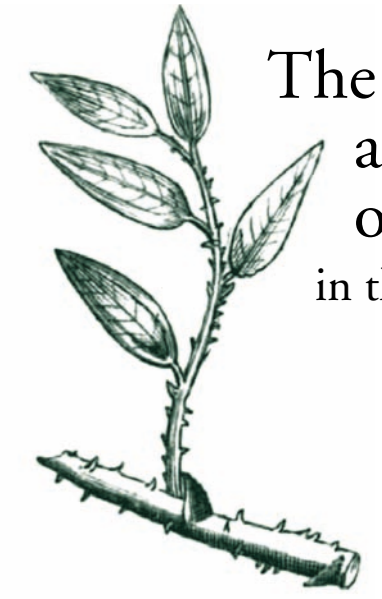
China root. In Cristóvão da Costa's *Tractado de las drogas y medicinas de las Indias Orientales*, Burgos, 1578.



The Euro-Asian Trade and Medicinal Usage of *Radix Chinae*

in the Early Modern Period (ca. 1535-1800)

Peter Borschberg*

In Western medicine, hardly anyone today has heard of *radix Chinae, Chinae ponderosae, smilax Chinae, cortex Chinae, rhizome smilacis Chinae* or in English, simply "China root". Texts dating from the 16th and 17th centuries sometimes refer to it by the name *chub-chini* or "China wood" used in Persia and Mogul India, or far less frequently, by the Arabic *labana*.[1] In Chinese, it is known today as *tu fu ling* 土茯苓. But to traders of early modern Europe and Asia, this medicinal substance found a steady demand and often returned reliable profits. What is *radix Chinae*? Why was it so desired and what was it used for? The present article sets out to explore these important questions.

* Studied at the University of Kent at Canterbury and King's College Cambridge. Since 1992 he teaches in the Department of History at the National University of Singapore, specializing in Early Modern Europe and Euro-Asian interaction with a focus on Southeast Asia.

Estudou na Universidade de (Canterbury) e no King's College (Cambridge). Especialista da fase inicial da Época Moderna na Europa e nas relações entre a Europa e a Ásia, especialmente com o Sudeste Asiático, lecciona, desde 1992, no Departmento de História da Universidade Nacional de Singapura.

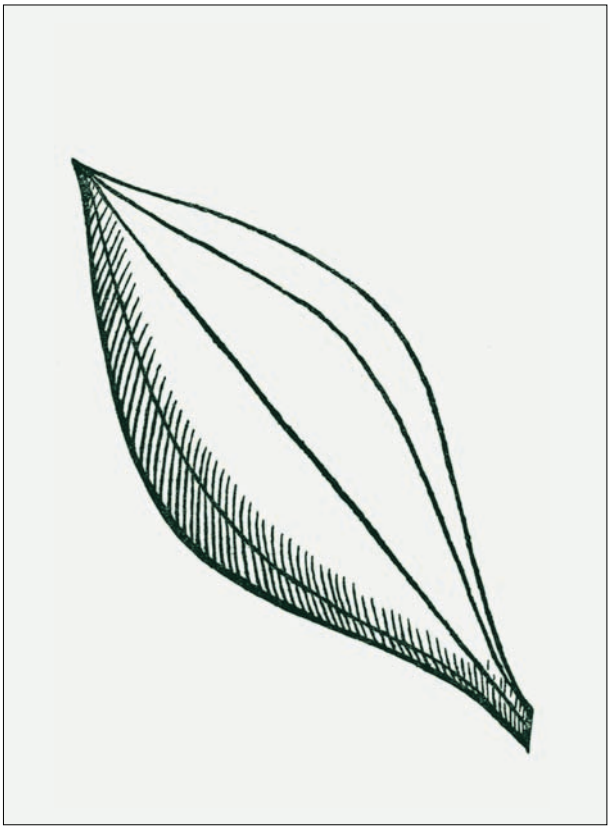
Since it was first introduced into Western medicine in the first half of the 16th century, *radix Chinae* has been traded and described under a variety of different names. In English circles, such as in Yule and Burnell's widely cited glossary *Hobson-Jobson,* we find an entry for "China root".[2] Medical texts of the early modern period employ the Portuguese *raiz, páo da China,* the Spanish *palo de la China,* the Italian *radice China* or the French *bois de Chine, bois d'echine* or *squine*.[3] In the German lands, as well as in the Low Countries, the tuber runs under an astonishingly broad variety of names. The most common is the *Chinawurzel* or *china wortel* or one of its close variants, but other far less familiar names include *Bocken-Wurtz, Pockenwurzel, Chinaknollen, Schina* and *Aschina*.[4] The expression *Pockenwurzel,* is an entry in Johann Heinrich Zedler's *Universal-Lexicon,* published in Leipzig in 1732. This German term may very well leave readers with the impression that the tuber found deployment in the symptomatic treatment of smallpox. The possibility should not be entirely dismissed, as many of the early

modern medicinal recipes involving *radix Chinae,* aim at the symptomatic treatment of skin problems such as abscesses, boils, open wounds, infections, pain, aches, itch, or swelling. Many medical texts of the 16th and 17th centuries also recommend the internal consumption of *radix Chinae* as a sudorific, in the treatment of spleen and liver disorders (including hepatitis), against body aches, joint pains, arthritis, gout, dropsy, headaches, ulcers, and (in-)famously in the treatment of symptoms associated with syphilis.[5]

Imports into Europe (and that would of course include England) appear to have dwindled to negligible amounts by the beginning of the 19th century. In his *Oriental Commerce,* William Milburne observes that hardly any *radix Chinae* was imported into the British Isles after 1804.[6] By 1876, Friedrich Flückiger confidently reported that the root was completely forgotten in Western pharmacology.[7]

Radix Chinae is essentially a tuber that belongs to the *smilax* family.[8] Today as in previous centuries, it is often confused with other roots that are believed to possess certain medicinal properties, especially galangal, ginseng and ginger. This confusion is far more widespread and enduring than many historians of trade and medicine generally believe. All three were, and still are, widely used in the context of Asian medicine. According to some authorities, it also finds application in herbal cuisine and the preparation of culinary delights.

When dried, the fist-sized,[9] tubular rhizomes appear knotty and feature a brown and sometimes blackish exterior. It is only when one cuts the root open to inspect the flesh inside, that clearer differences appear. Contrary to ginseng and ginger, the flesh of the *radix China* is a pale red that runs into a rust or brown color.[10] In his *Kreuterbuch* (Herbarium) first published in 1581, the German physician Adam Lonitzer describes the inside of the tuber as being of a pinkish hue, not unlike human flesh.[11] The inside, other authorities hold, is coarsely granular. When freshly harvested, *radix Chinae* is inodorous and its taste astringent.[12] The root hosts a woody, spiny vine[13] that is found in China and Japan and as far west as the Himalayas. It grows, according to most accounts, in very moist soil. Lonitzer explains that the plant is found near swampy areas near the sea, a view that is partially endorsed by the anatomist and physician Andreas Vesalius and 17th century German medic Johannes Schröder who describe the plant growing like reeds at the water's edge.[14] Where the plant cannot find support, it generally does not grow tall, about one meter off the ground at most. Where support is found on nearby bushes or trees however, the vine is known to grow far longer.[15] This growing pattern may very well be the source of the not uncommon belief among early modern luminaries, that the tuber sprouts and grows into a "tree" that reaches "high above the ground" and bears "few leaves".[16] The widely celebrated Portuguese herbalist and medic, Garcia da Orta, however parts company with the intellectual company of Lonitzer, by identifying the home of *radix Chinae* not along the coastal plains of China, but rather deep in the interior of the continent, near or at least "on the confines of Muscovy".[17] That description would place the root's origin in Central Asia or even Siberia.



China root's leaf. In Cristóvão da Costa's *Tractado de las drogas y medicinas de las Indias Orientales*, Burgos, 1578.

A closely related species of the *radix* or *smilax Chinae,* is found in the Americas and is known as the

radix pseudo-Chinae or "bastard China".[18] European medical books of the early modern period, and especially from the 16th and 17th centuries, clearly distinguish the two species. Schröder differentiates *radix Chinae orientalis* and *occidentalis* (i.e. Eastern and Western "China root"*),* explaining that the new-world tuber featured a flesh that was darker red than the species from Asia.[19] But the consensus brought forth in early modern medicals, attributes to the New World tuber inferior medicinal qualities than its counterpart from Asia.[20] This view was invariably reflected in both desirability and also price. In the following exposé, attention shall be paid only to the Asian variety.

THE INTRODUCTION OF *RADIX CHINAE* INTO WESTERN MEDICINE

At this juncture, it is important and also of considerable historical interest, to pose the very pertinent question: When was *radix Chinae* introduced into Western medicine? Few medicinal substances were introduced into the Western *pharmacopoeia* with so much excitement. This may very well have to do with the fact that, among the first patients in Europe to benefit from the soothing powers of this tuber, was a person no less illustrious than the Holy Roman Emperor Charles V, who also ruled as King Carlos I of Spain. The reportedly successful treatment of his gout by *radix Chinae* offered not only the best possible publicity and endorsement, but equally served to spur further research into the medical efficacy of the tuber.[21] The first comprehensive study to be published in Latin was penned by the hand of the renowned anatomist and court physician Vesalius.[22]

Consensus among historians of trade and medicine has it that *radix Chinae* was introduced to Europe sometime in the early 16th century. Lonitzer identifies the provenance specifically as China, but otherwise has nothing to say about how the medicinal root found its way into European pharmacology.[23] Vesalius explains that the tuber was sold by those traders who "also have pepper, cloves, ginger and cinnamon", including the Portuguese,[24] confirming thus the inherent link between *radix Chinae* and the spice trade. A very similar observation is made by Cristóvão da Costa in his Spanish commentary to Orta published in 1578.[25] In his work printed in Strassburg in 1601, the Spanish medic Juan Fragosus claims that *radix Chinae* was already known and used in Castile around 1525, but one suspects greatly that this may have been a reference to the New World and not the Asian variety. Other authors claim that the root was first brought to Goa either by Chinese or Portuguese traders in around 1535.[26] The Royal French cosmographer André Thevet, writing in the 1570s, boldly asserts that the root was first brought to Africa by two merchants from China whom he names "Nakmach" and "Makal". The names admittedly do not sound very Chinese and if even accurate, could also be the names of Muslim merchants based in China, or perhaps even refer to merchants of mixed descent. Subsequently, Portuguese traders presented a sample of *radix Chinae* to the Portuguese Viceroy, Dom Martin Afonso de Sousa, who was said to be suffering from an incurable disease.[27] No other author from the early modern period has been found to corroborate this specific account. Yet, another doubtlessly self-serving but admittedly more amusing variant, stems from the pen of Orta who in *Colóquio* 47 writes:[28]

> "At this time [referring to his own arrival in India], a very honourable and rich man was cured, who being in Diu, told my master Martim Affonso de Sousa, … how he had been cured of the root of China, which restored him to complete health … not requiring any special diet,[29] except that he was not allowed to eat beef, pork, fish or green fruit. … In China, fish is conceded because they [i.e. the Chinese] are great eaters of it. As this became well known, people had a strong desire to have this root. For all men are inclined to eat and drink, and much more in this land owing to their laziness."

According to Orta, *radix Chinae* was at that time very little known, and few studies on its medicinal efficacy were available – at least in the West. It also had a hard time competing against other more established

Untreated *radix Chinae* is a knotty root with a pinkish to salmon colour. Most pharmacies in China today sell the flesh dried and bleached. Copyright Peter Borschberg.

§. 5.

Was die **Kräffte** dieſer Wurtzel anbelanget / ſo iſt ſie durchdringender und ſubtiler Art / und komt derowegen *D. Simon Paulli* nicht ohne Urſach ungereimt vor / daß *Hernandez* derſelben eine kalte Natur zuſchreibet. Sie treibt nicht allein den Schweiß / ſondern purgiret auch dabey / welches auſſer dem *Fallopio* faſt bey keinem Scribenten zuleſen / doch aber auch von mir in der That ſelbſten obſerviret worden ; Weßwegen dann dieſe Wurtzel ein vortrefflich remedium gegen die gar zu feiſte Wänſte oder corpulentiam nimiam zu halten iſt. Abſonderlich aber heilet ſie alle gefährliche und alte Schäden / ja den anfangenden und verborgenen Krebs ſelbſten und wird deßwegen von einigen die Heilwurtz genennet. In den Frantzoſen oder Luc Veneréa iſt ſie viel gewiſſer / als das Frantzoſen Holtz / welches *Fallopius* in ſeinem Buch *de Morbo Gallico pag. 723.* auffrichtig bekennet / auch einige Exempel anführet / daß / da nach gehaltener Holtzcur noch einige Geſchwär / Schrunden im Affter / Lahmbelulen und dergl. zurück geblieben / ſolche durch dieſe Wurtzel vollends vertrieben worden. So kenne ich auch einen gewiſſen und ſehr verſuchten Chirurgum, ſo zugleich bey einen Hohen Fürſtl. Hauß Cammerdiener iſt / welcher eine gewiſſe Cur die Frantzoſen / welche von andern nicht können gezwungen werden / zu heilen hat / die er vor ſehr geheim hielte und vor kein Geld wolte mittheilen. Als ich aber mit ihm eine gewiſſe Adeliche Perſon in der Cur gehabt / hab ich in acht genommen / daß es die bloſſe Sarſaparilla ſey / und beſtunde ſein Geheimnuß in der coction, welche ihm doch auch abgeſehen / auch zum Theil in obangezogenem Ort des *Fallopii* und noch deutlicher in des *Cardani Tr. de rad. China. p. mihi 1619.* zufinden iſt. Unterdeſſen iſt wohl in acht zu nehmen / daß zu dieſer Cur immer die beſte Sarſaparilla zunehmen ſeye / ſonſten man wenig wird außrichten können.

Das XIII. Capitel

Von der Pocken oder CHINA-Wurtzel.

Radix Chinæ Plukenet *Rad. Chinæ Honand* *Radix Chinæ Fem*

substances.[30] "Be not surprised", Orta continues in his schoolmasterish dialogue with the (in-)famously gullible Dr. Ruano, "I have not heard any one else praise it [i.e. *radix Chinae*], so many writers praising [guachawood] every day. Among them, there is a German writer who composed a book on his labours in a very copious style and very pure Latin, which might have been all written on one sheet of paper. Of this other root of China, Vesali[us] and Laguna say many evil things, that it is rotten, and without virtue and very dear." Quite evidently, the opulent verbosity of his unnamed German colleague (with all likelihood Leonard Schmaus), even if written in the purest and most elegant of Latin, was insufficiently impressive to the cantankerous Orta, who cast his indicting judgment from the safe distance of Goa.

Whatever the precise historical background may be, the link to Europe via China and Goa is almost certainly beyond dispute. The inherent connection to the Middle Kingdom and also to Chinese pharmacology, is quite apparent and also repeatedly attested,[31] not least due to the fact that the earliest uses of *radix Chinae* among western doctors, overlap almost entirely with Chinese medicine. This includes its chief application in the treatment of syphilis, variously called the "disease of Naples" or the "disease of the French" in the European vernacular. According to Orta:[32]

> "As all these lands, China and Japan also have this *morbo Napolitano* [syphilis], it pleased a merciful God to provide this root as a remedy with which good doctors can cure it…"

By 1581 Lonitzer was in a position to report that *radix Chinae* was a medical substance that was highly praised and also frequently used.[33] But the German medic's testimony was not exactly a "consensus" view among members of his profession. To the contrary, medical authors are deeply divided precisely over the question of the tuber's pharmacological efficacy. When Andreas Vesalius published in or around 1546 his exposé on *radix Chinae*,[34] physicians in Italy and on the Iberian Peninsula had already gathered some experience in the treatment of various illnesses, including syphilis. But Vesalius, like other luminaries of the medical profession, such as the Parisian medic Julian Lepaulmier de Grentemesnil (alias Palmarius) and the Italian anatomist Gabriele Fallopio (Fallopius), one of the supposed "fathers" of the modern condom,[35] were far from impressed with the performance of *radix Chinae.* This basic outlook held well into the following century, for the German chemist Daniel Sennert writing around 1650, prefers *sarsaparilla* and guachawood over *radix Chinae* in the treatment of syphilis "by a long shot".[36] The former, brought from the Americas already during the earliest period of the Spanish voyages of exploration, was deemed by Nicolaus Poll (1517), Leonard Schmauss (1518), and Ulrich von Hutten (1519), the most effective medication in the treatment of this "new" disease in Europe, variously known as *morbo Gallico* ("disease of the French", "Franzosenkrankheit"), *morbo Napolitano* (the disease of Naples) and in Asia as the "disease of the Portuguese".[37]

What was it that changed this still rather obscure substance into a veritable miracle root, bordering on a panacea, within little more than a decade? Vesalius and his high-profile patient, Emperor Charles, may very well have contributed meaningfully to this development, for what was good for the Emperor was good for any prince, aristocrat, pope or bishop, not to speak of Europe's growing class of wealthy merchants! The publicity surrounding Charles V and the Latin treatise of Vesalius, spurred the publication of similar investigations into the medicinal value of the new miracle root, such as notably by Cardano and perhaps even influencing the brief account of Orta found in his *Colóquio* 47.

THE REPORT OF VESALIUS ON THE TREATMENT OF HOLY ROMAN EMPEROR CHARLES V WITH *RADIX CHINAE* (1546) AND OTHER RECIPES

As already stated, one of the most comprehensive and detailed studies on the application and medicinal potency of *radix Chinae* in Western medicine, stems from the hand of Andreas Vesalius, the famed anatomist from Brussels and one of Holy Roman Emperor Charles V's personal physicians. In his treatise first published in Basel in 1556, Vesalius explains that he first became familiar with the tuber while in Venice where it was introduced and employed with great praise and high levels of expectation.[38] The Emperor was administered the tuber at his own insistence for the symptomatic

Depiction of the *radix Chinae* root, vine and leaves from Michael Bernhard Valentini, *Museum Museorum...*, Frankfurt/M. 1704. Bayerische Staatsbibliothek, Munich, Germany.

treatment of body pains (almost certainly gout) and a stiff shoulder, and not at the counsel of his personal physicians. Indeed, one is reminded that Charles V was known to have a mind of his own and long held a record of ignoring the advice of his doctors.[39] Reports have it, that the Emperor's health improved, and the resounding endorsement only raised further the expectation amongst aristocrats and the wealthy about the treatment.[40] Not unlike the great Emperor Charles, they placed pressure on their personal physicians to administer the root to them in the treatment of a variety of illnesses, including syphilis.[41] But Vesalius clearly has his doubts about the medicinal properties of *radix Chinae* and on more than one occasion insists that it is not nearly as efficacious as guachawood.[42] Among the reasons cited is taste: What is one to hold, he wonders rhetorically, of a substance that has no taste of its own?[43]

Vesalius describes in considerable detail, the preparation for a decoction which he admits derives substantially from the writings of Italian doctors. But in order to prepare this decoction, it is important first to select the right quality of *radix Chinae,* which Vesalius attests, is reddish in colour, similar to galangal, and when dried, appears similar to a rotten calamus root. In order to give his readers a sense of the starkly varying quality of the specimens available on the market, Vesalius describes that the tubers appear as if they have been haphazardly pulled out of the soil, and broken into chunks of differing size and weight. They appear as if they had been tossed about for a long time until washed onto a sandy beach.[44] Many of the specimens are completely dried out, burst open, mouldy, rotten, or worm infested.[45] For this reason it is important that one selects only specimens that are not rotten, not worm infested, but still a bit juicy inside.[46] *Radix Chinae* has no taste and no odour of its own; even if one gnashes a piece between the teeth, there should be no flavour whatsoever. If it does feature odour or taste, this would have been absorbed from other medicines that were stored on board a vessel or in the pharmacy.[47]

To prepare the decoction, one takes a sharp knife and cuts the carefully inspected tubers into coin-shaped slices. One then takes two ounces of this sliced *radix Chinae,* places the pieces into a glazed clay vat that is capable of holding about sixteen pounds of water or about eight liters. This vat should feature a lid or a cover that can be closed. Next, pour twelve pounds of fresh spring water into the vat with the sliced *radix Chinae*. Then place the vat over a warm fire (not a roaring fire), and not over glowing ashes.[48] The fire should be smoke free. Cook the water down to about two thirds of its original volume. This, Vesalius explains is best done overnight, or at least through the evening before one intends to consume the decoction. The resulting liquid is ready to be consumed (straight from the vat), or if one prefers, after it has been sifted through a piece of cloth and poured into another container. The medallion-shaped slices of *radix Chinae* should then be removed from the vat, dried off with a piece of cloth and kept for the preparation of a second batch. If the stomach is not able to take the first or even the second batch, it may be necessary to dilute the decoction for administering to the patient.

The decoction, which is red in colour, should be administered warm. For this reason it can be placed over a very low fire, or better still, kept in a container wrapped with cloth or a blanket and placed next to the fire. The liquid should be kept there for as long as it is needed, and it is good for one day. If taken for long-term treatment, the decoction should be prepared daily in this manner.

In the morning, one should consume eight ounces of the liquid as hot as possible, and drink the same amount in four-hour intervals. It can also be served as a beverage at breakfast.

When the liquid is administered in the morning and in the evening, the patient should be in bed, and well covered so that he can develop a sweat. The patient should not be naked, but wear a dry garment. In order to avoid the need to change the sheets or to place the body in a place that is not warm, the patient should be wrapped in blankets. Some physicians recommend the evening session after dinner, but Vesalius is evidently against the idea that a patient has to "sweat" through the whole night. An important point is that the administration of *radix Chinae* be accompanied by a rigorous diet. This appears to have its origin in Chinese medicine.

Most of the medical books of the early modern period, including for example Sennert, prescribe this or a very similar concoction, but on the basis of extant

Another page from Michael Bernhard Valentini, *Museum Museorum...*, Frankfurt/M. 1704. Bayerische Staatsbibliothek, Munich, Germany.

§. 1.

Die ſo genandte **Pocken-Wurtzel** oder Radix CHINÆ iſt eine dicke/ gnodichte/ glatte und holtzichte Wurtzel / auſſwendig gelb-braun / inwendig röthlich-weiß / ohne Geruch und Geſchmack / obwohlen ſie friſch einen glebrichten und ſcharffen Geſchmack von ſich gibt. Sie komt auß Oſt-Indien und abſonderlich auß China, worvon ſie auch den Nahmen hat / und wird theils rohe / wie ſie auß der Erden komt / theils von der euſſerlichen Schale geſäubert herauß gebracht.

§. 2.

In Anſehen des Gewächſes / woher ſie entſpringet/gehöret ſie mit der Sarſaparilla unter ein Geſchlecht / dahero ſie beyde auch einerley Kräffte haben / dann es ingleichen eine Art der ſtechenden Winde iſt / welche von dem Seel. Hr. *D. Hermanno* und andern berümbten Botanicis Smilax aſpera Chinenſis, LAMPATAM dicta, genennet wird / beſihe davon *Sam. Dale Pharmacol. p.* 239. abſonderlich aber das 3. **Oſt-Indianiſch Sendſchreiben im Anhang dieſes Buchs** / wo das Gewächſe und deſſen Gebrauch gar ſchön beſchrieben werden; wie dann auch die Mexicaniſche China-Wurtzel / welche auß Weſt-Indien gebracht wird / ſo wohl von dem *Hernandez* als auch *Plukenet* vor eine Art der ſtechenden Winden gehalten und von jenem *Lib. 6. cap. 55. p. 212. Theſ. Rerum Med. Nov. Hiſp.* von dieſem aber *Tab. CX. n.* 4. beſchrieben und abgemahlet worden : obwohln auch die Alte Indianiſche Scribenten / als *Garcias ab Horto, Acoſta, Monardes* und andere deren ſchon gedacht haben. Dieſes Gewächs ſoll theils in Gärten erzogen / theils wild wachſen / und ſollen der letzten Wurtzel nur in Europam kominen / indem die zahme / als die beſte / von den Sinenſern behalten werden.

§. 3.

Ohne dieſen Unterſcheid der Oſt- und Weſt-Indiſchen Pocken-Wurtz pflegen die Materialiſten dieſelbe noch zuweilen in die Feine / Mittel-Gattung und die Gemeine zu ſortiren/davon die **Gemeine** gemeiniglich als alt verlegen und wurmſtichicht gar nichts / die **mittel-Gattung** wenig nutz / die **Feine** aber die rechte iſt. Dieſe/ als die beſte/ wird daran erkennet / wann ſie ſchwer und reſinos iſt / nicht leicht zerſchnitten werden kan und inwendig nicht zu roth / wie die Mexicaniſche und wilde / ſondern röthlich im weiß anzuſehen iſt. Man muß auch wohl in acht nehmen/daß ſie nicht wurmſtichicht und die Löchlein nicht wieder verſtopffet und vergleiſtert ſeyen / welche ſchöne Kunſt der Buchhalter *Georg Nicolaus* **Schurtz** in ſeiner **Neu-eingerichteten** *Material*-**Kammer** / als ein ſonderliches Kunſtſtücklein offentlich in Druck zugeben ſich nicht geſcheuet hat / wann er *pag.* 73. alſo ſchreibet : Wann ſolche wurmſtichicht worden / ſo „ muß man die China klein nehmen und ſtoſſen. „ Alsdann mit Gummi Tragant angemacht / in „ der Dicke wie ein Kitt: darnach muß die „ wurmſtichichte China ins Waſſer getaucht und „ der Kitt in die Löcher eingeſchlagen / hernach „ mahls die China wieder gleich geſchnitten / „ ein wenig mit Umbra angeſtrichen und mit Ve- „ nediſcher Seiffe geſchmieret und gerieben „ werden. Allein mein lieber Menſch / wer hat dich ſolches gelehret ? Iſt dieſes auch raiſonabel und gewiſſenhafft gehandelt ? O nein ! ein gewiſſenhaffter und auffrichtiger Materialiſt wird ſich dergl. und andern Künſten / welche *D. Ludvvig* von *Hornick* in unſern *Pandectis Medico-Legalibus Part. I. Sect. VI. Caſ. 6.* guten theils entdecket hat / niemahlen unterfangen und ſich deßwegen auch mehr Glücks zugetröſten haben.

§. 4.

Den **Gebrauch** der China-Wurtzel betreffend / ſoll derſelbe zu erſt Anno 1533. *Carolo* V. bekandt worden und nachmahlen von vielen Gelährten Medicis in beſonderen darvon geſchriebenen Tractaten gezeiget ſeyn/ worunter *Cardanus de Rad. China* und *Veſalius* in einem **Brieff** davon am meiſten bekandt ſind. Sie truckenet ſehr und treibet den Schweiß / heilet die Waſſerſucht / böſe Schwären / Grind und die Frantzoſen/worinnen ſie denen Sarſaparillen nahe komt / doch temperirter iſt. Sie curiret auch die außgedörrete und ſchwindſüchtige Leute / wann die Kranckheit von ſcharffen böſen Feuchtigkeiten herrühret/da ſie alsdann nutzlich mit den kleinen Roſinen gekocht wird / wie bey *D. Ettmüllern in Com. Schrad. de Rad. China* zuſehen. Ingleichen dienet ſie gegen alles Gliederweh / Podagram und dergl. Es wird ein Decoctum davon gemacht / wie man mit der Sarſaparilla verfähret/ und nimt man nach Unterſcheid ℥j. ad ℥ij. zu xv. ℔. Waſſer / wird 24. Stund eingeweicht / und in einem verdeckten Hafen ſolang gekochet / biß der dritte Theil eingeſotten/ wie *Cardanus l. c.* es zubereitet. *Schræderus* ſpricht / daß 2. Loth der Wurtzel zu 9. ℔. Waſſer ſchon gnug ſeyen : beſihe deſſen *Pharm. Med. Chym. lib. IV. p.* 44.

literature it is possible to recognize a far broader use of the tuber in the context of Asian, and specifically Arabic and Chinese medicine. The French royal cosmographer, Thevet, admits that use of *radix Chinae* is far more widespread in China than in subcontinental India or even in the Arab world. He describes that in China it is preserved in vats or jars "like rhubarb".[49] This may very well help explain why it is often cited in Dutch ledgers together with other preserved items such as ginger. Costa mentions a preserve prepared with *radix Chinae* and crushed pepper.[50] In China and notably India, it was and still is deployed in the treatment of rheumatic pains and syphilis.[51] It further serves as an aphrodisiac and is consumed in cooked form by the Mongol and the Turkoman tribes of Central Asia.[52] Costa describes a dish prepared with honey and sugar, a beverage with wine and also alludes to meat and fish recipes prepared with China root.[53] The following testimony from Jan Huygen van Linschoten, which is repeated by the German physician Michael Bernhard Valentini on the eve of the 18th century, testifies to the use of the tuber, to lend a rosy complexion to the face:[54]

> "The root of China is commonlie used among the Egyptians… specially for a consumption for which they seeth the root China in broth of a henne or cocke, whereby they become whole or fair of face."

PRICES AND MARKETING

The extensive use of *radix Chinae* in the context of Western medicine, spans from its introduction by the Portuguese to Goa and subsequently Europe around 1535, until its almost complete disappearance from cargo manifests at the opening of the 19th century. As has already been mentioned, Milburne sets that date at or around the year 1804.

During the peak of the *radix Chinae* trade between the second half of the 16th and the middle of the 18th century, there was hardly a vessel registered by Europe's early colonial powers that did not carry on board a specified or even unspecified amount of this medicinal tuber. Orta quotes several prices for the mid-16th century, in one instance 10 *cruzados* per *ganta* (of 24 ounces) and in another instance, 30 *reis* per *ganta.*[55] Francesco Carletti, the famed Tuscan merchant who traveled around the world on the eve of the 17th century, quotes a price at source in Canton of "four or five scudos the hundred pounds of twenty ounces each, which comes to a little more than twelve quattrini the pound of twelve ounces."[56] Quite evidently, he deems this inexpensive. By contrast, Andreas Vesalius confirms that China root is available "everywhere in Antwerp" and while he is unwilling to quote a specific price, he confirms that one pound of *radix Chinae* costs "several crowns" at the retail level in Europe.[57]

In the *Generale Missiven* (the annual reports of the Netherlands East India Company sent from Batavia to Amsterdam), *radix Chinae* is often mentioned or listed together with other stimulants and drugs, including tea and preserved ginger.[58] It was purchased on both the Chinese mainland and the island of Taiwan, brought to Batavia for export to Europe, or redistributed to destinations in Western Asia. Export destinations of the Dutch East India Company (VOC), include notably Persia, subcontinental India (especially Surat), as well as ports held by other early European colonial powers, such as Danish Tranquebar.[59] Of course, the Portuguese are large purveyors of *radix Chinae,* as well exporting it chiefly out of Macao to ports in India and insular Southeast Asia, such as Malacca and Macassar.[60] One Dutch official seethingly reports on Portuguese sales of *radix Chinae* to the English at the famed Bugis port, during the first half of the 17th century.[61] Lusitanian merchants also resell their cargos of *radix Chinae* in Japan. According to the report of Zeygert van Rechteren, the Portuguese sold 70,528 *kati* of "China root" (*wortel China*), for about 4231 *tael* of silver in Japan in 1637 (amounting to about 6 *tael* of silver per *picul*, approx. 60 kg).[62] Last but not least, the tuber is regularly featured as part of the Chinese bulk trade with Manila,[63] goods in other words, that were generally earmarked for re-exportation across the Pacific to Mexico and beyond.

Extant documentation, therefore shows a lively, truly global trade in *radix Chinae* that had its key Asian nodal points in Macao, the Fujian coastal ports, Malacca, Goa, Manila, and of course colonial Batavia. The volumes amassed at these entrepôts, could vary considerably from anything between a few hundred pounds to a few thousand *picul*.[64] Correspondingly, merchants and the East India Company had to cast a watchful eye on both quality and prices. Most unfortunately, it is not easy to glean much information about the development of procurement prices, profit margins or even proceeds. In any case, a comprehensive

study of these would reach far beyond the scope of the present article. Still, it is possible to gain a broader picture of prices and profits for the period under review.

First, to the supply side of the picture. How much did the European colonial traders pay when they purchased their *radix Chinae* at the trade fair in Canton or from Chinese traders calling at their ports? Purchase prices of course represented sensitive information that was rarely disclosed and always closely guarded. Reliable references are therefore few. During the early 17th century (we are informed by Martin Castaños), the Portuguese purchased their *radix Chinae* in Macao or Canton for 1 *tael* of silver or 12 *maçes* per *picul*.[65] In another location in the same text, the author quotes a procurement price in China of eight *maçes* per *picul*. This medicinal substance could then be re-exported to Japan and sold for four or perhaps even five *tael*. This rendered the short trip from China to Japan a highly lucrative enterprise. A similar picture is painted for the Portuguese trade with subcontinental India. Again, it was not unusual to generate gross profit margins of one hundred percent or even higher.[66]

The picture that emerges, based on documentation of the VOC, is complex and not always transparent. This is because in cargo manifests and bills of lading, *radix Chinae* is often found lumped together with other commodities and stimulants, including tea, sugar, benzoin, preserved ginger and even some metals and textiles. Additionally, the absence of even approximate quantities or a breakdown of the individual cargos and their value fails to enlighten.[67] Still, occasionally it is possible to calculate an approximate purchase price of a given consignment of *radix Chinae* at source. According to a VOC report dated 23 December 1687, prices paid in China for the medicinal tuber amounted to 2.8 *tael* of silver or 11.4 florins per *picul*.[68] To put this price into perspective, that amounted to about half the amount paid for the same quantity of pepper which is quoted at 6 *tael* or 24 florins per *picul*. Additional purchase prices are extant for the following century. According to a report on 30 November 1730, the VOC operations in Batavia purchased a total of 6107 Amsterdam *pond* of *radix Chinae* for 586.25 *rijksdaalder*.[69]That amounts to about 4.8 *stuiver* per *pond*. In another transaction mentioned in a report of 6 April 1736, the Dutch company had purchased 4424.31 *pond* for 233.13 florins, or about 1.05 *stuiver* per *pond*.[70]

As is known, subcontinental India represented one of the export destinations for *radix Chinae* by the VOC. In 1683, a consignment was sold at Surat for the equivalent of about 4.15 *stuiver* per *pond*.[71] Those sales reaped reasonable rates of return, but these admittedly amounted to only about half of the nominal proceeds per *pond* in Europe at the time.

At the demand side or European end of the operations, the ready availability of wholesale prices from the Dutch company and sometimes also retail prices in pharmacies across Europe, provide meaningful help in reconstructing profit margins and to an extent also risk profiles. As the use of *radix Chinae* was just gaining hold in the late 16th century (mainly in the treatment of advanced stages of syphilis and of smallpox), prices of this potentially life-saving or at least life-extending substance were correspondingly high, because demand quickly outstripped supply. Fragosus does not mention a price, simply that the substance was only to be had at a *magnum precium* – a substantial price. Orta purchased *radix Chinae* in Portugal and imported this to Goa, paying 5 *cruzados* per *arrátel*. At a retail level in the Holy Roman Empire (in the town of Annaberg in Saxony to be precise!), one finds a 1563 price quotation of 2.5 per pound of dried *radix Chinae*.[72] That was a price only the affluent could afford. But supplies to Europe quickly picked up into a veritable industry of *radix China* imports, that ran into thousands of pounds per consignment. For example, one is informed that on Monday, November 4 1743, the Amsterdam Chamber of the VOC offered for sale a total of 13,720 *pond* of the dried root for sale at its regular auction.[73] The sheer volumes procured and sold in Europe by the late 17th and 18th centuries, can be taken as an indication of just how popular this substance had become with physicians, druggists and their clients in the treatment of certain symptoms and diseases. And the volumes can also be taken as a broad gage of affordability. One of the early price lists of the Amsterdam chamber of the VOC, dating from 1603, pegs the wholesale price of one pound of *radix Chinae* at 7 *stuiver*. That was roughly equivalent by weight to the price of cardamom and about one half the price paid for benzoin or Japanese laurel camphor.[74] The nominal price of China root appears to have remained more or less constant in Holland during the 17th century. A *prijscourant* or price list of the VOC quotes offer prices in Amsterdam for April 28 1698,

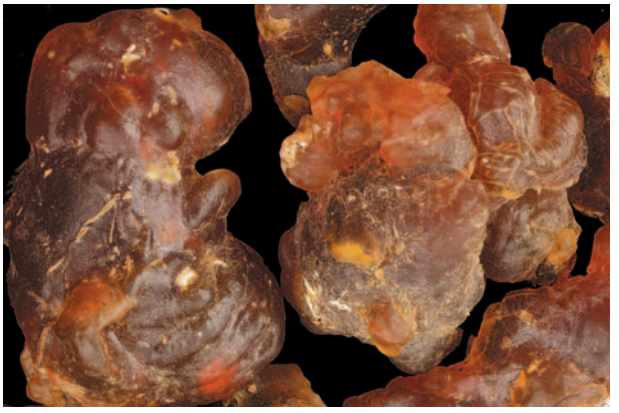
at 7-7.75 *stuiver* and for the VOC chamber in Hoorn at the auctions of May 22 and 26 1698, at about 8-8.25 *stuiver*.[75] But the price relation to cardamom and camphor had changed dramatically. Camphor now cost more than three times the price of *radix Chinae* and five times cardamom!

Castaños spoke of profits amounting to several hundred percent on the original investment and at a first glance at least, his observations would appear to hold true for the VOC as well. The reality is, that these margins were very hypothetical and did not take into consideration the cost of transportation or the risks associated with the long voyage back to Europe. Cargos of *radix Chinae* were easily affected by salt water, rot and the presence of parasites, including worms. In some instances, the Dutch company found itself not making a profit, but indeed swallowing a loss in its trade with the medicinal tuber. In his report of 13 December 1686, Dutch Governor-General Camphuys reported a loss of forty-five percent on *radix Chinae*. He points his blaming finger at the low quality of the tubers purchased.[76]

In comparison to other mainly outrageously priced commodities of medicinal or pharmacological value, including musk, ambergris or aloes wood, *radix Chinae* was far more affordable, but certainly not inexpensive. While the market scams may not have been as elaborate as those for the highly priced and greatly prized substances, company servants nevertheless had to remain on their toes and keep a watchful eye on quality and potential fraud. So, what was it exactly that one had to keep an eye open for when buying *radix Chinae*? Milburne's *Oriental Commerce* gives some useful hints to this effect. The tubers, he explains, should be selected "large, sound and heavy" and feature a pale red color inside. When fresh, he continues, the root "will snap short and look glittering within. If old, the dust flies from it when it is broken, and it is lite and kecky."[77] If, on inspecting the inside, it (ie the tuber) is discovered to be wormy, then it is utterly worthless.

FORGING THE QUALITY OF *RADIX CHINAE*

It is precisely at this juncture, that the con-artist steps in. The individual roots of the *radix Chinae* are often found to be wormy and knowing that this will certainly render a piece financially worthless, tricksters



The resin tragacanth was commonly used in the early modern period for falsifying the quality of *radix Chinae*. Copyright Peter Borschberg.

would colour the blackish worm marks with red soil or clay.[78] A very elaborate scam, is described by Georg Nicolaus Schurtz[79] and repeated by Valentini in posing the rhetorical question: "Just this, my dear fellow human being, who taught you such a thing?"[80]

> "If the tubers should be wormy, some China root should be cut into small pieces and pounded. The mass is then prepared with tragacanth, to a consistency of putty. The wormy China root is then immersed in water and the putty filled into the wormholes. The China root is then sliced into pieces, daubed with umbra pigment, and coated with and rubbed with Venetian soap."

Both scams would be difficult to detect by an untrained eye and when the tuber is dry and shriveled, it is not immediately evident whether or not it has been tampered with. One greatly suspects, that such scams were not pulled off by the wholesalers, but by the druggists, for disposing of spoilt or worthless specimens. Their unsuspecting clients often discovered, that dark worm holes began to appear when they soaked their tuber slices in fresh water! A similar scam is reported by Vesalius with reference to Antwerp. He claims, that in order to conceal the worm holes and enhance the surface appearance of the tuber, it is smeared with a substance he calls *bolus armenicus,* a soil containing iron oxide and lending a rust-brown external appearance to the tuber. Red ginger, he explains, is also sold in this form, a fact that greatly facilitated the confusion of the two roots when and if they were judged only by their external appearance. For this reason also, it seems that most doctors recommend that prospective buyers subject

the tubers to a range of tests, including an inspection of the interior and taste.

EPILOGUE

Radix Chinae or "China root" is a medicinal substance now sparsely used outside Asia. Historically however, it featured prominently in Western pharmacology between the 16th and the 18th centuries. "China root" was procured by European merchants in Asia and traded through established trading networks via Macao, Malacca, Goa, Manila and Batavia. It was resold in Europe, the Americas, subcontinental India and the Arabian world for reliable profits

One of the unique facets of *radix Chinae,* is that its introduction into Western pharmacology is well attested and its links to the Chinese *materia medica* is almost certainly beyond dispute. For much of the early modern period, clear parallels exist between Eastern and Western medicine in the preparation of decoctions and culinary delights using *radix Chinae*. Demand for this root increased significantly after the middle of the 16th century, when it was successfully administered to Holy Roman Emperor Charles V to treat his gout. The ringing endorsement stemming from this high profile patient however, was viewed critically by leading members of the medical profession on the Iberian Peninsula, Italy, France, Germany and beyond.

Given the relatively high price of *radix Chinae* across Europe, the exotic tuber can hardly be seen as a remedy affordable to the masses. Its lapse into obscurity by the beginning of the 19th century may very well be linked to the steady improvement in personal hygiene and competition from other attested medicinal substances. Most significantly of all, China root was used for the treatment of what was then Europe's new epidemic variously known as *morbo Gallico, morbo Napolitano,* or syphilis. Even so, consensus among the medical scholars of the early modern period, has it that guachawood and sarsaparilla were far more effective ("by a long shot") in rendering symptomatic relief. RC

NOTES

1 Thevet 1575 vol. 1, fol. 417 recto. Thevet also claims that the Chinese term for this tuber is *lampata,* a term that is evidently etymologically related to its Arabic counterpart.
2 Hobson-Jobson 1994: 199A-B. The description found here is almost certainly loosely paraphrased from Flückiger and Hanbury, 1874.
3 Orta, vol. 2 1913/1979: 259 et seq.; Costa 1578: 80, employs the term "*palo de la China*", *Documentação* 1962: 115, the undated report incip "Riquesas que produs o Estado da Índia …" calls it "*pao… da China*"; Pomet 1717/1986: 88; Flückiger and Hanbury 1874: 648.
4 Schröder 1685/1963: 877; Valentini 1704: 169. Vesalius 1922: 16, surmises that the name *Aschina* is probably derived from some "island" in the Indies.
5 Vesalius 1915: 19; Vielheuer 1576: 93; Thevet, 1575 fol. 417 recto; Acosta 1578: 81; Lonitzer 1679/1934: 149, where syphilis is called "*unkeusche Blattern*"; Schröder 1685/1963: 877; Valentini 1704: 170.
6 Milburne vol. 2, 1813/1999: 502.
7 Flückige and Hanbury, 1874: 649.
8 Matthioli 1557/1984: 118; Costa 1558: 80, "*smilax aspera*"; Valentini 1704: 170.
9 Costa 1578: 80.
10 Matthioli 1557/1984 118; Valentini 1704: 170 describes the exterior as yellow-brown.
11 Lonitzer 1679/1934: 148. Valentini 1704: 170, describes the interior as reddish-white.
12 Valentini 1704: 170, where the taste of freshly harvested *radix Chinae* is described as "earthy" (*glebricht*) and astringent (*scharf*).
13 Costa 1578: 80.
14 Vesalius 1915: 16; Lonitzer 1679/1934: 149; Schröder 1685/1963: 878.
15 Flückiger and Hanbury, 1874: 648.
16 Schröder 1685/1963: 877.
17 Orta, vol. 2, 1913/1979: 259.
18 Gerarde, 1636: 1617-1619, illustrates it under the names *pseudo-China* – "bastard China"; Valentini 1701: 170 calls it the "*Mexicanische China-Wurtzel*" or Mexican China-root. Other names used in early modern medical text include *cortex Peruvianus*.
19 Schröder 1685/1963: 877; Valentini 1704: 170.
20 Valentini 1704: 170.
21 Vesalius 1915; Costa 1578: 84; Sennert 1650: 587.
22 Vesalius 1546.
23 Lonitzer 1679/1934: 149.
24 Vesalius 1915: 16.
25 Costa 1578: 82.
26 The origin of this claim probably is Orta, vol. 2 1913/1979: 260. It is repeated amongst others by Vielheuer 1576 93; Sennert, vol. 3, 1650: 587; Schröder 1685/1963: 877; Valentini 1704: 170; Flückiger and Hanbury, 1874: 648.
27 Thevet, vol. 1, 1575 fols. 416 verso - 417 recto.
28 Orta, vol. 2 1913/1979: 380. Although Orta was evidently "politically motivated" to publish his *Colóquios* in Portuguese in Goa (1563), the

Latin translation by Clusius (1567) made this book the most widely quoted source on the medicinal plants of India.

29 This contrasts to some other prescriptions, including Vesalius 1915: 124 et seq. who recommended the administration of *radix Chinae* with a rigorous diet.

30 Ryff 1541.

31 Sennert, vol. 3 1650: 587.

32 Orta, vol. 2, 1913/1979: 379; for the original Portuguese text, see: Orta, vol. 2, 1563: 259.

33 Lonitzer 1679/1934: 148.

34 Vesalius 1546.

35 The prolific and famed Italian anatomist Andreas Fallopius discusses the treatment of syphilis with *radix Chinae* in his influential work "De morbo Gallico" (On Syphilis, 1564), chapter 60.

36 Sennert, vol. 3, 1650: 587.

37 Poll, 1517; Schmaus, 1518; Hutten, 1519.

38 Vesalius 1915: 10.

39 *Ibid*. 10, 12, 13.

40 *Ibid*. 14.

41 *Ibid*. 15.

42 *Ibid*. 12, 15.

43 *Ibid*. 17.

44 *Ibid*. 16.

45 *Ibid*. 20.

46 *Ibid*. 17.

47 *Ibid*. 18.

48 A similar recipe is described by Costa 1578: 81.

49 Thevet, vol. 1, 1575 fol. 417 recto.

50 Costa 1578: 83.

51 Orta, vol. 2, 1913/1979: 272.

52 Orta, vol. 2, 1913/1979: 272; Thevet, vol. 1, 1575: 417 recto; Flückiger and Hanbury, 1874: 649.

53 Costa 1578: 81.

54 Linschoten, vol. 2, 1956: 112; Valentini 1704: 170.

55 Orta, 1913/1979: 377.

56 Carletti, 1964: 149.

57 Vesalius, 1915: 24.

58 *Generale Missiven*, vol. 1, report of 4 January, 1636: 520; 720; *ibid.*, vol. 2, report of 22 Dec. 1643: 206; *ibid.*, report of 20 Jan. 1645: 256; *ibid.*, report of 18 Jan. 1649: 335; *ibid.*, vol. 9, report of 30 Nov. 1729: 65; Dagh-Register Batavia, 1674: 34, 38, 39.

59 *Generale Missiven*, vol. 2, report of 22 Dec. 1643: 206; *ibid.*, report of 23 Dec. 1644: 238; *ibid.*, vol. 4, report of 19 Dec., 1668, p. 662; *ibid.*, report of 19 March 1683, p. 810.

60 *Documentação* 1962: 115. Also: *Generale Missiven*, vol. 1, report of 15 Dec. 1529: 264; vol. 2, report of 20 Jan. 1651: 460; report of 19 Dec. 1651: 519.

61 *Generale Missiven*, vol. 1, report of 15 Dec. 1629: 264.

62 Rechteren, vol. 4, 1646/1969: 87.

63 *Generale Missiven*, vol. 9, report of 1733: 521.

64 See for example *Generale Missiven*, vol. 2: 37: cargo of 30 *picul*; *ibid.*: 46: cargo 3,000 *picul*; *ibid.*: 172: 2,000 *kati; ibid.*: 391, cargo of 10 *picul*; *ibid.*, vol. 3: 29, cargo of 5 *bahar*.

65 *Philippine Islands*, vol. 19: 311, 315.

66 *Ibid*. 309, 311.

67 *Generale Missiven*, vol. 3, report of 31 Jan. 1672: 810, where mention is simply made of a "*goede parthije*" (good quantity); *ibid.*, vol. 9, report of 30 Nov. 1729: 65, where the *radix Chinae* is lumped together with other goods, such as tea, spelter and silk.

68 *Generale Missiven*, vol. 5: 157.

69 *Ibid.*, vol. 9: 201.

70 *Ibid.*, vol. 9: 718.

71 *Generale Missiven*, vol. 4, report of 19 March, 1683: 579. Calculation based on a price of 5 *ropia* per man of 36.25 *pond*.

72 According to Flückiger cited in Vesalius, 1915, note 1, p. 24.

73 Ms. VOC 6986.

74 Ms. VOC 7525, fol. 91 recto.

75 Ms. VOC 6985.

76 *Generale Missiven*, vol. 5, report of 13 Dec. 1686: 62.

77 Milburne, vol. 2, 1813/1999: 502.

78 Valentini 1704: 170.

79 Schurtz 1672: 73.

80 Valentini 1704: 170.

BIBLIOGRAPHY

Manuscripts and Archival Materials

The Hague, National Archives
Ms. VOC 6986.
Ms. VOC 7525.
Ms. VOC 6985.

Pre-1800 Prints

Cardano, Girolamo. 1550. *De Subtilitate Libri XXI,* Paris: Michaelis Fezandat.

Clusius, Carolus. 1605. *Exoticorum Libri decem …* Leiden: Raphelengius.

Costa, Cristóvão da. 1578. *Tractado de las drogas, y medicinas de las Indias Orientales …* Burgos: Martin Victoria.

Fallopius, 1564. *De Morbo Gallico Liber,* Padua: no publisher.

Fragosus, Juan. 1601. *Discursos de las cosas aromaticas, arboles y frutales, y de otras muchas medicinas simples que se traen de la India oriental, y sirven al uso de medicina,* Strassburg: Iodocus Martinus.

Gerarde, John. 1636. *The Herball or Generall Historie of Plantes,* London: Norton & Whittakers.

Von Hutten, Ulrich. 1519. *De guaiaci medicina et de morbo Gallico liber unus,* Mainz: Scheffer.

Orta, Garcia da. 1563. *Colóquios dos simples, e drogas he cousas medicinais da India,* Goa: Ioannes de Enden.

Poll, Nicolaus. 1535. *De Cura Morbi Gallici per Lignum Guyacanum,* no place, no publisher.

Ryff, Walter Hermann. 1541. *New erfundne heylsame, und bewärte Artzney, gewisse hilff unnd Radt, nit allein die Frantzosen oder bösen Blattern, sondern auch andere sorgliche schwäre kranckheyt, mangel unnd gebrechen, menschlichs leybs, so sich eüsserlichen oder innerlichen erheben, aber bißher für unheylbar geacht worden, gründtlichen und gäntzlichen zu vertreiben, heylen und Curieren, mit vormals unbekandter, und biß auff dise zeyt unbewißter bereytung, gebrauch und würckung des Indianischen holtz Guaiacum oder Frantzosen holtz genennet, yetztundt newlich erfunden ….* Strassburg: Beck.

Schmaus, Leonard. 1518. *Lucubratiuncula de morbo Gallico et cura eius noviter reperta cu[m] ligno Indico,* Augsburg: Grim[m] and Wyrsung.

Schurtz, Georg Nicolaus. 1673. *Neu-eingerichtete Material-Kammer, das ist gründliche Beschreibung aller fürnehmsten Materialien und Specereyen … samt einer Erklärung der chimischen, medicinischen, metallinischen, mineralischen und anderen Characteren…* Nuremberg: Endter.

Sennert, Daniel. 1650. *Opera Omnia,* 3 vols., Lyon: Ravaud.

Thevet, André. 1575. *Cosmographie Universelle,* 2 vols., Paris: G. Chaudière.

Valentini, Michael Bernhard. 1704. *Museum museorum…* Frankfurt am Main: Zunner.

Vesalius, Andreas. C.1546. *Epistola, Rationem modumque propinandi radicis Chyne decocti, quo nuper inuictissimus Carolus V. Imperator usus est, pertractans,* …. Basel: no publisher.

Vielheur, Christoph. 1576. *Gründliche Beschreibung frembder Materialien und Specereyn Ursprung,* Leipzig: Johann Fritzsche.

Post-1800 Prints

Blair, Emma H. and Robertson, James A. 1903-1909. *The Philippine Islands, 1493-1898,* 55 vols., Cleveland: A.H. Clark.

Carletti, Francesco. 1964. *My Voyage Around the World,* translated by Herbert Weinstock, New York: Pantheon Books.

Van Der Chijs, J. A. et al. eds. 1896-1931. *Dagregister van het Casteel Batavia,* 30 vols., Batavia: Landsdrukkerij.

Coolhaas, W.Ph. et al. eds. 1960-2004. *Generale Missiven van gouverneurs-generaal en raden aan heren XVII der Verenigde Oostindische Compagnie,* 10 vols., The Hague: Martinus Nijhoff and Instituut voor Nederlandse Geschiedenis.

Van Dam, Pieter, 1929. *Beschryvinge van de Oostindische Compagnie,* edited by Frederik Willem Stapel, 6 vols., The Hague: Martinus Nijhoff..

Flückiger, Friedrich A. and Hanbury, D. 1874. *Pharmacographia. A History of the Principal Drugs of Vegetable Origin,* London: Macmillan and Co.

Van Linschoten, Jan Huyghen. 1956. *Itinerario, Voyage ofte Schipvaert ... Naer Oost ofte Portugaels Indien, 1579-1592,* edited by Hans Kern and revised by Heert Terpstra, second edition, The Hague: Martinus Nijhoff.

Lonitzer, Adam. 1934. *Kreuterbuch,* fac-simile edition of Wagner's revised German edition of Ulm, 1679, Leipzig: Hendel.

Matthiolus, Pierandrea. 1984. *I Discorsi di M. Pietro Andrea Matthioli Medico Sanese nei sei Libri della Materia Medicinale di Pedacio Dioscoride Anazarbeo,* fac-simile edition of the Italian translation of Venice, 1557, Bologna: Forni.

Milburn, William. 1999. *Oriental Commerce,* fac-simile reproduction of the London 1813 edition, 2 vols., New Delhi: Munshiram Mahoharlal.

Orta, Abraham Garcia da. 1979. *Colloquies on the Simples and Drugs of India,* based on the annotated Portuguese edition of 1895 by Conde de Ficalho and translated into English by Sir Clement Markham, reprint of the London 1913 edition, New Delhi: Periodical Expert Book Agency.

Pomet, Pierre, 1986. *Der aufrichtige Materialist und Specerey-Händler,* fac-simile edition of the German translation of 1717, Leipzig: Gledisch and Weidmann.

Rechteren, Zeygert van. 1969. "Journael Ghehouen op de Reyse ende weder-komste van Oost-Indien …" in: Isaac Commelin: *Begin ende Voortgang vande Vereenigde Neederlandsche Geoctroyeerde Oost-Indische Compagnie,* fac-simile edition of the original published in Amsterdam in 1646, Amsterdam: Uitgaven Nederland, vol. 4, pp. 19-89.

Silva Rego, J. da (ed.) 1962. *Documentação Ultramarina Portuguesa,* vol. II, Lisbon: Centro de Estudos Históricos Ultramarinos.

Schröder, Johannes. 1963. *Medicin-Chymische Apotheke*, fac-simile of the revised German edition of Nürnberg, 1685, München: Konrad Kölbl.

Vesalius, Andreas. 1915. *Brief van Andreas Vesalius van Brussel, keizerlijk arts, behelsende de aanwending van het decoct van Chynawortel…* edited by Herman Pinkhof and introduced by Evert Cornelis van Leersum, Amsterdam: Van Rossen.

Yule, Henry, and Burnell, A. C., 1994. *Hobson-Jobson, a Glossary of Colloquial Anglo-Indian Words and Phrases, and of kindred Terms, etymological, historical, geographical and discursive;* reprint, Sittingbourne: Linguasia.

Zedler, Johann Heinrich. 1961. *Grosses vollständiges Universal Lexicon aller Wissenschaften und Künste,* 64 vols., fac-simile of the original 1732 edition printed in Halle and Leipzig, Graz: Akademischer Druck- und Verlagsanstalt.