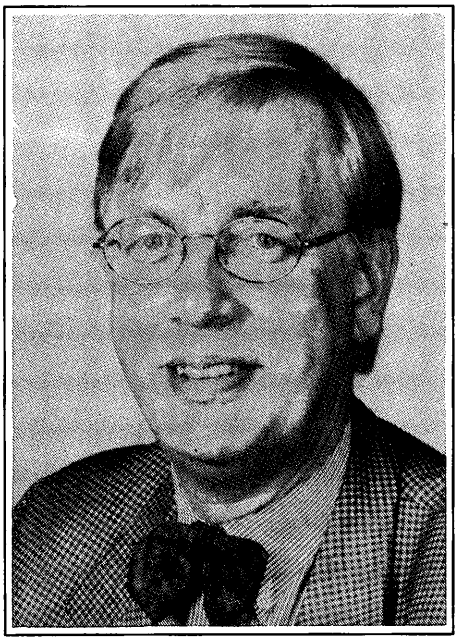


RED-HAIR MEDICINE

The Introduction of Western Anatomy in Japan

Harm Beukers

> The more we become aware of Dutch learning, the more strongly we are impressed by their empirical spirit.
> Sugita Gempaku, *Rangaku Kotohajime* (1815)

One of the many contributions of the name giver of this chair, George Sarton, is related to his role in calling attention to the science history of the Muslim world. His real interest was the entire Asian heritage, but, owing to lack of easily accessible sources, Sarton had to restrict himself to materials from the Near and Middle East. Consequently, China and Japan remained 'by far the largest terrae incognitae' in his *Introduction to the History of Science.*[1] Sarton has nevertheless included the limited, but available material related to the science history of the Far East in his monumental work. It strongly illustrates Sarton's concept of a unity of nature, of knowledge, and of humanity as three aspects of a single reality.[2] In that context it is worth mentioning that he gave the first half of the fifth century the title the 'Time of Fa-Hsien' [Fa Xia], the Chinese Buddhist who made a long journey to India (399-414) to collect Buddhist texts. Choosing a Chinese scholar as label for this period, Sarton wanted to express that China "was becoming one of the most important provinces of mankind." And he continued:

Also the name Fa-Hsien suggests Buddhism, which was then in one of its most vigorous phases - a civilizing power equal to Christianity and already spread over an immense area. Moreover, the monk Fa-Hsien was one of the greatest travellers of all ages. There is, however, an

essential difference between him and the Christian missionaries who roamed across Europe at the same time; they went out to teach, he went out to learn.[3]

The quotation is, to my opinion, illustrative for Sarton's sincerity to foreign cultures.

The first entry of Japan in the *Introduction to the History of Science* is just in the chapter dedicated to Fa-Hsien, when Sarton referred to the arrival of two Korean physicians, Kon-Bu or Kommu and Tokurai or Duklai, in Japan.[4] Kon-Bu was sent in 418 by the king of Silla (one of the three Korean kingdoms) upon request of the diseased Emperor Ingyō. Tokurai settled in 459 in Naniwa (present Osaka) and founded a medical school, the so-called *Naniwa no kusushi.* This school represented the first step in the introduction of continental, essentially Chinese medicine. Direct contacts between Japan and China existed only from the seventh century when Japanese Embassies or *kentōshi* visited the 'Middle Empire' regularly. In the period 630-838 students accompanied the Embassies to China where they stayed for a long time, initially ten years or more. They returned as specialists of Chinese philosophy, literature and medicine.[5] The beginning of this period coincides with the proclamation of a series of edicts, which gave the period 640-650 the name *Taika* or 'Great Transformation.' That name designates the reforms carried out under Emperor Kōtoku. They aimed for the formation of a centralised state modelled after Sui and T'ang China. For the propagation of learning this implied the establishment of three institutes for higher education in the capital Heiankyō (present Nara), among which the Institute of Medicine *(Ten 'yakuryō)* was responsible for both the training of physicians and the actual medical care. In line with the T'ang medical practice, courses were offered in medicine, botany, acupuncture, massage and exorcism.

The reception of Chinese scientific knowledge was not a mere acceptation of ideas and concepts borrowed from a foreign natural philosophy. The 'Transformation' included the adoption of the Chinese system of writing, despite the fact that both languages had complete

different structures. Ancient Chinese is essentially monosyllabic: almost all words consist of one syllable and have no inflections of number, case, tense and the like. The monosyllabicity makes it simple to represent each word by a unique character. This system is, however, not practical to write Japanese, which, in contrast, is characterised by highly inflected words. In the ninth and tenth century a Japanese syllabic script, the so-called *kana* developed, which was more suited to represent spoken Japanese. By then the first Japanese compilations of Chinese medicine had already been published. There had even appeared a work entitled *Daidō ruijūhō* or 'Classified prescriptions from the Daidō-period', a collection of indigenous therapies, which were in danger to be forgotten and which were compiled under imperial order in 808.

Sarton described a comparable process in his Keiser Foundation Lecture on *The Incubation of Western Culture in the Middle East*. Speaking of the "miracle of Arabic science" he stated:

...using the word miracle as a symbol of our inability to explain achievements which were almost incredible. There is nothing like it in the whole history of the world, except the Japanese assimilation of modern science and technology, during the Meiji era.[6]

The year 1868 marked, in the history of Japan, the end of the power of the Tokugawa shoguns and the accession to sovereign power by Emperor Mutsuhito. The young emperor named the period of his reign *Meiji* or 'Enlightened Government,' alluding to an extensive program of modernisation after the Western example. Sarton drew a parallel between the movement in Japan during the second part of the nineteenth century and the situation in the Middle East during the eighth century:

...the intellectual leaders of the Arabs realised the need of Greek science as urgently as the Japanese of two generations ago that of European science. Both had the best of teachers - necessity, compelling necessity. Both had the will and the kind of spiritual

energy which overcomes insuperable difficulties...[7]

1. Opening and seclusion

The Taika- and the Meiji-Reforms represent a special phenomenon of Japan's history, *viz,* that the interaction with foreign cultures is marked by measures of the central government to open the country or to close it for foreign influences. Upon this Sugimoto and Swain introduced a scheme of periodisation for the history of scholarship and science in Japan in which periods of cultural influx alternate with periods of isolation and prevalence of domestic developments.[8]

The first wave of Chinese influences is marked by the decision to follow the example of SuiT'ang China (the Taika Reforms of 646) and the decision to cancel the Embassy of 894. The latter decision put an end to the official relations with China and Japan began an era of semi-seclusion. At the end of the ninth century, Japanese culture had developed to such a degree that there was less need to learn from China. Moreover, the T'ang dynasty itself fell at that moment politically into decay. With the exception of a few Buddhist monks voyages to China were henceforth forbidden. At the same time restrictions were imposed on the arrival of Chinese ships.

The second Chinese Wave began about 1401, when shogun Ashikaga Yoshimutsu resumed official relations with the Ming Court. Japan broke its self-imposed seclusion, and merchants expanded their commercial activities to Southeast Asia. They even founded more or less autonomous commercial communities, the so-called *Nihonmachi* or 'Japanese towns' in Burma, Siam, Vietnam, the Philippines, etc. Sophisticated forms of Chinese learning finally rooted in Japan. A variety of Confucian schools was introduced, among which the philosophy of Chu Hsi, the *Shushigaku* - also known as Neo-Confucianism - became more or less the offical ideology in the seventeenth century.

The first Portuguese traders reached the south coast of Kyushu in 1543, and a period of almost a century began in which Japan was also

exposed to the first wave of European influences. A crucial role in the exchange of scholarly ideas was given to the Portuguese Jesuits, who arrived in Kagoshima in 1549.[9] As a result of the efforts of Allesandro Valignano, since 1573 Visitador of the Indies, *seminarios* were built in Arima and Azuchi, and a *collegio* in Funai. Due to changes in governmental policy, only the Nagasaki *collegio* and the Arima *seminario* were flourishing in the first decade of the seventeenth century. These schools introduced an advanced educational system, including instruction in elementary European mathematics and sciences. They thus provided the basis for a second Western Wave starting in 1720. In that context the Jesuits' study of the Japanese language should be mentioned. They completed not only the first grammars, but also a Japanese- Portuguese and even a Latin-Portuguese-Japanese lexicon.

European medicine was among the Western influxes in this period. The Jesuit Luis de Almeida, a graduate from Lisbon, founded a hospital for the destitute in Funai in 1557. He introduced European surgery and taught this subject to his helpers. His fellow-Jesuit Christovão Ferreira arrived in 1611. He gave a great impetus to the development of the so-called *Namban geka* or 'surgery of the South-Barbarians' among others by publishing treatises about surgery. He abjured Christianity after heavy tortures in 1633, and lived henceforth under the Japanese name Sawano Chūan. At least two Japanese, Handa Jun'an and Kurisaki Dōki, studied European surgery outside Japan, probably in Macao. Among Japanese *Namban geka* received such a prestige that it could continue its position -under a different name- after the expulsion of the Portuguese.

The first Western Wave came to an abrupt end in the seventeenth century when the political unity was restored under Tokugawa Ieyasu, who was appointed, in 1603, *Seii tai shōgun,* the 'Barbarian-oppressing Generalissimo.' The administrative centre of the Tokugawa family in Edo (present Tokyo) became actually the government centre of Japan. The landlords, *daimyō,* were submitted to a system of restrictions and control in order to prevent a possible revolt against the Tokugawa government. They were, for instance, obliged to maintain a permanent residence at Edo, where they lived - six or twelve months - alternately with their home

castles. In that context fitted the system of *metsuke* - in Dutch sources 'dwarskijkers'- who on the one hand recorded any misgovernment by civil servants and on the other hand spied on individuals or factions that were a possible threat to the authorities.

After the establishment of the Dutch and English trading posts at Hirado in 1609 and 1613 respectively, the Japanese authorities realised that it was not necessary to tolerate Christianity in order to maintain trade relations with European nations. They continued the persecutions of European missionaries and their Japanese followers, which had begun already at the end of the sixteenth century, not so much for religious reasons as well as for the political threat of the Christians. The persecutions came to a tragic end with the suppression of the Shimabara rebellion in 1637/8. The Tokugawa government decided, in 1639, to prohibit Christianity completely and to expel all the foreigners with the exception of the Dutch and the Chinese. The Dutch trading post was transferred to Nagasaki at the artificial island Deshima, which previously accommodated the Portuguese. Chinese merchants had only permission to trade exclusively in Nagasaki. That step had only to a limited degree consequences for the second wave of Chinese influences. As a matter of fact it stimulated the study of Chinese sciences and philosophy. Western influences, on the contrary, were initially strongly restricted, with the exception of surgery. The first Western Wave thus came to an end in 1639. From 1720 shogun Yoshimune allowed Western influences (the second Western Wave), when he eased the ban on the importation of certain categories of Western books. The national seclusion-policy was lifted with the treaty of Kanagawa (1854) and the subsequent opening of harbours to foreign ships. A complete turn towards the West occurred only after the aforementioned Meiji-Reforms of 1868.

2. Conditions for exchange

The preceding remarks give a rough outline of the background against which the Dutch-Japanese relations take place. Before going deeper into the introduction of Western medicine in Tokugawa Japan, it is good to recollect Sarton's fundamental ideas, as a demonstration of their

value in understanding the exchange processes between different scientific cultures. It involves in particular the concepts of the humanity of science and of the unity of nature.[10]

The former concept is important in evaluating the limits of science. Sarton defined science as "the reflection of nature (of everything that is) by the human mind" and not by "a perfect, godlike mind." Only the latter could make 'perfect science.' Science as exclusive human activity is thus by definition imperfect. Scientific results are always abstractions. Abstraction is a process in which consideration is given to certain aspects or features of a complex whole disregarding the remainder. The limitations imposed on that process are defined by the worldview prevailing in a culture. In other words, they are defined by principles, which are supposed to be common and invariable to the diversity of phenomena, such as the four Aristotelian elements or the Chinese principles *yin* and *yang,* and the Western causality or the Chinese systematic correspondences. The prevailing scientific ideal, such as a strict formalism following mathematics, imposes another type of limitation. The 'humanity of science' implies imperfection and susceptibility to extensions and corrections.

In the confrontation between different scientific systems, exchange will take place only when there is a certain degree of resonance between conceptions, or a similar approach of reality. The postulate of a 'unity of nature' is crucial in that context. It gives the natural sciences their rationale and a certain consistency. Contradictions concerning this aspect, observed between different cultures or within a culture during its historic development, demonstrate more likely the inadequacy of sciences as an activity of the human mind, caught as they are in language, religious beliefs and philosophical ideas. The conditions for a successful introduction of unfamiliar scientific concepts can simply be described with the metaphor of the seed, the soil and the climate. The seed of a new and unfamiliar scientific concept can grow only to full stature in a receptive and fertile soil under favourable climatic influences.

The introduction of Western medicine in Japan occurred under

limiting conditions. First and foremost was the language barrier. For the Western traditions the main language was Latin, for the Far Eastern tradition Chinese. Assuming a difference in scientific concepts, this means that Japanese scholars were introduced to unfamiliar ideas for which initially no terminology was available. The linguistic problem was even more complicated. From mid-seventeenth century the confrontation was not between traditional linguistic circles, but between Japanese and Dutch. Portuguese became an important intermediary: it was still the *lingua franca* among sailor nations and the Japanese interpreters had acquired considerable fluency in that language. With the help of the aforementioned dictionaries - in particular the Latin-Portuguesê-Japanese dictionary - problems could be solved, insofar classical medical knowledge was involved.

Next problem was the position of the central authorities. Japan was, from 1639-1854, practically cut off from European influences, except from those via contacts with the Chinese and the Dutch. The former contacts were especially important for the introduction of Western astronomy,[11] the latter for Western medicine. An essential turning point in the contacts with foreigners during the seclusion-period were the *Kyōhō* reforms under shogun Tokugawa Yoshimune in 1720. From that year Western sources were again available for Japanese scholars. This so-called second Western Wave will be discussed in more detail, focussing in particular on the introduction of anatomy.'[2]

3. Material restrictions

Japanese scholars depended for direct scientific contacts with Europeans on the Dutch trading post, since 1641 confined to Deshima. There were usually from ten to fifteen Dutch personnel in residence, including a senior surgeon and his assistant. Until the end of the eighteenth century only two *medicinae doctores* occupied the position of senior surgeon, *viz.* Willem ten Rhijne (Deshima 1674-1676), and Carl Pieter Thunberg (1775-1776). They remained relatively short at Deshima, like Engelbert Kaempfer (1690-1692) who took his degree only after returning from Japan. By far the largest numbers of medical men at Deshima were ship's surgeons. They were in fact artisans specialised in

surgery. There was no traditional division of labour between medical doctors and surgeons on board the East-Indianmen. Medical doctors were almost completely missing at the merchant fleet. It meant that ship's surgeons had to treat internal diseases like scurvy, dysentery and typhoid fever. They even had to prepare drugs. Abraham Titsingh, since 1752 Upper-Surgeon of Amsterdam's Admiralty and in that capacity also examiner of ship's surgeons, held the view that a ship's surgeon should not only study physics, chemistry, botany, anatomy and surgery, but also physiology, pathology (i.e. internal medicine), therapy, and pharmacy.[13] These subjects constituted the contents of the - among ship's surgeons popular - handbook *Oost- en West-Indische warande* (1694 and 1734), a translation of the Latin treatises by Jacob Bontius, Willem Piso and Georgius Markgraef on medicine in Asia and America.

Most of the surgeons stayed relatively long in Japan, on an average at least four years. In the first part of the eighteenth century a few surgeons even stayed much longer. The surgeons Willem Wagemans, Doede Everts and Philip Pieter Musculus occupied their position at Deshima for twelve, eleven and eight years respectively. Musculus was expelled because of his knowledge of the Japanese language. One should realise that medical knowledge at Deshima was not limited to the surgeons. Some knowledge was probably not unusual among the higher officials. According to his inheritance, Chief Gijsbert Hemmy possessed a number of books on surgery and anatomy.

Live at Deshima was under strict regulations. The Dutch were under continuous and close surveillance of *ottona* (head of the Deshima ward) and *metsuke,* to mention only a few members of the - compared to the Dutch population - fully overgrown Japanese bureaucracy at the small island. No one could enter or leave Deshima without official permission. The Dutch chief made annually, later once every four years, a visit to Edo. The secretary and the senior surgeon usually accompanied him. During the two or three weeks spent at Edo, the chief was received in audience by the shogun.

Possession of bibles and other Christian books or religious

pictures was strictly forbidden. They were impounded on entrance into Nagasaki Bay and were given back only on departure. The importation of Western books, even in Chinese translations, was under severe restrictions. Shogun Yoshimune lifted the ban, as we have seen earlier, with the exception of pure Christian literature. The objective of Yoshimune's measure was to improve knowledge of Western sciences useful for Japan, such as astronomy, medicine and botany. Books became an important source for the propagation of Western sciences. As long as the language was a serious barrier visual information probably played a more prominent role. Surgeons, who generally speaking were not familiar with Latin, had an extensive professional literature in Dutch at their disposal.[14] This was the literature to which Japanese scholars were introduced initially.

It is evident that the opportunities for direct personal contacts between the Dutch and the Japanese were extremely limited. Only two conditions occurred, *viz,* at Deshima with the official interpreters and during the court-journey to Edo with scholars from the court. The latter case refers to the custom that court officials and scholars visited the Dutch in their Edo-residence to inquire about Western sciences or to ask advice in medical questions. The role of interpreters was in these cases of vital importance, as it was when Japanese patients asked for the surgeon's intervention. The interpreters and student-interpreters at Deshima were civil servants, who constituted a kind of guild whose members belong to certain families. It is therefore not surprising that some interpreters gradually specialised in Western medicine. Members of the interpreter families Nishi and Narabayashi, for instance, founded medical schools, that became famous under the names *Nishi-ryūgeka* (Nishi-style surgery) and *Narabayashi-ryūgeka* (Narabayashi-style surgery). The founder of the latter school, Narabayashi Chinzan, translated parts of the Dutch edition of a handbook by the famous French surgeon Ambroise Paré under the title *Kōi geka soden* or 'Classical Tradition of Red [-hair] surgery' (1706). It is one of the first detailed treatises describing wound-treatment, surgical methods, instruments and wound-dressings.

A few Japanese received permission to apprentice to the Deshima surgeon. Some received a diploma after finishing their training. The

oldest example, signed by surgeon Daniel Busch, dates 1665. It was granted to Arashiyama Hōan, son of a merchant from Chikuzen (Fukuokaken). He actually received tuition from three surgeons. His book *Shinkokuchihō ruiju tekiden* or 'Explanation of different foreign methods of medical treatment' (1683) was a standard work for many years.

Practitioners of *Namban geka* ('South-barbarian surgery') from the pre-seclusion period sought advantage with 'Dutch surgery', and renamed their practice *Kōmō geka* or 'Red-hair surgery.' Knowledge of this speciality remained confined to small groups, mainly interpreters and court physicians. Compared with the traditional practitioners, their number was relatively small. The group of interpreter-physicians monopolised Western learning more or less. They passed their knowledge on as secrets only available to disciples. Yoshimune's reforms caused a greater availability of Dutch books, and from mid-eighteenth century book importation occurred regularly. Gradually the Nagasaki interpreters lost their monopoly position, also because their preparatory linguistic activities enabled Japanese scholars to translate Dutch books.

4. Anatomy as basis of medicine

Health and disease can in principle be explained by two kinds of theories. One theory expresses these conditions in modalities of the relation between man and his environment. The other theory departs from the state of the physical body.

In the former case the human body is considered as a microcosmic image of the universe, the macrocosm. The health of an individual depends on the interaction with the macrocosm, or more simply said with the environment. A human being is, in this view, an inextricable part of nature. He participates in the cycle of elements and follows the daily changes in nature and the changes of seasons. Diseases are generalised disturbances and the degree of disturbance can therefore be derived from general features such as the pulse or the complexion. Generally speaking there is no interest in the exact anatomical location of the disturbance. Such ideas are characteristic for the classical humoral pathology as it prevailed in Europe under the name Galenism. In this

system an equilibrium or harmony between four primary body-fluids (blood, phlegm, yellow bile and black bile) with opposite qualities (warm-cold and moist-dry) determines health and disease.

The principle of equilibrium or harmony is also fundamental in traditional Sino-Japanese medicine. Here it is based on a metaphysical dualism of *yin* (Jap. *in)* and *yang* (Jap. *yō),* the passive and active principles, and the notion that the cyclic changes in nature are characterised by a set of 'Five Phases' (Chin. *wu-hsing;* Jap. *go-gyō).* It is assumed that disorders occur when cyclical functioning of the human body is out of phase with that of the macrocosm. Although the phases are named after material aspects (wood, fire, earth, metal and water) they are primarily used to characterise functions. These functions are related to a kind of material force *ch 'i* (Jap. *ki)* which is more or less comparable with the Western concept of *pneuma.* The *ch 'i* maintains a pattern in the universe dictated by a formal principle *li* (Jap. *ri).* The Five Phases characterize everything in the universe, and are in particular used when relations in space and time are involved. They correlate with such phenomena as the planets, the seasons, the directions, the colours, the tastes, the senses and the organs.

As *yin* and *yang* and the Five Phases are assigned fundamental to all natural phenomena, they thus are basic to the theoretical framework for understanding the human body in health and disease. This is reflected in the binary and fivefold systems into which physiological activities are distinguished. The human body thus consists of two sets of functional systems: the Five Viscera (Chin. *wu-tsang,* Jap. *go-zō,* i.e. organs like the heart and liver where *ki* is stored, and the Six Bowels (Chin. *liu-fu,* Jap. *roku-fu),* i.e. organs like the large and small intestines where *ki* is collected. The Viscera and the Bowels are functionally interconnected and each pair is related to one of the senses. The heart is for instance connected with the small intestine and the ears, and the liver with the gall bladder and the eyes. There are also functional relations with certain areas on the surface of the body. Hence, these points are used in acupuncture, moxibustion and massage. As the *ki* of different organs manifests as rhythmic movement, pulse diagnosis is of great importance. The possibility to obtain at the exterior information about the activities of the

inner parts discouraged interests in accurate dissections of the human body.

The classical humoral pathology and the traditional Sino-Japanese medicine are primarily related to the functions and activities of the human body and less to spatial relations and structures in the body. The terminology used for these functions is only loosely corresponding to actual anatomical structures. The opposite is the case with the Western medicine practised by the Deshima surgeons. The focus on the physical structure body was dominant in Western medicine. Andreas Vesalius' book *De humani corporis fabrica* (1543) made anatomy the key-stone of European medicine. It gave medicine a positivistic and materialistic character. As the knowledge of the inner structures became increasingly more accurate, it was more or less self-evident to localise diseases in organs or their parts. Thus developed in European medicine the doctrine of solidism, i.e. the doctrine that diseases are primarily changes in the solid parts of the body. Anatomy was not only important in the development of university medicine. Surgery developed gradually from a simple craft into an anatomy-based science. Anatomy became essential in tuition in the surgeon's guilds. Anatomy textbooks therefore were not missing in the reference library of surgeons.

Anatomy visualises the inner parts of the human body. That visualisation culminated in the seventeenth century in detailing the knowledge of the vascular system, the discovery of the lymphatic system and the discovery of glands.[15] Essential for the propagation of anatomical knowledge is the objective description of inner structures, as are the spatial relations and their objective, realistic representation. The transition from humours to the solid parts implies a changing perception of reality and refers to a general cultural-historical motive.[16]

5. The Ancient Practice School

An important role in preparing a receptive climate for Western medicine was given to the so-called *koihō or kohōha,* the 'Ancient Practice School.' That school is the crownpiece of a process of assimilating Chinese medicine that finally resulted in traditional Japanese

Chinese-style medicine *kampō* (literal: 'Han-method').[17]

The acceptation of Chinese medicine in Japan was, until the sixteenth century, limited to an élite. It was monopolised by a small group, which transferred this knowledge, usually within the family, from one generation to the next. During the sixteenth century Chinese culture began to be rooted in wider strata of society, also because of the rise of a printing and publishing culture. Concerning medicine, focus initially was on medicine from the Ming-period (1368-1644) that was strongly influenced by earlier efforts to unify medical theory during the Chin and Yüan dynasties, better known as Li- and Chu-medicine. Under these influences *goseihōha* or the 'School of the later [i.e. Yüan] age' emerged in Japan. It obtained a dominant position, especially through Manase Dōsan, his private academy *Keiteki-in* and his systematic textbook *Keiteki-shu* (1574). Manase's teachings induced the secularisation of medicine by restricting Buddhist influences on medical theory and practice.

Towards the mid-seventeenth century, *koihō* emerged as a reaction to the dogmatic and metaphysically speculative character of *goseihōha.* The Ancient Practice School advocated a return to ancient medical classics, in particular the *Shang-han lun* (Jap. *Shō-kan ron* or 'Treatise on Cold Injuries') written by the Chinese physician Chang Chung-ching in the third century. The author supposed that fevers pass through six phases and that each phase is characterised by specific symptoms. The treatment depends on the phase in which the disease is. *Shang-han lun* was an attractive book. Compared with other classics, it was easy to read. It gave little attention to theoretical consideration, but emphasised practical, positivist approaches to cures.

The koihō mythologised, so to speak, the past around this treatise in order to introduce a more empirical approach of medical treatment. In China the revaluation of *Shang-han lun* began with the 'Conservative School' of Yu Ch'ang. He published, in 1648, an appraisal of this treatise entitled *Shang lun p'ien* (Jap. *Shō ron hen),* in which he unfolded the original classical purity of *Shang-han lun* by eliminating changes and

additions of later editions. The most important influences of *Shang-han lun* in Japan were a renewal of the disease-classification and the adoption of a system of diagnosing diseases in entities - the so-called *shō* - named according the drugs, which will be prescribed for their treatment. The latter system made a more direct relation with medical practice than the more abstract notions from *goseihōha.*

The *koihō* developed a new materialistic pathology, *viz,* that diseases resulted from a disturbance in the circulation of *ki.* One of the founders of Ancient Practice School, Gotō Gonzan, supposed that pathogenic factors caused a stagnation and accumulation of *ki* at certain spots. Diseases were, according this theory, no longer considered as generalised (i.e. affecting the whole body), but as localised disturbances. The School focussed on accurate descriptions of disease-entities and consequently on the methods of medical examination. Next to traditional diagnostic procedures (visual inspection, listening, interrogation and pulsefeeling), much value was set on palpation of the abdomen as method to localize the accumulation of *ki.* The Ancient Practice School did not confine itself to philological analysis of medical classics. On the contrary, these texts were a starting-point for reconsideration of traditional medical theories from an empirical or positivistic position.

6. Early dissections

Gotō Gonzan'pupil Yamawaki Tōyō evidently showed such an empirical attitude. He probably possessed the anatomy-textbook *Konstige ontledingh des menschelijken lichaems* (1659) by Johan Vesling. It is possible that this book raised the question about the value of traditional Chinese concepts concerning the inner structure of the human body, and in particular concerning the *zō-fu* concept. In 1754, a group of Kyoto physicians received permission - for the first time in Japan - to dissect the dead body of a criminal. Yamawaki was among that group. He published his observations in 1759 in a treatise entitled *Zōshi* or 'Description of the Organs' together with a few little detailed anatomical drawings made by his pupil Asanuma Suemitsu. Yamawaki compared the figures from Vesling's book with the situation observed during the dissection and was shocked by the accuracy of the European illustrations,

for instance concerning the lobe-structure of the liver.'[18] Yamawaki's objective was not to combat the *zō-fu* concept, but to alter it, making it more into agreement with anatomical observations.

The publication of *Zōshi* led to discussions on the value of anatomical dissections. Yoshimasu Tōdō, one of Yamawaki's colleagues in the Ancient Practice School defended the opinion that anatomical knowledge was completely useless for the treatment of diseases. Sano Yasusada wrote in his *Hi-zōshi* ('Anti-Zōshi', 1760) that observation of viscera in a dead body was meaningless:

What zō really means is not a question of morphology; they are storages of *ki* with different functions. If *ki* is absent, then *zō* is nothing more than an empty container. Nothing can be learned from dissections, because *ki* is missing.

Similar criticisms could not prevent the growing notion that Chinese descriptions of the inner organs were unreliable and that the Dutch anatomy books deserved a closer study because of their greater accuracy. Yamawaki's publication convinced other scholars that anatomical dissections were of value. It inaugurated an era, in which Japanese physicians started to anatomise. Over a decade after *Zōshi* a second anatomical treatise was published, *viz,* the *Kaishihen* or 'On dissection of bodies' (1772) by Kawaguchi Shinnin. It was based on two dissections performed by Kawaguchi himself in Kyoto in 1770. The book had twenty-three drawings, some representing organs in cross-section.'[19]

Only two years later a book was published which is considered as the start of *Rangaku* or 'Dutch studies' in Japan. That book, the *Kaitai shinsho* or 'New Book on Anatomy' (1774) resulted from three years diligent translation work by a group of enthusiastic young physicians, among whom Sugita Gempaku, Maeno Ryōtaku and Nakagawa Jun'an were prominent.[20] The idea to publish this book was not inspired by the need to improve practical medical knowledge. It reflected more a greater interest in the perceptible physical structure of the human body. A

genuine curiosity was excited on seeing the figures of two Dutch anatomy books, Johan Adam Kulmus' *Ontleedkundige Tafelen* and Caspar Bartholin's *Anatomia, ofte ontledinge des menschelijcken lichaems.* Sugita Gempaku described this in the autobiographic *Rangaku kotohajime* ('Dawn of Dutch Studies', 1815) as follows:

Of course, not a word in them could we read, but the structures of internal organs and the skeletal frames illustrated in them appeared very different from those we had seen in books or had heard of in the past. We concluded that these must have been drawn from the real things.[21]

When Sugita obtained the two books, he became "anxious to compare their illustrations with the real things." The three aforementioned Japanese attended the dissection of a female criminal at Kotsugahara (near Edo) in March 1771. They were surprised by the resemblance between the illustrations and the observed structures. Their objective became:

...to show to the people that the real structure of the human body was different from the one described in Chinese books.[22]

The only thought in me then was that a doctor cannot claim his title without first knowing the structures and functions of the internal organs.[23]

The three men decided to translate Kulmus' *Ontleedkundige Tafelen.* From the illustrations in *Kaitai shinsho* it is evident that they also had the anatomy books by Bartholin, Blankaart and Valverde at their disposal.

7. A **broader cultural context**

The publication *of Kaitai shinsho* enabled a greater circle of Japanese physicians to learn about Western anatomy in their own language. The publication of this translation can therefore be considered as the completion of an acceptation process, but not of an assimilation process. In the preceding chapters that acceptation is described as a more or less autonomous development of the medical science in Japan. Like the introduction of anatomy in European medicine, the process in Japan can not be viewed without considering more general cultural-historical

influences. Taken into account the wave of well-documented dissections before 1774, i.e. before the real introduction of Western medicine started, this suggests strongly a spontaneous interest of Japanese physicians in morphology. That claim is even stronger when we compare the situation in China. The first translation of a European anatomy book was already available in 1635, but it met little or no response among Chinese doctors.

Observations are not photographic registrations of the outer world; they are interpretations of sense perceptions. Sugita refered to such an interpretative process in his autobiography.[24] The actual post-mortem at Kotsugahara was performed by a ninety-year-old *eta* (a sort of untouchable), who had performed a number of dissections since his youth. The custom then was that he opened the body and pointed out the organs. The attendant doctors simply watched them, and all they could say, was: "We actually viewed the inwards of a human body." For the determination of abnormal situation the doctors had to rely on the dissector's words. In March 1771 too, the old man pointed out various organs. Further he pointed to other structures, remarking:

I do not know what they are, but they have always been there in all the bodies which I have so far dissected.

Comparing them with illustrations in the Dutch books, the young doctors were able to identify them arteries, veins and lymphatics. The old *eta* made gave a remarkable opinion upon this post-mortem:

In my past experience of dissection, the doctors present never showed puzzled or asked questions specifically about one thing or another.

The three doctors evidently perceived the reality of the human body different from their predecessors. The framework of their observations obviously was different.

That difference can partly be attributed to a special interpretation of the principles of Neo-Confucianism. Generally speaking the teachings of Chu Hsi are less transcendental and life denying than Buddhism, and his doctrines encouraged, at least according to some followers, a natural scientific approach. They explained the 'investigation of Things'

(kakubutsu) and the 'discovery of Heavenly Laws' *(kyūri)* as an encouragement to study 'things' empirically in order to discover their essence. Many books on natural history in the late Edo period included in their title the term *kakubutsu.* Prominent Neo-Confucianists like Hayashi Razan and Kaibara Ekkiken had a great interest in botany. The ultimate goal to study natural sciences was, according some Neo-Confucianists, to demonstrate that all Nature and all mankind were united in the creative will of Heaven. Western sciences thus could be considered as a branch of the 'investigation of Things' which supplemented deficiencies of Chinese Studies. In a sense, Sugita referred to that aspect when he described the, for him unexpected, flourishing of Dutch Studies:

Looking back now, I see that the Chinese learning took long to develop in this country, because perhaps it was primarily a rhetorical language while Dutch developed fast, because it expressed facts as they were and it was easier to learn. Or, perhaps, it was that Chinese had trained the Japanese mind and had made a foundation whereupon Dutch was able to make a rapid start. I cannot tell. Or, it may be that the time was just ripe for this type of learning.[25]

The latter can be interpreted as a hint to other aspects of the period in which anatomy in Japan emerged. This period, also known as Tanuma period (after the influential senior councillor Tanuma Okitsugu), is characterised by a cultural richness, largely the creation of wealthy merchants in the Kansai area - the area where the first dissections took place. These merchants were relatively free from the rigid codes of the samurai class and could find an outlet for their wealth and energy in creating a new town culture. The domination by the merchant class is responsible for the realism in the new art and literature. It encouraged detailed studies from nature, as can be seen in the naturalistic school of Maruyama Ōkyo from Kyoto. These artists recorded their observations of individual objects - flowers, animals, insects and the like -accurately in sketchbooks. In that respect their work differed from the traditional *kachō-ga* or 'bird and flower painting', where the external form is only indicated to catch the essence of an object. The introduction of Western elements like perspective and shading enabled the new realistic schools to create depth and space around objects. These techniques were essential in drawing anatomical illustrations, as Sugita probably realised. He invited

Odano Naotake, a samurai from Akita, to copy the drawings of Kulmus' anatomy. In that period Odano resided in the house of Hiraga Gennai, a low-ranking samurai, mainly known as a naturalist and student of Western sciences under patronage of councillor Tanuma. Hiraga was a fellow-student of Nakagawa Jun'an and it was through him that Hiraga became acquainted with Sugita Gempaku. Odano and his daimyo Satake Shozan later founded the famous mid-18th-century Akita school of Dutch painting, the *Akita ranga.*[26] The co-operation of Odano with Sugita in the 'Edo-days' resembled the co-operation of the anatomist and the artist common in Renaissance Europe.

8. **Concluding remarks**

The acceptation of Western anatomy was a crucial first step in the acceptation of Western medicine in Japan, since the fundamental difference between eighteenth-century Western and Eastern medicine concerned the emphasis on form and structure. It took almost a century after the publication *of Kaitai shinsho* before Western medicine was accepted, then as part of the general political movement by the Meiji government.[27] In that period came an end to the unique role of the inhabitants of Deshima. At the same time came, so to say, an end to the phantasy images of the foreigners, such as the one by the Shinto propagandist Hirata Atsutane.[28] He depicted the Dutch as people with a fair complexion, big noses, dog's eyes, without heels and long and slender legs, which made them resemble animals. A more generally accepted characteristic was the particular hair-colour. The usual name given to the Dutch was *kōmō-jin* or 'red-haired', suggesting more a demonic being (like the red-haired Buddhist demons) than the actual hair-colour. Whatever the idea behind this name may be, it became the attribute distinguishing the Western contribution to medicine in Japan: *kōmō-geka* or 'Red-Hair Surgery' and *kōmō-igaku* or 'Red-Hair Medicine'. Even Hirata had to admit that, despite their resemblance to animals, their addiction to sexual excess and their short lives, the Dutch:

> ...are a nation given to a deep study of things and to fundamental investigations of every description. That is why they are certainly the most skilled people in the world in fine works of all sorts, and excel in medicine as well as in astronomy and geography.[29]

The influences described in the previous sections demonstrate that realism and scientific objectivity, necessary for a climate receptive for Western anatomy, were not the prerogatives of physicians. They were embedded in broader layers of society. The willingness of physicians with a Confucianist background to accept anatomy was, apart from internal scientific motives, also determined by the realistic view characteristic for a town culture dominated by the merchant class. In that sense the acceptation in Japan is not essentially different from that in Renaissance Europe. Strictly speaking both processes demonstrate Sarton's concept of the unity of nature, of knowledge and of humanity: the cultural context represents the 'humanity of science' and is responsible for its imperfectness. I hope that I made clear that the East has much material available to be used for comparative science history. It is self-evident that such studies need a rejection of thoughts of Western supremacy or self-complacency. In that contexts it still is useful to reflect on George Sarton's 'four guiding principles': the idea of unity, the humanity of science, the great value of Eastern thought and the supreme need of toleration and charity.[30] With this in mind, I am greatly honoured to be appointed to the chair named after the eminent science historian George Sarton!

Notes

1. G. Sarton, 'Remarks on the History of Science in India, Central and Eastern Asia', *Introduction to the History of Science* vol. 1 (Baltimore, 1927) p. 35-37.

2. G. Sarton, 'Four Guiding Ideas', *Introduction to the History of Science* vol. 3, part 1 (Baltimore, 1947) p. 19-26.

3. G. Sarton, *Introduction to the History of Science* vol. 1 (Baltimore, 1927) p. 377.

4. Ibid. p. 393.

5. Mori Katsumi, 'Envoys to T'ang China' [Jap.] *Nihon rekishi shinsho series* (Tokyo, 1962).

6. G. Sarton, *The Incubation of Western Culture in the Middle East* (Washington, 1951) p. 27.

7. Ibid. p. 27-28.

8. M. Sugimoto and D.L. Swain, *Science and Culture in Traditional Japan* (Vermont & Tokyo, 1989).

9. Arimichi Ebisawa, 'The Jesuits and their Cultural Activities in the Far East', *Cahiers d'Histoire Mondiale* 5, 1959: 346-374.

10. Cf note 2.

11. Nakayama Shigeru, *A History of Japanese Astronomy: Chinese Background and Western Impact* (Cambridge, 1969).

12. General information about the history of anatomy in Japan: Ogawa Teizo, 'Meiji mae Nihon Kaibōgakushi' in *Meiji mae Nihon Igakushi* I (Tokyo, 1978) p. 49-249.

13. A. Titsingh, *Geneekconst der heelmeesters tot dienst der zeevaart* (Amsterdam, 1752).

14. H. Beukers, 'De dageraad van de Europese geneeskunde in Japan' in: *Oranda, de Nederlanden in Japan (1600-1868)* (Brussel, 1989) p. 39-48.

15. A.M. Luyendijk-Elshout 'Anatomia Reformata. The Dutch Handbook of Anatomy from the Baroque Period; the Contents and Presentation.', *Nihon Ishigaku Zasshi* 20, 1974: 91-104.

16. J.H. van den Bergh, *Het menselijk lichaam I: het geopende lichaam* (Nijkerk, 1959), and H. Beukers, 'The Role of Anatomy in the Acceptance of Western Knowledge during the Edo period' *Bridge between Japan and the Netherlands* 11, 1996: 359-374 [Jap.: 149-161].

17. Naoki Hirama, 'The Development of Traditional Chinese Therapeutics and its Background in early modern Japan' in: Y. Kawakita, S. Sakai and Y. Otsuka (Eds), *History of Therapy* (Tokyo, 1990) p. 117-156.

18. G. Achiwa, 'On the First Anatomical Chart in Japan', *Japanese Studies in the History of Science* 5, 1966: 193-205.

19. Takamichi Tsusaki, 'Shinnin Kawaguchi und seine Arbeit *Kaishihen'*, *Yokohama Medical Bulletin* 18, 1967: 39-56.

20. A.M. Luijendijk-Elshout,' "Ontleedinge" as underlying Principle of Western Medicine in Japan' in: H. Beukers, A.M. Luijendijk-Elshout, M.E. van Opstall and F. Vos, *Red-Hair Medicine, Dutch-Japanese medical relations* (Amsterdam, 1991) p. 27-36.

21. G. Sugita, *Dawn of Western Sciences in Japan,* translated by Matsumoto Ryōzō (Tokyo, 1969) p. 24.

22. Ibid. p. 43.

23. Ibid. p. 45.

24. Ibid. p. 29-31.

25. Ibid. p. 51-52.

26. C. French, *Through closed doors. Western influence on Japanese art 1639-1853* (Rochester, 1977) p. 123-128.

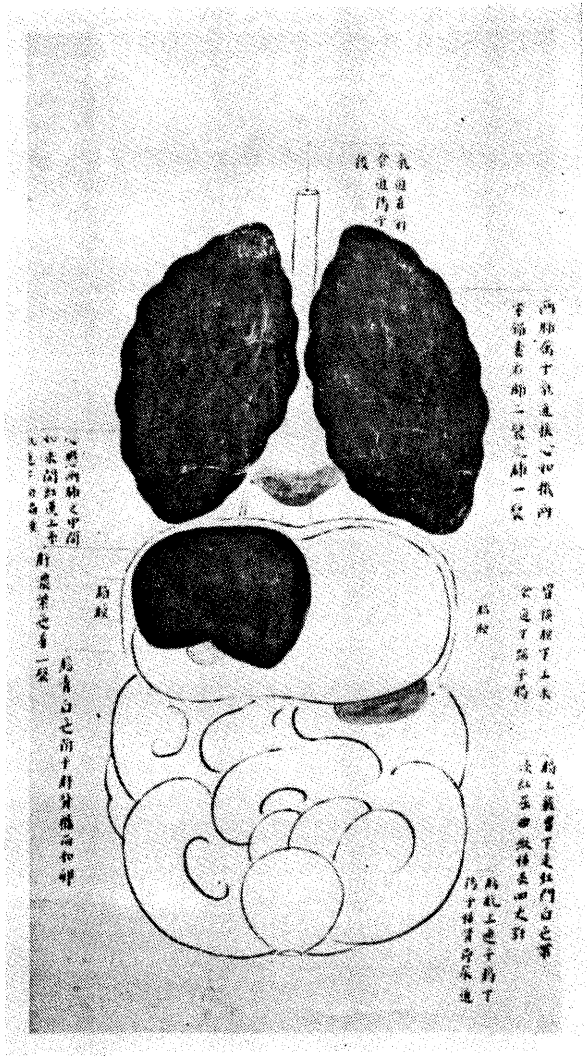
27. H. Beukers, 'The Fight against Smallpox in Japan: the Value of Western Medicine proved' in: H. Beukers, A.M. Luijendijk-Elshout, M.E. van Opstall and F. Vos, *Red-Hair Medicine, Dutch-Japanese medical relations* (Amsterdam, 1991) p. 59-77.

28. D. Keene, 'Hirata Atsutane and Western Learning', *T'oung Pao* 42, 1953: 353-380.

29. Ibid.

30. Cf note 2.

1. Frontal view of the internal organs from *Ton-i-sho* (1302/4), a medical encyclopaedia by the priest-physician Kajiwara Shozen. The drawings were after the Sung-Chinese example (1113) by Yang Chieh based on observations during the famous dissection of a rebel in 1045.



2. Frontal view of the internal organs from *Zōshi* (1759) by Yamawaki Tōyō. He described e.g. the heart as follows: "It looks like a pink lotus that has not bloomed yet. At the top it is connected to the bronchus. The lower part touches the intestines", and the liver as: "Deep purple, and a crease is seen in it."

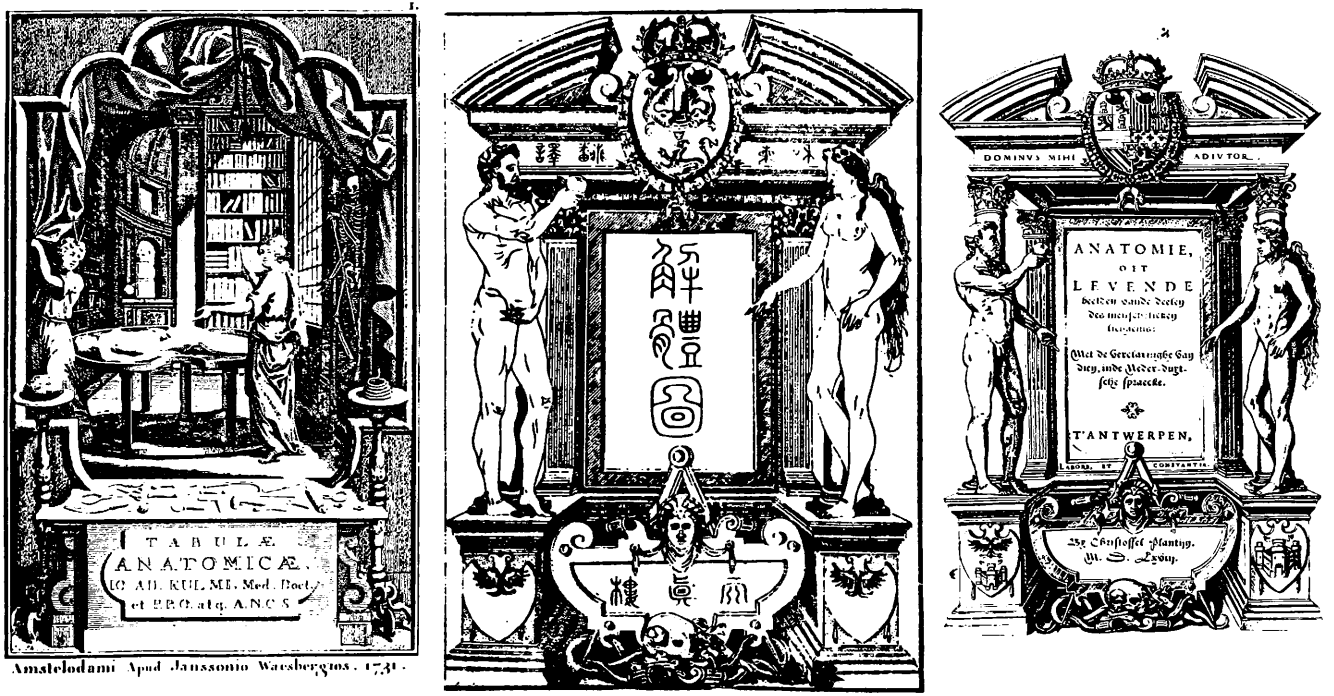


Fig. 3. The *Kaitai shinsho* is primarily based on Kulmus' *Ontleedkundige Tafelen.* Comparison of the frontispiece of the *Kaitai shinsho* (3b) with Kulmus' frontispiece (3a) shows that the translators also had Vervalde's *Anatomie* (3c) at their disposal.

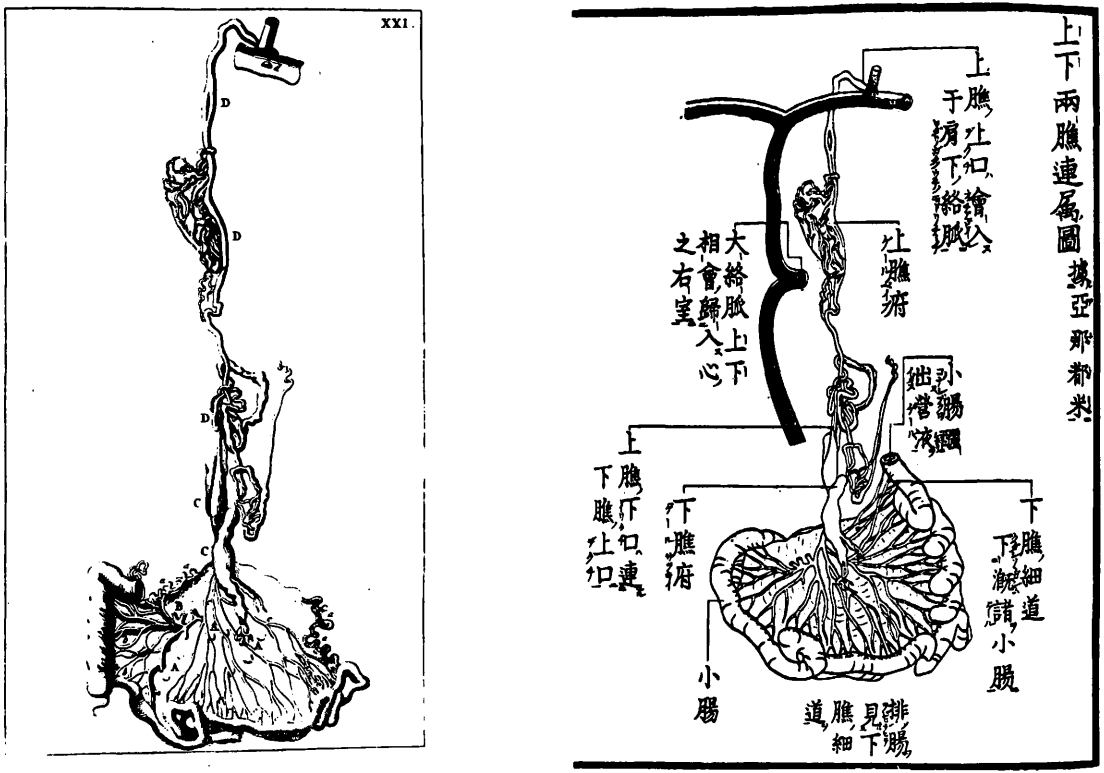


Fig. 4. The illustrations from Kulmus' *Ontleedkundige Tafelen* were the iconographic model for Japanese anatomical illustrations, as can be seen comparing the table representing the intestinal lymphatics and the thoracic duct in Kulmus (left) with the drawing in Mitani Kōki's *Kaitai hatsumō* (1813) (right). Mitami based his work on a dissection performed at Kyoto in 1802.