Tradition and Innovation – Medical Instruments in Edo and Meiji Japan

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伝統と革新 ― 江戸・明治期の日本における医科器械

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Abstract

In 1870, the Meiji government decided to adopt German medicine as the base of the new national health-care system while starting to restrict traditional Sino-Japanese medicine. These policies not only deeply affected the education and activities of physicians throughout the country but also had a profound impact on the production and distribution of pharmaceuticals and medical instruments. Facing a shrinking market for traditional drugs, acupuncture needles, and surgical instruments, merchants such as Shirai Matsunosuke (Osaka) searched for ways to secure their place in the new medical system. While importing instruments from Western companies, they also employed swordsmiths, gunmakers, glassblowers, and other traditional craftsmen and managed to lay the foundation for independent national production. Initially, orders came only from domestic hospitals and physicians, but soon new markets were developed in China, Korea, India, and Hawaii, among other places. After only a few decades, products that had received medals in national industrial exhibitions were also recognized in universal expositions. Without these flexible and farsighted entrepreneurs and the technical skills accumulated by traditional craftsmen during the Edo period, the quick modernization of medicine in Meiji Japan would not have been possible.

要旨

明治３年、新政府がドイツ医学の導入を決議すると、漢方医学から西洋医学への転換が急速に進み、大量の新しい医薬品及び医科器械が医療の現場に次々と現れた。その有望な新市場に最も早く着目したのは、医療界に精通していた薬種商、硝子壜商や鍼術用針製造業者だった。東京のいわしや松本市左衛門や石代十兵衛、大阪の田辺屋正兵英（２代目）、山口庄兵衛と白井松之助、名古屋の八神幸助はこの時期の草分けとなった。欧米各社からの医療器械を輸入しながら、刀剣師、鉄砲鍛冶、硝子職人など日本のものづくり職人の技術力を生かし、国産製品の開発に成功していた。当初、内地全国だった販売先は、次第に「清国、布哇、印度」に広がり、内国勧業博覧会で受賞した製品は、やがて海外の万国博覧会においても高く評価されるようになった。このような先見の明がある起業家と彼らを支える江戸時代の技能を蓄積していた職人ぬきにして明治期医療の近代化を十分に語れない。

1 Medicine and Pharmaceuticals in Early-Modern Japan

The question of whether Japan's development was impeded by the semi-seclusion policy of the Tokugawa regime, or whether two centuries of internal peace enabled its people to prepare solid foundations for the quick absorption of

Western technology after the reopening of the country, has been one of the main topics in historical studies for more than a century. No doubt, the restricted influx of foreign information affected many fields of studies in Early Modern Japan, but medicine and allied sciences developed in close interaction with the outside world throughout the Edo period. Since 1650, surgeons and physicians working at the Dutch trading post Dejima were continuously involved in medical training and the treatment of high-ranking patients in Nagasaki as well as at the court in Edo [1]. Dutch and Chinese ships brought drugs in great quantities to Nagasaki, and contrary to a widespread misunderstanding, books on medicine were exempted explicitly from Japanese import restrictions promulgated in 1641 [2].

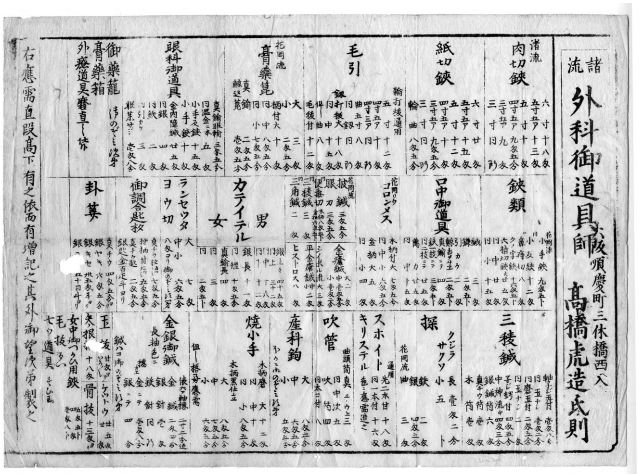

Figure 1: Edo period advertisement of medical instruments (author's collection).

Since the 15th century, Japanese physicians have responded to foreign stimuli with growing intellectual independence. Chinese and Western teachings were adapted, mixed, and sometimes deliberately ignored. Many authors dealing with Early Modern Japan tend to contrast Dutch-style medicine (*ranpō*, 蘭方) against Chinese-style medicine (*kanpō*, 漢方), but the reality was much more ambiguous, and eclecticism was widespread. That is why we find moxibustion sets and acupuncture needles among the instruments of adherents of Western medicine. On the other hand, "traditional" physicians, such as Mubun (夢分) and Misono Isai (御薗意斎), completely rejected the Chinese "meridian system", while the court physician Ogino Gengai (荻野元凱) studied Western phlebotomy and, following the pioneering example set by the "traditionalist" Yamawaki Tōyō, even participated in anatomical dissections.

Furthermore, the state of the economy in Japan, with its insufficient natural resources and export commodities, always had an influence on the course of studies. To achieve a greater independence from expensive "Chinese" and "Dutch" drugs and medicaments, foreign plants and seeds were repeatedly imported to expand local production. This inevitably boosted botanical, pharmaceutical, and agricultural studies. Chinese texts posed no language problem, and from the early 18th century, Dutch reading skills gradually improved outside the circles of the professional interpreters at Dejima. In 1722, the Tokugawa government authorized 124 merchants and brokers in Osaka to monopolize the drug trade by establishing an association (*kabunakama*, 株仲間) in return for inspections to ensure the quality and proper use of medical materials. Soon, the Doshō Quarter of Osaka became a place of studies and expertise, and as in Europe, well-to-do merchants, such as Kimura Kenkadō (木村蒹葭堂, 1736–1802), emerged as collectors and scholars [3].

Figure 2: "Materia medica exhibition" in Owari (author's collection).

The distribution of medical materials was closely controlled, but all over the country, physicians, botanists, collectors, and scholars turned to all kinds of natural objects. From the mid-18th century, so-called "materia medica exhibitions" (*yakuhin-e*, 薬品会) or "product exhibitions" (*bussan-e,* 物産会) were organized throughout the country. The participants brought their personal treasures, which were displayed and discussed. During the 116 years between 1751 and 1867, about 250 such exhibitions were held [4]. As there were no universities or museums, these events were instrumental in establishing a common base of knowledge and accelerating the exchange of information and objects.

The world of medical instruments was less complex, but here too, Japanese physicians had shown their ingenuity with inventions such as the guiding tube needle, tapping needle, and obstetric devices that drew the attention of 19th century Western physicians [5]. Nevertheless, in surgery, the "armory" (*armamentarium chirurgicum*) was comparatively simple. Hanaoka Seishū, who successfully

removed breast cancer under general anesthesia for the first time in the world (1804), got by with about 25 simple instruments [6]. There were occasional imports of amputation sets and even sets for cranial perforations (though the latter were never used), but as Edo-period advertising leaflets show, most of the scissors, scalpels, spoons, forceps, catheters, clysters, stethoscopes, etc., were made by Japanese craftsmen. A few among them, such as Hirose (広瀬) in Nagasaki or Nishikawa (西川) in Ōsaka, had gained a nationwide reputation. In some cases, the quality of the product was certified [7].

Supported by a high level of education, a flourishing publishing industry [8] and an environment of intellectual curiosity, over the course of about two centuries, Japanese physicians acquired knowledge of a great variety of treatment methods, an impressive amount of information on pharmaceuticals, a better understanding of human anatomy, and a basic lexicon of Western-style medical terminology. There was a highly organized distribution system for mainly "Eastern" drugs and medicaments and local production of simple instruments. As both medical knowledge and drugs had spread even into rural areas, the ground was well prepared.

2 Abrupt Changes

During the last decades of the Tokugawa regime, Western medicine had gained more and more attention among physicians and political decision makers, but when the authorities of the new Meiji government conducted a nationwide survey in 1869, it showed 79% of the Japanese physicians still practiced traditional medicine, and that even among those 21% who considered themselves Western-style doctors, there were many who used Western medicaments based on Sino-Japanese concepts. Thus, the radical change was going to affect the vast majority of medical doctors. As all thinking was governed by notions of "national embodiment"/"national polity" (*kokutai*, 国体), Japan preferred large scale scientific and technological transfers from selected Western countries as a whole rather than gathering specific small scale knowhow from various foreign universities, academic schools, or companies. Early railway construction and management for example was almost completely in the hands of hired specialists from Great Britain including directors, engineers-in-chief, traffic managers, mechanics, plasterers, carpenters, engine drivers, track maintenance workers etc. France had established herself already during the late Edo period as the main provider of expertise on silk production and modern silk weaving. The new Imperial Navy was essentially developed with British support, while the Imperial Army that had its own ministry turned from France to Prussia after the German victory in 1872. At the request of the Meiji government, Dutch civil engineers laid the foundations of modern river regulation, flood control und port building. For the first decades of Meiji Japan almost every field of expertise can be linked to one or two Western countries.

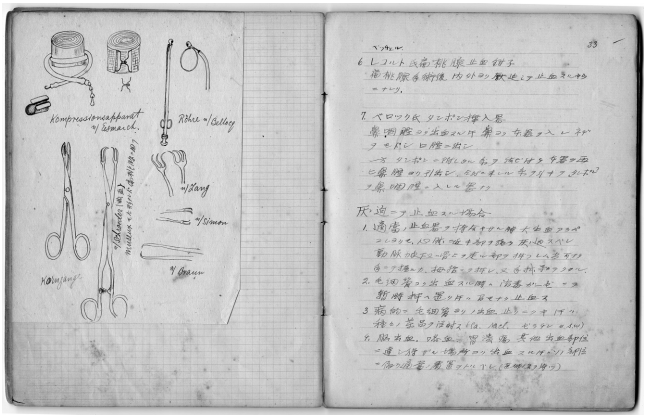

Figure 3: "Instrument Study" notebook from a nurse school in Fukuoka (author's collection).

These decisions drew from reports put up by fact-finding missions in Europe and America, but there were also unrelated political fights among Japanese decision makers. For a while, medicine too was heavily contested, but Sagara Chian (相良知安, 1836–1906 [9]) an administrator-turned-physician from Saga who considered German medicine to be superior to any other Western country's medicine, led the Council of State's (*taiseikan*, 太政官) decision in 1869 to develop the country's medical education and health-care system using the German model. One year later, the legate of the North German Confederation, Maximilian Scipio von Brand, was asked to arrange for the dispatch of medical teachers to Japan. That same year saw the first restrictions on the production and distribution of traditional medicine (*baiyaku torishimari kisei*, 売薬取締規制). After 1872, a Medical Affairs Bureau managed by Sagara Chian was involved in further reforms, the most important of which was a law for the medical system (*isei*, 医制) that came into effect on August 14, 1874. Its 76 paragraphs dealt with public health, medical education, and medical licenses, as well as pharmacies, pharmaceuticals, and the separation of medical treatment from the dispensing of medicaments [10]. Whoever wanted to become a physician had to pass medical examinations that focused on anatomy, physiology, pathology, internal medicine, surgery, chemistry, and pharmaceutics. In 1883, these examinations were declared compulsory even for those who wished to practice traditional medicine. In 1876, a license system was introduced for the production of pharmaceuticals. Three years later, the "Japanese Pharmacopoeia" (*Nippon Yakkyokuhō*, 日本薬局方) was promulgated as the first national pharmacopoeia in East Asia. Its regulations dealt another blow to herbal medicine and brought profound changes to the production of pharmaceuticals.

Figure 4: Store of Shirai Matsunosuke in 1882 [15]

3 From 'Materia Medica' to Medical Instruments

For the merchants of Osaka's Doshō Quarter, the outlook was bleak. The heyday of monopolized trade was over and the demand for traditional medicine was shrinking rapidly. Some trading houses, such as Tanabeya (田辺屋, founded in 1678) and Ōmiya (近江屋, founded in 1781), switched to Western pharmaceuticals as early as 1870 and 1871 and started their own production in 1885 and in 1895, respectively [11]. Soon, Japanese exports exceeded imports [12].

Other entrepreneurs, such as Matsumoto Ichizaemon (松本市左衛門) in Tōkyō and Shirai Matsunosuke (白井松之助) in Ōsaka, decided to break new ground [13]. The switch from Sino-Japanese to Western medicine not only affected education, reeducation, and pharmaceuticals throughout the country. A flood of hitherto unknown medical instruments, mainly from Germany, was about to appear in hospitals and practices. Liaison offices of foreign companies and small enterprises founded by foreigners living in Kobe, Ōsaka, and Yokohama indicated a rising international awareness of this huge market.

For the time being, both Matsumoto and Shirai continued to trade in pharmaceuticals while establishing connections to foreign companies and expanding the import and distribution of medical instruments. The demand was immense and their intimate knowledge of the regions, of local clinics, retail dealers, and physicians once again was a great advantage in an open market. Up to now, the complete inventory of medical instruments could be printed on a single sheet of paper. However, during the late 1870s and 1880s, the first Japanese catalogues circulated as booklets. They were based on the catalogues published by their foreign providers and played an important role in the reeducation of physicians. These catalogues were also instrumental in establishing a common nomenclature, because most of the Western products did not yet have a Japanese name. In medical and nursing schools, the study of medical instruments (*kikaigaku*, 器械学) became part of the curriculum.

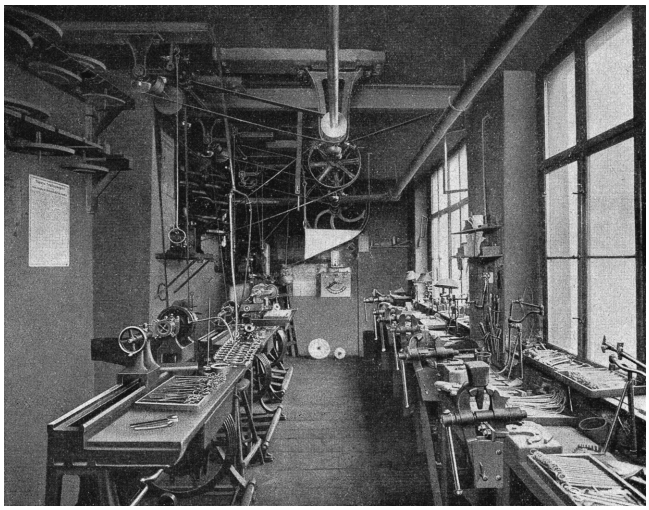

Figure 5: Workshop of H. Windler GmbH in Berlin.

Japanese production of modern medical instruments started with the imitation and gradual improvement of simple imports. Using highly skilled blacksmiths and glass craftsmen, it did not take long until new products appeared that were cheaper and met specific local needs. During the Edo period, "materia medica exhibitions" served as a prominent stage for information and exchange. In 1877, stimulated by the International Expositions in Paris (1867) and Vienna (1873), Japan started a series of National Industrial Exhibitions (*Naikoku kangyō hakurankai*, 内国勧業博覧会), where manufacturers competed for medals and future market shares. No serious competitor could ignore such events when they attracted hundreds of thousands, and later, millions of visitors [14].

Around the turn of the 20th century, the success of the new industry became obvious when Japanese manufacturers ventured out to international exhibitions and started exports to Korea, China, India, Hawaii, etc.

4 The Story of Shirai Matsunosuke

Most of the related source materials in the Kansai and Kantō regions are lost due to natural disasters and World War II, but fortunately, the case of Shirai Matsunosuke, who played an important role in the Meiji period in Osaka, can be traced comparatively well. Already in 1872, Shirai started to include medical instruments in his assortment of goods. According to his memoirs (1909), Dr. Christian Jacob *Ermerins (1841–1880)*, a Dutch physician working at the medical school and the Provincial Hospital Osaka, and the Japanese director of that same hospital, made him aware of the supply problems. For a while, brokers in nearby Kobe, one of the main import harbors, seem to have provided his merchandise.

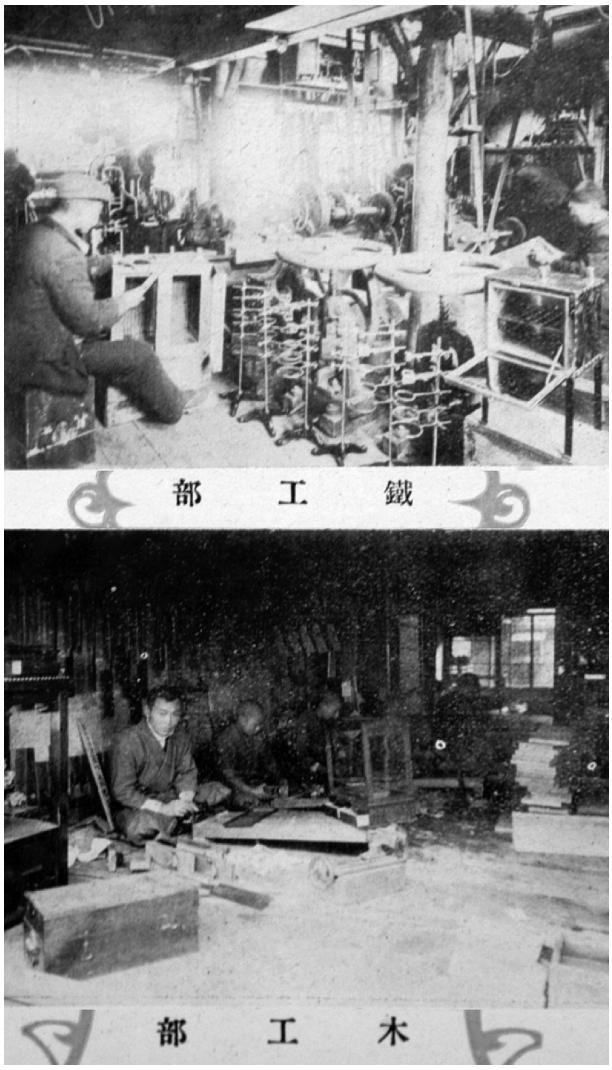

Figure 6: Workshop of Shiraimatsu Co. in Osaka [17]

Figure 7: Members of the Chamber of Commerce and Industry (Medical Instruments, 1913) [21]

Soon, Shirai prepared for his own production. With the breakdown of the Tokugawa regime, numerous craftsmen had lost their jobs, but not their skills. Shirai employed swordsmiths, gunsmiths, harness makers, woodworkers, etc., and started with simple tools. After a few years, during which he changed the name of his enterprise to "Shiraimatsu", he was able to procure competitive products. Close cooperation with hospitals and physicians turned out to be helpful. In 1879, when cholera raged in the Kasai region, Shirai secured the cooperation of the Dutchman B. J. Dwas, who worked at the Osaka Hygienic Laboratory, and developed a dehydration apparatus. Three years later, he was asked by the chief of the Osaka Hospital Pharmacy, Prof. Nomi Tatsuichi (乃美辰一), to develop a special distillation apparatus. When the deputy director of the Prefectural Hospital Okayama made an inspection tour of the southern island of Kyushu in the summer of 1883, Shirai was requested to participate [16].

The monopolized distribution system of the Edo period would never return, but in 1881, Shirai and 13 other fellow merchants established an Association of Medical Instrument Traders (*Ikakikaishō -kumiai*, 医科器械商組合), which tried to bring some stability and structure into the regional distribution system [18]. This did not exclude competition. Until 1892, the number of wholesalers and retailers in Osaka grew to 30, but in 1902, the numbers were back at a level below 20.

In 1877, Kokudai Jūbei (石代十兵衛) in Tokyo printed the first modern catalogue (120 pages) of medical instruments, to be followed by Matsumoto Ichibei in 1878. The names of the instruments and their depiction show that these catalogues were based on foreign sources. This also applies to Shirai's catalogue that was printed in 1886 as the first of its kind in Western Japan. As the preface shows, Shirai had managed to establish direct contacts to Otto Moecke, a German retail merchant with close relations to the University of Leipzig, and to Windler, a manufacturer and purveyor to the court in Berlin [19]. As in Japan,

Germany's industrialization began late, and at the end of the century there were still many first-generation entrepreneurs who had started as craftsmen or retail merchants and then successfully built medium-sized companies that ventured into international markets. Both Shirai's and Windler's products are highly specialized and up-to-date, but the workshops in Berlin and Osaka still show traces of preindustrial production methods. Until 1914, when Japan declared war on Germany and attacked its colonial possession Qingdao (China), Windler was Shirai's most important provider of instruments and information [20].

War brought a rising demand for surgical instruments. It is not clear whether the First *Sino-Japanese War* between Qing Dynasty China and Meiji Japan (1894/5) had a direct impact on Shirai's company, but the Russo-Japanese War (1904/5) boosted the demand for Shirai's field operation tables and stretchers and brought closer trade relations with the Army ministry (Rikugunshō , 陸軍省).

From 1881, Shirai exhibited his products in national and regional industrial exhibitions and received medals almost every time. In 1893, this small company went to the World's Columbian Exposition (the Chicago World's Fair), and was granted a foreign medal for the first time. More of this kind of accolade followed at the Exposition Universelle in Paris (1900), the Louisiana Purchase Exposition (1904), and the Alaska–Yukon–Pacific Exposition (1909). At this stage, Shirai's company had already established trade relations with foreign countries. According to data collected by the Osaka Chamber of Commerce and Industry in 1905, Shirai Matsunosuke was by far the highest taxpayer among manufacturers and dealers of medical instruments. He imported goods from Britain, America, and Germany and sold them together with his own manufactured instruments all over the Japanese archipelago, and in Qing China, India, and Hawaii.

Shirai Matsunosuke had not only managed to survive the dramatic changes during the first decades of the Meiji period, he had also successfully established his company in a field of technology that was previously unknown to him, laying the foundations for further export-driven expansion.

A closer look at the frontispiece of his catalogue reveals his views on his place in the world of medicine. Rooted in traditional Japanese handcrafts, he depicts himself as an equal partner with the physician who uses his instruments to cure disease and save lives.

Figure 8: Catalogue frontispiece of Shiraimatsu Co. (1889).

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