

Mapping the Japanese Empire: Colonial science in Shanghai and Manchuria

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Introduction

Is there a Japanese style of colonialism? In *Colonialism's Culture* Nicholas Thomas argues the need for more localized theories and historically specific accounts in the study of colonizing practices.¹ This paper attempts to analyse colonialism as a cultural process, focussing on how science provided a host of signs, metaphors and narratives.² This paper is divided into two major parts in order to show that the Japanese attempted to project scientific discourses in a number of regions under their influence at the same time, using similar institutions, practices and representations to control the people. The first part of the paper examines colonial/neo-colonial science in Manchuria and the second focuses on Shanghai - two "places" which were (1) collecting sites for data, (2) locations which would be mapped and ordered as part of Japan's growing sphere of influence, and (3) sites for the display of the phenomena that were gathered and exhibited in libraries, museums and research institutes and reported on in journals.³

Some twenty years ago George Basalla proposed a model for describing the introduction of Western science into non-European countries. Basalla's model consists of three overlapping stages. The first is when the country in question acts as a source for European science through scientific expeditions. In the second a colonial science is developed which is still based on the institutions and traditions of a scientifically advanced nation. The third and final stage is the development of a national science.⁴

The term "colonial science" refers to the overt use of a scientific "cover" for territorial expansion and also, as suggested above, to the use of a colony or territory as a source of scientific and often commercially useful material and data by the home country. There is also a linkage between

colonial science and scientific colonialism, a systematic approach to the domination of a colony.

Japanese historians of science have not developed Basalla's model. This is partly because the historiography of expansion in Japan has tended to be nationalistic in flavour and used before the Second World War as a way of justifying Japan's "right" to expand overseas. Marxist historians who have written on the subject have tended to see Japanese expansion as a result of pre-war Japanese fascism. Recently, however, renewed interest has been shown in Japanese imperialism in Asia, partly as a result of research by American scholars.⁵

The Japanese government during the Meiji period was able to establish modern science in Japan without having to enter into a "colonial-type" dependency relationship with an outside Western power. Japan's colonial empire, however, provides a case in which Basalla's three stages may find interesting application. China provides an example of how a number of industrialized nations sought to gain a foothold in order to ensure that their own interests in Asia would be safeguarded.

Colonial science in Manchuria

Early attempts to establish Manchuria as a source for Western science can be traced back to 1896, when the Russian botanist Vladimir Komarov, together with two other naturalists, carried out a scientific expedition to explore Manchuria and especially the regions where the lines for the new Manchurian railway were to be marked out.⁶ This connection between science and imperial expansion is all too clear from the end of the 19th century onwards.

By the end of the Russo-Japanese War in 1905 the Japanese had won dominance over southern Manchuria and the railway lines from Mukden to the port of Dairen.⁷ The South Manchuria Railway Company (SMR) was established by Japan in 1906, half of the company's original capital being provided by the Japanese government. This company dominated the Manchurian economy, with control over railways, coalmines and industrial plants. The railways provided Japan with the means by which to exploit Manchuria's natural resources and territory beyond its borders. The next few decades saw a period of intense railway rivalry between China, Russia and Japan in which economic and territorial rights were at stake.⁸

The first president of the SMR was Goō Shinpei, who had been chief civil administrator in Taiwan during the period 1898-1906. Goō advocated a scientific approach to colonialism which stressed the need for research for colonial development and which included the use of railways as a force for

"progress".⁹ Gotō advocated a "scientific" approach to colonial governance and development and what he referred to as "biological politics":

Any scheme of colonial administration, given the present advances in science, should be based on principles of biology. What are these principles? They are to promote science and develop agriculture, industry, sanitation, education, communications and the police force. If these are satisfactorily accomplished, we shall be able to persevere in the struggle for survival and win the contest of "the survival of the fittest". Animals survive by overcoming heat and cold and by enduring thirst and hunger. This is possible for them because they adapt to their environment. Thus, depending upon time and place, we too should adopt suitable measures and try to overcome the various difficulties which confront us. In our administration of Taiwan we shall then be assured of a future of brilliance and glory.¹⁰

In Gotō's eyes, colonial policy must restructure the social and physical environment in order for certain social changes and evolution to occur. Gotō invited Japanese scholars to examine and compile information on Chinese legal history and customs in order for Gotō and his administrators to implement certain reforms.¹¹

The Japanese colonial administrations showed a concern for the history and cultural traditions of the territories. Research and publications on the cultural heritage and historical preservation resulted in a positive contribution to their subject peoples by Japanese colonial rule. This included multi-volume histories, biographical dictionaries and huge compendia of fauna and flora of various places.¹² Colonial universities and colleges were established in Seoul, Taipei, Lushun and Manchuria during the 1920s, but the majority of students were Japanese. Scientific research which was conducted in the colonies tended to be limited to studies which were deemed "necessary for local development", while pure research was confined to the imperial universities back in mainland Japan.

During the 1920s and 1930s Americans too went to China to help reform agricultural practices. This confidence in American know-how was also reflected in the plans of the Rockefeller Foundation to help bring about change in rural China. The Chinese, it seems, were eager to obtain American advice regarding new agricultural programmes for Manchuria in order to strengthen China's hold there, especially in view of Russia's and Japan's designs on the territory. According to Edward C. Parker, a 27-year-old agriculturalist who worked in Manchuria around 1908, Manchuria was "the ideal experiment ground of all Asia for the testing of Western methods of economic progress on Eastern people".¹³ Manchuria was thus perceived by the Americans as a laboratory, a space in which social and scientific experiments could be carried out.

The Rockefeller Foundation's role in Western scientific and medical education in China is well-known. The foundation created the China Medical Board in 1914 to oversee its activities in medical education in

China. It in turn was responsible for the establishment of the Peking Union Medical College which was formally dedicated in 1921.¹⁴ The foundation's interest in building up goodwill in China was not entirely selfless. It should be noted that by the 1930s the biggest American-owned business in China was the Standard-Vacuum Oil Company, owned partly by Standard Oil of New Jersey. The operation represented an investment which has been estimated at US\$43 million, the largest such American commitment in all of East Asia. (John D. Rockefeller and his brother William had formed the original Standard Oil Trust back in 1882.)¹⁵ Kathleen Dugan has written of the involvement of the foundation in funding Davidson Black's research on the prehistoric Peking Man which had been discovered in 1926.¹⁶

In the years leading up to the 1930s there was the potential for Japan, Russia and other countries to use the plague as a pretext for moving into Manchuria if China were seen as not being able to cope.¹⁷ There is a large number of scientific papers published in English by research staff of Japanese institutions in Manchuria and China which reflect how epidemics provided opportunities for scientific research and promote the notion that the Japanese presence is necessary and desirable.¹⁸ If disease was to be controlled not only in the laboratory but throughout Manchuria and China, the people and the features of the laboratories would themselves have to be imposed upon the landscape.

The veritable "mapping", that is recording and description, of China by American interests showed the Japanese and others that here was space open to scientific appropriation. Further examination of Japanese scientific activities in its colonies and territories of influence will enable us to understand how they conceptualized the space of their activity. Manchuria, it can be argued, provided a space for the Japanese "mapped out" by railway lines and their collections of scientific data. However, it was essentially a Western concept which helped the Japanese on their mission to make the space of "Manchukuo", the Japanese puppet state born in March 1932, their own. The new name was a means by which the Japanese-led Kwantung Army and the SMR were able to impose a new concept on Manchuria, a way by which the Japanese established their domain. By 1939 the Japanese army had gained control of the major Chinese cities and railways. The railways were more than just "trains". They served as agents for Japanese expansion. Besides the trains the Japanese brought their own geography (Japanese place-names) and architecture,¹⁹ which helped to create a break with tradition and loudly proclaimed a new history for the region.

Japanese-staffed laboratories were an important part of the colonial enterprise, for without the transfer of the necessary personnel and features of the physical setting from the home country it would not be possible for experimental procedures to be reconstructed, standards to be maintained or data to be analysed.²⁰ With the construction of laboratories Japanese researchers became authorized inhabitants of the space and the local

inhabitants whom they gazed upon would in turn become visitors, objects of study or support staff.²¹

The objectification of the population was taken to an extreme with the bacteriological experiments on human subjects conducted in Manchuria during the Second World War. Manchuria offered opportunities for experiments and funding which were not available in Japan and a moral space where anything was permitted. Tsuneishi has looked at the role of social factors in the formation of the biological warfare unit led by the Japanese army surgeon Lieutenant Ishii Shiro in the 1930s and 1940s. The activities of the unit, Unit 731, were partly an attempt by medical doctors in the War Ministry to raise their own status.²²

The most prominent Japanese organization supporting scientific research in Manchuria was undoubtedly the SMR, Japan's engine of progress in Manchuria.²³ In recent years a spate of books on the SMR, mainly reminiscences, has been published in Japan.²⁴ The company established a number of research institutions, the Central Laboratory and the Geological Institute in Dairen being two of them. These institutions employed scientists who were given the task of finding exploitable resources and developing manufacturing processes which would lead to the creation of new industries. The Central Laboratory consisted of eight divisions: analytical chemistry, applied chemistry, textiles and dyeing, ceramics, fermentation, sanitation chemistry, electro-chemistry and a section called "detail".²⁵ The laboratories authenticated knowledge and lent legitimacy to colonial policy.

One of the primary activities of the SMR Hygiene Institute, established by the company in 1925 in Dairen, was to fight the epidemics which were rampant in Manchuria at the time. The Hygiene Institute was given the responsibility of advancing public health and overseeing sanitation in Manchuria and [Inner] Mongolia. In 1937 there were over one hundred employees spread over seven sections: bacteriology, serology, vaccines, pathology, chemistry, hygiene and general affairs. In addition to research activities the Institute was active in the manufacture of vaccines and pharmaceuticals.²⁶

Such activities or "public services" were, it seems, funded from the earnings of the SMR railway operations and the mines that it operated. They were considered as being part of the industrial and cultural development of Manchuria. For the financial year ending in March 1927 the following amounts were reported as having been spent by the SMR on "public services" (yen):

Hospitals	4,617,541
Schools	2,731,238
Libraries	178,320
Sanitation	183,123
Central laboratory	304,382
Agricultural experimental stations	296,886
Sanitation laboratory	134,229
Infectious animal diseases	101,743
Afforestation	65,561
Specimen halls	51,449
Administration	735,077
Local administration	951,389
Education	613,552
Encouragement of industrial enterprise	397,430
Water	469,292

There were additional costs involved in running the above operations. Museums, for example, are not included in the above.²⁷ The different categories in effect give the various institutions of colonial authority and convey a sense of order.

Institutions such as the Manchukuo Institute of Scientific Research and Manchurian museums produced English-language research reports which served to disseminate throughout the world the achievements of Japanese colonial science in Manchuria. The museums reminded readers of the reductive nature of the scientific enterprise, housing within their walls and publishing in their journal pages the gems of knowledge that they had collected.²⁸ They provided the public face of "objective", "non-political" science. Manchuria would provide knowledge for the rest of the world, and a space in the Asian continent for the Japanese.

While the scientific journals published by the institutions appear to be highly technical, they display many characteristics of colonial science which might be of interest to the historian. Ryūji Endō's paper on fossils published in 1937 by the SMR's Manchurian Science Museum does refer briefly to changes in the peace and order. He outlines how bandits and anti-foreign feeling in the Hsiao-shih area in 1928 prevented much fieldwork from being

carried out whereas in the 1930s (with occupation by the Japanese) he was able to re-examine some of the localities.²⁹

Many papers suggest an emphasis on studies which could be of commercial benefit. They show how the mapping of Manchuria depended on economic as well as strategic factors. Perhaps more importantly the very many papers produced established, by their sheer volume and continued publication, a type of authority derived from scientific discourse, from "knowing" Manchuria, which legitimated the presence there of the Japanese and enabled them to survey the landscape.

What is also clear from the papers is the existence of research networks between Manchurian institutions and universities back in Japan. These links facilitated data collection, provided channels for the flow of specimens to the home country and helped make local knowledge global. There were, for example, amateur scientists who, while normally pre-occupied with commercial work for Japanese companies in Manchuria, would come across interesting fossils that they would report about to scholars in universities in Japan. For them, Japan was the centre and Manchuria was the periphery. Publications also show information flowing back to scholars in Japan and research funding emanating from the centre flowing to the periphery. In the process Manchuria and its occupants were reduced to fossil-like specimens which could be counted, described, classified and rendered harmless.

Colonial science in Shanghai

In the 1920s the Japanese increasingly dominated Shanghai's economic life. They also sought to influence the city's cultural and intellectual life as well. Science enabled the Japanese to root themselves in a foreign landscape. By categorizing and historicizing the Chinese people and their environment they were able to map out their territory, fashioning boundaries and making differences where it suited their interests. This enabled the Japanese to create order where they felt none existed.

The Shanghai Science Institute was one part of the imperial architecture which helped the Japanese to stake their claim in the Shanghai cityscape. Shanghai was an international space in terms of the foreigners who flocked there and also when viewed as part of the network of science which existed between nations. Nature was seen as transcending national boundaries and its pursuit (all the way to Shanghai!) provided a useful excuse for colonial expansion. Laboratories were established in order to spread Western science and rationality, enabling the scientific data which were gathered to be reported in a manner suitable for journals.³⁰ An understanding of the activities of the institute should help us better come to

grips with the process of formation of empire and the attempt by the Japanese to reorganize China spatially, architecturally and scientifically.

Japan was not the only imperial power to take an interest in Shanghai. Peter Buck has written:

Missionary physicians and educators in late 19th-century China assumed that the principles of sound social order were concurrent with the laws of nature. They attributed the chief differences between China and the United States to the failure of the Chinese to structure their lives in accord with those principles and laws.³¹

The French, too, were of like mind. By the end of the First World War Shanghai boasted a French trade school, a French Jesuit university and Jesuit-run geophysical and astronomical observatories. Funding came from the French Ministry of Foreign Affairs, Jesuits in France, French commercial concerns and other sources. (The Japanese-run Shanghai Science Institute was in fact located in the French concession.) Such educational activities enabled military movements or commercial activities to be recast as scientific research. Research institutions were also structures designed to accumulate information.

The Shanghai Science Institute was one of the major components of Japan's "cultural" activities, an attempt to emulate the cultural diplomacy of Western nations. It was established in 1925 from Boxer indemnity funds and later funded by the cultural projects section of the Ministry of Foreign Affairs. The institute consisted of eight divisions: physics, chemistry, geology, biology, pathology, bacteriology, hygiene and pharmaceutical research (especially herbal medicine).³²

The institute was part of the Japanese presence in China, which served to ensure that Japan's economic and interests were looked after. It arose allegedly from "the necessity of endeavouring to raise the scientific ability of Chinese scholars", but almost all the researchers were Japanese.³³ The establishment of the institute can be considered rather an attempt to gain international scientific recognition.

The exploitative side of the institute was apparent to the Chinese from early on. Initially the research institution sought allies or "collaborators" in Chinese society. A board was formed called the "Tōhō Bunka Jigyō Shanhai Iinkai" ("Eastern Cultural Project Shanghai Committee") with ten Japanese members and ten Chinese. The Japanese included Okōchi Masatoshi, who was the Director of the Institute of Physical and Chemical Research in Tokyo. The first general meeting of the committee met in Shanghai in 1926 to plan the structure of the institute and to discuss research activities. In July 1927 a secretariat was formed, called the "Shanghai Rinji Jimu Iinkai".³⁴ Okōchi was later to become the chief planner of the "Tairiku Kagakuin" ("Continental Academy of Science") in the puppet state of Manchukuo. As

Eikoh Shimaō has suggested, "All this was a rehearsal of the mobilization of science by the state, which was not so easily feasible in the homeland."³⁵

In 1928, even before construction had started, the Chinese members of the Shanghai committee resigned because of the Tsinan Incident. The lack of Sino-Japanese co-operation served to reinforce the notion of the backwardness of the Chinese. The Japanese would have to enlighten the Chinese all by themselves. To a large extent the reluctance of the Chinese to become involved in the venture was solved by the employment of Japanese personnel and the distribution of findings throughout the world to an international audience rather than to a local one.

Architectural plans for the imposing, neo-gothic main building were completed in 1928 by Prof Uchida Shōzō of Tokyo Imperial University. The Shanghai committee wasted no time. Even during construction scholars conducted research on Chinese herbs, gravitation and magnetism, fish, geology, inorganic compounds, fermentation and epidemics.³⁶ These activities constituted what the Shanghai SMR in 1929 described as the "necessity of scientifically systematizing and co-ordinating the study of China".³⁷ As Timothy Mitchell has written,

Colonialism was distinguished by its power of representation, whose paradigm was the architecture of the colonial city but whose effects extended themselves at every level. It was distinguished not just by representation's extent, however, but by the very technique.³⁸

The institution which represented China to the world was located in the south-western section of the French concession of Shanghai, on a site of about 17 acres. Construction ended in August 1931. The cost of land and buildings was 2,500,000 yen. Equipment in the main building was valued at 800,000 yen. With such an investment the Japanese were anxious to formally open the institution. The Shanghai Science Institute opened its doors on 1 April 1931. Although its professed aims of enlightening the Chinese may have been viewed as a joke by the Chinese, the Japanese went earnestly about their research activities. The first director in charge of the institute was Emeritus Prof. Yokote Chiyonosuke, formerly of the Faculty of Medicine at Tokyo Imperial University. He continued in that position until February 1935 when a former president of Kyoto Imperial University, professor of astronomy and member of the Shanghai committee Shinjō Shinzō, was appointed in his place. That year (fiscal 1935-36) running costs amounted to 440,000 yen. There were 133 staff members as of June 1936.

The institute published two scientific journals, *Shanghai Shizen Kagaku Kenkyūjo Ihō* and *The Journal of the Shanghai Science Institute* which were sold by Maruzen in Japan, Kelly and Walsh Ltd in Shanghai and the Kai Ming Book Company Ltd in Shanghai. (During the Pacific war the Uchiyama Book Co. acted as agent for the sale of institute publications in Shanghai.) In addition to these journals from just before the time of the

Marco Polo Bridge Incident in July 1937 the institute also began to publish a monthly report on the educational and cultural scene in China. The report, entitled *Chūgoku bunka jōhō*, contains a wealth of information on institutions and individuals involved in the arts and sciences.³⁹

Some 14 Chinese researchers/assistants worked at the institute, but as was the habit of colonial science at least eight of these were graduates of Japanese tertiary institutions and six of these had gone to Japanese high schools. In the eyes of the Chinese the allegiance of these Chinese researchers was no doubt suspect. Chinese students who had studied in Japan under Boxer Indemnity stipends had to pledge that, "after graduation, I shall remember this beneficence and strive to reciprocate this favour from His Majesty the Emperor".⁴⁰

Similarly, one can discern links with the young Japanese researchers and the professors who had been original members of the Shanghai committee. Some of the researchers went on to become prominent scholars in the "mother country" after the Second World War. Toyama Ichirō joined Emperor Hirohito in conducting research in the Imperial Household Agency biology institute. Hayami Shōichirō became a professor of physics at Kyoto University. Komiya Yoshitaka, a researcher in the hygiene section of the Faculty of Medicine, Tokyo Imperial University, joined the Shanghai Science Institute in order to avoid political persecution in Japan rather than become an agent of Japanese imperialism. He had joined the Communist Party of Japan in 1930 and was subsequently jailed for three months. He went to Shanghai on the advice of university professors and conducted research on parasites.⁴¹

We have seen that epidemics in Manchuria and China provided opportunities for scientific research. A paper by Kuroya Masahiko and Ono Hiroshi studied the Shanghai cholera epidemic of 1932. It reports on how other Japanese researchers had studied cholera in Manchuria, Shanghai, Kwangtung and Harbin, reporting the results at a bacteriology conference back in Japan. There appeared to be considerable similarity in the types of cholera *vibrio* in areas of Japanese influence, namely Manchuria, Formosa, Shanghai and Japan, which suggested that they may have been linked. Such fears had been the concern of Americans over twenty years before. In 1910 the *Journal of the American Asiatic Association* reported:

The present intolerable hygienic and sanitary condition throughout China is, in this day of increasing political and commercial relationship, of great importance to the Western world. The United States, especially in considering the millions of dollars that were expended on the California coast last year for the extinction of the plague that had come directly from an Asiatic port, should feel a grave interest in any steps that are taken to ultimately do away with the conditions that make possible this great source of infection.⁴²

The Japanese were able to obtain information on the distribution of two types of cholera *vibrio* throughout Shanghai, courtesy of the Greater Shanghai city authorities. The names, homes and period of illness of cholera patients enabled the Japanese to literally map out Shanghai and appropriate the bodies of the sick into their colonial enterprise.⁴³ The visual representation of the location of cholera sufferers shows the precision with which the Japanese ordered their world. What is also striking is the Japanese enthusiasm for data and their desire to enhance their international prestige through publicizing their findings. For example, a separate print of the paper in question was received by the University of Manchester library on 3 April 1934, a few months after its publication.

The flow of publications continued even after the Second World War had commenced. The fate of geophysics research by Higashinaka Hideo is instructive. His paper, entitled "Investigation of the magnetic anomalies relating to the geological structures of the Chin-lin-chên iron-ore field, North China", was published confidentially in May 1938 by the North China Research Institute of Agricultural and Industrial Sciences. Permission was obtained from the Department of Foreign Affairs and Shanghai Science Institute to publish openly in the institute's journal. The paper was published in November 1940 and a separate print found its way to Manchester on 5 May 1941. This would suggest that cultural diplomacy continued right up until the beginning of the Pacific war.⁴⁴ The paper was the result of a magnetic survey of an iron-ore field in Shantung Province, North China, another form of "mapping" of China if ever there was one. It was conducted in the summer of 1937, amidst growing anti-Japanese feeling. This was conveyed within the context of a scientific paper in the following way:

The field surveys in China hitherto undertaken by Japanese have been accompanied by many anxieties and personal difficulties even when government protection was given. At the time of this survey the relations between Japan and China had deteriorated very much. Our work was interrupted several times by villagers. On one occasion one of them threatened us with a revolver.⁴⁵

Conclusion

The enthusiasm of Japanese scientists, in the face of real danger, to persist with their work shows how determined they were to sort and organize China, to reduce it to manageable proportions suitable for the pages of academic journals. This can be partly understood by the way in which "objectivity" assumed a distance between the observer and the observed, between colonizers and the colonized. The "Chinese" were not so much the "other" to the Japanese but rather a race lower down in the hierarchy in terms of industrial development, hygiene, rationality and order. To show this the

Japanese used Western labels to specify and categorize, in effect mapping an Asian people with a Western tool of empire. The large number of scientific papers which emanated from the institute placed the Chinese under the scrutiny of its text. The attempt to establish a colonial science network with the home country can be traced to the desire to impose structures which would somehow promote stability. By so doing the Japanese, who had borrowed heavily from Chinese culture over the decades, could compare themselves and see how far they had developed using a European yardstick to gauge it.

Such cultural policies did not engender a great deal of respect from the Chinese. After all, the Japanese were offering to the Chinese science and technology that they themselves had borrowed from the West, a secondhand type of knowledge if ever there was one. A show of force would, however, overcome any type of cultural resistance. In July 1937 the Marco Polo Bridge Incident occurred and soon after, in August, fighting broke out in Shanghai.⁴⁶ The Japanese, according to *Milestones of Progress*, a monthly supplement of the SMR Co. magazine *Contemporary Manchuria*, began flooding into China at an average rate of 206 per day.⁴⁷ The magazine suggested that it represented a

highly selected group in view of the great aim, the construction of a new order in East Asia, and no one who is not considered to possess the qualifications is given a permit to enter China.⁴⁸

In 1939 ten Chinese cities had 5,000 or more of these superior-type Japanese, Shanghai topping the list with 47,289. The Japanese sought to recontextualize the Chinese into the "Greater East Asian Co-prosperity Sphere", the people being subsumed by the grand narratives of Japanese colonialism and Western science. The establishment of numerous research institutions in China and Manchuria placed these territories within a new order, giving them a new history and place in time. The Shanghai Science Institute provided a model for colonial research institutes set up in territories under Japanese influence. The institute buildings are now used by research organizations affiliated with the Chinese Academy of Science. They form part of the "colonial legacy" of Japanese occupation and an example of the creation of an international space which transcended geography and architecture.⁴⁹ Through the use of Western science the Japanese sought to impose a modernity on the Chinese which was entwined with their own colonialist project.⁵⁰

Notes

- 1 Nicholas Thomas, *Colonialism's Culture: Anthropology, Travel and Government*, Cambridge: Polity Press, 1994.
- 2 For one excellent example see Warwick Anderson, "'Where every prospect pleases and only man is vile': Laboratory medicine as colonial discourse", *Critical Inquiry*, Vol. 18, Spring 1992, pp. 506-529.
- 3 See the discussion of "place" in Charles W.J. Withers, "Geography, natural history and the eighteenth-century enlightenment: Putting the world in place", *History Workshop Journal*, No 39, 1995, pp. 137-163.
- 4 G. Basalla, "The spread of Western science", *Science*, 5 May 1967, pp. 611-622.
- 5 L. Blussé, "Japanese historiography and European sources", in P.C. Emmer and H.L. Wesseling (eds.), *Reappraisals on Overseas History: Essays on Post-war Historiography about European Expansion*, The Hague: Martin Nijhoff for Leiden University Press, 1979, pp. 193-221. An example of American research is R.H. Myers and M.R. Peattie (eds.), *The Japanese Colonial Empire 1895-1945*, Princeton: Princeton University Press, 1984.
- 6 E. Bretschneider, *History of European Botanical Discoveries in China*, London: Sampson Low, Marston and Co., 1898; Mitsuzo Noda, *Chūgoku tōhoku (Manshū) no shokubutsushi* (The Flora of North-Eastern China/Manchuria), Tokyo: Kazema Shobō, 1971.
- 7 Michael A. Barnhart, *Japan Prepares for Total War: The Search for Economic Security*, Ithaca: Cornell University Press, 1987, p. 17.
- 8 See Chao Wei, "Foreign Railroad Interests in Manchuria: An Irritant in Chinese-Japanese Relations (1903-37)", unpublished Ph.D. dissertation, St. John's University, 1980.
- 9 John Young, *The Research Activities of the South Manchurian Railway Company 1907-1945: A History and Bibliography*, New York: The East Asian Institute, Columbia University, p. 3-4.
- 10 Yusuke Tsurumi, *Gotō Shimpei den* (Biography of Gotō Shimpei), 2 vols, Tokyo, 1937, Vol. 2, pp. 26-27; cited in Ramon H. Myers, 1973, p. 435.
- 11 Ramon H. Myers, "Taiwan as an imperial colony of Japan 1895-1945", *Journal of the Institute of Chinese Studies* 6 (1973), pp. 425-451, esp. p. 435.
- 12 Mark R. Peattie, "Japanese colonialism: Discarding the stereotypes", in H. Wray and H. Conroy (eds), *Japan Examined: Perspectives on Modern Japanese History*, Honolulu: University of Hawaii Press, 1983, pp. 208-213, esp. p. 211.
- 13 Randall E. Stross, *The Stubborn Earth: American Agriculturalists on Chinese Soil, 1898-1937*, Berkeley: University of California Press, 1986, p. 52.
- 14 See James C. Thomson Jr., *While China Faced West: American Reformers in Nationalist China, 1928-1937*, Cambridge, Mass: Harvard University Press, 1969, esp. ch. 6, "From models to training programs: The Rockefeller effort", pp. 122-150; and Mary Brown Bullock, *An American Transplant: The Rockefeller Foundation and Peking Union Medical College*, Berkeley: University of California Press, 1980.
- 15 Sherman Cochran, "Business, governments and war in China 1931-49", in Akira Iriye and Warren Cohen (eds), *American, Chinese and Japanese Perspectives on Wartime Asia 1931-49*, Wilmington, Delaware: Scholarly Resources Inc., 1990, pp. 117-145. For further details of the company and its role in US foreign policy see Irvine H. Anderson,

- The Standard-Vacuum Oil Company and the United States East Asian Policy 1931-41*, Princeton: Princeton University Press, 1975.
- 16 Kathleen Dugan and Weiwen Huang, "American Science in Republican China: The Search for Fossil Man", paper delivered at the Joint British Society for the History of Science and the History of Science Society Conference, Manchester, England, 11-15 July 1988.
 - 17 See Carsten Flohr, "Wu Lien-teh: The Beginning of the Chinese Public Health", unpublished M.Phil. paper, Wellcome Unit for the History of Medicine, University of Cambridge, April 1995.
 - 18 Carl F. Nathan, *Plague Prevention and Politics in Manchuria, 1910-1931*, Cambridge, Mass.: East Asian Research Centre, Harvard University, 1967.
 - 19 See this commented on in Peter Duus, Ramon H. Myers and Mark R. Peattie (eds.), *The Japanese Informal Empire in China 1895-1937*, Princeton: Princeton University Press, 1989, p. 161.
 - 20 See a discussion of the localized nature of laboratory science in Joseph Rouse, *Knowledge and Power: Toward a Political Philosophy of Science*, Ithaca: Cornell University Press, 1987, p. 111.
 - 21 This interpretation can be found in Adi Ophir and Steven Shapin, "The place of knowledge: A methodological survey", *Science in Context*, No. 1, 1991, pp. 3-21.
 - 22 See for example K. Tsuneishi, *Kieta saikinsen butai: Kanōgun dai 731 butai* (The Germ Warfare Unit that Disappeared: Unit 731 of the Kwantung Army), Tokyo: Kaimeisha, 1981; Tsuneishi and T. Asano, *Saikinsen butai to jiketsu shita futari no igakusha* (The Germ Warfare Unit and the Two Doctors Who Killed Themselves), Tokyo: Shinchōsha, 1982; and Tsuneishi, *Hyōteki, Ishii: 731 butai to Beigun chōhō katsudō* (Target, Ishii: Unit 731 and US Army Intelligence Activities), Tokyo: Otsuki Shoten, 1984. In English, see Peter Williams and David Wallace, *Unit 731: The Japanese Army's Secret of Secrets*, London: Hodder and Stoughton, 1989; Sheldon H. Harris, *Factories of Death: Japanese Biological Warfare 1932-45 and the American Cover-Up*, London: Routledge, 1994.
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