MALARIA AND GLOBAL NETWORKS OF TROPICAL MEDICINE
IN MODERN CHINA, 1919-1950

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Yubin Shen, M.A.

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Yubin Shen, M.A.

Thesis Advisor: Carol A. Benedict, Ph.D.

ABSTRACT

Based on multi-sited primary archival sources, this dissertation explores the origins and development of tropical medicine as a new medical subfield in twentieth-century China from 1919 to 1950. Inspired by various network theories, including social network theory and the concept of global scientific networks, it illustrates how China became an international center for tropical medicine by the 1950s. It further demonstrates how modern Chinese tropical medicine developed out of the investigations and interactions of a transnational cadre of scientific and philanthropic elite (both Chinese and foreign) working in many different registers and on many different levels, who were linked together by complex local, national, and global networks.

By illuminating the multifaceted experiences of these different networks in promoting Chinese tropical medicine and by demonstrating how they were, to varying degrees, driven by state-building, war and national defense, philanthropic, international cooperation, and individual professional agendas, this dissertation provides a new interpretation of the history of tropical medicine in China. It emends the “colonial medicine model,” still dominant in the field of the history of medicine, which treats tropical medicine solely as “a tool of empire” used to bolster western imperial expansion and colonial rule over the non-western world. While acknowledging that international philanthropic and scientific initiatives could represent a form of cultural imperialism, the
emergence of tropical medicine in China, as elsewhere, undeniably had enormous and long-lasting benefits for public health.

Using malariology as the primary case study, the main body of this dissertation covers four distinct but at times interconnected scientific and technological networks: the PUMC’s Division of Parasitology (1919-1941), the CFHS Department of Parasitology (1931-1936), the Yunnan Anti-Malaria Commission (1937-1945), and the Yunnan cinchona cultivation program (1930s-1950s). By situating the emergence of local, provincial, and national malaria research, modern mosquito control techniques, and cinchona cultivation in Republican China within a broader global context, this dissertation enhances our understanding of the processes through which Chinese technocratic elites, as members of disparate global scientific networks, contributed to biomedical knowledge and practice in the twentieth century.
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Introduction

Among all modern scientific disciplines, tropical medicine is one of the few that has a direct connection to China in terms of its origins. British physician Patrick Manson (1844-1922), the “father of tropical medicine,” established this new medical specialty in London during the 1890s, based mainly on his early career experiences in the Chinese Imperial Maritime Customs Service from the 1860s to the 1880s. For this reason, to some extent, China was regarded as “the cradle of tropical medicine.” However, in current scholarship on the history of tropical medicine, with the exception of those interested in Patrick Manson’s personal life and career in China, few have paid attention to the development of tropical medicine in its Chinese epicenter. While some historians have examined Tropical Medicine before Manson as part of the history of European colonial expansion, no one has bothered to ask: “What happened to tropical medicine in its Chinese birthplace after Manson left for Britain in the 1880s?”

For Zhong Huilan 鍾惠瀾 (Chung Huei-lan, 1901-1987), former professor of medicine at Peking Union Medical College (PUMC, Beijing xiehe yixue yuan 北京協和醫學院), and many other practitioners of Chinese tropical medicine in the first half of twentieth century, the answer would have been straightforward. Forty years after Manson’s departure, it was Zhong’s teacher Ernest Carroll Faust (1890-1978) who first

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3 David Arnold ed., *Warm Climates and Western Medicine: The Emergence of Tropical Medicine, 1500-1900* (Atlanta: Rodopi, 1996).
introduced tropical medicine to China in 1920 by setting up the Division of Parasitology at the PUMC. Supported by the Rockefeller Foundation, the division developed as one of the leading research and teaching centers of tropical medicine in China and in the world, until the PUMC was closed by the invading Japanese army in 1941.

There were also several other major promoters and institutions of tropical medicine in China in the first half of the twentieth century. In August 1928, Hong Shilue (S.L. Hung 洪式闇 1894-1955), a Chinese physician who studied parasitology at the Hamburg Institute for Marine and Tropical Disease, set up the Institute of Tropical Diseases in Hangzhou 杭州, Zhejiang Province (Hangzhou redaibing yanjiusuo 杭州熱帶病研究所). With a few research studies on malaria in Hangzhou, this Institute mainly focused on fasciolopsiasis and schistosomiasis during the 1930s, and hookworm after it retreated westward to the Beibei 北碚 district of Chongqing 重慶 after the outbreak of the Sino-Japanese War (1937-1945). In October 1928, the Fan Memorial Institute of Biology (Jingsheng shengwu diaochasuo 靜生生物調查所) was established in Beijing by Bing Zhi (秉志 1889-1965), one of the founders of modern Chinese biology. Although its major concerns were the “collection, description and classification” of fauna and flora in China, the Institute also conducted some studies on parasitology. In 1931, due to the cooperation between the Chinese Nationalist Government and the League of

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4 Hong Shilue, “Chuangshe redaibing yanjiuyuan yijian shu” 創設熱帶病研究院意見書, Yiyaoxue 醫藥學 5, no.6 (1928): 27-32.
5 Hong Shilue, “Hangzhou zhi nueji” 杭州之瘧疾, Yiyaoxue 醫藥學 8, no.2- no.5 (1931).
7 Mao Shoupai, 117-118; Hu Zonggang 胡宗剛, Jingsheng shengwu diaochasuo shigao 靜生生物調查所史稿 (Ji’nan: Shandong Jiaoyu Chubanshe, 2005).
Nations Health Organization (LNHO), the Central Field Health Station (CFHS, Zhongyang weisheng sheshi shiyanchu 中央衛生設施實驗處) was built in China’s capital, Nanjing 南京. The Department of Parasitology (Jishengchong xue xi 寄生蟲學系) of the CFHS led by Yao Yongzheng (Y.T.Yao 姚永政 1901-1987) made great efforts on malaria research and control before the war. Also in 1931, the Japanese-sponsored Shanghai Science Institute (Shanghai ziran kexue yanjiusuo/Shanghai shizen kagaku kenyūjo 上海自然科學研究所) was officially organized and subsequently made valuable contributions to studies of parasitic diseases, especially clonorchiasis.8 The Henry Lester Institute of Medical Research (Leishide yixue yanjiuyuan 雷士德醫學研究院) in Shanghai, founded in 1932 by the trustees of a foundation set up by British philanthropist Henry Lester (1840-1922) was another center of parasitological research, especially in helminthology and entomology.9

There were some other medical schools and universities with staff members trained in parasitology, such as the Shanghai National Medical College (Shanghai guoli yixueyuan 上海國立醫學院), Lingnan University (Lingnan daxue 嶺南大學) in Guangzhou, Fukien Christian University (Fujian xiehe daxue 福建協和大學) in Fuzhou, Cheeloo University (Qilu daxue 齊魯大學) in Ji’nan, Hsiang Ya Medical College (Xiangya yixueyuan 湘雅醫學院) in Changsha, and West China Union University (Huaxi xiehe daxue 華西協和大學) in Chengdu. Some physicians in missionary hospitals also

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9 Mao Shoupai, 118-119; R. Hoeppli, 93. Also see Henry Lester Institute Annual Reports (1933-1945), collections held at the Needham Research Institute. I want to thank John Moffett for providing this source.
had studied parasitic diseases in China.\textsuperscript{10} After 1937, some staff members of these institutions retreated to Southwest China and helped to establish Yunnan Province as a global center of tropical medicine. Their efforts included the Yunnan Anti-Malaria Commission (\textit{Yunnan sheng kangu}weiyuanhui 雲南省抗瘧委員會 YAMC) and the cinchona cultivation program in Yunnan during the wartime period, both of which were set up with support from Chinese and foreign governments and international health organizations.

Unfortunately, the development of tropical medicine in modern China and its historical importance have been largely ignored by Chinese themselves nowadays. In 1986, Zhong Huilan, as the chief editor of \textit{Redai yixue} 熱帶医学 [Tropical Medicine], the first comprehensive monograph on this medical specialty in China,\textsuperscript{11} lamented in the introduction that, “at present many teachers and students in medical schools and medical personnel in China had no clear idea about tropical diseases or tropical medicine, and had not recognized the great importance of tropical medicine for China.”\textsuperscript{12} It was not surprising that Zhong would make such a complaint: under the Chinese Communist regime after 1949, tropical medicine as a medical specialty was entirely abolished, because the term “tropical medicine” supposedly “represented western conquest of backward nations in colonies and semi-colonies.”\textsuperscript{13} As a result, “most of the medical

\begin{footnotesize}
\begin{enumerate}
\item R. Hœppli, 93-94.
\item Zhong Huilan ed., \textit{Redai yixue} (Beijing: Renmin weisheng chubanshe, 1986). Strictly speaking, Ying Yuanyue 應元岳’s \textit{Redai bingxue} 熱帶病学 [Tropical Medicine] (Beijing: Renmin weisheng chubanshe, 1951) was the first introductory monograph on this field in Chinese, but Zhong’s 1468-page book is far more systematic and comprehensive than Ying’s 397-page one.
\item Zhong Huilan, \textit{Redai yixue}, 2.
\item Chen Chaochang 陳超常 ed., \textit{Zhonghua difangbing xue} 中華地方病學 (Shanghai: Longmen lianhe shuju, 1950), 1. Chen suggested renaming tropical medicine as \textit{difangbing xue} 地方病学 [endemiology].
\end{enumerate}
\end{footnotesize}
personnel trained after the Liberation (i.e., after 1949) do not know what tropical medicine is.”

Based on primary sources from archives in China, America, and Britain, the first aim of this dissertation is to reconstruct the forgotten stories of the origins and development of tropical medicine in China from 1919 to 1950. It will demonstrate that during the first half of the twentieth century, China was a global center for tropical medicine, the legacies of which had a great influence on the development of public health in China and the rise of global health internationally. But this dissertation, as the first history of Chinese tropical medicine so far in any language, is not merely a record of the major events, figures, institutions, or achievements in the development of this medical specialty in China during this period, it also engages critically with current scholarship on the history of tropical medicine in general and modern Chinese history specifically.

To begin, it is necessary to deal with the following two questions: first, “what is tropical medicine,” and second, to paraphrase Shula Marks’s famous question “What is colonial about colonial Medicine?”, we might ask, “What is tropical about tropical medicine in China?”

Although tropical medicine has existed for over one hundred years, and many historians have attempted to define it in terms of its connections with problematic concepts such as “tropical,” “warm diseases,” and “tropical diseases,” and with the environmentalist tradition in western medicine (the relationship between geography, climate, and disease), the medical revolution of the germ theory in the late nineteenth

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century, and European imperial expansion into Africa and Asia, the term “tropical medicine” is surprisingly ambiguous, and even for practitioners of tropical medicine, there is still not “a common understanding of the precise constituents of their field.” For greater clarity, this dissertation follows the definition found in *The Oxford Companion to Medicine*: tropical medicine is “a specialty defined by the part of the world where the illness was acquired. The ties of tropical medicine to public health of developing countries (traditionally called tropical hygiene) are so close that they have to be considered together, and both are related to the natural history of the agents and vectors of warm climate diseases: the science known as parasitology. For the first half of the twentieth century tropical medicine and parasitology were closely intertwined and almost synonymous.” This dissertation does not make a clear distinction between tropical medicine and parasitology, and in the early twentieth century, parasitology in broad terms included protozoology, helminthology, and medical entomology.

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19 Pratik Chakrabarti in a recent study argues that traditions of tropical medicine in India did not include merely British-typed parasitology, but also French Pasteurian bacteriology. See Pratik Chakrabarti, *Bacteriology in British India: Laboratory Medicine and the Tropics* (University of Rochester Press, 2012).

As for the second question, there are two possible answers. The first one is straightforward: it focuses on diseases that occur in Chinese tropical latitudes, or to put this differently, it is about “diseases in tropical China.” Geographically speaking, some parts of Guangdong, Guangxi, Fujian, and Yunnan are situated in the tropical zone (from 23°27’ N to 23°27’ S). In 1934, Mao Xian 毛咸 (1890-1970), a parasitologist with German training and a resident physician at Wuzhou 梧州 Hospital, Guangxi Province, called for setting up Institutes of Tropical Diseases in Guangdong and Guangxi provinces. According to him, the two provinces, together with Fujian and Yunnan, were “close to the tropics,” and people there suffered “local tropical diseases,” such as malaria (nueji 疟疾 in Chinese) and relapsing fever. Therefore, it was necessary to build specific institutions to treat local patients.

Figure 1. The Tropical World. From Zhong Huilan ed., Redai yixue (Beijing: Renmin weisheng chubanshe, 1986), 4.

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The second answer to the question “What is tropical about tropical medicine in China?” is about “tropical diseases in China,” since major tropical diseases are not limited to the strictly-defined tropical zone.\textsuperscript{23} As Faust pointed out in 1926, China consisted of five major regions in terms of nosology: a tropical oriental region (including “the South China littoral as far north as central Fujian, together with Hainan and Taiwan”), a subtropical region (including the central and lower Yangzi (Yangtze) Valley, the China littoral from Fujian through Jiangsu Province), the intermediate region, the Palearctic region (including the cold semi-dry region of North China, and Manchuria), and the dry Palearctic region (including the arid upland plains of Northwest China). Except for the arid northern zone, major tropical diseases, especially malaria, can be found in the four other regions of China.\textsuperscript{24}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{map.png}
\caption{Nosogeographic Map in China. From Ernest Faust, “Parasitic Infections and Human Disease in China,” \textit{Contribution no. 71, the Parasitology Laboratory, PUMC, 1926}: 14.}
\end{figure}

\textsuperscript{24} Ernest Faust, “Parasitic Infections and Human Disease in China,” \textit{Contribution no. 71, the Parasitology Laboratory, PUMC, 1926}: 14-15, from “Ernest Carroll Faust Papers, 1918-1966,” The US National Library of Medicine, MS C 170. Ying Yuanyue, in a special issue on tropical medicine published in 1937 in the \textit{China Medical Journal}, also reminded us that malaria was endemic in almost all of China. See Ying Yuanyue 應元岳, “Nueji wenti zhi jiantao 疟疾問題之檢討,” \textit{Zhonghua yixue zazhi} 中華醫學雜誌 23, no.7 (1937): 914.
While it is not practical to write a comprehensive history that covers all major advocates of tropical medicine or all types of tropical diseases present in China in the first half of the twentieth century, this dissertation follows John Farley’s strategy of writing a history of tropical medicine by focusing on a single disease (bilharzia, in Farley’s case).\(^\text{25}\) It centers on research about malaria and efforts to control the disease in the north, southeast, and southwest, thereby addressing both the “diseases of tropical China” and “tropical diseases in China.” It uses malaria as a lens to shed light on the making of tropical medicine in modern China, and to make the narrative cohesive, it will mainly focus on the major figures and institutions closely related to the development of malariology as a specialized branch of biomedicine in China, including the Division of Parasitology at the PUMC in Beijing, the Department of Parasitology of the Central Field Health Station in Nanjing, and those working on malaria research and control in Yunnan Province.

\[\text{Figure 3. Malaria in China. From Zhongguo de jueji fangzhi yu yanjiu 中國的瘧疾防治與研究 (Beijing: Renmin weisheng chubanshe, 1991), 45.}\]

Malaria and the Making of Tropical Medicine

Malaria is one of the oldest and deadliest parasitic diseases known to humankind, occurring throughout human history, and as medical historian Michael Worboys has pointed out, scientific discoveries about malaria played a key role in the making of “Mansonian” tropical medicine. Given the centrality of this debilitating affliction for the history of tropical medicine more broadly, a brief overview of its epidemiology and global history is warranted before returning to the specific role the disease played in the emergence of tropical medicine in twentieth-century China.

Malaria Epidemiology and the Emergence of Modern Malariology

Malaria is caused by the parasite plasmodium and four species of this parasite can infect humans. Accordingly, there are four forms of human malaria: Plasmodium vivax (the cause of benign tertian, simple tertian, and tertian malaria), Plasmodium malariae (the cause of quartan malaria), Plasmodium falciparum (the cause of malignant tertian and subtertian malaria), and Plasmodium ovale (the cause of ovale tertian malaria). All four forms of malaria are transmitted to the human body by the bite of mosquito vectors, the females of forty species of the genus anopheles.

The life cycle of plasmodium is very complex. When malaria parasites are picked up by anopheles, they enter into the so-called extrinsic cycle, and reproduce inside the mosquito’s body. When an infected anopheles, who is relatively unaffected by plasmodium, takes a blood meal from one person, malaria parasites are injected into the

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26 Michael Worboys, “Germs, Malaria and the Invention of Mansonian Tropical Medicine: From ‘Diseases in the Tropics’ to ‘Tropical Diseases,’” in David Arnold ed., Warm Climates and Western Medicine: The Emergence of Tropical Medicine, 1500-1900 (Amsterdam: Rodopi, 1996), 181-207.
human body, entering into the intrinsic cycle. \textit{Plasmodia} first reproduce in the human liver, where the mature parasites remain dormant for a certain number of days. This stage lasts from seven to thirty days, depending upon the type of \textit{plasmodium} involved. Then these parasites move to the bloodstream, and multiply in red blood cells. It is during this circulatory stage that the clinical manifestations of malaria appear, including intermittent high fever and chills, enlarged spleen, organ failure, and severe anemia. Malaria can cause mortality, when patients, especially children, are in poor health or their immune system is weakened.\textsuperscript{28}

Before the discoveries of \textit{plasmodium} and its mosquito-vector in the late nineteenth century, in major civilizations and societies across the globe, there were different cultural descriptions and references to malaria.\textsuperscript{29} In Great Britain, because of its notable symptoms of periodic fevers and chills, this disease was called “ague” (chills), “intermittent fever,” “tertian fever,” or “quartan fever.”\textsuperscript{30} As early as the era of Hippocrates, people had already noticed that this disease might be related to stagnant marsh water, which was regarded as a source of harmful pollution or \textit{miasma}. With the development of this miasmatic theory, many European physicians believed that epidemics were caused by a miasma, or poisonous entities rotting from the air, wet earth or stagnant water. That is why this disease is called \textit{mal’aria} (“bad air” in Italian), “swamp fever” or \textit{paludism} (palude means swamp in Italian).\textsuperscript{31}

\textsuperscript{29} Masakazu Hashimoto 橋本雅一, \textit{Sekaishi no naka no mararia : ichi biseibutsu gakusha no shiten kara} (Tōkyō : Fujiwara Shoten, 1991).
\textsuperscript{30} Mary Dobson, \textit{Contours of Death and Disease in Early Modern England} (Cambridge: Cambridge University Press), 295.
\textsuperscript{31} Frank M. Snowden, \textit{The Conquest of Malaria: Italy, 1900-1962} (New Haven: Yale University Press, 2006), 11; Socrates Litsios, \textit{The Tomorrow of Malaria} (Pacific Press, 1996), 14; Caroline Hannaway,
It was not until 1880, after French colonial physician Alphonse Laveran (1845-1922), influenced by the emerging germ theory, identified the parasite *plasmodium* in malaria patients that Westerners began to more fully understand the etiology of malaria.\(^{32}\) Yet, speculations about the role of mosquitoes in transmitting malaria, “the world’s greatest killer,” had been made by many people in different civilizations, including those in Europe and the Americas, even earlier than 1880.\(^{33}\) It was Patrick Manson’s research in China that helped to establish the mosquito-vector theory of malaria in the first place. In 1877, Manson, as a medical officer working for the Chinese Imperial Maritime Customs Service at Amoy (Xiamen), discovered that a certain type of mosquito, the *Culex pipiens fatigans*, was the vector for spreading the parasites *bancroftian filariasis* to humans. It was the “first real evidence” that a human disease was transmitted by an insect.\(^{34}\) Following Patrick Manson, Carlos J. Finlay (1833-1915), a Cuban doctor working on yellow fever, declared in 1881 that this lethal disease was spread by mosquitoes to humans. In 1882, he identified one species of mosquito, *Aedes aegypti*, as the carrier.\(^{35}\)

Alphonse Laveran in 1891, and Robert Koch (1843-1912), another founding father of modern microbiology and the germ theory, in 1892, addressed their own

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\(^{34}\) M.V. Service, “Review Article: A Short History of Early Medical Entomology,” *Journal of Medical Entomology* 14, no.6 (1978): 603-626.

\(^{35}\) However, his theory was only confirmed twenty years later by the US army physician Walter Reed (1851-1902). Some historians insist that Carlos J. Finlay’s theory was influenced by Patrick Manson, but this has been denied by Cuban historians. See François Delaporte, *The History of Yellow Fever: An Essay on the Birth of Tropical Medicine* (Cambridge: The MIT Press, 1991), 33-63.
theories about the role of mosquitoes in spreading malaria.\textsuperscript{36} Manson postulated his mosquito-malaria hypothesis in the \textit{British Medical Journal} in December 1894.\textsuperscript{37} Though he was not the first to postulate the mosquito-vector theory, Manson’s role was critical for promoting it, because with his advice and support, in June 1898, Ronald Ross (1857-1932) discovered that bird malaria in India was indeed transmitted by the bite of mosquitoes. One month later, Manson publicized Ross’s findings, providing more details at the British Medical Association meeting in Edinburgh,\textsuperscript{38} and subsequently Ross was awarded the Noble Prize in Physiology or Medicine in 1902.\textsuperscript{39} Partly because of their contributions to the mosquito theories on tropical diseases generally and malariology specifically, in 1898, Manson received funding to organize one of the first two schools of tropical medicine in the world, the London School of Tropical Medicine, while Ross became the first lecturer at the other one, the Liverpool School of Tropical Medicine in 1899.\textsuperscript{40}

The first two decades of the twentieth century saw the rapid development of tropical medicine both in the western metropoles and non-western peripheries: new research centers were subsequently set up, including the Hamburg Institute for Marine and Tropical Disease (1901), the Lisbon School of Tropical Medicine and the Colonial Institute (1905), and the Imperial Medical School in India (1907). These institutions were established with the aim of combating malaria, which was a major public health problem in both tropical and temperate climates. The work of Scottish physicians in Egypt, Belgium, and India showed that malaria could be brought under control through the use of antimalarial drugs and the establishment of public health measures. By the early 1900s, the introduction of quinine, followed by the development of synthetic antimalarial drugs such as chloroquine, provided effective treatment and prophylaxis against malaria. Additionally, the use of mosquito nets and insecticides as preventive measures further contributed to the reduction of malaria incidence. These efforts led to a significant decline in the prevalence of malaria, particularly in areas where the disease was endemic. However, efforts to eliminate malaria entirely from certain regions, such as the Americas, faced significant challenges due to the complexity of the disease and the persistence of malaria vectors. Despite these setbacks, the work of scientists and health workers in the early 20th century laid the foundation for continued progress in malaria control efforts, which have helped to reduce the burden of the disease globally.
Hospital (1902), the Paris Institute for Colonial Medicine (1902), the Brussels School of Tropical Medicine (1906), the Royal Tropical Institute in Amsterdam (1910), and the Calcutta School of Tropical Medicine (1920); many more parasites and vectors of tropical diseases were also identified beyond those that caused malaria, such as ancylostomiasis (hookworm), bilharzia (schistosomiasis), onchocerciasis (river blindness) and trypanosomiasis (sleeping sickness). Malarial mosquito control, as one of the most important parts of tropical medicine from the outset, was also put into practice on a massive scale in many malaria-ridden areas.

The first war against malarial mosquitoes was officially declared by Ronald Ross in his inaugural lecture at the Liverpool School of Tropical Medicine in April 1899. Based on his mosquito-theory, Ross introduced “a new method” to control malaria in “certain limited areas”: in order to exterminate “the malaria-bearing species of mosquito.” He also led a Liverpool-based expedition team to Sierra Leone, a malaria-ridden British colony in the notorious “White Man’s Grave” of West Africa, to investigate the genus of *Anopheles* mosquitoes, and to test his mosquito-targeted

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method.\textsuperscript{44} They successfully identified \textit{Anopheles gambiae} and \textit{Anopheles funestus} as the two major vectors of malaria in that region. Although at first refuted, in the following year, their advice about the use of bed-nets, window screens, and especially treatment of standing pools of water with drainage and tar, were applied by local colonial authorities in the first attempt anywhere in the world to use anti-larval measures to control malaria.\textsuperscript{45}

In 1900, following Ross’s new method, Malcolm Watson, a British health officer in Malaya, successfully controlled local malaria to a lesser degree by draining pools and swamps in the hills as well as treating them with “a mixture of heavy mineral oils.”\textsuperscript{46}

The most influential victory against mosquito vectors began in the America continent in 1900. William Crawford Gorgas (1854-1920), the US chief sanitary officer in Havana was convinced by the efficacy of Ross’s method. He ordered his men to clear out mosquitoes’ breeding places, and in so doing controlled yellow fever and to some extent, malaria, in Havana. Applying the same methods, with drainage of swamps, the use of oil and kerosene, and biological controls of larvae eaters, such as fish, spider and bats, Gorgas initiated a massive campaign against mosquitoes in Panama in 1904, and successfully eliminated local yellow fever to safeguard the construction of the Panama Canal.\textsuperscript{47}

\textsuperscript{45} M.J. Boekarie, A.A. Gbakima and G. Barnish, “It All Began with Ronald Ross: 100 years of Malaria Research and Control in Sierra Leone (1899-1999),” \textit{Annals of Tropical Medicine & Parasitology} 93, no.3 (1999): 213.
\textsuperscript{46} Leon J. Warshaw, \textit{Malaria: The Biography of a Killer}, 117-121.
**Malaria, Mosquito-Vector Theories, and Mosquito Control in China**

In China, the earliest records of symptoms that might indicate the “chills and fever” of malaria use the term *nue* (in Chinese, malaria is translated as *nueji* 疟疾; *Ji* refers to “disease,” thus *nueji* literally means the *nue* disease). *Nue* 疟 can be found in the thirty-fifth chapter of “On Nue (Nue Lun 疟論)” in *Suwen* 素問, or the *Basic Questions of the Yellow Emperor’s Inner Canon* (*Huangdi Neijing Suwen* 黃帝內經素問). This is the most important and famous ancient text of Chinese medicine, composed between the fifth century BCE and the second century CE. In *Shuowen jiezi* 說文解字, the Chinese dictionary compiled around 100CE, *nue* is described as “chills and fevers occurring in turn repeatedly” (*nue, han re xiu zuo ye* 疟，寒熱休作也). To be sure, without laboratory evidence, identifying *nue* as malaria in ancient records such as these raises some serious methodological issues, as Carol Benedict and Andrew Cunningham have pointed out in their respective studies on plague in history.

Nevertheless, since these records describe the typical symptoms of malaria in some detail, medical historian Fan Ka Wai has insisted that, compared with other diseases that are more difficult to pin down in Chinese historical texts, it is possible to

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48 Shanghai zhongyi wenxian guan 上海中醫文獻館 ed., *Nueji zhuanji 疟疾專輯* (Shanghai: Shanghai kexue jishu chubanshe, 1965), 1-17.
49 Xu Shen 許慎 (author) and Duan Yucai 段玉裁 (annotator), *Shuowen jiezi zhu* 說文解字注 (Hangzhou: Zhejiang guji chubanshe, 1998), 350.
identify nue as malaria. According to Li Tao, a PUMC staff member who wrote on Chinese medical history in the 1930s, pre-modern Chinese explanations for the occurrence of malaria, similar to those obtaining in Europe before the rise of germ theory, were not linked with plasmodium or mosquitoes, but rather with “demonic influences” (gui shen shuo 鬼神說), “climatic influences” (qihou shuo 氣候說), “dietary reasons” (yinshi shuo 飲食說), “enlarged spleens” (nue mu shuo 瘀母說), and “Ying Yang disorders” (wuxing shuo 五行說).

The first statistical records on the prevalence of malaria in China were made by Manson’s colleagues in the Chinese Imperial Maritime Customs Service. Since 1871, all medical officers, including Manson himself, in different treaty-ports, were required to submit semi-annual or annual reports on local health conditions to the Medical Reports of the Chinese Imperial Maritime Customs Service. Even though before the 1880s, most of their records referred to this disease as “ague” or “intermittent fever,” these medical officers left some data that enables historians to reconstruct the prevalence of malaria and its various types in major Chinese port-cities. Based on their reports, Wataru Iijima has demonstrated that there was heavy endemicity in the Yangzi Valley and southern parts of China.

After the 1880s, medical missionaries and medical officers in the maritime customs service in China, who used to believe in the miasma theory, began to embrace and spread the germ theory of malaria and the concept of the mosquito-vector. The term

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51 Fan Ka Wai, “Han Tang shiqi nue bing yu nue gui” 漢唐時期虐病與瘀鬼, in Fu-shih Lin 林富士 ed., Jibing de lishi 疾病的歷史 (Taipei: Jinglian chuban gongsi, 2011), 201-244.
“malaria” replaced “ague” and “intermittent fever” in their medical reports. Some of them also introduced the discoveries of Laveran, Manson, and Ross to English readers residing in China in the late 1890s, but it was not until around 1900 that the mosquito-vector theory began to be accepted by the majority of them. For example, in March, 1897, Dr. E. W. Von Tunzelmann, the medical officer in the port of Yingkou reported local endemicity of “malaria fever” and “malaria plasmodium,” but he connected malaria fever with “the disturbance of soil which has long lain fallow.” In March 1897, The China Medical Missionary Journal had introduced Manson’s mosquito-theory in the section of Medical and Surgical Progress, but in 1899, Dr. James H. McCartney, the medical officer in Chongqing, still believed the germination of malaria was related to rain and sunshine, while in the same year, Dr. H. Rennie Robertson, the medical officer in Tianjin, clearly explained the disappearance of malaria in the foreigners’ settlement in terms of Ross’s anopheles theory.

During this period, foreign medical communities in China, especially members of the China Medical Missionary Association (CMMA), were also avidly translating western medical nomenclature into Chinese. According to historian Bridie Andrews, it was Dr. J. G. Kerr (1824-1901), an American medical missionary in Canton, who borrowed nue from Chinese classical medical texts in order to translate all three terms of ague, malaria, and intermittent fever into Chinese. His translation of nueji for malaria was accepted by the CMMA in its first list of medical nomenclature in 1904. As Andrews

56 “Dr. James H. McCartney’s Report on the Health of Chungking, for the Year ended 31st, March, 1899,” in Imperial Maritime Customs Medical Reports 57 (1899): 5.
pointed out, applying the somewhat ambiguous term of *nueji* to refer to malaria when speaking both in terms of germ theory and of *nue* as utilized in classical Chinese medicine resulted in heated debates between physicians of western medicine and practitioners of Chinese medicine. In short, through the global circulations of tropical medicine and malariology since the late nineteenth century, the knowledge of *nueji*/malaria as a parasitic disease carried by mosquitoes had already been introduced into and spread widely within China by the early twentieth century.

The introduction of mosquito-vector theory to China was a related and similar process. Long before the nineteenth century, Chinese had formulated their own understandings of mosquitoes, in *Bowu xue* 博物學 (natural history) and *Bencao xue* 本草學 (*materia medica*) texts. As Carla Nappi observed, in Li Shizheng’s typology as presented in the *Bencao gangmu*, the great Chinese *materia medica*, there are three kinds of insects, defined by their mode of birth: “by egg (卵生 *luansheng*), by change (化生 *huasheng*), or by means of moisture (濕生 *shisheng*)” The three categories often overlapped with each other.59


59 Carla Nappi, *The Monkey and the Inkpot: Natural History and its Transformation in Early Modern China* (Cambridge, Massachusetts: Harvard University Press, 2009), 96-97. Theories on the genesis of mosquitoes in China before the twentieth century were similar but even more complicated. The first theory states, *some* mosquitoes were born by their “bird mothers.” As early as the third century BCE, *Erya* 鄭雅, the first Chinese encyclopedic dictionary available, mentioned that a certain type of bird, “*Tian* 鶩,” was the “Mother of the Mosquito.” According to some later sources in the Tang and Song dynasties (618-1279), it was also called the “Mosquito-Vomiting Bird (*tu wen niao* 蚊鳴),” since “it would vomit mosquitoes.” It squawked on summer nights, “sounding like a human vomiting”, and “each time, it could vomit one or two liters of mosquitoes in the reeds.” (Perhaps when this bird was eating mosquitoes in the dusky light of reeds,
Even though they did not regard mosquitoes as vectors for transmitting diseases, in practice, Chinese had developed many measures to drive off these annoying blood-suckers, including canopies (mosquito nets), mosquito repellents and fumigation techniques.60 After the 1890s, medical missionaries and customs medical officers, who

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60 Chen Tao 陳濤, “Lun ‘Ma xing jie wu wen’: cong huan jing shi jiao du de chuan shi” 論馬行街無蚊—从環境史角度的詮釋, Shehui kexue luntan 社會科學論壇 no.10 (2007):146-150; Tao Changhua 陶昌華,
used to believe in the miasma theory of malaria, quickly began to embrace the mosquito-theory and introduced new mosquito control measures to deal with malaria. In March 1897, *The China Medical Missionary Journal*, the most influential medical journal in China, in its section of *Medical and Surgical Progress*, introduced Manson’s mosquito-theory as the vector of malaria. In the September-December issue, it introduced a study by Dr. Bignai of Italy, indicating malaria might be spread to humans by the bites of mosquitoes or other insects. Soon thereafter in 1900, the *China Medical Missionary Journal* confirmed the mosquito-vector theory, and introduced kerosene and petroleum as effective anti-larval agents to check malaria.

These new theories and methods clearly began to take hold in treaty-port China at the turn of the century. In the *Medical Reports of the Imperial Maritime Customs* in September 1899, Dr. H. Rennie Robertson, medical officer at Tianjin Custom Service, noticed fewer numbers of malaria cases found in the port of Tianjin, and cited Ross’s inaugural lecture at the Liverpool School of Tropical Medicine to explain that: “the stagnant ponds and puddles,” as “the homes and breeding ground for malarial-bearing mosquito genus Anopheles,” were cleared for building purposes. In the same issue, another medical officer in Wuzhou reported that kerosene was used to prevent mosquito-breeding in a missionary’s residence-boat in order to control malaria.

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“Gudai de fang wen yu mie wen” 古代的防蚊與滅蚊, *Yi gu wen zhishi* 醫古文知識 13, no.3 (1996): 33; To be sure, until the late nineteenth century, westerners had little superiority over Chinese in this regard: they did not know about the mosquito’s role in spreading malaria either; and their methods against mosquitoes were not much different from Chinese. See Paul F. Russell, *Man’s Mastery of Malaria* (Oxford University Press, 1955), 147-152.


The first mosquito gospel translated into Chinese was perhaps *The Mosquito as Man’s Enemy*, originally written by Dr. Andrew H. Woods, an American medical teacher of the Canton Christian College, and published in the college’s student journal in 1905. The Chinese title, *Du wen chuan bing shuo* 毒蚊傳病說 [The theory of poisonous mosquitoes spreading diseases] clearly indicated the transformation of mosquitoes from noxious pests to dangerous disease-vectors. In that article, Woods introduced Pasteur’s germ theory on the origin of human diseases, and then described how according to the mosquito-theory: “the seed of malarial fever” is spread to humans only by one mosquito genus *Anopheles*. In the end, he suggested that people in Canton should learn to avoid mosquito bites by clearing all stagnant ponds and puddles, or pouring oil into them, using mosquito-nets when sleeping, and taking quinine if infected with malaria. “Those are,” he concluded, “the vital methods to protect your life.”

Shortly after its founding, the first medical journal printed in Chinese, the *National Medical Journal of China*, in 1915 published an article “*Lun wen yu ying wei ren zhi ju di* 論蚊與蠅為人之巨敵 [On Mosquitoes and Flies as Human’s Big Enemies]” written by a Chinese physician, Diao Xinde 刁信德. In the introduction, this article stated, “according to recent studies by western medicine, insects are dangerous because they spread diseases to humans,” and among them, mosquitoes and flies were two of human’s most dangerous enemies. Then it briefly introduced the mosquito-vector theory and mosquito-control measures used in the West.

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65 Lin Ande 林安德 [Andrew H Woods], “*Du wen chuan bing shuo* 毒蚊傳病說, *Lingnan xuesheng ji* 嶺南學生界 (*The South China Collegian*) 2, no.5 (1905): 184-188.
The most influential mosquito gospel came to China ten years later. In November 1915, Bing Zhi, one of the founders of modern biology in China, then a doctoral student studying entomology and zoology in Cornell University, published the first part of his long article “Nue wen 瘧蚊 (Malarial Mosquito)” in Kexue 科學, the leading Chinese science journal run by the Science Society of China (Zhongguo kexue she 中國科學社). Together with the second part published in December 1915, and the last part in January 1916, this was the first medical entomological paper published by Chinese themselves, and was even regarded by some scholars as the beginning of modern entomology in China.

Unlike physicians, who concentrated on malaria in humans, Bing paid more attention to mosquito vectors, with the first two parts of the article introducing the life cycle and biology of mosquitoes in detail. Only in the last seven pages did he turn to malaria and mosquito control measures used by westerners. Besides pouring kerosene and other chemicals into swamps, drainage, planting trees, especially eucalyptus, and “lamp trap” with kerosene, Bing pointed out, Canadian farmers also ignited filings of pyrethrum chrysanthemums to drive away mosquitoes, which was similar to the Chinese way of burning mosquito incense made of mugwort.

Despite its similarity to older Chinese methods, the use of pyrethrum to control mosquitoes was a modern development. As historian Gordon Patterson has pointed out,

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68 Zhou Yao 周堯, Wang Siming 王思明 and Xia Rubing 夏如兵, Er shi shiji zhongguo de kunchong xue 二十世紀中國的昆蟲學 (Xi’an: Shijie tushu chubanshe, 2004), vi and 49.
before the use of DDT as an insecticide, there were three major stages in the application of different chemical insecticides in the early twentieth century: oil, Paris green after 1921, and pyrethrum after 1930.\textsuperscript{70} All three were introduced and experimented with in Chinese campaigns against malarial mosquitoes before the war with Japan.

Using oil as an insecticide against agricultural pests was not new for Chinese. As early as the sixth century, according to the agricultural text \textit{Qimin yaoshu} 齊民要術, sesame oil and pig oil had been used to control parasites afflicting herds.\textsuperscript{71} An eleventh-century source by the famous Chinese scholar Su Shi 蘇軾 (1037-1101), \textit{Wu lei xiang gan zhi} 物類相感志 also recorded that “oil could be used to kill all types of insects.”\textsuperscript{72}

During the Qing period, sesame oil had been widely spread over rice paddies to drive locusts away.\textsuperscript{73} The use of oil against pests was also widespread in Japan, and after 1670, Japanese developed a new method using whale oil to kill insect pests.\textsuperscript{74} However, few in pre-modern East Asia used oil to control mosquitoes, and it was still a relatively innovative practice even in the modern Euro-American world. According to malariologist Paul Russell, oils or common oils (whale oils) were used to kill mosquito larvae in the US in the late eighteenth and early nineteenth centuries.\textsuperscript{75} Leland Howard, the head of the Bureau of Entomology in the US Department of Agriculture, first used kerosene to kill mosquito larvae in 1867 when he was still a child. And in 1892 he carried out the first

\textsuperscript{70} Gordon Patterson, \textit{The Mosquito Crusades}, 157.
\textsuperscript{71} Cited from Zou Shuwen, \textit{Zhongguo kunchong xue shi}, 136.
\textsuperscript{72} Su Shi, \textit{Wu lei xiang gan zhi} (Reprint; Beijing: Zhonghua shuju, 1985), 1.
\textsuperscript{73} Zhou Yao, \textit{Zhongguo kunchong xue shi}, 81. Also see Itō Seiji 伊藤清司, \textit{Sanemori kigenkō: Nitchū hikaku minzokushi} サネモリ起源考: 日中比較民俗誌 (Tōkyō: Seidosha, 2001), 238-250.
\textsuperscript{75} Paul F. Russell, \textit{Man’s Mastery of Malaria} (Oxford University Press, 1955), 137.
experimental program of testing oil as a mosquito larvicide in USDA.\(^{76}\) It was not difficult for Chinese to apply oil against mosquitoes, since they were familiar with the similar method against locusts.

Paris green, an arsenic-containing pigment, was first used as a green paint in the nineteenth century. In the late 1860s, it was applied as an agricultural insecticide against insect pests, such as the Colorado beetle.\(^{77}\) In the early 1920s, American scientists discovered that Paris green was also effective against mosquito larvae.\(^{78}\) As the cheapest and most efficient chemical insecticide, Paris green was then widely deployed in the US and Europe. It was soon introduced to China. In 1928, H.E. Meleney, C.U. Lee and C.P. Yang from the Division of Tropical Medicine in the Department of Medicine at the PUMC, tested Paris green on the Yanjing University Campus and nearby rice fields in their anti-mosquito experiments.\(^{79}\) In 1933, Yao Yongzheng from the Department of Parasitology of the Central Field Health Station, applied Paris green as larvicide in the most endemic malaria area, Xiaolingwei, in China’s capital city Nanjing. The experimental results were also positive.\(^{80}\)

However, since arsenicals had been proven to have poisonous effects for humans, during the 1930s, pyrethrum, an organic insecticide was re-introduced. Pyrethrum flowers in the genus of Chrysanthemum (chu chong ju 除蟲菊 or the insect flower) had been used as an insecticide against lice and fleas in Persia and Dalmatia for many

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\(^{76}\) Gordon Patterson, *The Mosquito Crusades*, 14.


\(^{78}\) Gordon Patterson, *The Mosquito Crusades*, 118.


centuries. In 1828, powder of pyrethrum was manufactured in Europe and then introduced to the US in 1860.\textsuperscript{81} In 1881, the USDA distributed pyrethrum seeds to farmers for cultivation.\textsuperscript{82} In the early 1920s, both pyrethrum insecticidal powders and sprays were used in the US for agricultural and household use. And during the 1930s, pyrethrum sprays was widely used to kill adult mosquitoes around the world.\textsuperscript{83}

It was within this global context of the institutionalization of tropical medicine, the spread of germ and mosquito-vector theories, and the practice of new methods of malarial mosquito control that tropical medicine was introduced and developed in China in the first half of the twentieth century.

\textbf{“Global Networks” of Tropical Medicine: A New Approach}

The central argument of this dissertation is that tropical medicine’s emergence and development as a distinct discipline in China, as illuminated by the case study of malaria research and control, resulted from complicated interrelations of global networks linking Chinese (both at the central and local levels) and foreign governments, transnational philanthropic foundations, international health organizations, individual medical and agricultural specialists, and non-human agents such as parasites, insects, and plants.

In making this argument, this dissertation questions three earlier approaches in the study of tropical medicine within the history of medicine. The first longstanding one, the “internalist” approach, is applied by medical practitioners with an interest in the

\textsuperscript{81} Paul F. Russell, 154.
\textsuperscript{83} Paul F. Russell, 155-156.
“Whiggish” way of celebrating “great doctors and their achievements,” and mainly focuses on major figures and discoveries of tropical medicine. The second and currently dominant approach is the “colonial medicine model.” Scholars using this lens argue that similar to other modern technologies, tropical medicine was developed almost exclusively by Western imperialists as a “tool of empire” to enable colonial settlers to survive and to profit politically and financially in the “dangerous” tropics. Some post-colonial historians working in this vein treat tropical medicine as a form of cultural imperialism or a sign of “colonial modernity,” and emphasize the power relations and violence behind the imperialists’ mission of “civilizing” and “curing” indigenous peoples through the introduction of tropical medicine. According to colonial and post-colonial scholars, the term “tropical medicine” can be used interchangeably with “colonial medicine” or “imperial medicine.” Therefore, most of the current scholarship on the history of tropical medicine concentrates on the development of tropical medicine as part of the broader colonial medicine in the Western and Japanese empires and their colonies in Africa, South Asia, Southeast Asia, Taiwan, and Australia. A third approach, which

85 One early example is Henry Harold Scott, A History of Tropical Medicine (London: E. Arnold & Co., 1939); a recent one in this respect is Gordon C. Cook, Tropical Medicine: An Illustrated History of the Pioneers (London: Academic, 2007).
86 The “tool of empire” was first addressed in the early 1980s by Daniel Headrick in his book The Tools of Empire: Technology and European Imperialism in the Nineteenth Century (New York, 1981); also, see Philip D. Curtin, Disease and Empire: The Health of European Troops in the Conquest of Africa (Cambridge University Press, 1998).
87 David Arnold, Colonizing the Body: State Medicine and Epidemic Disease in Nineteenth-Century India (University of California Press, 1993).
88 John Farley, Bilharzia.
89 It is unnecessary and not practical to include the entire body of scholarship here. I can only list some representative monographs. For the history of tropical medicine in Europe, see Deborah J. Neill, Networks in Tropical Medicine; Michael A. Osborne, The Emergence of Tropical Medicine in France (The University of Chicago Press, 2014); in Africa, Philip D. Curtin, Death by Migration: Europe’s Encounter with the Tropical World in the Nineteenth Century (Cambridge: Cambridge University Press, 1989); Curtin, Disease and Empire; Megan Vaughan, Curing Their Ills: Colonial Power and African Illness (Stanford, California: Stanford University Press, 1991); Helen Tilley, Africa as a Living Laboratory: Empire,
appears in some recent critical studies of tropical medicine in Brazil, Italy and Argentina, disagrees with this equivalence between tropical and colonial medicine. This newer work points out that tropical medicine was primarily part of a broader state-building agenda to promote public health and forge national identity in a modern nation-state.90

My dissertation suggests that the development of tropical medicine in modern China is extremely complex and cannot be sufficiently explained by any one of these three approaches alone, particularly the dominant “colonial medicine model.” The major groups and individuals who promoted research and the development of malariology as a sub-field of tropical medicine in China—including Western physicians who worked in China, Chinese physicians with training or research experience in Euro-American institutes, and Chinese Nationalist and Communist officials, Chinese and US military

officers, the Rockefeller Foundation or the LNHO—supported these efforts for a variety of reasons. Some of these motivations can be explained by using one of the three approaches mentioned above, but others cannot. The promotion of tropical medicine by the Rockefeller Foundation, might be cataloged as the “tool of empire,” “cultural imperialism” or building “colonial modernity,” and the Chinese Nationalist government’s efforts might seem to be part of the project of building a public health system in the new Chinese nation-state. However, other groups of players had different purposes altogether. For example, some medical specialists, like Ernest Carroll Faust, hoped to advance their careers and profit financially by introducing and promoting tropical medicine in China, while the engagement of the LNHO was principally focused on international health cooperation.

If current approaches alone fail to fully illuminate its development, how did these different groups of players manage to establish tropical medicine in modern China? In this dissertation, I will use a “global networks” approach to provide a more comprehensive explanation than has heretofore been available in the scholarly literature. These groups of actors, although pursuing disparate agendas, were linked through local, national, and global networks of regimes, institutions, and individuals, whose communications, collaborations, and conflicts enhanced and sometimes hindered, the circulation of tropical medical knowledge, practice, people, and materials, both within China and abroad.

Two types of network theory applied in the history of science, technology, medicine, and the environment have informed my approach. One is “social network theory” which concentrates on “a particular member of a community, all ties to that
member, and all ties among those members.” A telling example in this respect is historian Terrence Jackson’s explanation on the spread of Japanese rangkaku (蘭学 Dutch studies) in the late eighteenth century and early nineteenth centuries. By focusing on rangkaku scholar Otsuki Gentaku (大槻玄沢 1757-1827) and his professional life, Jackson regarded the rangkaku community as a social network, which “aids our understanding of the way rangkaku scholars acted, the flow of information throughout the community, and access to resources and opportunities within the rangkaku field.”91 The other and the most influential network theory, at least for my own approach,92 is exemplified in recent studies on the British empire and global scientific networks. As Brett M. Bennett and Joseph M. Hodge have summarized, this type of network theory examines how “the rise and reconfiguration of various individuals and scientific networks, including academic scientists, agronomists, botanists, comparative anatomists, doctors, foresters, marine biologists, physicists and many others” led to “a constant tension between administrators and scientists who sought to centralize power and networks into rationalized systems of science against the forces of globalization, colonial nationalism, and internal bureaucratic and professional resistance.”93

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92 Bruno Latour’s “Actor Network Theory” has been influential in the field. Latour reminds us (using the case of the acceptance of Pasteurian germ theory in France) that it is through networks of interconnected human actors and actants that scientific knowledge is formed. However, he may have gone too far in over-emphasizing the role of non-human creatures and objects, or “actants.” See Bruno Latour, *The Pasteurization of France* (Cambridge: Harvard University Press, 1988). Mark Harrison provides a clear explanation on Latour’s actor network in the context of the history of diseases. See Mark Harrison, *Diseases and the Modern World: 1500 to the Present Day* (Polity Press, 2004), 28-30.
Some recent studies on the history of medicine in modern East Asia and the history of tropical medicine in particular have already applied these various network theories. Alexandra Bay and David Luesink have respectively examined the power of medical networks in the making of beriberi as a national disease in Japan and the development of anatomy in China in the early twentieth century.94 In the Chinese-speaking world, Li Shang-jen’s monograph on Manson and the making of tropical medicine and Liu Shiyung’s book on the spread of western medicine in modern Japan also relied on network theories in their analysis.95 Deborah J. Neill’s work on transnational networks of European medical experts in the establishment of tropical medicine and their collective authorities is, no doubt, the most relevant for my approach, although she still follows the colonial medicine model.96

Dissertation Structure

The main body of this dissertation consists of four chapters arranged roughly in chronological order. Each chapter focuses on one specific malaria-centered global network of tropical medicine. The first chapter reconstructs the origin and development of a Rockefeller network of tropical medicine based in the PUMC’s Division of Parasitology from 1919 to 1941. It examines how Ernest Carroll Faust, from 1919 to 1928, with

support from the Rockefeller Foundation (RF), successfully introduced tropical medicine
to China. After Faust left for the US in 1928, the Beijing network of tropical medicine
survived and was reconstructed via the RF. During this period, through the efforts of
medical entomologist Feng Lanzhou, who continued Faust’s work on malaria, the
Division became a center for malaria research in China and in the world.

The second chapter examines another major malaria-centered global network of
tropical medicine based in the Department of Parasitology of the CFHS, in Nanjing from
1931 to 1936. It points out that the Nanjing network differed from its counterpart in
Beijing in that it was heavily influenced by the League of Nations Health Organization
and its Eastern European social medical model, which emphasized state-led public health
efforts and investigations into the socio-economic determinants of health as well as
biomedical research. Designed as a government-led institution, the Department of
Parasitology of the CFHS emphasized conducting field work and solving practical
parasitic issues, especially malaria control. It was within this global network of tropical
medicine that Yao Yongzheng discovered that zhangqi, a mysterious disease in
Southwest China, was a form of subtertian malaria, which provided the foundations for
wartime malaria research and control in Yunnan.

The third chapter looks more closely at a wartime global network of malaria
research and anti-malaria campaigns by examining the origins, development, and demise
of the Yunnan Anti-Malaria Commission (Yunnan sheng kangnue weiyuanhui 雲南省抗
疟委員會 YAMC), during the Second Sino-Japanese War (1937-1945). It illuminates
how this commission successfully set up a state medicine system in Yunnan that served
to safeguard Chinese national defense along the malaria-infested Yunnan-Burma
Highway. During this process, the YAMC, the two pre-war networks of tropical medicine centered in Beijing and Nanjing respectively, the central and local Chinese governments, foreign allies, and international organizations cooperated and, sometimes, competed with one another in the realm of malaria control.

The last chapter turns to a global botanical network of tropical medicine in China: China’s first successful cinchona cultivation program in Yunnan’s southwest borderlands from the 1930s to the 1950s. It argues that the effort to plant cinchona trees in Republican Yunnan was not a pure scientific agricultural experiment, but was part of the Chinese Nationalist central and Yunnan provincial governments’ state-building and developmental projects that paralleled those undertaken elsewhere during these decades. This program was initiated in the early 1930s by “the local developmental state” of Yunnan province to develop and control its semi-autonomous southwest frontiers, as well as to eliminate endemic malaria in Yunnan, through global botanic networks of cinchona cultivation. Later on, during the Sino-Japanese War, together with other programs of state-led bio-prospecting for medicinal plants in Yunnan, it then became part of the Chinese state’s national defense project to control epidemics in southwest China.

By situating the emergence of local, provincial, and national networks of malaria research, modern mosquito control techniques, and cinchona cultivation in Republican China within a broader global context, this dissertation, as the first work on the history of Chinese tropical medicine, will help us better understand histories of tropical medicine, modern China, and global health.
Chapter One

The Rockefeller Network of Tropical Medicine in Beijing: Peking Union Medical College’s Division of Parasitology and its Malaria Studies, 1919-1941

In September 1926, Ernest Carroll Faust (1890-1978), Head of the Division of Parasitology (Jishengwu xue zu 寄生物學組) of Peking Union Medical College (PUMC, Beijing xiehe yixue yuan 北京協和醫學院), presented “An Inquiry into the Prevalence of Malaria in China” at the Biennial Conference of the newly re-named China Medical Association¹ in Beijing. This paper, which was later published in *The China Medical Journal*, was regarded as the first empirical study on malaria endemics in China.² Earlier that year, Faust had already published the first check list of known mosquito species in East Asia.³ To be sure, these malaria studies were only small portions of his overall scientific oeuvre. Faust also published widely on medical zoology and helminthology.

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¹ This medical association was first established in 1886 as *The Medical Missionary Association of China*. It later became known also as *The China Medical Missionary Association (Bo yi hui 博醫會 in Chinese)*. This association began to publish an English-language journal, *The Chinese Medical Missionary Journal* (known in Chinese as *Bo yi hui bao 博醫會報*), in 1887. In 1907, the journal was renamed *The China Medical Journal* (remaining *Bo yi hui bao 博醫會報* in Chinese). In 1925, the association was renamed *The China Medical Association* (still *Bo yi hui 博醫會* in Chinese). In 1932, it merged with *The National Medical Association of China* (NMAC, Zhonghua yixue hui 中華醫學會, established in 1915). Its journal was accordingly combined with the NMAC’s journal *The National Medical Journal of China (Zhonghua yixue zazhi 中華醫學雜誌)*. Since the 1932 merger, the association has been known as *The Chinese Medical Association (Zhonghua yixue hui 中華醫學會)*, and the association journal has been published as two editions: the English version, *The Chinese Medical Journal*, and the Chinese edition, *Zhonghua yixue zazhi 中華醫學雜誌*.


Nevertheless, with these articles, Faust established himself as one of the leading specialists on malaria and other mosquito-borne diseases in China.⁴

More importantly, it was Faust who reinvigorated modern tropical medicine by introducing American-zoology-based parasitology into China many years after Patrick Manson left for Britain in late 1880s.⁵ In one decade, from 1919 to 1928, Faust had successfully built an international network of tropical medicine based at the PUMC’s Division of Parasitology. With his professional reputation made in China, Faust was appointed as the Chair of the Division of Parasitology at Tulane University, where over the course of his remaining career, he significantly advanced the development of tropical medicine in the United States.⁶ For this reason, historian John Z. Bowers regarded Faust

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⁵ Rodrigo Fernós, Medicine and International Relations in the Caribbean: Some Historical Variants (Lincoln, NE: 2006), 164-165.

⁶ For example, he published Human Helminthology, the first English textbook on this subject in 1929, and in 1937, together with Charles Craig, he published Craig and Faust’s Clinical Parasitology which would become one of the most influential textbooks on parasitology. See John Duffy, Tulane University Medical Center: One Hundred and Fifty Years of Medical Education (Baton Rouge: Louisiana State University Press, 1984), 174-175.
as “the great pioneer of American parasitology, in a mold comparable to that of Manson for British science.”

After Faust left for the United States in 1928, under the leadership of its second head, Reinhard Hoeppli (1893-1973), the PUMC’s Division of Parasitology continued to develop, becoming a center for tropical medicine in China and in the world, until the PUMC was closed by the invading Japanese army in 1941. During this post-Faust period, through the efforts of medical entomologist Feng Lanzhou (L.C. Feng 馮蘭洲 1903-1972), who continued Faust’s work on malaria, the research focus of the Division shifted from human parasitology to insect-borne diseases. Accordingly, a Beijing network of malariology centered on the PUMC Division of Parasitology played a key role in promoting studies of malaria and *anopheles* mosquitoes in China throughout the twentieth century.

This chapter reconstructs the origin and development of the Division of Parasitology at the PUMC, and in particular focuses on its malaria research from 1919 to 1941. It aims not merely to present a historical narrative of the development of the Beijing network of tropical medicine, but also to analyze two major historiographical problems. The first is to reappraise George Basalla’s model of the spread of western science. Basalla suggested that there were “three overlapping phases or stages” of the global diffusion of western science: in Phase 1, “non-scientific” societies and nations provided sources for European science. Europeans visited and explored these new lands, gathered information of local flora, fauna, and physical features, and brought back those data to Europe. Phase 2 of “colonial science” as described by Basalla was characterized

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by a higher level of scientific activities conducted by European scientists and institutions in non-European nations, along with the emergence of local, or using Basallas’ term, “colonial,” scientists, who were trained by, yet inferior to, and dependent upon their European colleagues. In Phase 3, non-European societies completed “the process of transplantation with a struggle to achieve an independent scientific tradition (or culture).”

To a certain extent, we might roughly situate Patrick Manson’s research activities as Phase 1, “the Faust period” and “the post-Faust period” at the PUMC as Phase 2, and the post-1952 developments as Phase 3. However, in line with recent critiques of Basalla’s thesis by historians of non-western sciences, this chapter will point out that applying George Basalla’s linear model to the history of parasitology in China risks oversimplification of a complex process. The spread of parasitology to China, following Faust’s arrival in China, the establishment of the Division, and major shifts in the post-Faust period, were not a straight-forward evolutionary progression, but resulted from multifaceted and unpredictable historical contingencies, such as internal bureaucratic and disciplinary conflicts.

The second problem has to do with the colonial medicine model of tropical medicine. This chapter will argue that Faust’s introduction of parasitology/tropical medicine was not mainly for the purpose of promoting American colonial rule in China,

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8 George Basalla, “The Spread of Western Science: A Three-stage Model Describes the Introduction of Modern Science into any Non-European Nation,” *Science* 156, no.3775 (1967): 611-622. Even though his model was developed fifty years ago, it is still quite influential in the history of science, since it does provide a helpful overview for our understanding of the spread of modern science, albeit one which scholars have further refined since 1967.

but was principally a result of his own professional aspirations for the expansion of the Rockefeller Foundation (RF). What is more, the Division of Parasitology of the PUMC was part of broader global networks of tropical medicine shaped by the RF. It was the RF’s institutional network that helped introduce and spread tropical medicine in China, and made global circulations of parasitological knowledge, practice, and personnel take root in Beijing in the first half of the twentieth century.

**An “American Patrick Manson” in China:**

**Ernest Faust and the Beginning of the Division of Parasitology, 1919-1928**

Ernest Carroll Faust, the scientist who established the PUMC Division of Parasitology, was born in Carthage, Missouri in 1890. After graduating from Oberlin College in 1912, he served for two years as a research assistant for Professor Henry B. Ward (1865-1945), Head of the Department of Zoology at the University of Illinois. In 1914, Faust began graduate training in medical zoology/parasitology under Ward’s direction. In 1917, he received his Ph.D., writing a dissertation on agamic trematodes (flukes) in the Bitterroot Valley of western Montana. He then worked as an Instructor of Zoology in the same university for another two years. ¹⁰ When he was offered a position in parasitology at the newly-opened PUMC in 1919, Faust was still young with relatively little in the way of significant scientific contributions.¹¹ How could this inexperienced scientist, who would subsequently become known as the “American Patrick Manson,” be

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appointed to this tropical medicine position in China? The answer lies within the specific context of the historical development of tropical medicine in the US at the time.

The Rockefeller Foundation, American Tropical Medicine, and Henry Ward’s International Connections

In 1913, the newly chartered Rockefeller Foundation organized the International Health Division to launch its international health campaigns against tropical diseases, such as hookworm, yellow fever, and malaria, and thus the Foundation also became engaged in the global enterprise of promoting tropical medicine.\(^\text{12}\) One of the RF’s major decisions in this respect was to sponsor the Johns Hopkins University (JHU) to establish a School of Hygiene and Public Health for medical research and training public health workers in 1916. Supported by the RF’s strong interest in tropical medicine, in 1918 William Henry Welch (1850-1934), dean of this new school (and also dean of the Johns Hopkins Medical School) directed zoologist and parasitologist Robert Hegner (1880-1942) to establish the Department of Medical Zoology, which was of “the most immediate link with tropical medicine.”\(^\text{13}\) In 1919, Hegner recruited his friend William W. Cort (1887-1971), who was Ward’s doctoral student from the University of Illinois, and together they helped the Department of Medical Zoology develop as an important center for the study of tropical medicine in the US.\(^\text{14}\)

In 1915, the RF’s China Medical Board set out to rebuild the Union Medical College in Beijing, which had originally been established by American-British

missionaries in 1906. William Henry Welch went to Beijing to investigate medical education in China, and he subsequently advised that the new medical school should be modeled on the JHU’s Medical School. Re-organized as “the Johns Hopkins of China” in 1917, the PUMC embarked on setting up its college structure following the JHU’s example.\(^\text{15}\) Given the centrality of tropical medicine in the JHU curriculum, in 1919, the PUMC decided to hire a tropical medicine specialist to build a Division of Parasitology within the Department of Pathology.

There were two major factions of tropical medicine specialists in early twentieth-century America. One was associated with US military medicine, as Warwick Anderson has discussed in his historical work on American tropical medicine.\(^\text{16}\) Initially based in Philadelphia, those focused on diseases that afflicted US troops overseas were mainly members of the American Society of Tropical Medicine (founded in 1903), with the \textit{Journal of American Tropical Medicine} as their official journal. The other group, which was supported by the RF and Welch at the Johns Hopkins University, consisted of parasitologists trained in medical-zoological-based tropical medicine.\(^\text{17}\) These specialists were close to Ward and were associated with \textit{The Journal of Parasitology} (founded in 1914). They would establish the American Society of Parasitologists in 1924, and Ward would be elected the society’s first president.\(^\text{18}\)


As Faust’s mentor, Henry B. Ward played a key role in the establishment of parasitology in China. He also was instrumental for shaping the field in the US. He was born in Troy, New York in 1865. During the late 1880s, he studied in Germany with Rudolph Leuckart (1822-1898), the founder of modern parasitology, after he received his A.B. from Williams College in 1885. In 1892, he obtained his doctoral degree from Harvard University. Ward had taught zoology at the University of Nebraska for nearly sixteen years before he moved to the University of Illinois in 1909. At Urbana, Ward established the first parasitology graduate program in the US. Until his retirement in 1933, Ward continued to train Ph.D. students in parasitology at the University of Illinois.¹⁹ As the “Father of American Parasitology,” Ward avidly promoted his medical-zoological-based tropical medicine, which was not always easy. His field was still considered by many to be “out of the mainstream of medicine,” and it had to compete with those tropical medical specialists who focused on the military. To spread his knowledge of parasitology and tropical medicine, Ward tried very hard to promote his students’ careers.

in the American medical sciences. William W. Cort’s appointment to the Department of Medical Zoology at the JHU was one of the most successful examples of his efforts in this regard.\textsuperscript{20} It was also through Ward’s personal and professional networks that Faust was granted the position at the PUMC.

In early 1919, upon receiving the PUMC’s position advertisement, Ward had a talk immediately with Faust “at some length with reference to the opening,”\textsuperscript{21} and encouraged Faust to apply for this RF-supported position. In the meantime, he also wrote to Ralph G. Mills, head of the Department of Pathology at the PUMC, to recommend Faust: “If I might be free to make a suggestion, it is that Dr. Faust…is the ideal man for the position… I am confident that Faust will do more research than any one else of whom I know.”\textsuperscript{22} Although he praised Faust highly, he nonetheless suggested that Faust should begin as an associate in parasitology rather than “advance to the associate professorship,” since Ward was afraid that his pupil might “allow his natural tendencies to carry him so fast that he might stumble.”\textsuperscript{23} Ward also recommended Faust to Simon Flexner, Trustee of the China Medical Board, “if I could possibly prevent it I would not let Faust leave us…He is altogether the best man in my opinion of anything like his age in the country for the work in China.”\textsuperscript{24}


\textsuperscript{21} “Faust to Ralph G. Mills, April 28\textsuperscript{th}, 1919,” in “Parasitology-Staff-Faust EC (1919-1961),” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 820.

\textsuperscript{22} “Ward to Mills, March 26\textsuperscript{th}, 1919,” cited by Mill in his letter to Franklin C. McLean, ibid.

\textsuperscript{23} “Mills to Edwin R. Embree, May 1\textsuperscript{st}, 1919,” “Parasitology-Staff-Faust EC (1919-1961),” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 820.

\textsuperscript{24} “Ward to Simon Flexner, May 19\textsuperscript{th},” “Parasitology-Staff-Faust EC (1919-1961),” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 820.
Perhaps as a result of Ward’s efforts on his behalf, on May 27th, 1919, Faust was officially appointed as Associate in Parasitology for a term of four years at the PUMC. Even before Faust left for China in late December, 1919, Ward laid plans to promote his journal while doing what he could to further Faust’s future career. In October, he put Faust’s name on the list of foreign collaborators of *The Journal of Parasitology*, knowing that Faust would be of service to the journal “in various ways.” In early December, Ward wrote a letter to Henry Houghton, Acting President of the PUMC and a specialist of tropical medicine, asking him to support Faust’s work in China: “I know you are interested in this field and will welcome an opportunity to meet him and discuss various biological problems with him. I think that his knowledge of the zoological field will be helpful to workers there who have not been trained in that territory and on the other hand, I am equally sure that your own acquaintance with other aspects of the questions and with the local situation will be of great value to him.”

Faust’s decision to accept the position at the PUMC was clearly influenced by Ward, who convinced him that the post would provide “future opportunities for service and advancement,” since there were a lot of unknown parasitic diseases in China for further research. Several weeks after Faust reached China, Ward would also write to remind him that, “it is evident that you are going to have a marvelous opportunity, and I

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25 “Mclean to Faust, May 27, 1919,” “Parasitology-Staff-Faust EC (1919-1961),” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 820.
26 “Ward to Faust, October 31, 1919,” in “Ernest C. Faust Papers, 1919-1922,” University of Illinois Archives, Series Number: 26/20/1. I want to thank Chen Jing (the University of Illinois at Urbana-Champaign) for photocopying this collection of Faust’s papers for me.
28 “Faust to Ralph G. Mills, April 28th, 1919,” in “Parasitology-Staff-Faust EC (1919-1961),” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 820.
hope will proceed with such caution that you build permanent foundations.”

Faust later observed that “since the days when Sir Patrick Manson carried on his investigations in Amoy and Hong Kong, China has been known as a country of unusual interest and opportunity to the student of parasitology and tropical medicine.”

As Deborah J. Neill has shown, in the late nineteenth and the early twentieth centuries, many young European students of tropical medicine went to colonies in the tropics to hunt for new microbes and parasites, attempting to establish their expertise as well as to “save the world from deadly diseases.”

Driven by similar motives to build his own professional reputation and to make “China a healthy place to live in,” Faust accepted this job offer, and arrived in China with his newlywed wife in January, 1920.

In short, the introduction into China of the strand of American tropical medicine that focused on parasitology resulted from Henry Ward’s ardent promotion of this new field and Ernest Faust’s own career ambitions, within the context of the expanding global network of the RF. In this respect, Faust indeed resembled Patrick Manson to some extent. Manson’s early career as a medical officer in the British-dominated Imperial Chinese Maritime Custom Service started with the expansion of the British imperial network in the Far East in the late nineteenth century. What is more, as Douglas M. Haynes has demonstrated, the initial drive that forced Manson to leave for China was the overcrowded domestic medical market in Britain. Manson, along with many of his fellow Scottish countrymen who looked to “the empire to pursue their career ambitions,” also

30 Ernest Faust, “Parasitic Infections and Human Disease in China,” Contribution no. 71, the Parasitology Laboratory, PUMC, 1926: 1, from “Ernest Carroll Faust Papers, 1918-1966,” The US National Library of Medicine, MS C 170.
31 Deborah J. Neill, Networks in Tropical Medicine, 8.
32 “Faust to R.S. Greene, March 26, 1923,” in “Parasitology-Staff-Faust EC (1919-1961),” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 820.
went to China in search of professional opportunities. 33 Nevertheless, there was a noticeable difference between the two men. As a practitioner of medicine, Manson did not expect to establish a new medical specialty during his stay in China, while Faust already had certain ambitions in this regard as he began his work at the PUMC.

**Building a Beijing Network of Tropical Medicine**

Upon arriving in Beijing in mid-January, 1920, Faust immediately undertook three major tasks: first, contributing an article to Ward’s *The Journal of Parasitology*, publication of which would maintain his close connections with Ward and a broader group of parasitologists; second, embarking on preliminary research for a paper on *paragonimiasis* (a lung fluke caused parasitic infection common in East Asia), which he aimed to deliver at the China Missionary Medical Association (CMMA) annual meeting in Beijing in late February. These were Faust’s initial attempts to expand his professional circle by making contact with physicians and parasitological workers in China in order to establish his reputation there. His third commission was to train technicians “in goodly earnest” for his newly-built parasitological laboratory, an undertaking which he believed would help him to “make a rather extensive reconnaissance of the parasites of this region.” 34

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In the next eight years, with the growth of the Division of Parasitology at the PUMC, Faust continued his efforts to maintain and extend his personal and professional relationships with medical scientists both in the western metropole and in its colonized territories. He cultivated ties with his colleagues at the PUMC, and with foreign and Chinese physicians in China, working on a myriad array of typical parasitic diseases in East Asia, and teaching and training parasitologists at the PUMC and beyond. Before he left China in 1928, Faust had built up a new international network of tropical medicine centered on Beijing.

Throughout his professional life in Beijing, Faust always carefully maintained his mentee/mentor relationship with Ward through frequent correspondence. In his letters to Ward, Faust not only described his own life experiences, but also reported on his research and findings in China. He also mailed some rare Chinese specimens of parasitological materials to Ward for use in his mentor’s own research and teaching.\(^{35}\) In return, Ward also sent Faust some equipment, books, journals and other research materials which were not easily obtained in China. Moreover, he kept advising and supporting Faust’s career development. In fact, it was Ward who helped Faust secure a position at Tulane University later on.

To some extent, Faust and Ward had developed a mutually beneficial relationship similar to that of Patrick Manson and Ronald Ross, which was, according to historian Li Shang-jen, a key factor in Ross’s discovery of the mosquito as the vector of malaria.\(^{36}\)

There were two noticeable cases that illuminate this interdependent relationship: Faust

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\(^{35}\) “Faust to Ward, October 19, 1921,” in “Ernest C. Faust Papers, 1919-1922,” University of Illinois Archives, Series Number: 26/20/1.

\(^{36}\) Li Shang-jen 李尚仁, *Diguo de yishi: Wan baide yu yingguo redai yixue de chuangjian* 帝國的醫師：萬巴德與英國熱帶醫學的創建 (Taipei: Yunchen wenhua, 2012).
contributed at least ten China-based articles to *The Journal of Parasitology* in eight years, and a China Branch of the American Society of Parasitologists was organized by Faust in January, 1926, shortly after the Society held its first annual meeting. On the one hand, Ward and his journal and society extended their professional reach through Faust’s work in China. On the other hand, Faust could establish his own professional reputation and incorporate his Division into broader international networks of tropical medicine, which according to Faust, would provide “additional stimulus for parasitological inquiry and research” in China.

![Image of Ward's Christmas Card to Faust, 1920](https://example.com/ward_christmas_card)

**Figure 7.** Ward’s Christmas Card to Faust, 1920. From “Ernest C. Faust Papers, 1919-1922,” University of Illinois Archives, Series Number: 26/20/1.

Faust also actively extended international connections for the Division and himself by taking advantage of his special relationship with William Cort, Ward’s other favored student, via the RF network. Following a proposal by Faust and Cort, the RF approved a faculty exchange program between the School of Hygiene and Public Health and the PUMC in 1922. Cort was to serve as a visiting professor in the Division of

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Parasitology at the PUMC, while Faust would be appointed as a visiting associate in the Department of Medical Zoology at the JHU for the academic year 1923-1924.\textsuperscript{40}

\textbf{Figure 8. William Cort.} From \textit{The Union} vol. 2 (1927): 160.

This exchange, as William Henry Welch, who arranged this JHU-PUMC collaboration, pointed out clearly, was “of mutual advantage” for Cort and Faust.\textsuperscript{41} In the early 1920s, Cort was eagerly carrying out hookworm research in the Caribbean region, as part of the global campaign initiated by the RF’s International Health Division.\textsuperscript{42} Cort believed that a year in China would offer him “valuable experience for helminthological studies,” since “there are certain important lines of hookworm study which he could pursue in China better than anywhere else.”\textsuperscript{43} In May 1923, Cort arrived in China, and with the support of the RF’s representative John. B. Grant, he initiated a China

\textsuperscript{40} “H. S. Houghton to R. S. Greene, August 25, 1922,” “Greene to Welch, November 8, 1922,” “W. H. Welch to Greene, November 15\textsuperscript{th}, 1922,” and “Welch to Greene, November 24, 1922,” in “Parasitology, 1919-1946,” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 818.

\textsuperscript{41} “Welch to Greene, March 18, 1922,” in “Parasitology-Staff- Cort, W.W. (1922-1971),” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 819.


\textsuperscript{43} “Welch to Greene, March 18, 1922,” in “Parasitology-Staff- Cort, W.W. (1922-1971),” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 819.
Hookworm program. Together with faculty of the Division of Parasitology and medical missionaries, Cort conducted several surveys from Beijing to Guangzhou, during which he anxiously applied “new methods of discovering hookworm larvae in the soil” from his Caribbean experience to study “hookworm infection in fertilizers of various kinds in China.” In this respect, the Division of Parasitology of PUMC was also linked to the RF’s global enterprises against tropical diseases.

This exchange indeed provided great opportunities for Faust. From May to October, 1923, en route back to the US, Faust subsequently visited major research institutes of tropical medicine in the Philippines, French Indo-China (the Pasteur Institute, Saigon), Singapore, Kuala Lumpur, India (the Calcutta School of Tropical Medicine), Egypt, Italy, Switzerland, France and Britain (the Royal Society of Medicine in London and the Liverpool School of Tropical Medicine). In a six-month transnational trip before he took up his one-year visiting position at the JHU, Faust not only studied local parasitic diseases and examined the data he had collected in China under the direction of eminent tropical medicine specialists, he also made personal connections with those involved in networks of European tropical medicine.

One important observation is worth mentioning here. As many historians of tropical medicine have demonstrated, Euro-American colonial authorities applied and promoted tropical medicine in their colonies mainly in order to safeguard colonists’

health. During this journey, Faust also identified himself somewhat as an imperial physician akin to those who placed colonists’ interests over those of the colonized. Noticing that the British and French had made progress in tropical medicine by making their Southeast and South Asian colonies “fit places in which to live,” Faust found it “surely regrettable that our record in the Philippines during the first ten years of occupation had been permitted to slump.” It was also in this context, Faust suggested, that the RF and the PUMC should promote public health activities in China.

His one-year academic visit to the Department of Medical Zoology at the JHU enabled Faust to access cutting-edge knowledge and techniques in tropical medicine and to make closer connections with the American parasitologists related to the RF. It was also during this period that he was approached by an American publisher and asked to prepare *Human Helminthology*, which would be the first textbook in this field in the US. Moreover, when he returned to China from the US in August, 1924, Faust intentionally chose the Pacific route via Japan. He visited major medical institutes in Tokyo (the Science College of the Imperial University and the Kitasato Institute), Kyoto, and Kobe, and worked on problems of parasitology with Japanese parasitologists. By extending his professional network among Japanese colleagues, Faust was establishing himself as a leading expert of tropical medicine in East Asia. In 1925, when Faust, as a

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50 “Report to Houghton on Faust’s Visit to Japan, August,” in “Parasitology-Staff-Faust EC (1919-1961),” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 820.
representative of China, went to Tokyo to attend the Sixth Congress of the Far Eastern Association of Tropical Medicine, as he later recalled that he was “accepted as a leader” in his own special field.51

Understanding the importance of academic associations and journals in promoting the status of individual scientists and their discipline, based on his personal experience with Ward and The Journal of Parasitology, Faust eagerly participated in the CMMA’s annual meetings, and via this Association, he successfully kept close collaborations with medical missionaries in China, especially Claude H. Barlow (1876-1969), the leading expert on Chinese blood flukes in Zhejiang Province.52 Moreover, in September, 1920, he built a Tropical Medicine Section for the China Medical Journal,53 and served as an editor for this journal.54

Although Faust continually expanded his international contacts, while at the PUMC he regarded teaching and the promotion of parasitology and tropical medicine to be his most important duty. Above all, he was interested in developing a Division of Parasitology at the PUMC. In early 1920, as a means towards achieving this goal, he established a Museum of Parasitology.55 For the next eight years, Faust examined thousands of domestic and wild animals, and built up a wealth of materials about parasitic infections in animals for the Museum. Due to Faust’s academic training in

51 “Faust to Mary Ferguson, June 26, 1968,” in “Mary Ferguson Papers,” The Rockefeller Archive Center, Box 7, Folder 70.
52 In 1924, Faust co-authored with Barlow, and contributed an article on Chinese liver fluke in Zhejiang. See E.C. Faust and C.H. Barlow, “A Preliminary Note on the Life of Clonorchis sinensis in Chekiang Province, China,” American Journal of Hygiene 4 (1924): 69-71. In the 1940s, Barlow went to Egypt, and helped organize campaigns against schistosomiasis based on his experience in China. See “Claude H. Barlow Papers,” The Rockefeller Archive Center.
54 “Houghton to Greene, December 11, 1922,” in “Parasitology-Staff-Faust EC (1919-1961),” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 820.
medical zoology, he focused on hosts other than humans, but he insisted that his data provides “tentative clues for epidemiologic investigation of human and comparative parasitic infections.”

According to the PUMC’s curriculum, Faust gave his first parasitology course to first-year undergraduate medical students in the third trimester, in 1921. However, his debut was not a success. Faust believed his “lecture and laboratory work was possibly adequate,” but the students “were not sufficiently trained to understand the clinical implications of the subject.” As a result, the course was rescheduled for the second-year students, following the fundamental course in pathology.

Fortunately, Faust soon gained support for his teaching and study of parasitology and tropical medicine from Henry Edmund Meleney (1887-1970) and Li Zongen 李宗恩 (Chung-Un Lee, 1894-1962) from the PUMC Department of Medicine. Meleney, an M.D. from Columbia University, initially served as an associate in the PUMC Department of Pathology in 1920. Working with Faust in the same department, Meleney developed close personal ties with him, and he too became interested in tropical medicine. In 1922, in order to have more opportunities to study the clinical aspects of tropical diseases, Meleney transferred to the Department of Medicine. But he continued his collaboration with Faust on Chinese parasitic diseases research, especially

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56 Ernest Carroll Faust, “The Beginning of Organized Parasitology in China,” 86. In this respect, Faust is also similar to Raphael Balchard, the French pioneer in medical zoology and tropical medicine, or pathologie exotique. Michael A. Osborne, The Emergence of Tropical Medicine in France (Chicago: The University of Chicago Press, 2015), 185-215.
57 Ibid, 87.
58 “Transfer of Dr. H.E. Meleney, September 20, 1922,” in “Medicine-Staff-Meleny,” The Rockefeller Archive Center, China Medical Board Inc., Box 90, Folder 643.
Li Zongen was one of the first Chinese students studying tropical medicine in Britain, and he would later become the president of PUMC in 1947. In 1920, he graduated from University of Glasgow with a M.D. degree, and then continued his medical training at the London School of Tropical Medicine. He gained a diploma in Tropical Medicine and Hygiene in 1921 and worked in the School’s Helminthology Laboratory from 1920 to 1922. Before he went back to China to serve as assistant in the Department of Parasitology of the PUMC in 1923, he had established himself as a rising young specialist of tropical medicine. In 1923, Meleney and Li built a Division of Tropical Disease with the collaboration of the Department of Medicine and the PUMC Hospital for treating patients infected by parasitic diseases. Faust worked closely with Meleney and Li, and the two divisions collaborated in training personnel and conducting research. The clinical study of parasitic and tropical diseases by the Division of Tropical Disease was incorporated into the third year of the medical curriculum, which was intimately integrated with Faust’s course for the second-year students. Accordingly, medical students in parasitology enjoyed more clinical experience in the hospital. As Faust pointed out, his parasitology course “had ceased to be merely a lecture and laboratory discipline and had become a living entity.” Many medical students at the PUMC, such as Zhong Huilan (Chung Huei-lan, 1901-1987), took Faust and Meleney’s courses in parasitology and tropical medicine, and received training within the two divisions, and eventually became leading experts of tropical medicine in China.

Faust also built a Parasitology Laboratory shortly after he arrived at the PUMC. With the development of the Division of Parasitology in the following years, gradually, at first some foreign researchers, and later on physicians and laboratory technicians from different parts of China went to his laboratory “for special training, some for intensive short course, some for a year or more.” On the one hand, these visiting scholars and physicians assisted Faust’s research on many different parasitic diseases. On the other hand, like many other American professors at the PUMC, Faust understood that his position at the PUMC was “not permanent for as soon as Chinese were available to fill” their post they “should be willing to make way for them.” For that purpose, Faust secured two visiting scholars as staff for the Division of Parasitology, to provide stability once he was gone.

Figure 9. Parasitology Laboratory of the PUMC. From Address & Papers Dedication Ceremonies and Medical Conference, Peking Union Medical College September 15-22, 1921 (Peking: PUMC, 1922): 343.

One of these permanent staff members was Xu Yujie 許雨階 (Oo-kek Khaw, 1890-1983). Born in Penang, British Malaya, Xu graduated from the University of Edinburgh in 1913 with a Medical degree. Before he went to the Division of Parasitology and Faust’s laboratory as a research fellow in 1924, Xu had continued his training in tropical medicine and public health in major medical institutions in Europe: he got a diploma in Tropical Medicine at the Liverpool School of Tropical Medicine in 1913, a diploma in Public Health at the University of Cambridge in 1914, and a diploma of Tropical Medicine and Hygiene from the Hamburg Institute of Tropical Medicine in 1923.\footnote{“Personal History Record: O.K. Khaw, 1928,” in “Parasitology-Staff-Khaw OK,” The Rockefeller Archive Center, China Medical Board Inc., Box 114, Folder 826; Zhu Zhenyi 朱真一, Taiwan redai yixue renwu: kaituo guoji jiaoliu de yijie xianqu 台灣近代医学人物:開拓國際交流的醫界先驅 (Taipei: Taida chuban zhongxin, 2011): 53-63.} During his one-year fellowship at the PUMC, Xu worked with Faust on the problem of *Clonorchis sinensis*, or the Chinese liver fluke, and they co-authored four articles on this subject. In 1926, Xu went to Amoy University (*Xiamen daxue 廈門大學*) to serve as Professor of Bacteriology. However, due to irregular financial support of Amoy University by the provincial government, with Faust’s support, Xu returned to the PUMC Division of Parasitology as a regular faculty member in 1928.\footnote{“Houghton Interviews J.R. Cash, Re: Dr. O K Khaw, March 4, 1927,” in “Parasitology-Staff-Khaw OK,” The Rockefeller Archive Center, China Medical Board Inc., Box 114, Folder 826; “Greene to M.K. Eggleston, March 15, 1928,” in “Parasitology-Staff-Khaw OK,” The Rockefeller Archive Center, China Medical Board Inc., Box 114, Folder 826.} As we will see in Chapter Two, Xu played an important role in organizing the malaria program in the Department of Parasitology of the Central Field Health Station in Nanjing.
The other permanent staff member was Yao Kefang 姚克方 (1899-1973). A graduate of Hsiang-Ya Medical College (Xiangya yixue yuan 湘雅医学院) in 1924, Yao served as an Assistant in Parasitology at the PUMC from 1926 to 1929, during which time he worked closely with Faust on the problem of schistosomiasis. Later on Yao would become a high-ranking medical official for the Nationalist government and subsequently the PRC regime, leading anti-schistosomiasis campaigns in Hubei Province during the 1950s.66

Since Faust’s teaching obligation was confined to a one-trimester course, every year he took advantage of the remaining nine months to conduct his own research, investigations, and other academic activities.

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During his earliest years at the PUMC, Faust made some effort to survey human parasites in the Beijing area, but as he reported to Ward, “little can be said, for they are few. There is practically no malaria.” This partly explains why he mainly focused on parasites found in animals collected for his museum. In the summer, 1920, Faust went down to Shanghai for fieldwork, and confirmed that “the animal parasites of man in North China are relatively few and the infection is relatively small,” and “parasitology is evidently a much more significant subject” in the Yangzi Valley, than the dry northern regions. Thus, afterwards Faust went to the South almost every year for investigations. In 1923, for example, Faust studied parasitic diseases in Shanghai, Zhejiang, Fujian, Guangdong Provinces and Taiwan in collaboration with local medical missionaries and physicians.

Together with Meleney and other staff from the Department of Medicine, Faust also had hands-on clinical work related to parasitic diseases at the PUMC Hospital, given that there were many such patients from other regions in China being treated there. For his own research and for training students, Faust suggested the Hospital bring “typical patients of Central China” to Beijing, “who are suffering from infections not found in North China.” He believed that if the PUMC wanted to have some notable research accomplishments, it should encourage every permanent member to “spend a month or two each year in hospital work and investigation in Central or South China.”

69 “Ward to Faust, September 27, 1921,” in “Ernest C. Faust Papers, 1919-1922,” University of Illinois Archives, Series Number: 26/20/1.
70 “Faust to Greene, June 12, 1923,” and “Faust to Houghton, October 9, 1923,” in “Ernest Faust,” The PUMC Archives, Personnel Archive, no.153.
During his research trips to the South, Faust also went all out in his efforts to introduce and promote parasitology to a wider audience. For instance, he gave a series of lectures to physicians in Kuling, Jiangxi Province in Central China, and many doctors in attendance wrote to *The China Medical Journal* to ask Faust to prepare a textbook of parasitology in Chinese.\(^\text{71}\)

With increased collaboration between the two divisions in the teaching of parasitology and tropical medicine, augmented personnel trained in parasitology, and extended research and investigations at the PUMC and beyond, Faust’s Division of Parasitology indeed experienced significant development. Within the context of the Beijing network of tropical medicine that he helped establish, Faust made remarkable achievements in publications. During his tenure at the PUMC, he published more than seventy papers in different academic journals in China and in the world. Along with some general introductions to parasitology,\(^\text{72}\) his research mainly focused on helminthological diseases such as schistosomiasis and blood flukes, and sometime proto-zoological diseases such as trichomonias and river fever, and mosquitoes and malaria (Table 1).

\(^{71}\) “Edward M. Merrins to Greene, January 31, 1923,” in “Parasitology-Staff-Faust EC (1919-1961),” *The Rockefeller Archive Center, China Medical Board Inc.*, Box 113, Folder 820.

Table 1. Faust’s Publication Numbers at the PUMC, 1921-1930.

![Field Classification of Faust's Publications in the Name of the PUMC, 1921-1930 (In total: 72)](image)

**Faust’s Malaria Research and the Need for a Medical Entomologist**

Because of his contributions in teaching and research, Faust was promoted to Associate Professor in July, 1923 for a period of five years. With this promotion and the expansion of the Beijing network of tropical medicine, Faust was no longer satisfied with limiting himself to the study of helminthology and parasites in animals and he began to broaden his research to other aspects of parasitology and tropical medicine. In 1925, Faust embarked on his studies of malaria, the most important and prevalent tropical disease, both in China and in the world at that time.

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Faust’s 1926 article “An Inquiry into the Prevalence of Malaria in China” was not the first medical text on this topic in China. In 1910, supported by the Research Committee of the CMMA, W. Hamilton Jefferys and James L. Maxwell prepared a chapter on the prevalence of malaria in China in their famous monograph *Diseases of China*. According to Jefferys and Maxwell, “malaria still remains the commonest of diseases in China and the most serious cause of invalidism among Europeans in the East.”

![Figure 11. The Prevalence of Malaria in China, around 1910. From W. Hamilton Jefferys and James L. Maxwell eds., Diseases of China, including Formosa and Korea (London: John Bale, Sons & Danielsson, Ltd, 1910), 117.](image)

However, as Faust pointed out in his report, Jefferys and Maxwell’s data were incomplete because they merely utilized information provided by a few medical

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missionaries in some parts of China, and therefore their statistics were “likely to be misleading.” What is more, Faust believed that after nearly fifteen years, with the maintenance of more complete records and the accumulation of more accurate knowledge of malaria, it was both necessary and feasible to present a new survey on the prevalence of malaria in China. For that purpose, in June 1925, using connections he had with the Research Committee of the CMMA, Faust sent questionnaires to over 300 physicians in 180 hospitals located throughout China, inquiring as to the current incidence of malaria, the species of parasite present, and the species of anopheline hosts involved. Many of them responded and returned valuable statistical information. With these data as well as some other sources, Faust examined four major themes related to the malaria problem in China in his article. The first one was the distribution of malaria in China: he found that there were heavy infections of malaria mainly throughout all of the Yangzi Valley, the southeastern coastal provinces, and Yunnan province in the southwest, and some low incidence of malaria in Manchuria (Northeast China). Secondly, three major types of malaria, Plasmodium falciparum, Plasmodium vivax, and Plasmodium malariae, were found throughout these malaria-ridden areas. Thirdly, Faust discussed the problem of species of anopheles in China. Because medical entomology in China had “hardly existed before 1930,” there was very incomplete information about mosquitoes there. Faust could only draw some “unsafe” conclusions that the dominant anopheline species in China was Anopheles hyrcanus var. sinensis (Zhonghua nue wen 中华瘧蚊), but “there is

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76 Ibid, 943; Ernest Faust, “Parasitic Infections and Human Disease in China,” Contribution no. 71, the Parasitology Laboratory, PUMC, 1926: 5-6, from “Ernest Carroll Faust Papers, 1918-1966,” The US National Library of Medicine, MS C 170.
no experimental evidence to indicate that this species of mosquito is the actual predominant carrier of malaria in China proper.” He also briefly introduced the fourth theme: the relationship of rainfall and temperature to malaria in China. In his conclusion, Faust admitted that his data were still quite fragmentary, thus it would be necessary to conduct intensive malarial surveys in typical regions of China, and “little can be done to reduce the anopheline fauna” without “a knowledge of what anopheline mosquito is responsible for malaria in a particular locality or where the breeding places of the mosquito are to be found.”

As a result, making such a survey and recruiting a medical entomologist for the Division of Parasitology became two urgent tasks for Faust.

**Figure 12. Distribution and Amount of Malaria in China and Adjacent Regions.** From Ernest Carroll Faust, “An Inquiry into the Prevalence of Malaria in China,” The China Medical Journal 40, no.10 (1926): 938.

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In late September 1926, Faust and Meneley submitted to Henry Houghton a proposal for conducting a one-month malaria survey in Central and South China, starting from October 10. Faust planned to visit hospitals and medical institutions in Nanjing, Suzhou, Huzhou, Hangzhou, Shaoxing, Ningbo, Fuzhou, and Amoy. In past years, via the networks of the CMMA and the PUMC Division of Parasitology, Faust had already developed close working relationships with physicians in these cities, such as Claude H. Barlow in Ningbo and Xu Yujie in Xiamen, and these collaborators would provide assistance in gathering materials and statistics. Faust especially expressed the hope that he could find more *anopheles* during this trip.79

Houghton at first showed some interest in the plan, but having discussed it with Faust’s department chief Carl TenBroeck (1885-1966), who had served as the head of the Department of Pathology since 1923, they rejected Faust’s proposal since “the (malaria) problem is such a complex one…so difficult to do with, even in the most advanced countries, that it would be wise to consider it further…to a large project.”80

As early as 1920, Faust had already proposed to hire a medical entomologist. In his plan, in the future a proto-zoologist and a person to take charge of the Museum of Parasitology would also be secured. Together with himself as helminthologist, the Division of Parasitology would cover the entire field of parasitology.81

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79 “Houghton Interviews with Meneley and Faust, September 22, 1926” in “Parasitology-Staff-Faust EC (1919-1961),” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 820.
80 “Houghton to Faust, September 24, 1926,” in “Parasitology-Staff-Faust EC (1919-1961),” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 820.
insect-hosts” and “the life history and epidemiology” of another important parasitic disease: kala-azar.82

Kala-azar (visceral leishmaniasis, also known as the black fever, in Chinese, hei re bing 黑热病 or pi kuai bing 疟塊病), is the second largest parasitic killer (after malaria) in the world. This disease is caused by the protozoan parasite of the Leishmania genus, and is transmitted from a species of sandflies (bai ling 白蛉) to humans.83 During the first half of the twentieth century, kala-azar posed a deadly threat to millions of Chinese in North and Northwest China. In October 1922, Charles W. Young from the Department of Medicine proposed to the China Medical Board, which was organized to be responsible for the RF’s work in China, to initiate field studies on kala-azar. In 1923, this proposal was approved, and this fieldwork lasted until 1934. As a result, during this period, research on kala-azar became one of the PUMC’s priorities. Young, Li Zongen, Faust, Xu Yujie, and later on Zhong Huilan and Feng Lanzhou, among others, all joined in this project.84

In this context, Houghton recognized the importance of entomological parasitology and discussed this with Faust, before he left for JHU in early 1923. Houghton agreed to support Faust and proposed to the RF trustees to hire “a medical

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82 “Faust to Greene, October 29, 1921,” in “Parasitology-Staff-Faust EC (1919-1961),” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 820.
entomologist in connection with field work in kala-azar.”85 In October, 1923 when Faust had started his visit at JHU, he was still anxious about this issue, and he wrote to Houghton “In the first place, I feel very definitely that first of all there should be some room made for a medical entomologist.”86

Figure 13. Kala-azar Research Laboratory at the PUMC. From The Union vol.2 (1927): 58.

Faust’s Departure and the Beijing Network Transformed after 1928

The PUMC would in the end hire a medical entomologist for the Division of Parasitology. However, Faust never had a chance to meet that person during his professional life at the PUMC. On September 24, 1926, when Carl TenBroeck suggested Houghton reject Faust’s malaria survey proposal, he also expressed his disappointment and said he would like to find “a man with broader training” to replace Faust after the end

85 “Houghton to Greene, January 17, 1923,” in “Parasitology, 1919-1946,” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 818.
of his appointment in 1928. TenBroeck would succeed in forcing Faust to resign in 1927, but the Beijing network of tropical medicine survived this abrupt shift in personnel and would continue to develop in new ways after Faust’s departure.

**Disciplinary Conflicts and Faust’s Departure**

Carl TenBroeck was dissatisfied with Faust in many respects. First, as a medical graduate from Harvard University, he did not think much of Faust, who had no medical but only zoological training. To some extent, this apparent disdain for Faust’s schooling on the part of TenBroeck replicated the tensions between clinicians and scientists in early twentieth-century American medical education, as historian Thomas Neville Bonner has pointed out. TenBroeck believed that the research work of Faust’s Division of Parasitology, by focusing on the study of animal parasites, was on the wrong track. He suggested instead that Faust should relate his work “as closely as possible to the pathology of diseases occurring in man,” but Faust insisted that the study of animal parasites from the viewpoint of medical zoology, his field of expertise, “is essential for a full understanding of their relation to man, and that an exceptional opportunity is afforded for such studies in China.” Moreover, TenBroeck did not look favorably upon Ward’s zoology-based parasitology. He pointed this out directly, writing “Faust is essentially a helminthologist. He has had little to do with medical entomology and is very weak in protozoology, he had gotten into trouble in the past by some of his writings concerning

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87 “Houghton Interviews with TenBroeck, September 24, 1926,” in “Parasitology, 1919-1946,” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 818.
89 “Interview with Faust, August 10, 1925,” in “Parasitology, 1919-1946,” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 818.
protozoology.”

Moreover, TenBroeck regarded an American scientific education as inferior to that which could be obtained in Great Britain. In discussing the future of the Division of Parasitology with Houghton, TenBroeck admitted that he would have “ultimately a man of British training in this general division of parasitology,” because “their outlook is somewhat wider than those who have been trained in parasitological work in the US.”

Secondly, as Head of the Department of Pathology, TenBroeck strongly disagreed with Faust’s plan to remake the Division of Parasitology into a separate department at the PUMC. There was a certain tradition in some medical colleges that parasitology as a discipline was closely related to pathology, as historian June Jones has indicated in the study of medical sciences at Liverpool University. TenBroeck wanted to uphold this tradition at the PUMC, warning Faust that “it would be unwise to make parasitology a minor department,” as he “felt that it was so closely related to pathology as a whole.” What was more, he insisted that in a small school such as PUMC, “it was unwise to create any more independent departments than was absolutely necessary.”

Lastly and most importantly, TenBroeck did not support Faust’s promotion to a full professorship. As Faust had frankly admitted in 1925, “he was striving for an appointment in comparatively few years as professor, and that what he is doing here now

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90 “Interview with TenBroeck, March 15, 1926,” in “Parasitology, 1919-1946,” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 818.
is for the purpose of presenting himself for a post of considerable responsibility in the States.\textsuperscript{94} However, in TenBroeck’s opinion, Faust “had a very wide experience in his subject…namely helminthology,” but he “was publishing too much, that his work was too superficial.”\textsuperscript{95}

Faust realized that in this situation, he could not achieve his professional goals of acquiring a full professorship, expanding his Division of Parasitology, or conducting what he regarded as his most important work on the malaria problem in China. On May 30\textsuperscript{th}, 1927, he submitted his resignation letter to TenBroeck “After due consideration I have arrived at the decision to discontinue my services with the PUMC at the termination of my present contract, June 30, 1928.”\textsuperscript{96}

After submitting his resignation, Faust immediately turned to his mentor Ward for assistance in locating a new position. While he waited for word, he used his last chance to take advantage of PUMC’s resources, embarking on fieldwork on spanranmu infection in Fujian province and Taiwan, a parasite which was originally described by Patrick Manson.\textsuperscript{97} With a letter of introduction from Ward finally in hand,\textsuperscript{98} Faust wrote to Richard Mills Pearce (1874-1930), director of the Medical Sciences Division of the Rockefeller Foundation for possible job opportunities in the US, emphasizing his new findings by referencing Manson: “I had a most valuable and profitable experience this summer” in Fujian and Taiwan, “covering the problems which interested Sir Patrick

\textsuperscript{94} “Interview with Dr. E.C. Faust, November 5, 1925,” in “Ernest Faust,” the PUMC Archives, Personnel Archive, no.153.
\textsuperscript{95} “TenBroeck to C.C. Bass, August 4, 1927,” in “Parasitology-Staff-Faust EC (1919-1961),” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 820.
\textsuperscript{97} “Houghton Interview with Faust, May 9, 1927,” in “Parasitology-Staff-Faust EC (1919-1961),” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 820.
\textsuperscript{98} “Ward to Richard Pearce, September 6, 1927,” in “Parasitology-Staff-Faust EC (1919-1961),” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 820.
Manson during his early days in China. In addition to finding the second China case of Manson’s sparganum in the human host, I have proved experimentally that the parasite in this infection in the common reservoir hosts (frogs, toads, and snakes).”

With the support of Ward and Pearce, and utilizing the networks provided by Ward’s contacts in the field of parasitology and those of the RF, Faust was offered a position at Tulane University in December 1927. Faust would teach there from 1928 until he retired in 1956, and would become a leading figure in American tropical medicine.

Before he left for the US, Faust recommended that Reinhard Hoeppli (1893-1973), a German who served as Professor of Pathology at Amoy University, should take over his post. To a great extent, Hoeppli seemed to be the perfect candidate in China, as the PUMC administration would like to “have a man successor to Faust possessing a good clinical background in addition to thorough training in parasitological technique.”

Unlike Faust, Hoeppli was trained as a physician. After graduating from the University of Heidelberg in 1913, he continued his medical training at the University of Kiel, and got his M.D. in 1919. What was more, he had professional training in parasitology and tropical medicine, since he worked as an assistant in the Hamburg Institute for Tropical Medicine, from 1921 to 1927. He also studied medical zoology with Cort in 1924-1925, at the JHU. In certain respects, together with Faust, Hoeppli was also a member of Ward’s American parasitology network. Cort believed he was “the best of the present group of German parasitologists,” and “of all the available men in the world he would

99 “Faust to Pearce, September 13, 1927,” in “Parasitology-Staff-Faust EC (1919-1961),” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 820.
100 “Pearce to Ward, September 9, 1927,” in “Parasitology-Staff-Faust EC (1919-1961),” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 820.
101 “Houghton Interview with Francis Dieuaide, October 25, 1927,” in “Parasitology, 1919-1946,” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 818.
102 “Personal History of Reinhard Hoeppli,” in “Parasitology-Staff-Reinhard Hoeppli (1921-1941),” The Rockefeller Archive Center, China Medical Board Inc., Box 114, Folder 822.
probably be the very best for the position” at the PUMC. Moreover, Faust had personal contact with Hoeppli when he was conducting fieldwork in Fujian in 1927. He understood that Hoeppli was also good at English and Chinese, which would enable him to communicate with the Chinese staff without difficulty. As a result, Faust wrote, “I heartily recommend him for the position.” Greene believed that Faust was “so well acquainted with all the leading centers throughout the world in which medical zoology has been developed, and knows personally so many of the best workers, that his recommendation of any candidate as the best likely to be available should carry great weight.” He approved the appointment of Hoeppli as assistant professor of parasitology in December 1927.

Faust’s departure, on the one hand, promoted the development of tropical medicine at Tulane and in the US in general, given Faust’s experience in China. On the other hand, it provided opportunities for the Division of Parasitology at the PUMC to shift to a more balanced approach in the field of parasitology. However, just like Faust’s reintroduction of tropical medicine to China several decades after Patrick Manson had departed, this rebalancing was neither by careful design nor by natural evolutionary development. As Mike Shiyung Liu and Wataru Iijima have respectively demonstrated for Japanese colonial medicine, the spread of modern medicine including tropical medicine from the Japanese metropole to colonies in Taiwan, Korea, and Manchuria was more or less a result of academic rivalry and conflicts within Japan in the first two

103 “Cort to M.K. Eggleston, February 10, 1928,” in “Parasitology-Staff-Reinhard Hoeppli (1921-1941),” The Rockefeller Archive Center, China Medical Board Inc., Box 114, Folder 822.
104 “Faust to Pearce, September 13, 1927,” in “Parasitology-Staff-Faust EC (1919-1961),” The Rockefeller Archive Center, China Medical Board Inc., Box 113, Folder 820.
105 “Appointment of Dr. Reinhard Hoeppli, December 13, 1927,” in “Parasitology-Staff-Reinhard Hoeppli (1921-1941),” The Rockefeller Archive Center, China Medical Board Inc., Box 114, Folder 822.
decades of the twentieth century. Pupils of the famous Japanese physician Kitasato Shibasaburo were driven out to the colonies by the medical faculty at the Imperial University of Tokyo.\footnote{Shiyung Liu, “The Ripples of Rivalry: The Spread of Modern Medicine from Japan to its Colonies,” \textit{East Asian Science, Technology and Society: An International Journal} 2, no.1 (2008): 47-71; Iijima Wataru, “The Establishment of Japanese Colonial Medicine: Infectious and Parasitic Disease Studies in Taiwan, Manchuria, and Korea under the Japanese Rule before WWII,” \textit{Aoyama shigaku} 28 (2010): 77-106.} Similarly, in this respect, Faust’s departure was due to the “effect of rivalry” between TenBroeck and Faust, or more broadly speaking, between the professionalized mainstream medicine practiced by TenBroeck and Ward’s zoology-based parasitology in the US, pursued in China by Faust. Nevertheless, thanks to the RF’s extended international network, the Division of Parasitology at the PUMC after a short period of dysfunction, would continue to develop after Faust’s departure.

\textit{Rebuilding the Beijing Network of Tropical Medicine}

The Beijing network of tropical medicine had to meet an emergent challenge after Faust left for the US. Before the PUMC offered the assistant professorship to him, Hoeppli had already accepted an appointment as professor of pathology in the Hamburg Institute for Tropical Disease and he had returned to Germany in early 1928.\footnote{“Hoeppli to J.R. Cash, January 15, 1928,” \textit{In Parasitology-Staff-Reinhard Hoeppli (1921-1941)\textemdash The Rockefeller Archive Center, China Medical Board Inc., Box 114, Folder 822.}} But the PUMC did not give up. After one-year of negotiation, Hoeppli finally agreed to resign his permanent position in Hamburg and to serve as professor of parasitology at the PUMC for a four-year term, starting in December 1929.\footnote{“Margery K. Eggleston to Hoeppli, December 7, 1928,” “Hoeppli to R.M. Pearce, January 19, 1929,” and “Hoeppli to Eggleston, March 14, 1929,” \textit{In Parasitology-Staff-Reinhard Hoeppli (1921-1941)\textemdash The Rockefeller Archive Center, China Medical Board Inc., Box 114, Folder 822.}} However, this meant that there would be no head or even a professor in the Division of Parasitology for more than a year. Even though Xu Yujie, as Greene admitted, carried on the routine work satisfactorily as an associate of parasitology, the Division of Parasitology had been “greatly handicapped” by
Faust’s departure. What was worse, Henry Meleney who led the Division of Tropical Medicine in the Department of Medicine had also left for America in 1928. As a result, the Beijing network of tropical medicine almost ceased any activity during this transition period.

There might be two major reasons for Hoeppli to make the decision to return to China after having accepted a professorship in Germany: for one thing, long before he came to Amoy, China in 1927, Hoeppli had developed a strong interest in Chinese, and “learned to read Chinese as a hobby and he took every opportunity to get acquainted and make friends with the Chinese with whom he came in contact.” When the RF and the PUMC delegates approached him in Germany, Hoeppli indicated that “he would prefer life in the Orient than life in Hamburg.” For another, PUMC offered a competitive job package: he would be a full professor with complete control of the Division of Parasitology within the Department of Pathology; PUMC would provide sufficient funding and support for the development of his Division; and two Chinese parasitologists, Xu Yujie (his former colleague at Amoy) and Yao Kefang, would be assigned as his assistants. As well as teaching only one three-month course of parasitology each year, Hoeppli would have an honorary title in the Department of Medicine and lead the Division of Tropical Medicine at the PUMC hospital. What was more, as the PUMC side made every effort to point out, Hoeppli would have great opportunities for parasitological work in China: “the post at Beijing has few equals, if any, in the world. The material immediately available from the hospital is extremely good, and all of China lies at hand.

110 “Cort to Eggleston, February 10, 1928,” in “Parasitology-Staff-Reinhard Hoeppli (1921-1941),” The Rockefeller Archive Center, China Medical Board Inc., Box 114, Folder 822.
111 “Alan Gregg to Eggleston, November 13, 1928,” in “Parasitology-Staff-Reinhard Hoeppli (1921-1941),” The Rockefeller Archive Center, China Medical Board Inc., Box 114, Folder 822.
as a field in which to work. Working conditions in Beijing could not be more pleasant while lab facilities and funds for experimentation are adequate for investigations of any reasonable magnitude.\textsuperscript{112}

No matter what the deciding factors were, Hoeppli started his new career as the head of the Division of Parasitology in late 1929, a position he would hold until 1952, when he was forced to leave China by the Communist regime. It was under his leadership that the Division of Parasitology began to offer parasitological teaching in both biological and pathological aspects, rather than merely on parasites in animals as Faust had focused upon. The Beijing network was accordingly rebuilt and continued to be an influential center of tropical medicine in China.

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{image14.png}
\caption{Reinhard Hoeppli. From The Union vol.3 (1931-32): 45.}
\end{figure}

The first immediate important task for this newly revitalized Division of Parasitology was to recruit more staff members. In early 1929, Yao Kefang also left the PUMC. As a result, there was only one parasitologist, Xu Yujie, left in the division before Hoeppli’s arrival. Fortunately, Feng Lanzhou, who would considerably shape the

\textsuperscript{112} “Margery K. Eggleston to Alan Gregg, September 27, 1928” and “Cash to Hoeppli, December 6, 1928,” in “Parasitology-Staff-Reinhard Hoeppli (1921-1941),” The Rockefeller Archive Center, China Medical Board Inc., Box 114, Folder 822.
development of the Beijing network, joined the PUMC immediately after he graduated from School of Medicine at Cheeloo University (Qilu daxue 齊魯大學) in Shandong Province.¹¹³ Feng’s appointment had been on the horizon for several years. In 1925, the British Royal Society organized a commission to investigate kala-azar endemics in North China. Still a third-year medical student at that time, Feng served as assistant for this Kala-azar Commission until 1928. During his three years of service, Feng learned “a great deal of medical entomology” from British specialists, and was recommended by the Commission to Greene in 1926 as “a very promising student in medical entomology.” Securing a medical entomologist for the Division of Parasitology and the Kala-azar field study had been a priority at the PUMC since the early 1920s. Greene replied to the Commission that “it may be well to keep this young man (Feng) in mind for a future position in our department of parasitology. He might be a good man for assistant resident in pathology, after he completes his intern service.”¹¹⁴ As planned, Feng Lanzhou was appointed as assistant resident in the Department of Pathology starting from July 1, 1929.¹¹⁵ Since his special interest was in “parasitology and tropical medicine,” when there was one assistantship vacancy in the Division of Parasitology in August, Feng Lanzhou immediately wrote to Xu Yujie to apply for that position, and was transferred to the division on September ¹st.¹¹⁶

¹¹³ “Personal History of Feng Lanzhou, March 6th, 1933,” in “Pathology-Staff-Feng Lan-chou (1929-1947),” The Rockefeller Archive Center, China Medical Board Inc., Box 115, Folder 833.
¹¹⁵ “Appointment, Greene to Feng Lanzhou, March 6, 1929,” in “Feng Lanzhou,” The PUMC Archives, Personnel Archive, no. 1049 (1).
¹¹⁶ “Feng Lanchou’s Application to O.K. Khaw, August 21st, 1929,” and “O.K. Khaw to C.E. Lim concerning on Feng’s Application, August 21st, 1929,” in “Feng Lanzhou,” The PUMC Archives, Personnel Archive, no. 1049 (1).
Thanks to the RF’s support, in 1933-1934, Feng Lanzhou was sent to take courses in tropical medicine at the Liverpool School of Tropical Medicine, where he obtained a diploma in Tropical Medicine and a diploma in Tropical Hygiene. During his studies in Europe, he also got training in mosquito collection techniques at the Natural History Museum, London, the Hamburg Institute of Tropical Medicine, and the Institute of Pasteur, Paris. He also studied anti-malaria work and control of *anophelines* in Rome with the leading Rockefeller malariologist, Lewis Hackett, and thus was considerably influenced by the RF’s mosquito-targeted model of malaria control. In 1934, he returned to China via India, where he studied anti-malaria work and made comparisons of Indian and Chinese mosquitoes at the Calcutta School of Tropical Medicine.117 Through these close connections with transnational networks of malarial mosquito studies, Feng established himself as the leading medical entomologist of malaria in China. From 1928 to 1937, he published nineteen papers on mosquito research. In one paper in 1937, he identified five major malarial vectors: *Anopheles maculipennis atroparvus* in Manchuria,

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117 “Modified Plan of studies abroad for Feng Lanzhou, November 17, 1933,’ in “Pathology-Staff-Feng Lan-chou (1929-1947),” The Rockefeller Archive Center, China Medical Board Inc., Box 115, Folder 833.
A. sacharovi in Xinjiang, A. pattoni in North China, A. hyrcanus sinensis in Central China, and A. minimus in South China (See Figure 16).118


In 1938, Feng listed ninety-eight species of mosquitoes in China, and twenty-two of them were anophelines.119 Feng was promoted to associate in 1934, assistant professor in 1937, associate professor of parasitology in 1947, and in 1952 he would replace Hoeppli as the third head of the Division of Parasitology. During the post-Faust period (1929-1942), Feng in effect was the key figure in the Beijing network of tropical medicine.

With Hoeppli, Xu Yujie, and Feng Lanzhou in place, the Division of Parasitology was also avidly rebuilding a tropical medicine network in Beijing. It continued the training program in parasitology initiated by Faust, which was soon re-developed as a global center for “specialized parasitological research and training of both graduate and under-graduate students who were coming in increasing numbers.”\textsuperscript{120} According to its own statistics, from 1920 to 1950, there were 192 graduate and special students in the Division of Parasitology. 125 of them were Chinese, and the rest were from ten foreign countries. (See Table.2). Xu Xifan (徐錫藩, Hsu H.F 1906-1990), the fourth staff member of this new Division of Parasitology was also one of these graduate students. Xu, with a B.S. from the Department of Zoology at Amoy University, continued his graduate studies with Hoeppli in the Division of Parasitology in 1931. Since Hoeppli regarded him as “one of the best qualified of the younger workers in the field of parasitology in China,” Xu Xifan was appointed as assistant by the division in 1934.\textsuperscript{121} With the RF’s support, Xu studied parasitology in Europe and got his doctoral degree from the University of Neuchatel (Switzerland) in 1935. He would become a world-class helminthologist, recognized for his work on \textit{Clonorchis sinensis} and \textit{Schislosoma japonicum}.\textsuperscript{122} The four staff members also worked together to promote the education of parasitology in China by

\textsuperscript{121} “Dr. Hsu’s Appointment, March 27, 1940,” in “Parasitology-Staff-Hsu H.F,” The Rockefeller Archive Center, China Medical Board Inc., Box 114, Folder 835.
introducing their own teaching experience and principles of translating parasitological terminologies into Chinese at the PUMC to Chinese audience.\textsuperscript{123}

Table 2. Graduate and Special Students Classified in the Division of Parasitology, the PUMC, according to Nationality, 1920-1950.

<table>
<thead>
<tr>
<th>Nationality</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese</td>
<td>125</td>
</tr>
<tr>
<td>American</td>
<td>41</td>
</tr>
<tr>
<td>British</td>
<td>6</td>
</tr>
<tr>
<td>Canadian</td>
<td>5</td>
</tr>
<tr>
<td>German</td>
<td>5</td>
</tr>
<tr>
<td>Australian</td>
<td>2</td>
</tr>
<tr>
<td>Japanese</td>
<td>2</td>
</tr>
<tr>
<td>Korean</td>
<td>2</td>
</tr>
<tr>
<td>Norwegian</td>
<td>2</td>
</tr>
<tr>
<td>Finn</td>
<td>1</td>
</tr>
<tr>
<td>Italian</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
</tr>
</tbody>
</table>

Secondly, the parasitologist staff restarted collaboration with the Division of Tropical Medicine in the Department of Medicine, which had been led by Zhong Huilan after Henry Meleney’s departure. Zhong was a PUMC medical student who graduated in 1929, but he had studied tropical medicine and parasitology with Faust and Meleney. Early in 1926, with Meleney’s support, he conducted fieldwork on malarial mosquitoes in Shantou, Fujian Province, and found that a type of anopheles, \textit{A. minimus}, might be a local vector for malaria.\textsuperscript{124} After graduation in 1929, he was appointed as assistant in the

\textsuperscript{123} Xu Yujie, Feng Lanzhou and He Boli (何博禮, Hoeppli’s Chinese name), “Jiaoshou jishengchongxue zhi tantao” 教授寄生蟲學之探討, \textit{Yiyu} 醫育 1, no.5 (1936): 2-16; Feng Lanzhou and Xu Xifan, “Jishengwu zhi xueming hanyi caoan” 寄生物之學名漢譯草案, \textit{Yiyu} 醫育 2, no.6 (1936): 2-5.

\textsuperscript{124} Miu Yiqin 繆宜琴, \textit{Zhong Huilan zhuang} 鍾惠瀾傳 (Beijing: Beijing chubanshe, 1990), 55-57.
Department of Medicine. Funded by the RF, Zhong studied tropical medicine at the London School of Hygiene and Tropical Medicine, and gained a diploma in Tropical Medicine (D.T.M.) in 1935. In 1942, he was promoted to associate professor.\textsuperscript{125} Feng Lanzhou worked closely with Zhong in kala-azar studies in North China, and they co-authored more than ten articles on this topic before 1942.\textsuperscript{126}


Thirdly, although some staff members, especially Xu Xifan, continued Faust’s original projects on the epidemiology of helminth diseases such as clonorchiasis and schistosomiasis, the Division of Parasitology under the increasing influence of Feng Lanzhou, shifted its major attention to insect-borne diseases, including kala-azar, relapsing fever, and most importantly, malaria.\textsuperscript{127} During this period, this division became one leading center on malarial mosquito research in China.

In 1941, the Japanese Army closed the PUMC, and the Division of Parasitology was also suspended. But fortunately, the Beijing network of tropical medicine did not

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\textsuperscript{125} “Appointment of Dr. Chung Huei-lan as Associate Professor of Medicine, October 14, 1941,” in “Zhong Huilan,” the PUMC Archives, Personnel Archive, no.0953.
\textsuperscript{126} “List of Publications, the Division of Parasitology, Peking Union Medical College, Peking, China (1920-1950),” Peking Natural History Bulletin 19, no.2-3 (1950-51): 157-178.
\textsuperscript{127} L.C. Feng, “The Parasitology Number,” 83.
\end{flushright}
entirely disappear. In early 1940, just after Beijing was occupied by the Japanese, Feng Lanzhou led some students to retreat to Yunnan Province in Southwest China, and with the RF’s support, established a malaria laboratory. As we will see in Chapter Three, there they would encounter the Nanjing network of tropical medicine.

Conclusion

In 1951, in commemoration of thirty years of service performed by the Division, Feng invited Hoeppli and Faust to jointly contribute a special issue “The Parasitology Number” in the *Peking Natural History Bulletin* (*Beijing bowu zazhi* 北京博物雑誌). They all agreed that, even though some other later-established institutions, such as the Department of Parasitology of the Central Field Health Station (which will be studied in the next chapter), did make certain contributions in parasitology, their Division was the most important one in introducing and promoting parasitological studies in China.

Despite the claims made by Feng, Hoeppli, and Faust, based on archival materials, this chapter demonstrates that there was a key promoter of Chinese tropical medicine missing in their memoirs as published in the *Peking Natural History Bulletin*. Strangely, they did not mention a single word about the Rockefeller Foundation (RF), the American philanthropic organization that founded and had operated the PMUC. We may

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128 This special number in the *Peking Natural History Bulletin* 19, no.2-3 (1950-51) includes the following articles related to the Division of Parasitology of the PUMC: L.C. Feng, “The Parasitology Number,” 81-84; Ernest Carroll Faust, “The Beginning of Organized Parasitology in China,” 85-88; R. Hoeppli, “The Development of Parasitology in China from 1930 to 1950,” 89-146; L.C. Feng, “The Future of Parasitology in China,” 147-154; “List of Publications, Division of Parasitology, Peking Union Medical College, Peking, China (1920-1950),” 155-178; and “Staff Members, Graduate and Special Students of the Division of Parasitology, P.U.M.C. since 1920,” 179-181. I want to thank Chen Boyi (Washington University in St. Louis) and Wang Er (Beijing University) for providing me these materials from Beijing University Library.


understand the specific historical context for this omission: in 1951 the PUMC was taken over by the People’s Liberation Army, and due to the rise of anti-American political atmosphere after the outbreak of the Korean War, the RF had already been defined as an “agent of American imperialism.” As a result, Feng, in editing this special issue, ignored the contributions of the RF in an attempt not to infuriate the communist regime. However, this lop-sided account was unfair. Presenting a more balanced evaluation, this chapter shows that the RF, although representing a type of cultural imperialism to some extent, should be given more credit for its role in the development of modern medicine and public health in China. Rockefeller Foundation support for the PUMC Division of Parasitology enabled foreign and Chinese scientists, each of whom who had their own complex personal and professional agendas, to come together to establish the first Chinese institute of tropical medicine—an advance that had long-lasting implications for the control of infectious diseases in China, including malaria.

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Chapter Two

The Global Network of Tropical Medicine in Nanjing:

The Department of Parasitology of the Central Field Health Station

and the Identification of Zhangqi as Malaria, 1931-1936

In December 1935, Yao Yongzheng (Y.T.Yao 姚永政 1901-1987), Head of the Department of Parasitology (Jishengchong xue xi 寄生蟲學系) of the Central Field Health Station (CFHS, Zhongyang weisheng sheshi shiyanchu 中央衛生設施實驗處), claimed in a newspaper interview that he and his investigation team, after several months of field study in Guizhou and Yunnan provinces, had discovered the cause of zhangqi 瘴氣, a lethal disease prevalent in China’s southern and southwestern regions. Their research had shown it to be a type of subtetian malaria, which could be cured by effective medical measures.¹ Yao soon gained considerable fame, and his finding was subsequently regarded as “one of the major medical contributions in China” at that time.²

The identification of zhangqi as malaria was neither merely an incidental finding nor Yao’s individual heroic scientific adventure. It was, among other discoveries, a direct product of a global network of tropical medicine, which was centered on the CFHS Department of Parasitology and developed in Nanjing, the capital city of the Nationalist government during the 1930s. Focusing on Yao Yongzheng and the origins, development, and anti-epidemic activities (especially the identification of zhangqi) of the Department of Parasitology of the CFHS, this chapter will illuminate how this Nanjing network of

1 “Yungui zhangqi xi e xing nueji 雲貴瘴氣惡性瘧疾,” Dong nan ribao 東南日報, December 3rd, 1935.
tropical medicine was built and shaped by the Nationalist government through its cooperation with international health organizations, mainly the League of Nations Health Organization (LNHO) and, to some extent, the Rockefeller Foundation (RF). Both as state medicine and an international health program, the Nanjing network was different from its counterpart in Beijing, which was dominated by the American Rockefeller Foundation’s principle of pure-research and limited to private universities and colleges. This central-government-led network of tropical medicine, influenced greatly by the Eastern European social medicine model of the LNHO (partly based on RF’s experience), as we will see in this chapter, was more practice-oriented in its assumption that it was the responsibility of state medicine to control parasitic diseases in Nanjing and beyond. Before the outbreak of the Sino-Japanese War in 1937, this Nanjing network had established itself as another major center of tropical medicine in China, with distinctive features that set it apart.

Establishment of the Central Field Health Station (CFHS)

Yao Yongzheng was born in Shaoxing, Zhejiang Province in 1901. Graduating from the Zhejiang Public School of Medicine (Zhejiang gongli yiyao zhuan meng xue xiao) in 1919, he initially worked as a surgeon in Hangzhou and Nanjing hospitals for ten years. In 1928, introduced by his former teacher at the Zhejiang Public School of Medicine, Chen Fangzhi 陳方之 (1884-1969),³ who had just been

³ A graduate from the Imperial Tokyo University Medical School, Chen Fangzhi was among the first Chinese parasitologists who studied the problem of schistosomiasis. His pre-1949 fieldwork research on this disease in East China would provide important references for the anti-schistosomiasis movement in the 1950s and 1960s. Liu Guomin 劉國銘 ed., Zhongguo Guomingdang bainian renwu quan shu 中國國民黨百年人物全書 (Beijing: Tuanjie chubanshe, 2005), 1318. The Zhejiang Public School of Medicine was one of the major medical colleges established by the so-called “German-Japanese school (Deri xi 德日系)”
appointed as director of the Sanitary Department (Weisheng si 衛生司) in the Ministry of the Interior (Neizheng bu 内政部), Yao Yongzheng got a position as a technician in the Sanitary Department. When the Sanitary Department was incorporated into the Ministry of Health (Weisheng bu 衛生部) in November 1928, Yao transferred into this new Ministry, and served as chief of the First Division of the Department of Health and Sanitation (Baojian si 保健司). With a fellowship from the Rockefeller Foundation, in spring 1929, Yao went to the United States to study medical protozoology, medical helminthology, and medical entomology, returning to China with a Master’s degree in Public Health from the Johns Hopkins University in 1930. In 1932, after receiving a LNHO fellowship, he went abroad again to study human parasitology at the London School of Tropical Medicine.4 With his Chinese and preeminent international training in tropical medicine and parasitology,5 Yao was appointed as acting chief of the newly-opened Department of Parasitology of the Central Field Health Station, when he returned in spring 1933.

His home institution, the Central Field Health Station, was specifically set up as a public health personnel training center in May 1931. Similar to Yao Yongzheng’s
doctors (such as Chen Fangzhi), who were academic rivals of the Anglo-American school (Yingmei xi 英美系, such as those from PUMC). Yao’s close connection with the German-Japanese medical sect might explain, to some extent, the tensions between his Malaria Research Institute and the Rockefeller Malaria Laboratory (of the Anglo-American school) in Yunnan in the 1940s. For more about rivalries between the two medical schools in early twentieth-century China, see Xia Yuanyuan 夏媛媛, Minguo chuqi xiyi jiaoyu de jiangou yanjiu 民國初期西醫教育的建構研究 (Beijing: Kexue chubanshe, 2014), 79-104.
5 The School of Public Health at the Johns Hopkins University and the London School of Tropical Medicine were the two global centers of tropical medicine at that time. See John Farley, Bilharzia: A History of Imperial Tropical Medicine (Cambridge: Cambridge University Press, 1991), 80-89.
background, the CFHS combined Chinese and international elements. On the one hand, the CFHS, together with the Ministry of Health (later on the National Health Administration, NHA or Weisheng shu 衛生署), was developed as part of the Nationalist government’s state medical project. On the other hand, the CFHS was an international health program initially designed by the LNHO for its technical cooperation with China.

Figure 18. Yao Yongzheng. From Huang Shuze 黃樹則 ed., Zhongguo xiandai mingyi zhuan 中國現代名醫傳 (Beijing: Kexue puji chubanshe, 1987), 145.

Figure 19. The Central Field Health Station. From J. Heng Liu and P.Z. King, National Economic Council, Annual Report of the Central Field Health Station, for the year ending December 31, 1934.
**CFHS as Chinese State Medicine**

The establishment of the Central Field Health Station was closely related to the development of state medicine in early twentieth-century China. The concept of state medicine (guojia yixue 國家醫學 or gongyi 公醫)\(^6\) originated in the public health reforms and sanitary movements of Western Europe (principally in Britain, France, and Germany) in the early nineteenth century. Supporters of state medicine advocated that a modern state should assume responsibility for providing health care and regulating personal and public hygiene.\(^7\) During the late nineteenth and early twentieth centuries, some forms of European state medicine were introduced and reshaped in Japan, and then spread to China.\(^8\)

Following Japan’s model, the Qing government in 1905 set up a central Sanitary Department (Wei-sheng si 衛生司) whose mandate it was to take charge of all public health issues in China. The successive Beiyang government (1912-1927) and the Nanjing Nationalist government (in its first year of 1927) both maintained this department under the Ministry of the Interior.\(^9\) However, due to political turmoil and the government’s...
indifference, many of its functions in promoting public health in China were still in the planning stage. During this period (1905-1927), there was no effective system of state medicine.

Disappointed by this situation, in the mid-1920s, there were many discussions and proposals among Chinese physicians, medical students, and administrators to establish a nation-wide state medicine system in China. The first step towards that goal, they believed, was to set up a responsive central national health administration to organize and direct public health in China.\footnote{Ka-che Yip, \textit{Health and National Reconstruction in Nationalist China: The Development of Modern Health Services, 1928-1937} (Ann Arbor: Association for Asian Studies, Inc., 1995), 39-40.} It was clearly advocated by Yan Fuqing (F.C.Yen 顏福慶 1882-1970), a graduate from the Yale School of Medicine, and the deputy president of the Peking Union Medical College, in one proposal to the newly-established Nanjing Nationalist government in 1927. Yan argued that the Nationalist government should set up a Central Ministry of Health (\textit{Zhongyang weisheng bu} 中央衛生部), not only because the Nationalist Party’s late leader Sun Yat-sen had promised that his government would provide health care to the Chinese people, but also because any government of a modern state, such as those in the West and Japan, should take public health as its responsibility. And considering possible funding shortages, Yan suggested that the Ministry could turn to the Rockefeller Foundation or LNHO for financial support.\footnote{Yan Fuqing 顏福慶, “Guomín zhengfù yīng shě zhòngyáng weishēng bù zhī jiàn’yi” \textit{Zhonghua yixue zazhi} 中華醫學雜誌 13, no.4 (1927): 229-240.}
The Nationalist regime, following Yan’s suggestion, took public health and state medicine as part of its National Reconstruction plans. In November 1928, it finally set up the Ministry of Health (MOH, Weisheng bu 衛生部) in the new capital city Nanjing. Due to the financial crisis caused by the world depression, in April 1931, the MOH was re-merged with the Ministry of the Interior as the National Health Administration (NHA, Weisheng shu 衛生署).

In promoting its state medicine project in China, the MOH (and the NHA) soon realized that it had to overcome a longstanding obstacle: the shortage of trained public health personnel. As Liu Ruiheng (Liu J. Heng 劉瑞恆 1890-1961), Vice-Minister of the former MOH and Director both of the NHA and the CFHS, pointed out in the first report of the CFHS (published in 1934) the establishment of the MOH demonstrated the Nationalist government’s interest in public health, but “demand for public health work is great and existing facilities very few and inadequate, a Ministry of Health is of no avail unless supplemented by a technical health service.” As a result, in May 1931, the National Health Administration officially set up the Central Field Health Station in Nanjing. Its major functions included not only “the training of the technical staff,” but also “the establishment of experimental and investigating institutions, and the demonstration of practical field work.”

One year later, in October 1932, “in order to make its organization more effective financially as well as politically,” the CFHS was officially transferred to the newly

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13 Liu, The First Report of the Central Field Health Station, April 1931-December 1933 (Shanghai: 1934), 3.
14 Ibid.
established National Economic Council (Quanguo jingji weiyuanhui 全國經濟委員會), a special advisory and executive agency in charge of national economy and developmental projects. And according to the National Government’s *Three Year Plan for the Chinese National Health Service* in 1931, the Central Field Health Station would expand to incorporate the North Manchurian Plague Service (in Shenyang, Northeast China) and the National Epidemic Prevention Bureau (in Beijing, North China) as its branch Field Health Stations.¹⁵

The relation of the Central Field Health Station, the Ministry of Health (National Health Administration) and state medicine was also clearly elaborated by Liu Ruiheng. In the second annual report of the CFHS, he emphasized that “it should be noted that the Central Field Health Station and the National Health Administration are inseparable institutions… (together with other public health institutions) form one medical and health headquarters.”¹⁶ In another article, published in the *Chinese Medical Journal* in 1935, Liu introduced the work of the CFHS to a general medical audience: The Nationalist government accepted state medicine as “the most logical policy—an idea based on the best socio-economic principles,” to realize its objective in public health. But “in view of the vast size of the country in land and in population, and the short history since the introduction of public health in China… the available number of trained personnel is far from being sufficient,” and thus the CFHS was established to train public health workers to supplement the administrative function of the NHA. At the end of that article, he

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claimed that the Central Field Health Station was “a part of the general trend of the reconstruction of the country,” and “it will grow in importance as time goes on,” because it “has distinct advantages in the form of personnel and special facilities which can never be obtained in a medical school or other medical institutions.”

**CFHS as an International Health Program**

The Central Field Health Station was far more than simply an aspect of the Chinese state medicine building project. As predicted by Yan Fuqing, due to the shortage of technical and financial resources, the Chinese Nationalist Government had to look for international support. In fact, the Central Health Field Station was the first major cooperative project China carried out with the League of Nations Health Organization (LNHO). This effort, as we will see, was greatly shaped by the LNHO’s Eastern European social medicine model.

The League of Nations Health Organization, the predecessor of the World Health Organization, was first established in 1921 in Geneva as a Provisional Health Committee of the League of Nations (LON). Until its demise in 1946, the LNHO had developed as one of “the most successful auxiliary organizations” of the League of Nations. As historian Iris Borowy has pointed out, even though “not widely known today beyond a small group of specialist historians...the formation of the LNHO was an ongoing process which, gradually, formed international health work as we know it.” The LNHO made several major contributions to the development of global public health: creating an international health administration to advance the development of preventive medicine,

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19 Iris Borowy, *Coming to Terms with World Health: The League of Nations Health Organisation, 1921-1946* (Frankfurt am Main: Peter Lang, 2009), 12 and 33.
setting up a Service of Epidemiological Intelligence to collect and disseminate global and
regional epidemiological information, establishing standards for nomenclature and
biological agents (such as vaccines), and more importantly, providing technical assistance
and medical personnel exchanges to help many countries build national health systems.
China was a major beneficiary among them.  

Even though technical cooperation with China was a major achievement in the
history of the LON, as historian Jürgen Osterhammel noticed in 1979, it had been a
marginal topic in modern Chinese history for a long time. In the following two decades,
under the “China-centered” paradigm, described and promoted by Paul Cohen, LON’s
engagement with China, together with other historical topics of “imperialism” and
foreign relations, continued to be considered as less important in understanding modern
China relative to a “more interior” perspective. However, recent studies have
convincingly argued that many, if not all important developments in China were closely
intertwined with international or global factors. And Ka-che Yip, Chang Li, and John R.
Watt in their works demonstrated that the LNHO indeed played an important part in
building Republican China’s public health system. The LNHO’s role in promoting

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tropical medicine and international cooperation in China during the 1920s and 30s was equally significant.

Although the initial contact between the LNHO and China began in 1922, it was not until 1929 that the two sides finally set up their cooperation agenda. To enhance its relations with the newly established Nanjing government, in early 1929, the LON deputy general-secretary Joseph Avenol (1879-1952) paid an official visit to China, and expressed the LON’s willingness to provide technical assistance. The Nationalist government considered this as opportune support for its state medicine project, and responded positively: the Ministry of Health in January 1929 requested the LNHO to dispatch its Medical Director Ludwik Rajchman (1881–1965) to visit China, and invited him to serve as the MOH’s International Advisory Council member.

25 In November of that year, in response to a proposal from Japan’s delegate to the LNHO, Miyajima Mikinosuke 宮島幹之助 (1872-1944), the LNHO dispatched a commission led by its chief epidemic commissioner, F. Norman White, to investigate epidemic diseases in major port-cities in the Far East (China, Korea, Japan, Southeast Asia, and India). From late March to early April 1923, this commission visited several large Chinese ports, including Harbin, Shenyang, Dalian, Niuzhuang (Yingkou), Beijing, and Shanghai. During their trip in China, White proposed to the Beiyang government that the LON could cooperate with China in developing a maritime quarantine service. But the China side at that time had little interest, and did not follow up. However, this mission was not entirely futile. After White returned to Geneva in 1924, he submitted a report. Following his suggestion in that report, in 1925 the LNHO established its Eastern Bureau in Singapore to collect and communicate epidemiological intelligence in the Far East region, which would also help promote the development of public health and tropical medicine in China. See Iijima Wataru 飯島済, Kansenshō no Chūgoku shi : kōshū eisei to Higashiajīn 感染症の中国史 : 公衆衛生と東アジア (Tōkyō: Chūō Kōron Shinsha, 2009), 108-112; F. Norman White, The Prevalence of Epidemic Disease and Port Health Organization and Procedure in the Far East: Report Presented to the Health Committee of the League of Nations, Official No. C- 167-M-43-1924-III-EN (Geneva, 1923), 6; Chang Li, 73; and Lenore Manderson, “Wireless Wars in the Eastern Area: Epidemiological Surveillance, Disease Prevention and the Work of the Eastern Bureau of the League of Nations Health Organization, 1925-1942,” in Paul Weindling ed., International Health Organizations and Movements, 1918-1939 (Cambridge University Press, 1995): 109-133.

26 The direct reason for this trip was the LON feared that China would withdraw from this League, since China had just lost its permanent membership to the LON Council. E.P. Walters, A History of the League of Nations (New York: Oxford University Press, 1952), 332; Chang Li, 76.

The LNHO approved this request. It would not be Rajchman’s first trip to China. Two years earlier, in December 1925, as arranged by John Grant (1890-1962), professor of public health at the PUMC, Rajchman had already paid a visit to China. During that fifteen-day trip, Rajchman visited several major Chinese cities, and discussed possible LNHO-China cooperation with some top Chinese medical administrators, which unfortunately was not initiated at that time.  

At the end of October, 1929, Rajchman arrived in Shanghai. He was more than happy to take on this mission. As a Polish socialist and former revolutionary, Rajchman showed great interest and sympathy towards the Chinese revolution under the leadership of the Chinese Nationalist Party. In the next two months, he visited Beijing, Nanjing, and Guangzhou, and eagerly supported the Nationalist government, and helped to prepare

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28 Chang Li, 74.
29 The director of the China Medical Board, Roger Greene, thought the Nationalist government under Chiang Kai-shek “might fall at any moment,” and could not understand Rajchman’s unusual sympathy to “a succeeding government”, and described it as “Dr. Rajchman…seems to take a philosophical view of the situation…” “Roger Greene’s letter to R. M. Pearce, December 11, 1929,” The Rockefeller Archive Center, RG1.1 100 International, Box 21, Folder 174.
its health cooperation with the LNHO. And later on, in 1933, he would return to serve as the LON technical delegate in China, and would lead massive China-LON cooperation projects.

Rajchman’s enthusiastic engagements with China came from not only his personal revolutionary vision, but also from his ambitions for promoting the LON’s social medicine model. Although used by different people with different meanings, the concept of social medicine, which emerged in nineteenth-century Europe, “at its core was a critical approach to health care that stressed the social determinants of disease.” Rather than approaching health and disease in terms of biomedicine, supporters of social medicine preferred to emphasize the social and economic relations of health and disease and thereby advocated the promotion of social welfare for the health of population. As a medical alleviation to the aftermath of the First World War (1914-1918), social medicine began to be warmly embraced and promoted by many medical experts, including Rajchman himself, in the early 1920s. Largely by the means of Rajchman’s personal efforts and influence as the Medical Director, international social medicine had become a major principle of the LNHO by the late 1920s and 1930s. For Rajchman, China’s

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31 Chang Li, 145.
positive request for health cooperation was “a once-in-a-lifetime opportunity” to “put into reality” this principle.\textsuperscript{35}

After several discussions with Chinese medical officers, Rajchman sent a letter to Liu Ruiheng on December 16\textsuperscript{th}, 1929, which included a detailed draft proposal for the LNHO-China collaboration. The Nationalist government approved this proposal on December 24, and sent an official version back to Rajchman for the final confirmation of the LNHO. Among other things, the first plan in their proposals was to build a central field health station for “the study of essential problems of public health…and for practical application in the field, as well as for training public health personnel and auxiliary staff.” As Rajchman explained, the work of this field station corresponded to schools and institutes of hygiene in Europe, which were linked up by the LNHO, thus the Chinese government could obtain expert advice and assistance from the LNHO for building the central field station.\textsuperscript{36}

These schools and institutes of public health/hygiene were products of the expansion of the American public health education system in Europe after the end of the First World War. Funded by the Rockefeller Foundation, they were to a large extent modeled upon the Johns Hopkins School of Public Health.\textsuperscript{37} Except for the schools in Madrid (in 1924) and London (in 1929, rebuilt based on the London School of Tropical Medicine), most of these schools and institutes were established in war-torn Eastern European countries: Poland (Warsaw, in 1925, built by Rajchman himself), Yugoslavia

\textsuperscript{35} Iris Borowy, \textit{Coming to Terms with World Health: The League of Nations Health Organisation, 1921-1946} (Frankfurt am Main: Peter Lang, 2009), 312.
\textsuperscript{37} About the Johns Hopkins model, see Elizabeth Fee, \textit{Disease and Discovery: A History of the Johns Hopkins School of Hygiene and Public Health, 1916-1939} (Baltimore: The Johns Hopkins University Press, 1987).
(Zagreb, in 1926), Czechoslovakia (Prague, in 1930), and Greece (Athens, in 1930).

However, due to the practical need for public health and the influence of social medicine among medical experts in these Eastern European countries, the schools and institutes were different from the American model which was based on universities and focused on research. As governmental agencies under the direction of their Ministries of Health, they were part of state medicine systems in their respective countries, and as such stressed field work, practical training for health administration experts, and sanitary campaigns. Also due to their state-led-nature and Rajchman’s personal connections, the directors of these schools were recruited as members of the LNHO’s Commission on Education in Hygiene and Preventive Medicine, and thus they were also closely related to the LNHO. During the 1920s and 1930s, the LNHO organized several international meetings of these directors to discuss and guide public health/social medicine training and teaching. In this sense, these schools and institutes represented an Eastern European social medicine model of the LNHO.

In May 1930, the LNHO held such a conference of the directors of these schools and institutes of hygiene/public health, and asked for their views and advice in operating the central field health station in China. This conference recommended that it should be set up with nine sections, including medical relief and social medicine, maternal and infant hygiene, bacteriology and epidemiology, chemistry and pharmacology, sanitary engineering, parasitology and malariology, vital statistics, school hygiene and physical

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education, health training and popular health education. And soon after that, as suggested by Rajchman, the LNHO sent one of those directors, Dr. Berislav Borčić (1891-1977) from the Zagreb National School of Hygiene (Yugoslavia) to China to directly organize the CFHS.39

The Zagreb National School of Hygiene was the most typical one of the Eastern European social medicine model. Its founder, Andrija Štampar (1888-1958), the director of the Hygienic Department of the Ministry of Public Health of the newly created Kingdom of Yugoslavia, was one of the most famous promoters of social medicine and rural hygiene in interwar Europe. (Later on, in 1933-1936, he arrived in China to serve as the LNHO expert for China’s rural reconstruction project).40 In 1926, with funding from the RF, Andrija Štampar opened this school, and his close colleague Berislav Borčić was appointed as its director. The Zagreb National School of Hygiene consisted of the following divisions: Administration, Bacteriology-Epidemiology, Biological Products, Chemistry, Rabies Control, Smallpox Vaccination, Hospital, Parasitology, Social Medicine, and Sanitary Engineering. Its major task was to research and control infectious diseases and to educate the people (especially those in the rural areas) with public health knowledge.41 As its director, Berislav Borčić naturally brought Zagreb experience into his China mission.

One year later, in May 1931, with the cooperation of the Chinese Government and
the LNHO, and under Berislav Borčić’s direct guidance, the CFHS was inaugurated in
Nanjing, as part of the National Health Administration, and soon of the National
Economic Council. Initially, due to financial limitations, it only established four of the
planned departments: Health Education, Bacteriology and Epidemic Disease Control,
Chemistry and Pharmacology, and Sanitary Engineering. By October 1933, it finally built
up the other five departments: Parasitology, Medical Relief and Social Medicine,
Maternal and Child Health, Industrial Health, Epidemiology and Vital Statistics. Even
though Liu Ruiheng didn’t like the “clumsy” name of the Central Field Health Station, he
had to accept it, since “it was not by us in China but by a committee of experts called
together” by the LNHO. And with several minor changes, the structure of the CFHS
was mostly following recommendations by the Conference of Directors of Schools of
Hygiene. As Sunil S. Amrith, AnElissa Lucas, and Liu Shiyung have pointed out, the
CHFS was heavily influenced by the the Zagreb or more broadly speaking, the LNHO’s
Eastern European Social Medicine model, introduced by those Eastern European medical
expects (Rajchman, Borčić, and Štampar).

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The LHNO indeed dominated the planning and development of the CHFS, but another international organization, the Rockefeller Foundation, also played a certain role. Liu Ruiheng, a graduate of Harvard Medical School, kept close relations with this American philanthropic enterprise, especially with Dr. John Grant, the RF’s representative in China. As he admitted years later, even if there was collaboration between China and the LHNO, he still had Grant as his “most intimate and trustworthy adviser” for operating the CFHS.\textsuperscript{44} In late 1931, Liu Ruiheng sent the official proposal of the CFHS to John Grant, for his advice and to seek RF’s funding. Grant did not support the nine department structure. He believed “bacteriology” and “parasitology” as two independent units were “un-economical,” and suggested that “there should be six divisions”: Sanitation, Medical Relief, Laboratory, Epidemiology and Statistics, Maternal and Child Health, and School Health. He explained that “a considerable amount of communicable disease control would be naturally undertaken as part of the routine of the

last three divisions.” Grant also had his opinions on its personnel arrangements. For example, Borčić and Yao Yongzheng were suggested as the senior staff of the division of Epidemiology and Statistics.\(^{45}\) Even though in the end, Grant’s suggestions were not taken by the Chinese government, the RF later on would still provide some funding to the CFHS’s training program.

### Building the Nanjing Network of Tropical Medicine and Malariology

Among the nine departments of the CFHS, the Department of Parasitology, where Yao Yongzheng served, was especially influenced by the LNHO’s policy. This department, although not among the first four departments built in May 1931, was set up a few months later, and was responsible for investigating and controlling parasitic diseases, especially malaria.\(^ {46}\) Originally as a malariology division, with the direct support from the Malaria Commission of the LNHO, it would soon be established as the center of the Nanjing network of tropical medicine and malariology.

### Origin of the Department of Parasitology

In the summer of 1931, a series of floods struck almost all provinces in the Yangzi Valley. These floods were among of the most devastating natural disasters in modern Chinese history, causing millions of death and refugees.\(^ {47}\) What was worse, malaria spread more widely and seriously after the flood, because of migrations of malaria-infected flood refugees. The Nationalist government once again turned to the

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\(^{45}\) “Grant’s letter to Liu Ruiheng, Nov.21, 1931” The Rockefeller Archive Center, RG1.1, Projects 601 China, Box 10, National Economic Council, Folder 101.

\(^{46}\) “Quanguo jingji weiyuanhui weisheng shiyanchu zuzhi tiaoli” 全國經濟委員會衛生實驗處組織條例, Zhonghua yixue zazhi 中華醫學雜誌 30, no.6 (1933): 1009.

League of Nations. To help the Chinese control malaria epidemics, and also to build the proposed section of Parasitology and Malariology, in November 1931, Secretary of the Malaria Commission of the LNHO, Prof. Mihai Ciuca (1883-1969) was sent to China. A noted Romanian malariologist, he was also the founder of the Iaşi hygiene school in Romania (once again an Eastern European expert of social medicine in China!). The Chinese government assigned Dr. Xu Yujie (O. K. Khaw 許雨階, 1883-1983), an associate of parasitology from the PUMC, and Yao Yongzheng from the CFHS, to assist Ciuca’s mission in China.


During and after the First World War, severe malaria epidemics reappeared in Europe, especially in Italy and certain Eastern European countries. Initially established in 1924 to deal with this “malaria problem” in Europe, the Malaria Commission of the LNHO gradually extended some of its attention to other regions. One of its major tasks was to investigate epidemiological information and to study the results of different methods for guiding anti-malarial work in Europe and the “Tropics.” Before Ciuca came to China, the Malaria Commission had organized several similar investigations in

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malaria-ridden countries, including Bulgaria, Greece, Italy, Romania, Russia, Yugoslavia, Palestine, the southern US, and India. Mihai Ciuca’s China trip can be considered part of that global mission.

Ciuca and his Chinese assistants could not control malaria in the flooded area, due to shortage of local health support, but they succeeded in conducting the first massive survey on malaria endemicty in the Yangzi Valley. This survey was of importance for building a center of malaria research in Nanjing. On the one hand, it provided field experience for Yao Yongzheng and his Chinese colleagues of the CFHS to utilize standard scientific methods, that is, checking enlarged spleens and conducting blood examinations for malarial parasites in order to identify malaria patients; on the other hand, after examining more than 14,000 persons in Nanjing, Suzhou, Hankou, Hangzhou and eleven other cities in the lower Yangzi Valley, it was confirmed that malaria was present in all those places. And using this investigation result, Mihai Ciuca and Xu Yujie successfully persuaded the Chinese authorities to officially establish the planned Division of Malariology (Nueji gu) at the CFHS in Nanjing, which would be expanded in April 1932 as the Department of Parasitology.

Cuica’s contribution was more than the survey and organizing the Division of Malariology. After completing his mission, and before leaving China, Cuica delivered a

52 Chang Li, 84-85.
lecture at the PUMC on January 29, 1932, in which he introduced the LNHO’s malaria policies to his Chinese colleagues.

Based on massive field investigations mainly in Europe and the Middle East, the Malaria Commission of the LNHO published several reports on malaria control in the 1920s and 1930s. Among them, two general reports respectively published in 1924 (“The Report on Its Tours of Investigation in Certain European Countries in 1924”) and 1927 (“Principles and Methods of Antimalarial Measures in Europe”) typically reflected the LNHO’s general polices towards malaria control during this period. Ever since Ronald Ross discovered the role of the *Anopheles* mosquito in transmitting malaria to humans in the late 1890s, there were two major different approaches in controlling malaria. One group of malariologists, including Ross himself and many American experts, insisted malaria was just an entomological problem, and the best method was “species sanitation,” or eliminating those mosquito-vectors, especially their larvae, by drainage, oiling, and poisoning swamps. For the other group, including most of the European specialists in the Malaria Commission, the mosquito-centered approach was impractical, because it would require too much financial support for drainage, insecticides, and labor forces. There were still many unknown relations between the malarial parasites, mosquitoes, and malaria endemicity, such as the puzzle of “anophelism without malaria.” Before solving these problems through research and investigation, such anti-mosquito measures would be just a waste of money. Based on the success of Italy’s anti-malaria work in the

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53 It was observed that in many places in Europe, *anopheles* mosquitoes were abundant, yet there was no malaria. In the 1930s, this puzzle was finally solved by Rockefeller malariologist Lewis Hackett. He found that different types of *anopheles* had different patterns of behaviors, and some of them preferred to suck the blood of domestic animals to that of man. But before that, “anophelism without malaria” was used as an argument against the species sanitation approach. See Socrates Litsios, *The Tomorrow of Malaria* (Pacific Press, 1996), 57-61; also Randall M. Packard, *The Making of a Tropical Disease: A Short History of Malaria* (Baltimore: The Johns Hopkins University Press, 2007), 125.
1920s, they believed that malaria was a social problem, which could be controlled by distributing quinine and improving social and living conditions in malarial-ridden regions. And for them, treating patients should be placed at the center of malaria control. The split later on was often described as the American technological model opposed to the LON’s socioeconomic model. But as Partrick Zylberman and Hughes Evans have pointed out, the Malaria Commission of the LNHO was not at all clear cut in its malaria policies. Even though favoring the social medical model, to a large extent, they attempted to unite the two approaches in their general reports: investigations should be conducted in malarial countries to determine which methods of malaria control were mostly suitable to local conditions.

In his lecture, Cuica mainly elaborated on the Commission’s major tasks of malaria research and control based on the two general reports, and in the end, he recited the Commission’s recommendation (for the division of malariology at the CFHS): an anti-malaria administration should be organized, and its first duty, as favored by the social medicine advocates in the LNHO, “is to provide for the treatment of the malarious sick with the object of reducing sources of infection.” To balance the two different models, “simultaneously, or subsequently,” the administration should undertake a study of the cause of the malaria endemicity, to decide and carry out “the most efficacious, the cheapest and best adapted method or methods in the solution of the local problem.

Provision should also be made either for radical measures (bonification,\textsuperscript{57} or large-scale drainage) or for other temporary measures (anti-larval work).”\textsuperscript{58}

Dr. Xu Yujie from the PUMC, who helped Cucia build the Division of Malariology of the CFHS, also played a key role in shaping the development of this new division. Shortly after it was established, in 1932, Dr. Xu published an essay “The Malaria Problem in China,” in which he clearly related Cucia’s lecture and the Malaria Commission’s malarial policy to the issue of malaria control in China. Xu pointed out that although the mosquito-centered approach might be very effective in preventing malaria, the cost of human labor to carry out these measures was too huge for China to afford. What was worse, the relations between different types of \textit{Anopheles} mosquitoes and malaria endemics in China were still unclear. Without careful investigation, it would be a waste of money to apply anti-larval measures. For the newly-built maliology division, Xu suggested that, its first and most important step was to apply “the Primary and Direct Measure,” as introduced by Cucia and in the second general report of the Malaria Commission, to treat malarial patients, kill mosquitoes inside the house, and safeguard against mosquito bites. In the meantime, Xu argued this division should choose several locations to establish anti-malaria demonstration and observation stations. With

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\textsuperscript{57} As defined by the second general report by the Malaria Commission of the LNHO, “The term of bonification generally signifies all work carried out with the object of making regions that are periodically or permanently marshy more healthy and more suitable for agriculture.” League of Nations Health Organization Malaria Commission, \textit{Principles and Methods of Antimalarial Measures in Europe} (Geneva, 1927), 84.
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collaboration between the division and local authorities, these stations would investigate relations between mosquitoes and malaria, to test different anti-mosquito measures.  

**Anti-Malaria Work in Nanjing**

The Malariology Division and the future Department of Parasitology of the CFHS would indeed follow the LNHO’s Malarial Commission’s directions, in its malaria control activities. The first major task for the Department of Parasitology was to work towards solving the malaria problem in Nanjing. Before it was chosen as the capital in 1928, Nanjing experienced a certain stability of malaria endemicity: the spleen rate (the number of palpable enlarged spleens per 100 individuals) within the urban area was about 2%, and in the east and west suburban area it was about 6%. Local residents, those with sound feeding and housing who lived in malaria-ridden neighborhoods, enjoyed a certain resistance to malaria. Therefore, malaria was not an emergent problem in Nanjing during that period. But after 1928, new massive construction projects for building the new national capital, such as the Sun Yat-sen Mausoleum and the State Stadium, in those malarious districts, broke the “balance between flora and fauna”: these projects resulted in the creation of many artificial ponds and brought in considerable cheap contracted laborers (as new non-immunes in poor living conditions, they tended to become infected with malaria), which respectively provided abundant breeding places and food supply for mosquitoes. As a result, several malaria epidemics broke out in 1930 and 1931. The malaria situation was intensified when crowd refugees (more food for mosquitoes, and

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thus more malaria sufferers) from the 1931 flood poured into Nanjing: in 1932, the spleen rate rose to 18% and the index of endemicity to 13%.62

The Department of Parasitology, as their first priority, started several major malaria surveys in Nanjing. In 1932, it set up four experimental districts, including Jinling College and Zhongshan Gate inside the Nanjing city wall, and Xiaolingwei (or the Sun Yat-sen Mausoleum), and Tangshan in the south-eastern suburb to investigate local malaria endemicity. A total of 8,919 persons were examined for enlarged spleens, and 1,021 of 8,905 persons were examined and found to have malarial parasites in their blood. In 1933, the experimental field of malarial control was extended from ten more districts to all of Nanjing, and systematic surveys were conducted among school children and in suburban areas. 303 of 5,648 children were found to have an enlarged spleen, ninety-six of 5,387 were examined and found to have malaria parasites in their blood. The results of investigations in the suburbs were more striking: 1,119 of 5,328 had enlarged spleens, and 1,264 of 5,228 were found to have malaria parasites in their blood.63

In the meantime, treatments were conducted as well as malaria surveys. During the malaria survey along the Yangzi Valley in 1931, the CFHS staff distributed 21,000 quinine tablets (2-grain) to malarial patients. In 1932 and 1933, the Department of Parasitology set up four clinics in the experimental districts. Yao Yongzheng and his staff undertook house-to-house visits to treat malarial patients in Nanjing, in which 78,300 quinine tablets were used.64 The influence of the Malaria Commission of the LNHO was particularly obvious in the Department’s experiments with some other anti-malarial drugs,

64 Ibid, 17.
such as totaquina, atebrin and plasmoquine in its house-to-house treatments. In the 1920s, the Malaria Commission called for a study of atebrin and plasmoquine in order to supplant quinine. And in the early 1930s, it recommended the use and study of totaquina. As Yao Yongzheng admitted, it was in response to the Commission’s request that they tested the therapeutic values of totaquina, quinine, atebrin and plasmoquine on Chinese patients, even though they did so without their informed consent (in accord with the standards of the time). 65

Yao Yongzheng and his staff also undertook anti-mosquito work in Nanjing. From 1932 to 1934, several major mosquito surveys were conducted in those experimental districts. After collecting and dissecting numbers of mosquitoes, they concluded that, one anopheline species, *A. hyrcanus var. sinensis*, was the vector responsible for spreading malaria in this region. They also chose Xiaolingwei District, the most endemic area for malaria, to conduct mosquito control experiments. In the fall of 1933, 1% of Paris Green (Copper aceto-arsenite, a new popular larvicide in Europe and America, which was recommended by the LNHO in the 1920s and 1930s) and 99% sifted road-dust was applied to all water surfaces in this district, including forty-nine ponds, six ditches, and four rice fields. According to Yao’s report, both adults and larvae of anopheline mosquitoes were greatly reduced as a result. 66

As suggested by Dr. Xu Yujie, the Department of Parasitology also cooperated with the Nanjing municipal government in malaria control. In spring 1935, they worked together to organize the Capital Anti-Malaria Commission (*Jing shi kangnue weiyuanhui*

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which led a malaria campaign till the winter in the center area of Nanjing, covering an area of 229,437 square meters. They set up twelve stations to trap mosquitoes for research, and sprayed Paris green or anti-malaria oil (for wet rice fields which could not be treated with the poisonous Paris green) over 350 ponds once a week. According to their records, the number of malaria cases and mosquitoes that year were remarkably reduced in the areas treated. In 1936, the area under control was extended to nearly 271,708 square meters, and the number of larvicide-sprayed ponds increased to 517. Even though they could keep down the number of mosquitoes to the level of 1935, the ratio of malaria cases was still lower than that of outside area.

Figure 23. Control of Malaria with the Use of Paris Green (in Nanjing). From J. Heng Liu and P. Z. King, *Annual Report of the Central Field Health Station for the Year Ending December 31, 1935* (Nanjing, 1936), FIG. 5.

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Beyond Nanjing and Malaria

As an official agency designed to promote state medicine in China, the Central Field Health Station was responsible for helping to organize public health and disease-prevention activities nation-wide. The Department of Parasitology of the CFHS thus extended its anti-malarial work beyond Nanjing. In 1933, three major malarial surveys were undertaken in Jiangsu, Jiangxi, and Hebei provinces. And in 1934, the most extensive survey was conducted in the localities newly recovered from the Chinese Communists in Jiangxi Province, where a malaria epidemic was spreading among the Nationalist armies. In 1935 and 1936, the Department’s malaria survey was extended into Fujian, Guizhou, and Yunnan provinces. Beginning in January 1934, in order to collect epidemiological information beyond Nanjing, the Department of Parasitology sent malaria case-record forms to about 500 hospitals and medical practitioners throughout the whole country, and received and studied monthly returns of epidemiological data from them.69

The Department of Parasitology did not limit itself to malaria research and control work. Kala-azar was also one of the Department’s major targets, like its counterpart in the Beijing network. In the 1920s, the Rockefeller Foundation and the PUMC conducted several surveys and fieldwork on kala-azar in China (See Chapter One), and the Department of Parasitology of the CFHS in May 1933, also carried out a preliminary survey of the disease in Suzhou (蘇州), in southern Jiangsu province. But the real hell was in the poor northern part of Jiangsu, especially the Qingjiangpu (清江浦, aka

Huaiyin 淮陰) region, where more than 100,000 people were infected with kala-azar in the early 1930s. There were even some villages where all residents died of kala-azar within several years. This terrible disaster soon attracted the Nationalist government’s attention. Since as a modern state, it claimed to promote state medicine and public health, saving citizen’s lives against kala-azar became its responsibility. What was more, the kala-azar epidemic broke out in the core region (aka Jiangsu province) of its direct jurisdiction and failure to control this disease would result in a huge loss of life that could lead to a legitimacy crisis. Therefore, in mid-January 1934, Yao Yongzheng and two staff members from the Department of Parasitology were sent by Liu Ruiheng to northern Jiangsu for a preliminary survey. To control the local kala-azar epidemic and to prevent it throughout China, in April, they decided to organize a Kala-azar Research Station (Hei re bing yanjiu dui 黑熱病研究隊), which was finally opened on June 22 in Qingjiangpu. As well as conducting epidemiological field surveys, another emergent task for this Station was to treat local patients. 691 patients made 7,789 visits and received free treatment in 1934, and in the next year, 2,087 persons were registered as new patients, and the total number of attendees was 21,414. In 1936, the attendance record rose to 28,938, with 2,587 new patients. The station also built a laboratory to undertake entomological research on the life cycle, geographical distribution and seasonal variations of different species of sandflies.70

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The Department of Parasitology also undertook research and field work on other parasitological diseases. In 1934, in cooperation with the Zhejiang Provincial Public Health Administration, it set up two anti-schistosomiasis units in Hangzhou, the capital city of Zhejiang province (fieldwork was conducted in Gudang 古蕩 near Hangzhou and Qu Xian 衢縣). The two units not only conducted clinical work to treat local schistosomiasis patients, but also studied the intermediate host of this disease, the *Oncomelania* snails, and carried out experiments to kill them with lime and cooper sulphate. In 1936, the Qu Xian Unit was handed over to the Zhejiang Provincial Administration, but the Department of Parasitology of the CFHS continued to provide technical and financial support till the end of June 1937. From 1934 to 1936, the Department also conducted surveys of schistosomiasis in several other counties in Zhejiang, Anhui, and Jiangsu provinces. Besides the snail disease (aka, schistosomiasis), it

also established two units on other parasitic diseases: one anti-paragonimiasis (a parasitic infection caused by the lung fluke) unit in Shaoxing (紹興) and one anti-fasciolopsiasis unit in Xiaoshao (蕭山) in Zhejiang province.\textsuperscript{71}

![Image](image.jpg)

**Figure 25. One of Many Patients at the Anti-Schitosomiasis Clinic in Qu Xian: Before, During, and After Treatment.** From J. Heng Liu and P. Z. King, *Annual Report of the Central Field Health Station for the Year Ending December 31, 1935* (Nanjing, 1936), FIG. 6.

The Department was also responsible for teaching parasitology. From 1933 to 1935, the CFHS and the NHA held two six-month courses for medical doctors and inspectors in the spring and autumn every year. For each course, the Department gave 112 hours of lectures and laboratory exercises on applied parasitology. In 1934, it also provided parasitological lectures and laboratory demonstrations to the classes for School

Health Teachers from Fujian, Anhui, and Hebei provinces. And in 1935, the Department offered two to three months of special training in parasitological laboratory work to a number of medical officers from various provinces.\(^\text{72}\)

**Staffing and International Exposure**

Yao Yongzheng was not alone in conducting research and field work on parasitic diseases and in building this Nanjing network of tropical medicine. He was assisted by his well-trained staff at the Department of Parasitology, many of whom would become promoters of tropical medicine in China: Zhu Hairu (H.J. Chu 祝海如), a Bachelor of Science from Yenching University (Yanjing daxue 燕京大學), served as Senior Assistant Technical Expert in charge of the Helminthological Laboratory (while Yao was in charge of the Protozoological Laboratory).\(^\text{73}\) Lin Liangcheng (L.C. Ling 林樑城, 1894-1973), a graduate of the Medical School of St. John’s University (Shenyuehan daxue yixue yuan 聖約翰大學醫學院, 1922) in Shanghai with a Diploma of Tropical Medicine (D.T.M.) from the Liverpool School of Tropical Medicine (1932), was another Senior Assistant Technical Expert.\(^\text{74}\) Pu Nangu (L.G. Poo 蒲南谷), a graduate of Hsiang-Ya Medical...

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\(^\text{73}\) Unfortunately, Zhu’s biographical information cannot be identified. In the 1950s, as a professor at Taijin Military Medical College, he published several textbooks on parasitology, including *Renti jishengchong shiyan shouce 人體寄生蟲實驗手冊* (Beijing: Renmin junyi chubanshe 人民軍醫出版社, 1950) and *Jianyao renti jishengchong xue 簡要人體寄生蟲學* (Beijing: Junwei weisheng bu 軍委衛生部, 1951).

College, was appointed as Special Member in charge of the Kala-azar Research Station at Qingjiangpu (to March, 1935), while Sun Zhirong (C.J.Sun 孫志戎 1903-1981), graduate of the Medical School of St. John’s University (1930), was another Special Member in charge of this Station from April 1935.\textsuperscript{75} Gan Huaijie (H.C.Kan 甘懷傑 1901-?), graduate of the Shanghai Medical College (Shanghai yixue yuan 上海醫學院 1931), was Assistant Technical Expert, in charge of the Anti-Schitosomiasis Unit at Qu Xian.\textsuperscript{76} Wu Zhengjian (C.C.Wu 吳徵鑑 1909-1982), B.S.(Biology, 1931) of the University of Nanking (Jinling daxue 金陵大學), who would be Yao’s close companion in Yunnan later on, was then one of the six technical assistants at the Department of Parasitology.\textsuperscript{77} Together with several nurses and technicians, the personnel of the Department of Parasitology at the CFHS formed the basis for a strong research and training center of tropical medicine in the 1930s.

\textsuperscript{75} Sun in the early 1940s would assist Yao Yongzheng' anti-malarial work in Yunnan. In 1947, he was appointed as Director of the Kala-azar Prevention Bureau (黑熱病防治處) under the Nationalist government. From 1951 to 1958, he served as professor of parasitology at Hebei Medical College, and in 1958, he was sent to teach public health and epidemiology at Qinhai Medical College. See Zhang Tingyou 張廷猷 and Yang Jie 楊傑, “Sun Zhirong xiansheng yu hei re bing 孫志戎先生與黑熱病,” in \textit{Gaoyou wenshi ziliao 高郵文史資料} vol.9 (Gaoyou: 1989), 122-124.


\textsuperscript{77} Wu followed Yao Yongzheng to Yunnan, Chongqing, and back to Nanjing in the late 1940s. In 1945 he was sent to study at the Calcutta School of Tropical Medicine, and in 1946 served as Deputy Director of Kala-azar Prevention Bureau. After 1949, he became a leading expert of parasitology and medical entomology in PR China. From 1951 to 1953, as requested by the Ministry of Health, he organized two classes to train parasitologists for the new China. He also published many textbooks on parasitology. See Zhongguo kexuejia cidian bian wei hui 中國科學家辭典編委會 ed., \textit{Zhongguo kexuejia zhuangue cidian 中國科學家傳略辭典, xian dai 現代} vol.4 (Beijing: 1982), 1415-1418; and \textit{Wo men de fuqin Wu Zhengjian 我們的父親吳徵鑑} (unpublished Festschrift edited by Wu’s surviving offspring).
The Department of Parasitology also attempted to enhance its international status by keeping its connection with the League of Nations Health Organization active. After its first study tour of malaria, the Malaria Commission of the LNHO understood that malaria-ridden countries were short of specialists of malariology, and thus starting in 1926, it opened a program of International Courses in Malariology in Europe every year. Up to 1933, 188 medical officials from European countries were trained in this program, and 109 of them were engaged with anti-malarial work in their own countries. However, it was difficult and expensive for Far East countries to send their medical officers to the course given in Europe. What was more, as Mihai Ciuca had noticed while on his China mission, the malarial problem in the Far East was different from that of Europe, thus the anti-malarial courses based on European experience might not be suitable. Thus in 1932, when he returned from China, Cuica proposed to organize another program of International Courses in Malariology in Singapore, under the administration of the Eastern Bureau of the LNHO. The Malaria Commission approved that proposal, and in April 1934, the first International Malaria Course for the Far East was opened at the King Edward VII College of Medicine in Singapore. Experts of malariology in Southeast Asia, including Ciuca himself, were invited to teach systematic courses on malariology. The Department of Parasitology of the CFHS sent two of its staff, Lin Liangcheng and Sun Zhirong to attend this course. (Lin’s study trip in fact was supported by a LNHO fellowship.) In 1935, two other staff, Pu Nangu and Wu Zhengjian, were sent to Singapore to be trained in the second course.78

The Ninth Congress of the Far Eastern Association of Tropical Medicine (FEATM)\textsuperscript{79} held in Nanjing in October 1934, provided another great opportunity for Yao and his staff’s international exposure. As one of the most active transnational organizations in the Asian and Pacific region in the first half of the twentieth century, the FEATM played an important role in promoting tropical medicine and international health in this region.\textsuperscript{80} In this Nanjing congress, 329 participants (253 Chinese and 76 foreigners) presented 120 papers in ten sections, and personnel from the Department of Parasitology, delivered six papers in the section of Parasitology and the section of Malaria.

By 1936, the Department of Parasitology had established itself as a center of tropical medicine in China with extensive international ties, and Yao Yongzheng and his staff had accumulated solid experience in malaria surveys and control. And it was within this context that Yao Yongzheng successfully identified the \textit{zhangqi} disease as malaria.

\textbf{Discovering Zhangqi}

For thousands of years, \textit{zhangqi} was a mysterious and deadly disease, thought to be caused by poisonous vapors generated in warm and moist mountains and valleys. According to traditional Chinese medical records, it was associated with China’s southern and southwestern provinces, especially Yunnan and Guizhou. Although some western

\textsuperscript{79} Established in Manila, 1908, the objectives of the FEATM were “The promotion of the science and art of medicine in the Far East; The union of the medical profession; The development and diffusion of scientific knowledge; The promotion of friendly international intercourse between scientific men; The elevation of the standard of medical education; The enlightenment of public opinion in regard of the prevention of diseases; The publication of the results of scientific investigations.” See “Articles and By-laws of the Association,” \textit{Transactions of the Ninth Congress of the Far Eastern Association held in Nanjing, 1934} vol.1 (Nanjing: 1935), 76.

physicians, such as Dr. J.L. Michoud, the medical officer of the Chinese Maritime Customs in Mengzi of Yunnan, had made assumptions that zhangqi might be a type of malarial disease as early as 1894,\(^8\) there was no solid evidence for his claim. For most Chinese in the first half of twentieth century, zhangqi was a lethal disease that could not be cured.

In May 1935, Generalissimo Chiang Kai-shek (Jiang Jieshi 蔣介石) ordered the NHA to investigate the zhangqi disease in Guizhou Province. Chiang had just come back from Guizhou’s capital city Guiyang, where he was shocked that his troops suffered heavy losses from zhangqi in the encirclement campaigns against the Chinese Communist Red Army. Several days later, an investigation team of twelve men, including parasitologists, clinicians, and technicians led by Yao Yongzheng, was immediately organized and sent to Guizhou.\(^8\)

Having accumulated field work experience with malaria surveys and control in Nanjing and beyond, Yao and his team suspected the disease to be some form of malaria, before they actually diagnosed local patients.\(^8\) This suspicion was proven by their field work in Guizhou’s southern borderland with Guangxi, where this mysterious disease was most prevalent. Their patients who had been diagnosed by local Chinese physicians with zhangqi, showed all the clinical signs of malaria. By examining zhangqi patients’ blood and spleen, the methods they had come to be quite familiar with in previous years, Yao and his team indeed found malaria parasites in these patients’ blood and they observed

\(^8\) J.L. Michoud, “Dr. J.L. Michoud’s Report on the Health of Mengtsz, for the year ended 30\(^{th}\) April 1894,” Medical Reports of Chinese Imperial Maritime Customs 47 and 48 (Shanghai, 1895): 36.
their enlarged spleens. They also collected specimens of mosquitoes in those regions. All these studies demonstrated that *zhangqi* was clinically and microscopically a form of subtertian malaria.\(^{84}\)


In September 1935, Yao and his team received a new order from Liu Ruiheng, and went to neighboring Yunnan Province to investigate *zhangqi* there. In the following five months, Yao and his team workers conducted a comprehensive *zhangqi* investigation in southern Yunnan, especially in the borderland between Yunnan and Burma, the so-called Sipu Borderland (*Sipu yanbian* 思普沿邊), or the Chinese Shan States, which was believed to be the original home of *zhangqi*. Leaving from Kunming, they successively visited the major towns in this regions, including Simao 思茅, Ning-er 寧洱, Cheli 車裡, Fohai 佛海 and Ta-lo 打洛 on the Yunnan-Burma border. In all these towns, Yao and his team examined the spleens and blood of patients suffering from *zhangqi*. The results were the same as in Guizhou: most of those examined had enlarged spleens and several types

\(^{84}\) Ibid, 726-738.
of malaria parasites, especially *Pl. falciparum* were found in their blood. What was more, nearly every zhangqi case “responded beautifully to quinine and plasmoquine treatment.” Once again, according to the team, zhangqi was proven to be subtertian malaria.\(^85\)


**Figure 28. Children with Enlarged Spleen in Yunnan Zhangqi Area.** From L.C. Ling, K.B. Liu and Y.T. Yao, “Changchʻi in Yunnan”: 1818.

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Conclusion

This chapter has traced the national and international developments leading up to Yao Yongzheng’s discovery that *zhangqi* was a form of subtertian malaria. The establishment of a Nanjing-based network of tropical medicine, which had a dual character both as a manifestation of Chinese state medicine and of international health initiatives, was essential for this important discovery. The origins and developmental trajectories of the Central Field Health Station and its Department of Parasitology, which was the center of this network, were heavily influenced by the League of Nations Health Organization and its Eastern European social medical model. Designed as a government-led institution, the Nanjing network emphasized conducting field work and solving practical parasitic issues, rather than pure medical science.

Some recent historical studies have argued that *zhangqi* in Chinese history was a much more complicated term with distinctive etiological, cultural and environmental characteristics. It included not only malaria, but also some other different diseases. To some extent, it had similar meanings with “miasma.” However, Yao’s scientific identification of *zhangqi* as malaria in Guizhou and Yunnan cannot be dismissed as erroneous. As David Bello has pointed out, even if *zhangqi* could not be completely identified with malaria, the reality that malaria was widely distributed in Yunnan and people there suffered malaria miserably cannot be denied. The importance of Yao’s

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“discovery” should not be underestimated. Yao’s scientific findings would exert great influence on Chinese (central and Yunnan) medical administrators: since zhangqi was no longer mysterious, but was verified as malaria, the Chinese government was able to utilize modern medical and public health measures to control it. Yao’s findings would thus provide a convincing scientific foundation for the establishment of China’s first provincial governmental agency designed to combat malaria in Yunnan, the Yunnan Anti-Malaria Commission (Yunnan sheng kangnue weiyuanhui 雲南省抗瘧委員會 YAMC), during the Second Sino-Japanese War (1937-1945).

What was more, as we will see in the next chapter, Yao Yongzheng would lead some former colleagues from the Department of Parasitology of the CFHS to continue their anti-malaria work in Yunnan in a context where the Nanjing network would not only come into direct contact with its Beijing counterpart, but would also engage with ever more complicated local, national, and global wartime networks of malaria research and control.
Chapter Three

Global, National, and Local Networks of Malaria Research and Control in Wartime Southwest China:
The Yunnan Anti-Malaria Commission and its Rivals, 1939-1945

In late July 1939, Jin Baoshan (also known as P.Z. King, 1893-1984), the Deputy Director of the National Health Administration (NHA), flew to Yunnan Province’s capital city Kunming from China’s wartime capital Chongqing. Invited by Long Yun (1884-1962), Governor of Yunnan Province, Jin’s purpose for this trip was to chair the opening meeting of the Yunnan Anti-Malaria Commission (YAMC). As a new governmental agency, this Commission was organized specifically to deal with serious endemic malaria in Yunnan. Several days later, on August 2nd, 1939, the opening meeting of the YAMC was held in the meeting room of the Yunnan Provincial Health Administration (YPHA). Jin Baoshan announced that the YAMC was officially established.

In this meeting, several memoranda, articles, and working proposals of the Yunnan Anti-Malaria Commission were also approved. According to these official documents, the YAMC was to be directly affiliated with the Yunnan Provincial Government, parallel to the Yunnan Provincial Health Administration. Long Yun’s right-hand man, Miao Jiaming (1894-1988), head of the Yunnan Economic Committee (Yunnan jingji weiyuanhui), was appointed as the chair of the YAMC archives (Yunnan sheng kangnue weiyuanhui dang), 1030-001-00007-011.

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1 In Chinese, Yunnan sheng kangnue weiyuanhui 雲南省抗瘧委員會.
2 In Chinese, Yunnan quan sheng weisheng shiyanchu 雲南省全省衛生實驗處.
3 Yunnan Provincial Archives (Yunnan sheng dang ‘an guan) 雲南省檔案館), The YAMC archives (Yunnan sheng kangnue weiyuanhui dang 雲南省抗瘧委員會檔案), 1030-001-00007-011.
the YAMC. This commission consisted of two main sub-organizations: one was the General Corps (Kangnue zong dui 抗瘧總隊), which was located in Kunming and was in charge of all anti-malaria activities. It was under the direction of Yao Xunyuan 姚尋源 (1899-?), who was sent by the NHA to organize the provincial Health Administration and to serve as its first commissioner in 1936. The other sub-organization was the Malaria Research Institute (MRI), or Nueji yanjiusuo 瘧疾研究所), responsible for training anti-malarial staff and studying malaria problems in Yunnan. Yao Yongzheng 姚永政, the key figure in the Nanjing network of tropical medicine, who had already moved to Southwest China (as part of the wartime relocation of the central government), was invited to serve as the Director of the MRI. Concerning the budget issues, it was agreed that the Nationalist central government and the Yunnan Provincial Government would together provide financial support to the YAMC. However, due to limited funding, the YAMC could only cover one-third of the MRI’s budget, and they planned to turn to foreign foundations, especially the Rockefeller Foundation, to secure the other two-thirds.

From these initial blueprints, we can recognize some characteristics of the Yunnan Anti-Malaria Commission: first, it was by no means a pure scientific research institute, but was in part a government agency that cooperated with the Yunnan provincial government and the Nationalist central government in public health and state medicine initiatives. Second, by appointing Yao Yongzheng, and building up the MRI, the YAMC transplanted the pre-war Nanjing network of tropical medicine to Yunnan. Third, their quest for RF’s financial support shows that the YAMC understood the

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4 Yunnan Provincial Archives, The YAMC archives, 1030-001-00007-001, 006, 009.
importance of situating Yunnan’s malaria control within the broader context of international health. To some extent, much like the Department of Parasitology of the Central Field Health Station in Nanjing, the YAMC was designed to be a new center for national and international networks of malaria research and control during wartime.

In practice, as this chapter will explain, the reasons for the origin, development, and ultimate demise of the YAMC were very complicated. In the six years that followed its establishment, while leading China’s first provincial-wide malaria control movement, the YAMC was closely intertwined with other multifaceted local, national, and global actors of malariology in wartime Yunnan, sometimes cooperating but other times competing with them. On the one hand, the YAMC and Yunnan’s malaria control efforts could not make any significant advancements without financial, material, and personnel support from local and central governments and international organizations, such as the League of Nations Health Organization. On the other hand, due to struggles over limited-resource allocations, conflicts of interests, and different schemes for pursuing malaria control, the YAMC experienced a lot of difficulties due to, and later on was even destabilized by, its interactions with others who disapproved of their particular approach in the interconnected Yunnan local, national, and global networks of malaria research and control.

**The Origins of the Yunnan Anti-Malaria Commission (YAMC)**

In his presidential address at the opening conference of the YAMC, Jin Baoshan introduced briefly how this commission came into being. According to him, there were three major contributing developments: Yao Yongzheng and his team successfully identified the *zhangqi* problem in Yunnan as endemic malaria in 1935; the NHA sent Yao
Xunyuan to plan and build the Yunnan Provincial Health Administration in Kunming in 1936, and as a consequence he drafted a five-year plan to control malaria; and the Executive Yuan (Xingzheng yuan 行政院) approved the budget for this “Five Year Program of Anti-Malaria Work” (Wu nian kangnue jihua 五年抗癲計劃) in July 1939.5

![Jin Baoshan](image)

**Figure 29. Jin Baoshan.** From Jin Baoshan wen ji (yang ben) 金寶善文集(樣本), (Beijing: Beijing yike daxue gonggong weishen xueyuan, 1991), frontispiece.

**Zhangqi, Malaria, and Local Medical Initiatives**

As discussed in the preceding chapter, Yao Yongzheng and his zhangqi investigating team played a key role in providing a scientific foundation for the YAMC. Nevertheless, the role of local actors in assisting Yao’s investigation, which had been almost ignored by official narratives written by Jin Baoshan, Yao Yongzheng, and the central government, was also crucial for setting this foundation. What was more, before Yao’s arrival, some local medical men had drawn conclusions that zhangqi was malaria based on their own research, and had attempted to call local and national attention to the need for malaria control with Yunnan. Many of these local physicians and public health administrators would join in the YAMC to engage in malaria control directly.

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5 Yunnan Provincial Archives, The YAMC archives, 1030-001-00007-011.
For centuries, communities in Yunnan had been struck by many epidemics and endemics of infectious diseases, such as plague, smallpox, cholera, malaria, typhus, relapsing fever, and schistosomiasis. Many local residents suffered and died from those diseases every year. As Carol Benedict has pointed out, this province had been called as “a place of pestilence and death” for a long time.

Throughout the first half of the twentieth century, among these afflictions, malaria (or more accurately speaking, zhangqi) was no doubt the most serious one in Yunnan, especially in its southern and western parts. From 1901 to 1910, the French colonial administration in Indochina constructed a transnational railway, subsequently known as the Yunnan-Vietnam Railway (Dian yue tielu 滇越鐵路), to connect Haiphong (in northern Vietnam) and Kunming. Around 200,000 to 300,000 local laborers were recruited to construct this railway along the malaria-ridden Yunnan-Vietnam borderland. More than 40,000 of them died of malaria during this period.

In 1919, Simao 思茅, a prosperous regional commercial center in southwestern Yunnan, was attacked by a devastating malaria epidemic, which would last nearly thirty

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8 It must be pointed out that the following records on local malaria epidemics were mainly retrospective reconstructions. Without clear laboratory medical evidence, this reconstruction might suffer “serious methodological issues” in identifying zhangqi/zhang as malaria, as Carol Benedict has shown in her reflections on identifying plagues in Chinese history. See Carol Benedict, “Framing Plague in China’s Past,” in Gail Hershatter et al, Remapping China: Fissures in Historical Terrain (Stanford: Stanford University Press, 1996), 27–41. Also see Andrew Cunningham, “Transforming Plague: The Laboratory and the Identity of Infectious Disease,” in Andrew Cunningham and Perry Williams eds., The Laboratory Revolution in Medicine (Cambridge: Cambridge University Press, 1992), 209–44; Samuel Cohn, The Black Death Transformed: Disease and Culture in Early Renaissance Europe (Oxford: Oxford University Press, 2002), 41-55.
years. Its population dropped from 76,800 to 24,106 in 1927. After that date the population continued to decrease: in 1935 only 4,000 survivors lived there, and in 1953, Simao nearly became a ghost city with only 1,092 residents.

Yunxian, another county located in western Yunnan had a population of 140,000 in 1933, but it also suffered a disastrous malaria epidemic that lasted from that year until 1940. Almost 90% of local residents came to be infected with malaria. In 1940 the population dropped to around 106,000, and more than 30,000 people died of malaria between 1933 and 1940. This demographic collapse was not solely the consequence of malaria—many likely moved away to avoid the disease or died from other causes—but malaria undoubtedly caused a great many deaths in both counties.

Due to a lack of medical personnel and financial sources in this far-southwestern hinterland province, there was no provincial public health administration in Yunnan, but only a small Division of Hygiene (*Weisheng ke* 衛生課) under the Department of Civil Affairs (*Minzheng ting* 民政廳), which was organized in 1933. It goes without saying there was no government-supported agency on malaria control in the area.10

When Yao’s team arrived in Yunnan in late 1935, the Division of Hygiene assigned two staff members, Li Zhucao 李竹操 and Li Anbang 李安邦, to host their investigation in the Sipu Borderland (*Sipu yanbian* 思普沿邊), which was dominated by the semi-autonomous non-Chinese Shan states. From November 1935 to January 1936, Li Zhucao and Li Anbang accompanied Yao’s team in their entire journey along

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10 Chen Shiguang and Zhou Qinglai, “Minguo shiqi Yunnan weisheng shihua,” 197.
Yunnan’s southwestern highland frontier. They indeed played a part in liaisons with local authorities, securing accommodations and motor vehicles on site, and assisting blood examinations of local residents. Considering the poor transportation conditions locally and the extreme communication difficulties with local non-Chinese Shan people, among other obstacles, Yao’s zhangqi investigation might not have moved so quickly without the two Lis’ support.\(^{11}\) On the other hand, after this trip, Li Zhucao and Li Anbang both recognized the reality of severe malaria endemics in this region, and thus published their own investigation reports urging the central and the provincial governments to take measures to control the malaria problem in Yunnan.\(^{12}\) Despite their contributions to the team’s efforts, Li Zhucao and Li Anbang were merely acknowledged anonymously with only a brief mention in Yao’s final report published in The Chinese Medical Journal:

“They must also thank …the officials of the different district governments for their courtesy and help rendered them during the progress of their investigation.”\(^{13}\)

However, they were not the only persons who were overlooked. Hou Jinxiu 后晋修 (1906-1970), another important local physician who conducted research on zhangqi and malaria, was also missing from Yao’s report. Born and raised in Simao county, Hou became determined to study medicine after having experienced the horrible outbreaks of malaria in 1919. In 1928 he graduated from the Southeastern Medical College (Dongnan yike daxue 東南醫科大學) in Shanghai, and in 1934 he served as a medical professor in

\(^{11}\) “Yunnan sheng kangnue weiyuanhui wu nian jihua cao an ji Minguo er shi ba nian gongzuo baogao ji jiantao huikan” 雲南省抗瘧委員會五年計劃草案及民國 28 年工作报告及檢討彙刊, 1, Yunnan Provincial Archives, The YAMC archives, 1030-001-00034-001.


the Yunnan Army Medical School (Yunnan lujun junyi xuexiao 雲南陸軍軍醫學校) in Kunming. In the same year, local elites appealed to Hou to save his hometown and his fellow Simao townspeople from zhangqi epidemics (zhangyi 瘟疫). Hou went back to organize the Simao Hospital to study the local zhangqi problem. In 1935, based on his fieldwork research, he came to think that zhangqi was actually malaria. Based on this insight, he proposed a project “Malaria Control to Revive Simao” (Kangnue fuxing Simao 抗瘧復興思茅). Later on, he went to Nanjing to report his findings to Liu Ruiheng, hoping the NHA would support malaria control in Yunnan. With an introduction from Liu, Hou attended the parasitology training class held by the NHA and the Department of Parasitology of the CFHS, and thus he can be regarded as member of the Nanjing network of tropical medicine. He also linked himself with the Beijing network by visiting Feng Lanzhou and Xu Yujie at the PUMC, and consulted with them on questions about malaria treatment, medical entomology, and microbiology.

Back in Simao, under his direction, the Simao Hospital conducted investigations on malaria endemics, carried out treatments of malaria patients, collected mosquito specimens, and researched plasmodia. In his efforts to introduce malaria knowledge to local residents, Hou was so eager to publicize the fact that mosquito elimination was the key to control malaria that he even got a nickname “Hou the Big Mosquito” (Hou da wenzi 后大蚊子). Unfortunately, due to the extreme shortage of financial resources from the local society, Hou could not continue his malaria control project on his own so he had to leave for Kunming in November 1935. Along the way, he met Lin Liangchen and Liu Jingbang from Yao Yongzheng’s team, who had been sent to Simao to investigate local
zhangqi problem. Hou informed them about details of the malaria epidemics in Simao.\textsuperscript{14}

However, like the two Lis, Hou’s own finding on zhangqi and his role as an informant for the YAMC team were not mentioned at all by Yao Yongzheng. Even though in 1938, based on his first-hand investigations and experience in Simao, Hou published one of the first empirical studies on malaria and malarial control in Yunnan, his name was seldom recorded in contemporary mainstream medical literature.\textsuperscript{15}

\begin{figure}[h]
\centering
\includegraphics[width=0.3\textwidth]{hou_jinxiu.png}
\caption{Hou Jinxiu. From Zhou Xinwen 周新文 et al., \textit{Yunnan sheng jueji fangzhi yanjiusuo zhi} 云南省疟疾防治研究所志 (1998), 121.}
\end{figure}

\textit{Public Health for a Local Developmental State}

The other two developments mentioned by Jin Baoshan, both of which involved administrative and financial cooperation between the central government and the local Yunnan government, were equally important for the establishment of the YAMC.


\textsuperscript{15} Hou Jinxiu 吕晋修, “Simao zhi jueji ji qi liuxing zhi chubu yanjiu” 思茅之癆疾及其流行之初步研究, \textit{Xi’nan bianjiang} 西南邊疆 3 (1938), 7-46.
At first glance, the Yunnan Provincial Health Administration could be considered as an extension of the Nanjing Nationalist central government’s state-medicine-building project. In 1928, after the establishment of the Nationalist regime in Nanjing, the Ministry of Health (which became the National Health Administration after 1931) was organized to build a nationwide modern public health system in China.\textsuperscript{16} The new ministry required all provinces to set up their own provincial health administrations, with the promise that the NHA would provide support to provincial governments if possible.\textsuperscript{17} In actuality, throughout the entire Nanjing period (1928-1937), similar to other agencies of the Nationalist government, the NHA had no real direct control over provincial and municipal health administrations beyond the southeastern regions.\textsuperscript{18} The 1928 order, to some extent, was an attempt to expand central administrative powers to the provincial level. Indeed, after 1928, several major provincial health administrations were established under the direction of the NHA.\textsuperscript{19} While the YPHA on the surface appears to simply be one such top-down initiative, a closer examination indicates that it was also a public health project carried out by the Yunnan local developmental government from the bottom-up.

In many respects, the Yunnan Provincial government under Long Yun’s rule resembled what several scholars have termed “a local developmental state.” Recent studies on Nationalist state-building in China (1928-1949) have reminded us that at both the central and local levels, the Nationalist regime made significant strides during its two


\textsuperscript{17} Chen Shiguang and Zhou Qingsheng, “Minguo shiqi Yunnan weisheng shi hua,” 197.


\textsuperscript{19} Another example is the Sichuan Provincial Health Administration. See Nicole Elizabeth Barnes, “Protecting the National Body: Gender and Public Health in Southwest China during the War with Japan, 1937-1945,” Ph.D. dissertation, University of California, Irvine, 2012.
decades of rule.\textsuperscript{20} Robert E. Bedeski, in his pioneering work published in 1981 pointed out that within a context of “unpropitious circumstances,” the Nationalist regime was “moderately successful” in its national reconstruction efforts.\textsuperscript{21} Borrowing Chalmers Johnson’s term “the developmental state,” which Johnson originally used to describe the Japanese state’s regulation and planning in Japan’s economic development,\textsuperscript{22} William Kirby has argued that the Nationalist regime was an embryonic developmental state run by technocrats.\textsuperscript{23} Scholars such as David A. Pietz and Seiichiro Yoshizawa have further elaborated on Kirby’s argument, demonstrating that the Nationalist government appropriated the authority of technocrats to legitimate its developmental policies when reconstructing Huai River hydraulics or opening up the Northwest.\textsuperscript{24}

\textsuperscript{20} The developmental state literature demonstrates that the Nationalist regime was not a total failure, or “an abortive revolution” as Lloyd Eastman originally described it. For the now contested “failure narrative,” see Lloyd E. Eastman, \textit{The Abortive Revolution: China under Nationalist Rule, 1927-1937} (Cambridge: Harvard University Press, 1974); \textit{Seeds of Destruction: Nationalist China in War and Revolution, 1937-1949} (Stanford: Stanford University Press, 1984).


Other studies of the developmental state have shifted their attention from the Nationalist government in Nanjing to local provincial authorities. In a case study on Feng Rui 馮銳, an agricultural expert and bureaucrat working for warlord Chen Jitang 陳濟棠 and his Guangdong provincial government during the 1930s, Emily Hill has shown how the local Guangdong government relied on technocrats to carry out its developmental policies and industrial construction projects, especially related to the sugar industry.

Long Yun ruled Yunnan in a manner consistent with his Guangdong counterpart. After he took control of the province in 1927, Long Yun called for “reconstructing a new Yunnan” (jianshe xin Yunnan 建設新雲南) and he established several new and effective economic, military, educational and public health institutions and services. One noticeable example, as J.C.S. Hall had illustrated, was the Yunnan Economic Committee led by the technocrat Miao Jiaming, who would become Chair of the YAMC. By developing and innovating Yunnan’s economic and mining sections with modern technology, the Yunnan Economic Committee successfully accomplished a certain level of industrialization and provided sufficient financial support for Long Yun’s regime.

However, poor public health conditions in Yunnan posed huge dangers for people’s lives and welfare, as well as obstacles to local social and economic development. Recognizing that the Nanjing central government intended to establish a state-medicine system in China, Long Yun realized that public health reforms could help strengthen his

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25 One theoretical example is Elizabeth J. Remick, Building Local States: China during the Republican and Post-Mao Eras (Cambridge: Harvard University Asia Center, 2004).
own legitimacy and could also provide healthier laborers for his local developmental state. Therefore, he planned to turn to the NHA to build a provincial health administration.\footnote{There was another personal but direct factor shaping Long’s determination for promoting modern medicine and public health in Yunnan. His beloved wife Li Peilian 李培莲 died following a difficult childbirth in 1934. Her dying wish was that Long Yun build a better hospital in Yunnan. See Zheng Zuyou 鄭祖佑, “Jiefang qian Yunnan yiyao weisheng jianshi” 解放前雲南醫療衛生簡史, Kunming wenshi ziliao huicui 昆明文史資料叢刊 No.2 (Kunming: Yunnan keji chubanshe, 2009), 1154.}

Situated in this context, the YPHA was another important part of Long Yun’s local state-building project.

In 1934, Long Yun ordered Zhang Banghan 張邦翰, who served as Yunnan’s representative in Nanjing at that time, to contact the NHA for assistance with organizing the Yunnan Provincial Health Administration. The NHA regarded this as a good opportunity to get involved in Yunnan’s provincial public health. Since Yao Yongzheng was still investigating the zhangqi problem in Yunnan at that time, he was appointed by the NHA to negotiate with Yunnan officials, and as a result a preliminary plan for the agency was drafted. Later on, the NHA sent its advisor Dr. Andrija Stampar, from the League of Nations Health Organization (LNHO), to investigate public health problems in Yunnan, and made an agreement to organize the YPHA. On July 1\textsuperscript{st}, 1936, the YPHA was officially established. Yao Xunyuan was appointed by the NHA as the first commissioner of the YPHA.\footnote{Yunnan sheng weisheng ting 雲南省衛生廳 ed., Yunnan weisheng tongzhi 雲南衛生通志 (Kunming: Yunnan keji chubanshe, 1999), 42-43.}

\textit{Funding the Five-Year Program of Anti-Malaria Work in Yunnan}

Yao Xunyuan, a graduate from the PUMC with a Masters of Public Health from the Johns Hopkins University, was a well-trained medical administrator.\footnote{Yunnan Provincial Archives, The YAMC archives, 1030-001-00007-09.} In 1929, he was sent by John Anderson (1890-1962), the head of PUMC’s Department of Public
Health and Hygiene, to Dingxian 定縣 to organize the rural health experiment there, in collaboration with the famous Dingxian Rural Reconstruction (xiangcun jianshe 鄉村建設) project led by Yan Yangchu 晏陽初. Before the outbreak of the war, he served as the Director of the Department of Medical Relief and Social Medicine at the Central Field Health Station in Nanjing.

![Yao Xunyuan (upper-left) and His Colleagues in Dingxian, 1930.](image)

In Yunnan, Yao Xunyuan avidly embarked on establishing a provincial public health system. At first, he made great efforts to build county health centers (xian weisheng yuan 縣衛生院) in Gejiu 個舊, Yuanjiang 元江, Jinggu 景谷, Lancang 澜沧 and Jingdong 景東 counties. But soon he became aware of the serious malaria problem in Yunnan: it had caused more morbidity and mortality in Yunnan than all other causes combined and had greatly retarded the economic growth of the province. Working together with the Yunnan provincial government, in spring 1939, Yao Xunyuan proposed

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setting up a new governmental agency to control malaria in Yunnan, which was named the Yunnan Anti-Malaria Commission. He also drafted a five-year program for it.

According to this draft program, the commission would be divided into two sections with a General Corps headquartered in Kunming and a Malaria Research Institute located in Yunxian. The General Corps, in charge of all anti-malaria activities, was to consist of three major divisions: Anti-Malaria Stations (*Kangnue suo* 抗瘧所) in nine counties, which would have three sub-sections focused respectively on sanitary work, medical service, and disease inspection; a Mobile Anti-Malaria Corps (*Xunhui kangnue dui* 巡邏抗瘧隊) which would work on other malaria-infected counties that lacked a permanent station; and a Corps of Engineers (*Gongcheng kantan dui* 工程勘探隊). The Malaria Research Institute would study the epidemiology of malaria and the distribution of malarial mosquitoes and would carry out mosquito control experiments. It was also scheduled to operate the Anti-Malaria Training Class (*Kangnue renyuan xunlian ban* 抗瘧人員訓練班) and the Kunming Anti-Malaria Demonstration District (*Kunming kangnue shifan qu* 昆明抗瘧示範區).34

In the first year, two anti-malaria stations were to be built in Simao and Ning-er 寧洱; four stations in Yunxian, Shunning 順寧, Zhefang 遮放 (or Chefang) and Fohai 佛海 in the second year; in the third year, the last three stations in Yuanjiang 元江, Hekou 河口, and Jinggu 景谷; the fourth year plan called for the use of all nine counties as intensive experimental areas, such that the anti-malarial activities carried out by each station would gradually extend to adjacent vicinities or neighboring counties. They also

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34 Yunnan Provincial Archives, The YAMC archives, 1030-001-00007-001,006, 011, 051 and 058; 1030-001-00010-004, and 005.
planned to plant cinchona trees and manufacture quinine. In the last year, the plan was to continue “to do the task initiated in the fourth year, examining the records, and making an end of the work.”

**Table 3. Organizational Structure of the YAMC.**
Based on “A Brief Report on the Activities of the Anti-Malaria Commission,” (May 16th, 1941), Yunnan Provincial Archives, The YAMC archives, 1030-001-00010-005; and “Kunming shi fanqu zuzhi zhangcheng” 昆明示範區組織章程 (August 3rd, 1939), Yunnan Provincial Archives, The YAMC archives, 1030-001-00007-051.

However, due to the lack of sufficient funding, the proposal for operating the YAMC with the outlined five-year anti-malaria program could not be implemented. After an extended negotiation between the central and the provincial governments, a budget was finally fixed, and approved by the Executive Yuan in July 1939. In the end, these funds would prove inadequate to cover all costs.

The total sum for the five-year program was N.C.$1,824,000 (National Currency Yuan, or 法幣 Fabi). The central government would provide an initial fund of $160,000

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and an operating budget of $832,000, while the provincial government of Yunnan would give a grant of $832,000 to support the operating expenses of the commission, for a total of $1,824,006 (details of the budget are indicated in the following table).

Table 4. Distribution of the Appropriation from the Nationalist Central Government and Yunnan Provincial Government for Five-Year Program of Anti-Malaria Work in Yunnan.

From “F.C. Yen’s letter to Dr. Balfour (August 31, 1939), Memorandum on the Five-Year Program of Anti-Malaria Work in Yunnan Province, Appendix 3,” The Rockefeller Archive Center, RG1 601 Box 43, Folder 356, 601 I Malaria 1938-1939.

<table>
<thead>
<tr>
<th>Year</th>
<th>Capital (Initial Expenses)</th>
<th>Running Expenses</th>
<th>Total</th>
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<tr>
<td>1st</td>
<td>60,000</td>
<td>0</td>
<td>160,000</td>
</tr>
<tr>
<td>2nd</td>
<td>60,000</td>
<td>0</td>
<td>304,000</td>
</tr>
<tr>
<td>3rd</td>
<td>40,000</td>
<td>0</td>
<td>200,000</td>
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<tr>
<td>4th</td>
<td>0</td>
<td>0</td>
<td>100,000</td>
</tr>
<tr>
<td>5th</td>
<td>0</td>
<td>0</td>
<td>68,000</td>
</tr>
<tr>
<td>Total</td>
<td>160,000</td>
<td>0</td>
<td>832,000</td>
</tr>
<tr>
<td>Grand Total</td>
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<td></td>
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</tr>
</tbody>
</table>

It was true that, as Jin Baoshan explained in his speech, the three scientific, institutional, and preliminary financial foundations were important for establishing the YAMC. However, achieving this cooperative agreement at this very moment in time was not merely because the central and Yunnan provincial governments intended to promote their legitimacy and state-building projects, or as the official statement described, the “beloved” Chiang Kai-shek and Long Yun wanted to save millions of malaria-infected Yunnan people. In fact, the critical conditions of the Second Sino-Japanese War (1937-

36 Yunnan Provincial Archives, The YAMC archives, 1030-001-00078-018.
1945) exerted a more influential impact on their determination to fund anti-malaria work in Yunnan than did immediate humanitarian concerns.

Wartime Relocation of National and International Medical Resources

With the westward retreat of the Nationalist central government after the fall of Nanjing in 1938, the previous distant provinces in southwest China became of predominant military strategic importance as the “Great Rear Area against the Japanese Invasion” (Kangzhan da houfang 抗戰大後方). In this context, many national and international medical resources, which were limited mainly to the eastern coastal areas in the pre-war period, were accordingly relocated to the western hinterlands.37

Along with other medical colleges and hospitals, four major national medical institutions retreated to the Rear Area. The NHA was stationed in Chongqing while the Central Field Health Station and the Emergency Medical Service Training School (Zhanshi weisheng renyuan xunlian suo 戰時衛生人員訓練所) temporarily stayed for two years in Guiyang, the capital city of Guizhou Province. In April 1941, they moved to Keleshan 歌樂山 near Chongqing, and were incorporated with the NHA as the National Institute of Health (Zhongyang weisheng shiyanyuan 中央衛生實驗院).38 The fourth one, the National Epidemic Prevention Bureau (Zhongyang fangyi chu 中央防疫處), led by

38 Before the outbreak of the war, in 1936, in order to train more public health workers, the Department of Medical Education of the Central Field Health Station was rebuilt as an independent Public Health Personnel Training Institute (Gonggong weisheng renyuan xunlian suo 公共衛生人員訓練所) under the NHA. In 1938, following the Nationalist Central Government, the NHA temporarily stationed in the China’s first wartime capital, Wuhan 武漢, where it reorganized an Emergency Medical Service Training Class (Zhanshi weisheng renyuan xunlian ban 戰時衛生人員訓練班) together with the Chinese Red Cross to meet the huge wartime need for medical personnel. Soon the Class was renamed as the Emergency Medical Service Training School (EMSTS, or Zhanshi weisheng renyuan xunlian suo 戰時衛生人員訓練所), and moved to Guiyang in 1939. Deng Tietao 鄧鐵濤 ed., Zhongguo fangyi shi 中國防疫史 (Nanning: Guangxi kexue jishu chubanshe, 2006), 369-372; John R. Watt, Saving Lives in Wartime China, 127-129.
Dr. Tang Feifan 汤飞凡 (1897-1958), relocated to Kunming and stayed there until the end of the war.³⁹

To help local health authorities control major epidemics among refugees and troops, the NHA set up an Anti-Epidemic Corps (Weisheng shu yiliao fangyi dui 衛生署醫療防疫隊) in 1938. While headquartered in Chongqing, the Corps sent mobile units to Yunnan and other areas still under the control of the Chinese government.⁴⁰ The Emergency Medical Service Training School, under the direction of Dr. Lin Kesheng 林可勝 (Robert K.S. Lim, 1897-1969), Professor of Physiology at the PUMC, trained twenty-five mobile units of personnel for the NHA Anti-Epidemic Corps.⁴¹

There were also foreign medical resources pouring into west China. The Rockefeller Foundation, among other things, provided financial support to the Emergency Medical Service Training School.⁴² Another source of funding came from the American Bureau for Medical Aid to China (Meiguo yiyao yuanhua hui 美國醫藥援華會, ABMAC), which was established in New York in late 1937 by overseas Chinese communities and some former PUMC faculty in the US. The ABMAC mainly distributed its medical and material supplies to the Chinese Red Cross.⁴³ The most critical relocated medical sources during the early period of the war were from the League of Nations. In

³⁹ The Central Epidemic Prevention Bureau was established in 1919 in Beijing firstly as the national agency in charge of directing epidemic prevention, but after 1928 it was reorganized as a research institution focused on biological products. It moved to Nanjing in 1935, and retreated to Kunming in 1939. “Zhongyang fangyichu ershi nian zhi jingguo ji zhuangkuang”中央防疫處二十年之經過及現在之狀況, in Yunnan Provincial Archives, The Central Epidemic Prevention Bureau Archive, 1029-1-48.
⁴² Ibid, 179-180.
late 1937, as requested by the Chinese government, the LON approved a proposal to offer two million Swiss francs to China. They also sent a League of Nations Epidemic Commission to China (Guolian fangyi tuan 国联防疫团) to support Chinese wartime anti-epidemic work. The LON purchased and transported large quantities of medical supplies, including drugs, sera, vaccine, laboratory equipment and disinfectants to China, while three units of the commission arrived in China in early February 1938. Unit No. 1 was stationed in Xi’an 西安, the capital city of Shaanxi 陕西 Province in northwestern China. Unit No. 2 was in Changsha 长沙, the capital city of Hunan 湖南 Province in central China; and Unit No. 3 established its headquarter in Nanning 南宁, the capital city of Guangxi 广西 Province in southwest China. These units engaged in various activities to meet the needs of their stationed localities. They mainly helped to build laboratories for vaccine production and health stations, general medical relief work, and epidemic control.44

In early 1938, Yao Yongzheng, who had retreated with the CFHS to Guiyang, was appointed as the Chinese government’s technician to assist Unit No. 3 of the League of Nations Epidemic Commission to China (Guolian fangyi tuan di san fen tuan 国联防疫团第三分团). Much like the pre-war international health cooperation, with the financial and technical support from the LON, Yao built a malaria laboratory in Nanning, and led his staff to do anti-malaria work in Guangxi Province.45 However, only a few

months later, in late 1938, Yao was ordered by the NHA to rush to Yunnan to control malaria endemics there.

Yao’s reappointment was not surprising; due to the construction and operation of the Yunnan-Burma Highway (Dian mian gonglu 滇湎公路) in 1938, Yunnan became “the key to the war against Japan and national reconstruction (Kangzhan jianguo zhi zhongxin 抗戰建國之重心).” 46 The malaria problem in Yunnan was now posing an immediate and serious threat to China’s national survival.

**The Malaria Problem along the Yunnan-Burma Highway**

This highway, extending from Kunming to Lashio (Lashu 腊戌), Burma, became a most critical route to transport international military supplies and material resources from abroad for China’s survival during the war against Japan, when the Japanese occupied major Chinese ports along the eastern coast. In China, the highway was divided into two major sections: the eastern half, which had been built by the Yunnan provincial

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46 “Yunnan sheng kangnue weiyuanhui wu nian jihua cao an ji Minguo er shi ba nian gongzuo baogao ji jiantao huikan” 雲南省抗瘧委員會五年計劃草案及民國 28 年工作報告及檢討彙刊, 28, Yunnan Provincial Archives, The YAMC archives, 1030-001-00034-001.
government in 1935 as part of its local state development project, was a route of 412 km running from Kunming to the Xiaguan town of Dali (or Tali). The western part, not yet built, was a newly planned route of 548 km, linking Xiaguan to Wanting, a small town on the China-Burma border, from which the highway would extend into Burma’s territory. To be sure, the “construction of the Yunnan-Burma highway” mainly referred to this western route, which when completed, would cut across mountains and valleys located in the historically notorious malaria-ridden region of Southwestern Yunnan.47


In January 1938, about 150,000 laborers were mobilized to embark on this construction project. Many of them suffered from back-breaking work or were injured or even killed by falling rocks due to landslides, but even more were afflicted by malarial mosquitoes. The majority of these laborers were Chinese, and unlike the local Shan people who had a certain degree of resistance against malarial parasites, they were liable to become infected with malaria. Several thousands of them died from the disease. As a result, many of the hardier native non-Chinese inhabitants were later hired as construction workers. However, after the Yunnan-Burma Highway was preliminarily opened to traffic on July 7th, 1938, a large number of non-immune Chinese workers, drivers, soldiers, passengers, and refugees traveled into this endemic region. High morbidity rates of these newcomers brought about great challenges for the transportation of supplies along the route and for the maintenance of the highway.

The NHA immediately recognized the emergency posed by the malaria problem along the highway. In fall 1938, it dispatched Unit No. 25 of the NHA Anti-Epidemic Corps to a station at Zhefang, the capital of a local Shan state located in the middle of the route from Mangshi to Wanting, which suffered from the most serious malaria endemic. In 1939, a clinic was built in Mangshi. Led by Dr. Ma Longrui 馬龍瑞 (1914-1997), a graduate of the National Medical College of Shanghai (Guoli Shanghai yixue yuan 國立上海醫學院), the mobile unit mainly treated afflicted residents along the

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highway. In that year, 50% of their patients were infected with malaria, 80% of whom were diagnosed as having falciparum malaria (E’xing jue 惡性瘧疾). In September 1940, the NHA set up a Yunnan-Burma Highway Bureau Medical Service (Dian mian gonglu weisheng chu 滇緬公路衛生處) in Kunming to direct malaria control and public health along the Highway. Unit No. 25 of the Anti-Epidemic Corps at Zhefang was soon affiliated with this Highway Medical Service, and was renamed as the Zhefang Health Station (Zhefang weisheng zhan 避放衛生站). It would later on serve as the Zhefang Anti-Malaria Station (Zhefang kangnue suo 避放抗瘧所) for the YAMC. 50

The malaria problem along the Yunnan-Burma Highway also gained attention from the League of Nations Epidemic Commission to China. Dr. Robert Cecil Robertson (1890-1942), Director of the Division of Pathological Sciences, the Henry Lester Institute of Medical Research, Shanghai, was seconded to Unit No. 2, which was originally stationed in central China. 51 In April 1939, interested in the malaria problem in Yunnan, Robertson conducted a malaria survey along the Highway, mainly in Mangshi-Zhefang-Wanting area. For nearly seven months, Robertson and his Chinese assistants found three major types of malarial parasites: P. vivax, P. falciparum, and P. malariae in this region, and the type of malignant tertian (P. falciparum) was the commonest infection (See Figure 34). They also identified eighteen species and varieties of Anopheles, two of them not been previously reported. They published their survey reports in The Chinese Medical Journal in 1940, and the Transactions of the Royal Society of Tropical Medicine and

50 Yunnan sheng Luxi xian zhi bianzhuang weiyuanhui 雲南省陸西縣志編撰委員會 ed., Luxi xianzhi 雲西縣志 (Kunming: Yunnan jiaoyu chubanshe, 1993), 388-389; Yunnan sheng weisheng ting 雲南省衛生廳 ed., Yunnan weisheng tongzhi 雲南衛生通志 (Kunming: Yunnan kexue jishu chubanshe, 1999), 64.
Hygiene in 1941, attempting to call more attention to this problem. What was more, shocked by the local high rates of morbidity and mortality due to malaria, Robertson drew up a recommendation of malaria control to be presented to the NHA, which was thought to constitute a basis for anti-malaria work in Yunnan.\textsuperscript{52}

![Figure 34. Map Showing Distribution of Malaria along the Yunnan-Burma Highway. From R. Cecil Robertson and T.L. Chang, “Malaria Survey in Western Yunnan, Lungling Area and Lushih County,” The Chinese Medical Journal 58, no.4 (1940): 453.](image)

There was some support from the League of Nations Epidemic Commission for malaria control in Yunnan. Dr. H. M. Jettmar of Unit No. 1, previously stationed in northwest China, was invited by the NHA to give a series of lectures and practical introduction on malariology in Kunming, in late 1939 and early 1940. The commission also set up two anti-malaria units on the Yunnan-Burma Highway. One of them was stationed in Zhefang, under the direction of Dr. Sun Zhirong (C.J. Sun 孫志戎 1903-\textsuperscript{52})

1981). He was Yao Yongzheng’s colleague in the Department of Parasitology, CHFS in Nanjing, and followed Yao in retreating to Yunnan. According to the LON’s record, this Zhefang anti-malaria unit treated 8,168 malaria patients from June to December 1939.53

Situated in these broader contexts, the YAMC was a product of the interactions between local, national, and global networks of malaria research and control. This point is illustrated even more clearly from the organizational schemes put in place when the establishment of the YAMC was officially announced on August 2nd, 1939.

Organizing a Wartime Network of Malaria

On the same day the YAMC was established, several major staff nominations, articles, and working proposals for organizing the commission were also discussed and approved. The first one was to elect nine committee members to serve on the commission, from both the local and national networks. The four recommended by the NHA who came from outside of Yunnan Province included Jin Baoshan, Tang Feifan, Yao Yongzheng, and Huang Zifang 黃子方, Professor of Public Health from the National Medical College of Shanghai. Four other members were designated by the Yunnan provincial government: Miao Jiaming, Li Peitian 李培天 (Commissioner of Civil Affairs), Zhang Banghan (Commissioner of the Bureau of Reconstruction), and Lu Chongren 陸崇仁 (Commissioner of the Bureau of Finance). Yao Xunyuan, the NHA-dispatched Director of the YPHA was the last committee member. Considering that others might need to focus on assuming their own institutional duties, Miao Jiaming, Yao Xunyuan, and Yao Yongzheng were selected as members of the Standing Committee to direct the routine work of the YAMC. Accordingly, Miao was assigned as the Chair of the

Commission, Yao Xunyuan served as the General Director of the YAMC’s General Corps, and Yao Yongzheng was appointed as the Director of the Malaria Research Institute.54

The YAMC also proposed to hire three eminent specialists in malaria control as consultants, who had retreated to southwest China as a result of the wartime relocation of medical personnel: Ying Yuanyue 應元岳, a leading expert in tropical medicine in China; Gu Jingkai 谷鏡開, Director of the Department of Pathology, the National Medical College of Shanghai; and Tao Baokai 陶葆楷, Professor of Environmental Engineering, Tsinghua University (Qinghua daxue 清華大學). From archival sources, we find that only Tao actually engaged in some real advisory work for the YAMC, especially on how to promote anti-malaria engineering projects at the local level.55

Another major agenda item was to discuss and approve the YAMC’s first-year working plan. Slightly different from the proposals in the Five-Year Program of Anti-Malaria Work, the YAMC anticipated engaging in the following activities during the first year: (1) initiating anti-malaria work in Yunxian, Shunning, Ning-er, and Simao, all localities which suffered from the most severe malaria endemics; (2) training anti-malaria personnel; (3) cooperating with the Bureau of Reconstruction in cinchona farming. To achieve these three main aims, the YAMC planned to set up anti-malaria stations in the four counties, and to establish the Malaria Research Institute.56

54 Yunnan Provincial Archives, The YAMC archives, 1030-001-00007-017; “Name List of Members of the Anti-Malaria Committee in Yunnan,” from “F.C. Yen’s letter to Dr. Balfour (August 31, 1939), Memorandum on the Five-Year Program of Anti-Malaria Work in Yunnan Province, Appendix 5,” The Rockefeller Archive Center, RG1 601 Box 43, Folder 356, 601 I Malaria 1938-1939.
55 Yunnan Provincial Archives, The YAMC archives, 1030-001-00007-024 and 059.
56 Yunnan Provincial Archives, The YAMC archives, 1030-001-00007-001.
The selection of directors of the anti-malaria stations was another noticeable example indicating that the YAMC aimed to build a new inter-provincial network of malaria research and control by recruiting both local and national medical personnel. Lin Liangcheng (L.C. Ling 林樑城), another of Yao Yongzheng’s colleagues from the CFHS Department of Parasitology, was recommended as the Director of Yunxian Anti-Malaria Station while Wang Qizong 王启宗, a Yunnan local physician who graduated from the Yunnan Army Medical School, was to be the Acting Director of Shunning Anti-Malaria Station. For the Ning-er station, the directorship would be granted to one of two chief surgeons from the Yunnan-Burma Highway and Railway System administration; and Hou Jinxiu, not surprisingly, was nominated as the Director of the Simao Anti-Malaria Station.57

The proposed Malaria Research Institute was to “take charge of all the researches on malaria and give the technical advice in anti-malaria work.”58 It was surely considered as “the foundation for anti-malaria work” (kangnue shiye zhi jichu gongzuo 抗瘧事業之基礎工作) in Yunnan. The YAMC believed that the conditions that gave rise to malaria endemics differed in distinct locations. Therefore, it was necessary to do research to comprehend specific reasons for local endemics before conducting anti-malaria work in that location. The Malaria Research Institute was set up for this purpose and its work, as outlined in the proposal, focused on five major areas: (1) training anti-malaria personnel; (2) studying the epidemiology of malaria; (3) surveying topographies of Anopheles

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57 Yunnan Provincial Archives, The YAMC archives, 1030-001-00007-009.
58 “F.C. Yen’s letter to Dr. Balfour (August 31, 1939), Memorandum on the Five-Year Program of Anti-Malaria Work in Yunnan Province, Appendix 9,” The Rockefeller Archive Center, RG1 601 Box 43, Folder 356, 601 I Malaria 1938-1939.
breeding sites in malaria-ridden areas; (4) conducting anti-mosquito experiments; and, (5) examining cinchona cultivation.\(^{59}\)

To enroll staff for the MRI, Yao Yongzheng turned to his colleagues and students from the CFHS Department of Parasitology, many of whom also had relocated to southwest China. Wu Zhengjian (C.C. Wu 吳徵鑑), Yao’s chief assistant in Nanjing, was appointed as the MRI’s Senior Assistant Technical Expert. Liu Yongmao 劉永楙, a Sanitary Engineer of the CFHS, with a Master’s degree in Public Health from Harvard University, was hired as Assistant Technical Expert. Three former technical assistants from the CFHS, Jiang Boren 姜博仁, Yang Wenhua 楊文遠, and Yu Jintao 俞錦濤, who were all trained in the NHA-CFHS Training Class, were offered Assistant positions in the MRI.\(^{60}\) To some extent, Yao Yongzheng was planning to transplant his Department of Parasitology to the MRI and to re-build a wartime national network of malaria based in the YAMC.

The YAMC was clearly conscious of the importance of linking itself to international organizations. This was shown most obviously from the financial problems of the MRI. The commission proposed the following budget for the MRI: the start-up cost was N.C.$49,000 and operating expenses were N.C.$8,940 per month. The YAMC pledged to provide one-third of the funding, and it planned to ask the Rockefeller Foundation and the Sino-British Boxer Rebellion Indemnity Commission to pay for the

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\(^{59}\) Yunnan Provincial Archives, The YAMC archives, 1030-001-00007-006.

\(^{60}\) “Yunnan sheng kangmue weiyuanhui renshi lei 雲南省抗瘧委員會人事類, 1939-1944,” Yunnan Provincial Archives, The Yunnan Provincial Health Administration archives (Yunnan sheng weisheng chu dang 雲南省衛生處檔案), 21-2-11-3,17, and 22; “Yunnan sheng kangmue weiyuanhui di yi ci changwu weiyuan huiyi jilu” 雲南省抗瘧委員會第一次常務委員會議記錄, Yunnan Provincial Archives, The YAMC archives, 1030-001-00034-001.
other two thirds. The two well-endowed foreign foundations had cooperated with the
Chinese government for a long time, especially the RF, which had played a key role in
the development of public health and medical education in China since the 1910s. It
was also known that the RF had a strong interest in anti-epidemic work in China, so the
YAMC naturally assumed that the RF would be more than willing to support this
financial plan for the MRI. As a result, the YAMC approved this budget without
contacting the foundation in advance to confirm its financial support for the enterprise.

Development and Destabilization of the YAMC

In 1939, as the YAMC got off the ground, nearly all participants in the
commission had strong confidence that they would build a successful network of malaria
research and control with their local, national, and global supporters. To be sure, the
YAMC would indeed contribute greatly to malaria control in Yunnan as it developed.
However, the YAMC did not always benefit from its interaction with other actors at the
local, national, or international levels. On many occasions, participation in this complex
web of interconnected interests and aims proved to be a double-edged sword.

Bargaining with the US Public Health Service Mission

and the Rockefeller Foundation Delegation

Ironically, the first major task the YAMC needed to fulfill had little to do with its
Five-Year Program of Anti-Malaria Work. Instead, it had to host a US Public Health

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61 Yunnan Provincial Archives, The YAMC archives, 1030-001-00007-001.
62 See Mary E. Ferguson, China Medical Board and Peking Union Medical College: A Chronicle of
Fruitful Collaboration, 1914-1951, China Medical Board of New York, Inc., 1970; John Z. Bowers,
Foundation, 1972; Mary Brown Bullock, An American Transplant: The Rockefeller Foundation and Peking
Union Medical College, Berkeley: University of California Press, 1980; and The Oil Prince’s Legacy:
Service Mission (USPHSM) and a delegation from the Rockefeller Foundation (RF). The Chinese side thought these foreign friends would bring in considerable financial and technical resources to support the YAMC. They did not expect that these two groups of visitors would destabilize the YAMC and the MRI, which in fact is what happened.

During the summer of 1939, it was reported that a number of epidemics of an unknown type were spreading among the Chinese laborers who were maintaining the southwestern section of the Yunnan-Burma Highway. Kong Xiangxi (H. H. Kung 孔祥熙), Vice-Premier of the Executive Yuan, requested the US government to send medical experts to control this disease in the name of the Chinese government. The US government, which had not yet declared war on Japan, also understood the importance of the Yunnan-Burma Highway for US interests, because it was “the only avenue through which tung oil can be transported for shipment to the US.” Tung oil, as an important painting and preservative material, was widely used. It also represented a vital financial resource because according to one observer, it “constitutes the chief means by which China is repaying the loan given by the Export Import Bank. Delay in completing therefore, imperils the investment of this government corporation.”  

Mediated by Hu Shi 胡适, China’s ambassador to the US, in October 1939, the US Public Health Service dispatched a Mission, consisting of senior surgeon L.L. Williams, surgeon Hiram J. Bush, and special expert Bruce Mayne, to Yunnan to investigate this epidemic and to make recommendations for its control. Based on certain evidence, the US Public Health Service Mission thought that pernicious malaria might be the major cause of the deaths,

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63 “Thomas Parran’s letter to Wilbur Sawyer August 2, 1939,” The Rockefeller Archive Center, RG1 601 Box 43, Folder 356, 601 I Malaria 1938-1939.
64 “Telegram from Hu Shih to Waichiao pu, Washington DC, USA, October 13, 1939,” Yunnan Provincial Archives, The YAMC archives, 1030-001-00007-039.
and thus prepared equipment for studying malaria before departure.\textsuperscript{65} For this reason, it was also called the Malaria Investigation Mission in Western Yunnan (\textit{Dianxi nueji kaocha tuan 滇西瘧疾考察團}).

Since the USPHSM was officially sent by the US government, the NHA took it very seriously. After ordering the YAMC to try their best to host the delegation without concern for cost, on November 21\textsuperscript{st}, 1939, Yan Fuqing, Director of the NHA, flew to Kunming to receive this Mission in person.\textsuperscript{66}

Yao Xunyuan, Commissioner of the YPHA and the General Director of the General Anti-Malaria Corps, was ordered to accompany the USPHSM during their six-month investigation along the Yunnan-Burma Highway.\textsuperscript{67} Since Yao did not enjoy the social engagements that were a necessary part of bureaucratic duties in Kunming, and had developed hostile relationships with some high officials in the Yunnan Provincial Government, he took this order as a good chance for a change of scene. In May 1940, the NHA officially transferred Yao Xunyuan away from Yunnan.\textsuperscript{68} With Yao and other Chinese officials, the USPHSM examined the blood and spleens of the sick laborers along the highway, and not surprisingly, they identified this epidemic as malaria. After that, members of the mission temporarily stationed themselves in Zhefang, where they mainly engaged in research on local malaria endemics and anopheles. The USPHSM believed that none of the NHA staff had experience in malaria control,\textsuperscript{69} which was obviously not true, based on what we have learned in Chapter Two. Nonetheless, ignorant

\textsuperscript{66} “The NHA’s order to the YAMC, November 10, 1939,” Yunnan Provincial Archives, The YAMC archives, 1030-001-00007-039.
\textsuperscript{67} Yunnan Provincial Archives, The YAMC archives, 1030-001-00034-001.
\textsuperscript{68} Chen Shiguang and Zhou Qinlai, “Minguo shiqi yunnan weisheng shihua,” 199.
\textsuperscript{69} Yunnan Provincial Archives, The YAMC archives, 1030-001-00078-014.
of the facts, they asked their Chinese counterparts to send some Chinese staff to be
trained in order that they might conduct malaria surveys and practice malaria control
methods.  

Figure 35. Malaria Patients along the Burma-Yunnan Road. From “Malaria Control along the

Figure 36. The US Public Health Service Mission. From the US National Library of Medicine,
Special Collections, MSC 169, Louis Laval William papers, 1910-1970, Box 5, China Photos.

70 L.L. Williams, Hiram J. Bush, and Bruce Mayne, “Report on Investigations of Epidemic Conditions on
China-Burma Highway, November, 1939- May 1940,” NLM Special Collections, MSC 169, Louis Laval
71 I want to thank Prof. Robert Marks for informing me of the photo collection “Malaria Control along the
China-Burma Highway, 1939-1940” in the Library of Congress.
Almost at the same time, as planned, the YAMC was looking for RF’s funding support for the MRI. Even though the MRI was officially established on August 3rd, 1939, it was in fact still in the planning phase. Yao Yongzheng and his staff were still in Kunming preparing to build the MRI in Yunxian. Since the YAMC had no direct connection with the RF, they had to rely on the NHA to negotiate with the Foundation.

On August 31, 1939, Yan Fuqin wrote a formal letter to M.C. Balfour, the RF’s Representative in the Far East, requesting the Foundation’s help. According to the letter, the MRI needed (1) two foreign experts respectively in epidemiology and entomology; (2) laboratory equipment, along with a list of books and journals; (3) cash in the amount of US $25,000 per year for three years.72 In November 1939, Balfour informed the NHA that he would pay a visit, travelling from Vietnam to Yunnan for a field investigation on local anti-malaria work.

The NHA once again ordered the YAMC to prepare to host the RF delegation. In their official order, the NHA informed the Yunnan office that the RF had already agreed to provide financial support for malaria research in Yunnan. Therefore, Yao Yongzheng, assuming that the MRI would be funded, immediately took a train to Hekou on the China-Vietnam border to receive Balfour in advance, and to accompany him to Kunming.73

However, the RF had a very different plan. On April 24, 1937, the Scientific Directors of the RF had approved a proposal for the RF’s International Health Division

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72 “F.C. Yen’s letter to Dr. Balfour, August 31, 1939,” The Rockefeller Archive Center, RG1 601 Box 43, Folder 356, 601 I Malaria 1938-1939.
73 Yunnan Provincial Archives, The YAMC archives, 1030-001-00007-044.
(IHD)\textsuperscript{74} to set up a new program in China for the control and investigation of diseases, including malaria.\textsuperscript{75} Early in 1939, the IHD had decided that this program would conduct malaria field studies in Yunnan. With this new program, which was based on his own experience implementing anti-malaria measures in Greece, M.C. Balfour insisted that the IHD maintain “an independence of our budget and field activity for the present,” and “for several years at least, and perhaps always, our interests should be limited to fundamental studies and should not become involved in mass training of personnel or the application of anti-malaria measures. We may advise the government on these matters, but I would refrain from becoming a part of the administrative machine.”\textsuperscript{76} Balfour further advised, “the most likely and useful form of assistance” to the Chinese agencies was “quinine given either directly or indirectly.”\textsuperscript{77}

On December 11, 1939, the IHD approved a malaria study program to be conducted over a two-year period, which would “be organized independently of but in cooperation with the central and provincial governments.” Following M.C. Balfour’s suggestion, W.C. Sweet, a RF malaria specialist then working in India, was appointed as the program’s director.\textsuperscript{78}

\textsuperscript{75} “Far East-Studies, Nov. 6, 1939,” The Rockefeller Archive Center, RG1 601 Box 43, Folder 356, 601 I Malaria 1938-1939.
\textsuperscript{76} “Balfour’s letter to W.A. Sawyer, July 1\textsuperscript{st}, 1939,” The Rockefeller Archive Center, RG1 601 Box 43, Folder 356, 601 I Malaria 1938-1939.
\textsuperscript{77} “Balfour’s letter to W.A. Sawyer, August 16\textsuperscript{th}, 1939,” The Rockefeller Archive Center, RG1 601 Box 43, Folder 356, 601 I Malaria 1938-1939.
\textsuperscript{78} “China-malaria studies--designation and budget Dec. 11, 1939,” The Rockefeller Archive Center, RG1 601 Box 43, Folder 356, 601 I Malaria 1938-1939.
Invited by Yen Fuqin in August,79 and also with a directive to join the malaria program with the US Public Health Service Mission negotiated and agreed to by IHD’s Director W.A. Sawyer and the US Public Health Service’s Surgeon General Thomas Parran,80 M.C. Balfour made a trip to Kunming in December. No matter how hard the YAMC and Yao Yongzheng attempted to please Balfour, the RF representatives had no interest in providing financial support for the proposed MRI. What was worse, for Balfour, his first meeting with Yao Yongzheng was not one he held with “enthusiasm,” because Balfour questioned Yao’s qualifications for malaria research. According to Balfour, Yao was only a “one-year I.H.D Hopkins fellow ‘29-30, and perhaps was pushed along too rapidly.”81

On March 6th, 1940, in Chongqing, the US Public Health Service Mission, the NHA, and the YAMC held a joint conference on anti-malaria work in Yunnan which was attended by both M.C. Balfour and W.C. Sweet. The RF side announced that the foundation would set up its malaria fieldwork program, or more specifically, a malaria laboratory in Zhefang, where the USPHSM had already been stationed for several months. The two groups of US specialists suggested that the YAMC move its proposed MRI from Yunxian to Mangshi, because Mangshi and Zhefang “are on the highway and within easy communications,” and “it will be more convenient” for the MRI in Mangshi to “collaborate with the RF in the research program.”82 Two weeks later, the Rockefeller Foundation’s Malaria Laboratory (RFML, Meiguo Luoshi jijing Zhefang nueji yanjiusuo

80 See “Sawyer’s letter to Parran, July 31, 1939,” and “Parran’s letter to Sawyer, August 2, 1939,” The Rockefeller Archive Center, RG1 601 Box 43, Folder 356, 601 I Malaria 1938-1939.
81 “Balfour’s letter to Sawyer, Jan 1st, 1940,” The Rockefeller Archive Center, RG1 601 Box 43, Folder 357, 601 I Malaria 1940-1941.
82 Yunnan Provincial Archives, The YAMC archives, 1030-001-00078-008, “Minutes of conference on Anti-Malaria Work in Yunnan at the Waichiao pu hostel, Chunking, March 6, 1940.”
In the following months, as requested by the RF, three Chinese specialists of parasitology and entomology from the PUMC, the center for the Beijing network of malaria research and control, Fen Lanzhou (L.C. Feng 馮蘭洲), Zhou Qinxian (C.Y. Chow 周欽賢) and Xu Shiju (S.C. Hsu 許世鉅) arrived in Chefang and joined the RF’s Malaria Laboratory.\(^83\)

The NHA and the YAMC had no choice but to order Yao Yongzheng to move the MRI to Mangshi following the US specialists’ recommendation. In August 1940, the Malaria Research Institute was inaugurated in Mangshi, thirty kilometers from the Rockefeller Foundation’s Malaria Laboratory in Zhefang. As a result, there were two malaria research institutes at the same time in southwest Yunnan.

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\(^83\) W.C. Sweet, “Annual Report of Malaria Studies, Chefang, Yunnan, China, Feb 27 to December 31, 1940,” The Rockefeller Archive Center, RG5.3. 601 I, Box 218, Folder 2727.

\(^84\) I want to thank Prof. Shiyung Liu for providing me with this documentary film.
Managing the Malaria Research Institute

The MRI started its work in this unexpected condition of having a foreign-run competitor nearby. On the one hand, throughout the period from 1940 to 1942, before it retreated to Kunming, the MRI tried very hard to work with the RFML. On some occasions they cooperated together, but in general, their competitive relationship was hostile. On the other hand, by collaborating closely with the national/provincial governmental agencies and local society, the MRI made some progress in anti-malaria work, even though it suffered insufficient funding and difficulties in dealing with its RF counterpart.

In the first year of its co-existence with the RF’s Malaria Laboratory, the MRI staff did not give up their dream of working collaboratively. The YAMC and the NHA attempted repeatedly to persuade the RF to reorganize its Malaria Laboratory into a substation of the MRI, so that “the two institutes would forward the efficiency of the work
and cooperate with each other in the research program.”

For the MRI, this would have been a good opportunity to garner more funding and other resources from the Rockefeller Foundation. However, the Rockefeller Foundation’s Malaria Laboratory insisted on maintaining its independence, especially from the Yunnan Provincial Government. When, in October, 1940, Yao once again proposed the incorporation of the RF’s institute into the MRI, W.C. Sweet replied “since this Malaria Laboratory was fully funded by the Rockefeller Foundation, it has a broader task. It could not be affiliated with any province, or its work would be limited in a single province.” W.C. Sweet rejected Yao’s proposal and reminded Yao that the full name of his program was “The National Health Administration and the Rockefeller Foundation Joint Malaria Laboratory,” underscoring its national scope.

To be sure, the two institutes maintained a certain degree of cooperation. In the first year (1940), the MRI borrowed a complete set of meteorological equipment from the RFML for its own research on the impact of climate on and the seasonal distribution of *Anophelines*. In November of that year, the MRI drew up an illustrated poster identifying adult *Anophelines* in Yunnan, and presented one copy to the RFML. According to the MRI’s record, W.C. Sweet thought it was very useful for their entomological studies.

However, unfortunately there were more tensions between the two institutions than there were instances of collaboration. The RFML did not give enough credit to the

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87 “Yunnan sheng kangnue weiyuanhui nueji yanjiusuo minguo sanshi niandu di er nian gongzuo baogao” Yunnan weisheng 1, no.6 (1941): 4.
88 “Nueji yanjiusuo er shi jiu nian yi yue gongzuo baogao” 疾病研究所二十九年十一月工作报告, Yunnan Provincial Archives, The YAMC archives, 1030-001-00069-003.
MRI and even denigrated their potential for success. First of all, the RFML was well equipped and funded, but the MRI was always struggling with insufficient financial support and lack of equipment. Thus, the RMLF doubted the MRI could conduct any systematic research. Secondly, because the RMLF staff were from the most prestigious PUMC, and were led by a prominent foreign expert (W.C. Sweet), while the MRI was staffed with physicians from some less-famous medical colleges and training classes, the RFML regarded themselves as superior. And finally, as we have learned in Chapter Two, there was a dispute between the RF and the LNHO in their methods of malaria control. The RFML followed the mosquito-targeted approach, which had been advocated by the PUMC and the RF specialists, and thus their work focused on investigating anophelines and developing measures to control those mosquitoes.\(^89\) In 1942, Sweet, Feng, Zhou and Xu, together published a paper, reporting that in 26,372 dissections of 13 species of anopheles in Western Yunnan, malaria infections were only found in *Anopheles minimus*, with an infection rate of one per cent.\(^90\) This finding was of importance, since all of their subsequent mosquito-control work could focus only on this species, saving considerable resources. In Chefang, the RFML used pesticides such as Paris green and pyrethrums in its large scale control of *Anopheles minimus*.

The MRI, under the direction of Yao Yongzheng, was more like a miniature version of the CHFS Department of Parasitology influenced by the LNHO model, which emphasized treatment of malaria patients as well as training of anti-malaria personnel over mosquito control. As a result, the RFML looked down upon the MRI, insisting that

\(^89\) W.C. Sweet, “Annual Reports of Malaria Studies, Chefang, Yunnan, China,1940,” The Rockefeller Archives, RG5.3. 601 I, Box 218, Folders 2727.

their own pure scientific work was more valuable.\textsuperscript{91} Many years later, Zhou Qinxian in his memoirs still discredited the MRI because “their work did not include anti-mosquito measures.”\textsuperscript{92}

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{mosquito_control.jpg}
\caption{Mosquito Control, Chefang, the RF’s Malaria Laboratory. From Harmon Foundation/Universal Trading Corporation/China Institute in America, \textit{Burma Road: Under Heaven all is One Family} (1941), US National Archives, NN368-14.}
\end{figure}

It was true that the MRI was not a pure scientific research institute. As part of the state-medicine system, it had to assume some non-research duties, such as personnel training and technical assistance to anti-malaria stations. Nevertheless, the MRI also did not dismiss \textit{anopheline} surveys and experimenting with anti-mosquito measures.\textsuperscript{93} In practice, it conducted a considerable amount of such work.\textsuperscript{94} To be fair, Zhou and his colleagues in the RFML never paid serious attention to the MRI, due to their prejudice against what they considered an inferior organization. On the other hand, the MRI did not

\textsuperscript{91} “Annual Reports of Malaria Studies,” The Rockefeller Archive Center, RG5.3. 601 I, Box 218, Folders 2727-2728.
\textsuperscript{93} Yunnan Provincial Archives, The YAMC archives, 1030-001-00007-006. Also see “F.C. Yen’s letter to Dr. Balfour, August 31, 1939, Memorandum on the Five-Year Program of Anti-Malaria Work in Yunnan Province,” The Rockefeller Archive Center, RG1 601 Box 43, Folder 356, 601 I Malaria 1938-1939,
\textsuperscript{94} Yunnan Provincial Archives, The YAMC archives, 1030-001-00069-003.
have much praise for its Zhefang counterpart. In 1943, after he left Yunnan, Yao Yongzheng openly critiqued the RFML, writing: “The laboratory studied the seasonal variations of malaria and *anopheline*. It laid stress on the finding of the chief vector of malaria,” but “No control work was done.”

Losing the anticipated funding from the RF and keeping its relationship with the RFML were really not easy for the MRI. Fortunately, with support from other local, national, and global networks of malaria research and control, the MRI managed to achieve some of its goals.

Shortly after it was nominally established in August 1939, the MRI organized an Anti-Malaria Personnel Training Class in Kunming. Yao Yongzheng and Wu Zhenjian taught some courses, including parasitology, entomology, malariology and anti-malaria fieldwork; in the meantime, the MRI also invited medical professors, who had retreated to Kunming with their universities, such as those on the faculty of the Medical School of Shanghai and the Southwestern Associated University (*Xi’nan lianhe daxue* 西南聯合大學), to teach other courses. Moreover, following a request by Yao, the CFHS Department of Parasitology also lent and transported its own equipment and chemicals to the MRI for this Training Class. In February 1940, fourteen students graduated from this course, and were assigned to support the YAMC’s anti-malaria work at the county level.

After the MRI moved to Mangshi, it mainly engaged in the following major activities: malaria research, mosquito research and control, anti-malaria medicine studies,

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96 Yunnan Provincial Archives, The YAMC archives, 1030-001-00007-001and 058.
97 Yunnan Provincial Archives, The YAMC archives, 1030-001-00034-001.
98 Yunnan Provincial Archives, The YAMC archives, 1030-001-00032-001.
and treatment of malarial patients, all endeavors which required the assistance and collaboration of others in the malaria research and control network.

Noticing that the rates of mortality and morbidity from malaria among the local Shan people was less than those among Chinese residents in the area, and also that their symptoms were milder, the MRI regarded the puzzle of non-Chinese resistance to the disease as one major theme in its malaria research.\textsuperscript{99} The staff thus decided to make direct contact with the Shan community.

\textbf{Table 5. Numbers of Chinese and the Shan Patients Examined for Malaria in Yuanjiang County, September 1941.} Based on Zhou Yimin 周以敏, “Xunhui kangnue dui zai Yuanjiang xian zhi gongzuo gaikuang” 巡迴抗瘧隊在元江縣之工作概況, \textit{Yunnan weisheng} 1, no.12 (1942): 10.

\begin{table}[h]
\centering
\begin{tabular}{|c|c|}
\hline
 & \textbf{Malaria Patients Examined in Yuanjiang, Sept. 1941} \\
\hline
 & \begin{tabular}{c}
\textbf{Chinese (888)} \\
\textbf{Shan People (56)}
\end{tabular} \\
\hline
\end{tabular}
\end{table}

To pursue this research, the MRI in the first place had to secure support from the local Shan society in Mangshi. On July 6\textsuperscript{th}, 1940, Yao Yongzheng proposed that the

\textsuperscript{99} “Yunnan sheng kangnue weiyuanhui nueji yanjiusuo minguo sanshi niandu di er nian gongzuo jihua shu” 雲南省抗瘧委員會瘧疾研究所民國三十年度第二年工作計畫書, \textit{Yunnan weisheng} 1, no.6 (1941): 2-6.
YAMC ask the Yunnan Provincial Government to hire two honorary advisers to promote the MRI’s anti-malaria work. One was Balfour, and the other was Fang Keguang, former Deputy Chieftain of Mangshi (Mangshi Anfu si daiban 芒市安撫司代辦). While granting the honorary title to Balfour was obviously designed to encourage him to provide funding, Fang’s endorsement was very important for conducting anti-malaria work in the Shan state. As Yao Yongzheng clearly put it, Fang was “prestigious and authoritative” in Mangshi, and “the local non-Chinese people obeyed his orders no matter what he decided to advance.” It would be easier for Yao to deal with local society with Fang’s assistance.100 Fang would indeed support Yao’s work later on. It was with Fang’s help that the MRI was able to purchase a local western-style house as its office building.101

Another type of support was reported by Frank Outram and G. E. Fane of The National Geographic Magazine. The two journalists accidently ran into Yao at the Zhefang Chieftain’s residence on their trip along the Yunnan-Burma Highway in late 1940. Yao Yongzheng told them that at first he had language difficulties in understanding local people who mainly spoke the Shan language with some pidgin Chinese, which posed a huge challenge for Yao’s malaria research. Following a request by Yao, a nearby American Baptist Mission Hospital sent three Shan nurses to help out. The three Shan women tried very hard to communicate with local people on behalf of Yao.102

100 “Yunnan sheng kangnue weiyuanhui renshi lei 雲南省抗瘧委員會人事類, 1939-1944,” Yunnan Provincial Archives, the Yunnan Provincial Health Administration archives (Yunnan sheng weisheng chudang 雲南省衛生處檔案), 21-2-11-41.
101 “Nueji yanjiusuo er shi jiu nian shi er yue gongzuoe baogao” 疟疾研究所二十九年十二月工作報告, Yunnan Provincial Archives, The YAMC archives, 1030-001-00069-003.
The MRI’s mosquito control project also relied on external support. In May 1941, the YAMC ordered the MRI to cooperate with the Yunnan-Burma Highway Bureau Medical Service when embarking on anti-malaria engineering projects in Mangshi and Zhefang. The MRI then sent a request to the Sino-British Boxer Rebellion Indemnity Commission for funding of its investigation of *Anophelines* and anti-mosquito engineering experiments in Mangshi. The Commission provided N.C.$20,000 for that effort. Even though the Commission could not offer any funding before 1942, due to a huge loss of interest income, for the MRI, this pledge of funding was still better than anything received from the RF. Many chemical supplies for the MRI’s mosquito control projects, such as anti-mosquito oils, were also allocated by the NHA and the LON Epidemic Commission to China.

103 Yunnan Provincial Archives, The YAMC archives, 1030-001-00039-048-066.
104 Yunnan Provincial Archives, The YAMC archives, 1030-001-00039-001 and 043; 1030-001-00040-020.
105 Yunnan Provincial Archives, The YAMC archives, 1030-001-00039-048-044.
As with the studies of anti-malaria medicines, the MRI made efforts to assist the Yunnan Reconstruction Bureau’s cinchona cultivation program in Hekou county.\textsuperscript{106} It also helped to examine and promote some new medicines from traditional Chinese materia medica, such as \textit{Bai Qiang-gan} (白桟桟 Fraxinus malacophylla Hemsl), that were reputed to be successful in the treatment of malaria for the National Drug Research Institute (\textit{Zhongyang yaowu yanjiusuo} 中央藥物研究所) in Kunming.\textsuperscript{107} However, all these planned pharmaceutical experiments were not conducted effectively due to the limits of funding and medical resources.

Unlike the RF’s Malaria Laboratory, which continued its “pure” scientific investigations, the MRI also focused on treating local residents, and it set up an affiliated clinic. In the month of August 1941, for instance, this clinic treated 358 patients, diagnosing 181 of them with malaria infections.\textsuperscript{108} Considering that many poor malarial patients in the distant villages could not afford the expense of traveling to the clinic, the MRI organized a circulating team for them.\textsuperscript{109} The MRI’s major treatment method, the distribution of quinine pills, was not surprisingly just like that of the Nanjing network. As a result, the MRI required huge supplies of quinine. For example, in 1941, it requested 200,000 pills, a large number which had to rely on the NHA’s allocation.\textsuperscript{110}

It was within this multi-networking context that the MRI attempted to develop as a new center of malaria research in China. Moreover, the YAMC’s other programs, such

\textsuperscript{106} “Letters between the YAMC and the Yunnan Construction Administration concerning cinchona plantation,” Yunnan Provincial Archives, The YAMC archives, 1030-001-008/009. For a detailed account and research on history of cinchona plantations in Yunnan, see Chapter Four.

\textsuperscript{107} Yunnan Provincial Archives, The YAMC archives, 1030-001-00010-040; \textit{Yunnan weisheng} 1, no.6 (1940): 4; also see Chapter Four.

\textsuperscript{108} Yunnan Provincial Archives, The YAMC archives, 1030-001-00002-002.

\textsuperscript{109} Yunnan sheng kangiue weiyuanhui nueji yanjiusuo minguo sanshi niandu di er nian gongzuoe jihua shu,” \textit{Yunnan weisheng} 1, no.6 (1941): 6.

\textsuperscript{110} Yunnan Provincial Archives, The YAMC archives, 1030-001-00039-048-022.
as anti-malaria stations and the circulating corps, were also initiated in this nested and scaled local, national, and international context.

**Networking Anti-Malaria Stations and the Mobile Corps**

Although most of the proposed station directors never took their positions, anti-malaria stations were still established in several counties as planned: Simao Anti-Malaria Station on October 12\(^{th}\), 1939; Ning-er Anti-Malaria Station on October 12\(^{th}\), 1939; Shunning Anti-Malaria Station on April 15\(^{th}\), 1940; Yunxian Anti-Malaria Station on April 15\(^{th}\), 1940; Zhefang Anti-Malaria Station on September 17\(^{th}\), 1940;\(^{111}\) and Hekou Anti-Malaria Station on December 24\(^{th}\), 1940.\(^{112}\) These anti-malaria stations in general had three major tasks: conducting malaria and mosquito surveys, treating local malaria patients and dispensing free quinine, and lastly, anti-mosquito engineering and sanitation improvement projects.\(^{113}\) Suffering limited financial and medical resources, and even sometimes encountering local resistance, these anti-malaria stations still managed to carry out many preliminary surveys, treatment, and environmental projects.


\(^{112}\) “Report of the Establishment of the Hekou Anti-Malaria Station, Jan 7\(^{th}\), 1941,” Yunnan Provincial Archives, The YAMC archives, 1030-001-00010-005.

\(^{113}\) “Reports of Anti-Malaria Stations,” Yunnan Provincial Archives, The YAMC archives, 1030-001-00032-001.
The Zhefang Anti-Malaria Station led by Ma Longrui was the most typical one in this regard. This station, reorganized from the former NHA Anti-Epidemic Corps Unit No. 25 and the Zhefang Health Station of the Yunnan-Burma Highway Bureau Medical Service, was itself a collaborative product of different intersecting networks. It built a clinic for malaria treatment and organized a mobile team that covered the Zhefang-Wanting route. It also promoted public health education using posters, slogans, public speeches, home visits, and even healthy baby competitions among local Chinese and Shan people. The station paid particular attention to anti-mosquito experiments by
spraying Paris Green, supervising drainage system reconstruction projects, and conducting topographical surveys with the support from the YAMC’s Engineering Corps and Professor Tao Baokai from Tsinghua University.\textsuperscript{114}

The station struggled with many networking problems even as it carried out its anti-malaria work. First, it faced huge financial problems for its engineering project, which would cost N.C.$30,000. With the YAMC as negotiator, the Yunnan-Burma Highway Bureau Medical Service agreed to provide N.C.$18,000 for that purpose. However, in the end, it could only afford N.C.$5,600.\textsuperscript{115} Second, throughout its existence, the station was always short of personnel. But since the Zhefang station was comparatively more staffed than others, and perhaps also because it was in fact still affiliated with the Yunnan-Burma Highway Bureau Medical Service, the YAMC assigned most graduates of the MRI’s Training Class to other stations, leaving Zhefang perennially understaffed. Lastly, unlike Yao Yongzheng in Mangshi, Ma Longrui and his station suffered extreme difficulties posed by their interactions with the local Shan society. Station personnel did not understand the Shan language, which made home visits for treatment and medical publicity less successful than they might otherwise have been.\textsuperscript{116} What was worse, due to cultural misunderstandings, the local “uncivilized” \textit{(minzhi diluo 民智低落)} Shan people (from the point of view of Han Chinese personnel) destroyed the surveyor’s poles in the fields, making topographical surveys useless. In addition, the Zhefang Chieftain \textit{(Zhefang tusi 遮放土司)}, for some reason was not

\textsuperscript{114} Yunnan Provincial Archives, The YAMC archives, 1030-001-00075-001; Ma Ronglui, “Dian mian gonglu zhi nüeji wenti” 滇緬公路之婦疾問題, \textit{Yunnan weisheng} 1, no.12 (1942): 4-9.
\textsuperscript{115} Yunnan Provincial Archives, The YAMC archives, 1030-001-00010-023.
\textsuperscript{116} Yunnan Provincial Archives, The YAMC archives, 1030-001-00075-006.
interested in assisting the station’s anti-malaria work, and did not help to communicate with his subjects or order them to collaborate with the station.\footnote{117 Yunnan Provincial Archives, The YAMC archives, 1030-001-00011-008, 019, 023, and 028.}

In contrast to Zhefang, the Yunxian Anti-Malaria Station was a case where networking was actually helpful. Yao’s colleague Lin Liangcheng did not take up the director position, instead a Dr. Zheng Zuyou (鄭祖佑, 1908-?) was sent to Yunxian to organize this station in 1940. Born in Luyang County, Yunnan Province, and a graduate of the Yunnan Army Medical School in 1935, Zheng was part of the local network of Yunnan physicians. Like Hou Jinxiu, he had a strong sense of responsibility to help his fellow Yunnan people, and in Yunxian he was eager to promote anti-malaria work. As a Yunnan physician, he was able to gain the support of the Yunxian county government and also local residents when organizing malaria surveys and training classes in local elementary schools.\footnote{118 Zheng Zuyou, “Jiefang qian yun xian nueji fangzhi jianshu,” 59-67} At the same time, he also built his relationship with the MRI by attending Yao Yongzheng’s Anti-Malaria Personnel Training Class.\footnote{119 Zhou Xinwen et al., Yunnan sheng nueji fangzhi yanjiusuo zhi (1998), 124.} The MRI avidly provided assistance for Zheng to examine patients’ blood and identify Anophelines in Yunxian.\footnote{120 Yunnan Provincial Archives, The YAMC archives, 1030-001-00069-003 and 004.} In 1941, the YAMC’s Engineering Corps also helped Zheng and the Yunxian station complete drainage projects on two notorious swamps, which were the major breeding sites of malarial mosquitoes. As a result, the malaria morbidity rate dropped noticeably.\footnote{121 Zheng Zuyou, “Jiefang qian yun xian nueji fangzhi jianshu,” 65 and 66; Yunnan Provincial Archives, The YAMC archives, 1030-001-00080-004.}
Under the direction of the YAMC, anti-malaria stations also made connections with the MRI and even foreign networks of malaria research and control. In 1941, two staff members of the Shunning and Yunxian stations were dispatched to the MRI for a
three-month training course.\textsuperscript{122} Tang Yigang 汪一鳴, Director of the Ning-er Anti-Malaria Station was selected by the NHA to study tropical medicine in India for a short term in 1942, an assignment that further extended MRI’s contacts abroad.\textsuperscript{123}

The Mobile Anti-Malaria Corps, another important element of the YAMC’s anti-malaria program, also interacted with the MRI, its anti-malaria stations, and local societies. On September 1\textsuperscript{st}, 1940, the Corps was organized in Kunming, and Wang Qizong was assigned as its captain. It would be dispatched to implement anti-malaria measures following a routine similar to the one adhered to by Yao’s zhangqi investigation team in 1934-1935: successively from Xinpíng 新平, to Yuanjiang, Mojiang 墨江, Jinggu, Ning-er, Simao, Cheli, and lastly to Fohai, where an anti-malaria station would be set up. During this trip, the Corps would have three major tasks: treating malaria patients with free quinine pills, conducting malaria and mosquito surveys, and improving public awareness about current malaria theories and anti-malaria methods.\textsuperscript{124}

In preparing for this trip, Wang was informed by many anti-malaria station staff that they faced difficulties in identifying local anophelines. With Yao Yongzheng’s help, Wang made several copies of entomological books and references for anophelines identification, which were to be distributed to local stations.\textsuperscript{125}

However, just before the mobile corps set out, a severe malaria epidemic broke out in Hekou. Wang was immediately sent to treat patients there and later on helped to

\textsuperscript{122} Yunnan weisheng 1, no.8 (1941): 9.

\textsuperscript{123} Yunnan Provincial Archives, The YAMC archives, 1030-001-00038-069, and 070.

\textsuperscript{124} Yunnan Provincial Archives, The YAMC archives, 1030-001-00004-001.

\textsuperscript{125} Yunnan Provincial Archives, The YAMC archives, 1030-001-00053-116.
establish the Hekou Anti-Malaria Station. As a result, the Corps was temporarily suspended without its captain.\textsuperscript{126}

It was not until August 1941, that the Mobile Anti-Malaria Corps finally made its circuit, with the additional task of helping local governments establish county health centers if possible.\textsuperscript{127} In the first three months, the Corps achieved considerable success in treating patients and conducting surveys, especially in Yuanjiang, where the local society provided the warmest support for their efforts.\textsuperscript{128} However, when it arrived in Simao in November, the Corps ran out of funds. Without financial resources, the Corps had to suspend its work and return to Kunming.\textsuperscript{129}

The most successful anti-malaria effort of the YAMC, including the MRI, the anti-malaria stations, and the Mobile Corps, was distribution of massive quantities of quinine tablets to malaria patients in Yunnan.\textsuperscript{130} This contribution was, to a large extent, the result of YAMC’s close cooperation with international organizations, such as the League of Nations and the American Red Cross,\textsuperscript{131} and overseas Chinese communities in Southeast Asia,\textsuperscript{132} which provided most of those anti-malaria medicines.

\textsuperscript{126} Yunnan Provincial Archives, The YAMC archives, 1030-001-00032-001.
\textsuperscript{127} Yunnan Provincial Archives, The YAMC archives, 1030-001-00006-026.
\textsuperscript{128} Yunnan Provincial Archives, The YAMC archives, 1030-001-00006-034.
\textsuperscript{129} Yunnan Provincial Archives, The YAMC archives, 1030-001-00006-038.
\textsuperscript{130} The actual effect of quinine distribution for malaria control in wartime Yunnan still needs to be studied. For a similar case study in colonial Vietnam, see Laurence Monnais, “Rails, Roads, and Mosquito Foes”: The State Quinine Service in French Indochina,” in Robert Peckham and David M. Pomfret eds., \textit{Imperial Contagions: Medicine, Hygiene, and Cultures of Planning in Asia} (Hong Kong: Hong Kong University Press, 2013), 195-213.
\textsuperscript{131} Wu Yang 武洋, “1939-1944 nian Yunnan kangnue weiyuanhui nue fang yanjiu” 1939 年-1944 年雲南抗瘧委員會瘧防研究, \textit{Xi’nan huanjing shi yanjiu} 西南環境史 no.3: 39 and 43. I thank Prof. Zhou Qiong for providing this paper.
\textsuperscript{132} Yunnan Provincial Archives, The YAMC archives, 1030-001-00010-00.
Table 6. Patients Numbers and Quinine Tablets Consumed in Anti-Malaria Stations, Jan-August, 1941.
From *Yunnan weisheng* 1, no.10 (1941): 4.

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<th>Simao</th>
<th>Ning-er</th>
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<tr>
<td></td>
<td>Patient Numbers</td>
<td>Malaria cases</td>
<td>Quinine tablets</td>
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<tr>
<td>Jan</td>
<td>213</td>
<td>86</td>
<td>3050</td>
</tr>
<tr>
<td>Feb</td>
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<td>257</td>
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<td>July</td>
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<td>Patient Numbers</td>
<td>Malaria cases</td>
<td>Quinine tablets</td>
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<tr>
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<td>612</td>
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</table>
End of the YAMC and Responses of the Local Networks

In late 1941, another group of US medical specialists, the US Medical Commission to the Yunnan-Burma Railway (Die mian tielu Meiguokangnue tuan 滇緬鐵路美國抗瘧團), arrived at Yunnan. This visit would almost paralyze the YAMC.

The Yunnan-Burma Railway project was initiated in 1938 by a confederation of China, Britain, and the US. The US would provide lend-lease funds, while China and Britain would build this railway respectively in Yunnan and Burma.\(^{133}\) It was to “extend from Lashio in Burma to Kunming … more than six hundred miles. When completed, it will carry many times the supplies now transported over the Burma Highway.”\(^{134}\) However, the proposed line went through malaria-ridden areas. As its Director Victor H. Hass explained, the US Medical Commission was “appointed in August (1941) by the US Public Health Service at the request of the Chinese government, with the approval of the State Department. Its responsibility is to control malaria and to supervise sanitation and medical care among 250,000 Chinese workers who are building” this railway.\(^{135}\) But this commission had to assume another responsibility as well as malaria control: the US government had allocated $1,150,000 of lend-lease funds to the work, and “more than one million dollars of the total has been set aside to protect the health of the 250,000 coolies who will be employed in the construction.” It will also “have full responsibilities

\(^{133}\) Li Qunqing 李群慶, “Bei yiwang de dian mian tielu he zhong yin youguan” 被遺忘的滇緬鐵路和中印油管, Yunnan wenshi ziliao xuanji 雲南文史資料選輯 No. 52 (Kunming: Yunnan renmin chubanshe, 1998), 260.

\(^{134}\) “Excerpt from Report on RFHC, June 27, 1940-June 30, 1941,” The Rockefeller Archive Center, RG1, Series 601, Box 44, Folder 363, 6011, Burma-Yunnan Railroad, 1941.

for administering these funds.”  

Under the leadership of Victor H. Hass, this commission of sixteen members including surgeons, entomologists and sanitary engineers, left San Francisco for China on August 23, 1941. They arrived in Kunming in November, and were then stationed at Lashio.

The NHA took this commission very seriously. It decided to assist it with “20 senior medical officers, 15 sanitary supervisors and 150 sanitary inspectors.” Jin Baoshan, now the Director of the NHA, flew from Chongqing to Kunming to receive the commission in late October, and then called the Fourth Meeting of the YAMC to discuss how to cooperate with the commission on October 30th, 1941. In this meeting, it was proposed that the specialists and technicians of the MRI should be transferred to the Yunnan-Burma Railway project to assist the US Commission. Since the US Commission planned to conduct anti-malaria work in Yunxian and Shunning, the NHA ordered Zheng Zuyou to hand over all anti-malaria records, equipment and station houses to the US side, and two stations in Yunxian and Shunning were accordingly abolished.

On November 10, Yao Yongzheng received an official telegram from Jin Baoshan, ordering him to transfer to Lashio to work with the US Commission. Two months earlier, Yao had already submitted a resignation letter to the YAMC, explaining that he suffered badly from tuberculosis, and was too sick to work in Mangshi. The YAMC agreed that Yao could take a short-term sick-leave, but insisted he should remain in his position.

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136 “Medical Commission to the Burma-Yunnan Railroad,” Sept. 12, 1941, The Rockefeller Archive Center, RG1, Series 601, Box 44, Folder 363, 6011, Burma-Yunnan Railroad, 1941.
137 “Malaria Project in China,” *The Journal of the A.M.A* (September 6, 1941), from the Rockefeller Archive Center, RG1, Series 601, Box 44, Folder 363, 6011, Burma-Yunnan Railroad, 1941.
138 Yunnan weisheng 1, no.10 (1941): 5.
139 Yunnan weisheng 1, no.8 (1941): 9.
140 Yunnan weisheng 1, no.10 (1941): 5-7; Zheng Zuyou, “Jiefang qian yun xian nueji fangzhi jianshu”, 66.
141 Yunnan Provincial Archives, The YAMC archives, 1030-001-00087-030.
However, taking Jin’s order as a good opportunity, just like Yao Yunxuan before him, Yao Yongzheng left Mangshi and the MRI on November 30th.\textsuperscript{142}

During the same period, most of the staff of the MRI also received transfer orders. For Jin Baoshan, from the viewpoint of the Central Government, supporting the Yunnan-Burma Railway project was the most important immediate task. For that purpose, he even preferred to close the MRI at the expense of the YAMC. On November 20\textsuperscript{th}, all clinical and malaria research activities of the MRI were suspended for lack of personnel.\textsuperscript{143} In effect, the NHA’s orders had essentially placed MRI on the edge of extinction.

In response, members of the YAMC and the MRI insisted that the MRI continue operating to support anti-malaria work in Yunnan.\textsuperscript{144} Lou Qiaoshen, one of MRI’s high-ranked staff, put it clearly in his report: “from the standpoint of our own YAMC,” he could not agree with the proposal to incorporate the MRI into the US Commission. For him, if in the future the YAMC wanted to re-establish a similar institution after the collaboration ended, it would have to spend a huge sum of money. What was more, in the previous two years, the MRI had already become well-stocked with considerable equipment. Moving all of the gear back to the YAMC in Kunming would cost a lot in transportation fees. Instead, he believed the best solution was to set up a Mangshi-Zhefang Anti-Malaria Institute (Mang-Zhe kang nue suo 芒遮抗瘧所) on the original site of the MRI to promote malaria control and research in the Mangshi-Zhefang region. If the YAMC would take his suggestion, Lou stated that “it will be fortunate for

\textsuperscript{142} Yunnan Provincial Archives, The YAMC archives, 1030-001-00057-058.
\textsuperscript{143} Yunnan Provincial Archives, The YAMC archives, 1030-001-00002-002.
\textsuperscript{144} Yunnan Provincial Archives, The YAMC archives, 1030-001-00001-005.
our Yunnan’s anti-malaria work (shi wei wu dian kangnue zhi xing ye 實為吾滇抗瘧之幸也).

To be sure, the YAMC itself did not want to abandon the MRI. On January 7th, 1942, it ordered Lou and Gong Kechang 龔克昌, Director of the Hekou Anti-Malaria Station, who at the time was at the MRI for short-term training, to take over all property and equipment of the MRI, and continue to maintain the work of the institute.

Having already been severely destabilized by the NHA and the US Medical Commission, the YAMC soon had to face an even more critical challenge, when Japanese troops advanced to Burma and Yunnan in early 1942. Before Japanese troops occupied Lashio and moved forward to the Zhefang-Mangshi area in April, the US Commission had already retreated in advance, and it was soon completely cancelled. The Yunnan-Burma Railway project was also abandoned a few months later. The dysfunctional MRI moved back to Kunming in March and April, where it would operate an anti-malaria demonstration project in Xiaoyuanshan 小圓山. On April 29, the RFML retreated from Zhefang to Chongqing, where it would be incorporated into the National Institute of Health. In early May, the YAMC’s last anti-malaria station in Zhefang was abolished. Before he left for Kunming in the early morning of May 3rd, Ma Longrui lamented in his daily report: “My three-year anti-malaria work in the Mangshi-

145 Lou Qiaoshen 姜樵生, “Guan yu jian yi jiang ‘Yunnan kangnue yanjiusuo’ gai wei ‘Mang zhi yanjiusuo’ shi, November 26, 1941” 關於建議將“雲南抗瘧研究所”改為“芒迤抗瘧所”事, Yunnan Provincial Archives, The YAMC archives, 1030-001-00001-005.
146 Yunnan Provincial Archives, The YAMC archives, 1030-001-00057-059.
147 Yunnan Provincial Archives, The YAMC archives, 1030-001-00010-078.
148 Yunnan Provincial Archives, The YAMC archives, 1030-001-00080-004.
Zhefang-Wanting region now is ruined completely. I am feeling so depressed and angry that I will almost burst into tears."\textsuperscript{150}

The Japanese invasion and the withdrawal of financial and medical resources from the national and global networks totally disrupted the YAMC’s anti-malaria program, and exacerbated even further its shortage of funding, equipment, and personnel. To a certain degree, the Japanese were responsible for the suspension of the YAMC and its malaria control program.

Nevertheless, participants in the Yunnan local network did not completely give up. In late July 1942, when the MRI could not continue its research work, Yan Wengui 顏文貴, a local practitioner of traditional Chinese medicine, who did not believe that \textit{zhangqi} was malaria, suggested that the Yunnan Provincial Health Administration turn to Yunnan’s own local medical sources to deal with febrile disorders. He proposed setting up a Research Institute of \textit{Zhangqi Disease} (\textit{Yunnan yanzhang bing yanzhisuo} 雲南炎瘴病研治所), and urged that skillful Chinese physicians be hired to treat \textit{zhangqi} patients using Chinese materia medica.\textsuperscript{151}

In late 1942, the YAMC rebuilt the Yunxian Anti-Malaria Station, and established a new anti-malaria station in Yuanjiang. Because it faced extreme financial limitations, the MRI and the General Corps were officially abolished in 1943, and the Mobile Corps and the Engineering Corps were also cancelled in 1944. But the YAMC still made great efforts to keep the four county-level anti-malaria stations in Yuanjiang, Yunxian, Simao and Ning-er and to continue their work in the treatment of malaria patients and

\textsuperscript{150} Yunnan Provincial Archives, The YAMC archives, 1030-001-00011-029.

\textsuperscript{151} "Yunnan weisheng shiyanchu zai Yunnan kangnue suo she zhi ‘Yunnan yanzhang bing yanzhisuo’shi, August 5, 1942” 雲南衛生實驗處在雲南抗瘧所設置“雲南炎瘴病研治所”事, Yunnan Provincial Archives, The YAMC archives, 1030-001-00001-008.
prevention of the malarial mosquito. In 1944, the YAMC even operated a new training program.\textsuperscript{152}

It was not until 1945 that the YAMC was finally abolished. All of its anti-malaria work was transferred to the Yunnan Provincial Health Administration. But the story of malaria control in Yunnan did not stop there, and the legacies of the YAMC would not just disappear without any trace. Four years later, the new Yunnan Provincial Government in the People’s Republic of China re-initiated anti-malaria work and malaria research in Yunnan. Hou Jinxiu and Zheng Zuyou avidly joined in this new program, and in 1956, with many former members of the YAMC, they established the Yunnan Provincial Malaria Prevention Institute (\textit{Yunnan sheng nueji fangzhi yanjiusuo} 雲南省瘧疾防治所).\textsuperscript{153}

\textbf{Conclusion}

The short-lived YAMC was of historical importance in at least two respects. First, by establishing the provincial Anti-Malaria General Corps and local anti-malaria stations in several major malaria-ridden counties, sending mobile Anti-Malaria Corps to those counties without stations, and building a Research Institute for Malaria to conduct fieldwork studies, the YAMC not only saved the lives of many malaria patients, it also successfully set up a state medicine system in Yunnan, one of China’s most underdeveloped frontier provinces at the time. Second, during the brief time it was in existence, it contributed to China’s national defense and it helped Sino-foreign allies defend against the Japanese invasion by protecting soldiers and civilians against disease,

\textsuperscript{152} Yunnan Provincial Archives, The YAMC archives, 1030-001-00080-003.
\textsuperscript{153} Zhou Xinwen et al., \textit{Yunnan sheng nueji fangzhi yanjiusuo zhi} (1998), 115.
especially in the malaria-infested areas along the Yunnan-Burma Highway and the Yunnan-Burma Railway Project.

The origin, development, and the demise of the YAMC also illustrates the importance of intersecting networks for the making of tropical medicine in modern China—and thus supports the central argument of this dissertation. The origins of the YAMC were more complicated than the three developments addressed by Jin Baoshan as outlined at the beginning of this chapter. In addition to the scientific recognition that *zhangqi* was endemic malaria, the concurrent establishment of a provincial health administration, and the drafting of a five-year plan to control malaria, local, national, and even international actors played a role in bringing the YAMC into existence. At the provincial level, the YAMC was conceived by Yunnan’s own medical initiatives and the local developmental state; nationally, it was the extension of the NHA’s state medicine project into Yunnan. The strategic international importance of the Yunnan-Burma Highway drove the Nationalist Central Government, the Yunnan Provincial Government and some foreign organizations to work together to control malaria in southwest Yunnan. Indeed, it was the westward wartime relocations that made the YAMC possible, because the influx of officials, scientists, and doctors into the southwest provided provincial authorities and local communities with the considerable national and international medical resources needed to carry out their malaria research and control initiatives.

What is more, during the process of its development, the YAMC was also greatly influenced by its interactions with overlapping but distinct local, national, and global networks. Wartime Yunnan became a central node for the intersecting strands in these webs, in which the central and the provincial governments, local Shan society, foreign
allies, international organizations, and individual physicians, each for their own respective reasons, cooperated and, sometimes, competed with one other. Within the context of these crisscrossing ties, the YAMC developed as the center of a new wartime network of malaria research and control. Intensified competition and lack of funding eventually caused these ties to fray, and as the web unraveled, YAMC became increasingly dysfunctional. The demise of the YAMC was, in essence, due to the wartime destruction of the national and global networks of which YAMC was an integral part. Nevertheless, even when external networks withdrew their support and removed resources from Yunnan, local agents on the ground managed to build revitalized networks of malaria research and control based on the foundations and legacies YAMC left behind.
Chapter Four

Global Botanical Networks of Anti-Malarial Medicines:

Cinchona Cultivation Programs in Yunnan and Beyond, 1930s-1950s

In April 1937, the Ministry of Foreign Affairs of the Republic of China received an official protest statement from the Netherlands legation in China, requesting that the central government reprimand Yunnan Commissioner of the Bureau of Reconstruction, Zhang Banghan 張邦翰 (1885-1958), for his serious misrepresentations of the Netherlands Government’s attitude towards the quinine trade. According to the Netherlands legation, in a February 3rd telegram “Cinchona trees found in abundance in Yunnan,” from the Central News Agency, Peiping Branch (Beiping zhongyang tongxun she 北平中央通訊社), Zhang was quoted by the news agency reporters as having said in an interview, “that at present the best quinine was largely produced in the Netherlands and Hawaii, but owing to the strict restrictions imposed by the Netherlands Government exports have been scarce” (italicized in the original protest statement for emphasis). The Netherlands legation pointed out that “almost every word of this statement is contrary to the truth” and they therefore felt “obliged to correct the glaring misstatements.” The statement went on to say “The best quinine is almost exclusively produced not in the Netherlands but in the Netherland Indies (Java)” and that neither the Netherlands government nor the Netherlands Indian Government had imposed restrictions on exports. What is more, not only did the Netherlands government (the Kina Bureau at Amsterdam)
sell quinine to Chinese at “considerably lower” prices, but also it had donated huge amounts of quinine to the Chinese flood victims in 1931 and 1935.¹

Long Yun, the warlord and governor of Yunnan, forwarded this statement to the Yunnan Bureau of Reconstruction, ordering Zhang Banghan to deal with this issue.²

Zhang Banghan replied with a furious rebuttal, saying that the news agency reporters had made a mistake in recording his words. The Yunnan Bureau of Reconstruction had previously asked an American, Dr. Luo Yueke (name translated in Chinese as 駱約克, perhaps Joseph Rock), to purchase cinchona seeds for cultivation, but he failed in that mission. According to Luo Yueke, “the Netherlands government restricts exportation of cinchona seeds to keep its monopoly.” Zhang touched on this topic in his interview with newspaper reporters, but they mistook “cinchona seeds” (Jin ji na shu zi zhong 金雞納樹籽種) for “quinine” (Jin ji na shuang 金雞納霜) in their report. Zhang then stated that “it was interference in China’s internal affairs” for the Netherlands legation to request that Chinese officials be punished without any further investigation.³ Zhang seemed to be much angrier with the Central News Agency for reporting that “large numbers of cinchona trees…are found…” in Yunnan.⁴ In another statement, he requested that the Central News Agency correct this “ridiculous” (huang miu 荒謬) mistake: cinchona trees in Yunnan were not “found” in Yunnan but had been imported and cultivated by the Yunnan Commission of Reconstruction.⁵

¹ Memorandum, Yunnan Province Governmental Instructions, Miscellaneous no.351, May 5th, 1937, Yunnan Provincial Archives (YPA), 77-9-1471.
² Yunnan Province Governmental Instructions, Secret and Miscellaneous, no 351, April 22, 1937, YPA, 77-9-1471.
³ Reply from Yunnan Commission of Reconstruction, May 5th, 1937, YPA, 77-9-1471.
⁵ Reply from Yunnan Commission of Reconstruction, May 8th, 1937, YPA, 77-9-1471.
Zhang’s particular concern with this issue is understandable. Although cinchona bark, quinine’s raw material, was first introduced into China as a wondrous anti-malarial drug as early as the late eighteenth century, quinine had only been a widely used imported medicine since the late nineteenth century. Several cultivation experiments had failed previously in Fujian and Guangdong provinces in the 1920s. It was not until 1935, under his direct supervision, that the cinchona tree itself was successfully cultivated in Yunnan, the first time in Chinese history.

This chapter analyzes the developmental state’s efforts to produce anti-malarial medicines in modern China. It begins with an overview of how cinchona bark and quinine were respectively introduced and used as anti-malarial drugs in China through global networks in two phases from the eighteenth century to the early twentieth century. The bulk of the chapter focuses on the introduction and cultivation of the cinchona tree itself in early twentieth-century China, during a third more expansive phase of modern global botanic networks of knowledge, practice, and personnel. A close examination of Zhang Banghan and his colleagues’ cinchona cultivation program from the 1930s to the 1950s, especially the Hekou County Experimental Farm for Tropical Plants located in Yunnan’s southwest borderlands, indicates that this program was not a pure scientific agricultural experiment, but was part of the central Chinese Nationalist’s and the Yunnan provincial government’s state-building and developmentalist projects. This program was initiated in the early 1930s by “the developmental state” of Yunnan province to develop and promote national self-sufficiency as well as to eliminate endemic malaria in the province. Later on, during the Sino-Japanese War (1937-45), one new aim of the central government was to develop and control Yunnan’s semi-autonomous southwest frontiers.
(part of the so-called Zomia)\textsuperscript{6} to supply sources for the war; and together with other programs of producing medicinal plants in Yunnan, the cinchona cultivation initiative became part of the Chinese state’s national defense project to control epidemics in southwest China. After the war, this program continued to be supported by the central and provincial governments until 1948.

**Global Jesuit Networks and the Introduction of Cinchona to China**

Cinchona, a genus of twenty-three species of the \textit{Rubiaceae} family originally grown mainly in the high altitudes of Bolivia, Ecuador, and Peru in South America, is one of the most important medicinal plants. Known for its properties in treating malaria, its bark contains four natural alkaloids: quinine, cinchonine, cinchonidine and quinidine, all of which, especially quinine, kill the malaria parasites during their blood stages.\textsuperscript{7}

Jesuit missionaries first brought cinchona bark from Peru to Rome sometime in the 1630s to 1640s. A dubious popular legend holds that Francisca Henriquez de Ribera, the fourth Countess of Chinchon and wife of the Spanish Viceroy in Peru, carried this bark back to Europe after her malarial fever was cured by it, hence the name Carl Linneaus bestowed upon it (although he mistakenly left out the first “h” in Chinchon). Cinchona bark is also known as Peruvian bark and Jesuits’ bark/powder, a more historically accurate designation.\textsuperscript{8}

\textsuperscript{6} For more about the Zomia, see James Scott, \textit{The Art of Not Being Governed: An Anarchist History of Upland Southeast Asia} (New Haven: Yale University Press, 2009).
As Steven J. Harris has pointed out, the Jesuits established a long-distance network of overseas missions and science education, and cinchona was distributed around the globe via this network. Although in Europe the therapeutic properties of

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10 Steven J. Harris, “Long-Distance Corporations, Big Science, and the Geography of Knowledge,” *Configurations* vol.6, no.2 (1998): 290-293.
cinchona bark would still be questioned and investigated until the eighteenth century, the knowledge and therapy of Jesuits’ bark/powder and the bark/powder itself was diffused widely through the Jesuit networks, first to European elite circles, and then to the common people of the Atlantic world by the end of the seventeenth century.

It was through these early modern global networks that the use of cinchona was first introduced into China in 1693 when Jesuits cured the second emperor of the Qing Empire with Quinquina (wine with cinchona bark). In the summer of that year, Kangxi (康熙 reigned 1661–1722) suffered a serious malarial fever. French Jesuits Claude de Visdelou (Liu Ying 劉應 1656-1737) and Jean de Fontaney (Hong Ruohan 洪若翰 1643-1710), who obtained medical knowledge about the use of cinchona bark at the College of St. Paul in Goa, bought a pound of Quinquina from another Jesuit, Father Dolu in Pondicherry, and offered it to Kangxi. Since Kangxi did not quite understand the property of this new medicine (it was not that surprising because even in Europe at that time, the use of cinchona was still rare), he ordered four of his officials to examine it. The four officials first tested it on three other malarial patients. After they recovered, the four officials took a small dose themselves, and none of them found it harmful. Kangxi then took Quinquina, and soon his fever was cured. After that, Kangxi was fully convinced

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11 There were many reasons to be skeptical about cinchona bark, the most important medical one was that it did not conform to the dominant humoral theory of the time. See Andreas-Holger Maehle, Drugs on Trial: Experimental Pharmacology and Therapeutic Innovation in the Eighteenth Century (Amsterdam and Atlanta, Editions Rodopi B.V., 1999), 223-309.
14 Jean de Fontaney: “Lettre: Du pere de Fontaney, missionnaire de la Compagnie de Jesus a la Chine, au reverend pere de la Chaise, de la meme Compagnie, confesseur du Roi,” in Lettres édifiantes et curieuses, écrites des missions étrangères- mémoires de la Chine, Volume 9, ed. Jean-Baptiste du Halde (Lyon: 1819), 447-50; Alphouse Favier (樊國樑), Yanjing kai jiao lue (燕京開教略), Volume 2 (Beijing: Jiu shi tang, 1905), 41; Also see J. W. Stephens, “Pates Medicinales and Quinquina: The Treatment of K'ang Hsi,
by the medical efficacy of this “divine remedy” (sheng yao 聖藥), and he used it as an imperial gift for his loyal officials suffering from malaria.\textsuperscript{15}

This episode illuminates clearly how the long-distance networks of Jesuit science worked: the cinchona bark was first collected in Peru, then transported to Europe (Rome), shipped to India (Goa and Pondicherry), and finally offered to Kangxi in Beijing. However, the following case, the other most cited story of cinchona use in Qing China indicates that the Jesuit network failed to introduce it to ordinary Chinese in the eighteenth century, because its use remained limited to those with ties to the court.

Cao Yin 曹寅 (1658-1712), one of Kangxi’s closest bondservants, caught deadly malaria in Yangzhou in southern China in 1712. He begged for the “emperor’s divine remedy (zhu zi sheng yao 主子聖藥),” when he realized Chinese physicians could not cure him. Receiving this message, Kangxi sent cinchona to Yangzhou from Beijing through the state courier system with the intent to rescue him. Unfortunately, it was too late to save Cao’s life: he passed away weeks before the cinchona arrived. In this failed mission, Kangxi left an edict illuminating that he understood how to use cinchona medicinally, as indicated by Jonathan Spence’s translation: “Quinine (Jingjina) alone cures malarial fever. Use two-tenths of an ounce, powdered, mix with wine, and swallow. Afterward change to doses of one-tenth of an ounce, or eight fen [0.08 ozs], and repeat this twice; this will remove the root of the illness. If he does not have malaria, this medicine must not be used. You must be very thorough, I urge you, I urge you, I urge Emperor of China,” \textit{Journal of Tropical Medicine and Hygiene} vol.40, no.16 (1937): 187-188. For a detailed introduction to the spread of cinchona bark in Qing China in Chinese, see Wang Jiming 王吉民, “Guan yu jin ji na chuan ru woguo de ji zai” 門於金雞傳入我國的記載, \textit{Zhonghua yishi zazhi} 中華醫史雜誌 vol.6, no.1-4 (1954): 28-31.

\textsuperscript{15} Zhang Bijun 張碧君, “Kangxi yu jin ji na shuang” 康熙與金雞納霜, \textit{Beijing dang’an} 北京檔案, no. 3 (1999): 40.
What should be pointed out here, which Spence’s translation has omitted, is that in Kangxi’s original edict, cinchona was spelled in Manchu as *gingina* rather than as *jin ji le* (金雞勒) or *jin ji na* (金雞納) in Chinese (see part of this original edict below). This difference between the Chinese and Manchu vocabulary shows that cinchona remained in the imperial court as a form of secret knowledge, and did not circulate among Chinese society. This was similar to the western knowledge of anatomy, which was similarly only translated into Manchu.

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18 Marta Hanson, “Jesuits and Medicine in the Kangxi Court (1662-1722),” *Pacific Rim Report* (July, 2007): 1-10. According to Li Huan 李歡, Kangxi also ordered French Jesuits to complete a Manchu manuscript called *Si yang-ni ogto-i bithe* (Xiyang yao shu 西洋藥書), cinchona was classified among the first entries. See Li Huan 李歡, “Qing gong jiuzang manwen ‘Xiyang yaoshu’” 清宮舊藏滿文《西洋藥書》, *Zijin cheng* 紫禁城 no.4 (1999): 30. For more about Jesuit science in Qing China, see Benjamin Elman, *On Their Own Terms: Science in China, 1550-1900* (Cambridge: Harvard University, 2005), 61-211.
It was not until the early nineteenth century that cinchona bark began to be used beyond the imperial court. For example, Zhao Xuemin (趙學敏, 1719-1805), a Chinese physician based in Hangzhou, Zhejiang Province, wrote in his Supplements to Systematic Materia Medica that “there is a kind of bark called jin ji le 金雞勒 (cinchona) in the West (xiyang 西洋). It is used to treat malaria. (Malaria patients) will be cured at once after taking it. In 1800, Zhao Jinzhai, one in my clan, brought it back from western Canton…According to the barbarians in Macau (namely, the Portuguese), taking decocted 1/10 ounce cinchona bark with half of one ounce cinnamon, or 2/10 ounce cinchona bark for those with strong constitutions; all types of malaria could be cured.”\(^{19}\)

This record indicates that at least some Chinese in China’s coastal area (such as Canton, Macau and Hangzhou) acquired certain knowledge about cinchona bark and used it to treat malaria. During the same period, however, the use of cinchona bark experienced a tremendous change in Europe and North America, and cinchona would soon once again arrive at China in a different form, quinine, via another global network of knowledge driven by western imperial expansions. And this time, it came into the life of many ordinary Chinese as well as the imperial elite.

**Western Imperial Networks and the Introduction of Quinine to China**

The early nineteenth century saw several major chemical innovations in extracting active ingredients from medicinal plants, such as morphine from opium in

1804, and emetine from ipecacuanha in 1817 by a French chemist, Pierre-Joseph Pelletier (1788-1842). On September 11, 1820, Pelletier and his student Joseph Bienime Caventou in Paris successfully extracted two active medical constituents, cinchonine and the most important alkaloid, quinine, from cinchona bark. After their discovery was published, Pelletier called for physicians to test the medical efficacy of the two new alkaloids against malarial fevers. Several French doctors conducted experiments to treat patients with quinine and cinchonine, and proved that quinine was the superior medicine. Pelletier and Bienime were rewarded 10,000 francs for their discovery from the Institut de France in 1827.

The isolation of quinine from cinchona bark was of great importance for many reasons: first of all, quinine gradually became accepted as an anti-malarial drug in widespread pharmaceutical use. In the 1820s, in several European expeditions to West Africa, quinine was already supplied in small quantities, but its price was still too high for common people. By 1825, quinine had become the recommended treatment for intermittent fevers (malaria) by doctors in Philadelphia, even though, there were still many doubts about its use. It was not until the 1840s and the 1850s that the popular acceptance of quinine was firmly established, after several physicians in Britain and America independently demonstrated the anti-malarial value of quinine with massive

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21 Bureau for Increasing the Use of Quinine, Malaria and Quinine (Amsterdam: Bureau for Increasing the Use of Quinine, 1927), 25; Charles M. Poster and George W. Bruyn, eds., An Illustrated History of Malaria (London and New York: The Parthenon Publishing Group, 1999), 93-94.
23 Friedrich August Flückiger and Daniel Hanbury, Pharmacographia: A History of the Principal Drugs of Vegetable Origin, Met with in Great Britain and British India (London : Macmillan and co., 1879), 358.
experimental and clinical evidence.\textsuperscript{26} Secondly, this finding and experiments with quinine proved that different species of cinchona vary in quinine content; some cinchona might contain little or none of the effective anti-malarial alkaloids. This discovery prompted a quest for new species of cinchona which resulted in Charles Ledger’s finding in the 1860s that \textit{Cinchona ledgeriana} tree has the highest proportion of quinine (average 10%). With the successful cultivation of \textit{Cinchona ledgeriana} in Java, the Netherlands began to monopolize the global production of cinchona and quinine in the last quarter of the nineteenth century.\textsuperscript{27}

This discovery also opened a new quinine industry, since compared with crude cinchona bark quinine was more effective because of its purity.\textsuperscript{28} And with the massive production reducing its price, the use of quinine began to supplant that of pure cinchona bark. Pelletier himself set up a factory to manufacture quinine in Paris in 1820. Quinine production grew steadily from the mid-1820s in France, Britain, Germany, the Netherlands, and the US. In the late 1830s, France produced more than 3,400 kilograms of quinine per year.\textsuperscript{29} By 1883, 150,000-250,000 kilograms of quinine was produced every year by fifteen factories in the world.\textsuperscript{30} In 1888, the world consumption of quinine was estimated to be around 140,000 to 170,000 kilograms.\textsuperscript{31} With such considerable production, the price of quinine, in the US, for example, dropped from $16.00-20.00 per

\begin{thebibliography}{99}
\bibitem{28} Leo B. Slater, \textit{War and Disease: Biomedical Research on Malaria in the Twentieth Century} (New Brunswick: Rutgers University Press, 2009), 21-22.
\end{thebibliography}
ounce in 1823 to $0.24-0.37 per ounce in 1897. Historian James Webb points out that this replacement of the bark with quinine came largely in the North Atlantic World after the 1860s, and poor farmers in the US could afford quinine by the late 1880s.

With constant, massive and cheap supplies of quinine, as Daniel Headrick and Lucile H. Brockway have pointed out respectively, European imperialists, including colonial administrators, soldiers, merchants, and missionaries, could survive in and control malaria-ridden Asian and African colonies. Thereby, quinine was regarded as a “tool of empire” or an “essential arm of …imperialism” in European colonial expansion.

In China, the introduction of quinine was a similar story of imperialist expansion, since it first came to this country during the First Opium War (1839-1842). In 1840, William Lockhart (1811-1896), one of the first Protestant medical missionaries to China, set up a hospital in Dinghai (定海, in Zhejiang Province) off China’s east coast, shortly after the British forces captured that malaria-ridden island. To attract local malarial patients, William Lockhart supplied quinine to them. This tactic turned out to be a big success: after some of them recovered, more patients and even some local Chinese

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physicians came to his hospital for help. The local demands were so large that the quantity of Lockhart’s quinine on hand became “very inadequate.”³⁵

In the following decades, quinine gradually gained considerable popularity among Chinese. On the one hand, the knowledge of quinine was being introduced to more Chinese. In 1857, the Shanghai-based medical missionary Dr. Benjamin Hobson (1816-1873) introduced the use of quinine against malarial fever in his Xiyi luelun (Summary of Western Medicine) writing, “quinine (ji na 雛哪) is the essence (jin jiang 精漿) of cinchona (jin ji na 金雞哪), and it is the best medicine to cure malaria (zhi nue di yi liang yao 治癒第一良藥).”³⁶ In 1858, Hobson elaborated on the updated knowledge of quinine in his Nei ke xin shuo 内科新說 writing, “in the past, people only knew the use of cinchona. In recent days, quinine, the essence of cinchona (ji na 雛哪, gui na, 桂哪 or ji nian 雛年) is used specifically …its effect is more powerful.”³⁷ In 1866, jin ji na shuang (金鶯納霜, literally this means the salt of cinchona), the most common translation of quinine in the late nineteenth and early twentieth centuries, was already included by the German missionary Wilhelm Lobscheid (Luo Cunde 羅存德 1822-1893) in his English-Chinese dictionary (Ying-Hua zidian 英華字典).³⁸ This new knowledge was also circulated among some Chinese. For instance, in 1893, a Chinese student named

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³⁶ Benjamin Hobson (He Xin 合信) and Guan Maocai 管茂材, Xiyi lue lun 西醫略論, 3 vols. (Shanghai: Renji yiguan 仁濟醫館, 1857), 1: 46-47.
Xu Keqin 許克勤 in the Shanghai Polytechnic Institution (Shanghai ke zhi shu yuan 上海格致書院) could clearly discuss the usage of quinine in his examination paper.\textsuperscript{39}

On the other hand, the use of quinine was also accepted and widely used by Chinese. In 1859, according to another medical missionary, Dr. John G. Kerr in the Medical Missionary Society’s Hospital at Canton, quinine was “one of our most valuable medicines.” Local Chinese “value it very highly,” and “large quantities of quinine have recently been brought to this market,” and sold to them.\textsuperscript{40} In 1860, “300 dozen pieces of quinine, valuing 876 Mexican dollars” were imported to Canton.\textsuperscript{41} According to medical officers of the imperial Chinese maritime customs, quinine was already widely used in treating Chinese patients with malarial fevers in the early 1870s. Dr. Huang Kuan (Wong Fun 黃寬 1829-1878), medical officer in the Canton maritime customs, and also the first Chinese who gained a M.D. degree aboard (University of Edinburgh), pointed out in his report of 1872: “quinine is the only febrifuge we possess which has a decided superiority over those of the Chinese… They use quinine in ague (malaria), and this medicine is in increasing demand every year.”\textsuperscript{42} In the same year, Dr. John Dudgeon (1837-1901), medical officer in the Beijing maritime customs reported that, to treat patients with ague, “our large supply of quinine was soon exhausted… The efficacy of quinine is now

\textsuperscript{39} Xu Keqin (許克勤), “Taixi yixue yuan liu” 泰西醫學源流, in Huang chao jing shi wen san bian 皇朝經世文三編 vol 6., ed. Chen Zhongyi 陳忠倚 (Shanghai: Bao wen shuju 寶文書局, 1898), 2.
\textsuperscript{41} “Returns of the Import and Export Trade at the Port of Canton, for the Half-Year Ended 31\textsuperscript{st} December 1860,” in Zhongguo jiu hai guan shiliao (1859-1948) 中國舊海關史料 170 vols, ed. Zhongguo jiu hai guan shi liao bianji wei yuanhui 中國舊海關史料編輯委員會編 (Beijing: Jing hua chubanshe 京華出版社, 2001), 1: 64.
\textsuperscript{42} Wong Fun, “Dr. F. Wong’s Report on the Health of Canton for the half year ended 30\textsuperscript{th} September, 1872,” Medical Reports of Imperial Maritime Customs Service no. 4 (1872): 71.
recognized and widely known among the natives, and large quantities might be sold to them.\textsuperscript{43}

Western medical companies in China also recognized this demand for quinine. A German firm, Seimsson & Co., started to sell quinine in the Shanghai market beginning around 1875 and continuing to 1908. The British pharmaceutical giant Burroughs Wellcome & Co. opened a branch in Shanghai in 1909, and not surprisingly quinine was one of its major commodities.\textsuperscript{44} Even in the far frontier of western Yunnan in 1912, “most traders there learned the efficacy of quinine and it is rare to meet a caravan without its supply of this useful drug.”\textsuperscript{45}

The following tables of quinine imports indicate that during the late nineteenth century and early twentieth century, there was a growing demand for quinine in China. Nevertheless, it was not until the 1920s that Chinese began to cultivate cinchona trees. In this third modern phase, the plant itself, in the form of seeds, came to China via yet another global botanical network.

\textbf{Table 7. Quinine Imports in Canton, 1898-1903.}

Based on \textit{Zhongguo jiu hai guan shiliao} (1859-1948) 中國舊海關史料 170 vols, ed. \textit{Zhongguo jiu hai guan shi liao" bianji weiyuanhui} 中國舊海關史料編輯委員會編 (Beijing: Jinghua chu ban she 京華出版社, 2001), vols. 27, 30, 32, 34, 36, 38.

<table>
<thead>
<tr>
<th>Year</th>
<th>1898</th>
<th>1899</th>
<th>1900</th>
<th>1901</th>
<th>1902</th>
<th>1903</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity (Bottles)</td>
<td>8496</td>
<td>29359</td>
<td>12799</td>
<td>9192</td>
<td>4670</td>
<td></td>
</tr>
<tr>
<td>Value (Customs Tael, CT)</td>
<td>1147</td>
<td>1787</td>
<td>1224</td>
<td>2172</td>
<td>1531</td>
<td>4677</td>
</tr>
</tbody>
</table>

\textsuperscript{43} John Dudgeon, “Dr. John Dudgeon’s Report on the Health of Peking for the half year ended 30th September, 1872,” \textit{Medical Reports of Imperial Maritime Customs Service no. 6} (1873): 8.
\textsuperscript{44} Shanghai shi yiyao gongsi and Shanghai shehui kexueyuan, \textit{Shanghai jindai yiyao hangye shi} 上海近代西藥行業史 (Shanghai: Shanghai shehui kexueyuan chubanshe, 1988), 19 and 27.
Table 8. Chichonine and Quinine Mixtures Imports in Shanghai, 1912-1919.
Based on Zhongguo jiu hai guan shi liao, vols. 58, 62, 65, 69, 73, 77, 81, 85.

<table>
<thead>
<tr>
<th>Year</th>
<th>1912</th>
<th>1913</th>
<th>1914</th>
<th>1915</th>
<th>1916</th>
<th>1917</th>
<th>1918</th>
<th>1919</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value (CT)</td>
<td>24200</td>
<td>21544</td>
<td>23538</td>
<td>38140</td>
<td>166825</td>
<td>125868</td>
<td>78323</td>
<td>108794</td>
</tr>
</tbody>
</table>

Table 9. Quinine Imports in Chinese Maritime Customs, 1920-1936”.
From Shanghai shi yiyao gongsi and Shanghai shehui kexueyuan, Shanghai jindai yiyao hangye shi 上海近代西藥行業史 (Shanghai: Shanghai shehui kexueyuan chubanshe, 1988), 68.

<table>
<thead>
<tr>
<th>Years</th>
<th>1920-1925</th>
<th>1926-1931</th>
<th>1932-1936</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value (CT)</td>
<td>1128523</td>
<td>19538.6</td>
<td>1900659</td>
</tr>
</tbody>
</table>

The Global Botanical Networks for Cultivating Cinchona

The modern global botanical network of cinchona cultivation was initially built by British and Dutch colonial botanists and naturalists in India and Java respectively in the mid-1850s, and was joined later on by the French, American, Japanese and other imperial powers.

There were several reasons for the British to transplant cinchona seeds in India. Since the 1830s, many Europeans believed that cinchona trees in South America were facing extinction due to local wasteful lumbering practices. It was necessary for them to save this precious medicinal plant, even though that danger was more or less a false impression.46 The more important reason lay in economic and political needs: to save Great Britain huge expenditures and to safeguard its colonial enterprise. The Spanish empire had established a royal monopoly over the cinchona bark trade in South America

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in the 1750s, when they fully realized the medicinal and economic importance of cinchona bark. Monopolistic policies were continued by the newly independent South American republics.\textsuperscript{47} In malaria-infested British India, the demand for massive quantities of cinchona bark forced the British East India Company to spend £100,000 to import this monopolized product from South America in the 1820s.\textsuperscript{48} In the 1850s, the EIC needed to pay £53,000 every year for quinine imports to India.\textsuperscript{49}

To break down the South American monopoly, and to “rescue” the cinchona plant, the British began to smuggle cinchona seeds out of South America and they tried to cultivate them in India in the 1850s. With the support of the British India government and the Kew Botanic Gardens, the first successful efforts were made by Clements R. Markham and Richard Spruce in the 1860s. Thanks to the political instability of newly independent Peru and Bolivia, these two men were finally able to bring back seeds of the \textit{C. calisaya} (the yellow bark) and the \textit{C. succirubra} (the red bark) trees respectively. They nurtured the seeds in the Kew Gardens, and then transported them to Ootacamund Botanic Garden in the Niligiri hills of South India, where the cinchona trees were successfully cultivated.\textsuperscript{50} After that, under the direction of Kew and its branch botanical gardens in various British colonies (including the Calcutta Botanic Garden in Bengal, which would play a role in Yunnan’s enterprise later on), cinchona plantations were established in East Africa, the Caribbean, India, Ceylon, and Burma.\textsuperscript{51} Among these efforts, cinchona cultivation in Ceylon (Sri Lanka) was the most successful. Its

\begin{footnotesize}
\begin{itemize}
\item[51] Lucile H. Brockway, \textit{Science and Colonial Expansion}, 120.
\end{itemize}
\end{footnotesize}
production was about 75% of the world production before the 1890s. Lucile H. Brockway demonstrated three decades ago that this botanical network of cinchona transfer by the Kew Gardens and its colonial satellite gardens had served to provide quinine for the British colonists against malaria in India and Africa. Richard Drayton also highlights the role of botanists in Kew Gardens in acclimatizing cinchona in India. Kavita Philip underscores that cinchona’s transplantation to British India resulted from Kew Garden’s “global reach and its connections with state power” in a “global network of exploration collection and systematization of botanical knowledge.”

Almost at the same time, the Dutch government was also engaged with cinchona cultivation in the Netherlands East Indies, particularly in Java, which boasted a similar topography and climate as South America. Under the direction of colonial scientists such as Franz Junghuhn and K.W. van Gorkom and with the Dutch government’s support, cinchona plantations in Java experienced rapid development. They began to enjoy huge economic profits, especially after 1872 when Charles Ledger’s seeds (Cinchona ledgeriana) were widely planted in Java. From 1890 and 1940, the Dutch gradually replaced British India, coming to dominate the cinchona bark trade: more than 90% of the world’s supply was provided by the Netherlands East Indies.

Many other imperial powers were also joining in the global networks of cinchona transplantation and cultivation. The French started their cinchona cultivation experiments in 1848, but soon failed. In 1869, seeds of cinchona trees were transported from Java to the Saigon Botanical Garden in French Indochina. After several major failures in the following five decades, led by the famous bacteriologist Alexandre Yersin (1863-1943) of the Pasteur Institute in Saigon, cinchona trees were finally successfully cultivated in the 1920s in southern Vietnam. The Germans’ project of cinchona was
mainly carried out in its colony Tanganyika of East Africa starting in 1900, while the Americans cultivated cinchona trees in the Philippines from 1927. The Japanese empire initiated its own cinchona cultivation plan in the 1880s, but only succeeded in 1922 in its tropical colony of Taiwan, treating cinchona as “plants of national policy.”

**Yunnan Initiatives and Cultivating Cinchona Trees**

When Zhang Banghan and his colleague Huang Riguang (also known as Huang Huang) started their cinchona program in Yunnan in the 1930s, they recognized that there were already extensive global botanical networks of cinchona cultivation. Educated in Europe as engineers but committed to the Chinese nationalist revolution, they both served the local developmental state above all. They intended to take advantage of and join in the global botanical networks in order to cultivate cinchona trees and produce quinine in China. Their original purpose was to reduce Chinese expenditures and to save lives in the malarial region of Yunnan by side-stepping the Dutch monopoly.

**Engineers and the Local Developmental State**

Zhang Banghan and his Bureau of Reconstruction were crucial elements in the provincial administration of Long Yun’s local developmental state, a topic which we have discussed in Chapter Three. Zhang was born in Zhenxiong County, Yunnan, in 1885. Because of his academic performance in the imperial examination system as a

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at the age of twenty he was sent by the Qing government to study in the
École Pavie of Hanoi in 1905. This school was founded in 1904, by the French colonial
authorities expressly for Chinese students, particularly sons of official elites from Yunnan
and Guangxi provinces. Although this school intended to develop French influence in
southwest China, ironically, many Chinese students receiving French education there
became anti-imperialists and revolutionaries against the Qing government. Zhang
Banghan was one of them. He joined in the anti-Qing Chinese Revolutionary Alliance or
the Tongmenghui 同盟會 in 1906. The leader of the Tongmenghui, Sun Yatsen, thought
Zhang was “young and ambitious,” and ordered him study in France in 1909. Zhang later
on moved to Belgium to study architecture. After the success of the 1911 Revolution,
Zhang was called back to China by Sun Yatsen. Serving briefly on the Yunnan
Commission of Foreign Affairs, Zhang soon left again for Belgium to continue his
studies. In 1920, he returned to Yunnan with a Belgian diploma of Electrical Engineering.
After the Nationalist regime was established in 1928, Zhang served as Yunnan’s delegate
in Nanjing, and was appointed by Long Yun as Yunnan Commissioner of Reconstruction
in July 1928, a position he would hold until 1945.

As a professional engineer and life-long disciple of Sun Yat-sen and his
developmentalist ideas, Zhang was very ambitious when planning Yunnan’s
reconstruction projects. In a 1931 newspaper interview, Zhang expressed his optimism

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62 Tracy C. Barrett, The Chinese Diaspora in South-East Asia: The Overseas Chinese in Indo-China, 1870-
63 Xiang Guoxiang 向國香, Cai Yongshu 蔡永樹 and Liu Pingshan 劉平山, “Zhang Banhan zhuanlue” 張
about Long’s reconstructions of finance, military, and transportation even though Long Yun’s new regime in Yunnan was still facing serious difficulties.⁶⁴

Two years later, in a special issue on Yunnan reconstruction in the journal *Construction of China (Zhonguo jianshe 中国建设)*, Zhang systematically elaborated on his developmentalist ideas and Yunnan’s reconstruction plans. He alleged that he would follow Sun Yat-sen’s will and accomplish the reconstruction enterprise. In that special issue, Zhang introduced the most critical reconstruction plans in Yunnan, including industrial and commercial administration, modern transportation systems (such as highways, airplanes, a postal service, and telecommunications), hydraulic works, electricity, agriculture and forestation.⁶⁵ In the part on *Yunnan’s Forestation Plan (Yunnan sheng zao lin jihua 雲南省造林計劃)*, Zhang drafted a very detailed plan on establishing several forest farms 林場 in four different forest regions (central Yunnan *dian zhong 滇中*, south Yunnan *dian nan 滇南*, west Yunnan *dian xi 滇西* and *Puer 普洱*)

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of Yunnan, according to each region’s environmental factors. In the southern Yunnan region, there would be farms for tropical cash crops, such as coffee, tung trees and plantains.  

Zhang indeed paid a great deal of attention to forestry in Yunnan. But he was not an expert in this field. Fortunately, he had a very qualified colleague to help him with the forestation projects in Yunnan, Huang Riguang. Huang graduated from the National Institute of Agriculture (Institut national agronomique) in Paris, where he was one of the founding members of the statist Chinese Youth Party (Zhongguo qing nian dang 中国青年党) established in 1923. He returned from France around 1924, and became a professor and chair of the experimental farm in the College of Agriculture of the newly established Guangdong University.

This College of Agriculture was formerly the independent Guangdong Provincial Agricultural School. As Emily Hill has pointed out, during the early twentieth century, intellectuals and officials believed agriculture was the basis for China’s economy, and thus it was necessary to save China by modernizing Chinese agriculture.  

E. Elena Songster has also demonstrated that afforestation under the science of forestry policy, part of the western agricultural sciences, were critical for Chinese nationalism and the economy. Sun Yat-sen was also convinced by this faith in modern agricultural science, and thus he pushed for incorporation of the school into Guangdong University, in order to

66 Ibid, 85-100.
build a strong agricultural specialty for Chinese livelihood. This college was renamed the College of Agriculture of Sun Yat-sen University in 1926. It soon became one of the most influential agricultural colleges, especially for its fame in forestry in republican China. Later on graduates from this college would lead the task of cinchona cultivation in Yunnan.

Having established himself as an expert on agriculture and tropical plants, Huang was invited by Zhang Banghan (the two might also have known each other when in Europe) to Yunnan to serve as director of the Forest Section in the Bureau of Reconstruction in 1928.

Zhang Banghan and Huang Riguang shared many similarities: they were both trained in Europe as technical specialists, and working for the Yunnan local developmental state, they both believed that by using modern scientific methods and rational management styles, they could develop Yunnan more efficiently. In the years that followed, they set up several institutes for improving rice production, sericulture, tobacco, cotton, animal husbandry, tea, pest control and many other trees that could be grown for profit. They also built a provincial-wide system of tree farms for the purpose of afforesting Yunnan. To some extent, their efforts were modestly successful in increasing crop production.

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70 Luo Shiming, et al., Hua 'nan nongye daxue xiaoshi 華南農業大學校史 (Guangzhou: Guangdong keji chubanshe, 1999); E. Elena Songster, “Cultivating the Nation in Fujian’s Forests”: 461.
71 In 1940, Huang published the first monograph on tropical plantations in China. See Huang Huang 黃晃, Zhongguo redai zuowu 中國熱帶作物 (Changshan: Shangwu yinshuguan, 1940).
Saving Lives and National Revenues in a Tropical Environment

It was Huang Riguang who convinced Zhang Banghan of the importance of cultivating cinchona trees in Yunnan. Beyond rice and cash crops, Huang also had a strong interest in cultivating certain tropical plants. As early as 1924, he acquired dozens of cinchona seeds from overseas Chinese contacts in Java, and started experimenting with cinchona cultivation on the college farm, but unfortunately these efforts failed.\(^{74}\) When Huang went to Yunnan from Guangdong, he attempted to continue his efforts in cultivating cinchona. Zhang warmly supported Huang’s efforts.\(^{75}\)

There were three major reasons for pursuing cinchona cultivation in their original plan. First, Yunnan, particularly its southwestern part was notorious as a malaria-ridden region (\textit{nue qu} 疫區). Over ten thousand patients died from malaria every year in Yunnan due to the shortage of quinine supplies. Thus, cultivating cinchona (to produce quinine) would save lives.\(^{76}\)

The second reason was to save national revenues. Malaria was endemic not only in Yunnan, but was widespread throughout China’s southern provinces. Every year millions of Chinese suffered from malaria. According to Zhang and Huang, eight to ten tons of quinine pills were imported from overseas, which resulted in a huge loss of government funds. What is more, the quantities of imported quinine could not meet the needs of even one third of the total malarial patients in China. Increasing imports three-

\(^{74}\) Jiangsu sheng Tao Xingzhi yanjiu hui 江蘇省陶行知研究會 ed., \textit{Tao Xingzhi rizhi} 陶行知日誌 (Jiangsu jiaoyu chubanshe, 1991): 265.

\(^{75}\) Yunnan jianshe ting zhongzhi jin ji na zhi shikuang 雲南建設廳種植金雞納之實況, 1940, Yunnan Provincial Archives, 77-23-76.

fold would mean more expense.\textsuperscript{77} According to another calculation made in the 1930s, in the single province of Yunnan, around sixteen tons of quinine were required to treat all malarial sufferers there. And throughout all of China, the total demand for cinchona bark, not to mention quinine products, was around 2 million jin (100 tons) every year, which would cost the government 150 million yuan.\textsuperscript{78} The following table related to quinine importation from Java in the 1930s shows the huge demand for the drug in China.

<table>
<thead>
<tr>
<th>Year</th>
<th>1935</th>
<th>1936</th>
<th>1937</th>
<th>1938</th>
<th>1939</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity (Metric Ton)</td>
<td>70</td>
<td>79</td>
<td>38</td>
<td>32</td>
<td>65</td>
</tr>
</tbody>
</table>

As Margherita Zanasi has demonstrated, the idea of achieving autarky and building China’s national economy were widely accepted by officials in their national reconstruction projects.\textsuperscript{79} Zhang and Huang were among the technocrats who believed in these principles. They could not abide the fact that China needed to pay huge sums for quinine imports. They thus planned to cultivate cinchona trees with an eye towards future quinine self-sufficiency and possibly even considerable profits for the state,\textsuperscript{80} as others had sought to promote sugar industry to gain government revenues in Guangdong Province.\textsuperscript{81}

\textsuperscript{77} Yunnan Hekou tuiguang zhongzhii jin ji na shu ji shiyian jihua shu 雲南河口推廣種植金雞納樹及試驗計劃書, Jan 2, 1940, Yunnan Provincial Archives, 77-23-76.

\textsuperscript{78} Liang Guangshang 梁光商, Jin ji na shu zhi zaipei yu yongtu 金雞納樹之栽培與通途 (Zhengzhong shuju: 1942), 81.

\textsuperscript{79} Margherita Zanasi, \textit{Saving the Nation: Economic Modernity in Republican China} (Chicago: The University of Chicago Press, 2006).

\textsuperscript{80} Yunnan Hekou tuiguang zhongzhii jin ji na shu ji shiyian jihua shu 雲南河口推廣種植金雞納樹及試驗計劃書, January 2, 1940, Yunnan Provincial Archives, 77-23-76.

\textsuperscript{81} Emily M. Hill, \textit{Smokeless Sugar}: 122-178.
The final reason had to do with Yunnan’s potentially favorable climate and environment for growing cinchona trees. Cinchona is perhaps one of the most difficult plants to cultivate. According to the scientific knowledge circulating through the modern global botanical networks, it was clear that cinchona had strict environmental requirements for trees with a high proportion of quinine to thrive. Such trees could only be grown at latitudes from 10 degrees north to 20 degrees south, altitudes from 1200 to 2000 meters, with average temperatures from 18-22°C, annual rainfall from 2.5-3.5 meters with little monthly variation, and humus-rich soil. Zhang and Huang, familiar with this knowledge, believed that taking into consideration the factors of tropical climate and soil in Yunnan, cinchona trees might be cultivated in Yunnan’s south and southwest Pusi region, that is, in the most malaria-ridden regions on the borders of the province.

Seeking Cinchona Seeds through Global Networks

Since Zhang Banghan had agreed to implement cinchona cultivation in Yunnan, the first and most critical task for him would be to acquire cinchona seeds. During the 1930s, the Dutch government had placed strict restrictions on the exportation of cinchona seeds from Java, at least to Chinese. After several failed attempts, Zhang was very angry with the Dutch government. That was why he mentioned the Dutch’s monopoly of quinine to newspaper reporters in 1937, as noted in the introduction to this chapter.

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82 Lin Xixun 林錫勳, “Yunnan zhi jin ji na” 雲南之金雞納, Nong Shen 農聲 225 (1942): 82-83.
83 Yunnan jianshe ting zhongzhi jin ji na zhi shikuang 雲南建設廳種植金雞納之實況, 1940, Yunnan Provincial Archives, 77-23-76.
84 According to Norman Taylor, the Dutch did not limit seed exportations. Many countries successfully purchased cinchona seeds from the Dutch. See Norman Taylor Cinchona in Java: The Story of Quinine (New York: Greenberg, 1945), 77-78. It was not until 1937 when the Dutch began to forbid its exportation. See Tanaka Chōzaburō田中長三郎, Nanpō shokusan shigen ron 南方梢蔔資源論 (Tokyo: Yokendo, 1943), 109. Why the Dutch targeted China is still unclear.
In 1932, Zhang turned to Henry Forster Handley-Derry (1879-1966), the British consular official in Yunnan. Handley-Derry agreed to help Zhang, and managed to purchase eight ounces of seeds of cinchona (at a cost of 380 yuan)\(^85\) from Java and Calcutta. Huang took some seeds to Lufeng Forest Farm 臘豐林場,\(^86\) south of Kunming, for planting, but they all soon died. Then the rest of seeds were cultivated on a farm in Hekou 河口 county. The seeds grew very well and the young plants were soon leafing out. But the director of Hekou Farm, Zhang Jiliang 張吉亮, noticed the leaves were totally different from the phyllotaxy of cinchona as described in textbooks. At that time, the famous American explorer and botanist, Joseph Rock\(^87\) (1884-1962) was traveling through Yunnan. Huang Riguang asked him to examine the plants. The results were very striking: these plants turned out to be ficus (banyan 榕樹) not cinchona! There were two possible explanations for this mix-up: either the suppliers had offered ficus seeds in the first place, or the cinchona seeds were stolen and replaced with ficus midway somewhere in Vietnam. Either possibility indicated that obtaining cinchona seeds was still not an easy task.

In the winter of 1933, Handley-Derry once again purchased eight ounces of cinchona seeds from the Calcutta botanical garden for his Yunnan friends. This time, he

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\(^86\) The Lufen Farm was the oldest tree farm in modern Yunnan, dating back to 1904. See Li Ronggao 李榮高, “Yunnan minguo shiqi linchang kao” 雲南民國時期林場考, *Nongye kaogu 農業考古*, no. 1 (2003): 172. For more about history of agricultural experiment stations in early twentieth-century China, see Peter Lavelle, “Agricultural Improvement at China’s First Agricultural Experiment Stations,” in Denise Philips and Sharon Kingsland (eds.), *New Perspectives on the History of Life Sciences and Agriculture* (Springer Verlag, 2015), 323-344.

carefully packed and delivered them to Yunnan in secure diplomatic bags. Via the network of cinchona cultivation, established by Clements R. Markham in India, the Yunnan operatives finally obtained authentic cinchona seeds, and successfully cultivated them in Hekou. In the following years, with close international cooperation, Yunnan horticulturalists continued to acquire cinchona seeds from other nodes lying along the global networks of cinchona cultivation. In 1939, the French government presented them with cinchona seeds as gifts. In 1940, the British consulate sent them seeds of red cinchona (C. succirubra). The American consulate offered 5.6 grams of three types of cinchona seeds in 1942. By the 1940s, Yunnan had become part of the global network of cinchona cultivation.

*Acclimating Cinchona in Chinese Soils*

The cinchona seeds from Calcutta were all brought to the Hekou Experimental Farm for Tropical Plants for cultivation. This farm was the former No. 3 Farm for Street Trees, which was established in 1930 mainly for planting urban trees. In spring 1933, this farm was renamed the Hekou Farm for Tropical Plants since it grew plants such as coconuts, bananas and coffee. Zhang Banghan and his colleagues understood that this farm in Hekou was not a perfect place for growing cinchona. The soil there was sandy loam, and its altitude was

89 Hekou zuowu shiyanchang shizhong gezhong zuowu zhongmiao laiwang feiyong kai zhi, Yunnan Provincial Archives, 77-11-1967.
90 Yunnan sheng jianshe ting Yi’xi redai zuowu shiyanchang 1941 niandu gongzuo baogao 雲南省建設廳迤西熱帶作物試驗場 1941 年度工作報告, Yunnan Provincial Archives, 77-9-966-02.
91 Yi’xi redai zuowu shiyanchang wenti baogao 迤西熱帶作物試驗場問題報告, Yunnan Provincial Archives, 77-32-51.
93 Hekou redai zuowu shiyanchang 河口熱帶作物試驗場, 1940, Yunnan Provincial Archives, 77-9-1502.
only 100 meters. It therefore could not meet some of the critical requirements for cinchona cultivation. However, located on the border between Yunnan and Vietnam, it was the southernmost state-controlled farm and the only available one located around the latitude of 20° north in Yunnan. What is more, Hekou had certain climatic advantages favoring the growth of cinchona trees, such as an average temperature above 21°C (see Table 11). For these reasons, it was worth a try for the Yunnan initiatives.94

**Table 11. Temperature Records (in Celsius degree) in Hekou, 1939.**
From Lin Yongxin’s Reply to the Yunnan Anti-Malaria Commission, Yunnan Provincial Archives, 77-11-1967.

<table>
<thead>
<tr>
<th>Month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Yearly Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>16.5</td>
<td>18.5</td>
<td>22.1</td>
<td>22.1</td>
<td>26.0</td>
<td>26.4</td>
<td>27.8</td>
<td>27.5</td>
<td>26.4</td>
<td>24.8</td>
<td>20.2</td>
<td>15.3</td>
<td>22.8</td>
</tr>
<tr>
<td>Minimum</td>
<td>13.5</td>
<td>16.3</td>
<td>18.4</td>
<td>18.9</td>
<td>22.5</td>
<td>23.3</td>
<td>23.9</td>
<td>23.4</td>
<td>22.4</td>
<td>20.3</td>
<td>17.7</td>
<td>11.3</td>
<td>19.3</td>
</tr>
<tr>
<td>Average</td>
<td>15.0</td>
<td>17.4</td>
<td>20.3</td>
<td>20.5</td>
<td>24.3</td>
<td>25.0</td>
<td>25.8</td>
<td>25.4</td>
<td>24.4</td>
<td>22.6</td>
<td>18.9</td>
<td>13.3</td>
<td>21.7</td>
</tr>
</tbody>
</table>

There was another important advantage for cultivating cinchona trees at Hekou Farm: the director and staff working on this farm, trained as professional forestry experts, had a very strong will directed at transforming Yunnan through modern agricultural science. The director, Zhang Jiliang, had graduated from the School of Agriculture, Guangdong University, majoring in forestry.95 Lin Yongxin 林永昕, his deputy director was also an alumnus from that college. As Lin recalled years later, “to cultivate cinchona trees to save the patients’ lives,” they were “resolute in their determination.”96 It was true that since “the foreigners kept the knowledge of cinchona cultivation as secrets,” they had

95 Gong wu ren zhen bie biao 公務人員甄別表 Zhang Jiliang 張吉亮, Yunnan Provincial Archives, 77-1-247.
little practical information or experience in cultivating this unfamiliar plant.\(^{97}\) They attempted to sow cinchona seeds eight times, but each time the trees all failed to sprout. Zhang Banghan still encouraged them by citing the example that the experiments of the drug Salvarsan failed 606 times before this magic bullet against syphilis was created.\(^ {98}\) On the ninth try, Zhang Jiliang and his staff at Hekou Farm experimented with a technological innovation: they first planted the seeds in boxes. This time the seeds finally germinated, and over 1,800 young plants were successfully transplanted in the mountainous topography of Hekou Farm. After 1936, they could sow the seeds of cinchona trees growing in Hekou.\(^ {99}\) This news was soon broadcast around China, as mentioned at the beginning of this chapter, Zhang Banghan and Hekou Farm became well-known in China’s science and medical journals. The Yunnan initiatives were praised, even though Hekou had many disadvantages for the successful cultivation of cinchona in China. With this model, there was great optimism that in the future, Chinese would continue “acclimating cinchona trees to Chinese environments.”\(^ {100}\)

**Cultivating Cinchona for the War:**

*Developing the Pusi Frontier and Anti-malarial Drugs*

The Yunnan state-building technocrats were not satisfied with the minor success they achieved in cultivating several cinchona trees in Hekou. They drafted ambitious plans to cultivate millions of cinchona trees in the southwest region or the so-called Pusi frontier 普思沿邊, where there was more suitable land at higher altitudes. After the

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\(^{97}\) Jin ji na shu chonghai baogao 金雞納樹蟲害報告(1938), Yunnan Provincial Archives, 77-23-93.


\(^{99}\) Yunnan jiansheng ting zhongzhi jin ji na zhi shikuang 雲南建設廳種植金雞納之實況, 1940, Yunnan Provincial Archives, 77-23-76.

\(^{100}\) Lin Xixun 林錫勳, “Yunnan zhi jin ji na” 雲南之金雞納, *Nong Shen* 農曆 225 (1942): 83.
outbreak of the second Sino-Japanese war in 1937, two new motive forces pushed them to put some of these plans into practice.

The first force was the perceived need to develop Yunnan’s Pusi frontier in order to supply resources and food for wartime needs. After the outbreak of the war, the Nationalist central government retreated to southwest China for its survival. Over one million refugees from Japanese-occupied areas as well as overseas Chinese also fled to Yunnan. As Micah S. Muscolino has shown in the case of land reclamation and wartime refugees in Shanxi province,\(^{101}\) to support the war and the huge population, it was becoming critical to stimulate Yunnan’s economy further to provide more food and resources. As Long Yun claimed in his speech on the relationship between the Anti-Japanese war and developing the province of Yunnan, Yunnan boasted rich resources, such as water power and “uncultivated wasteland”, which could be better utilized to achieve the final victory against the Japanese.\(^{102}\) Among these so-called fertile wastelands, the Pusi frontier was regarded as “the perfect cultivable land for agriculture (\textit{wan mei zhi nong keng qu} 完美之農墾區)”.\(^{103}\)


\(^{102}\) Long Yun 龍雲, “Changqi kanzhan yu kaifa Yunnan zhi guanxi xing”長期抗戰與開發雲南之關係性, \textit{Yunnan sheng zheng fu cong bao} 雲南省政府公報 vol.11, no.22 (1939): 24-25.

\(^{103}\) Jiang Yingliang 江應樑, \textit{Sipu yanbian kaifa fang’an} 思普沿邊開發方案 (Yunnan sheng minzheng ting bianjiang xingzheng sheji weiyuanhui 雲南省民政廳邊疆行政設計委員會, 1945), 34.
Since the Qing period, there had been many discussions and proposals on how best to develop the Pusi frontier. The most frequently mentioned solution was to move Han Chinese with sophisticated knowledge of agricultural methods into the area to cultivate the land. However, as James Scott and others have pointed out, this region was part of the so-called Zomia, where local indigenous regimes had maintained semi-autonomy for hundreds of years.\textsuperscript{104} The Chinese central government could not completely control this territory.\textsuperscript{105} What was worse, the Pusi frontier was notorious for its serious malaria endemicity. While the local Tai people could survive with hard-won resistance against malarial parasites, for most of the new Han immigrants, the disease was fatal.


\textsuperscript{105} For more on historical information about the Pusi frontier, see C. Patterson Giersch, \textit{Asian Borderlands: The Transformation of Qing China’s Yunnan Frontier} (Cambridge: Harvard University Press, 2006).
This was the land where “no Han could go for long.” Paradoxically, as David Bello pointed out, during the Qing period, the solution for eliminating malaria in Yunnan was still to encourage more Han Chinese to migrate and reclaim land there. Republican intellectuals and officials held a similar view: “…there is a mutual waning and waxing relation between reclamation and malaria… if more people move in, and all wastelands are reclaimed, malaria endemcity will just go away.”

After cinchona trees were successfully cultivated in Yunnan, Republican officials began to view cinchona tree plantations together with Han agricultural immigration as the best solution. Huang Riguang elaborated this point in a public lecture at Yunnan University in 1939: promoting the cultivation of cinchona was “the pioneering solution for reclaiming the malarial region.” Thus, it became necessary to transplant cinchona trees in counties of Pusi frontier beyond Hekou. To a certain extent, the cinchona cultivation in Southwest Yunnan frontier resembles Qing state’s agricultural reconstruction with tree planting in the northwest frontier, Xinjiang, in the 1880s.

To collect more information about the Pusi frontier, and seek suitable places for planting cinchona trees there, on November 27, 1938, Huang Riguang led an Investigating Team of the Pusi Frontier, starting their investigations in

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106 David Bello, “To Go Where No Han Could Go for Long: Malaria and the Qing Construction of Ethnic Administrative Space in Frontier Yunnan,” Modern China vol. 31, no. 3 (Jul., 2005), 283-317.
107 David Bello, “Malaria in Qing Yunnan,” Conference paper in Southwest Environmental History International Conference in Yunnan, August, 2014.
108 Jiang Yingliang, Bianjiang xingzheng renyuan shouce (Yunnan sheng minzheng ting bianjiang xingzheng sheji weiyuanhui, 1944), 53.
109 Liang Guangshang, “Yunnan jin ji na shu zhi peizhi yu kaifa nuequ” Yi shi bao (Kunming), June 16, no.10, 1939. I thank Prof. Zhou Qiong and her students in Yunnan University for providing this source.
those Pusi counties, such as Yuanjiang, Ning’er, Simao, Cheli, Fohai, and Nanqiao. The team returned on February 16, 1938. During this trip, they left some bottles of cinchona seeds in Cheli and Yunxian, instructing local officials to try to cultivate cinchona trees there. The major successes in this regard were achieved in Nanqiao and Baoshan. Zhang Jiliang brought seeds of cinchona to Nanqiao Forest Farm, finding that its altitude of 1400 meters was more suitable for cultivating cinchona, and thus a program was set up to cultivate cinchona there.\(^{112}\)

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112 Zhang Jiliang’s reply to the Yunnan Commission of Reconstruction, Yunnan Provincial Archives, 77-23-121.
In 1942, Yixi Farm for Tropical Plants was established in Baoshan County, specifically for cultivating cinchona. Yunnan initiatives regarded this farm as an important step to promote cinchona cultivation in Yunnan. Hekou farm provided as many resources as it could: the former deputy director of Hekou Farm, Lin Yongxin, was appointed as the director, and another 50 grams of new cinchona seeds were sent to Yixi Farm soon thereafter. Yixi Farm planned to plant 100,000 young cinchona trees in 1943; however, after four months’ failed attempts for cultivating cinchona, they temporarily abandoned this Yixi project. However, the seeds left in Fohai, and Nanqiao, especially in the local Mengzhe town were successfully cultivated, and hundreds of cinchona trees survived.

Another important motive for developing cinchona tree plantations was the need for anti-malarial drugs on the part of the central government. Malaria became a major national problem after the outbreak of war. Even though the Allies and international organizations provided huge amounts of quinine pills, the demand in total could not be met. There was a desperate search, or “bio-prospecting,” nation-wide for Chinese anti-malarial drugs that could serve as a substitute for quinine.

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113 Yi’xi redai zuowu shiyanchang wen ti 迤西熱帶作物試驗場問題 Yunnan Provincial Archives, 77-32-51.
114 Yunnan sheng jianshe ting Yi’xi redai zuowu shiyanchang 1942 niandu gongzuo baogao, Yunnan Provincial Archives, 77-9-966-02.
115 Yunnan Provincial Archives, 77-32-51.
116 Yunnan Provincial Archives, 77-9-966-02.
The most famous and successful case was the promotion of Chinese herb *changshan* (*Dichroa febrifuga*) in the 1940s, whose importance has been readdressed by Sean Hsiang-lin Lei. Lei notes that it had “paved the way for the governmental project to search for antimalarial drugs from Chinese herbs in the 1960s, which culminated with the world renowned discovery of artemisinin.”119 *Changshan* was recorded in many traditional Chinese pharmacopoeias and credited with certain efficacy against malaria, but modern/western medical practitioners in China did not trust it, since traditional Chinese medicine was regarded as useless during the early twentieth century, and there were no modern scientific experiments on *changshan*. Promoted by Chen Guofu 陳果夫 (1892–1951), one of the highest ranking members of the ruling Nationalist Party, who also believed in traditional Chinese medicine, in 1940, the central government set up a special institute to examine *changshan*’s efficacy with modern scientific methods, and finally proved it.120 Compared with quinine, *changshan* was much cheaper: to cure one malarial patient, it only cost 0.75 yuan, while only one quinine pill would cost more 1 yuan.121 The Nationalist central government soon began to promote massive *changshan* cultivation projects in Southwest China. In 1943, as ordered by Chiang Kaishek, a Changshan Cultivation Experimental Farm (農林部中央林業實驗所常山種植實驗場)

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was planned in the Jinfoshan 金佛山 region in Sichuan province, and in it was officially set up in 1945.122

![Image](image.jpg)

**Figure 51. Changshan in Li Shizheng’s Bencao Gangmu (Zhang Shaotang edition, 1885).**

But there was also another noticeable Chinese herb in use during wartime, which was soon forgotten after the war: *Bai Qianggan* 白槍桿 (*Fraxinus malacophylla* Hemsl, or *Fraxinus sinica* as it was called by Chinese researchers as China’s particular species). Unlike *changshan*, it had not previously been recorded in any Chinese pharmacopoeia. The knowledge that *Bai Qianggan* could cure malaria was only locally circulated in Southwest Chinese frontier zones. In 1939, Liu Shaoguang 劉紹光, Director of the National Drug Research Institute (*Zhongyang yaowu yanjiusuo 中央藥物研究所*) in Kunming used the powder of *Bai Qianggan* in a local clinic, curing seventeen malarial patients. In 1940, Liu published their team’s research on *Bai Qianggan*’s efficacy curing...  

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malaria, claiming that it contained a new alkaloid (he called it as sinine 新靈 xin ling) which was better than quinine. He also called for the massive cultivation of Bai Qianggan in China, because it was much easier to grow than cinchona trees. Following him, later on in 1940, the Yunnan Bureau of Reconstruction ordered Hekou farm to cultivate 100,000 Bai Qianggan plants. In 1941, the National Drug Research Institute cooperated with pharmacy companies to produce two types of new anti-malarial drugs based on Bai Qianggan: Chunine 瘴靈 and Sinine 新靈. And they even sent several samples to Yunnan Anti-Malarial Commission for clinical field use.

Figure 52. Bai Qianggan. From Feng Kuomei 馮國楣 and Feng Hanying 馮漢英, Yunnan de zao lin shu 雲南的造林樹 (Beijing: Zhongguo kexueyuan, 1954), 190.

Nevertheless, in this context of seeking anti-malarial drugs, still much more attention was paid to the cultivation of China’s own cinchona trees in Yunnan. In 1936, the Fourth Congress of the Chinese Medical Association sent an official letter to the Central Field Health Station of the National Economic Committee stating that to save

123 Liu Shaoguang et al., “Xi’nan kangnue yaocai zhi yanjiu” 西南抗瘧藥材之研究, Zhonghua yixue zazhi 中華醫學雜誌 27, no.6 (1940): 327-42.
124 Yunnan Provincial Archives, 77-23-76.
125 Yunnan Provincial Archives, 1030-001-00010-040.
lives in malaria-ridden areas, to save revenue, and to prepare for a possible world war, it was necessary to promote cinchona cultivation in China. The letter also asked the Central Field Health Station to send experts to open experimental farms to cultivate cinchona in China’s tropical provinces: Guangdong, Guangxi, Yunnan, and Guizhou. And “if successful, massive cultivations should be promoted at once.”\textsuperscript{126} The Central Field Health Station agreed to this plan, but could not engage in cinchona cultivation projects, due to limited resources and the extreme difficulty in cultivating cinchona.\textsuperscript{127} Hearing the news about Hekou’s successful cinchona cultivation, the Congress of the Chinese Medical Association then sent another letter to the Kunming Municipal Medical Association inquiring after details of their success, which was forwarded to the Yunnan Commission of Reconstruction. Following a suggestion by the Kunming Municipal Medical Association, the Yunnan Bureau of Reconstruction agreed that this was a good opportunity to attract the central government’s attention, and the bureau thus requested that Hekou farm prepare two copies detailing its cultivation achievements for the Congress of the Chinese Medical Association and the National Economic Committee.\textsuperscript{128}

Hekou Farm soon enjoyed a boom in the number of visitors in 1939, especially those from the Central governmental agencies, such as the director of the Factory of Hygienic Materials, and director of the Central Drug Research Institute. Most of those who visited agreed that Hekou Farm needed more financial support from the Central government. Before 1939, the monthly fund for Hekou Farm was only 300 \textit{yuan}; after September, 1939, the Yunnan provincial government allocated 870 \textit{yuan} each month, and

\textsuperscript{126} Quanguo yishi lianhehui zhi quanguo jingji weiyuanhui han, Yunnan Provincial Archives, 77-11-1965.
\textsuperscript{127} Weisheng shiyanchu huaxue yaowu xi jianzhu yijian 衛生實驗處化學藥物系建設意見, Yunnan Provincial Archives, 77-11-1965.
\textsuperscript{128} Yunnan Provincial Archives, 77-11-1965.
the Central Agriculture Department subsidized 250 yuan. However, the total funds were still too limited to promote massive cultivation projects. Among the visitors, Zhang Jiangzong 张建中, the provost of the Military Medical School was especially concerned with Hekou Farm’s financial shortage. After his visit in January 1940, he reported this situation to Chiang Kai-shek. Chiang agreed to provide more funding from the central government in February 1940.129

Hekou Farm also tried to gain more funding by proving that their cinchona bark contained a high percentage of quinine alkaloids. In November 1939, they sent several samples of cinchona bark to the Military Medical Bureau’s Army Factory of Hygienic Materials. And according to a 1940 report, these samples contained 6.54% quinine alkaloids, which reached beyond the minimum level of 5.4% required by the United States Pharmacopeia. In 1940, the farm sent two samples of cinchona bark to the Tonkin Institute of Chemical Analysis (in Vietnam) requesting that institute scientists examine their dosage of quinine alkaloids. And the results as the following table indicates were also quite promising.

<table>
<thead>
<tr>
<th></th>
<th>Dosage of Alkaloids in Three Years Old Plant (%)</th>
<th>Dosage of Alkaloids in Seven Years Old Plant (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cinchona legeriana</td>
<td>3.00</td>
<td>13.97</td>
</tr>
<tr>
<td>Cinchona succirubra</td>
<td>2.56</td>
<td>9.52</td>
</tr>
<tr>
<td>Cinchona malabar</td>
<td>1.75</td>
<td>7.92</td>
</tr>
</tbody>
</table>

129 Yunnan jianshe ting zhongzhi jin ji na zhi shikuang 雲南建設廳種植金雞納之實況, Yunnan Provincial Archives, 77-23-76.
During malaria epidemics in Hekou in the 1940s, local malaria patients were treated with Hekou cinchona bark prepared using traditional Chinese medical methods. And many of them were cured. The Hekou Anti-Malaria Station distributed self-produced quinine from the Hekou cinchona bark, which was also very effective in curing malaria patients. The Hekou staff claimed that this evidence was sufficient to prove that “cinchona bark from our farm is considerably useful.”

Yunnan’s cinchona cultivation project was now part of the national defense effort. The central government began to provide funding to the Yunnan Bureau of Reconstruction for its cinchona cultivation. In 1940, the National Congress (Can yi hui 參議會) proposed that the central government should utilize special medicines produced in Southwest China to save more wounded and sick soldiers’ lives, thereby strengthening China’s power against the Japanese. No doubt, cinchona was listed among those medicines (together with Bai Qianggan): the Congress proposal argued “since Cinchona trees have been successfully cultivated in Yunnan, if we then build factories to produce quinine, we may achieve self-sufficiency and even gain profits.”

With all these factors, in 1939, the Yunnan state-builders believed there would be a promising future for their cinchona cultivation project, and they drafted the following ambitious plan: from 1941-1945, Hekou Farm would cultivate millions of cinchona trees, set up eight new cinchona farms within five years, and even build a quinine factory in 1951. In the first year, everything was going well: the mature trees in Hekou numbered 3,000, and seedlings numbered more than 50,000. And several new farms were already

130 Yunnan Provincial Archives, 77-9-966-02.
131 Can yi yuan ti an 參議院提案, Yunnan Provincial Archives, 77-23-76.
established along the Pusi frontier, where cinchona trees had all successfully been transplanted.  

Table 13. Cinchona Trees Cultivated in Hekou Farm (1941).
From Yunnan Provincial Archives, 77-9-966-02.

<table>
<thead>
<tr>
<th>Location</th>
<th>Planting Time</th>
<th>Height</th>
<th>Condition</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mountain Field</td>
<td>5/1934</td>
<td>4 meters</td>
<td>Good</td>
<td>377</td>
</tr>
<tr>
<td>Mountain Field</td>
<td>5/1939</td>
<td>1 meter</td>
<td>Good</td>
<td>1560</td>
</tr>
<tr>
<td>Nursery</td>
<td>5/1939</td>
<td>none</td>
<td>Good</td>
<td>32000</td>
</tr>
<tr>
<td>Nursery</td>
<td>5/1940</td>
<td>0.1 meter</td>
<td>Good</td>
<td>40000</td>
</tr>
<tr>
<td>Baisa Field</td>
<td>5/1934</td>
<td>6 meters</td>
<td>Good</td>
<td>250</td>
</tr>
</tbody>
</table>

War-Time Destruction and Post-War Reconstruction

However, these plans never came to fruition. After the Japanese occupied French Indochina in late 1941, Hekou became a frontline zone in the war against the Japanese. Most financial and technological support from the central government was cut off, and the staff began to flee back to the Yunnan interior. Cinchona cultivation was totally suspended in 1943. After Director Feng Yulin died accidentally in 1946, Hekou Farm was officially abandoned, and then neglected. Of the remaining cinchona trees, only 100 or so of them survived, and these were handed over to a local military garrison.

In 1948, based on the observation that “cinchona trees are very important in medicine,” “cinchona cultivation in China only succeed in Hekou farm,” and “if abandoned, many years’ hardship and efforts in cultivating cinchona would totally wasted,” the Yunnan Bureau of Reconstruction proposed to re-start its cinchona

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132 Yunnan sheng zhengfu jianshe ting gongzuo baogao 雲南省政府建設廳工作報告 1941, Yunnan Provincial Archives, 77-9-971.
133 Yunnan Provincial Archives, 77-23-104.
134 Yunnan Provincial Archives, 77-23-179.
cultivation program on Hekou Farm. However, there were certain objections to this plan inside Yunnan’s government. Opponents insisted that “since modern synthetic drugs, such as Atabrine and Proguanil, have been invented, which are more powerful than quinine in curing malaria, we could just research and produce these new drugs. Why bother to cultivate cinchona trees?” Supporters argued that, “we need to take a long term view… the opponents’ argument is just like, ‘since man-made silk has been invented, we don’t need promote mulberry sericulture any more.’ Is that true? Even though there are man-made medicinal substitutes, quinine still has not lost its important role in curing malaria. Especially in China, we are not able to follow those Euro-American developed counties to develop substitutes, due to huge limits of human and economic sources. What is more, efficacy of Atabrine is not quite convincing in malarial-ridden areas. It will be our country’s loss and also a stupid idea to abandon cinchona trees in Hekou Farm!”

The new Yunnan governor Lu Han 卢汉 agreed with the arguments presented by those in favor of cinchona cultivation and in late 1948, he ordered that the Hekou Cinchona Cultivation farm be reopened. But soon thereafter with the Nationalist’s defeat in 1949, Hekou farm was taken over by the new Chinese communist regime. The PRC government continued this project in Yunnan, and set up several new cinchona cultivation farms along the Pusi frontier. Their purpose was not only to meet the need of its nation-wide public health campaigns against epidemics, but also to provide a reliable supply of quinine for other malaria-ridden communist countries, a plan not unlike the

135 Ibid.
136 “Hekou jin ji na shu cong chang xun li ”河口金雞納樹農場巡禮, Min yi bao 民意報, August 27, 1940. Cited from Yunnan Provincial Archives, 77-23-179.
137 Yunnan Provincial Archives, 77-23-179.
rubber plantation programs in Yunnan. As one agricultural expert pointed out, “the cinchona tree in Yunnan is not only the Chinese people’s treasure, but also the Cinchona mother trees (mushu 母樹) are for today’s socialist and new-democratic republics.”

Ironically, in 1953, Hekou farm itself was transformed into a new experimental field for rubber plantations to supply “communist” rubber to the Soviet Union. All its cinchona cultivation programs were entirely abandoned.

![Figure 53. Cinchona Trees in Yunnan (1970s). From Zeng Yanqin 曾延慶, “Yunnan de jin jí na shu” 雲南的金雞納樹, Redai nongye keji 熱帯農業科技 no.3 (1983): 48.](image)

In the 1960s, the PRC government re-started massive cinchona cultivation programs in Yunnan to support their Vietnamese comrades who were fighting against the Americans on the malaria-ridden battlefield, while during the same time for the same purpose they also initiated a secret Project 523 to look for new anti-malarial drugs. The

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139 Qin Renchang 秦仁昌, “Guan yu jin jí na shu de shèng chǎn” 關於金雞納樹的生產, *Zhiwu xuebao* 植物學報 13, no.1 (March 1954), 3.
140 *Hekou xian zhi* 河口县志, (Beijing: San lian chubanshe, 1994), 213.
efforts in re-cultivating cinchona eventually failed in the 1970s, but Project 523 successfully led to the renowned discovery of the new anti-malarial drug artemisinin from the traditional Chinese medical drug *qinghao* (*Artemisia annua* 青蒿).\(^{142}\)

Nevertheless, the cinchona cultivation program was not a total failure. Together with other programs of seeking anti-malarial drugs in southwest China during the wartime period, they paved the way for the coming of *qinghaosu*.

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Conclusion

Based on multi-sited primary archival sources, this dissertation explores the origins and development of tropical medicine as a new medical subfield in twentieth-century China from 1919 to 1950. Inspired by various network theories, including social network theory and the concept of global scientific networks, it illustrates how China became an international center for tropical medicine by the 1940s. It further demonstrates how modern Chinese tropical medicine developed out of the investigations and interactions of a transnational cadre of scientific and philanthropic elite (both Chinese and foreign) working in many different registers and on many different levels, who were linked together by complex local, national, and global networks. In particular, using malarialogy as the primary case study, the main body of this dissertation covers four distinct but at times interconnected scientific and technological networks: the PUMC’s Division of Parasitology (1919-1941), the CFHS Department of Parasitology (1931-1936), the Yunnan Anti-Malaria Commission (1937-1945), and the Yunnan cinchona cultivation program (1930s-1950s). In each instance, it situates the emergence of local, provincial, and national malaria research, modern mosquito control techniques, and cinchona cultivation in Republican China within a broader global context.

By illuminating the multifaceted experiences of these different networks in promoting Chinese tropical medicine and by demonstrating how they were, to varying degrees, driven by state-building, war and national defense, philanthropic, international cooperation, and personal professional agendas, this dissertation supports several new interpretations of the history of medicine in China—which can be more broadly applied to the comparative global history of tropical medicine and colonial medicine.
First, in line with revisionist trends underway for some time now, it rejects as too simplistic older “diffusionist” arguments that viewed western medicine as a benefit bestowed by technologically advanced civilizations on societies considered “backward,” Instead it argues that the development of Chinese tropical medicine—as demonstrated by the specific example of malariology—was not the result of the unidirectional diffusion of a well-defined medical system from the Euro-American “metropole” to the Chinese “periphery” but rather was a complicated and highly contingent process which involved diverse networks of both foreign and Chinese actors.

Second, it challenges the still dominant “colonial medicine model” in the history of medicine. This model, which is mainly based on European imperial and colonial experiences in South Asia and Africa, treats tropical medicine, or modern western medicine and science in general, either as a “tool of empire” promoted solely for western imperial expansion and colonial rule, or a type of “colonial modernity” addressed by post-colonial historians from the Indian subaltern studies group. This dissertation has underscored that international health organizations, philanthropic and scientific initiatives, such as those undertaken by the Rockefeller Foundation in support of the Division of Parasitology at the PUMC, were not necessarily motivated by imperialism but could represent genuine humanitarian impulses as well. What is more, it reveals that the ambitions and agendas of individual scientists, physicians, and officials working within overlapping and intersecting networks, mattered for shaping the contours of tropical medicine in China. Academic feuds, professional interests, educational background, sources of funding, and institutional ties, all predisposed different actors towards
different malaria research and control strategies, and sometimes competitions between these individuals and/or institutions could hinder research efforts.

Third, by arguing that tropical medicine in China was both a project of international health and a state-building agenda aimed at promoting public health and forging national identity in the creation of a hygienically modern nation state, this dissertation provides potential links and comparisons with Italy, Mexico and Argentina, where tropical medicine and malaria research/control, as state medicine, were greatly influenced by international health organizations in ways similar to the Chinese experience.

The thesis also makes several contributions to the history of modern China. In the first place, by arguing that the emergence of tropical medicine in China was closely intertwined with international and global developments, it supports the “internationalization” thesis of William Kirby and others and demonstrates the limitations of the China-centered approach when dealing with topics such as the history of twentieth-century medicine or science. It also insists that the development of modern science/medicine in China is not the story of the one-way transfer of scientific knowledge from the West, but a more global and interactive process. What is more, it shows how Chinese scientists and technocrats clearly viewed themselves both as nationalists and as part of a transnational community, the boundaries of which transcended specific national borders. Therefore, it enhances our understanding of the processes through which Chinese scientists and physicians contributed to globally circulating biomedical knowledge and practice in the first half of the twentieth century.
This dissertation has further demonstrated that the emergence of tropical medicine in China was part of a broader effort by the local and national “developmental states,” led by technocratic elites, to construct a “hygienically” modern nation-state within the context of intersecting local, national, and global networks of global health. Thus, it adds further evidence for those who argue that the Republican era “developmental state,” under the Nationalist regime actively sought to harness scientific and technical knowledge as part of its state-building, national defense, and economic development efforts. It also contributes insights into how the modern Chinese nation-state was constructed regionally as well as centrally. As we have seen from the chapters on malarial control in Yunnan, critical state-building efforts were carried out on the provincial level by the “local developmental state.”

Last but not the least, it contributes to on-going revisions of an earlier “failure” narrative about the Nationalist regime (1928-1949), and particularly adds to the growing body of literature on the pivotal period between 1937 and 1945—when China was at war with the Japanese—a crucial decade that has been understudied until recently. As the chapter on the CFHS Department of Parasitology has indicated, during the Nanjing Decade, newly established state-led scientific institutions indeed achieved substantial progress in medical research. This dissertation, particularly in the chapter on Yunnan Anti-Malarial Commission also points out that there was significant progress made even under difficult wartime circumstances, and argues that set-backs in the 1940s were primarily due to war and other factors that could not be anticipated or controlled by the party-state.
The Chinese experience of tropical medicine had a great influence on the development of public health in post-1949 China and global health in the post World War II era. As we have seen in the foregoing chapters, participants in the major networks of tropical medicine eagerly promoted massive health campaigns and epidemic control in the PR China. The best example of the lasting legacy of the networks constructed in the 1930s and 1940s is perhaps Zhou Qinxian, medical entomologist of the Rockefeller Foundation’s Malaria Program in China. In 1946, after the Japanese surrender, this program moved from Chongqing to Nanjing, where the first massive field experiments of DDT spray were conducted by Zhou and J.C. Carter of the Rockefeller Foundation. In 1948, Zhou and Carter went to Taiwan to continue their DDT and Anopheles control experiments. Based on pre-war and wartime mosquito research and control, as well as experimentation with DDT in mainland China, Taiwan would develop its own effective methods to control malarial-mosquitoes and totally eliminated endemic malaria on the island in 1965. This success would subsequently be promoted as a model by the WHO for other malaria-ridden countries.\(^1\) In the 1980s, Zhou, as an expert working for the WHO, was invited back to China, and he introduced Taiwan’s experience and helped train medical experts to control malaria on Hainan island.\(^2\)

As detailed in the preceding chapters, Republican-era networks of malariology and tropical medicine faced challenges and setbacks, some of which were brought on by personal or professional rivalries but most of which were due to China’s particular geopolitical circumstances at the time. By fits and starts, however, the individual

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\(^1\) Xu Fengyuan 許峰源, *Shijie weisheng zuzhi yu Taiwan nueji de fangzhi*, 1950-1972 世界衛生組織與台灣瘧疾防治 (Taipei: Guoji zhengzhi daxue lishi xi, 2015). I want to thank Dr. Xu for sending his book to me.

\(^2\) Zhou Qinxian, “Zhongguo chuqi fang nue gongzuo jian shi.”
scientists, philanthropists, and officials who planted cinchona trees or carried out malaria research and control measures together helped to establish the field of tropical medicine in China. In the long run, their collective efforts contributed to the exceptional health transition China experienced over the course of the twentieth century, making China a primary health model for other developing countries. In this sense, their impact on the development of Chinese public health and the rise of global health internationally has been profound, if not always remembered.
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