術出版社

Huang Jianping 黄建平 *et al*. 1993, *Zhong xi yi bi jiao yan jiu* 中西醫比較研究, Changsha 長沙:

Hu nan ke xue ji shu chu ban she 湖南科學技術出版社
Huang Lansun 黃蘭孫 1955, 'Li shi zhen dui jin dai yao xue de zhong da ying xiang ji qi zhi xue jing shen 李時珍對近代藥學的重大影響及其治學精神', *Yao xue tong bao* 藥學通報, 3(8): 351-354
Huang Runhua 黃潤華 and Qu Liusheng 屈六生 1991, *Quan guo man wen tu shu zi liao lian he mu lu* 全國滿文圖書資料聯合目錄, Beijing 北京: Shu mu wen xian chu ban she 書目文獻出版社
Huang Shengbai 黃勝白 1956, 'Zai ping zhong guo yao xue da ci dian 再評中國藥學大辭典', *Zhong yao tong bao* 中藥通報, 2(1): 16-18
Huang Tianhua 黃天化 2001, 'Lun min guo shi qi xi kang jian sheng 論民國時期西康建省', *Si chuan shi fan da xue xue bao (She hui ke xue ban)* 四川師範大學學報(社會科學版), 28(4): 95-100
Huang Xin 黃鑫 2005, *Jin dai fang ji xue cheng jiu yu te dian yan jiu (1840-1949)* 近代方劑學成就與特點研究(1840-1949) (MA Thesis), Beijing 北京: Zhong guo zhong yi yan jiu yuan zhong yi yao xue shi fang xiang shuo shi xue wei lun wen 中國中醫研究院中醫藥學史方向碩士學位論文
Huang Yuhe 黃宇和 2013, '21 shi ji chu xi fang ya pian zhan zheng yan jiu fan ying de zhong da wen ti——cong jin nian suo jian de san bu ya pian zhan zheng shi yan jiu zhu zuo shuo qi 21世紀初西方鴉片戰爭研究反映的重大問題——從近年所見的三部鴉片戰爭史研究著作說起', *Qing hua da xue xue bao* (*zhe xue she hui ke xue ban*) 清華大學學報 (哲學社會科學版), (1): 84-93
Ji Xiangxiang 計翔翔 1997, 'Ming mo zai hua chuan jiao shi jin ni ge mu zhi kao 明末在華傳教士金尼閣墓誌考', *Shi jie zong jiao yan jiu* 世界宗教研究, (1): 103-109
Ji Xiaofeng 季嘯風 (ed.) 1992, *Zhong guo gao deng xue xiao bian qian* 中國高等學校變遷, Shanghai 上海: Hua dong shi fan da xue chu ban she 華東師範大學出版社
Ji Xiaofeng 季嘯風 1996, *Zhong guo shu yuan ci dian* 中國書院辭典, Hangzhou 杭州: Zhe jiang jiao yu chu ban she 浙江教育出版社
Jia Daquan 賈大泉 and Chen Shisong 陳世松 2010, *Si chuan tong shi* 四川通史 (vol. 6), Chengdu 成都: Si chuan ren min chu ban she 四川人民出版社
Jia Shucun 賈熟村 2004, 'Ding bao zhen bian nian shi lue 丁寶楨編年事略', *Lin yi shi fan xue yuan xue bao* 臨沂師範學院學報, 26(1): 90-94
Jiang Jinxing 蔣金星 2004, *Qing dai zhu juan ji cheng de wen xian jia zhi he xue shu jia zhi*《清代硃卷集成》的文獻價值和學術價值研究 (PhD Thesis), Hangzhou 杭州: Zhe jiang da xue Zhong guo gu dian wen xian xue bo shi xue wei lun wen 浙江大學中國古典文獻學博士學位論文
Jiang Meng 姜萌 2015, *Zu qun yi shi yu li shi shu xie: Zhong guo xian dai li shi xu shu mo shi de xing cheng ji qi zai qing mo de shi jian* 族群意識與歷史書寫: 中國現代歷史敘述模式的形成及其在清末的實踐, Beijing 北京: Shang wu yin shu guan 商務印書館
Jiang Sanjun 蔣三俊 1993, 'Dong chong xia cao kao 冬蟲夏草考', *Zhong guo shi ping* 中國食品, (12): 29-30
Jiang su sheng wu jin xian xian zhi bian zuan wei yuan hui [JSSWJXXZBZWYH] 江蘇省武進縣縣志編纂委員會 1988, *Wu jin xian zhi* 武進縣志, Shanghai 上海: Shang hai ren min chu ban she 上海人民出版社
Jiang su xin yi xue yuan [JSXYXY] 江蘇新醫學院 (ed.) [1977] 1986, *Zhong yao da ci dian* 中藥大辭典, Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社
Jiang su xin yi xue yuan [JSXYXY] 江蘇新醫學院 (ed.) [1977] 2004, *Zhong yao da ci dian* 中藥大辭典, Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社
Jiang su xin yi xue yuan [JSXYXY] 江蘇新醫學院 (ed.) 1977, *Zhong yao da ci dian* 中藥大辭典, Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社
Jiang Tao 姜濤 2002, 'Wan qing shi yan jiu xiang he chu qu? 晚清史研究向何處去?', *Qing shi yan jiu* 清史研究, (2): 1-8
Jiang Tao 姜濤 2006, 'Tong shang kou an ti xi de xing cheng yu zhong guo jin dai cheng shi ti xi de bian dong 通商口岸體系的形成與中國近代城市體系的變動', *Si chuan da xue xue bao (zhe*

xue she hui ke xue ban) 四川大學學報 (哲學社會科學版) (5): 16-24
Jin Mei 金梅 and Zhu Wenhua 朱文華 1992, *Zheng zhen duo ping zhuan* 鄭振鐸評傳, Tianjin 天津: Bai hua wen yi chu ban she 百花文藝出版社
Kang Huan 康歡 2008, 'Lun yin yang xue shuo dui zhong yao yao xing li lun de shen tou 論陰陽學說對中藥藥性理論的滲透', *Zhong hua zhong yi yao xue kan* 中華中醫藥學刊 26(3): 616-617
Kong Lingren 孔令仁 and Li Dezheng 李德征 (eds.) 1998, *Zhong guo lao zi hao: Yao ye juan* 中國老字號: 藥業卷, Beijing 北京: Gao deng jiao yu chu ban she 高等教育出版社
Lai Wen 賴文 *et al*. 2002, 'Jin 50 nian de zhong guo gu dai yi qing yan jiu 近 50 年的中國古代疫情研究', *Zhong hua yi shi za zhi* 中華醫史雜誌, 32(2): 108-113
Lai Xinxia 來新夏 2005, *Qing ren bi ji sui lu* 清人筆記隨錄, Beijing 北京: Zhong hua shu ju 中華書局
Lai Xinxia 來新夏 and Guo Fengqi 郭鳳岐 (eds.) 2001, *Tian jin da ci dian* 天津大辭典, Tianjin 天津: Tian jin she hui ke xue yuan chu ban she 天津社會科學院出版社
Lan Yong 藍勇 1989, *Si chuan gu dai jiao tong lu xian shi* 四川古代交通路線史, Chongqing 重慶: Xi nan shi fan da xue chu ban she 西南師範大學出版社
Lan Yong 藍勇 1995, 'Cong tian di sheng zong he yan jiu jiao du kan zhong hua wen ming dong yi nan qian de yuan yin 從天地生綜合研究角度看中華文明東移南遷的原因', *Xue shu yan jiu* 學術研究, (6): 71-76
Lan Yong 藍勇 2002, *Zhong guo li shi di li xue* 中國歷史地理學, Beijing 北京: Gao deng jiao yu chu ban she 高等教育出版社
Lan Yong 藍勇 2013, 'Zhong guo di yu fang wei hua yu shan bian yu dong ya da lu tian di sheng bei jing 中國地域方位話語嬗變與東亞大陸天地生背景', *Jiang han lun tan* 江漢論壇, (10): 30-41
Lei, Hsiang-Lin 雷祥麟 2003, 'Fu ze ren de yi sheng yu you xin yang de bing ren——Zhong xi yi lun zheng yu yi bing guan xi zai min guo shi qi de zhuan bian 負責任的醫生與有信仰的病人——中西醫論爭與醫病關係在民國時期的轉變', *Xin shi xue* 新史學, 14(1): 45-96
Lei, Hsiang-Lin 雷祥麟 2008, 'Chang shan: Yi ge 'xin' kang nue yao de dan sheng 常山: 一個「新」抗瘧藥的誕生', In: *Cong yi liao kan zhong guo shi* 從醫療看中國史, Li Jianmin 李建民 (ed.), Taipei 台北: Lian jing chu ban gong si 聯經出版公司
Li Baozhen 李寶珍 1991, 'Lan xue zai ri ben de chuan bo yu ying xiang 蘭學在日本的傳播與影響', *Ri ben xue kan* 日本學刊, (2): 108-121
Li Binglan 李冰嵐 1993, 'Chan hua de ben cao xue kao zheng 蟬花的本草學考證', *Xian dai ying yong yao xue* 現代應用藥學, 10(2): 21-22
Li Changli 李長莉 2005, 'Wan qing shang hai de xin zhi shi kong jian 晚清上海的新知識空間', In: *Jin dai zhong guo she hui yu min jian wen hua* 近代中國社會與民間文化, Beijing 北京: She hui ke xue wen xian chu ban she 社會科學文獻出版社版
Li Chuanbin 李傳斌 2001, 'Li hong zhang yu jin dai xi yi 李鴻章與近代西醫', *An hui shi xue* 安徽史學, (3): 21-24
Li Fengzhen 李鳳珍 1991, 'Qing dai xi zang la ma chao gong gai shu——Jian ping cha li xun de xi zang chao gong shi wai jiao he mao yi guan xi de miu lun 清代西藏喇嘛朝貢概述——兼評理查遜的西藏朝貢是外交和貿易關係的謬論', *Zhong guo zang xue* 中國藏學, (1): 70-81
Li Gengdong 李耕冬 and He Tingchao 賀廷超 1990, *Yi zu yi yao shi* 彝族醫藥史, Chengdu 成都: Si chuan min zu chu ban she 四川民族出版社
Li Guangchao 李廣超 and Chen Weiming 陳偉明 2008, 'Jin dai zhong guo liu ri xue sheng de yi shu huo dong (1896-1937) 近代中國留日學生的譯書活動(1896-1937)', *Guang xi she hui ke xue* 廣西社會科學, (5): 117-120
Li Honghe 李洪河 2011, 'Xin zhong guo cheng li chu qi 'zhong yi ke xue hua' de li shi kao cha 新中國成立初期"中醫科學化"的歷史考察', *Dang dai zhong guo shi yan jiu* 當代中國史研究, 18(4): 70-77
Li Huan 李歡 1999, 'Qing gong jiu cang man wen Xi yang yao shu 清宮舊藏滿文《西洋藥書》', *Zi jin cheng* 紫禁城, (4): 30

Li Huaxing 李華興 and Chen Zuhuai 陳祖懷 1996, ‘Liu xue jiao yu yu jin dai zhong guo 留學教育與近代中國’, *Shi lin* 史林, (3): 41-52

Li Jian 李劍 1993, ‘Quan guo yi yao tuan ti zong lian he hui de chuang li, huo dong ji qi li shi di wei 全國醫藥團體總聯合會的創立、活動及其歷史地位’, *Zhong guo ke ji shi liao* 中國科技史料, 14(3): 67-75

Li Jian 李劍 and Deng Tietao 鄧鐵濤 1989, ‘Min guo shi qi si ge yi shi xue hui de bi jiao 民國時期四個醫史學會的比較’, *Guang zhou zhong yi xue yuan xue bao* 廣州中醫學院學報, 6(2): 94-96

Li Jianmin 李建民 (ed.) 2012, *Cong yi liao kan zhong guo shi* 從醫療看中國史, Beijing 北京: Zhong hua shu ju 中華書局

Li Jianmin 李建民 2008, *Sheng ming shi xue——Cong yi liao shi kan zhong guo li shi* 生命史學——從醫療史看中國歷史, Shanghai 上海: Fu dan da xue chu ban she 復旦大學出版社

Li Jichou 李計籌 2015, ‘Guang zhou bo ji yi xue tang yu jin dai zhong guo xi yi jiao yu 廣州博濟醫學堂與近代中國西醫教育’, *Xi bei yi xue jiao yu* 西北醫學教育, 23(4): 667-670

Li Jingwei 李經緯 1998, *Zhong wai yi xue jiao liu shi* 中外醫學交流史, Changsha 長沙: Hu nan jiao yu chu ban she 湖南教育出版社

Li Jingwei 李經緯 and Lin Zhaogeng 林昭庚 (eds.) 1999, *Zhong guo yi xue tong shi (gu dai juan)* 中國醫學通史(古代卷), Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社，1999 年，第 266-267 頁。

Li Jingwei 李經緯 and Zhang Zhibin 張志斌 1996, ‘Zhong guo yi xue shi yan jiu 60 nian 中國醫學史研究 60 年’, *Zhong hua yi shi za zhi* 中華醫史雜誌, 26(3): 129-136

Li Jingwei 李經緯 *et al*. (eds.) 1995, *Zhong yi da ci dian* 中醫大辭典, Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社

Li Ling 李零 2000, *Zhong guo fang shu kao* 中國方術考, Beijing 北京: Dong fang chu ban she 東方出版社

Li Min 李民 2013, ‘19 shi ji shang ban ye e guo dui zhong yao de shi yan xing yan jiu 19 世紀上半葉俄國對中藥的實驗性研究’, *Ji nan shi xue* 暨南史學, 8: 423-436

Li Nan 李楠 2014, *Min guo shi qi (1912-1949) zhong yao wen xian ji qi xue shu kao cha yu yan jiu* 民國時期(1912-1949)中藥文獻及其學術考察與研究 (Ph.D Dissertation), Beijing 北京: Zhong guo zhong yi ke xue yuan jin xian dai zhong yi yao wen xian yan jiu fang xiang bo shi xue wei lun wen 中國中醫科學院近現代中醫藥文獻研究方向博士學位論文

Li Nan 李楠 and Wan Fang 萬芳 2013, ‘Min guo shi qi zhong yao ci dian de bian zuan ji qi dui zhong yao xue fa zhan de ying xiang 民國時期中藥辭典的編纂及其對中藥學發展的影響’, *Bei jing zhong yi yao da xue xue bao* 北京中醫藥大學學報, 36(9): 586-588, 594

Li Nan 李楠 and Wan Fang 萬芳 2015, ‘Min guo shi qi zhong yao shi yan yan jiu de jie jian yi yi 民國時期中藥實驗研究的借鑒意義’, *Zhong hua yi shi za zhi* 中華醫史雜誌, 45(3): 147-149

Li Nan 李楠 *et al*. 2014, ‘Chen cun ren Zhong guo yao xue da ci dian xue shu ping jia 陳存仁《中國藥學大辭典》學術評析’, *Zhong guo zhong yi ji chu yi xue za zhi* 中國中醫基礎醫學雜誌, 20(3): 307-308

Li Qiang 李強 2010, *Nian geng yao* 年羹堯, Kaifeng 開封: He nan jiao yu chu ban she 河南教育出版社

Li Shi 李石 2013, *Dian bi shi mo——min guo shi qi yun nan di fang huo bi jin rong ti xi chu tan* “滇幣”始末——民國時期雲南地方貨幣金融體系初探, Yun nan da xue ren wen xue yuan li shi xi shuo shi xue wei lun wen 雲南大學人文學院歷史系碩士學位論文

Li Tiangang 李天綱 1998, *Zhong guo li yi zhi zheng: Li shi wen xian he yi yi* 中國禮儀之爭: 歷史·文獻和意義, Shanghai 上海: Shang hai gu ji chu ban she 上海古籍出版社

Li Tingju 李廷舉 and Yoshida Chuu 吉田忠 1996, *Zhong ri wen hua jiao liu shi da xi: Ke ji juan* 中日文化交流史大系: 科技卷, Hangzhou 杭州: Zhe jiang ren min chu ban she 浙江人民出版社

Li Xiaofang 李曉方 2011, ‘She hui shi shi ye xia de di fang zhi li yong yu yan jiu lun shu 社會史視野下的地方志利用與研究述論’, *Zhong guo di fang zhi* 中國地方志, (7): 26-33

Li Xisuo 李喜所 (ed.) 2010, *Zhong guo liu xue tong shi (wan qing juan)* 中國留學通史(晚清卷),

Guangzhou 廣州: Guang dong jiao yu chu ban she 廣東教育出版社
Li Yongfang 李永芳 2012, 'Teng tian feng ba——Qing mo xi fang nong xue yin jin de xian xing zhe 藤田豐八——清末西方農學引進的先行者', *She hui ke xue* 社會科學, (8): 142-149
Li Yuheng 李玉衡 2007, 'Da po dong chong xia cao dong fang shen yao de shen hua 打破冬蟲夏草'東方神藥'的神話', *Shou du yi yao* 首都醫藥 (23): 15-16
Liang Hairui 梁海銳 *et al*. 1988, 'Zhong yao yin yang huo de shang pin diao cha he ben cao kao zheng 中藥淫羊藿的商品調查和本草考證', *Zhong yao tong bao* 中藥通報, 13(12): 7-10
Liang Qizi 梁其姿 2007, Yi liao shi yu zhong guo "xian dai xing" wen ti 醫療史與中國"現代性"問題', *Zhong guo she hui li shi ping lun* 中國社會歷史評論, 8: 1-18
Liang Shan 梁珊 2012, 'Lun dun hui lai hua chuan jiao shi yi bo en yu ta de zhong yi yao yan jiu 倫敦會來華傳教士伊博恩與他的中醫藥研究', In: *Duo xue ke shi ye xia de zhong guo ji du jiao ben tu hua yan jiu xue shu yan tao hui lun wen ji* 多學科視野下的中國基督教本土化研究學術研討會論文集, Fuzhou 福州: Fu jian shi fan da xue zhong guo ji du jiao yan jiu zhong xin 福建師範大學中國基督教研究中心
Liang Shan 梁珊 2014, 'Lun dun hui lai hua chuan jiao shi yi bo en yu ta de zhong yi yan jiu 倫敦會來華傳教士伊博恩與他的中醫研究', In: *Zhong guo ji du jiao qing nian xue zhe lun tan* 中國基督教青年學者論壇, Shanghai 上海: Shang hai da xue chu ban she 上海大學出版社
Liang Zongqi 梁宗琦 (ed.) 2007, *Zhong guo zhen jun zhi* 中國真菌志 (vol. 32), Beijing 北京: Ke xue chu ban she 科學出版社
Liao Shengfeng 廖聲豐 2009, 'Qing dai qian qi yang zhou guan de shang pin liu tong 清代前期揚州關的商品流通', *Jiang nan da xue xue bao* (*Ren wen she hui ke xue ban*) 江南大學學報(人文社會科學版), 8(1): 103-108
Liao Yuqun 廖育群 1988, 'Niu dou fa zai jin dai zhong guo de chuan bo 牛痘法在近代中國的傳播', *Zhong guo ke ji shi liao* 中國科技史料, 9(2): 36-44
Liao Yuqun 廖育群 1991, *Qi huang yi dao* 岐黃醫道, Shenyang 瀋陽: Liao ning jiao yu chu ban she 遼寧教育出版社
Liao Yuqun 廖育群 2005, 'Liang han yi xue shi de chong gou 兩漢醫學史的重構', *Ke xue wen hua ping lun* 科學文化評論, 2(4): 46-64
Liao Yuqun 廖育群 *et al*. 1998, *Zhong guo ke xue ji shu shi: Yi xue juan* 中國科學技術史: 醫學卷, Beijing 北京: Ke xue chu ban she 科學出版社
Lin Ganliang 林幹良 1980, 'Wo guo jin dai zao qi de zhong yi xue xiao 我國近代早期的中醫學校', *Zhong hua yi shi za zhi* 中華醫史雜誌, 10(2): 90-92
Lin Ganliang 林幹良 2014, 'Yi dai zong shi san jue qian 一代宗師三絕簽', *Zhong yi yao wen hua* 中醫藥文化, (3): 66-67
Lin Rizhang 林日杖 2012, 'Ming qing shi qi lai hua e ren dui da huang de ren shi 明清時期來華俄人對大黃的認識', *Fu jian shi fan da xue xue bao (Zhe xue she hui ke xue ban)* 福建師範大學學報(哲學社會科學版), (6): 146-153
Liu Hong 劉虹 2008, *Yang wu jiao yu yu xi xue dong jian* 洋務教育與西學東漸, Dalian 大連: Liao ning shi fan da xue chu ban she 遼寧師範大學出版社
Liu Jidong 劉季冬 2010, 'Kong zi 'duo shi yu niao shou cao mu zhi ming' de wen hua yi han——Jian lun *Lun yu yang huo* pian kong zi shi jiao de si xiang zhi gui 孔子'多識於鳥獸草木之名'的文化意涵——兼論《論語 陽貨》篇孔子詩教的思想旨歸', *Xian dai zhe xue* 現代哲學, (6): 109-113
Liu Jizeng 劉繼增 and Zhang Baohua 張葆華 (eds.) 1991, *Zhong guo guo min dang ming ren lu* 中國國民黨名人錄, Wuhan 武漢: Hu bei ren min chu ban she 湖北人民出版社
Liu Lihong 劉力紅 2003, *Si kao zhong yi* 思考中醫, Guilin 桂林: Guang xi shi fan da xue chu ban she 廣西師範大學出版社
Liu Luya 劉魯亞 1995, 'Jiu zhong guo de zhi yao gong ye 舊中國的製藥工業', *Li shi dang an* 歷史檔案, (2): 105-112
Liu Qi 劉祺 2012, *Xi fang yi xue zai jin dai zhong guo (1840-1911)——Yi shu, wen hua yu zhi fu bian qian* 西方醫學在近代中國(1840-1911)——醫術、文化與制度的變遷, Tianjin 天津: Nan kai da xue li shi xue zhuan ye bo shi xue wei lun wen 南開大學歷史學專業博士學位論

文
Liu Shixun 劉世珣 2014, ‘Di ye jia de zai xian: Kang xi nian jian gong ting xi yao de li ya ga chu tan 底野迦的再現: 康熙年間宮廷西藥德里鴉噶初探’, *Qing shi yan jiu* 清史研究, (3): 12-22, 148
Liu Shiyang 劉世揚 2012, *Jin dai yi chang kou an mao yi yan jiu* (1877-1919) 近代宜昌口岸貿易研究 (1877-1919), Hu bei da xue zhong guo jin xian dais hi shuo shi xue wei lun wen 湖北大學中國近現代史碩士學位論文
Liu Shoushan 劉壽山 (ed.) 1963, *Zhong yao wen xian yan jiu zhai yao (1820-1961)* 中藥文獻研究摘要(1820-1961), Beijing 北京: Ke xue chu ban she 科學出版社
Liu Weidong 劉衛東 2008, ‘20 shi ji 30 nian dai ‘zhong yi ke xue hua’ si chao lun xi 20 世紀 30 年代‘中醫科學化’思潮論析’, *Qi lu xue kan* 齊魯學刊, (2): 35-41
Liu Xiaoyan 劉小燕 and Yao Yuan 姚遠 2010, ‘*Nong xue bao* ji qi bian ji chuan bo ce lue 《農學報》及其編輯傳播策略’, *Xi bei da xue xue bao (Zhe xue she hui ke xue ban)* 西北大學學報(哲學社會科學版), (6): 54-59
Liu Zesheng 劉澤生 2000, ‘Zhong guo jin dai di yi wei xi yi sheng——Guan Tao 中國近代第一位西醫生——關韜’, *Zhong hua yi shizazhi* 中華醫史雜誌, (2): 98-100
Liu Zesheng 劉澤生 2001, ‘Yu yue fei zhi zhong yi si xiang gen yuan tan suo 俞樾廢止中醫思想根源探索’, *Zhong hua yi shi za zhi* 中華醫史雜誌, 31(3): 171-174
Liu Zuoyi 劉作易 *et al*. 2003, ‘ Dong chong xia cao xian wei jie gou zai guan cha de zi nang bao zi fa yu yan jiu 冬蟲夏草顯微結構再觀察和子囊孢子發育研究’, *Gui zhou ke xue* 貴州科學, 21(1-2): 51-57, 68
Liu Zhengwen 劉正文 1985, ‘天津社會教育廣智館簡介’, In: *Tian jin wen shi cong kan* 天津文史叢刊 (Vol. 4), Tianjin 天津: Tian jin shi wen shi yan jiu guan 天津市文史研究館
Lou Zhicen 樓之岑 (ed.) 1995, *Zhong guo ke xue ji shu zhuan jia zhuan lue: Yi xue bian ·yao xue juan I* 中國科學技術專家傳略: 醫學編•藥學卷 I, Beijing 北京: Zhong guo ke xue ji shu chu ban she 中國科學技術出版社
Lu Di 蘆笛 2014, ‘Nan tu cang *Gan yuan xiao zhi* chao ben chu tan 南圖藏《柑園小識》抄本初探’, *Chang jiang xue shu* 長江學術, (2): 88-93
Lu Di 蘆笛 2015, ‘Wan qing *Zhi wu xue* yi shu de wai wen yuan ben wen ti 晚清《植物學》一書的外文原本問題’, Zi ran bian zheng fa tong xun 自然辯證法通訊, 37(6): 1-8
Lu Di 蘆笛 2016, Min guo yao wu xue shu li cheng zai tan: ji yu she hui diao cha he tong ji de kao cha 民國藥物學術歷程再探: 基於社會調查和統計的考察, *Ji nan shi xue* 暨南史學, 13: 147-172
Lu Di 蘆笛 2017, ‘Guo min zheng fu de yao wu biao zhun tong yi gong zuo —— yi yao dian de chou bei, bian zuan he tui xing wei zhong xin 國民政府的藥物標準統一工作——以藥典的籌備, 編纂和推行為中心’, *Fu jian shi fan da xue xue bao (zhe xue she hui ke xue ban)* 福建師範大學學報(哲學社會科學版), (1): 142-152
Lu Huiyuan 陸惠元 1989, ‘Lu xin nong xian sheng nian pu 陸辛農先生年譜’, In: *Tian jin wen shi cong kan* 天津文史叢刊 (Vol. 10), Tianjin 天津: Tian jin shi wen shi yan jiu guan 天津市文史研究館
Lu Minghui 盧明輝 1990, *Qing dai meng gu shi* 清代蒙古史, Tianjin 天津: Tian jin gu ji chu ban she 天津古籍出版社
Lu Xiaodong 陸曉東 1987, ‘Shao lan sun sheng ping kao lue 邵蘭蓀生平考略’, *Zhe jiang zhong yi za zhi* 浙江中醫雜志, 22(5): 233
Lu Yangyuan 陸仰淵 and Fang Qingqiu 方慶秋 1991, *Min guo she hui jing ji shi* 民國社會經濟史, Beijing 北京: Zhong guo jing ji chu ban she 中國經濟出版社
Lu Zhaoji 陸肇基 1991, ‘Zhong guo zui zao de guan li xi yi xue xiao 中國最早的官立西醫學校’, *Zhong guo ke ji shi liao* 中國科技史料, 12(4): 25-30
Lü Shunchang 呂順長 2012, *Qing mo zhong ri jiao yu wen hua jiao liu zhi yan jiu* 清末中日教育文化交流之研究, Beijing 北京: Shang wu yin shu guan 商務印書館
Luo Dashang 羅達尚 1986, ‘Dui *Yue wang yao zhen* de yan jiu gai lun 對《月王藥診》的研究概論’, *Xi zang yan jiu* 西藏研究 (4): 69-76

Luo Gang 羅鋼 2014, '"bei da ming de chuan tong"——*Ren jian ci hua* shi ru he cheng wei guo xue jing dian de "被發明的傳統"——《人間詞話》是如何成為國學經典的', *Nan jing da xue xue bao: Zhe xue ·ren wen ke xue ·she hui ke xue* 南京大學學報: 哲學 ·人文科學 社會科學, (3): 81-90
Luo Jing 羅靖 and Song Jianmin 宋建民 2007, 'Zhong yao chan hua de ben cao xue kao zheng 中藥蟬花的本草學考證', *Jiang xi zhong yi xue yuan xue bao* 江西中醫學院學報, 19(6): 14-15
Luo Kun 羅琨 and Zhang Yongshan 張永山 1996, *Luo zhen yu ping zhuan* 羅振玉評傳, Nanchang 南昌: Bai hua zhou wen yi chu ban she 百花洲文藝出版社
Luo Zhufeng 羅竹風 1993, *Han yu da ci dian* 漢語大詞典 (vol. 8), Shanghai 上海: Han yu da ci dian chu ban she 漢語大詞典出版社
Ma Boying 馬伯英 1983, 'Zhong xi yi hui tong shi gai 中西醫匯通史概', *Zhong xi yi jie he za zhi* 中西醫結合雜誌, 3(6): 376-379
Ma Boying 馬伯英 *et al*. 1993, *Zhong wai yi xue wen hua jiao liu shi——Zhong wai yi xue kua wen hua chuan bo* 中外醫學文化交流史——中外醫學跨文化傳播, Shanghai 上海: Wen hui chu ban she 文匯出版社
Ma Dazheng 馬大正 2002, 'Zhong guo gu dai de bian jiang zheng ce yu bian jiang zhi li 中國古代的邊疆政策與邊疆治理', *Xi yu yan jiu* 西域研究, (4): 1-15
Ma Jinshuang 馬金雙 2011, *Dong ya gao deng zhi wu fen lei xue wen xian gai lan* 東亞高等植物分類學文獻概覽, Beijing 北京: Gao deng jiao yu chu ban she 高等教育出版社
Ma Xuexin 馬學新 *et al*. (eds.) 1992, *Shang hai wen hua yuan liu ci dian* 上海文化源流辭典, Shanghai 上海: Shang hai she hui ke xue yuan chu ban she 上海社會科學院出版社
Ma Yufeng 馬譽峰 2009, Qin huang dao ren wu zhi 秦皇島人物志, Beijing 北京: Zhong yang wen xian chu ban she 中央文獻出版社
Mamin 馬敏 and Hong Zhenqiang 洪振強 2009, 'Min guo shi qi guo huo zhan lan hui yan jiu: 1910-1930 民國時期國貨展覽會研究: 1910-1930', *Hua zhong shi fan da xue xue bao (ren wen she hui ke xue ban)* 華中師範大學學報(人文社會科學版), 48(4): 69-83
Mao Haijian 茅海建 2005, *Tian chao de beng kui: Ya pian zhan zheng zai yan jiu* 天朝的崩潰: 鴉片戰爭再研究, Beijing 北京: Sheng huo du shu xin zhi san lian shu dian 生活 讀書 新知三聯書店
Mao Mengfei 毛夢飛 2010, *Xie li heng sheng ping shi ji ji qi yi xue si xiang yan jiu* 謝利恒生平事蹟及其醫學思想研究 (MA Thesis), Shanghai 上海: Shang hai zhong yi yao da xue zhong yi yi shi wen xian zhuan ye shuo shi xue wei lun wen 上海中醫藥大學中醫醫史文獻專業碩士學位論文
Mao Yifei 毛逸斐 and Liu Gengsheng 劉更生 2013, '*Ben cao bei yao* yan jiu ping shu 《本草備要》研究評述', *An hui Zhong yi xue yuan xue bao* 安徽中醫學院學報, 32(3): 17-19
Masini, Federico [1993] 1997, *Xian dai han yu ci hui de xing cheng——shi jiu shi ji han yu wai lai ci yan jiu* 現代漢語詞彙的形成——十九世紀漢語外來詞研究, Huang Heqing 黃河清 (trans.), Shanghai 上海: Han yu da ci dian chu ban she 漢語大詞典出版社
Mayanagi Makoto 真柳誠 2002, 'Ri ben jiang hu shi qi chuan ru de zhong guo yi shu ji qi he ke 日本江戶時期傳入的中國醫書及其和刻', Liang Yongxuan 梁永宣 (trans.), *Zhong guo ke ji shi liao* 中國科技史料, 23(3): 232-254
Mayanagi Makoto 真柳誠 2010, 'Zhong ri han gu yi ji shu ju bi jiao yan jiu 中日韓越古醫籍資料的比較研究', Guo Xiumei 郭秀梅 (trans.), *Zhong guo ke ji shi za zhi* 中國科技史雜誌, 31(3): 243-256
Mei Kai 梅凱 2013, *Su zhou bo xi yi yuan zao qi li shi yan jiu (1883-1927)* 蘇州博習醫院早期歷史研究(1883-1927) (MA Thesis), Suzhou 蘇州: Su zhou da xue zhong guo jin xian dai shi shuo shi xue wei lun wen 蘇州大學中國近現代史碩士學位論文
Meyn, Thierry 2014, 'Wan ming zhong guo de wen yi fu xing jiao yu——Guan yu ye su hui shi gao yi zhi *Tong you jiao yu* de chu bu yan jiu 晚明中國的文藝復興教育——關於耶穌會士高一志《童幼教育》的初步研究', *Guang dong she hui ke xue* 廣東社會科學, (6): 119-130
Miao Xicheng 苗西成 *et al*. 2000, 'Dong chong xia cao de jing yan zhu cun fa jie shao 冬蟲夏草的經驗貯存法介紹', *Shi zhen guo yi guo yao* 時珍國醫國藥 11(10): 905

Minehan, Bridie 2009, ''Xie zheng' yu zhong guo yi xue shi '血症'與中國醫學史', In: *Qing yi lai de ji bing yi liao he wei sheng: yi she hui wen hua shi wei shi jiao de tan suo* 清以來的疾病, 醫療和衛生: 以社會文化史爲視角的探索, Yu Xinzhong 余新忠 (ed.), Beijing 北京: Sheng huo • du shu • xin zhi san lian shu dian 生活•讀書•新知三聯書店

Ming yi yao lan bian shen wei yuan hui [MYYLBSWYH] 名醫搖籃編審委員會 1998, *Ming yi yao lan——Shang hai zhong yi xue yuan (Shang hai zhong yi zhuan men xue xiao) xiao shi*, Shanghai 上海: Shang hai zhong yi yao da xue chu ban she 上海中醫藥大學出版社

Nan jing shi jian ye qu di fang zhi bian zuan wei yuan hui [NJSJYQDFZBZWYH] 南京市建鄴區地方誌編纂委員會 2003, *Jian ye qu zhi* 建鄴區志, Beijing 北京: Fang zhi chu ban she 方志出版社

Nan jing tu shu guan [NJTSG] 南京圖書館 (ed.) 2011, *Zhong guo jin xian dai ren wu xiang zhuan* 中國近現代人物像傳, Shanghai 上海: Shang hai gu ji chu ban she 上海古籍出版社

Nan jing zhong yi yao da xue [NJZYYDX] 南京中醫藥大學 (ed.) 2006, *Zhong yao da ci dian (fan li)* 中藥大辭典(凡例), Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社

Nan shi qu di fang zhi bian zuan wei yuan hui [NSQDFZBZWYH] 南市區地方誌編纂委員會 (ed.) 1997, *Nan shi qu zhi* 南市區志, Shanghai 上海: Shang hai she hui ke xue yuan chu ban she 上海社會科學院出版社

Nie San 聶三 1984, 'Dong chong xia cao tan qu 冬蟲夏草談趣', *Shi yong jun* 食用菌, (1): 42-43

Niu Yahua 牛亞華 2003, 'Qing mo liu ri yi xue sheng ji qi dui zhong guo jin dai yi xue shi ye de gong xian 清末留日醫學生及其對中國近代醫學事業的貢獻', *Zhong guo ke ji shi liao* 中國科技史料, 24(3): 228-243

Osodo Hiroshi 小曾戶洋 2012, 'Ri ben han fang yi xue xing cheng zhi gui ji 日本漢方醫學形成之軌跡', Guo Xiumei 郭秀梅 (trans.), *Zhong guo ke ji shi za zhi* 中國科技史雜誌, 33(1): 80-85

Pan Dawei 潘大爲 2015, 'Zhong guo gu dai gong ting shi yao ren zhi du ji qi yan jin 中國古代宮廷試藥人制度及其演進', *Yi xue yu zhe xue* 醫學與哲學, 36(12A): 79-82

Pan Jixing 潘吉星 1984, 'Tan 'Zhi wu xue' yi cu zai zhong guo he ri ben de you lai 談'植物學'一詞在中國和日本的由來', *Da zi ran tan suo* 大自然探索, (3): 167-172

Pan Jun 潘鈞 2008, *Ri ben ci shu yan jiu* 日本辭書研究, Shanghai 上海: Shang hai ren min chu ban she 上海人民出版社

Pan Junxiang 潘君祥 (ed.) 1998, *Jin dai zhong guo guo huo yun dong yan jiu* 近代中國國貨運動研究, Shanghai 上海: Shang hai she hui ke xue yuan chu ban she 上海社會科學院出版社

Peng Shenhong 彭升紅 2008, *Qing dai min guo xi zang fang zhi yan jiu* 清代民國西藏方志研究 (MA Thesis), Chengdu 成都: Si chuan shi fan da xue shuo shi xue wei lun wen 四川師範大學碩士學位論文

Pi Guoli 皮國立 2006, 'Tan suo guo wang, fa xian xin fa——Jin dai zhong guo ji bing shi de yan jiu hui gu 探索過往, 發現新法——近代中國疾病史的研究回顧', *Tai wan shi da li shi xue bao* 臺灣師大歷史學報, (35): 251-278

Pi Guoli 皮國立 2008, *Jin dai zhong yi de shen ti guan yu si xiang zhuan xing: Tang zong hai yu zhong xi yi hui tong shi dai* 近代中醫的身體觀與思想轉型: 唐宗海與中西醫匯通時代, Beijing 北京: Sheng huo ·du shu ·xin zhi san lian shu dian 生活 讀書 新知三聯書店

Pi Guoli 皮國立 2009, *Tai wan ri ri xin: Dang zhong yao peng shang xi yao* 臺灣日日新: 當中藥碰上西藥, Taipei 臺北: Tai wan shu fang chu ban you xian gong si 臺灣書房出版有限公司

Pi Guoli 皮國立 2012, 'Yi liao yu jin dai she hui——Shi xi lu xun de fan zhong yi qing jie 醫療與近代社會——試析魯迅的反中醫情結', *Zhong guo she hui li shi ping lun* 中國社會歷史評論, (13): 353-376

Pi Guoli 皮國立 2013, 'Min guo shi qi de yi xue ge min yu yi shi yan jiu——Yu yan (1879-1954) "Xian dai yi xue shi" de gai nian ji qi shi jian 民國時期的醫學革命與醫史研究——余岩(1879-1954) "現代醫學史" 的概念及其實踐', *Zhong yi yao za zhi* 中醫藥雜誌, (S1): 159-185

Pi Guoli 皮國立 2013, 'Zhong xi yi xue hua yu yu jin dai shang ye——Yi *Shen bao* shang de 'sha

yao shui' wei li 中西醫學話語與近代商業——以《申報》上的'痧藥水'為例', *Xue shu yue kan* 學術月刊, (1): 149-164
Qian Shifu 錢實甫 1980, *Qing dai zhi guan nian biao* 清代職官年表, Beijing 北京: Zhong hua shu ju 中華書局.
Qian Yimin 錢益民 and Yan Zhiyuan 顏志淵 2007, *Yan fu qing zhuan* 顏福慶傳, Shanghai 上海: Fu dan da xue chu ban she 復旦大學出版社
Qiao Yong 喬永 2010, '*Ci yuan* bian xiu yi bai nian 《辭源》編修一百年', *Ci shu yan jiu* 辭書研究, (4): 109-116
Qiao Zhaohong 喬兆紅 2003, 'Hua qiao yu nan yang quan ye hui 華僑與南洋勸業會', *Wen shi zhe* 文史哲, (2): 103-108
Qing hai sheng sheng wu yan jiu suo [QHSSWYJS] 青海省生物研究所 and Tong ren xian long wu zhen liao suo [TRXLWZLS] 同仁縣隆務診療所 1972, *Qing zang gao yuan yao wu tu jian* 青藏高原藥物圖鑒, Xining 西寧: Qing hai ren min chu ban she 青海人民出版社
Qiu Guangming 丘光明 *et al*. 2001, *Zhong guo ke xue ji shu shi: Du liang heng juan* 中國科學技術史: 度量衡卷, Beijing 北京: Ke xue chu ban she 科學出版社
Qiu Peiran 裘沛然 (ed.) 2002, *Zhong guo yi ji da ci dian* 中國醫籍大辭典, Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社
Qu Shiguang 渠時光 1979, *Zhong guo yao xue jian shi* 中國藥學簡史, Shenyang 瀋陽: Shen yang yao xue yuan 瀋陽藥學院
Qu Shiguang 渠時光 1989, *Zhong guo yao xue shi* 中國藥學史, Shenyang 瀋陽: Liao ning da xue chu ban she 遼寧大學出版社
Qu Tiehua 曲鐵華 and Li Juan 李娟 2010, *Zhong guo jin dai ke xue jiao yu shi* 中國近代科學教育史, Beijing 北京: Ren min jiao yu chu ban she 人民教育出版社
Que Wensan 闕文三 2003, 'Ri ben jiang hu shi qi de lan xue 日本江戶時期的蘭學', *Li shi yue kan* 歷史月刊, 181: 48-54
Rao Yi 饒毅 2013, 'Xian dai ke xue yan jiu zhong yao de xian qu——Zhang Chang shao 現代科學研究中藥的先驅——張昌紹', *Zhong guo ke xue: Sheng ming ke xue* 中國科學: 生命科學, 43(3): 263-270
Rong Xinchun 肜新春 (ed.) 2010, *Min guo jing ji* 民國經濟, Beijing 北京: Zhong guo da bai ke quan shu chu ban she 中國大百科全書出版社.
Shan dong sheng zheng xie wen shi zi liao wei yuan hui [SDSZXWSZLWYH] 山東省政協文史資料委員會 (ed.) 1998, *Shan dong wen shi ji cui* 山東文史集粹, Beijing 北京: Zhong guo wen shi chu ban she 中國文史出版社
Shan xi sheng di fang zhi bian zuan wei yuan hui [SXSDFZBZWYH] 陝西省地方誌編纂委員會 (ed.) 1996, *Shan xi sheng zhi ·wei sheng zhi* 陝西省志 衛生志, Xi'an 西安: Shan xi ren min chu ban she 陝西人民出版社
Shan Yude 單于德 (ed.) 2004, *Hui zu yi yao xue jian shi* 回族醫藥學簡史, Yinchuan 銀川: Ning xia ren min chu ban she 寧夏人民出版社
Shang hai jiu zheng quan jian zhi zhi bian zuan wei yuan hui [SHJZQJZZ] 《上海舊政權建置志》編纂委員會 2001, *Shang hai jiu zheng quan jian zhi zhi* 上海舊政權建置志, Shanghai 上海: Shang hai she hui ke xue yuan chu ban she 上海社會科學院出版社
Shang hai shi bao shan qu di fang zhi bian zuan wei yuan hui [SHSBSQDFZBZWYH] 上海市寶山區地方誌編纂委員會 1992, *Bao shan xian zhi* 寶山縣誌, Shanghai 上海: Shang hai ren min chu ban she 上海人民出版社
Shang hai shi yi yao gong si [SHSYYGS] 上海市醫藥公司 *et al*. 1988, *Shang hai jin dai xi yao hang ye shi* 上海近代西藥行業史, Shanghai 上海: Shang hai she hui ke xue yuan chu ban she 上海社會科學院出版社
Shang hai shi zhong yi wen xian guan [SHSZYWXG] 上海市中醫文獻館 and Shang hai zhong yi yao da xue yi shi bo wu guan [SHZYYDXYSBWG] 上海中醫藥大學醫史博物館 2008, *Hai pai zhong yi xue shu liu pai jing cui* 海派中醫學術流派精粹, Shanghai 上海: Shang hai jiao tong da xue chu ban she 上海交通大學出版社
Shang hai tong zhi bian zuan wei yuan hui [SHTZBZWYH] 上海通志編纂委員會 2005, *Shang*

hai tong zhi 上海通志 (book 1), Shanghai 上海: Shang hai ren min chu ban she 上海人民出版社, Shang hai she hui ke xue yuan chu ban she 上海社會科學院出版社
Shang hai zhong yi xue yuan yi shi bo wu guan [SHZYXYYSBWG] 上海中醫學院醫史博物館 (ed.) 1965, *Liu shi nian lai zhong yi bao kan mu lu* 六十年來中醫報刊目錄, Shanghai 上海: Shang hai zhong yi xue yuan yi shi bo wu guan 上海中醫學院醫史博物館
Shang hai zu jie zhi bian zuan wei yuan hui [SHZJZBZWYH] 《上海租界志》編纂委員會 (ed.) 2001, *Shang hai zu jie zhi* 上海租界志, Shanghai 上海: Shang hai she hui ke xue yuan chu ban she 上海社會科學院出版社
Shang Zhijun 尚志鈞 2009, *Zhong guo ben cao yao ji kao* 中國本草要籍考, Shang Yuansheng 尚元勝 and Shang Yuanou 尚元藕 (eds.), Hefei 合肥: An hui ke xue ji shu chu ban she 安徽科學技術出版社
She Zhixiang 佘之祥 (ed.) 2011, *Jiang su li dai ming ren lu: Ke ji juan* 江蘇歷代名人錄: 科技卷, Nanjing 南京: Jiang su ren min chu ban she 江蘇人民出版社
Shen Jigang 沈季剛 *et al*. 1996, 'Zhong yi xue jia cao bing zhang shi lue 中醫學家曹炳章事略', In: *Zhe jiang wen shi ji cui (jiao yu ke ji juan)* 浙江文史集萃(教育科技卷), Hangzhou 杭州: Zhe jiang ren min chu ban she 浙江人民出版社
Shen Weidong 沈偉東 2012, *Zhong yi wang shi: 1910-1949 min guo zhong yi qi kan yan jiu* 中醫往事: 1910-1949 民國中醫期刊研究, Beijing 北京: Shang wu yin shu guan 商務印書館
Shi Guoqiang 史國強 2013, '*Tian shan fu* zhu zhe kao bian 《天山賦》著者考辨', *Zhong guo dian ji yu wen hua* 中國典籍與文化, (4): 56-59
Shi Nianhai 史念海 1991, *Zhong guo li shi ren kou di li he li shi jing ji di li* 中國歷史人口地理和歷史經濟地理, Taibei 臺北: 臺灣學生書局
Shi Qi 施杞 1994, *Shang hai li dai yi jia jian jie* 上海歷代醫家簡介, Shanghai 上海: Xue lin chu ban she 學林出版社
Shi Yuguang 史宇廣 (ed.) 1991, Zhong guo zhong yi ren ming ci dian 中國中醫人名辭典, Beijing 北京: Zhong yi gu ji chu ban she 中醫古籍出版社
Shou Zhuheng 壽祝衡 2011, 'Meng mu di 孟目的', In: *Zhong hua min guo shi: Ren wu zhuan (di si juan)* 中華民國史: 人物傳(第 4 卷), Beijing 北京: Zhong hua shu ju 中華書局
Song Sixi 宋嗣喜 1986, 'Gou tong zhong e wen hua de shi zhe——Ji shi jiu shi ji lai hua de e guo yi sheng 溝通中俄文化的使者——記十九世紀來華的俄國醫生', *Qiu shi xue kan* 求是學刊, (1): 93-96
Song Yongping 宋永平 1996, 'Tan Cui and the Local Chronicles of Yunnan 檀萃與雲南地方志', *Shi xue shi yan jiu* 史學史研究 (1): 77-78
Song Zhiqi 宋之琪 1994, 'Zhong guo jin dai zui zao xue xi xi yi de ren——Guan Tao 中國近代最早學習西醫的人——關韜', *Zhong hua yi shi za zhi* 中華醫史雜誌, (4): 256
Song Zhiqi 宋之琪 1996, 'Zhong guo yao xue shi yan jiu 60 nian 中國藥學史研究 60 年', *Zhong hua yi shi za zhi* 中華醫史雜誌, 26(3): 186-192
Song Zhiqi 宋之琪 1997, 'Zhong guo yao xue shi yan jiu jin zhan 中國藥學史研究進展', *Zhong guo yao xue za zhi* 中國藥學雜誌, 32(11): 711-714
Su Quanyou 蘇全有 and Zou Baogang 鄒寶剛 2012, 'Dui jin dai zhong xi yi lun zheng yan jiu de hui gu yu fan si 對近代中西醫論爭研究的回顧與反思', *Nan jing zhong yi yao da xue xue bao (she hui ke xue ban)* 南京中醫藥大學學報(社會科學版), 13(1): 9-15
Su zhou da xue fu shu di yi yi yuan [SZDXFSDYYY] 蘇州大學附屬第一醫院 2008, *Su zhou da xue fu shu di yi yi yuan yi bai er shi nian jiao yu hui mou* 蘇州大學附屬第一醫院一百二十年教育回眸, Suzhou 蘇州: Su zhou da xue fu shu di yi yi yuan 蘇州大學附屬第一醫院
Sun Guangrong 孫光榮 2013, 'Yi an yan jiu yu zhuan xie de si lu yu fang fa 醫案研究與撰寫的思路與方法', *Bei jing zhong yi yao da xue xue bao* (*Zhong yi lin chuang ban*) 北京中醫藥大學學報 (中醫臨床版), 20(5): 3-6
Sun yi xian bo shi yi xue yuan chou bei wei yuan hui [SYXBSYXYCBWYH] 孫逸仙博士醫學院籌備委員會 1935, *Guang zhou bo ji yi yuan chuang li bai zhou nian ji nian* 廣州博濟醫院創立百周年紀念, Guangzhou 廣州: Ling nan da xue 嶺南大學
Sun Yuqin 孫玉琴 2004, 'Jian shu jin dai shang hai dui wai mao yi zhong xin di wei de xing cheng

簡述近代上海對外貿易中心地位的形成’, *Zhong guo jing ji shi yan jiu* 中國經濟史研究, (4): 81-85
Tan Qixiang 譚其驤 1996, *Zhong guo li shi di tu ji* 中國歷史地圖集 (book 8), Beijing 北京: Zhong guo di tu chu ban she 中國歷史地圖出版社
Tan Ruqian 譚汝謙 (ed.) 1980, *Zhong guo yi ri ben shu zong he mu lu (fu biao)* 中國譯日本書綜合目錄(附表), Hongkong 香港: Zhong wen da xue chu ban she 中文大學出版社
Tan Xiurong 譚秀榮 *et al*. 2014, ‘*Yao xue ji kan* de chuang kan ji qi ke xue shi jia zhi 《藥學季刊》的創刊及其科學史價值’, *Bian ji xue bao* 編輯學報, 26(3): 226-230
Tang Tingyou 唐廷猷 2001, *Zhong guo yao ye shi* 中國藥業史, Beijing 北京: Zhong guo yi yao ke ji chu ban she 中國醫藥科技出版社
Tao Chisun 陶熾孫 1933, *Zhong guo yi xue shi* 中國醫學史, Shanghai 上海: Dong nan yi xue yuan 東南醫學院
Tao Feiya 陶飛亞 2010, ‘Chuan jiao shi zhong yi guan de bian qian 傳教士中醫觀的變遷’, *Li shi yan jiu* 歷史研究, (5): 60-78
Tao Xiandu 陶賢都 and Luo Yuan 羅元 2010, ‘*Ke xue shi jie* yu zhong guo jin dai ke xue ji shu chuan bo 《科學世界》與中國近代科學技術傳播’, *Ke xue ji shu zhe xue yan jiu* 科學技術哲學研究, 27(4): 90-93
Tian Feng 田峰 and Wang Mimi 王咪咪 2007, ‘Cong ‘Yang wu yun dong’ dao ‘Zhong xi’ yi hui tong 從‘洋務運動’到‘中西醫匯通’’, *Zhong yi wen xian za zhi* 中醫文獻雜誌, (1): 56-58
Tian Tao 田濤 1995, ‘Qing mo min chu zai hua ji du jiao yi liao wei sheng shi ye ji qi zhuan ye hua 清末民初在華基督教醫療衛生事業及其專業化’, *Jin dai shi yan jiu* 近代史研究, (5): 169-185
Tong Xun 佟洵 1999, ‘Sho lun dong zheng jiao zai bei jing de chuan bo 試論東正教在北京的傳播’, *Bei jing lian he da xue xue bao* 北京聯合大學學報, 13(2): 9-17
Unschuld, Paul U. 2003, ‘Xi dang de zhong guo yi xue shi yan jiu: Cheng jiu, fang fa ji zhan wang 西方的中國醫學史研究: 成就, 方法及展望’, Mai Jinsheng 麥勁生 (trans.), *Dang dai shi xue* 當代史學, 6(2): 1-11
Wan Ming 萬明 2011, *Ming dai zhong wai guan xi shi lun gao* 明代中外關係史論稿, Beijing 北京: Zhong guo she hui ke xue chu ban she 中國社會科學出版社
Wang Chengtao 王成濤 2008, *Zhong hua zhi ye jiao yu she yu zhong guo zhi ye jiao yu jin dai hua* 中華職業教育社與中國職業教育近代化 (MA Thesis), Chongqing 重慶: Xi nan da xue jiao yu shi fang xiang shuo shi xue wei lun wen 西南大學教育史方向碩士學位論文
Wang Hongbin 王宏斌 2011, ‘Qian long huang di cong wei xia ling guan bi jiang, zhe, min san hai guan 乾隆皇帝從未下令關閉江、浙、閩三海關’, *Shi xue yue kan* 史學月刊, (6): 40-45
Wang Jiarong 汪家熔 2001, ‘*Ci yuan, Ci hai* de kai chuang xing 《辭源》、《辭海》的開創性’, *Ci shu yan jiu* 辭書研究, (4): 94, 130-140
Wang Junmo 王筠默 *et al*. (eds.) 1994, Zhong yao yan jiu yu wen xian jian suo 中藥研究與文獻檢索, Shanghai 上海: Shang hai yuan dong chu ban she 上海遠東出版社
Wang Kaisui 王開隊 2010, ‘Liu zan ting yu jin dai kang qu fang zhi bian xiu 劉贊廷與近代康區方志編修’, *Zhong guo di fang zhi* 中國地方誌, (3): 60-63
Wang Lei 王镭 1991, *Xi zang yi xue shi* 西藏醫學史, Nanjing 南京: Yi lin chu ban she 譯林出版社
Wang Lüping 王綠萍 (ed.) 2011, *Si chuan bao kan wu shi nian ji cheng (1897-1949)* 四川報刊五十年集成(1897-1949), Chengdu 成都: Si chuan da xue chu ban she 四川大學出版社
Wang Mingke 王明珂 2008, *Qiang zai han zang zhi jian: Chuan xi qiang zu de li shi ren lei xue yan jiu* 羌在漢藏之間: 川西羌族的歷史人類學研究, Beijing 北京: Zhong hua shu ju 中華書局
Wang Qianjin 汪前進 and Huang Yanhong 黃豔紅 (eds.) 2010, *Zhong guo ke xue yuan ren wu zhuan (vol. 1)* 中國科學院人物傳(第 1 卷), Beijing 北京: Ke xue chu ban she 科學出版社
Wang Qisheng 王奇生 2008, ‘Min guo shi qi de ri shu han yi 民國時期的日書漢譯’, *Jin dai shi yan jiu* 近代史研究, (6): 45-63
Wang Ruixiang 王瑞祥 2009, *Zhong guo gu yi ji shu mu ti yao* 中國古醫籍書目提要, Beijing 北

京: Zhong yi gu ji chu ban she 中醫古籍出版社
Wang Shimin 王世民 2006, '*Ben cao bei yao* he *zeng ding ben cao bei* yao xiao kao 《本草備要》和《增訂本草備要》小考', *Shan xi zhong yi* 山西中醫, 22(1): 41-42
Wang Weikang 王偉康 2000, 'Wu jing zi yu yang zhou 吳敬梓與揚州', *Jiang su guang bo dian shi da xue xue bao* 江蘇廣播電視大學學報 11(1): 57-61
Wang Weikang 王偉康 2010, 'Wu jing zi yu yang zhou guan xi kao cha de qi shi 吳敬梓與揚州關係考察的啟示', *Yang zhou zhi ye da xue xue bao* 揚州職業大學學報, 14(4): 15-18
Wang Wengru 王翁如 1983, 'Lu wen yu xian sheng de ku xue cheng jiu 陸文郁先生的苦學成就', In: *Tian jin wen shi cong kan* 天津文史叢刊, Tianjin 天津: Tian jin shi wen shi yan jiu guan 天津市文史研究館
Wang Wensheng 王文聖 2012, *Wan qing chong qing hai guan de li shi kao cha* 晚清重慶海關的歷史考察, Hefei 合肥: An hui da xue chu ban she 安徽大學出版社
Wang Xiangrong 汪向榮 2014, *Ri ben jiao xi* 日本教習, Beijing 北京: Shang wu yin shu guan 商務印書館
Wang Xiaojun 王小軍 2011, 'Zhong guo shi xue jie ji bing shi yan jiu de hui gu yu fan si 中國史學界疾病史研究的回顧與反思', *Shi xue yue kan* 史學月刊, (8): 100-108
Wang Xiaonan 王瀟楠 2001, 'Wu wang guo chi——Jin dai zhong guo bu ping deng tiao yue zhong de chuan jiao tiao kuan tou shi 勿忘國恥——近代中國不平等條約中的傳教條款透視', *Shi jie zong jiao wen hua* 世界宗教文化, (2): 7-8
Wang Xiaoqiu 王曉秋 and Ooba Osamu 大庭脩 1996, *Zhong ri wen hua jiao liu shi da xi: Li shi juan* 中日文化交流史大系: 歷史卷, Hangzhou 杭州: Zhe jiang ren min chu ban she 浙江人民出版社
Wang Yong 王勇 2009, 'Zhong guo jin dai yi xue de kai tuo zhe liu rui heng xian sheng 中國近代醫學的開拓者劉瑞恒先生', *Nan jing yi ke da xue xue bao (she hui ke xue ban)* 南京醫科大學學報(社會科學版), (1): 86-88
Wang Yunwu 王雲五 [1973] 2008, *Shang wu yin shu guan yu xin jiao yu nian pu* 商務印書館與新教育年譜, Nanchang 南昌: Jiang xi jiao yu chu ban she 江西教育出版社
Wang Yusheng 王渝生 2000, *Zhong guo jin dai ke xue de xian qu: Li Shanlan* 中國近代科學的先驅: 李善蘭, Beijing 北京: Ke xue chu ban she 科學出版社
Wang Zhenru 汪振儒 1988, 'Guan yu zhi wu xue yi ci de lai yuan wen ti 關於植物學一詞的來源問題', Zhong guo ke ji shi liao 中國科技史料, 9(1): 88
Wang Zhenrui 王振瑞 2002, ''Zhong xi yi jie he' yu 'zhong xi yi hui tong' de ben zhi qu bie ''中西醫結合'與'中西醫匯通'的本質區別', *Zhong hua yi shi za zhi* 中華醫史雜誌, 32(2): 122-124
Wang Zhipu 王致譜 2014, 'Chen bang xian xian sheng zao qi yi shi xue yan jiu gong zuo 陳邦賢先生早期醫史學研究工作', In: *"Yi shi yan jiu hui" bai nian ji nian wen ji* "醫史研究會"百年紀念文集, Taiyuan 太原: Zhong hua yi xue hui yi shi xue fen hui 中華醫學會醫史學分會
Wang Zichun 汪子春 1981, 'Zhong guo zao qi chuan bo zhi wu xue zhi shi de zhu zuo *Zhi wu xue* 中國早期傳播植物學知識的著作《植物學》', *Zhong guo ke ji shi liao* 中國科技史料, (1): 86-87
Wei Guangqi 魏光奇 2012, 'Xi shou yu chong gou: Jin dai zhong guo jing yin de 'jin bu guan' 吸收與重構: 近代中國精英的"進步史觀"', *Quan qiu shi ping lun* 全球史評論, 5: 268-285
Wu Guosheng 吳國盛 2016, 'Bo wu xue: chuan tong zhong guo de ke xue 博物學: 傳統中國的科學', *Xue shu yue kan* 學術月刊, 48(4): 11-19
Wen Xiang 文庠 2007, *Yi zhi yu chao yue—— Min guo zhong yi yi zheng* 移植與超越——民國中醫醫政, Beijing 北京: Zhong guo zhong yi yao chu ban she 中國中醫藥出版社
Wu Hailan 吳海蘭 *et al.* 2013, 'Xin zhu shen he nao zhu shen tan xi 心主神和腦主神探析', *An hui zhong yi xue yuan xue bao* 安徽中醫學院學報, 32(1): 8-9
Wu Jieping 吳階平 (ed.) 1998, *Zhong guo xing ke xue bai ke quan shu* 中國性科學百科全書, Beijing 北京: Zhong guo da bai ke quan shu chu ban she 中國大百科全書出版社
Wu Likun 吳立坤 2006, *Jin dai xi fang yao xue de chuan ru ji dui zhong yao xue de ying xiang* 近代西方藥學的傳入及對中藥學的影響 (MA Thesis), Beijing 北京: Bei jing zhong yi yao da xue lin chuang zhong yao xue shuo shi xue wei lun wen 北京中醫藥大學臨床中藥學碩士學

位論文
Wu Qinggui 吳慶貴, Su Zhixian 蘇智先, Chen Guangdeng 陳光登 2009, 'Si chuan dong chong xia cao zi yuan xian zhuang ji ke xue bao hu cuo shi 四川冬蟲夏草資源現狀及科學保護措施', *Mian yang shi fan xue yuan xue bao* 綿陽師範學院學報, 28(5): 53-57, 63
Wu Ren'an 吳仁安 1997, *Ming qing shi qi shang hai di qu de zhu xing wang zu* 明清時期上海地區的著姓望族, Shanghai 上海: Shang hai ren min chu ban she 上海人民出版社
Wu Songdi 吳松弟 2009, 'Zou xiang shi jie: Zhong guo can jia zao qi shi jie bo lan hui de li shi yan jiu——Yi zhong guo jiu hai guan chu ban wu wei zhong xin 走向世界: 中國參加早期世界博覽會的歷史研究——以中國舊海關出版物為中心', *Shi lin* 史林, (2): 42-51
Wu Songdi 吳松弟 2011, 'Zhong guo jiu hai guan chu ban wu ping shu——yi mei guo ha fo yan jing tu shu guan shou cang wei zhong xin 中國舊海關出版物評述——以美國哈佛燕京圖書館收藏爲中心', *Shi xue yue kan* 史學月刊 (12): 54-63
Wu Songdi 吳松弟 2012, 'Zhong guo jiu hai guan chu ban wu de shu ming nei rong he liu bian kao zheng: tong ji cong shu zhi ri bao yue bao he ji bao 中國舊海關出版物的書名、內容和流變考證: 統計叢書之日報、月報和季報', *Shang hai hai guan xue yuan xue bao* 上海海關學院學報 (2): 1-8
Wu Songdi 吳松弟 and Fang Shusheng 方書生 2007, ' Zhong guo jiu hai guan tong ji de ren zhi yu li yong 中國舊海關統計的認知與利用', *Shi xue yue kan* 史學月刊 (7): 33-42
Wu Zhengyi 吳征鎰 and Li Xiwen 李錫文 1977, *Zhong guo zhi wu zhi* 中國植物誌 (vol. 66), Beijing 北京: Ke xue chu ban she 科學出版社
Xi Xia 奚霞 2005, 'Shang hai min guo shi qi de zhong xi yi lun zheng (dai xu) 上海民國時期的中西醫論爭(待續)', *Zhong yi wen xian za zhi* 中醫文獻雜誌, (1): 46-48
Xi Xia 奚霞 2005, 'Shang hai min guo shi qi de zhong xi yi lun zheng (xu wan) 上海民國時期的中西醫論爭(續完)', *Zhong yi wen xian za zhi* 中醫文獻雜誌, (2): 44-46
Xi zang zi zhi qu zang yao yuan yao wu yan jiu suo [XZZZQZYYYWYJS] 西藏自治區藏醫院藥物研究所 2002, *Zhong hua ben cao* (*Zang yao juan*) 中華本草(藏藥卷), Shanghai 上海: Shang hai ke xue ji shu chu ban she 上海科學技術出版社
Xia Dongyuan 夏東元 2010, *Yang wu yun dong shi* 洋務運動史, Shanghai 上海: Hua dong shi fan da xue chu ban she 華東師範大學出版社
Xiang Xuan 項旋 2013, 'Qing dai nei fu tong huo zi kao lun 清代內府銅活字考論', *Zi ran ke xue shi yan jiu* 自然科學史研究, 32(2): 254-262
Xiao Guanyao 蕭觀耀 1943, 'Shang hai xin yao ye gai kuang 上海新藥業概況', *Yin hang zhou bao* 銀行週報, 27(27-28): 9-23
Xiao Qunzhong 肖群忠 2002, *Zhong guo xiao wen hua yan jiu* 中國孝文化研究, Taibei 臺北: Wu nan tu shu chu ban gu fen you xian gong si 五南圖書出版股份有限公司
Xiao Yifei 肖伊緋 2016, 'Min guo na hui er, Dong chong xia cao cai bu zhi qian 民國那會兒,冬蟲夏草才不值錢', *Bei jing qing nian bao* 北京青年報, 1 March, Section B: B6
Xiao Yuqiu 肖玉秋 2008, 'Shi lun qing dai zhong e wen hua jiao liu de bu ping heng xing 試論清代中俄文化交流的不平衡性', *Shi xue ji kan* 史學集刊, (4): 37-43
Xiao Yuqiu 肖玉秋 2014, '17-19 shi ji e guo ren dui zhong yi de yan jiu 17-19 世紀俄國人對中醫的研究', *Shi xue yue kan* 史學月刊, (3): 60-67
Xie Huimin 謝惠民 and Cong Luoluo 叢駱駱 (eds.) 2013, *Zhong guo yao xue shi can kao* 中國藥學史參考, Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社
Xing Xingqiu 幸興球 1975, 'Da chan cao he xiao chan cao de fen lei 大蟬草和小蟬草的分類', *Wei sheng wu xue bao* 微生物學報 15(1): 21- 26
Xiong Yuezhi 熊月之 (ed.) 2005, *Shang hai ming ren ming shi ming wu da guan* 上海名人名事名物大觀, Shanghai 上海: Shang hai ren min chu ban she 上海人民出版社
Xiong Yuezhi 熊月之 [1994] 1995, *Xi xue dong jian yu wan qing she hui* 西學東漸與晚清社會, Shanghai 上海: Shang hai ren min chu ban she 上海人民出版社
Xiong Yuezhi 熊月之 2011, *Xi xue dong jian yu wan qing she hui* 西學東漸與晚清社會, Beijing 北京: Zhong guo ren min da xue chu ban she 中國人民大學出版社
Xue Linping 薛林平 2015, *Bei jing chuan tong cun luo* 北京傳統村落, Beijing 北京: Zhong guo

jian zhu gong ye chu ban she 中國建築工業出版社

Xue Liyong 薛理勇 (ed.) 1999, *Shang hai zhang gu ci dian* 上海掌故辭典, Shanghai 上海: Shang hai ci shu chu ban she 上海辭書出版社

Xue Qinglu 薛清錄 (ed.) 2007, *Zhong guo zhong yi gu ji zong mu* 中國中醫古籍總目, Shanghai 上海: Shang hai ci shu chu ban she 上海辭書出版社

Xue Yu 薛愚 (ed.) 1984, *Zhong guo yao xue shi liao* 中國藥學史料, Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社

Xue Yu 薛愚 1987, *Zhong guo yao xue hui shi lue (1907-1986)* 中國藥學會史略(1907-1986), Beijing 北京: Zhong guo yi yao ke ji chu ban she 中國醫藥科技出版社

Yan Aiping 閆愛萍 2013, 'Zai "chuan tong" yu "fa ming" zhi jian: Guan gong xin yang de she hui wen hua gong neng yan bian 在"傳統"與"發明"之間: 關公信仰的社會文化功能演變', *Qing hai she hui ke xue* 青海社會科學, (2): 191-195

Yan Shaodang 嚴紹璗 1992, *Han ji zai ri ben de liu bu yan jiu* 漢籍在日本的流布研究, Nanjing 南京: Jiang su gu ji chu ban she 江蘇古籍出版社

Yang Changhong 楊長虹 2006, '*Liu zan ting cang gao* yan jiu 《劉贊廷藏稿》研究', *Zhong guo zang xue* 中國藏學, (4): 34-42

Yang Hongyu 楊宏宇 and Chang Cunku 常存庫 2006, 'Zhong guo gu dai yao shi guan li cuo yao 中國古代藥事管理撮要', *Zhong yi yao xue bao* 中醫藥學報, (5): 61-63

Yang Jiaming 楊嘉銘 2000, *De ge yin jing yuan* 德格印經院, Chengdu 成都: Si chuan ren min chu ban she 四川人民出版社

Yang Jianxin 楊建新 2006, ''Zhong guo' yi ci he zhong guo jiang yu xing cheng zai tan tao "中國"一詞和中國疆域形成再探討', *Zhong guo bian jiang shi di yan jiu* 中國邊疆史地研究, 16(2): 1-8

Yang Jin 楊進 (ed.) [1989] 2008, *Wen bing xue* 溫病學, Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社

Yang Jing 楊菁 1999, 'Shi lun kang zhan shi qi de tong huo peng zhang 試論抗戰時期的通貨膨脹', *Kang ri zhan zheng yan jiu* 抗日戰爭研究, (4): 90-105

Yang Mingzhe 楊明哲 2009, 'Li hong zhang yu jin dai xi fang yi xue zai zhong guo de chuan bu 李鴻章與近代西方醫學在中國的傳佈', *Chang geng ren wen she hui xue bao* 長庚人文社會學報, 2(2): 299-340

Yang Nianqun 楊念群 2006, *Zai zao 'bing ren': Zhong xi yi chong tu xia de kong jian zheng zhi: 1832-1985* 再造"病人": 中西醫衝突下的空間政治：1832-1985, Beijing 北京: Zhong guo ren min da xue chu ban she 中國人民大學出版社

Yang Shimin 楊世民 1994, 'Shan xi zhi yao gong ye he yao xue jiao yu de chuang shi ren xue dao wu xian sheng 陝西製藥工業和藥學教育的創始人薛道五先生', *Xi bei yao xue za zhi* 西北藥學雜誌, 9(4): 181-182

Yang Xiangyin 楊祥銀 2008a, 'Jin dai xiang gang yi liao, ji bing yu wei sheng shi yan jiu 近代香港醫療, 疾病與衛生史研究', *Shi xue li lun yan jiu* 史學理論研究, (4): 116-123

Yang Xiangyin 楊祥銀 2008b, 'Wei sheng (jian kang) yu jin dai zhong guo xian dai xing——Yi jin dai shang hai yi liao wei sheng guang gao wei zhong xin de fen xi (1927-1937 nian) 衛生(健康)與近代中國現代性——以近代上海醫療衛生廣告為中心的分析(1927-1937 年)', *Shi xue ji kan* 史學集刊, (5): 52-59

Yang Xinglin 楊杏林 and Lou Shaolai 樓紹來 1997, 'Ding gan ren nian biao 丁甘仁年表', *Zhong yi wen xian za zhi* 中醫文獻雜誌, (1): 37-40

Yang Xinglin 楊杏林 and Lou Shaolai 樓紹來 1998, 'You guan shang hai zhong yi zhuan men xue xiao chuang li de kao zheng shuo ming 有關上海中醫專門學校創立的考證說明', *Zhong hua yi shi za zhi* 中華醫史雜誌, 28(4): 225

Yang Xinglin 楊杏林 and Tang Xiaohong 唐曉紅 1991, *Shang hai zhong guo yi xue yuan yuan shi* 上海中國醫學院院史, Shanghai 上海: Shang hai ke xue ji shu wen xian chu ban she 上海科學技術文獻出版社

Yang Xinglin 楊杏林 and Wang Qiaochu 王翹楚 1994, 'Chen cun ren 陳存仁', In: *Zhong guo xian dai ke xue jia zhuan ji (di wu ji)* 中國現代科學家傳記(第五集), Beijing 北京: Ke xue

chu ban she 科學出版社
Yang Yiwang 楊奕望 *et al*. 2014, 'Shi lun min guo shi qi *Yi shi za zhi* de ban kan te se 試論民國時期《醫史雜誌》的辦刊特色', *Zhong guo ke ji qi kan yan jiu* 中國科技期刊研究, 25(3): 453-455
Yang Zhong 楊忠 2008, *Ding gan ren zhuan* 丁甘仁傳, Shanghai 上海: Shang hai zhong yi yao da xue chu ban she 上海中醫藥大學出版社
Yao Xinyong 姚新勇 2000, 'Xian dai xing yan shuo zai zhong guo——1990 nian dai zhong guo xian dai xing hua ti de sao miao yutou shi 現代性言說在中國——1990 年代中國現代性話題的掃描與透視', *Wen yi zheng ming* 文藝爭鳴, (4): 4-13
Yao Yuan 姚遠 *et al*. (eds.) 2006, *Zhong guo jin dai ke ji qi kan yuan liu: 1792-1949* 中國近代科技期刊源流: 1792-1949, Jinan 濟南: Shan dong jiao yu chu ban she 山東教育出版社
Ye Enguo 葉恩國 (ed.) 2008, *Chuan tong ren wu guan gong* 傳統人物關公, Fuzhou 福州: Hai chao she ying yi shu chu ban she 海潮攝影藝術出版社
Ye Fazheng 葉發正 1995, *Shang han xue shu shi* 傷寒學術史, Wuhan 武漢: Hua zhong shi fan da xue chu ban she 華中師範大學出版社
Ye Sanduo 葉三多 1955, 'Ping zhong guo yao xue da ci dian 評中國藥學大辭典', *Zhong yao tong bao* 中藥通報, 1(2): 70-73
Ye Xinmiao 葉新苗 and Tang Yun 唐雲 2004, 'Lun zhang ci gong *Yao wu xue* 論章次公《藥物學》', *Zhong hua yi shi za zhi* 中華醫史雜誌, 34(1): 37-39
Yi Baozhong 衣保中 and Guo Xinwang 郭欣旺 2004, 'Teng tian feng ba yu qing mo zhong guoxi fang nong xue yin jin 藤田豐八與清末中國西方農學引進', *Dong bei ya lun tan* 東北亞論壇, 13(3): 79-83
Yi Li 伊麗 2000, 'Nian xi yao de sheng ping ji qi dui yi shu he ke xue de gong xian 年希堯的生平及其對藝術和科學的貢獻', *Zhong guo shi yan jiu* 中國史研究, (3): 155-165
Ying Junsheng 應俊生 and Chen Dezhao 陳德昭 2001, *Zhong guo zhi wu zhi* 中國植物志 (vol. 29), Beijing 北京: Ke xue chu ban she 科學出版社
Yong Heming 雍和明 2004, 'Guan yu zhong guo ci dian shi yan jiu de si kao 關於中國辭典史研究的思考', *Ci shu yan jiu* 辭書研究, (2): 14-21
Yong Mei 詠梅 2007, 'Dong yang shi xue jia teng tian feng ba zai zhong guo de huo dong ji qi ying xiang 東洋史學家藤田豐八在中國的活動及其影響', *Nei meng gu shi fan da xue xue bao (zhe xue she hui ke xue ban)* 內蒙古師範大學學報(哲學社會科學版), (2): 143-144
Yu Chuanfu 於傳福 and Yu Yansun 於燕蓀 1983, 'Huan nian yu da wang jiao shou 懷念於達望教授', *Yao xue tong bao* 藥學通報, 18(9): 43-44
Yu Dawang 於達望 *et al*. 1930, 'Zhong hua yao dian bian zuan jing guo 中華藥典編纂經過', *Yi yao xue* 醫藥學, 7(2): 23-36
Yu Gengzhe 于賡哲 and Liang Li 梁麗 2013, 'Gu dian yi xue de 'xi xue jing xiang' 古典醫學的"西學鏡像"', *Ren wen za zhi* 人文雜誌, (10): 93-102
Yu Ling 於玲 2014, ''Xin zhu shen ming' yu 'nao zhu shen ming' su yuan "心主神明"與"腦主神明"溯源', *Shan dong zhong yi yao da xue xue bao* 山東中醫藥大學學報, 38(4): 328-330
Yu Rongchun 於溶春 1986, ''Zhong guo' yi ci de you lai, yan bian ji qi yu min zu de guan xi "中國"一詞的由來，演變及其與民族的關係', *Nei meng gu she hui ke xue* 內蒙古社會科學, (2): 75-80
Yu Shenchu 余慎初 1981, *Zhong guo yao xue shi gang* 中國藥學史綱, Fuzhou 福州: Zhong hua quan guo zhong yi xue hui fu jian fen hui yin 中華全國中醫學會福建分會印
Yu Shenchu 余慎初 1987, *Zhong guo yao xue shi gang* 中國藥學史綱, Kunming 昆明: Yun nan ke ji chu ban she 雲南科技出版社
Yu Xin 余欣 2015, 'Bo wu xue yu xie ben wen hua: dun huang xue de xin jing yu 博物學與寫本文化：敦煌學的新境域', *Zhong guo gao xiao she hui ke xue* 中國高校社會科學, (2): 79-83
Yu Xinzhong 余新忠 2001, 'Guan zhu sheng ming——Hai xia liang an qing qi ji bing yi liao she hui shi yan jiu 關注生命——海峽兩岸興起疾病醫療社會史研究', *Zhong guo she hui jing ji shi yan jiu* 中國社會經濟史研究', (3): 94-98
Yu Xinzhong 余新忠 2002, '20 shi ji yi lai ming qing ji yi shi yan jiu shu ping 20 世紀以來明清疾

疫史研究述評’, *Zhong guo shi yan jiu dong tai* 中國史研究動態, (10): 15-23
Yu Xinzhong 余新忠 2003, ‘Zhong guo ji bing, yi liao shi tan suo de guo qu xian shi yu ke neng 中國疾病, 醫療史探索的過去、現實與可能’, *Li shi yan jiu* 歷史研究, (4): 158-168
Yu Xinzhong 余新忠 2012, ‘Hui dao ren jian ju jiao jian kang——Xin shi ji zhong guo yi liao shi yan jiu chu yi 回到人間 聚焦健康——新世紀中國醫療史研究芻議’, *Li shi jiao xue* 歷史教學, (22): 3-11
Yuan Guiqing 袁桂清 and Wang Jing 汪鏡 1997, ‘Zhong guo yi xue qi kan bian ji chu ban shi chub u yan jiu 中國醫學期刊編輯出版史初步研究’, *Zhong guo ke ji qi kan yan jiu* 中國科技期刊研究, 8(2): 50-54
Yuan Jiahong 袁佳紅 and Zhang Haiyan 張海豔 2011, ‘*Liu zan ting cang gao* shu lue——Jian lun liu zan ting *Cang gao* de zheng li yan jiu 《劉贊廷藏稿》述略——兼論劉贊廷《藏稿》的整理研究’, *Chong qing tu qing yan jiu* 重慶圖情研究, (2): 55-59
Yuan Qing 元青 (ed.) 2011, *Zhong guo jin dai chu ban shi gao* 中國近代出版史稿, Tianjin 天津: Nan kai da xue chu ban she 南開大學出版社
Yuan Shicheng 袁士誠 and Xie Haizhou 謝海洲 1981, ‘Re xin yao xue shi ye de meng mu di jiao shou 熱心藥學事業的孟目的教授’, *Yao xue tong bao* 藥學通報, 16(3): 22-25
Yuan Yuan 袁媛 2010, ‘Zhong guo xi yi jiao yu zhi fa duan: Tian jin zong du yi xue tang 中國西醫教育之發端: 天津總督醫學堂’, *Zi ran bian zheng fa tong xun* 自然辯證法通訊, 32(1): 63-69
Yue Zheng 樂正 1994, ‘Jin dai shang hai de jue qi yu guang zhou de shi luo 近代上海的崛起與廣州的失落’, *Er shi yi shi ji* 二十一世紀, (4): 29-38
Zang Mu 臧穆 and Noriko Kinjo 金城典子 1996, ‘Dong chong xia cao mo shi biao ben de yan jiu 冬蟲夏草模式標本的研究’, *Acta Botanica Yunnanica* 雲南植物研究, 18(2): 205-208
Zhan Xiaoyong 占驍勇 2001, ‘*Liu ya wai bian* zuo zhe xu kun sheng ping kao 《柳崖外編》作者徐昆生平考’, *Ming qing xiao shuo yan jiu* 明清小說研究, (2): 197-202
Zhan Yinxin 詹鄞鑫 1992, *Shen ling yu ji si——Zhong guo chuan tong zong jiao zong lun* 神靈與祭祀——中國傳統宗教綜論, Nanjing 南京: Jiang su gu ji chu ban she 江蘇古籍出版社
Zhang Benzhong 張本中 1976, ‘Za lan ‘ai luo bu zhi’ 砸爛‘艾羅補汁’, *Xin yi xue* 新醫學, 7(12): 605
Zhang Daqing 張大慶 2006, *Zhong guo jin dai ji bing she hui shi (1912-1937)* 中國近代疾病社會史(1912-1937), Jinan 濟南: Shan dong jiao yu chu ban she 山東教育出版社
Zhang Daqing 張大慶 2007, ‘Yi xue shi jiao yu zai zhong guo: Li shi, wen ti yu zhan wang 醫學史教育在中國: 歷史, 問題與展望’, *Zhong guo ke ji shi za zhi* 中國科技史雜志, 28(4): 432-439
Zhang Dengben 張登本 and Sun Lijun 孫理軍 2004, ‘Xin zhu shen, nao zhu shen, xin nao gong zhu shen quan shi 心主神, 腦主神, 心腦共主神詮釋’, *Zhong yi yao xue kan* 中醫藥學刊, 22(11): 1985-1986
Zhang Fengcong 張豐聰 2013, *Jin dai zhong yao yan jiu yu li lun shan bian——Yi jin dai yi yao xue qi kan wei zhong xin* 近代中藥研究與理論嬗變——以近代醫藥學期刊為中心 (PhD Thesis), Jinan 濟南: Shan dong zhong yi yao da xue zhong yi yi shi wen xian fang xiang bo shi xue wei lun wen 山東中醫藥大學中醫醫史文獻方向博士學位論文
Zhang Gengtian 張耕田 and Chen Wei 陳巍 2005, *Su zhou min guo yi wen zhi* 蘇州民國藝文志, Yangzhou 揚州: Guang ling shu she 廣陵書社
Zhang Guogang 張國剛 2003, *Cong zhong xi chu shi dao li yi zhi zheng——Ming qing chuan jiao shi yu zhong xi wen hua jiao liu* 從中西初識到禮儀之爭——明清傳教士與中西文化交流, Beijing 北京: Ren min chu ban she 人民出版社
Zhang Haipeng 張海鵬 *et al*. (ed.) 2014, *Jia wu zhan zheng de bai nian hui gu* 甲午戰爭的百年回顧, Beijing 北京: Zhong guo she hui ke xue chu ban she 中國社會科學出版社
Zhang Haiying 張海英 2002, *Ming qing jiang nan shang pin liu tong yu shi chang ti xi* 明清江南商品流通與市場體系, Shanghai 上海: Hua dong shi fan da xue chu ban she 華東師範大學出版社
Zhang Heng 張衡 (ed.) 2013, *Min guo ke jiao jing ying bai ren zhuan* 民國科教精英百人傳,

Nanjing 南京: Nan jing chu ban she 南京出版社
Zhang Jian 張劍 2005, *Ke xue she tuan zai jin dai zhong guo de ming yun——Yi zhong guo ke xue she wei zhong xin* 科學社團在近代中國的命運——以中國科學社為中心, Jinan 濟南: Shan dong jiao yu chu ban she 山東教育出版社
Zhang Jinsheng 鄭金生 2007, 'Lun ben cao shu zhong de xie shi cha hua yu yi shu cha hua 論本草書中的寫實插畫與藝術插畫', In: *Xing xiang zhong yi* 形象中醫, Wang Shumin 王淑民 and Vivienne Lo (eds.), Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社
Zhang Kai 章楷 1985, 'Wu nong hui, *Nong xue bao*, *Nong xue cong shu* ji Luo Zhenyu qi ren 務農會、《農學報》、《農學叢書》及羅振玉其人', *Zhong guo nong shi* 中國農史, (1): 82-88
Zhang Kaiyuan 章開沅 and Yu Zixia 余子俠 (eds.) 2013, *Zhong guo ren liu xue shi* 中國人留學史, Beijing 北京: She hui ke xue wen xian chu ban she 社會科學文獻出版社
Zhang Liang 張亮 2012, *Luo zhen yu yu wan qing nong ye shu lun* 羅振玉與晚清農業述論, Baoding 保定: He bei da xue zhong guo jin xian dai shi fang xiang shuo shi xue wei lun wen 河北大學中國近現代史方向碩士學位論文
Zhang Lihong 張莉紅 1993, 'Lun ming qing chuan zang mao yi 論明清川藏貿易', *Zhong guo zang xue* 中國藏學, (3): 83-92
Zhang Minggao 張鳴皋 (ed.) 1993, *Yao xue fa zhan jian shi* 藥學發展簡史, Beijing 北京: Zhong guo yi yao ke ji chu ban she 中國醫藥科技出版社
Zhang Minjie 張敏傑 2004, *Zhong guo gu dai de hun yin yu jia ting* 中國古代的婚姻與家庭, Hangzhou 杭州: Zhe jiang ren min chu ban she 浙江人民出版社
Zhang Qizhi 張豈之 (ed.) 2005, *Zhong guo chuan tong wen hua* 中國傳統文化, Beijing 北京: Gao deng jiao yu chu ban she 高等教育出版社
Zhang Renfeng 張人鳳 and Liu Hecheng 柳和城 2011, *Zhang yuan ji nian pu chang bian* 張元濟年譜長編, Shanghai 上海: Shang hai jiao tong da xue chu ban she 上海交通大學出版社
Zhang Shanzhen 張珊珍 2006, *Chen li fu sheng ping yu si xiang ping zhuan* 陳立夫生平與思想評傳, Beijing 北京: Zhong gong zhong yang dang xiao chu ban she 中共中央黨校出版社
Zhang Shichen 張世臣 and Guan Huai 關懷 2000, 'Lei gong pao zhi lun cheng shu nian dai xin tan 《雷公炮炙論》成書年代新探', *Zhong guo zhong yao za zhi* 中國中藥雜誌, 25(3): 179-183
Zhang Tianlu 張天祿 1985, 'Xian shen yu yao xue bian ji shi ye de chen xin xian bian shen 獻身于藥學編輯事業的陳新謙編審', *Yao xue tong bao* 藥學通報, 20(12): 760-761
Zhang Tianlu 張天祿 and Chen Xinqian 陳新謙 1986, 'Jie fang qian zhong guo yao xue hui de fen hui 解放前中國藥學會的分會', *Yao xue tong bao* 藥學通報, 21(3): 182-184
Zhang Weifeng 張尉豐 (ed.) 2012, *Zhong xi yi wen hua de peng zhuang* 中西醫文化的撞擊, Nanjing 南京: Nan jing chu ban she 南京出版社
Zhang Xianwen 張憲文 *et al*. (ed.) 2001, *Zhong hua min guo shi da ci dian* 中華民國史大辭典, Nanjing 南京: Jiang su gu ji chu ban she 江蘇古籍出版社
Zhang Xiaoxia 張效霞 2015, 'Shou bu zhong yi yao ci dian: Zhong guo yi xue da ci dian 首部中醫藥辭典: 《中國醫學大辭典》', *Zhong guo zhong yi yao bao* 中國中醫藥報, 23 January, Section 8
Zhang Yan 張彥 2003, 'Jin hai yu kai hai——Ya pian zhan zheng qian qing zheng fu de wai mao zheng ce shi xi 禁海與開海——鴉片戰爭前清政府的外貿政策試析', *Tian fu xin lun* 天府新論, (6): 97-100
Zhang Yanjie 張燕潔 2008, 'Qing dai zhong xi yi hui tong cong shu yan jiu chu tan 清代中西醫匯通叢書研究初探', In: *Quan guo di shi ye jie zhong yi yi shi wen xian xue shu yan tao hui lun wen ji* 全國第十一屆中醫醫史文獻學術研討會論文集, Nanning 南寧: Guang xi zhong yi xue yuan 廣西中醫學院
Zhang Yuan 章原 2014, 'Yu yue fei zhong yi zhi mi 俞樾廢中醫之謎', *Du shu* 讀書, (2): 168-173
Zhang Zanchen 張贊臣 1955, *Yao wu xue shi lue* 藥物學史略, Shanghai 上海: Qian qing tang shu ju 千頃堂書局
Zhang Zhibin 張志斌 2008, 'Zhong guo yi xue shi xue ke jian she de hui gu yu zhan wang 中國醫學史學科建設的回顧與展望', In: *Zhong hua yi xue hui yi shi xue fen hui di 12 jie 1 ci xue*

shu nian hui lun wen ji 中華醫學會醫史學分會第12屆1次學術年會論文集, Chongqing 重庆: Zhong hua yi xue hui yi shi xue fen hui 中華醫學會醫史學分會

Zhang Zhongmin 張仲民 2008, 'Wan qing chu ban de sheng li wei sheng shu ji ji qi du zhe 晚清出版的生理衛生書籍及其讀者', *Shi lin* 史林, (4): 20-36

Zhang Zhongmin 張仲民 2011, 'Bu nao de zheng zhi xue: 'ai luo bu nao zhi' yu wan qing xiao fei wen hua de jian gou 補腦的政治學: '艾羅補腦汁'與晚清消費文化的建構', *Xue shu yue kan* 學術月刊, 43(9): 145-154

Zhang Zhongmin 張仲民 2014, 'Wan qing shang hai yao shang de guang gao zao jia xian xiang tan xi 晚清上海藥商的廣告造假現象探析', *Zhong yang yan jiu yuan jin dai shi yan jiu suo ji kan* 中央研究院近代史研究所集刊, (85): 189-247

Zhang Zhuo 張琢 1991, *Zhong guo chuan tong she hui pou xi* 中國傳統社會剖析, Xian 西安: Shan xi ren min jiao yu chu ban she 陝西人民教育出版社

Zhang Zigao 張子高 and Yang Gen 楊根 1964, 'Ya pian zhan zheng qian xi fang hua xue chuan ru wo guo de qing kuang 鴉片戰爭前西方化學傳入我國的情況', *Qing hua da xue xue bao* 清華大學學報, 11(2): 1-14

Zhao Baisui 趙百歲 *et al*. 2001, 'Meng yao xue zhuan zhu *Bai jing jian* jian tan 蒙藥學專著《白晶鑒》簡探', *Zhong guo min zu yi yao za zhi* 中國民族醫藥雜志, 7(2): 41-42

Zhao Hongjun 趙洪鈞 1989, *Jin dai zhong xi yi lun zheng shi* 近代中西醫論爭史, Hefei 合肥: An hui ke xue ji shu chu ban she 安徽科學技術出版社

Zhao Jimeng 趙際猛 2012, *Zhong guo jin dai zhong yao yao li xue jian shi* 中國近代中藥藥理學簡史 (MA Thesis), Beijing 北京: Zhong guo zhong yi ke xue yuan jin xian dai yi xue shi fang xiang shuo shi xue wei lun wen 中國中醫科學院近現代醫學史方向碩士學位論文

Zhao Shiyu 趙世瑜 2008, 'Zheng tong de yi han yu min zu de yi han: Huang di 'chuan tong' de fa ming 正統的意涵與民族的意涵: 黃帝"傳統"的發明', *He nan she hui ke xue* 河南社會科學, (3): 10-12

Zhao Tingting 趙婷婷 2013, *Qing dai zhong qi xi qu jia yuan dong yan jiu* 清代中期戲曲家袁棟研究, Nanjing 南京: Nan jing shi fan da xue xi qu xi ju xue shuo shi xue wei lun wen 南京師範大學戲劇戲曲學碩士論文

Zhao Xiangyu 趙翔宇 2014, 'Chuan tong de fa ming yu wen hua de chong jian——Tu jia zu bai shou wu chuan cheng yan jiu 傳統的發明與文化的重建——土家族擺手舞傳承研究', *Gui zhou min zu yan jiu* 貴州民族研究, (4): 62-65

Zhao Yuntian 趙雲田 2014, *Qing mo xin zheng yan jiu* 清末新政研究, Harbin 哈爾濱: Hei long jiang jiao yu chu ban she 黑龍江教育出版社

Zhe Jianping 朱建平 1996, 'Zhong hua yi xue hui yi shi xue hui 60 nian 中華醫學會醫史學會60年', *Zhong hua yi shi za zhi* 中華醫史雜誌, 26(3): 137-146

Zhen Xueyan 甄雪燕 and Zheng Jinsheng 鄭金生 2003, 'Xi du shi ji qi chuan ru kao 吸毒石及其傳入考', *Zhong guo yao xue za zhi* 中國藥學雜誌, 38(7): 552-554

Zhen Zhiya 甄志亞 1996, '60 nian lai zhong guo jin dai yi shi yan jiu 60 年來中國近代醫史研究', *Zhong hua yi shi za zhi* 中華醫史雜誌, 26(4): 205-211

Zheng Hong 鄭洪 2012, 'Ming fen you guan: Jin dai zheng zhi zhong de zhong xi yi chen wei zhi zheng 名分攸關: 近代政制中的中西醫稱謂之爭', *Zhong guo she hui li shi ping lun* 中國社會歷史評論, 13: 338-352

Zheng Jinsheng 鄭金生 (ed.) 2007, *Zhong hua da dian: Yao xue fen dian ·yao wu tu lu zong bu ·mo xian tu juan* 中華大典: 藥學分典 藥物圖錄總部 墨線圖卷, Chengdu 成都: Ba shu shu she 巴蜀書社

Zheng Jinsheng 鄭金生 1986, 'Du *Zhong guo yao xue shi liao* (Di san bian) 讀《中國藥學史料》(第三編)', *Yao xue tong bao* 藥學通報, 21(12): 750-752

Zheng Jinsheng 鄭金生 2007, *Yao lin wai shi* 藥林外史, Guilin 桂林: Guang xi shi fan da xue chu ban she 廣西師範大學出版社

Zheng Jinsheng 鄭金生 and Li Jianmin 李建民 1997, 'Xian dai zhong guo yi xue shi yan jiu de yuan liu 現代中國醫學史研究的源流', *Da lu za zhi* 大陸雜誌, 95(6): 26-35

Zheng Rong 鄭蓉 2002, '20 shi ji zhong guo jin dai yi xue shi yan jiu gai lun 20 世紀中國近代醫

學史研究概論’, In: *Dong xi fang yi xue de fan si yu qian zhan* 東西方醫學的反思與前瞻, Beijing 北京: Zhong yi gu ji chu ban she 中醫古籍出版社

Zheng Xuemeng 鄭學檬 2000, *Zhong guo fu yi zhi du shi* 中國賦役制度史, Shanghai 上海: Shang hai ren min chu ban she 上海人民出版社

Zheng Xuemeng 鄭學檬 2003, *Zhong guo gu dai jing ji zhong xin nan yi he tang song jiang nan jing ji yan jiu* 中國古代經濟重心南移和唐宋江南經濟研究, Changsha 長沙: Yue lu shu she 嶽麓書社

Zheng Zhimin 鄭志敏 1998, ‘Lue lun min guo yi lai tai wan yu da lu sui tang wu dai li xue shi de yan jiu 略論民國以來臺灣與大陸隋唐五代醫學史的研究’, *Xin shi xue* 新史學, 9(1): 152-181

Zhong guo ke xue yuan min zu yan jiu suo si chuan shao shu min zu she hui li shi diao cha zu [ZGKXYMZYJSSCSSMZSHLSDCZ] 中国科学院民族研究所四川少数民族社会历史调查组 1963, *Gan zi zang zu zi zhi zhou de ge di qu she hui diao cha bao gao* 甘孜藏族自治州德格地区社会调查报告, Beijing 北京: [Press Unknown]

Zhong guo xu mu shou yi xue hui [ZGXMSYXH] 中國畜牧獸醫學會 (ed.) 1992, *Zhong guo jin dai xu mu shou yi shi liao ji* 中國近代畜牧獸醫史料集, Beijing 北京: Nong ye chu ban she 農業出版社

Zhong guo yao cai gong si [ZGYCGS] 中國藥材公司 1995, *Zhong guo zhong yao zi yuan* 中國中藥資源, Beijing 北京: Ke xue chu ban she 科學出版社

Zhong guo yao xue hui [ZGYXH] 中國藥學會 (ed.) 2008, *Zhong guo yao xue hui shi* 中國藥學會史, Shanghai 上海: Shang hai jiao tong da xue chu ban she 上海交通大學出版社

Zhong guo zhi wu xue hui [ZGZWXH] 中國植物學會 (ed.) 1994, *Zhong guo zhi wu xue shi* 中國植物學史, Beijing 北京: Ke xue chu ban she 科學出版社

Zhong guo zhong yi yan jiu yuan zhong guo yi shi wen xian yan jiu shi [ZGZYYJYZGYSWXYJS] 中國中醫研究院中國醫史文獻研究室 (ed.) 1989, *Yi xue shi lun wen zi liao suo yin (1903-1978)* 醫學史論文資料索引(1903-1978), Beijing 北京: Zhong guo shu dian 中國書店

Zhong guo zhong yi yan jiu yuan zhong guo yi shi yan jiu suo [ZGZYYJYZGYSWXYJS] 中國中醫研究院中國醫史文獻研究所 (ed.) 1988, *Zhong yi ren wu ci dian* 中醫人物詞典, Shanghai 上海: Shang hai ci shu chu ban she 上海辭書出版社

Zhong hua zhong yi yao xue hui [ZHZYYXH] 中華中醫藥學會 (ed.) 2014, *Zhong guo zhong yi yao xue ke shi* 中國中醫藥學科史, Beijing 北京: Zhong guo ke xue ji shu chu ban she 中國科學技術出版社

Zhong Jingbai 衷敬柏 2013, ‘Yan jiu yi an shi xue xi yi jia jing yan de zui jia tu jing 研究醫案是學習醫家經驗的最佳途徑’, *Bei jing zhong yi yao da xue xue bao* (*Zhong yi lin chuang ban*) 北京中醫藥大學學報 (中醫臨床版) 20(5): 12-13

Zhong shan shi ren min zheng fu di fang zhi ban gong shi [ZSSRMZFDFZBGS] 中山市人民政府地方誌辦公室 2012, *Zhong shan shi ren wu zhi* 中山市人物志, Guangzhou 廣州: Guang dong ren min chu ban she 廣東人民出版社

Zhong Shaohua 鐘少華 1996, *Ren lei zhi shi de xin gong ju——Zhong ri jin dai bai ke quan shu yan jiu* 人類知識的新工具——中日近代百科全書研究, Beijing 北京: Bei jing tu shu guan chu ban she 北京圖書館出版社

Zhong wai ming ren yan jiu zhong xin [ZWMRYJZX] 中外名人研究中心 1993, *Zhong hua wen hua ming ren lu* 中華文化名人錄, Beijing 北京: Zhong guo qing nian chu ban she 中國青年出版社

Zhong yi da ci dian bian ji wei yuan hui [ZYDCDBJWYH] 《中醫大辭典》編輯委員會 1987, *Zhong yi da ci dian* (*Nei ke fen ce*) 中醫大辭典 (内科分冊), Beijing 北京: Ren min wei sheng chu ban she 人民衛生出版社

Zhong yi yan jiu yuan zhong yi jiao cao bian ji wei yuan hui [ZYYJYZYJCBJWYH] 中醫研究院中醫教材編輯委員會 (ed.) 1960, *Zhong guo yi xue shi* 中國醫學史, Beijing 北京: Zhong yi yan jiu yuan zhong yi jiao cao bian ji wei yuan hui 中醫研究院中醫教材編輯委員會

Zhou Haiying 周海嬰 2001, *Lu xun yu wo qi shi nian* 魯迅與我七十年, Haikou 海口: Nan hai

chu ban gong si 南海出版公司
Zhou Haiying 周海嬰 2008, 'Lu xun bing bu fan dui zhong yi 魯迅並不反對中醫', *Zhi shi jiu shi li liang* 知識就是力量, (5): 12
Zhou Jiarong 周佳榮 2001, 'Er shi shi ji zhong guo yi xue shi de hui gu 二十世紀中國醫學史研究的回顧', *Dang dai shi xue* 當代史學, 4(2): 1-12
Zhou Jinlin 周金林 *et al*. 1987, 'Jiang yu bo ji qi yi xue si xiang 蔣玉伯及其醫學思想', *Hu bei zhong yi za zhi* 湖北中醫雜誌, (6): 36-38
Zhou Qiuguang 周秋光 and Zeng Guilin 曾桂林 2008, ' Jin dai xi fang jiao hui zai hua ci shan shi ye lun shu 近代西方教會在華慈善事業述論', *Gui zhou shi fan da xue xue bao (She hui ke xue ban)* 貴州師範大學學報》(社會科學版), (1): 6-13
Zhou Wenquan 周文泉 2009, 'Guang xu yi jing bing zhi fa fen xi 光緒遺精病治法分析', In: *Qing gong yi an ji cheng* (*Xia ce*) 清宮醫案集成 (下冊), Chen Keji 陳可冀 (ed.), Beijing 北京: Ke xue chu ban she 科學出版社
Zhou Xinglai 周幸來 2010, *Dian zhen liao fa da quan* 電針療法大全, Changsha 長沙: Hu nan ke xue ji shu chu ban she 湖南科學技術出版社
Zhou Yanyang 周艷煬 2006, *Lan cang jiang wang shi* 瀾滄江往事, Beijing 北京: Zhong guo zang xue chu ban she 中國藏學出版社
Zhou Yichuan 周一川 2008, 'Jin dai zhong guo liu ri xue sheng ren shu kao bian 近代中國留日學生人數考辨', *Wen shi zhe* 文史哲, (2): 104-112
Zhou Yuming 周育明 2014, 'Ya pian zhan zheng yi hou de wu kou kai bu wen ti 鴉片戰爭以後的五口開埠問題', *Qing shi yan jiu* 清史研究, (3): 115-120
Zhou Zhongying 周仲瑛 (ed.) 2003, *Zhong yi nei ke xue* 中醫內科學, Beijing 北京: Zhong guo Zhong yi yao chu ban she 中國中醫藥出版社
Zhu Baojiong 朱寶炯 and Xie Peilin 謝沛霖 1979, *Ming qing jin shi ti ming bei lu suo yin* 明清進士題名碑錄索引, Shanghai 上海: Shang hai gu ji chu ban she 上海古籍出版社
Zhu Cheng 朱晟 and He Duansheng 何端生 2007, *Zhong yao jian shi* 中藥簡史, Guilin 桂林: Guang xi shi fan da xue chu ban she 廣西師範大學出版社
Zhu Chuanyu 朱傳譽 (ed.) 1979, *Zhu liu xian zhuan ji zi liao* 朱騮先傳記資料, Taipei 台北: Tian yi chu ban she 天一出版社
Zhu Ci'en 朱慈恩 2016, 'Lun qing mo min chu de bo wu xue 論清末民初的博物學', *Jiang su ke ji da xue xue bao (she hui ke xue ban)* 江蘇科技大學學報(社會科學版), 16(2): 19-24
Zhu Deming 朱德明 2012, *Zhe jiang yi yao qu zhe li cheng: 1840-1949* 浙江醫藥曲折歷程: 1840-1949, Beijing 北京: Zhong guo she hui ke xue chu ban she 中國社會科學出版社
Zhu Hua 朱華 2010, *Jin dai zhong guo ke xue jiu guo si chao yan jiu* 近代中國科學救國思潮研究, Beijing 北京: Ren min chu ban she 人民出版社
Zhu Jianhua 朱建華 *et al*. 2010, 'Min guo shi qi shan xi *Yi xue za zhi* gai kuang 民國時期山西《醫學雜誌》概況', *Shi jie zhong xi yi jie he za zhi* 世界中西醫結合雜誌, 5(11): 926-927, 972
Zhu Jianping 朱建平 2004, 'Jin wu nian lai zhong guo de yi xue shi yan jiu 近五年來中國的醫學史研究', *Zhong hua yi shi za zhi* 中華醫史雜誌, 34(1): 54-59
Zhu Longyu 朱龍玉 1957, *Dian zhen liao fa* 電針療法, Xian 西安: Shan xi ren min chu ban she 陝西人民出版社
Zhu Xiaopeng 朱曉鵬 2011, *Chuan tong si xiang de xian dai wei du* 傳統思想的現代維度, Beijing 北京: Zhong guo she hui ke xue chu ban she 中國社會科學出版社
Zhu Yaping 祝亞平 1992, 'Lei gong pao zhi lun zhu zuo nian dai xin zheng 《雷公炮炙論》著作年代新證', *Zhong hua yi shi za zhi* 中華醫史雜誌, 22(4): 217-221
Zhu Yin 朱音 and Li Jie 李潔 2011, 'Gu dai zhong yi yi an zheng li yu yan jiu gai shu 古代中醫醫案整理與研究概述', *Yi xue xin xi* 醫學信息 24(1): 237-239
Zhu Zhengang 祝振綱 1956, 'Dong chong xia cao kao 冬蟲夏草考', *Shang hai zhong yi yao za zhi* 上海中醫藥雜志, (10): 43-44
Zhu Zongzhou 朱宗宙 1989, 'Qian long nan xun yu yang zhou 乾隆南巡與揚州', *Yang zhou shi yuan xue bao* (*She hui ke xue ban*) 揚州師院學報 (社會科學版) (4): 136-140
Zhuang Jifa 莊吉發 2011, 'Hu dong yu dui hua: Cong kang xi nian jian de man wen shi liao tan tao

zhong xi wen hua jiao liu 互動與對話: 從康熙年間的滿文史料探討中西文化交流’, In: *Liang an gu gong di san jie xue shu yan tao hui: Shi qi shi ba shi ji (1662-1722) zhong xi wen hua jiao liu hui yi* 兩岸故宮第三屆學術研討會：十七、十八世紀(1662-1722)中西文化交流會議, Taipei 臺北: Gu gong bo wu yuan 故宮博物院

Zuo Xuchu 左旭初 2013, *Bai nian shang hai min zu gong ye ping pai* 百年上海民族工業品牌, Shanghai 上海: Shang hai wen hua chu ban she 上海文化出版社