



The Japanese Colonial Sciences in the Greater East Asian Co-Prosperity Sphere: Mere Successor of the Europeans, or the Initiator of the New Era?

Tsukahara, Togo

(Citation)

Journal of the Japan-Netherlands Institute, 6:175-188

(Issue Date)

1996

(Resource Type)

journal article

(Version)

Version of Record

(URL)

<https://hdl.handle.net/20.500.14094/90005779>



The Japanese Colonial Sciences in the Greater East Asia Co-Prosperity Sphere: Mere Successor of the Europeans, or the Initiator of the New Era?

TSUKAHARA Togo

In this paper, I would like to discuss science and technology transfer in the framework of Japanese expansion in the period of our concern (1880-1950), and examine its historical characteristics from the viewpoints provided by the framework of 'Science and Empire.' The diversity and complexity in the two different stages of Japanese colonial sciences — those in the relatively old colonial areas as Korea, Taiwan and Manchuria, and those in the territories acquired during the war such as Malaya, Singapore and the Netherlands East Indies — will be explained. This paper also aims to illustrate how some case studies on Japanese colonial science fit into the historical context of Japanese colonial expansion.

The first set of questions that I am concerned with here may be summarized as follows: if one takes the current argument that science is an ideology within imperialism, then how did the Japanese adapt 'European' science to the 'Japanese' imperial ideology? How was it possible to fit 'European' scientific ideology into the formation of 'the Greater East Asia Co-Prosperity Sphere,' which supposedly denounced 'European' colonial rule and pretended to liberate fellow Asians from subordination to 'European' superpowers?

A second set of questions is concerned with practical aspects of science and technology. If we accept an assumption of so-called 'technological determinism,' that science and technology are 'the tools for (the) Empire,' then there are several perspectives in which we can reexamine Japanese colonial history. These can be subsumed under the following three points: 1) How did the Japanese exploit science and military technology at the early stages of their expansion and how did they reinforce their military, economic and political force by mobilizing indigenous resources? How did

they, thereafter, disseminate science and technology to the indigenous people? 2) What was their strategy for the dissemination of production technology and how did they carry out, or confiscate their predecessors' results of scientific research in the exploitation of natural resources, agriculture, mining, fishery and industry? And 3) Did medical care for the colonial population provided by the Japanese occupation forces ever contribute to the dissemination of knowledge or enhance the welfare of her colonial subjects? What was their colonial education, and how were science and technology placed within it?

In order to discuss these issues, two case studies — the Northern Korean Chemical venture and Japanese medical research in the former Netherlands East Indies — will be presented, while recent work on the Japanese colonial sciences will be reviewed.

An outline of Japanese of colonialism and science, 1880-1950

When surveying Japanese history, it is helpful to pay special attention to the relationship between her political-economic development and overseas expansion. Sasaki states that, even more so than the Meiji restoration of 1868, the year 1881 should be considered the beginning of the emergence of Japan as an imperialist state.¹ In this year, under the political leadership of Ito Hirobumi, Japan decided to adopt the Prussian state model, and also it was around this year that the absolutism of the Imperial system began to be consolidated and the policy of 'rich country and strong army' was introduced. In 1886, the Emperor issued the Ordinance on the Imperial University, in which scholars were considered to be in service of the Emperor. As a result, Japanese scientists began to make efforts to become scientists on a par with their counterparts in the so-called 'first class countries' of Europe and America, first of all for national prestige.

The next stage of the history of science of Imperial Japan was marked by the colonization of other Asian countries. As a consequence of the Sino-Japanese War, Japan acquired dominion over Taiwan as a colonial territory in 1895. In the following years it successively colonized or semi-colonized Korea, Manchuria and the South Sea island of Palau. Some important char-

acteristics of Japanese science between 1895 and 1945 are exhibited in these colonial territories.

Partly intending their rule to be permanent, and also partly out of the necessity of utilizing colonial manpower, the Japanese established higher educational institutions for scientific, technological and medical studies. In Manchuria, three technical and medical colleges were opened in 1922. As a part of the Japanese Imperial University system, Keijo (Seoul) Imperial University and Taihoku (Taipei) Imperial University were established in 1924 and 1928 respectively. Applied disciplines were emphasized there, reflecting imperial interests. The educational system was based on the Japanization policy, in other words, Japanese was adopted as the official language and Japanese culture was forced upon local people.

As many economic historians agree, the basis for Japan's modern industrial development was laid during the last thirty years of the nineteenth century. The first development occurred in the traditional sectors of the economy. Freed from Tokugawa restrictions and given impetus by institutional innovations and reforms, Japan's traditional small industries underwent notable expansion. The second wave of advance came in the modern sector during the late 1880s and 1890s. But we must keep this nineteenth-century growth in perspective. In spite of its qualitative brilliance, it was small. In a quantitative sense, Japan's 'takeoff' really began after the Russo-Japanese War. At the end of the nineteenth century the country was still technologically backward, exporting for the most part raw or half-processed materials such as silk.

Iriye and other economic historians agree that there was general approval of the government's science and technology policy because this policy meshed well with the industrialization effort which, in turn, was considered to be one of the keys to the development of a modern state.² Industrial production, primarily of cotton and silk textiles but also including iron and steel, grew rapidly after the Sino-Japanese War, more than doubling in volume between 1895 and 1900. Some of this would have taken place even if the war and the resulting colonization had not taken place. But part of the industrial revolution was undoubtedly linked to these external affairs. For instance, cotton textile exports, surpassing imports for the

first time in 1897, were aided by the opening of more treaty ports in China as a consequence of the war and by an optimism prevailing among industrialists at the time in investing capital in machinery. The iron and steel industry, for its part, was a clear response to the needs of the armed forces. The Yawata Iron Works, created by an act of the Diet in 1895, is a typical example. It began producing steel in 1901, the first successful development in heavy industry in Japan. Likewise, the shipbuilding industry was given a boost by naval construction and government subsidizing of shipyards for the construction merchant ships to be used in the expanding opportunities in Korea and China.

Imperialism, then, coincided with rapid industrialization, confirming the prevailing view that all these, as well as great-power status, were part of a single historical development.

The rate of economic growth after 1900 was, according to Reischauer and Craig, 'spectacular.'³ The upsurge of the late nineteenth century continued almost uninterrupted for four decades. Between 1900 and the late 1930s the production of raw materials more than tripled, and the output of manufactured goods increased well over twelvefold. By the late 1930s the Japanese economy was relatively mature. Close to 60% of the export trade, which had grown about twentyfold meanwhile, consisted of wholly manufactured goods, and certain industries within the great manufacturing nations of the West had become almost hysterical because of Japanese competition.

Many scholars have attributed this economic growth simply to Japan's exploitation of its new colonial empire. However, this does not always hold true. The Japanese certainly wrested from their colonies what they could, and control over the agricultural products and mineral resources of Korea and Taiwan proved to be an important strategic advantage. Although exploitative, the empire was in economic terms, as Reischauer and Craig put it, probably more of an economic drain than an asset.⁴ More was spent in the colonies than taken from them, even if we disregard the greatly increased military outlays required for their seizure and defense.

As the Japanese economy developed, it became more closely integrated in the world economy. Japan lacked extensive mineral resources and so, as

industrial output rose, it became necessary to import ever increasing amounts of raw materials, which could be paid for only by a corresponding expansion of exports. Most of the time these were easily obtained; but the psychological awareness of dependence became more and more intense. Moreover, while foreign trade was not the motor of Japan's economic growth, it was large enough to make the difference between an economy running in high or in low gear. In the 1950s and 1960s it was said that when New York sneezed, Tokyo came down with a cold. The beginning of this situation was already visible in the 1920s and 1930s.

Case study 1: Noguchi and the Japanese electrochemical industry in Korea.

In 1950, when the Korean War broke out, American army staff officers worried about the industrial capacity of Northern Korea. It constituted a grave menace to UN troops, as its logistical potential was fearsome. One of the biggest industrial complexes in the world had been established by the Japanese around the Changjin river area, centering on the Japan's leading chemical industrial enterprise, Japan Nitrogenous Fertilizer. It provided not only chemicals related to ammunitions, but also strategic materials including metals and electricity. All this had been taken over by the 'Communists' after 1945, and UN troops' fears were not unfounded.

The development project around the dam on the Changjin river has been compared to the development project of the Tennessee River by the Tennessee Valley Authority (TVA) in the United States, both in scale and its technological complexity. Iida, for instance, has compared their capacity for generation of electricity.⁵

The comprehensiveness of the Chanjin river industrial project is striking, for it contained not only fertilizer plants for ammonium sulfate or nitrogen processing but also various plants producing aluminum, zinc and artificial gum. Not only industrial capacity was constructed, but the whole project also promoted agriculture in the area through the development of a complete system of irrigation, and the fostering of forestry and fishery. As a result, the population of the area had risen to 180,000 people. Although this

industrial complex had suffered from warfare and its development was interrupted several times during the war, its great significance as an industrial complex should not be disregarded in the historical perspective of the time. Barbara Molony's work on this project is strongly recommended, as she excellently describes the economic and political aspects of the project.⁶ In addition, the historical characteristics of the industrial complex provide us with some remarkable features for the study of Japanese colonial science and technology.

The chief planner of the complex, Noguchi Shitagau (1873-1944), is well known as the founder of the leading chemical company in pre-war Japan, Japan Nitrogenous Fertilizer.⁷ By the 1930s, he was already a man of reputation among his contemporaries, as a result of his success in the field of electrochemistry, as well as his being a prominent leader in the industrial world, an investor in colonialism and the remarkable pioneer of power generation. Besides his contribution to Japanese colonialism, he was also known to be an idealist in his venture Changjin river electrochemical project. Whatever Japanese colonial management was in Korea, he wrote that he was aiming to establish 'an earthly paradise of electricity and chemistry' in Northern Korea. His case was not exceptional, and like most colonial scientists and industrialists, his idealism went hand in hand with Japanese colonial policy. Noguchi viewed science, particularly chemistry, as an instrument for the enhancement of the welfare of the people in the colony, no matter what cruelty military advancement meant to them. As we have seen, his project aimed at a comprehensive integration of industry and agriculture, forestry and fishery. Most amazingly, he was an exception the Japanese colonizers because of his philanthropic ideas: he established a foundation to grant scholarships to Korean students, contrary to the colonial image of the Korean natives as an inferior 'race.'

Except for his benevolent and patronizing attitude towards the colonial subjects, his Northern Korean electrochemical industrial development project can be seen as a representative case of colonial Japanese scientific and technological achievement. Had it been completed, there can be no doubt that its technological standards and industrial scale would have been of the highest levels achieved in the world at the time. The historian of technolo-

gy, Hoshino, has remarked that, 'if there had been no war, this industrial area would have grown out to be the world's greatest electrochemical industrial center.'⁸ In this sense, Noguchi could be regarded as a personification of the combination of scientific idealism and colonialism.

The remarkable success of this project could be considered representative of the speed and 'success' of Japanese industrial development since the second half of the nineteenth century, particularly after the Meiji Restoration in 1868 and the full scale modernization movement of the 1870s. This development, however, should not be viewed as a mere success in the well-worn framework of 'modernization' studies which tend to measure industrializing countries by some Western standards. Instead, this should be discussed, as Morris Low warns, from the viewpoint that regards the process of scientific and industrial development as 'relative to the local and regional, as well as international environment, rather than gauged solely according to some absolute mark of success.'⁹ The question of differing rates of modernization, industrialization or Westernization, which looms as the major item on the agenda of histories of science and technology, should be examined with reference to, what Morris Low called, a 'new maturity' emerging in the field of history of science: namely, new examination of the subject in the context of a center vs. periphery perspective and in the growing literature on colonial science. Noguchi's 'success' should also be discussed from this angle.

As has become clear from the example of Noguchi, the chemical industry was one of the strategic branches of state investment in Japan and in the Japanese colonies, as early as 1926. Barbara Molony clarified this point in her study on Noguchi's contribution, and illustrated how various elements, such as political climate, resources, capital and technology had interrelated to create conditions best suited for Noguchi and his venture.¹⁰ It is also true that through his case we can see how it can be fitted into the newly emerging framework of the history of science and technology, namely 'Science and Empire.'

Recent works on science in Japanese colonies, and case study 2

In order to discuss Japanese colonial history, there are several historiographical problems. One of the difficult issues is the moralistic judgment on Japan's aggressive past. Too much emotion used to be poured out, and the histories told or written tended to be either sharp accusations or, in the worst case, mere self-justification. It is not an easy task for Japanese historians to deal with the negative and dark aspects of colonial history, and therefore this field was relatively untouched by serious scholarship after the Second World War, as Eckert remarked.¹¹ In my opinion, science and technology in the Japanese colonies are surely one of these omitted angles in historiography. However, now after some fifty-odd years, several research projects are looking more closely at Japanese colonial history. So I would like to introduce some of these recent studies in Japanese scholarship.

First of all, a comprehensive eight volume series compiling well-balanced monographs was published in 1992 and 1993 by Iwanami Publisher, and is considered to be the standard work for Japanese colonial studies.¹² The volumes are divided into appropriate topics such as industrialization in the colonies (volume 3) and cultural imperialism (volume 7), and each volume contains about ten to twelve contributions.

It should also be mentioned that a journal of Japanese colonial studies was inaugurated in 1988.¹³ Such an inauguration of a new journal is rightly considered to be indicative of a rise of interest in this field. This journal is based on a research group concerned with Japanese colonies, represented by Prof. Asada of Komazawa University, and is published once a year by Ryukei Shosha Pub., Tokyo.¹⁴ Each volume contains articles on various topics in the historical analysis of Japanese colonies, and it is expected that this journal and the group will encourage the promotion of this field of studies in Japan.

Concerning our particular case of science and technology in the former Japanese colonies, Prof. Shigeru Nakayama has been working on Japanese overseas scientific activities since 1960s.¹⁵ Under his influence some researchers continue to explore this aspect of the history of Japanese science and technology.

Recently, Prof. Sasaki Chikara has been most ardently promoting this field of study at Tokyo University.¹⁶ With his encouragement, some young and rising scholars are organizing their research projects focusing on various aspects of Japanese colonial science and technology. To name a few, Kato Shigeo is dealing with the function and strategic role of the Shanghai Natural Science Institute, which was known to be the most important scientific institution on the Chinese mainland under Japanese occupation.¹⁷ Shin Cheng-Geon is looking at the Japanese scientific management in Korea while focusing on the establishment of the Japanese Imperial Science Museum in Seoul.¹⁸ Okamoto Takuji, on the other hand, discusses scientific and technological investigations, as well as medical ones, carried out in the Keijo (Seoul) Imperial University.¹⁹ Sakano Toru is also interested in the Japanese scientific research carried out in Korea.²⁰ While Shin and Okamoto take an institutional approach to the issues at hand, Sakano is trying to analyze the scientific discourse of eugenics and the concept of 'race' discussed in the colonial scientific arena internally.

In addition to these recent studies, I would like to outline my own research, as part of the second case study. It concerns Japanese scientific and technological management in the former Netherlands East Indies. Although the Japanese occupation of the territory was much shorter than the Dutch one, the Japanese paid their best efforts to utilize their predecessors' scientific facilities. Contrary to the accusations made by Dutch and Indonesian patriotic writers in the form of political manifestos, the Japanese were not extraordinarily destructive colonizers: they were ordinary colonizers and diligent successors of the colonial Europeans. As any colonizer did, so too have they attempted to maximize their gains from the colony. Of course I do not mean to say the Dutch were bad and the Japanese were good: my intention is not to politicize nor to condemn either of them. The purpose of my research here is to clarify historical continuity or discontinuity between the two colonizers. In terms of scientific and technological activities, some of the Dutch colonial scientific institutions were managed and research activities were maintained even during the Japanese occupation — a remarkable feat in view of the difficult war situation and the much shorter time-span they could be active compared to the Dutch. For instance,

Prof. Nakai of the Kyoto University Botany School was appointed as the director of the botanical garden at Buitenzorg (now Bogor), and carried out extensive research in Central and East Java. Geological and mineralogical research did not progress very much during the Japanese occupation. However, because the very reason for the Japanese invasion into the area was petroleum, Japanese researchers seem to have done some meaningful work, as far as my research revealed from records left at the Geological Museum in Bandung. As for chemistry, some important Kina (Quinine) laboratories were kept running, as well as some research facilities for the advancement of the sugar cane industry.

There clearly was continuity as well as discontinuity between the Dutch and Japanese colonial management policies. Generally speaking, Dutch policy was more separatistic, while the Japanese, partly out of necessity, mobilized the population for their colonial management and, above all, for their war effort. The scientific research mentioned above represents the continuous aspect, but discontinuity can also be pointed out. An example of the introduction and quick diffusion of a technology unseen in the Dutch period is represented by the weaving industry in Bali. Here prohibitions on weaving for certain social classes (Balinese caste) were easily broken under the Japanese military administration. Contrary to their European egalitarian ideals, the Dutch in their separationist policy preferred to preserve the social classes of the Balinese castes in order to facilitate their rule through existing social repression, and actually, the 'caste' notion was purposefully reinforced by them. The Japanese, on the other hand, who were allegedly oriental despots, initiated democratization of cloth production. Ironically, the weaving machine called ATBM which the Japanese disseminated in Bali had actually been developed by Dutch engineers in the Engineering Institute in Bandung, but those machines were not widely used on Bali during the Dutch administration.²¹ Social barriers to access to technology were, in this case, undoubtedly broken down by the Japanese policy of mobilizing the indigenous population for the war effort.

In the medical field, the Japanese colonial scientists were as notorious as the German Nazi doctors, because of their cruelty in the development of biochemical weapons, and the use of live people in their experiments,

including vivisection. These activities remain known under the team's name, 731, or of its leading officer, Ishii. However gruesome the documents about similar experiments in Java are, they should be discussed here in our context. The document I have found is dated December 8th 1944, and signed by Lieutenant Nakamura Gen, and stamped 'secret'²² Now the document and related materials are under further analysis in cooperation with Prof. Kurasawa Aiko, so I can only present a preliminary outline.²³ The incident concerned the application of tetanus virus to Romusha (forced laborers, mostly Javanese natives) in Jakarta. A tricky point is that it is not recorded as a Japanese attempt to develop a biological weapon, but it was claimed that an Indonesian doctor, Dr. Ahmad Mochtar, had carried out the experiment, and he was said to have intended to use the virus against the Japanese as a biological weapon. He was consequently accused of treason by the Japanese. The historical background is not revealed completely, but mysteriously enough, Dr. Mochtar was detained and reportedly died of unknown causes in a jail at Bogor. Possibly Dr. Mochtar had been singled out by the Japanese and forced to carry out the experiment. Or, it might have been that Dr. Mochtar was just a dummy who was framed by the Japanese. The case is still cloaked in mystery. After the war, Dr. Mochtar's honour was restored, but many facts still need to be cleared up about this incident, now known as the 'Mochtar incident.'

The political implications of this issue are extremely complicated, but here I should like to limit the discussion by looking at the historical background. At the time, tropical medicine was still relatively new to the Japanese. Ishii's team 731, however, was aware of its strategic importance simply because epidemic diseases spread much faster and caused more drastic damage in tropical areas. The document which I am studying clearly states that the deployment of these viruses is far more effective in the tropics than in Manchuria where the main activities of Ishii's team were concentrated. At the Japanese colonial university in Taiwan, Taipei Imperial University, an institute for tropical medicine had been newly established.²⁴ It was there that a group of Japanese doctors carried out research on tropical medicine. They also made extensive studies of Dutch

medical journals and even a project to translate these from Dutch into Japanese was carried out.

The development of biological weapons by the Japanese was clearly an abuse of scientific knowledge. But the story is also highly ironical. Modern medical science had been taught to the Japanese by the Dutch since the Edo period. Most of the knowledge on tropical medicine which the Japanese doctors acquired on Taiwan came from Dutch sources and Dutch research. In a sense, the Dutch had prepared the way for the abuse. Even literally so, since the instrument in the Mochtar incident, the tetanus virus, had been developed by the Pasteur Institute which was the main biomedical research institution of the Dutch East Indies. Moreover, Dr. Mochtar was an elite doctor on Java who had been educated in the Netherlands. The medical facilities used in the incident had all been established in the Dutch period. Science clearly is a 'double-edged sword' easily abused in the wrong hands. Unfortunately, the abuse did not end with the Japanese defeat. After the war the results of Japanese biomedical research were confiscated by the Americans and the other Allied Forces and reportedly utilized in the wars in Korea and Vietnam. The abuse of science seems to be a continuous element in the different stages of the colonial sciences.

Concluding remarks

Historical studies on Japanese colonial science and technology exhibit different facets of the political, economic, social and cultural encounter between the colonialists and the colonized, the European colonizer's inheritance and the inheriting Japanese scientists. The Japanese did not just destroy the order which their predecessors had created, certainly not the order of organized scientific pursuit of nature and technological advancement of the people's welfare. As the case of the Northern Korean industrial complex by Noguchi shows, colonial policy need not be purely exploitative, long term comprehensive management and development of the colony could be part of it and even idealistic elements of trying to benefit the local population can be pointed out. The scientific and technological activities in the former Netherlands East Indies show — though my research is prelimi-

nary — that the Japanese endeavored to organize every direction of scientific research while utilizing their predecessor's facilities. They were indeed aggressive invaders and military despots, but they were also good students who tried to develop science and technology in their colonies. Their attempts were modeled after their predecessors, and actually their scientific and technological research was in great part facilitated by the European ideology and institutions. Now, fifty years after the end of the Second World War, this field of colonial studies is sure to attract more scholarly interests.

Notes

1. Sasaki Chikara, 'Science and the Japanese Empire 1888-1915: an Overview in Science and Empires' in: *Science and Empires* (Boston 1992) 243-246.
2. Iriye et al. For the general view on the Japanese economic history, see W.J. MacPherson, *The Economic Development of Japan c. 1868-1941* (Cambridge 1993).
3. E.O. Reischauer and A.M. Craig, *Japan: Tradition and Transformation*, 193.
4. E.O. Reischauer and A.M. Craig, *Japan: Tradition and Transformation*, 193.
5. Iida Kenichi, 'Kagaku to Denki no Risōkyō no Kensetsu,' [Construction of an earthly paradise of electricity and chemistry] *Gijutsu no Shakaishi* [Social history of technology] 4 (1982) 220-232.
6. Barbara Molony, *Technology and Investment: The Pre-War Japanese Chemical Industry* (Cambridge Mass. 1990).
7. For Noguch's biography, see Kiichiro Yoshikawa, *Noguchi Shitagau* (Tokyo 1962).
8. Hoshino, 'Noguchi Shitagau Gijutsu no Kakushin,' [Noguchi Shitagau: innovation of technology] *Chūō Kōron* February (1965).
9. Morris Low, 'The Butterfly and the Frigate: Social Studies of Science in Japan,' *Social Studies of Science* XIX, 2 (1989) 313-342.
10. Molony, *Technology and Investment*.
11. Carter J. Eckert, 'Total War, Industrialization and Social Change in Late Colonial Korea,' transl. into Japanese as 'Shokuminchi Makki Chōsen no Sōryokusen, Kōgyōka, Shakai Henka,' *Shisō* 841, July (1994).
12. The series is entitled 'Kindai Nihon to Shokuminchi,' literally translated: 'Modern Japan and Her Colonies' published in 1992-1993 by Iwanami Publ., Tokyo.
13. The journal is entitled 'Nihon Shokuminchi Kenkyū,' literally: 'Studies on Japanese Colonial History.'
14. The research group is called 'Nihon Shokuminchi Kenkyūkai,' literally: 'Research Group on Japanese Colonies.'

15. Nakayama edited a major source book on the international aspect of Japanese science and technology. It was published as volume seven of *Nihon Kagaku Gijutsushi Taikei* [Outline of Japanese history of science and technology] (Tokyo 1968).
16. Sasaki Chikara is also known as a contributor to *Science and Empires* edited by Patrick Petitjean, Catherine Jami and Anne Marie Moulin (Boston 1992).
17. Kato Shigeo, 'Joron: Shokuminchi Kagaku no Tenkai,' [Introduction: The development of colonial science] *Kagakushi, Kagaku Tetsugaku* [History and philosophy of science] XI (1993) 48-57.
18. Shin Cheng-Geon, 'Shokuminchi Chōsen to Kagaku,' [Colonized Korea and science] *Kagakushi, Kagaku Tetsugaku* XI (1993) 58-69.
19. Takuji Okamoto, 'Keijo Teikoku Daigaku to Kagaku,' [Seoul Imperial University and science] *Kagakushi, Kaagaku Tetsugaku* XI (1993) 70-84.
20. Tōru Sakano, 'Kiyono Kenji no Nihon Jinshuron,' [Kiyono Kenji's theory on the Japanese race] *Kagakushi, Kagaku Tetsugaku* XI (1993) 85-99.
21. On the historical background of the handweaving industry in Bali, see Nakatani Ayami, *Contested Time: Women's work and Marriage in Bali* (unpublished D. Phil. Thesis; 1995); on the system of hierarchy under Dutch colonial rule, see H. Schulte-Nordholt, *Bali, Colonial Conceptions and Political Change 1700-1940, From Shifting Hierarchies to 'Fixed Order'* (Rotterdam 1986).
22. The document is written and authorized by Nakamura Gen, Lieutenant, who is also titled to be 'A Member of the Southern Region Forces Sanitation and Water Supply Team.' The title of the document is 'About Treason Using Tetanus Virus in Jawa.' Sealed 'Top Secret.'
23. Kurasawa Aiko, *Nihon Senryōka no Jawa Nōson no Henyō* [The transformation of rural life in Java under the Japanese occupation] (1992) 224.
24. Taihoku Teikoku (Imperial) university was established in 1928. For the establishment of the university and the education policy in colonial Taiwan, see a contemporary description by Yauchihara Tadao, *Teikokushugika no Taiwan* [Taiwan under imperialism] (1929). The Faculty of medicine was inaugurated in 1936 and the Institute of Tropical Medicine was established within the university in 1941. The university also had an Institute of Humanistic Studies on Tropical Regions and a Research Institute for Tropical Natural Resources.
25. For the scientific and technological institutions which had been taken over from the Dutch, see Sumio Fukami, 'Nihon Gunseika Jawa ni okeru Chōsa Kenkyū Kikan,' [Research institutions in Java under the Japanese occupation] *Nichiran Gakkai Kaishi* [Bulletin of the Japan-Netherlands Institute] XIII-1, XXV, Oct. (1988) 21-36.