

## Medical Communication in the First Global Age

Willem ten Rhijne in Japan, 1674-1676

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The period that saw the beginnings of global capitalism also saw the beginnings of global science. Actions in one part of the world could have consequences for another in ways that could not have been predicted. While countless people from every place were subject to great brutalities in the quest for mastery, exotic new wonders also burst upon human consciousness the world over. Everywhere seemed to be opening to new experiences, whether travellers encountered strange new places and peoples, or whether local people encountered strange new ideas and commodities imported from abroad. At the same time, hosts of people throughout worked to gather new and old information, and to sort out the true from the false, which was no simple task. The gathering together of what Europeans were beginning to call ‘facts’--a words imported from legal discourse<sup>1</sup>--this gathering of ‘facts’ not only created great excitement, but depended on enormous investments of time, energy, expertise, experience, and money. It also required collaborative work. Even what seem like minor bits of information came into being through the labors of large networks of people. The so-called scientific revolution was built not by a few geniuses thinking in their rooms, but from the collective efforts of countless people.

In the midst of the changes wrought by the new global enterprises, many new medical treatments came to the notice of the European public, some being imported from the Americas, Africa, and Asia. In the 1660s, for example, the famous English chemist Robert

Boyle wrote in his work on experimental philosophy that he expected “some improvements to the *Therapeutical* part” of medicine from “the writings of so ingenious a people as the *Chineses*” as well as from experiments suggested “partly by the *Indians* and other barbarous Nations.”<sup>2</sup> He might already have had in mind old medicines from Asia being imported to Europe in large new amounts, such as true rhubarb, pepper, nutmeg, cinnamon, cloves, and opium, or newer medicines from Asia and the New World like China root, sarsparilla, ipecacuana root, guaiac wood, tobacco, and cocoa, or the most recent medicinal imports such as cinchona bark (or “Jesuit’s Bark”) from South America, coffee from Arabia, and tea from East Asia.

The quotation from Boyle makes it clear that the knowledge of other people was of interest to him, but it also implies that such new knowledge came from the initiative of the Europeans themselves, who went out to discover things. In fact, however, much of what the Europeans learned not only came from other people, but originated as an indirect product of someone else’s agency. The account I want to give you today is an example, I think, of how Europeans learned about an Asian medical practice because of the attempts of people in Asia to learn from the Europeans. In the case at hand, it was initiatives launched by the Japanese that indirectly gave rise to new knowledge in Europe about acupuncture, rather than the other way around.<sup>3</sup>

It was through Dutch networks that the first good description of acupuncture first came to the attention of Europeans. The Dutch had built a global trading network in the 17th century that stretched from North America and the Caribbean to Brazil and the Guinea Coast of Africa, to the Cape Colony at the southern tip of Africa to places throughout Asia--often by the ruthless exercise of force, but often enough, too, by clever diplomatic negotiation. As you will all know, in East Asia the Dutch East India Company, or VOC, made many attempts to open direct trade with China, but remained shut out, retaining access to the Chinese market only through Chinese merchants who came to their trade stations, or factories. One of the factories was Fort Zeelandia on Taiwan, established in 1623-4, although following the fall of the Ming dynasty it fell to a military leader, CHENG Ch’eng-kung (who the Dutch called

‘Coxinga’), in 1662. In Korea, a Dutch ship sailing from Taiwan for Japan in 1653 was shipwrecked on Quelpaert (Cheju) Island, and the sailors were removed to the Korean mainland, eight of whom finally managed to find their way to the VOC factory in Japan in 1666.<sup>4</sup>

In Japan itself, the famous episode of Will Adams, the pilot who in 1600 came aground off Japan and eventually gained the trust of the Shogun eased the VOC establishment of a regular trade at Hirado, just off Kyushu, by 1609. Within a few years, the Japanese government (the Bakufu) grew very suspicious of the Spanish and Portuguese, and identified the Christians they had converted as a political threat and in 1616 undertook severe measures to stamp it out. By the late 1620s, trade with the Dutch also ceased temporarily before renewal in 1632. In 1637 and 1638, the Shimabara revolt saw Christians in the region east of Nagasaki rise against the government. The Dutch gave naval assistance to the bakufu in putting down the revolt, whereas the Portuguese were blamed for supporting it, which caused trade with the Portuguese to be prohibited and their delegation sent to appeal the decision in 1638 all beheaded. That left only the Dutch among Europeans allowed intercourse with the Japanese.

The bakufu placed the Dutch under severe restrictions, however. They shifted the Dutch trading station from Hirado to the more closely controlled port of Nagasaki, where their ships were allowed only in summer, returning with the trade winds of autumn. From July 1641, Dutch-Japanese exchanges were focused on the man-made island of Deshima in the harbor of Nagasaki. The island was built in shape of fan, with east and west sides 210 feet long, the north side (facing town) 557 ft, and south side (facing harbour) 796 ft, for a total of about 15,700 sq. yds; the whole was surrounded with high board fence topped by double row of iron spikes to prevent smuggling, with a landing gate on the W side opened only when Dutch ships loaded or unloaded. They laid out a garden, and kept cows, sheep, pigs, and chickens, but they paid the Japanese government an annual rent for the island, for fresh water which came through bamboo pipe from a river in Nagasaki, and for the construction and upkeep of the buildings on the island; they also had to provide for living space on the island

for Japanese overseers, interpreters, and guards. No vessels could approach the island without the permission the Japanese governors, while foot traffic all went via a stone bridge guarded by sentries at both ends. Even the courtesans who spent time on Deshima reported to the police. Foreigners were also prohibited from learning the Japanese language, which placed all communication in the hands of the Japanese interpreters, who were government officials.<sup>5</sup> For about 200 years, then, the main direct channel for the exchange of information between Japan and Europe lay via the Dutch station of Deshima, mainly via the Japanese interpreters, many of whom were very well educated. The Dutch picked up information from them, and thereby served as one of the main channels of communication about East Asian natural knowledge to Europe, the other major route being the Jesuit missionaries in China. For their part, the Japanese came to call what they learned from the Dutch *Rangaku*--or 'Dutch studies.'

Among the pieces of medical information conveyed from Asia to Europe by the Dutch was the first description in a European language of acupuncture.<sup>6</sup> It came in a work in Dutch and Latin by a physician who spent two years on Deshima, Willem ten Rhijne. He was there not on his own initiative, however, but because of a request from the Japanese government. On 6 January 1667, a Japanese official formally requested the Dutch East India Company (or VOC) to send them a doctor trained in European chemistry and botany. Another request came on April 1, 1668.<sup>7</sup>

Let me suggest a hypothesis about the background to these requests. Under the shogun Ietsuna, Japan was experiencing a period of relative peace and a revival of learning, including medical learning.<sup>8</sup> Many scholars were at work trying to create a culture that would substitute learning for raw military power, with the younger sons of displaced samurai often trying to make a career as savants: as physicians, teachers, and scholar-advisors to the powerful.<sup>9</sup> Occasionally, if one became a physician and advisor to a great lord like a daimyo, it was even possible to recover one's samurai status. While classical Chinese sources pertaining to the Way remained very important in Japanese learned culture, during the 1660s and '70s, attempts to create a uniquely Japanese philosophy were strong.<sup>10</sup> Therefore, just

when the bakufu requested that a learned Dutch physician be brought to Japan, many powerful voices were moving away from their initial Sinophilia. In medicine, this meant that many well-placed Japanese scholar-physicians were seeking to adapt the principles of classical Chinese medicine to their own ends, or even to adopt other principles. In the process, they were intrigued by the possibility of incorporating Western medical knowledge.

As early as the mid-16th century, Japanese physicians had already begun to incorporate into their practices some new remedies, and some new methods of diet (such as chicken eggs, milk, and wine) that had been introduced from Europe, mainly by Jesuit missionaries. The new hospitals established by the Jesuits were also points for the diffusion of knowledge of European medicine. The influence of these elements on Japanese medicine was relatively minor, but from at least the 16th century onward Japanese physicians were quite aware of medical practices outside the classical traditions of East Asia.<sup>11</sup> Japanese contacts with European medicine continued, partly through Korea and China, but especially via the last remaining European trading post, the Dutch factory on Deshima. The Japanese continued to learn about European medicine mainly from the surgeons stationed on Deshima. The most important development came via Caspar Schamberggen, who in 1649 accompanied the head of the East India Company on the annual journey required of the Dutch to Edo (now Tokyo), at the end of which he was invited to stay at the Shogun's court for six months, lecturing on and demonstrating surgery to the court physicians. This led the development of a surgical system known as the Kasuparury geka, or the Caspar school of surgery.<sup>12</sup> The keen interest displayed by some Japanese for Western surgery was also demonstrated by HOAN Arashiyama, physician to the lord of Hirado. He received a surgical education from the Dutch on Deshima around 1650, and in 1665 received a surgeon's certificate from the head of the Deshima station; there may have been others being trained there during the mid-17th century. A pupil of HOAN Arashiyama, HOCHIKU Katsuragawa, founded the Katsuragawa school, which strongly advocated Dutch surgery. Moreover, a number of the Japanese translators at Deshima developed a special skill in medical translation; one of them, NISHI Kichibei, even obtained a certificate in surgery from the Dutch in 1668. This translator,

physician, and surgeon is better known by the name of Genpo, and he took a very important part in the transmission of knowledge between the Dutch and Japanese.<sup>13</sup> It was during the period that Genpo was studying medicine and surgery with the Dutch that the VOC received the requests to send a real physician--not just a surgeon--to Deshima, and it is therefore likely that he is behind the initiative.

The request came from the local Japanese governor, the Nagasaki magistrate, or Bugyō. In the second letter, the Japanese translator, Sinosie, left the Dutch with the impression that the Shogun wanted them to send him a personal physician, although that may not have been quite so plain.<sup>14</sup> It took the governors of the East India Company back in Amsterdam a few years to get around to advertising the position. In early 1673, however, a young graduate of Leiden's medical faculty, Willem Ten Rhijne, won the post over four other applicants.<sup>15</sup> He was a recent graduate of the medical faculty of the University of Leiden, a favorite student of the most famous professor there, François de Boë Sylvius, who was then developing his theory about acids and alkalies in the cause and treatment of disease. As a student at Leiden, Ten Rhijne became deeply imbued with the values of Hippocratic and chemical medicine, both of which stressed active investigation into the details of nature, and he was also a fine botanist. Like many other Dutch medical students, he finally took his degree at the cheaper university of Angers, in France, and after a time visiting in Paris set up practice in Amsterdam about 1670. But the war that broke out between the Dutch and the allied French and English in 1672 almost destroyed his country, and the young doctor, as yet unmarried, sought the advertised job to travel to Japan on behalf of the East India Company. He was also willing, as he later put it, to become a slave at the Japanese court if it helped to promote Dutch interests. Ten Rhijne left the Netherlands for the main Dutch staging post in the east, Batavia (now Jakarta), in June of 1673, where he arrived near the end of January 1674. After a few months in Batavia, he set off with the trading fleet for Deshima, where he arrived in the summer, about a year after leaving the Netherlands.<sup>16</sup>

Within a day of his arrival, Ten Rhijne was asked to respond to medical questions from the Japanese translators, by order of the Bugyō, USHIGOME Chuzaemon, the person in

control of foreign trade. The Buggyō himself questioned Ten Rhijne on at least one occasion in October. Later, on November 17, he sent Ten Rhijne 19 questions about the best medicines to use in various illnesses, and medical interpreters came every day to try to get the answers. But Ten Rhijne gave evidence of being frustrated by the servants of the Buggyō who interviewed him, since they apparently could not understand his answers very well. He rather thought that they were ignorant, but expressed the opinion that he nevertheless was doing his best to make them understand, working hard at it every day despite the suffering he had to endure. For instance, on November 14, just three days before the list of 19 questions arrived, he wrote that ‘we can’t just give up.’<sup>17</sup>

The difficulties of finding a Japanese vocabulary for Ten Rhijne’s language was clearly difficult. Behind the words used by both parties lay linguistic histories and assumptions about the body and nature’s powers that could not simply be translated, although the Japanese had already made a good start on finding words. This was a much greater problem with the principles of medicine than the details of surgery. Even with direct borrowing, in which both sides simply wrote down approximations of the sounds made by the other party in reference to particulars, it was hard to make the exchange of knowledge work. Perhaps that is the reason why the greatest amount of information that passed between the Japanese and Ten Rhijne involved remedies rather than theories: so-called matters of fact could penetrate the barriers of language and outlook much more easily than views of the world--which is still true.

Nevertheless, the learned interpreters with whom Ten Rhijne worked had a much greater understanding of the Dutch language and western medicine than he at first realized. The chief among them was MOTOGI Shodayu. While Ten Rhijne did not at first think Motogi’s facility with Dutch sufficient for his purposes, he recognized in him a person with a good knowledge of medicine and a keen mind. In addition, Ten Rhijne made the acquaintance of IWANAGA Soko, a physician who, like Genpo, was a pupil of one of the most famous Japanese scholars to study Western knowledge, MUKAI Kensho. (A neo-Confucian scholar and physician, Mukai had lead the effort to bring a work of western

astronomy into Japanese.) Iwanaga was one of four physicians sent by the central government to Deshima to deal with the Dutch. With his knowledge of Western medicine and science, Iwanaga prepared the questions for Ten Rhijne in a way that he thought Ten Rhijne could answer--so there was already a fair amount of preparation undertaken even before the translators started to work. Moreover, the Bugyō who asked the medical questions seems to have done so at the behest of Gempo, who had risen to the post of physician to the Shogun after having been the chief translator on Deshima.<sup>18</sup>

Ten Rhijne's greatest trial came when, later in November, another Bugyō sent him a list of 164 questions, with the answers to be given within one month and brought to the governor by Ten Rhijne himself. Ten Rhijne's answers were recorded in a section of a Japanese medical text compiled by KATSURAGAWA Hochiku, called Zeneishi-tsuwa, which was printed over 20 years ago by Seiichi Iwao.<sup>19</sup> As one would expect, given the difficulties of mutual understanding, most of the questions concerned the composition of Western medicines, and about their use. Nevertheless, Ten Rhijne was asked two questions that probed for his more general assumptions: 'Why do you touch only the left radial pulse?'; and 'How do you discriminate the Yang-type (warm natured) and Yin-type (cold natured) carbuncle?' In answer to the first question, Ten Rhijne explained that with the circulation of the blood, the pulse in both hands would be the same; he ignored the second question and simply described carbuncles. Following the completion of this exchange, the Bugyō paid a visit to Ten Rhijne, being met at the bridge to the Dutch quarters on Deshima by Ten Rhijne and the Dutch governor, who escorted him to the East India Company headquarters for dinner and drinks.<sup>20</sup> The Bugyō followed this with requests that Ten Rhijne visit select patients in downtown Nagasaki, and in February he sent two interpreters to accompany Ten Rhijne on a visit to the Nagasaki pharmacies, where he was questioned on what he knew of the drugs there. During this period, the Japanese learned much else from Ten Rhijne. One of the chief translators with whom he worked, Motogi, composed a short book on anatomy (called 'Anatomical Charts of Holland,' apparently a translation of the anatomical atlas of Johannes

Remmelin). This was the first western-style anatomical treatise in Japanese, and apparently largely done under the guidance of Ten Rhijne.

In early February, Ten Rhijne left Deshima on the annual journey to the Shogun's capital of Edo. The Dutch governor and a few accompanying persons were required to make this month-long journey each year, and to present the Shogun and his servants with gifts and a promise of continued good behavior in exchange for their right to trade with the Japanese. The day after his arrival in Edo, Ten Rhijne was visited by the Shogun's personal physician, Genpo, who knew so much already about Western medicine. The visit was friendly, and Ten Rhijne expressed his willingness to share his knowledge with Genpo. A few days later, Genpo and the physician to one of the senior councilors, or elders, of the Shogun's government, visited Ten Rhijne and asked only a few questions. The Roju's physician was mainly interested in asking about a woman who was suffering terribly from breast cancer, although she had been mentioned to the Dutch two years earlier and was still alive. (One can assume that this is a female relation of one of the high-ranking men in Edo, although her name was never given.) In addition to giving information on at least two occasions to Japanese court physicians about how best to treat the woman's breast cancer, Ten Rhijne was consulted by many other physicians, and by high-ranking Samuri. For instance, in March 21, he went to a Samuri's house to examine a young man of about 15 years old whose right leg was carious and very hot to the touch; Ten Rhijne thought he could cure him, but the patient refused to take western drugs. The most high-placed people Ten Rhijne visited were the Roju himself--he had pains in his finger-nails, and after the examination, Ten Rhijne sent a list of drugs to try--and one of the Shogun's relatives, the head of one of the 'three houses' (at Mito) who traced their lineage to the first Tokugawa Shogun.

After returning to Deishima, Ten Rhijne was not especially busy--although he was allowed by the Bugyō to visit a woman who had been suffering from fever for six months after delivering a child, and to prescribe medicines for her. On 5 December he also gave a book summarizing the latest Western anatomy and physiology to the Bugyō, and in January a physician was sent out from Edo to question Ten Rhijne about it. The work in question was

Adriaen van den Spiegel's Opera quae extant, omnia (Amsterdam, 1645), edited by Johannes vander Linden, which contained Giulio Casserio's anatomical tables, a work on the lacteal vessels, Harvey's De motu, and Johannes Walaeus's work on the motion of the chyle and blood. Later that month three physicians came to ask medical questions, but on the first visit they mostly socialized, with Ten Rhijne offering them a new medical concoction invented by his teacher Sylvius: jenever, or Dutch gin.

He accompanied the Dutch governor of the Deishima station on the journey to Edo again in the spring, where he became rather popular with samurai who wished to taste this new medicine and learn how to use it. He was finally received by the Shogun, and his medical opinion was solicited in many cases, throughout his six-week stay there. After arriving back on Deshima, Ten Rhijne continued to be consulted by the Bugyō, who wanted to learn about how to regain his youth, and by emissaries from the Shogun, who wanted to know how to raise the dead. But Ten Rhijne never gained the post of physician to the Shogun, which caused him to grow increasingly angry. He wrote a long letter to the head of the Dutch factory outlining his suspicions about a political conflict between the various Bugyō's, at least one of whom thought that having a Dutch physician at the court of the Shogun was a recipe for disaster.<sup>21</sup> The head of the factory in turn remonstrated with the Shogun about what he considered to be dishonest dealing by the translators, causing a bit of a diplomatic crisis.<sup>22</sup> But Ten Rhijne himself finally left Deshima for Batavia at the end of October 1676, arriving there in mid-December.

During the two years Ten Rhijne spent in Japan, he not only communicated his knowledge of Western medicine to the lords and physicians there, he also learned from the Japanese. It was quite unusual for a university-educated European physician to have a chance to meet Japanese colleagues--this may even have been the first such encounter. Ten Rhijne took full advantage of his opportunity. The personal relationships he established with the translators and physicians, and the freedom of movement he obtained in order to visit patients, allowed him to learn a great deal about Japanese medicine and natural history. For instance, he sent back to Europe a detailed and accurate description of the Japanese tea plant, along

with samples of it and the valuable camphor tree. He also got the Japanese to explain their use of moxibustion to him and found out much about their use of acupuncture, and obtained four drawings of acupuncture points, which he brought back with him.

During the next few years, Ten Rhijne took on a number of various other administrative responsibilities for the East India Company in diverse parts of Asia. But in the late 1670s and early 1680s, living on the west coast of Sumatra, he had a chance to put many of his medical thoughts in order, and to send a manuscript back to his friends in Amsterdam who were handling his affairs at home. He also wrote a letter to Henry Oldenburg, the Secretary of the Royal Society, dated from Batavia in July 1681, asking whether the Society would be interested in seeing his work.<sup>23</sup> One part of the manuscript contained the first detailed report by a European on acupuncture. The members of the Royal Society thought that Ten Rhijne's views on acupuncture would indeed be very interesting. Ten Rhijne's letter arrived in London about five months after it was written, and (since Oldenburg had recently died) it was brought to a meeting of the Royal Society by Theodore Haak on 18 January 1682, where it caused considerable discussion. Ten Rhijne's remarks about the classical East Asian ways of understanding the pulse led the President (Sir Christopher Wren) to note that the Chinese 'were extremely curious about feeling the pulse of the patient' over the whole body, suggesting that perhaps even Galen's knowledge of the pulse had been superior to that of modern European physicians. Hooke offered other remarks on Chinese pulse doctrine. Since Ten Rhijne had promised many further observations if the Royal Society wished, including a description of the as yet unheard of practice of acupuncture, the virtuosi decided to encourage him, and to look into publishing his finished manuscript.<sup>24</sup>

A delegation therefore paid a visit to the local contact Ten Rhijne had mentioned: his boyhood friend, Joannes Groenevelt, a Dutch physician and surgeon then practicing in London, who could vouch for Ten Rhijne. Since truths of nature that were reported rather than demonstrated depended very much on the honest character and trained observation of the investigator, Ten Rhijne's character had to pass muster, as did that of the person vouching for him. The Royal Society delegation seemed satisfied about them both. They felt confident

enough about Groenevelt that even before reporting back to the Society they plunged ahead and asked him to arrange to have Ten Rhijne's manuscript sent over from Amsterdam, which they undertook to publish at their own expense, while Secretary Aston wrote directly to Ten Rhijne inviting him to send the Society any further observations he had about the medicine or natural history of the east.<sup>25</sup> Groenevelt immediately wrote from London to another boyhood friend of both Ten Rhijne and himself, Casparus Sibelius, then in Amsterdam, who had the manuscript in his possession.<sup>26</sup> With a bit of prompting from Groenevelt, Sibelius finally had it delivered at the end of that March 1682.<sup>27</sup> By the end of June, Groenevelt could report to Sibelius that the Royal Society planned to print Ten Rhijne's treatise, and asked to have Ten Rhijne's picture sent over, so that it could be engraved for the frontispiece.<sup>28</sup>

The manuscript may have been more than the Society had bargained for: the final printed Latin and Dutch text took up 334 pages. It contained several essays: an introduction by a Dutch minister in Batavia who had recently published on moxibustion (Hermann Busschoff); a general discussion of the gout (including a section on its cure by caustics, among them moxibustion); the four Japanese diagrams showing the points to which the moxa and the acupuncture needles ought to be applied, together with a short description of Japanese medical practice; a discussion of acupuncture; an account of a pestilential fever that had struck Ten Rhijne's ship when he was sailing to the east; and three other assorted essays. When it came to Japanese and Chinese doctrine on acupuncture and moxibustion, Ten Rhijne also supplied a rationale for the practices. He returned to views he had presented in several theses during his medical education, arguing both that the practices worked because of various vapors circulating in the blood, and that there were Hippocratic precedents. The book finally appeared in May 1683.<sup>29</sup> The Royal Society ordered on 9 May 1683, that a copy of the book be placed in their library, and a long account of the work quickly appeared in the Royal Society's Philosophical Transactions, while a translation into Dutch was published not long after.<sup>30</sup>

Another Dutch physician who spent time in Deshima and Edo in the early 1690s, Engelbert Kaempfer, also came to write of acupuncture and moxibustion, like Ten Rhijne

believing that they both worked well, and attributing the cause of their operation to the liberation of gases from the body.<sup>31</sup> Even years later, the early 18th-century surgical encyclopedia of Lorenz Heister, included a section on acupuncture with an illustration of the needle taken from Ten Rhijne. Heister had his doubts: ‘one wonders how such clever nations can esteem these remedies so highly’ he sighed.<sup>32</sup>

But my point today is not to argue about Ten Rhijne’s influence on later medical practices, nor even to suggest that he anticipated the modern revival of interest in Asian medicine--although these would be interesting issues to explore. It is, rather, to suggest that there are dense networks of human relationships behind a great many of the best medical books of the 17th century, networks that could span the world, and that show agency on the part of many people, not just the Europeans. In the case of Ten Rhijne’s book, the human chain reached from Amsterdam to Batavia, to Edo and Deshima, and back to Amsterdam and London. It involved famous and anonymous people, from the Japanese Shogun, the governors of Nagasaki, various Japanese medical scholars and translators, Ten Rhijne’s boyhood friends, his teachers, his patrons, the governors of the East India Company, Dutch chiefs of the trading post at Deshima, merchant vessels plying the seas, famous physicians and virtuosi in London, and printers and booksellers. One might even begin to wonder about the question of authorship in a book like Ten Rhijne’s, or contemplate the nature of fate, and what forces might have brought just these people together in the places and times it did to produce the result we call a medical book.

But let me leave you with a less exalted moral: a new world of what we call ‘factual’ knowledge was being created in the midst of the new global economy. The Dutch trading companies were certainly not established for the disinterested pursuit of knowledge, yet their servants sometimes helped to spur on the sometimes Herculean investigations of nature that began to tie together the practical information of all the people of the world. The beginnings of a global science occurred during the period of the rise of a global economy. Perhaps that is no coincidence.

The connections can be shown in many ways, but I leave you with one: exchange. The new global economy, of course, depended on exchanging both goods and information, placing value on what could be exchanged far more than on what might be found through personal, inner knowledge. Amsterdam, for instance, had erected a very large building where people came to exchange goods and information: the *Beurs*. Here people traded one thing for something quite different. To do so in a way that added value to your portfolio depended on having to hand a great range of information about commodities, prices, peoples, markets, anticipated demand and other matters of fact. Based on their best information, merchants could agree on their common value among the things they wished to exchange--they were making the world commensurable, finding a common value among things that at first sight seemed to have nothing in common. This had already happened with exchanging money. From at least the thirteenth century, most of urban Europe had been monetized: that is, people commonly used money for paying taxes and settling accounts, or at least as a means of calculating debt and credit. Money proved useful because it provided a medium for the exchange of relative value among very different things, but with monetization came other problems, such as how to convert the value of one set of coins into another.<sup>33</sup>

One might call this the problem of commensurability--a word used to great effect by Thomas Kuhn:<sup>34</sup> how does one find the common denominator among diverse things, allowing comparison? Specialized money changers and bankers arose who dealt with such problems. Indeed, it gradually came to be recognized that the ability to transform one value into another was not neutral--it had a value of its own: that is, money possessed some sort of added value simply by virtue of its exchangeability.<sup>35</sup> The fundamental problem of monetary exchange may even have led philosophers of the period to try to quantify the similar qualities in diverse things, such as the hot or cold qualities of different medicinal herbs, as a way of making them commensurable.<sup>36</sup> One thing critical to the early modern economy, then, was how to make comparisons among things--it seemed to be the new miracle that created wealth and power. This may have encouraged those around them to appreciate the possibilities of thinking of the living world in mechanical and mathematical ways.

In this way, then, Ten Rhijne did not simply encounter and speak with various sorts of people, exchanging words of respect with them; he did so in light of strong assumptions about valuing ‘matters of fact’ over belief. He converted local words and things into parcels of information that could be packaged in Dutch or Latin words and syntax. At the same time he discarded the contexts in which he found the information, either not understanding them or self-consciously stripping them away as religious ‘idolotry.’ In other words, he privileged certain kinds of knowledge: that having to do with things and the material uses of those things. Foreign nouns, adjectives and verbs that were concrete--the simple things that came from the five senses rather than the mind’s eye--were readily transferable; abstract concepts he ignored, misunderstood, or dismissed. Many ideas about medicine held by the Japanese translators remained incommensurable with his own concepts. He therefore transformed the knowledge he acquired into ‘objective’ statements. As he acquired this kind of information, either from his own sensations or from translation, he accumulated it in his head and, when he had enough to constitute a parcel of knowledge sufficiently valuable to others, he set it down on the page in the form of bundles of information about a natural object (its description, depiction, uses and pleasures). Proceeding in this way, he expected it to be of use to almost anyone else. Ten Rhijne was boiling things down to their lowest common denominator, information units that could be circulated in just about any context. He (re)produced knowledge, accumulated it, and handed it on, making information commensurable. Matters of fact were the coin of his realm.

Let us then return to the message of Robert Boyle with which we began. Along with the Chinese and Indians from whom one could learn these matters of fact, he included ‘Midwives, Barbers, Old Women, Empirics, and the rest of that illiterate crue.’ He certainly had no special case to make for the importance of Asian medicine, but nor did he dismiss it or any other possible practices that could yield knowledge of therapeutic matters of fact. As he and his contemporaries knew so well, the medical and scientific revolution of 17th century involved hosts of people all over the globe, of all kinds of social ranks, backgrounds, and training, who were grubbing around for facts--just the simple, curious, unexpected

facts--about which they tried to ascertain their truth, utility, and moral value. Historians are beginning to recognize once again that early modern medicine and science owe as much to Pliny as to Aristotle; and that changes in intellectual culture did not emerge from flashes of insight, as Athena emerged from the head of Zeus. Rather, they grew from the experience of wrestling with the bodies of nature, and with one another, as in the Labors of Hercules. And like the Labors of Hercules, the labors of these others often involved travel. The discovery of 'matters of fact' did not happen in the study but in the field, and it was as much about hope of material progress as it was about curiosity. This was a remarkable enterprise, stimulated by the new economy of global exchange, a system rooted in what we might now call an information economy. It somehow does not seem so long ago.

## Notes

1. See esp Barbara J. Shapiro, *Probability and Certainty in Seventeenth-Century England: A Study of the Relationships Between Natural Science, Religion, History, Law, and Literature* (Princeton: Princeton University Press, 1983); Barbara J. Shapiro, "The Concept 'Fact': Legal Origins and Cultural Diffusion," *Albion* 26 (1994): 227–52; Steven Shapin and Simon Schaffer, *Leviathan and the Air Pump: Hobbes, Boyle, and the Experimental Life* (Princeton: Princeton University Press, 1986).
2. Robert Boyle, *Usefulnesse of Experimentall Naturall Philosophy* (Oxford: Printed by Hen. Hall Printer to the University, for Rich. Davis, 1663), 220–21.
3. I would like to thank my friend and colleague, Prof. Harm Beukers, of the University of Leiden, for encouraging me to pursue the story of Willem ten Rhijne, who I first came across in 1987 when looking into the life of Joannes Groenevelt, a childhood friend of Ten Rhijne's.
4. Gari Ledyard, *The Dutch Come to Korea* (Seoul: Royal Asiatic Society, Korea Branch, in conjunction with Taewon Publishing Company, 1971).
5. For a description of the island, see Grant K. Goodman, *Japan: The Dutch Experience* (London: The Athlone Press, 1986), 19.
6. Willem Ten Rhijne, *Dissertatio de Arthritide* (London: R. Chiswell, Societatis Regalis typographi, at the Rose and Crown in St. Paul's Churchyard, 1683).
7. See Seiichi Iwao, "Dutch Physician Willem Ten Rhijne and Early Western Medicine in Japan [Orig. in Japanese]," *Bulletin of the Japan-Netherlands Institute* 1, no. 2 (1976): 17. I am very indebted to Shigehisa Kuriyama for sending me a copy of this article when he learned of my interest in Ten Rhijne, to a PhD student in Madison, Tomomi Kinukawa, for orally translating the first part of it for me in the mid-1990s, and to Sumiyo Umekawa and Penny Barrett for making a translation of both parts of the article for me in 2003.

8. Yasuo Otsuka, "Chinese Traditional Medicine in Japan," in *Asian Medical Systems: A Comparative Study*, ed. Charles Leslie (Berkeley: University of California Press, 1976), 322–40.
  
9. Conrad Totman, *Early Modern Japan* (Berkeley: University of California Press, 1993), 126.
  
10. Y. Fujikawa, *Japanese Medicine*, trans. John Ruhräh, reprint, 1911 (New York: Paul B. Hoeber, 1934); Herman Ooms, *Tokugawa Ideology: Early Constructs, 1570–1680* (Princeton: Princeton University Press, 1985).
  
11. Frits Vos, "From God to Apostate: Medicine in Japan Before the Caspar School," in *Red-Hair Medicine: Dutch-Japanese Medical Relations*, eds H Beukers et al. (Amsterdam: Rodopi, 1991), 9–26; Mieko Macé, "Évolution de la Médecine Japonaise Face au Modèle Chinois: Des Origines Jusqu'au Milieu Du XVIIIe Siècle; L'Autonomie par la Synthèse," *Cipango: Cahiers d'Études Japonaises*, no. 1 (1992): 144–46.
  
12. Wolfgang Michel, *Von Leipzig Nach Japan: Der Chirurg und Handelsmann Caspar Schamberger (1623–1706)* (München: Iudicium, 1999).
  
13. Fujikawa, *Japanese Medicine*; T.M. van Gulik, "Dutch Surgery in Japan," in *Red-Hair Medicine: Dutch-Japanese Medical Relations*, eds H Beukers et al. (Amsterdam: Rodopi, 1991), 42–43.
  
14. Iwao, "Willem Ten Rhijne," 17.
  
15. J. Heniger, *Hendrik Adriaan Van Reede Tot Drakenstein (1636–1691) and Hortus Malabaricus: A Contribution to the History of Dutch Colonial Botany* (Rotterdam: A.A. Balkema, 1986), 56.
  
16. The standard work on Ten Rhijne is J.M.H. van Dorssen, "Willem Ten Rhijne," *Geneeskunde Tijdschrift Voor Nederlands Indië* 51 (1911): 134–228. Also see Yasuo Otsuka, "Willem Ten Rhyne in Japan [in Japanese with English Abstract]," in *Rangaku in Japanese Culture* (Tokyo: Tokyo University Press, 1971), 251–59, and Wolfgang Michel, "Willem Ten Rhijne und die Japanische Medizin (I)," *Studien Zur Deutschen und Französischen Literatur*, no. 39 (1989): 75–125, Wolfgang Michel, "Willem Ten Rhijne und die Japanische Medizin (II)," *Studien Zur Deutschen und Französischen Literatur*, no. 40 (1990): 57–103.

17. Iwao, “Willem Ten Rhijne,” 4–5.
18. I am indebted to Tomomi Kinukawa for information on these translators.
19. Iwao, “Willem Ten Rhijne.”
20. For the details of what follows, I have checked the day-books of the Deishma station held in the VOC archives in The Hague (01.04.21 Het Archief van de Nederlandse factorij in Japan, vols. 87, 88, 89) told in Iwao, “Willem Ten Rhijne.” and Michel, “Ten Rhijne.”; Michel, “Ten Rhijne.”.
21. The letter was copied into the day-book (no. 89) on 20 April 1676.
22. Pieter van Dam, *Beschryvinge Van de Oostindische Compagnie*, Rijks Geschiedkundige Publicatiën: Groote ser., vols. 63, 68, 74, 76, 83, 87, 96, ed. F.W. Stapel and C.W.Th. van Boetzelaer (The Hague, 1927–54), VII: 643–4.
23. Royal Society LBC.8.240-242; summarized but not printed in A. Rupert Hall and Marie Boas Hall, eds, *The Correspondence of Henry Oldenburg* (Madison, Wisconsin and London: University of Wisconsin Press, Mansell, and Taylor and Francis, 1965–86), XIII:368.
24. Thomas Birch, *The History of the Royal Society of London for Improving of Natural Knowledge from Its First Rise*, introd. by A. Rupert Hall, reprint, 1756–07 (London: Johnson Reprint, 1968), IV:119–20.
25. Royal Society, LBC.8, fols. 276-278.
26. Groenevelt to Sibelius, 24 January 1682, Sloane 2729, fol. 109.
27. Groenevelt to Sibellius, 31 March 1682, Sloane 2729, fol 116-117.
28. Sloane 2729, fols. 122-123, 27 June 1682.
29. Ten Rhijne, *Dissertatio de Arthritide*; Sloane 2729, fol. 140 (30 May 1683). The Royal Society ordered on 9 May 1683, that a copy of the book be placed in their library (Birch, *History of the Royal Society*, 4:204).

30. Philosophical Transactions, vol. 13, no. 148 (10 June 1683), pp. 221 [sic for 222]-235. Ten Rhijne, Verhandeling van het Podagra en Vliegende Jicht ... Chinese Japanse wijze om door het branden van Moxa en het steken met een Goude Naald, alle ziekten en voornamelijk het Podagra te genesen. Door den Heer W. Ten Rhyne, Med. Doct. etc. (Amsterdam: Jan ten Hoorn, 1684). Further reports about the use of moxa in the East Indies from Busschoff appeared in Stephen Blankaart, ed., Collectanea Medico-Physica, oft Hollands Jaar-Register: Der Genees- en Natuur-kundige Aanmerkingen van gantsch Europa, etc. Tweede en Derde Deel des Jaars MCDCLXXXI en LXXXII (Amsterdam: Johan ten Hoorn, 1683), pp. 14-20.

31. John Z. Bowers and Robert W. Carrubba, “The Doctoral Thesis of Engelbert Kaempfer on Tropical Diseases, Oriental Medicine, and Exotic Natural Phenomena,” *Journal of the History of Medicine* 25 (1970): 303–10.

32. George Rosen, “Lorenz Heister on Acupuncture: An Eighteenth Century View,” *Journal of the History of Medicine* 30 (1975): 387.

33. Reinhold C. Mueller, *The Venetian Money Market: Banks, Panics, and the Public Debt, 1200–1500* (Baltimore: Johns Hopkins University Press, 1997); John H. Munro, “Bullionism and the Bill of Exchange in England, 1272–1663: A Study in Monetary Management and Popular Prejudice,” in *The Dawn of Modern Banking*, University of California Center for Medieval and Renaissance Studies, Los Angeles (New Haven: Yale University Press, 1979), 169–215; Frank J. Swetz, *Capitalism and Arithmetic: The New Math of the 15th Century* (La Salle, Illinois: Open Court, 1987), 257–97.

34. Thomas S. Kuhn, *The Structure of Scientific Revolutions*, vol. 2, number 2 of *Foundations of the Unity of Science*, 2d ed., reprint, 1962, International Encyclopedia of Unified Science (Chicago: University of Chicago Press, 1967).

35. Thomas J. Sargent and François R. Velde, *The Big Problem of Small Change* (Princeton: Princeton University Press, 2002), 102–08.

36. Richard Hadden, *On the Shoulders of Merchants: Exchange and the Mathematical Conception of Nature in Early Modern Europe* (Albany, NY: State University of New York Press, 1994), xiv-xv.

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