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Michel, Wolfgang

Faculty of Languages and Cultures, Kyushu University : Professor : History of Euro-Japanese
Cultural Exchange

Werger-Klein, Elke

Arthur van Schendelstraat

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Drop by Drop: The Introduction of Western Distillation Techniques into Seventeenth-Century Japan

Wolfgang MICHEL¹ and Elke WERGER-KLEIN²

¹*Department of Comparative Culture and Language Studies, Faculty of Languages and Cultures, Kyushu University, Japan*

²*Arthur van Schendelstraat 130, 3511 MG Utrecht, The Netherlands*

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Introduction

In 1672, six Japanese interpreters compiled a detailed, illustrated report describing the production of a series of pharmaceutical oils. They had gathered their information from a European pharmacist at Dejima, the Dutch trading post where the distillations were performed. For the first time, a technology with which to refine oil was introduced to Japan, together with Western distillation apparatus that, for that time, was rather sophisticated. Sôda Hajime was the first to describe related manuscripts and point out their importance. Mention of this distillation can also be found in chronologies such as that by Ôtsuki Nyoden.¹⁾ However, until now, nothing has been reported about this background of the introduction or about those involved. Based on evidence found in Dutch and Japanese sources, this study reconstructs the technological transfer and elucidates the circumstances, the motivations, and the interests that both the Japanese and Dutch pursued in this matter.

Early Distillation Equipment

A Chinese alchemical text from the Song era, *Confidential instruc-*

tions on the manual of the heaven-piercing golden flower elixir (*Jinhua chongbi dan jing bizhi*),²⁾ includes numerous illustrations of reaction vessels, stoves, ambics, and different types of cooling systems,³⁾ but the first evidence of stills in Japan seems to be closely related to the introduction of “burnt wine” (Chinese *shaojiu*, Japanese *shôchû*).⁴⁾ Sôda and others suggest that during the sixteenth century, burnt wine and its production methods were brought to the kingdom of Ryûkyû, a prominent cultural link between Japan, China, and southeast Asia. After troops from the Japanese domain of Satsuma forced Ryûkyû into a semi-dependent relationship in 1609, brandy from that kingdom found its way to the court in Edo and gradually spread throughout Japan.⁵⁾

During that same era, distillation apparatus arrived in Japan, where it was called *ranbiki*. Technically, it was an extractor topped by an advanced version of a “Moor’s head”, in which cooling water surrounds the annular rim. Made of ceramics, and sometimes of copper, it consisted of three chambers. The lowest chamber contained a liquid or broth that was heated with a charcoal fire. The liquid evaporated and rose to the top chamber, where it condensed, moved through a side pipe, and then dripped into a receiving vessel. If the middle chamber was filled with herbs, the steam extracted herbal oils. Until the nineteenth century, such *ranbiki* could be found in pharmacies, in the houses of physicians, and in the homes of well-to-do families. With a height of about 50 cm, they were



Fig. 1. A magnificent porcelain *ranbiki* made in the nineteenth-century for Lord Nabeshima Shigeyoshi⁶⁾, Saga Domain (Takeo City Historical Archive)⁷⁾

easy to handle, but their capacities were limited.

Later authors of the Edo era, such as Hiraga Gennai in his *Butsurui hinshitsu* (1762), gave the Dutch credit for the introduction of the *ranbiki*.⁸⁾ However, the Dutch used other terminology and different types of stills. Apparently, the name *ranbiki* is a Japanese version of the Portuguese *alambique* (Arabic *al-anbiq*; ad. Greek *ambik*, cup), and in that *araq*⁹⁾ was introduced into Japanese wound surgery by the Portuguese ("Southern Barbarians"), they probably also brought the first *ranbiki*. This does not necessarily suggest a Portuguese origin of the *ranbiki*. Most of the merchandise on Portuguese galleons came from Asian markets, and the distillation of brandy was brought from southeast Asia to the Ryūkyū Islands during the same era. Therefore, the Portuguese might have acted only as intermediaries.

Caspar-style Surgery and Pharmaceutical Oils

For a few years, there were promising medical encounters in the Jesuit hospital at Funai, but with the increasing oppression of Christianity in Japan from the mid 1580s, any chance of a sustained exchange between Japanese and Portuguese physicians quickly vanished. However, when the Dutch East India Company (*Verenigde Oostindische Compagnie*, VOC) established a trading post on the western island of Hirado in 1609, European surgeons arrived in Japan in greater numbers than before. While their ships were at anchor waiting for the autumn winds, Dutch ship surgeons occasionally attended Japanese patients, sometimes even in Edo.¹⁰⁾ Nevertheless, Japanese sources do not show any Western influence on Japanese medicine during these early decades. The situation changed after the trading post was relocated to Nagasaki, a city under the direct control of the central government. In 1641, the East India Company established a position for a permanent physician on the small island of Dejima, to which its personnel were confined. This decision significantly altered the conditions of medical contact

between Japan and central Europe, and during the following years, occasional deliveries of medicaments indicate that Japanese officials became more interested in the medical services that the Dutch had to offer.¹¹⁾

In the middle of the seventeenth century, Caspar Schamberger (1623–1706), a German surgeon trained during the Thirty Years' War, caught the attention of high-ranking Japanese officials.¹²⁾ He had arrived in Edo among the entourage of the Dutch envoy, Andries Frisius, at the end of 1649. After months of negotiations, Frisius returned to Nagasaki, but Schamberger, mortar gunner J. Schedel, Schedel's assistant W. Smid, and the merchant W. Bijlevelt, were requested to stay until October 1650 in order to demonstrate and teach their special knowledge. Inomata Denbei acted as their interpreter, summarizing Master Caspar's treatment methods and explanations. Copies and excerpts of his official report soon circulated among fellow interpreters and physicians in Nagasaki and Edo and led to the development of so-called Caspar-style surgery (*Kasuparyû geka*).¹³⁾

Various manuscripts relating to Schamberger's teachings show that oils were important ingredients of his plasters for all kinds of "swellings", from ulcers to abscesses. He particularly favoured oil mixtures as healing lotions. For instance, the leg of a page of the powerful Lord of Mito was treated with *Oleum Anethinum*, *Oleum Caryophyllorum*, *Oleum Chamomillae*, *Oleum Juniperi*, *Oleum Laurinum*, *Oleum Petrae*, *Oleum Succini*, and *Oleum Terebinthinae*.¹⁴⁾ To cure the aching arm of Lord Inaba Masanori from Odawara, Schamberger applied *Oleum Caryophyllorum*, *Oleum Chamomillae*, *Oleum Laurinum*, *Oleum Petrae*, *Oleum Terebinthinae*, and *Oleum Vulpinum*.¹⁵⁾ Inoue Masashige, imperial inspector general and ardent supporter of Schamberger, encouraged his personal physician Tôsaku¹⁶⁾ to study Western methods. Tôsaku himself underwent a cure with *Oleum Laurinum*, *Oleum Terebinthinae*, and *Oleum Vulpinum*.¹⁷⁾ While in Edo, Schamberger exhausted his supply of oils

and asked the chief factor (*opperhoofd*) at Dejima for additional supplies. However, when careless handling during transportation severely damaged the flasks, a further urgent request was sent to Nagasaki. Japanese witnesses of these events became convinced that oils were of great importance in Schamberger's cures. The recipes for his plasters and ointments made their way into many later writings and were copied for more than 150 years.

In 1652, only a few months after Schamberger had left Japan, Inoue's physician ordered twenty drugs and medicaments, including *Oleum Amygdalarum*, *Oleum Terebinthinae*, *Oleum Caryophyllorum*, *Oleum Olivarum*, and *Oleum Vitrioli*. During the following decades, high-ranking officials and regional lords increased their requests for pharmaceutical oils. Their orders were forwarded to Batavia, the VOC headquarters for the Far East.

Among the items ordered by Inspector General Inoue a few months after Schamberger's departure, we find two glass vessels for the distillation of *Oleum Vitrioli*, *Oleum Sulphuris* (*Acidum sulfuricum fulmans*), and nitric acid.¹⁸⁾ As such glass equipment could not be produced in Batavia, the company ordered it from the Netherlands.¹⁹⁾ On another occasion, in July 1659, the company delivered a glass alembic, four glass cups and a volume of Ambroise Paré's *Chirurgie* to the two Nagasaki governors, but the impact of this delivery is unclear.²⁰⁾

An examination of seventeenth-century European pharmacopoeia shows that not all pharmaceutical oils required distillation. Some were isolated *per expressionem*, others *per infusionem et decoctionem*, techniques that were within the capabilities of the VOC surgeons in Japan.²¹⁾ On one occasion, fox oil (*Oleum Vulpinum*) was even produced in the narrow quarters of the Nagasaki Inn (*Nagasakiya*) in Edo, where the Dutch stayed during their annual visit to the court.²²⁾

An Official Request

It is not clear why the shôgunate, after a decade of relatively regular orders of oils, suddenly decided to import the relevant technology. It may be attributable to the problem of high drug prices throughout the country, because in October 1666 (ninth month in the sixth year of the *Kanbun* era), the government forbade any monopoly in drug trading. Understandably, this was not well received by the merchants in Edo and Osaka. It seems that the government then turned its attention to the import of herbs and the production of pharmaceutical oils. On 6 November 1667, the Dutch East India Company received a request from the Nagasaki governor, Kawano Gon'emon Michisada,²³⁾ who was leaving for Edo, and his co-governor Matsudaira Jinzaburô Takami,²⁴⁾ who was preparing to take over the office in Nagasaki for the subsequent twelve months.²⁵⁾ During their audience with the departing Dutch chief factor, Daniel Six, and his successor, Constantin Ranst, they conveyed the following message from Edo, carefully recorded in the trading-post diary:

an order was given to send to Japan a mature person, well versed and experienced in the extraction of oils and waters from various fresh medicinal herbs, together with the necessary instruments and a variety of young plants [...] This request for a distiller and herbalist, by order of the shôgun and his senior councillors, has already been discussed at length in Edo and has been once again brought explicitly to our attention by the governors. Therefore, we are considering it very seriously and report it to the Governor General at Batavia.²⁶⁾

There can be no doubt about the nature of this request, which must have involved influential imperial councillors in Edo. Goodwill in such matters considerably facilitated trade negotiations. Therefore, as a first response, the VOC shipped medicinal herbs to Japan in the summer of 1668, with a promise of more in the future.²⁷⁾

The First Western Pharmacist in Japan

In July 1669, the young pharmacist Godefried Haeck arrived at Dejima. The spelling of his name suggests that he was one of the many Germans employed by the VOC. Chief factor Daniel Six, who had come to Japan for a second term, introduced him to Governor Kawano as a distiller and herbalist. However, Six knew that Haeck was not the mature specialist his Japanese counterparts had in mind. Haeck's abilities were strongly doubted, even among the Dutch, as is revealed in a letter from the authorities in Batavia to the chief factor in Nagasaki:

The distiller or herbalist, requested by the Japanese for the second consecutive year, is now coming on one of the ships, but we are not sure if he possesses all the requirements asked for. Persons of such great qualities are very rare, even in the Netherlands, and seldom travel to the Indies. However, we shall do our utmost to find a person more suitable should the one we send now not meet the Japanese expectations.²⁸⁾

Much to the displeasure of the Nagasaki governor, the desired instruments for distillation had again not arrived. On behalf of the central government, he thanked the Dutch authorities for sending Haeck, but emphatically repeated his request for distillation instruments.²⁹⁾

On several occasions between 1 August 1669 and 19 June 1671, Haeck searched for useful plants in the vicinity of Nagasaki by order of the governor, and interpreters noted the Western and Japanese names and medicinal properties of the herbs judged to be useful.³⁰⁾ The results of the first two excursions are preserved in the tract *Yakusô no na narabini wabun no hikae* (Medicinal Herbs and their Japanese Descriptions).³¹⁾ When adjusted to the Western calendar, the Japanese dates are identical with those given in the diary of the Dutch trading post.³²⁾ According to the diary of the chief factor, Martinus Caesar, twenty-four herbs were found on their first excursion, which is in perfect agreement with the number of herbs listed

in the Japanese manuscript. The latter shows the names of the interpreters involved: Kafuku Kichizaemon,³³⁾ Nakajima Seizae-mon,³⁴⁾ Tominaga Ichirôbei,³⁵⁾ and Narabayashi Shin'emon.³⁶⁾ Later works, such as *Ranpô sôki nôdoku shû* (Medicinal Effects of Herbs and Trees in the Dutch Tradition), describe the results of the first two excursions, together with another twenty-three herbs from other field trips.³⁷⁾ These descriptions of local Japanese plants seen through European eyes eventually found their way into the *Oranda geka shinan* (Compass of Dutch Surgery), printed in 1696. The fourth book, *Yakusô kuketsu* (Oral Instruction on Medicinal Herbs), lists all the plants described in these treatises, together with a few more from other sources.³⁸⁾

Haeck's youth, and perhaps the somewhat meagre results of his research, raised doubts in Nagasaki, and on several occasions Governor Kawano had him questioned at length. He wanted to know if Haeck was fully qualified in distillation techniques, how many plants he knew, and what he thought would be the best time for gathering herbs. Other questions dealt with his education, his birthplace, and his linguistic abilities. Some of the answers can be found in the trading post diaries. Haeck had started work in a pharmacy at the age of fifteen, and worked for years in the pharmacy in Batavia. He was able to extract and prepare everything that was made in his homeland if he had the necessary tools and plants. He knew the properties of about forty to fifty plants and thought the best time for collecting herbs to be between May and July.³⁹⁾ On another occasion, when the governor wanted to know whether distillation instruments were made in Batavia and whether distillation was performed there, Haeck explained that copper instruments for the distillation of certain oils could be produced in Batavia, but that all glass vessels must be brought from the Netherlands.⁴⁰⁾

In October 1669, during his farewell audience, Kawano told Six that he considered Haeck too young and inexperienced and reiterated that a mature, experienced person, together with distillation

instruments, should be supplied without delay. He also asked for more seeds, roots, and medicinal plants.⁴¹⁾ Therefore, in 1670, the VOC shipped dried herbs and seeds to Japan together with an inventory.⁴²⁾ Nagasaki's governor, Matsudaira, ordered the interpreters to translate the list and collect information about the properties of the plants and seeds.⁴³⁾ Assisted by Haeck, they struggled for almost a month. The trading post diary tells us that many of the plants did not originate in the Netherlands but in Italy, Turkey, Egypt, Java, and other regions in the Indies.⁴⁴⁾

Rising Dissatisfaction and the Interpreter's Plight

When the East India Company failed for the third consecutive year to send distillation apparatus, the interpreters were placed in a difficult situation. Chief factor, François de Haas, pointed out the long distance between Japan and the Netherlands. He further explained that a person with the capacities required by the shōgunate was difficult to find, and that even if he could be found, it would be unlikely that such a specialist would serve the company in a distant country. Because requests from the government had to be fulfilled under all circumstances, the interpreters refused to translate his message. Instead, they proposed to tell the Nagasaki governor that such a person was on his way from the Netherlands and might arrive soon. A grumbling de Haas wrote in his diary: "These people think that if Japan demands such a person he has to be brought to Japan, if necessary against his will."⁴⁵⁾

Whenever the Dutch gave straightforward explanations, Japanese interpreters struggled to find less offensive expressions. They were much more aware of the problems on both sides, as the chief factors realized. Once, after conveying a request for young trees of clove, nutmeg, and cinnamon, the interpreters added that it would not matter if these plants did not survive the trip, at least it would show that the Dutch respected the shōgun's orders.⁴⁶⁾ Obviously, they knew very well that the company guarded its monopoly in the spice

trade. Only a few years earlier, in 1667, the VOC had captured the clove monopoly by destroying the trees on various islands of the Moluccas and concentrating the crop on Ambon.

On 1 November, when de Haas paid a last visit to the two governors of Nagasaki, they again made clear that the Japanese government was very serious about the introduction of Western distillation techniques.⁴⁷⁾

Imported Herbs in the "Emperor's Garden"

Finally, in the summer of 1671, Frans Braun, an experienced pharmacist, arrived at Dejima with sufficient distillation instruments, seeds, and plants to satisfy the Japanese demands.⁴⁸⁾ On its way to Japan, his ship had hit a sandbank and was wrecked, but fortunately, most of the cargo was rescued and brought to Nagasaki on another ship.⁴⁹⁾ The governor was delighted that a mature pharmacist and his tools had arrived, but Braun soon ran into trouble. When officials conducted the usual baggage checks, they found Spanish flies (*Lytta vesicatoria*) in his medicine chest. These were used both for pharmaceutical purposes and as an aphrodisiac. However, in 1668 the Japanese government had established a list of commodities that should not be brought into Japan. Whereas most of the items were simply considered unnecessary, some, such as Spanish flies ("Spaense vliegen"), were judged to be dangerous. Because many Europeans at the Japanese trading post ignored these restrictions, on 18 April 1670 the authorities in Batavia reiterated them.⁵⁰⁾ Therefore, the Dutch chief factor, Martinus Caesar, found it difficult to excuse Braun as a newcomer who was unfamiliar with the Japanese restrictions.⁵¹⁾

Braun's problems continued. In the beginning of 1672, the interpreters questioned him on several occasions about the oils he could distil. According to Caesar, who attended these meetings, Braun gave the same answers each time. The interpreters, however, insisted that the information he gave about the extraction of nutmeg oil

was inconsistent and called him a rogue, a cheat, and a liar.⁵²⁾ Braun suffered greatly from the interpreters' insults and gradually lost all enthusiasm and zeal for his work.⁵³⁾

The plants and seeds that Braun had brought to Japan received a great deal of attention. According to the trading post diary, they were soon transferred to "the emperor's garden" ('s *keizers tuin*). The only place in Nagasaki deserving such a name was the herb garden of the Jûzen-tempel (*Jûzenji yakuen*),⁵⁴⁾ established by Sue-tsugu Heizô Shigetomo,⁵⁵⁾ government supervisor (*daikan*) of the area around Nagasaki and one of the wealthiest merchants in Nagasaki. After his secret involvement in overseas trading was discovered in 1676, he was stripped of all his possessions. It is generally held that his former garden was used as a shôgunal garden from 1680 to 1688, but it was probably already being used for government purposes during the 1670s.

Here the soil was prepared with sheep dung from Dejima.⁵⁶⁾ Twice a day, a gardener watered the plants and took all measures necessary for successful cultivation.⁵⁷⁾ At the invitation of the Nagasaki governor, chief factor Caesar, together with his successor Joannes Camphuys, pharmacist Braun, the trading-post surgeon Hofman, and others visited the garden. Caesar was delighted to see how well the imported plants were faring and to share his pleasure with the Japanese herbalists he met there.⁵⁸⁾ However, the joy on both sides did not last long; when the Dutch gardener inspected the emperor's garden in spring 1672, the seeds had not germinated and all but three or four plants brought on the Tulpenburgh had withered.⁵⁹⁾ Despite this failure, in June all interpreters came to receive instructions from the surgeon, the pharmacist, and the gardener on the effects and qualities of medicinal herbs.⁶⁰⁾

Another remark made by Camphuys in the autumn of that same year underlines the Japanese interest in plant studies. On 11 September, the interpreters asked whether one of the surgeons (in the trading post or on one of the ships anchored in the bay) was able to

translate the *Hortus Eystettensis*.⁶¹⁾ This *Garden of Eichstaedt*, published by the Nuremberg apothecary and botanist Basilius Besler in 1613, depicts over a thousand plants on 367 folio-size plates and was one of the most magnificent books of its time. Following an order of the imperial councillor Inaba Masanori (1623–1696),⁶²⁾ the Dutch brought a copy to Japan in 1669, probably the second edition of 1640. Besler gave only the Latin and German names and sources of scientific descriptions, but unfortunately Japanese interpreters were not familiar with either language.

Establishment of a Distillery on Dejima

From the middle of October, after the newly appointed governor, Ushigome Chûzaemon, arrived in Nagasaki, much attention was given to distillation. Before leaving for Edo, Governor Kawano had looked closely at the instruments so that he would be prepared if officials at the court asked him about such matters. The interpreters questioned Braun thoroughly about the time required to produce a few samples of oils extracted from aniseed, cloves, nuts, and the like, about the methods for building a laboratory, and about the plants, minerals, and other ingredients needed for distillation.⁶³⁾

Ushigome offered a site within his precincts as a suitable location for a laboratory (*distilleerhuisje*), but Braun declared it too much of a fire risk. Instead, on 14 November 1671, masons and carpenters began construction at the southeastern edge of the island of Dejima. In a letter dated 8 January 1672, the chief factor informed his superiors at Batavia that there was now a building for distillation at Dejima, and that the shōgun had paid for it. He suggested that, in return, the company should pay for the instruments and asked them to immediately send another six to eight stoneware retorts from Batavia and more glass vessels from the Netherlands.⁶⁴⁾

Among the few illustrations of Dejima made during the seventeenth century, a sketch from the collection of Motoki Ryōei (1735–1894)⁶⁵⁾ reveals a cottage in exactly the place described in the Dutch

diary. Chinese characters describe it as an “oil extraction house” (*abura tori ie*). This sketch (Fig. 2) was obviously made by Ryôei’s ancestor Motoki Shôdayu (1624–1697),⁶⁶⁾ who witnessed the first distillation in 1672 as an interpreter.

First Oil Distillation

Distillation was soon begun. Frans Braun tested the laboratory for several weeks by preparing ointments and plasters for the senior imperial councillor, Inaba Masanori. On 6 February 1672, he distilled oil from turpentine in the presence of the Nagasaki governor and other Japanese officials.⁶⁸⁾ So that the chief factor, Camphuys, could take samples to Edo on his yearly journey to court, Braun was ordered to prepare oil from nuts, cloves, camphor, rosemary, aniseed, and fennel. However, he had only ten days to do so, with no oil press for the nuts, and there was only one bush of rosemary in the company’s garden: “Too little for even a single drop of oil.”⁶⁹⁾ Instead, he produced orange peel oil as a sample to be taken to the court, together with the turpentine oil.

Camphuys’s journey took about three months. During his absence, Braun produced two ounces of fennel oil, two ounces of aniseed oil, eighteen ounces of clove oil, eight ounces of rosemary oil, thirty-three ounces of nutmeg oil, six ounces of camphor oil and three-quarters of an ounce of juniper berry oil. Samples of these oils were taken to Edo by the emperor’s “factoir” to present to the imperial councillors and to the emperor himself.⁷⁰⁾

An oil press was made on Dejima to produce nutmeg oil, but its screw was too weak and it could not be repaired. This oil press is depicted in a beautifully coloured sketch by the interpreter Narabayashi Chinzan, another witness of these events in 1672 (Fig. 3).

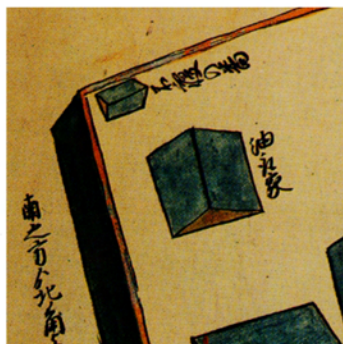


Fig. 2. The “oil extraction house” on Dejima.⁶⁷⁾

Many Japanese officials and physicians came to see Braun at work, and the interpreters saw to it that nobody left Dejima hungry or thirsty, generously entertaining them at the East India Company's expense.⁷²⁾ Braun was also required to teach distillation, and on 30 May 1672 Japanese doctors and surgeons (*doctouren en chirurgijns*) distilled oil for the first time from cloves and turpentine without help.⁷³⁾ Obviously, the transfer of technical knowledge went smoothly.

For about a decade, Dutch chief factors left notes about the distillation performed at Dejima, most of which was of oil produced from cloves. In 1673, a burglary in the "laboratory" was reported, but Braun found nothing missing.⁷⁴⁾ Later that year, the Nagasaki governor visited Dejima and saw Braun at work.⁷⁵⁾ When in 1668 Arashiyama Hoan received one of the rare surgeon's licences issued by the trading-post surgeon, Daniel Busch, he had learned about distillation only from illustrations.⁷⁶⁾ However, Japanese physicians who were sent to the Dutch trading post to learn surgery now also had the chance to acquire practical skills in distillation.⁷⁷⁾

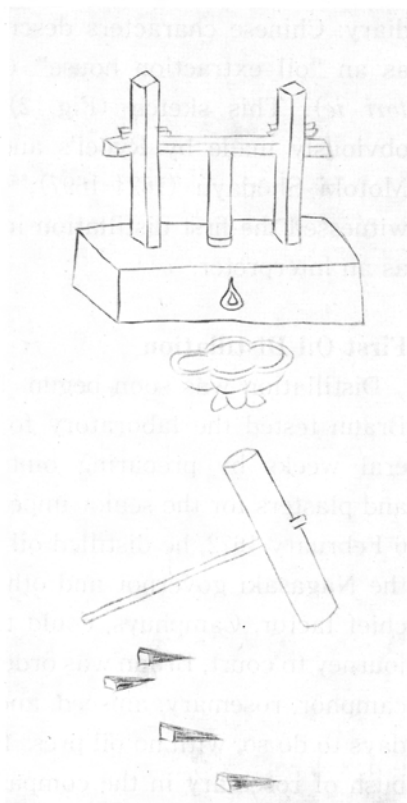


Fig. 3. Oil press.⁷¹⁾

Japanese Sources Describing Braun's Distillation in Spring 1672

Six high-ranking interpreters were required to record in detail all

Braun's activities for the governor. Their report, finished on the thirteenth day of the third month of the twelfth year of *Kanbun* (10.4.1672), describes the distillation apparatus and the production of several pharmaceutical oils. It includes a series of illustrations showing the oven, various vessels, cooling coils, and flasks. A short explanation at the end of the text states that a Dutchman well versed in the production of oils and their qualities had demonstrated the technique of producing oil at Dejima. It was signed by Nakajima Seizaemon, Namura Hachizaemon, Narabayashi Shin'emon, Tateishi Tahyôe, Motoki Shôdayu, and Kafuku Kichizaemon.⁷⁸⁾

As usual, each of those involved made his personal copy. Eventually, although handed over only to sons, favourite adepts, or close friends, some of these copies became more generally available and gradually spread throughout the country. It is unclear how many copies remain, as many manuscripts are held in private family collections. A comparison of available versions shows that later copyists sometimes omitted parts or added further material. For reasons of space, a detailed analysis must be postponed for a separate publication and only the basic types of manuscripts and the essential parts of the interpreters' reports are described.

A few manuscripts can be linked directly to individual interpreters who wrote the reports. The *Oranda chokuden abura no sho* (Book of Oils Conveyed Directly from the Dutch)⁷⁹⁾ was copied in 1762 by the well-known physician Kawaguchi Shinnin (1736–1811)⁸⁰⁾ during a visit to the Kafuku family, still a prominent interpreter family in Nagasaki. This text, which includes a set of illustrations of the distillery used on Dejima, obviously reflects the version owned by Kafuku Kichizaemon. However, additional illustrations show an iron oven that is not mentioned in any of the Dutch sources and may have been taken from Western books.

Another manuscript, *Seiyu kônô zuki* (Illustrated Notes on the Production and Properties of Oils),⁸¹⁾ is part of the compendium *Zenseishitsu iwa* that was compiled by the eminent physician Katsu-

ragawa Hochiku (1661–1747).⁸²⁾ Katsuragawa was a disciple of Arashiyama Hoan (1632–1693)⁸³⁾ one of the few Japanese allowed to enter Dejima to receive medical instruction and finally a medical licence from the company surgeon.⁸⁴⁾ As another part of the *Zensei-shitsu iwa* reveals, Arashiyama had also participated in Haeck's plant gathering.⁸⁵⁾ Comparisons of Katsuragawa's text on distillation with many other manuscripts suggest that this manuscript is very close to the original report.

Among the witnesses of Braun's distillation, Narabayashi Shin'emon (alias Chinzan) is famous for his strong interest in Western medicine. His studies are documented in the manuscript *Kôï geka sôden* (Surgery of the Redhead Barbarians).⁸⁶⁾ The famous copy kept in the Kyôu shoku Collection consists of five separate volumes, each bearing a Japanese and a Dutch title.⁸⁷⁾ The *Abura no sho* (Book of Oils) is also called *Distelee-Boek* and the Dutch title of the *Abura toriyô sho* is *Apotheeque-Boek* (Pharmacist's Book). Both manuscripts directly implicate Frans Braun. The technical descriptions of the distillation apparatus used on Dejima are less extensive than those found in Katsuragawa's manuscripts, but the elaborate colourful illustrations emphasize how highly valued this text was. As Narabayashi intensively studied Ambroise Paré's works, he added an illustration demonstrating the use of sunlight for distillation purposes that was taken from Paré's treatise on distillation published as the twenty-seventh book of the *Chirurgie*.⁸⁸⁾

A similar manuscript *Oranda-koku yakuyu shûge* (Explanation of Pharmaceutical Oils from Holland)⁸⁹⁾ is kept in the Medical Library of Nagasaki University. Kept in an old box together with two volumes entitled *Geka sôden* (Narabayashi's *Kôï geka sôden*), it includes a preface by the famous Confucian scholar Kaibara Ekiken (1630–1714) dated 1706.⁹⁰⁾ All three volumes have identical physical features (size, paper, writing) and are therefore considered of the same origin. Because the *Orandkoku yakuyu shûge* presents the same set of colourful illustrations of the distillation apparatus as the

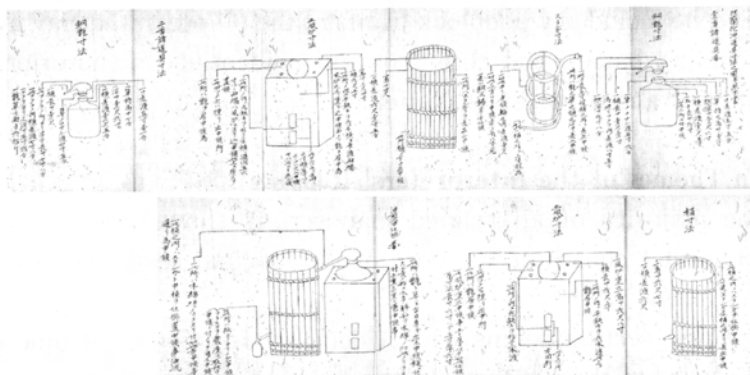


Fig. 4. Distillation apparatus used on Dejima in 1672.⁹¹⁾

Abura no sho mentioned above, there is no doubt that Narabayashi invested much effort in his personal version of the report collated in 1672.

Many copies made by those outside the circle of interpreters preserve the illustrations of the oven, the vessels, flasks, the oil press and so on, while omitting the names of the interpreters and the date the text was finished. The *Oranda yakuyu seihô narabi ni zu* (Illustration and Way of Production of Dutch Pharmaceutical Oils),⁹²⁾ dated 1696, shows that further texts had already been added in the seventeenth century. Another manuscript, the *Ranpô seiyakuhô* (Dutch Methods of Making Medicine) includes an elaborate description of the production of forty-nine pharmaceutical oils combined with the illustrations from 1672.⁹³⁾ Caspar Schamberger, whose name adorns the *Ôriromuto Kasuparu-den* (Oils by Caspar),⁹⁴⁾ was highly esteemed in Japan, but he was in Nagasaki two decades before Braun. On the other hand, sometimes even nineteenth-century copies such as the *Oranda yudôgu sunpô no zu narabini senpô sho* (Illustrations and Measurements of Dutch Oil Instruments and Ways of Distillation, 1808) remain close to the original report.⁹⁵⁾

A few items found their way into printed publications. When Senno Yoshitaka published *Oranda seizai* (Dutch Pharmaceuticals)

in 1805, he included woodblock prints of the oil press, the clay oven, the cooling barrel, and coils from an unidentified manuscript describing Frans Braun's distillation.⁹⁶⁾

Main Themes of the Interpreters' Reports

The majority of all related manuscripts show three thematic sections that constitute the core of the original report collated in 1672.

The first section begins with a detailed description of nine oils with regard to their properties, the scope of their applications, and the distillation techniques required for each. The nine oils are *Oleum Terebinthinae* (turpentine oil), *Oleum Cort. Aurantiorum* (oil of orange peel), *Oleum Caryophyllorum* (clove oil), *Oleum Rosmarini* (rosemary oil), *Oleum Nucis Moschatae* (nutmeg oil), *Oleum Anethi* (fennel oil), *Oleum Anisi* (anise oil), *Oleum Juniperi* (juniper oil), and *Oleum Camphorae* (camphor oil). For example, *Oleum Cort. Aurantiorum* is explained as follows:

Oleo Orangorum [sic]⁹⁷⁾ is oil from dried orange peel.

Properties: When winds accumulate in the abdomen and cause pain, put three or four drops of this oil into hot water and take it together with the water twice a day, in the morning and in the evening. If one feels pain throughout the abdomen, put four or five drops in sake or hot water and take it. It is good against rumbling in the intestines caused by wind-evil, furthermore against swollen spleen and pain in the stomach. When children are suffering from abdominal pain by worm pneuma, warm a little bit of this oil, rub it [on the abdomen], wrap some cotton round it and leave it so. Then the pain will be cured.⁹⁸⁾

Because knowledge of Western medicine was still very limited, pathological explanations were barely understood. Therefore, almost inevitably, Eastern medical ideas were incorporated during the process of translation. In the above example, the occidental concept of colic is translated in terms like *fūja* (wind evil)⁹⁹⁾ and

mushike (worm pneumonia),¹⁰⁰⁾ which even now remain untranslatable. As a consequence, Japanese physicians applied Western-style oils, ointments, and plasters in many cases, while following an only slightly modified Sino-Japanese aetiology.

The preparation of turpentine oil, widely used in European plasters and ointments and brought to Japan by the Portuguese in the late sixteenth or early seventeenth century, was explained in detail:

Method for extracting turpentine oil

Place seven to eight *shō* of water in a copper vessel, then add six *kin* of turpentine fat and one *gō* of salt.¹⁰¹⁾ Close the vessel with a lid, add wheat flour to the water, put this on cotton and wrap it twice around the juncture of the vessel and lid. When boiling on a charcoal fire, oil and water become steam, which rises up to the lid, enters into the pipe and comes down into the flask. Its mouth is wrapped with cotton to avoid evaporation. When the flask is full, it is replaced with another one and left for a while. The oil comes up and the water goes down. A small bottle is attached to it and one end of a cotton wick is inserted into the bottle and the other into the flask containing the oil. Then the oil moves into the small bottle.¹⁰²⁾

Most of the other oils were prepared in similar ways, but in the case of camphor oil, now a by-product of camphor refining, many illustrations were required to demonstrate the various steps of distilling, mixing, and separating.

The 1672 report ends with a short statement that the oils mentioned above were prepared by an *abuteikiru* (apothecary), a professional who was different from a surgeon and similar to a Japanese *kusuriya* (drug merchant).

The second section of the report consists of annotated illustrations showing a rectangular oven made of brick and clay, into which a copper vessel, called *deisuteiruketeru* (*destilleerketel*), is put on an iron grate. The lid of the copper vessel is called *haruma* (*helm*). The tube of this alembic leads to a copper coil inside a wooden barrel

filled with water. The condensed water and oil finally drop into a flask. When the condensate has reached a certain level, the flask is exchanged. Then a cotton wick inserted into the flask sucks up the lighter oil and transfers it into the final bottle.

The remainder of the illustrations demonstrate the process of extracting camphor oil. First, a flask called *korofu* (*kolf*) is filled with camphor, crushed almonds, and water, and the mouth of the flask is covered with thick paper. An iron vessel filled with sand serves as a sand bath, which is put on the oven's grate. Then the flask, which is buried in the sand, is heated and alcohol is added over a period of six days. On the seventh day, after removing the paper, an alembic connected to a smaller receptacle is set on top of the flask. While the alcohol condenses into this receptacle, the camphor and water remain in the flask. On the final day, the floating camphor is separated from the water and passed into a retort, together with the alcohol collected the previous day. This retort is buried in the sand bath and connected to a small flask. Once again, the alcohol is distilled while the camphor remains. The latter, together with half the alcohol, is then transferred into another flask and the mouth wrapped with paper. When this flask has been warmed, the camphor oil sinks whereas the alcohol floats. Finally, the mouth of the flask is wrapped with a piece of leather and held upside down, and the camphor oil drops into a tea bowl through a tiny hole pierced in the leather.

The last three illustrations also show the oven, all the vessels, the flasks, and so on, and give the exact measurements of each.

The third and concluding section of the report is a short statement claiming that the described properties of the oils, as well as the illustrations and measures, were conveyed by a Dutchman who produced oil at Dejima. The date is given as the thirteenth day of the third month in the twelfth year of Kanbun, which corresponds to 10 April 1672.

There are some indications that the interpreters did not merely

record Braun's instructions but added information from other sources. For example, when detailing the raw material for the distillation of turpentine oil, the text refers to statements made by a Dutchman called "Arumansu" that the resin of a very young Japanese pine could serve as a substitute when Western resin was not available.¹⁰³⁾ This advice came from Hermanus Katz, who worked at Dejima from 1661 to 1662, more than a decade earlier. Furthermore, the illustrations showing the general apparatus with a water-filled barrel bear a certain resemblance to an illustration in Ambroise Paré's book depicting an apparatus for distilling plant oils.¹⁰⁴⁾ As Paré's work stood in the surgeon's corner at Dejima as well as on Japanese bookshelves,¹⁰⁵⁾ it might have been used to some extent. However, Paré gives no measurements, and the production process of oils explained by Braun differs considerably from Paré's descriptions.

Fading Japanese Interest

In June 1674, Braun was mentioned for the last time. After he left Japan, the trading-post surgeons undertook the distillations, but gradually the Japanese authorities lost interest in these activities. Due to climatic problems, insufficient knowledge, and perhaps spoiled seeds, the cultivation of foreign plants was not highly successful. Moreover, the Dutch did not deliver important plants such as clove or nutmeg. Therefore, it must have become clear that a production cycle for the most valuable oils could not be realized.

During the 1670s, some oils produced at Dejima were sent to Edo as part of the annual gifts to the shōgun. The official *Chronicles of the Tokugawa Shōgunate* (*Tokugawa Jikki*) usually state the number of items and give only the names of things considered to be of some importance. Clove oil (*chōjiyu*)¹⁰⁶⁾ appeared sometime in 1677 and in 1679, and from 1680 to 1689 it is registered annually. However, in 1682, the chief factor was told by the Japanese authorities that henceforth, clove oil for the emperor and his councillors should be

sent in bottles from Batavia, packed in cases made especially for this purpose. Oil from Dejima might have lost much of the esteem it enjoyed during the previous decades.¹⁰⁷⁾ The ascent of a new shōgun, Tokugawa Tsunayoshi (1646–1709), probably also played a role. After Tsunayoshi succeeded Ietsuna in 1680, a variety of changes in the Dutch-Japanese intercourse occurred.

The trading-post diary does not tell us what happened during the 1680s. The production of plant oils for officials in Nagasaki or Edo might have continued for a while, although Engelbert Kaempfer (1651–1716), who arrived in Japan in 1690 and worked for two years as trading-post physician, makes no mention of distillation nor does his sketch of Dejima show the still.¹⁰⁸⁾ Nevertheless, at least the house was still there. On 10 December 1691, Cornelis van Outhoorn described the execution of two Japanese who were guilty of contraband trade, and the place where everybody assembled was “the most eastern part, not far away from the emperor’s distillation cottage”.¹⁰⁹⁾

Concluding Remarks

The introduction of Western science and technology into Japan has been closely linked to the emergence of Dutch studies (*rangaku*) in the early eighteenth century. Usually, changes in society and certain political measures, such as the lifting of import restrictions on Western books by Tokugawa Yoshimune, are used to explain this phenomenon. Therefore, the second half of the seventeenth century appears to be a period of stagnation resulting from the Japanese government’s seclusion policy. This view ignores the fact that the policy made in Edo and Nagasaki during the first half of the seventeenth century aimed at a strict control of trade and information rather than the closure of the country. When banning any return of the Portuguese and Spanish to Japan in 1639, government officials made sure that the Dutch East India Company was able and willing to deliver silk, medicine, etc., in sufficient quantities.¹¹⁰⁾ The

Japanese leaders were well aware of their dependence on foreign supplies. Furthermore, Great Commissioner Inoue Masashige, the governors of Nagasaki, and imperial councillors made great efforts to use foreign knowledge and goods to stabilize the country, and studies of European medicine, herbs, astronomy, land survey, and so on, began shortly after the so-called closure.

The import of distillation apparatus and the introduction of distillation techniques is a remarkable example of the early transfer of Western technological knowledge. This initiative of the Japanese government was aimed at a new and independent production cycle. All requests and orders show that the drug and spice plants had to be cultivated in Japan in order to procure the raw material for the distillation of important pharmaceutical oils. However, while the technology itself was quickly absorbed, the cultivation of tropical and subtropical plants was not successful. Furthermore, the VOC was very reluctant to deliver plants over which it had just achieved a monopoly in southeast Asia. Finally, perhaps because of a shift in policy after the rise of the new shōgun, Tokugawa Tsunayoshi, government officials lost interest in the project.

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- 1) Sōda, Hajime, *Nihon seiyaku gijutsu shi no kenkyū* [A Study on the History of Pharmaceutical Techniques in Japan]. Tōkyō: Yakuji Nippō-sha, 1965, p. 69-71 (『日本製薬技術史の研究』薬事日報社). Sōda, Hajime, *Nihon iryō bunkashi*. Kyōto: Shibunkaku, 1989, p. 131-132 (宗田一『日本医療文化史』). Ōtsuki, Nyoden, *Nihon Yōgaku-hen nenshi* [Chronicle of »Western Studies«]. Kinseisha: Tōkyō 1965 (大概如電『洋学編年史』錦正社).
- 2) Jinhua chongbi dan jing bizhi『金華冲碧丹經秘旨』.
- 3) Needham, Joseph et al., *Science and Civilization in China*, Vol. 5, Part IV, Cambridge University Press, 1980, p. 72f.
- 4) shaojiu 焼酒, shōchō 焼酎.
- 5) For more on brandy in Japan, see Sōda, Hajime, *Nihon iryō bunkashi*, p. 117-119.
- 6) Nabeshima Shigeyoshi 鍋島茂義.
- 7) Takeo-shi rekishi shiryōkan 武雄市歴史資料館.

- 8) Hiraga Gennai, *Butsurui hinshitsu*, 1763. Reprinted by Yasaka Shobô, Tôkyô, 1972 (平賀源内『物類品騰』松籟館蔵版, 宝暦13年. (平賀源内『物類品騰』松籟館蔵版, 宝暦13年. 翻刻: 八坂書房, 東京, 1972年).
- 9) By the fourteenth century, the distillation of wine was transferred from the Near East to Europe, and the Arabic word âraq (sweat) became widely used in its various forms in the Latin alphabet (arak, araka, araki, ariki, arrack, arack, raki, raque, racque, rac, rak, araka). Written in Chinese as 阿里乞, 阿利吉, and in Edo-Japanese also as 阿利吉 and 阿刺吉. *The Different Aspects of Islamic Culture, Science and Technology in Islam*, Vol. 4, Part II, UNESCO, 2001. Robert S. Lopez and W. Raymond Irving, *Medieval Trade in the Mediterranean World*, Columbia University Press, 1990, p. 109.
- 10) In 1631, for example, all ship surgeons discussed the appropriate treatment of Shimada Toshimasu, governor of the city of Edo. National Archive 1.04. 21, Nederlandse Factorij in Japan 482 [below: NFJ], fol. 457 (Letter from Neijenroode to Janszoon, Hirado, 23.3.1631).
- 11) NFJ 766, Factuur 28.6.1642 (De Paeuw); NFJ 770, Factuur, Casteel Batavia, 18.6.1646 (De Zeeroos).
- 12) Wolfgang Michel, *Von Leipzig nach Japan. Der Chirurg und Handelsmann Caspar Schamberger (1623-1706)*. Iudicium Verlag, München, 1999.
- 13) A copy of Inomata's report was given to the physician Kawaguchi Ryôan. Within twenty years, further copies were spread through Kawaguchi to disciples in Kyôto, Shikoku, and northern Honshû. See Michel, *Von Leipzig nach Japan*, p. 168f.
- 14) Michel, *Von Leipzig nach Japan*, p. 158.
- 15) Michel, *Von Leipzig nach Japan*, p. 117.
- 16) Tôsaku 藤作.
- 17) Michel, *Von Leipzig nach Japan*, p. 159.
- 18) NFJ 65, Dagregister, 24.5.1652.
- 19) NA 1.04.03, VOC 1297: fol. 382r; *Generale Missiven*, 31.1.1675.
- 20) 1. Casken voor de Gouverneurs van Nangasacky, daar in een glazen alem-bik, 4. glase coppen en een Chirurgie van Ambrosius Paree cost fl 18:-: (NFJ 783, Factura Casteel Batavia, 16.7.1659).
- 21) In 1657, when preparing 'fox oil', the surgeon Hans Juriaen Hancko caused such an evil stench and smoke that the chief factor, Zacharias Wagenaar, found it unbearable and complained (NFJ 70, Dagregister 20.2.1657). In 1665, the under-surgeon Abraham van Kerpen produced almond oil for the Nagasaki governor, Shimada Kyûtarô Toshiki (島田久太郎忠政). Shimada held the position of Nagasaki governor from 1662-1666. Towards the end of

- 1665, he ordered a glass still (NA 1.04.02, VOC 1253, DDDD. Derde Boek: Batavia's ingekomen brievenboek, deel II).
- 22) NFJ 70, Dagregister, 20.2.1657.
 - 23) Kawano Gon'emon Michisada 河野権右衛門通定.
 - 24) Matsudaira Jinzaburō Takami 松平甚三郎隆見.
 - 25) Both governors were newly appointed in April 1666. In 1671, Matsudaira Jinzaburō asked to be dismissed and Ushigome Chūzaemon Shigenori (牛込忠左衛門重恭) was appointed in his place. Kawano Gon'emon was replaced in 1672 by Okano Magokurō Sadaaki (岡野孫九郎貞明). Usually one governor resided in Edo and the other in Nagasaki. Each year in autumn they exchanged residencies.
 - 26) Ten laetsten wiert g'eyecht een bejaert persoon bequaem en g'experimenteert omme te trecken extracten, olien en wateren uyt allerhande groene medicinale cruyden, benefens de nodige instrumenten daer toe moettende dienen. Item diverse jonge spruyten daer men de zaden niet wel versch in Japan om te zayen van can overbrengen, omme aen te planten en voort te connen queeken: welcke voorz: mandaten en 't versoeck van de distelateur en cruyden kenner, door des Keyzers last ende der Rijcxraden ordre door meergen[oemde] govern[eu]rs, nu expres op 't laetst van 't vertreck wiert de novo indachtigt, hoewel 'tzelve genoech in Jedo was geschiet op dat het selve te naeuwer te observeeren en voor ernst te achten, mitsgaders aen den Ed. Heer Governor Generael te rapporteren hadden. (NFJ 81, Dagregister, 6.11.1667).
 - 27) NFJ 299: Letter from the Governor General at Batavia, dated 29.6.1668.
 - 28) NFJ 300: Letter from the Governor General at Batavia, dated 20.5.1669.
 - 29) NFJ 82, Dagregister, 20.7.1669.
 - 30) According to the Dagregisters, Haeck collected plants in Japan on 1.8.1669, 23.8.1669, on two days in April and May 1670, and again on 12.7.1670, 28.4.1671, 7.5.1671, and 29.6.1671. Sōda (*Nihon iryōbunka shi*, p.128f.) mentions Japanese manuscripts bearing the dates of Kanbun 10/3/7 and 10/3/29, which correspond to 26.4.1670 and 18.5.1670 in the Western calendar. This clarifies the vague Dutch information for April and May 1670. Further details, including Japanese sources, will be published separately.
 - 31) *Yakusō no na narabini wabun no hikae*. Manuscript, Edo era, Kyōto University Library, Fujikawa-Collection (「薬草の名並和文扣」).
 - 32) 西ノ七月五日, 1 August 1669; 西ノ七月廿七日, 23 August 1669.
 - 33) Kafuku Kichizaemon 加福吉左衛門.
 - 34) Nakajima Seizaemon 中嶋清左衛門.

- 35) Tominaga Ichirōbei (富永市郎兵衛) is mentioned frequently in the VOC diaries during the 1660s. His signature can be found on a medical certificate that Arnout Dirksz issued for the physician Seo Shōtaku in 1667, and in the *Yakusō no na narabini wabun no hikae* describing the first two plant-gathering excursions made by G. Haeck. Tominaga's interest in medicine is obvious, but the Dutch trading-post diary, as well as the criminal register (*hankachō*) of the Nagasaki governor, reveal that he lost his job and one finger in 1677 because of his involvement in illegal business. NFJ 91, Dagregister, 31.10.1677; Morinaga, T. (ed.): *Hankachō. Nagasaki bugyōsho hanketsu kiroku*. Nagasaki Gakkai, Nagasaki, 1956, Vol. 1, p. 33 (森永種夫編『犯科帳 長崎奉行所判決記録』犯科帳刊行会).
- 36) Narabayashi Shin'emon alias Narabayashi Chinzan (櫛林新右衛門・鎮山, 1648-1711). He was the first to tried to render parts of Ambroise Paré's *Chirurgie* into Japanese.
- 37) *Ranpō sōki nōdoku-shū*. Manuscript, Edo Era, Michel Collection (蘭方草木能毒集), 写本, W・ミヒエル蔵).
- 38) *Oranda geka shinan*, Uemura Hirazaemon: Kyōto, 1696. Book 4: *Yakusōkuketsu* (『阿蘭陀外科指南』京, 上村平左衛, 元禄9年刊. 卷4:「薬草口訣」).
- 39) NFJ 83, Dagregister, 23.2.1670, 4.6.1670 (entry by Adriaen Gillis on events between March and May during the absence of the chief factor, Franois de Haas), 9.7.1670.
- 40) It was not before 1675 that the VOC sent a glass blower, Jan Vrouling, to Batavia (NA 1.04.03, VOC1297, 382r). See also *Generale Missiven*, 31.1.1675. Printed in W.Ph. Coolhaas, *Generale Missiven van Gouverneurs-Generaal en Raden aan Heren XVII der Verenigde Oostindische Compagnie*. Deel IV, 1675-1685. 's-Gravenhage: Martinus Nijhoff, 1971.
- 41) NFJ 82, Dagregister, 12.10.1669.
- 42) An entry in the trading post diary mentions two catalogues, one with descriptions of the medicines brought to Dejima, the other with descriptions of the dried herbs and seeds (NFJ 83, Dagregister, 3.8.1670). These catalogues no longer exist in the VOC Archives in The Hague.
- 43) NFJ 83, Dagregister, 3.8.1670.
- 44) NFJ 301, Letter from François de Haas to the Governor General at Batavia, dated 19.10.1670: Dat de zaaden en medicinale cruiden niet en komen uijt Hollant maer uijt vreemde landen, als Italië, Tourkije, Egipten en elders en oversulx qualijck te bestellen zijn hebben haer oock bericht [...].
- 45) NFJ 83, Dagregister, 4.8.1670.
- 46) NFJ 82, Dagregister, 29.8.1670. Similar remarks can be found in a letter de

Haas wrote on 19.10.1670.

- 47) NFJ 83, Dagregister, 1.11.1670.
- 48) NFJ 865, Journal held by the bookkeeper of the VOC at Dejima, 1670-1671.
- 49) On 31.5.1670, the ships Schermer and Tulpenburgh left Batavia for Japan. A few days later, the Schermer hit a sandbank at the mouth of Banka Strait and was wrecked. Fortunately, parts of the cargo were rescued by the Tulpenburgh. Among the rescued goods were medicinal plants (NFJ 865, Journal 1670-1671: 20 balies met geplante kruiden waarvan d'balien overboort zijn geworpen end'kruyden herplant ind balien van Tulpenburgh.)
- 50) Voorschrift nopens de goederen, welke naar Japan niet mogten medegenomen worden. Printed in J.A. van der Chijs, *Nederlandsch-Indisch Plakaatboek 1602-1811*. Tweede Deel (1642-1677), Batavia: Landsdrukkerij / 's Hage: Nijhoff, 1889, pp. 509-512.
- 51) NFJ 84, Dagregister, 21.7.1671.
- 52) NFJ 85, Dagregister, 9.1.1672.
- 53) NFJ 303, Letter to the Governor General and Council of the Indies by the chief factors Joannes Camphuys and Martinus Caesar, dated 12.11.1672.
- 54) Jūzenjiyakuen 十禅寺薬園.
- 55) Suetsugu Heizō Shigetomo 末次平藏茂朝.
- 56) NFJ 84, Dagregister, 21.7.1671.
- 57) NFJ 84, Dagregister, 23.7.1671, 30.7.1671.
- 58) NFJ 84, Dagregister, 10.8.1671.
- 59) NFJ 85, Dagregister, May 1672 (entry by Cornelis van Heyningen on events between February and May, during the absence of the chief factor Joannes Camphuys).
- 60) NFJ 85, Dagregister, 11.6.1672.
- 61) NFJ 85, Dagregister, 11.9.1672.
- 62) Inaba Masanori 稲葉政則.
- 63) NFJ 85, Dagregister, 29.10.1671, 2.11.1671.
- 64) NFJ 303, Letter to the Governor General and Council of the Indies by the chief factor Joannes Camphuys, 8.1.1672.
- 65) Motoki Ryōei 本木良永
- 66) Motoki Shōdayu (本木庄太夫) became famous for his "translation" of a Dutch edition (1667) of Johannes Remmelin's *Pinax Microcosmographicus* under the title *Oranda zenku naigai bungōzu* (Dutch Anatomical Atlas of the Whole Body). It took almost a century for the value of this work to be recognized.
- 67) Shoga ezu-shū. Motoki Collection, Nagasaki Municipal Museum. This

- sketch was printed in Nagasaki-shi Dejima shiseki seibi junbi shingi-kai (ed.): *Dejima-zu-sono keikan to henssen*. Chûdô kôron bijutsu shuppan, Tôkyô, 1990, p. 94f. (長崎市出島史跡整備準備審議会編『出島図—その景観と変遷』改訂版, 平成2年).
- 68) NFJ 85, Dagregister, 6.2.1672.
 - 69) NFJ 85, Dagregister, 5.2.1672.
 - 70) NFJ 85, Dagregister, May 1672 (entry by Cornelis van Heyningen on events between February and May, during the absence of the chief factor Joannes Camphuys).
 - 71) *Ranpô sei-yakuhô*. Manuscript, Edo Era, Michel Collection (「蘭法制薬方」, 写本, W・ミヒエル蔵).
 - 72) NFJ 85, Dagregister, May 1672 (entry by Cornelis van Heyningen).
 - 73) NFJ 85, Dagregister, 30.5.1672.
 - 74) NFJ 86, Dagregister, 7.6.1673.
 - 75) NFJ 86, Dagregister, 10.10.1673.
 - 76) W. Michel/Y. Sugitatsu: Ôtaguro Gentan no Oranda-geka menkyojô to sono haikai ni tsuite, p. 462
 - 77) NFJ 87, Dagregister, 26.11.1673, 17.12.1673.
 - 78) Nakajima Seizaemon, Namura Hachizaemon, Narabayashi Shin'emon, Tateishi Taôhye, Motoki Shôdayu and Kafuku Kichizaemon (中嶋清左衛門, 名村八左衛門, 榑林新右衛門, 立石太兵衛, 本木庄太夫, 加福吉左衛門).
 - 79) *Oranda chokuden abura no sho*. Manuscript kept by Tôyô-Bunko — The Oriental Library, Tôkyô (「阿蘭陀直傳油之書」河口信任写, 宝歴12年12月18日), 東洋文庫蔵).
 - 80) For more on Kawaguchi Shinnin, see Kawashima Junji, *Doi-han rekidai ran' i Kawaguchi-ke to Kawaguchi Shinnin* [The Dutch-Style Physicians of the Kawaguchi Family in the Domain of Lord Doi and Kawaguchi Shinnin], Kindai Bungeisha, Tôkyô 1989 (川島恂二『土井藩歴代蘭医河口家と河口信任』近代文芸社).
 - 81) *Zenseishitsu iwa*, Vol. III. Kyôto University, Fujikawa Collection. 「繕生室医話」, 第3巻, 「製油功能図記」, 京都大学, 富士川文庫.
 - 82) Katsuragawa Hochiku 桂川甫筑.
 - 83) Arashiyama Hoan 嵐山甫庵.
 - 84) For more on Arashiyama's licence, see W. Michel/Y. Sugitatsu: *Ôtaguro Gentan no Oranda-geka menkyojô to sono haikai ni tsuite* [The Surgical License of Ôtaguro Gentan and its Background]. *Journal of the Japan Society of Medical History*, Vol. 49, No. 3 (2003), pp. 461-464 (ミヒエル・ヴォルフガング, 杉立義一「太田黒玄淡の阿蘭陀外科免許状とその背景について」

『日本医史学雑誌』).

- 85) *Zenseishitsu iwa, Yakusô no nô* (「繕生室医話」下乾, 「藥草ノ能」).
- 86) *Kôï geka sôden*. Kept by Kyôu sho'oku (Kyôu Archive), Ôsaka. (檜林鎮山「紅夷外科宗伝」, 「油取様書」, 杏雨書屋蔵)
- 87) 仕掛書 Genees-Boek; 金瘡書 Wondheyttng-Boek [sic]; 金瘡跌撲 Anatomie-Boek; 膏藥書 Pleyster-Boek; 油之書 Disteleer-Boek, 油取様書 Apotheequers-Boek.
- 88) Narabayashi used a Dutch translation of the fourth French edition, probably the 1649 print: *De Chirurgie en de opera van alle de werken van Ambrosius Paré*. Carolus Battus. Amstelred. 1649
- 89) *Orandakoku yakuyu shûge*. Medical Library, Nagasaki University (「和蘭国薬油集解」, 長崎大学附属図書館医学分館蔵).
- 90) Narabayashi Tokitoshi (= Chinzan), *Geka sôden*. (檜林時敏「外科宗伝」. 序文: 貝原益軒, 宝永3年. 長崎大学附属図書館医学分館蔵)
- 91) *Oranda yudôgu sunpô no zu narabini zenpô sho*. Manuscript, 1808, kept by Medical Library, Kyûshû University (「阿蘭陀油道具寸法之圖并煎方書」文化5年写, 九州大学附属図書館医学分館蔵)
- 92) *Oranda yakuyu seihô narabini zu*, Manuscript, Genroku Era, kept by Kyôu shooku, Ôsaka (「阿蘭陀薬油製法并図」杏雨書屋蔵).
- 93) *Ranpô seiyakuhô*. Manuscript, Edo Era, Michel-Collection (「蘭法製薬方」, 写本, W・ミヒエル蔵).
- 94) *Ôriromuto Kasuparu-den*. Vol. 3: Kômô Kasuparu-den abura no bu. Manuscript, Edo Era, Tôkyô University Library (「於津良武土加寸波留伝」, (巻3)「紅毛カスバル伝油之部」, 東京大学附属図書館)
- 95) *Oranda yudôgu sunpô no zu narabini senpô sho*. Ms, 1808. Kyûshû University Medical Library (「阿蘭陀油道具寸法之図并煎方書」文化5年写, 九州大学附属図書館医学分館蔵).
- 96) Senno Yoshitaka: *Oranda seizai*. Kyôto, Iya Ichiemon, 1805 (千野良岱(元達)『和蘭製剤』京都, 夷屋市右衛門).
- 97) The Japanese text puts the name of this oil in katakana characters: *ôri oranyôromu*. In Latin, the first part should be "oleum", but as this word had already been introduced by Iberians during the "Christian Century" (1549–1639), the Portuguese *óleo* was used throughout the Edo era.
- 98) *Zenseishitsu iwa*, Vol. 3, fol. 2v.
- 99) fûja 風邪.
- 100) *mushike*, 虫気, literally the ki of worms.
- 101) 1 shô (升), 1.8 litre; 1 gô (合), 0.180 litre; 1 kin (斤), 600 gram.
- 102) *Zenseishitsu iwa*, Vol. 3, fol. 2r, 2v.

- 103) *Zenseishitsu iwa*, Vol. 3, fol. 1v.
- 104) Ambrosius Paré, *De Chirurgie ende alle de Opera, ofte Wercken [...] uut de Fransoysche in onse gemeyne Nederlantsche sprake [...] uyt de vierde Editie getrouwelick overgeset*: Door D. Carolum Battum. Amsterdam, 1615, p. 891: Een en oven met sijn distilleervat, door den welcken alle essentien, alle vegetabile ofte aller ghewassen dingen ghedistilleert worden, ghelijck salvie, rosemarijn, thymus, lavendule, annijs, venckelzaet, cruijtnagelen, muscaten, canneel, peper, gyneber, ende meer andere.
- 105) Cf. Michel, *Von Leipzig nach Japan*, p. 164-166.
- 106) *chōjiyu* 丁子油.
- 107) Generale Missive, deel IV: 1675-1685, RGP Grote Serie 134: 19.3.1683, p. 547.
- 108) Engelbert Kaempfer: *Heutiges Japan*. Herausgegeben von Wolfgang Michel und Barend J. Terwiel. Iudicium Verlag: München, 2001, p. 715-717.
- 109) [...] aen het oostelijckste eijnde niet verre van 't keijzers disteleer-huijsje. (NFJ 105, Dagregister, 10.12.1691).
- 110) NFJ 55, Dagregister, 20-27.5.1639.

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