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Institutionalizing Modern Science in China:

Social Trends Accompanying Intellectual Shifts

from the Mid-19th to the Mid-20th Century

Wen Heng

Outline

Chapter One Introduction

The introduction establishes that the subject of the dissertation is the historical process through which modern science became an integral part of the Chinese society during the first half of the twentieth century. Current evaluations from the point view of an intellectual history characterize Chinese scientists as "estranged" from their country's urgent needs. Such approaches only constitute a small part of the intellectual shifts China was undergoing in the early decades of the twentieth century, and while recent scholarship has unveiled in more detail the internal dynamics of these intellectual shifts, its focus on the interpretation of "science" does not go very far due to the ambiguities of the concept in its original Western European context. Since science is as much a practice as a concept, institutional aspects need to be examined as well to achieve a better understanding of the process of development of modern science in China.

However, current case-focused institutional accounts of related disciplines, organizations, and individuals do not fully address the large social trends with which scientific development was closely intertwined, and thus fail to provide an overall picture. Attempts to achieve such a picture, on the other hand, apply the sociological frame of "institutionalization" of modern science. This approach suffers from a teleology inherent in the frame, whereby the historical process is broken down into various miniscule categories, again preventing an overall understanding to emerge. The Japanese experience, where the Meiji Government actively introduced modern science as part of its overall modernization project, hints a solution to this dilemma. Since an unequivocal purpose can be observed in cases where modern science was introduced, it is possible to characterize the activities of science promoters and practitioners as "institutionalizing" modern science. Scrutinizing the beginnings and early development of modern science in China in this light also helps bring to the fore several factors that have largely been overlooked heretofore.

Chapter Two

Half-hearted Efforts: Missionary Activities and the Self-Strengthening Movement, 1840s–1894

Piecemeal introduction of Western empirical knowledge into China started as early as the late sixteenth century, when the country was still under the reign of the Ming dynasty. This was done through missionaries, whom the imperial court generally welcomed but posed major restrictions in their preaching activities. The comprise the missionaries had to reach was to try to convince the emperor and high-profile officials of the superiority of Christianity through the useful technical knowledge native to the culture in which the religion was embedded, like astronomy and mathematics. Related scientific literature was translated into Chinese, and this missionary endeavor

lasted through the next regime, Qing, which was also China's final imperial era.

Warfare stemming from trade disputes forced China to open its market to industrial powers in the mid-nineteenth century. This provided missionaries with extra venues for evangelical activities, of which they made use to expand the introduction of modern science, mainly through education and publishing. Missionaries efforts were supplemented by the Self-Strengthening Movement launched in the early 1860s, whereby translation bureaus were also created to facilitate necessary literature for the newly built arsenals and shipyards. This period also saw the earliest official efforts of sending young Chinese overseas to learn advanced technology. Together with missionaries already in the field, these government enterprises enlarged the channels through which knowledge of modern science was introduced.

These developments have been well chronicled in historians' explorations of their interest in China's intellectual traditions, but these accounts only briefly deal with events after that. In contrast, this chapter looks at related events with the later institutionalizing process in mind. More than tracing missionary and government activities that only partially incorporated introducing facets of modern science, special attention is paid to these endeavors' limited impact on the Chinese intelligentsia and society at large. Underlying factors that rendered related trends insufficient offer clues to what conditions were necessary in order to generate a more systematic effort to import modern science for that purpose. As such, these half-hearted efforts during the last decades of Qing provide both an anchoring point and a frame of reference for the intellectual shift whose completion would require more profound changes in social conditions facilitated by future trends.

Chapter Three

Intrigued Learners: Studying Overseas, 1898–1910s

The defeat in the 1894–1895 Sino-Japanese War triggered a wave of reflection among Chinese intellectuals, and the result was a more comprehensive embrace of Western civilization. After domestic reform efforts ended up in vain after the failure of the so-called Hundred Days' Reform in 1898, prominent intellectuals and bureaucrats turned their eyes abroad and decided to import various branches of modern governing system from Japan. To secure the personnel for implementation, officials actively encouraged young Chinese to study in Japan. The choice of destination was later diversified by a program of sending students to the U.S. started in 1909, which stemmed from the indemnities that the Qing government had to pay the U.S. for its failure in suppressing the Boxer Rebellion at the turn of the twentieth century.

This growing trend of studying overseas for the first time produced a considerable number of Chinese well versed in science, amongst whom emerged science advocates determined to promote the development of modern science in China. Their first attempt was to introduce scientific knowledge to China through publishing, and based on that effort societies were established. The group in the U.S. took the first move as they launched the journal *Kexue* and formed the Science Society of China in 1915. This was followed by those studying in Japan, with the journal *Xueyi* started and Science and Art Society of China created in 1916. Both groups were convinced of the instrumentality of science in modernizing China and aspired to build a foundation for the practice of modern science within their home country.

Although the movement of studying overseas has been examined from various perspectives, its impact on the beginnings of institutionalizing modern science in China has not been sufficiently explored. The promoters of science, together with their practicing peers, have barely been seen in

the light of the earliest force trying to institutionalize modern science in China. To rectify this, this chapter acknowledges these actors as the personnel indispensable to the institutionalizing process and the implementation of necessary measures. That studying in Japan started a decade earlier than in the U.S. yet the first organized effort to introduce modern science to China originated from the latter experience indicates different trajectories of Chinese students in various places. A comparative perspective can thus be helpful in finding out the contingencies that accelerates or hinders institutionalizing efforts. This perspective becomes even more important after both groups relocated back to China and those who returned from the U.S. assumed a dominant role.

Chapter Four

Frustrated Advocates: Dealing with Political Turmoil, 1910s–1928

Once the mint promoters and practitioners of science moved back to China, they immediately realized the urgency of securing financing to maintain their activities, yet soon found their hands tied in a hopelessly vicious political setting. The absence of a functional education administration had also caused the low quality in science teaching in domestic education institutions during the 1910s, and even for those who had managed to find positions in universities and colleges, their teaching was more often than not stymied by the inadequate equipment of the science departments to which they were assigned.

Under such circumstances, Chinese educators actively sought any opportunity that could help relieve the situation. Their first target was the China Medical Board (CMB) of the Rockefeller Foundation (RF), which had been providing support to upgrade science education in missionary colleges to facilitate its state-of-the-art medical education enterprise in China, the Peking Union Medical College (PUMC). The scheme was extended to institutions under Chinese auspices from 1922 upon the latter's successful negotiations to enroll CMB cooperation. This alliance proved instrumental in channeling a major part of the second American remission of the Boxer Indemnities for the use of developing modern science, thus securing Chinese promoters and practitioners of science their own financial source through their active participation in the activities of the China Foundation for the Promotion of Education and Culture.

These dynamics concerning the patronage of China's scientific development have only been partially addressed through a stress on the U.S. impact in the development of modern science in China during the 1920s. Although such a narrative puts the presence of Science Society personnel in perspective, it nonetheless makes little direct reference to the participation of this group of science advocates in related activities, thus reducing these Chinese actors' activities to a submissive role. This chapter examines in greater detail financing as a crucial aspect of institutionalizing modern science in China by paying attention to the attempts to engage existing funding agencies and direct new financial opportunities toward the development of science. Such an emphasis on Chinese participation in the activities of the CMB and the China Foundation helps highlight the role of these funding agencies as portals linking individual energies as well as administrative thrust, which assisted a scientific community to emerge and burgeon.

Chapter Five

Consolidated Development: Enjoying a "Golden Decade," 1928–1937

Their American background navigated the major funding agencies through the 1920s largely immune from China's political chaos among the warring military cliques, and the venues of

activities concerning the development of modern science were further expanded toward the end of the decade when the Kuomintang (KMT) unified various factions and took power in 1928. For instance, the National Peking University, the base of the May Fourth Movement, had suffered from political activism over most of the 1920s, but was able to benefit from government intervention under the more stabilized KMT regime, whereby a funding scheme specifically for its science program was arranged in association with the China Foundation.

Likewise, incorporation of the development of modern science under state auspices enabled a generally favorable institutional environment for the development of both education and research in science. This was achieved most notably through the implementation of a unified education program, as the government took over the supervision of universities, who were able to enjoy a much more stable flow of funding than before. A bona fide education sector also made professors' job easier, as they could routinize their teaching and eventually find room for research. The 1930s then saw Chinese scientists making continuous contributions to the advancement of science on the international stage.

The involvement of the KMT government adds one more major participant in the ongoing efforts to institutionalize modern science in China, and it is tempting to examine related dynamics under the lens of the relationship between science and the state. Yet current characterization of scientists enjoying "autonomy" from government interference is too premature, as both a scientific community and a functioning national government were only beginning to take shape. To explore this relationship in richer detail, this chapter then looks at the nuances in the interactions between China's burgeoning scientific community and the state forces by examining how each party sought support from the other to advance their own causes. The picture resulting from related dynamics suggests that the KMT government showed little special interest in scientific development, and what Chinese scientists were able to enjoy was at best a relatively laissez-faire environment where they could follow their own research interests. Meanwhile, by making use of government resources wherever possible, promoters and practitioners of science were able to further strengthen their own community.

Chapter Six

A Resilient Enterprise: Surviving the War, 1937–1945

The Nanking decade, during which modern science developed in a robust fashion even without an actively supportive stance on the part of the Kuomintang government, came to an abrupt end in July 1937, when Japan launched its full-fledged invasion into China. This national crisis immediately uprooted every aspect of the Chinese society, and scientists, together with the infrastructure on which they had been increasingly relying, were not spared. At the outset, the locale where activities in the education and research of science took place moved from China's prosperous coastal areas to its largely impoverished hinterland. With prewar abundant lifestyle impossible to sustain, scientists had to deal with more mundane issues before their work, which itself had to depend on improvisation in many occasions as most of the equipment and material resources had been left at home.

With an ongoing war, the Kuomintang government tightened its control over all civil sectors by setting priorities for them to follow, which had profound albeit sometimes indirect impact on both education and research of science. On the one hand, education policies during the war stressed immediate utility, and students who chose to study natural sciences accordingly decreased in number.

On the other hand, the KMT's lack of specific interest in promoting scientific research continued into the war, and with a much more limited amount of resources at disposal, distribution favored those enterprises that could tangibly help the government strengthen its stand in the conflict, necessarily leaving scientists to their own devices.

How promoters and practitioners of science coped with the devastating situation and continued their activities during the war with remarkable perseverance has been depicted in histories of various branches of natural sciences and related organizations. Although these accounts are helpful in evaluating the resilience of China's scientific community shaped through previous institutionalizing efforts, their focus on specific aspects makes that big picture incomplete. As a remedy, this chapter looks at the scientific community's wartime experience from the perspective of continuities and discontinuities. This is done not only through an evaluation of the relationship between scientists and the state during the war, but also by paying attention to external forces that helped sustain China's nascent scientific enterprise. The ability of scientists both to retain their identity even without active support from the KMT government, and to prove their value through the engagement of foreign assistance, testifies to the success promoters and practitioners of science had made in their prewar efforts to institutionalize modern science in China.

Chapter Seven Conclusion

This chapter looks back at the institutionalizing process of modern science in China. It took some time before old intellectual conventions broke down, but once that took place, almost without missing a beat some Chinese studying overseas became determined to institutionalize modern science to fill the void left behind. Step by step the small group engaged at first prominent intellectuals, then funding agencies, and eventually the state to further their cause. These efforts created a place for modern science in the Chinese society, and by gradually expanding that place, a scientific enterprise emerged resilient enough to survive a brutal war.

Such an institutionalizing history constitutes a more comprehensible understanding of the process through which modern science became an integral part of the Chinese changing society. This clearer picture also fills several gaps in the more detailed intellectual and institutional accounts concerning the development of modern science in China. Intellectual shifts are now more tangibly manifested through a generational rift amongst the Chinese intelligentsia between those following old domestic conventions and those exploring the various connotations of modern science while studying overseas. Meanwhile, through a closer look at patronage and state involvement, entities such as the China Medical Board, the China Foundation, and the Kuomintang government have a more highlighted presence.

All these insights contribute to a new historiography where the state of "estrangement" between science and the Chinese society is taken as a mere premise, and attention is instead directed to the process of how promoters and practitioners strived to integrate modern science into their country by eliminating that very state.