UNIVERSIDADE DE ÉVORA

The Journey of Artifacts:

The Study and Characterization of a Nucleus of Lacquered Luso-Asian Objects from the 16th and 17th Centuries

Ulrike Körber

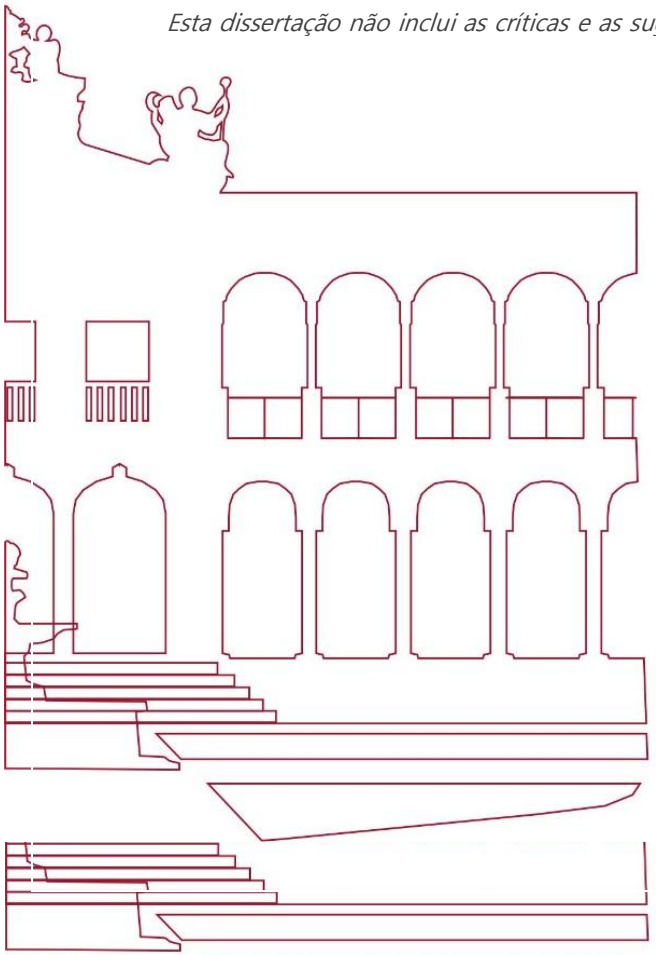
Prof. Doutor Paulo Alexandre Rodrigues Simões Rodrigues

Prof. Doutora Maria Cristina Barrocas Dias

Tese apresentada à Universidade de Évora para obtenção do Grau de Doutor em História da Arte

Évora, Setembro 2018

Esta dissertação não inclui as críticas e as sugestões feitas pelo júri



INSTITUTO DE INVESTIGAÇÃO E FORMAÇÃO AVANÇADA

UNIVERSIDADE DE ÉVORA

THE JOURNEY OF ARTIFACTS

CHARACTERIZATION AND STUDY OF A NUCLEUS OF LACQUERED LUSO-ASIAN OBJECTS FROM THE 16TH AND 17TH CENTURIES

Appendix

Ulrike Körber

Tese apresentada à Universidade de Évora

para obtenção do Grau de Doutor em História da Arte

Especialidade: História da Arte.

ORIENTADORES: *Prof. Doutor Paulo Alexandre Rodrigues Simões Rodrigues*

Prof. Doutora Maria Cristina Barrocas Dias

Esta tese não inclui as críticas e sugestões feitas pelo júri

ÉVORA, SETEMBRO DE 2018

INSTITUTO DE INVESTIGAÇÃO E FORMAÇÃO AVANÇADA

Table of Content

I The Ryūkyū Kingdom

The chain of 45 Ryūkyū Islands bordering the East China Sea between Taiwan and Kyushu formed the Kingdom of Chūzan or Ryūkyū from 1429 to 1879 (today's Japanese prefecture of Okinawa). Despite sharing the same prehistoric origins with Japan (Paleolithic and Jōmon cultures) the Ryūkyū people ended up (at least until 1609, and 1879) being less like their closest neighbors and rather preserve a strong cultural influence from China since the time this insular kingdom became a privileged tribute partner of the new Ming dynasty from the late 14th century onward.

Not only Ryūkyūan culture has deeply absorbed main characteristics from Chinese civilization, it was also further enriched by all the various influences brought from the many Asian empires it traded with throughout the centuries. This constant cross-cultural transference of influences is highly reflected, on one hand, in the merchandise Ryūkyūans carried to the multiple ports across maritime Asia and, on the other hand, in a myriad of decorative arts that they richly developed during these centuries to culminate in their unique Ryūkyūan culture[1].

In 1372 the diplomatic relations with official envoys[2] between the new Ming Dynasty and the Ryūkyū kingdom started when king Satto (1350-1396) of Chūzan – one of the three different kingdoms (Hokuzan, Chūzan, Nanzan) that ruled the islands until their unification in 1429, each with its capital on the biggest island Okinawa – sent tribute to the Ming court in Yingtian (Nanjing)[3], as a reply to the appeal made by the first Ming Emperor Hongwu. Amongst the abundant gifts presented to the Ming court there were objects like: sandal wood fans; gold and silver wine cups; cosmetic boxes with gold and silver powder; and gold lacquer fans, along with raw and fine materials such as: turban shells and a variety of clams; cornelian; ivory; crimson lac; brass; tin; ramie cloth; cow leather; different herbs; roots and

[1] Kreiner (1972; 1992; 1996; 2012), Garner (1972; 1973a; 1979), Arakawa & Tokygawa (1977), Tokugawa (1989; 1995), Arakawa (1989; 1995), Takara (1996), Ptak (2003), Wade (2007).

[2] The first Ryūkyūan envoys were allowed to enter the port of Quanzhou (1372-1471) and later that of Fuzhou, both in Fujian province.

[3] Yingtian was the first capital of the Ming Empire from 1368 till 1421 when Emperor Yongle moved the capital to Beijing ("northern capital") and gave the current name Nanjing ("southern capital") to the city.

incenses; sapan wood; ebony; pepper; sulphur; and grinding stone[4]. By the lack of natural resources, apart from seashells and mussels from the surrounding coral reefs, sulphur and natural products (ramie cloth, cow leather, and banana fiber cloth among others) Ryūkyūan economy depended on imports of various goods from abroad. While some scholars take evidences from the composition of these tribute gifts to state that arts and crafts were already established in the islands at that early date, others state that there must have existed previous commercial contacts with other people in the region as evidenced by the exchanged merchandise[5].

In late 14th century, the first tribute missions to China initiated a long process of profound Sinicizing of the islands' culture, whether that came through tribute, trade or cultural exchange.[6] After the unification of the three kingdoms in 1429, by the Kingdom of Chūzan, alongside the important frequent trade and tribute contacts with China[7] and missions to Japan[8], the islanders specialized on broadening their maritime commerce engaging trade with other different kingdoms while playing (within the Ming tribute system) as intermediates connecting ports in China, Japan, Korea[9] and Southeast Asia[10]. Within the same system these islanders had a privileged position, compared to other tribute partners, being allowed for certain periods to send missions to China more frequently, which is twice a year. Thereby they provided as a trade intermediary a row of territories with coveted Chinese

---

[4] The gold and silver *makie* decorated lacquerware (and possibly the folding fans) were probably valuable tribute gifts of Japanese origin and highly prized in China, Korea and Southeast Asia.

[5] Kobata & Matsuda (1969), Kamakura (1972, p.367), Arakawa (1989, p.172), Tokugawa (1989, pp.ii-ix), Boxer (1993).

[6] In addition to the exchange of tribute and merchandise, as early as 1392 Ming Emperor Hongwu ordered that 36 families of shipbuilders (and most likely other craftsmen) were relocated from Fujian to settle in Okinawa to facilitate the exchange of tribute (see our chapter 1.3.) A the same time, young Ryūkyūan women and men were sent to Nanjing to study Chinese language and culture to be later serve in the kingdom's trade affairs with China, cf. Wade (2007, pp.10,16-18).

[7] Yet not soundly established the Ming dynasty sought control over the Ryūkyūs ensuring their access to sulphur, on one hand, and to horses, on the other, as needed to continue combating the Mongols in the North of China. For this matter, historical records show a purchase of 980 horses in the year of 1383, Takara (1996, p.46).

[8] Between 1403 and 1448 Ryūkyūans visited Kyoto seven times, Kreiner (1996a).

[9] The first recorded envoy to King Sinch'ang of Koryo was in 1389 and then on from 1382 onward envoys continued to be sent to the newly established Kingdom of Chosŏn. Among other tributary goods sent in 1389 were already pepper and sapan wood, apart from sulphur, horses and other regional products of Ryukyu and Japan.

[10] Siam (1425), Palembang (1428), Java (1430), Malacca and Aceh (1463), Patani (1490), and Annam (1509).

goods, a prosperous and flourishing venture for around two centuries. Ryūkyūan kings exchanged an array of presents with the various rulers within the same tributary system, trading territory and network of allies. To Patani they brought porcelain and other goods in exchange of pepper and sapan wood (*Caesalpinia sappan*) and to Siam, sulphur; various satin fabrics; swords folding paper fans; small and big blue vases and bowls in exchange of sapan wood and red cotton cloth. Commonly, Ryūkyūan junks could carry satin fabrics (white and dyed); fans[11]; lacquerware and Chinese style lacquered trays; long and short swords; big and small blue vases and bowls; hemp fabric; pepper; ivory; alum and sapan wood. Offering these goods as gifts or tributes, or trading them as exchange-coin, they would then receive, for example, from Siam, sapan wood and, from Korea, "white folding fans"; tiger or leopard skin; linen; ink stabs; brushes; candles; colored rush mats; Ginseng; as well as Buddhist Sutras[12].

Like several scholars suggest, the Ryūkyūan maritime activities were carried out as a strictly ruled royal undertaking, supervised by Chinese authorities and supported, on one side, by the city-port of Naha – a hub of Chinese, Japanese and Korean colonies for long engaged in this maritime enterprise – and on the other, by the network of several oversea Chinese settlements, which shipping crews were mainly composed of Fujianese, Korean and Japanese individuals[13]. The strategic location of the islands, the kingdom's flourishing trade, as well as all the rich merchandise carried by its royal fleet of junks led Ryūkyūan goods to all the many different destinations where and for as long as interest and demand grew upon them. However, in the course of the 16th century and towards its end, a series of factors, including the arrival of Portuguese and other European merchants to the region, led the Ryūkyūs to lose its role as a significant trade intermediary, and meanwhile weakening its strategic power, made it far more vulnerable to outside attacks and attempts to be taken over by rivals. When the presence of European merchants in Asian waters grew, Ryūkyūan merchants stopped heading to Malacca right after the Portuguese conquest of the port-city in 1511 and, instead,

[11] The so called "native fans" also appear mentioned as either "fans", "folding fans", "folding paper fans", "fans with black bamboo ribs", "white fans", or "fans of various colors" and "gold fans from Hangzhou" (Zhejiang province). This variety of names may evidence the multiple origins of this type of object, and that Ryūkyū functioned principally more as a distributer and not, as in many cases, as the actual producer.

[12] Kobata & Matsuda (1969).

[13] Sakamaki (1964), Kobata & Matsuda (1969), Boxer (1993, pp.8,12).

concentrated their activities with other Southeast Asian trading centers[14]. Eventually, the Ryūkyūan competed with the Portuguese also in Canton and Fujian[15]. And, meanwhile the circulation of Japanese traders (wakō smugglers) increased, also the power of the "all-dominant" and protective Ming dynasty finally decreased. Soon, taking advantage of these circumstances, the Daimyo of Satsuma, Shimazu Tadatsune (1576–1638) invaded the islands in 1609, gradually replacing the Chinese influences by Japanese preferences, but nevertheless enjoying the Ryūkyūan's privileged easy access to Chinese merchandise. In time, the extensive trade network broke down and the islands' kingdom became isolated, thereafter with more and more growing influence of Japanese mainland until 1879, when Okinawa and the surrounding smaller islands with their unique cultural background were annexed as Japanese territory. The slow and gradually transition from a more dominant Chinese influence to a more Japanese one is exemplary reflected in the decorative arts – lacquer art-craft included – and surviving architecture on the islands. At the end of World War II, during the catastrophic 72 day battle in Okinawa, the majority of the cities (Naha, Okinawa, Urasoe, etc) were completely destroyed, royal residences and warehouses torn down, and with them very important historiographic documentation disappeared, frazzling both cultural heritage and identity. The territory was under American rule from 1945 till 1972 when the prefecture of Okinawa was returned to Japanese administration.

If the study of Ryūkyūan history and culture might always be incomplete because of the repetitive loss of vast amounts of documentation and original artifacts, due to at least three major disasters: the Satsuma invasion in 1609, the 1923' Kantō earthquake, or the Battle of Okinawa in 1945, only a tiny part of the important records written in Chinese or Ryūkyūan have resiliently survived, and continues to be studied by various scholars till today[16].

Apparently deprived from core material references of its cultural heritage and historiography, new approaches and initiatives continue to be made by various scholars to

---

[14] Kobata & Matsuda (1969), Takara (1996), Kreiner (1996a, p.20), Ptak (2003; 2007), Wade (2007).

[15] Ptak (2007).

[16] Important sources on the history of the Ryūkyū Kingdom include the Ming Reign Annals (*Ming shi-lu*), or a compilation about Ryūkyūan foreign missions and diplomatic documents such as *Rekidai hōan* or "Precious Documents of Successive Generations". For information on Ryūkyūan history and extant historic records dealing with the Ryūkyūan maritime enterprise, cf. Sakamaki (1964), Kobata & Matsuda (1969), Garner (1973a), Kreiner (1996), Takara (1996), Editorial Office of Rekidai Hoan (2003), Wade (2007).

reenact Ryūkyūan cultural identity in Okinawa. Along the different academic studies focusing on this unique culture, maritime history and its whimsical decorative arts that developed throughout the kingdom, another important example is the reconstruction of the Shuri Castle, residence of the Ryūkyūan-Shō dynasty (Shan in Chinese[17]) and home of Chinese embassies for centuries.

One thing seems certain; Ryūkyūans were a well-known seafaring-people amongst the many others with whom they have traded with throughout 16th century Asia. This fact is widely testified by a manifold of contemporary Portuguese and Spanish reports in letters and historiographic records mentioning the strategic localization of the Ryūkyū Islands (*Liu Kiu, Ilhas Léquias, Luchu* Islands, *Léquios*), describing its inhabitants (*léquios* or *gores*) or enunciating sorts of commodities exchanged. Timely, all the merchandise carried and exchanged by the Ryūkyūans, comprising all goods and products of multiple origins, surely left a great impression on the Portuguese, to start, on their quest for prosperity and wealth fantasies, as recorded in the several proposals of conquering the islands made by different individuals to the Portuguese or Spanish kings alike. As early as 1498, Vasco da Gama, on his way from Melindi (Malindi, Kenya) to Calicut, received information from his Arab pilot about the kingdom (al-Ghur, Likiwu), which sparked immediate interest among the Portuguese. Later on, D. Afonso de Albuquerque receives information on the Ryūkyūs in 1510 and includes them right away in his official account to King D. Manuel I[18], who himself while informing Pope Leo X in his letter in 1513 about the capture of Malacca, refers to the Ryūkyūans (*Gores*) as sending two or three ships to this port per year. In Malacca, Portuguese must have heard of or eventually encountered Ryūkyūan merchants like it happened later in the ports of Canton or the Siamese Ayutthaya, and possibly elsewhere[19]. In his *Suma Oriental que trata do Mar Roxo até aos Chins* (1512-1515) Tomé Pires who stayed in Malacca, Java, Cochin and Canton, also refers to the Kingdom as a vassal of China and the frequent arrival of Ryūkyūan traders at Chinese ports, along with accounts of their trade between China, Malacca and Japan. Pires dedicates a whole separate chapter to this insular

[17] This name was initially attributed during the coronation of the first king of the reunited kingdoms in 1429 by the Xuande emperor (reg. 1426-1435).

[18] Kreiner (1996a, pp.18-19).

[19] In a letter written in 1548 by the Spanish Garcia de Escalante Alvarado to the viceroy in Mexico are reported contacts between Portuguese and Ryūkyūan traders in the Siamese Ayutthaya region or at the Ryūkyū Islands itself, cf. Kreiner (1996a, p.20).

kingdom, further mentioning it in entries on Bengal, China, Java and Japan. As a vassal of China where they buy and frequent the port of Fujian, Chinese sometimes accompany the Ryūkyūan ships. It is also reported that Ryūkyūans produce gilded coffers and rich fans, carry armors and well manufactured swords among a variety of goods, and so that part of their merchandise was doubtlessly of Japanese or Chinese origin. Additionally, these goods from Japan (swords, armor, *makie* lacquerware, etc.) were exchanged for gold and copper, along with silk, musk, porcelain, and damask from China[20]. Several other records follow, including reports about attempts to approach Ryūkyū; letters from prisoners in Canton referring to the Ryūkyūans and their merchandise in 1524 and 1555[21], or even accounts of direct contact between the islanders and merchants shipwrecked in Okinawa on their way to Japan in 1542. However, the majority of information seems to originate from hearsay and repeats itself partly in the course of the centuries, direct contacts with Portuguese or Spanish merchants were likely more of a sporadic character, and there are no accounts on contacts between the Society of Jesus and other religious orders and Ryūkyūans howsoever[22].

[20] Cortesão (1944, pp.88-94, 116-131, 166-199; 1978, pp.370-73), Kreiner (1996a).

[21] For various other accounts on Ryūkyū see Kreiner (1996a, pp.20-22).

[22] There are rumors and unproven reports on attempts to sail the islands, visits by merchants and stranded ships from 1517 or around the mid-16th century, Kreiner (1996a, pp.20-22). For more information on European reports on the Ryūkyūans, cf. Boxer (1948; 1986; 1993), Cortesão (1944; 1978), Kreiner (1996a), Polido (2016).

II Chinese Auspicious Motifs and Their Hidden Meanings

Asian Paradise Flycatcher (*Terpsiphone paradisi*) (Pinyin: *shòudàiniǎo*) – "solored ribbon bird", "bird that brings longevity", "bird of long-lived or enduring generations". As its name includes the word *shòu* for longevity it is a symbol of the same. In the Ming official hierarchy this bird represents lower rank officials[23].

Present on: 2.4.1.

Bamboo (Pinyin: *zhú*) – means "to wish", "to congratulate", "to compliment". Bamboo is rich in symbolism, and stands for "youth", "strength" (Daoism), "integrity" (Confucianism), "endurance", "longevity", "evergreen", "immutable", "humility", and a "pure heart" – due to its hollow stem. Further, bamboo is a symbol of "old age"[24]. As it does not die in winter it is one of the Three Friends of Winter, it is also a spiritual metaphor, and added to a composition of motifs it often serves as a way of saying: "I wish you…"[25].

Present on: 2.1.5., 2.2.2., 2.2.3., 2.2.4., 2.4.1., 2.7.1., 2.7.2., and 2.7.4.

Bat (Pinyin: *fú*) – is homophonous to the character for "happiness" and "good fortune", thus a bat became a symbol of the latter; or expressed the wish for "longevity", "happiness", and "good luck". A pair of bats means double "good fortune", as well as five bats represents the Five Blessings (a long life, riches, health, love of virtue and a natural death). They are often depicted in a highly stylized way. As the shape of their wings alludes to the Fungus of Importability, the bat motif is often confused with the *rúyì* scepter or the other way around. It is also frequently depicted flying among clouds (Pinyin: *yún*), which is homophone to "good fortune", to enhance this message or wish[26].

[23] Welch (2008, pp.67-68), Osselt (2011, pp.11, 48).

[24] Eberhard (1986, p.28), Welch (2008, pp.20-21).

[25] Osselt (2011, pp.11, 70, 170-171).

[26] Welch (2008, pp.112-13), Osselt (2011, pp.172-73).

Bee (Pinyin: *féng*) – means industry, harvest, to be industrious or ennobled. It is also homophonous to the words for "salary" and "abundant, plentiful". Depicted together with bamboo it transmits the wish "may you live in abundance"[27].

Present on: 2.5.1.?, and 2.9.1.

Birds of prey, hawk and eagle (Pinyin: *yīng*) – represent boldness, and *yīng* is a homophone for one of the two characters that comprise the word "hero" (*yīngxióng*), and another word for profit (*yīng*). The falcon is also admired by nomad and hunting cultures[28].

Present on: 2.2.1.

Butterfly (Pinyin – *húdié* or *dié*) – is a symbol of "summer", "beauty", "romance", and "dreams". A pair of butterflies represents "love" and an "undying bond between lovers", as well as a "happy social life for the young". Because of their linkage with flowers they are often associated with woman and decorate objects of female use. A butterfly and a flower are a sign of the "permanent feeling of affinity or conjugal fidelity". Particularly in southern China, such as Hunan, butterflies are often depicted instead of bats to express happiness as the other word for butterfly *hu* sound alike *fú.* The second syllable also keeps a homophone for the word "septuagenarian" thus expressing the wish that someone reaches old age. Together with bamboo butterflies express the wish for a "long life"[29].

Present on: 2.1.2., 2.1.3., 2.2.1.- 2.2.4., 2.3.1., 2.5.1., 2.7.1., 2.7.3., and 2.9.1.

Camellia (Pinyin: *chahua, shānchá*) – is native to China, the tea plant, thriving in the mountains and valleys of Zeijiang, Jiangxi, Sichuan, Yunnan, and Guangdong provinces. Known by a variety of names it is commonly called mountain tea (Pinyin: *shānchá*) or winter hardy (Pinyin: *nàidōng*). Due to its early bloom, it is a symbol of "winter" and of "endurance". Additionally it symbolizes "good luck", "longevity" and "prosperity"[30].

Present on: 2.1.1., 2.1.3., and 2.7.4.

---

[27] Welch (2008, p.91), Osselt (2011, pp.172-73).

[28] Welch (2008, pp.73-74).

[29] Welch (2008, pp.91-93), Osselt (2011, pp.174-75).

[30] Welch (2008, p.23), Osselt (2011, pp.174-75).

Carp (Pinyin: *lǐ*) – is a symbol of "wealth" and "advantage", as it is homophonous to the character for "profit", and to another character meaning "power", "strength", and "ability". It may carry a wish for benefit or advantage in business. Among lotus (*lián*) a carp expresses the concept of "continually having excess wealth". Jumping carp represent "determination", "perseverance" and "accomplishment"[31].

Fish in general (Pinyin: *yú*), is homophone to the character meaning "surplus" or "abundant" and might add the meaning of "plenitude" and "abundance" in combination. Fish paintings became popular among the literati to whom they represented the "qualities of contemplation". The act of fishing was considered inspiring. Only freshwater fish, depicted in natural surrounding with lilies or reeds were considered acceptable to be pictured. Carps or goldfish often represent simply fish[32].

Present on: 2.4.1., and 2.5.1.

Cloud (Pinyin: *yún*) – is amongst the oldest motifs in Chinese decorative arts and related to China's agricultural past. Clouds present the heavens and are simultaneously homophonous to the character meaning "good fortune". They are often depicted together with bats flying among them to form the combination "good luck and good fortune". In a commonly stylized version a bat may appear in a shape simultaneously resembling that of the auspicious fungus (pinyin: *língzhī*), or that of the *rúyì* scepter[33].

Present on: 2.3.1., and 2.7.4.

Cherry (Pinyin: *ying-t'ao*) – literally meaning "baby peach", in China the cherry is related with the female mystique (beauty, strength and sexuality)[34].

From the Heian period (794-1185 AD) onward, the cherry flower became the most beloved flower among the Japanese. Japanese cherry blossoms (*sakura*) are a timeless metaphor for human existence (life, death and renewal), are contemplated and used in spring cherry blossom displays and celebrations. In Japan this motif has a more spiritual

[31] Wolfram (1986, p.57), Welch (2008, p.97), Osselt (2011, pp.86,174-175).

[32] Welch (2008, pp.96-97, 182-183).

[33] Welch (2008, pp.249-50), Osselt (2011, pp.178-79).

[34] Eberhard (2004, p.157), Baird ((2001, pp.48-50)

meaning and is deeply rooted in the culture. It is a symbol of "happiness", "love", "joy", "hope" and "spiritual awareness".

Present on: 2.7.5.

Chrysanthemum (Pinyin: *jú*) – is associated with the season they are blooming – autumn, the number nine, and the month of September. Additionally, these flowers are symbolic of "intellectual accomplishments". They can express "all in abundance", as they share a homophone with "entire", "whole" (Pinyin: *jǔ*). The multiple petalled blossoms also resemble the sun. Together with pine, autumn or winter symbols it symbolizes "longevity"[35].

Present on: 2.1.2., 2.2.2., 2.3.1., 2.4.1., 2.7.3., 2.7.6., and 2.9.2.

Cricket (Pinyin: *qūqū* or *xīshuài*, sometimes *cùzhī*) – is associated with spring and summer in Chinese art. They are added to other motifs due to their homophonous relation with "happiness" and "auspicious" (*xī*)[36].

Present on: 2.2.3.

Deer (Pinyin: *lù*) – is an auspicious Daoist symbol of immortality, especially the spotted deer who are believed to be able to locate the fungus of importability (Pinyin: *língzhī*). Deer depicted under a pine tree represent "longevity". It is also homophone to the word for "official salary" (Pinyin: *lú*), thus a picture of a deer may also express the wish for an official position with a good salary. As *lù* also sounds alike *liú* (the number six), a deer standing by a river, or depicted with either a lotus (*lián*) or a crane (*hè*) may be a rebus referring to the Six Harmonies (heaven, earth, north, south, east, and west), or mean the "world in its entirety". Generally deer present "wealth", "longevity", "nobility" and "success"[37].

Present on: 2.2.4., 2.4.1., and 2.5.2.

[35] Welch (2008, pp.24-25).

[36] Welch (2008, p.95).

[37] Werness (2006, pp.130-31), Welch (2008, pp.116-18), Osselt (2011, pp.180-81).

Dove and Pigeon (Pinyin: *gē* = united, well-matched; *niao* = bird) – are birds of conjugal harmony. In Chinese folk art they are regarded as faithful and filial, thus are symbols of "longevity", "lifelong fidelity", and f"ertility"[38].

Dragon (Pinyin: *lóng*) – is the highest-ranking animal in Chinese animal hierarchy and one of the oldest imaginary creatures in Chinese culture. Characterized by their habitat there are three distinct types of dragon, sky, oceans, and marshes and mountains. They are always bearded with whiskers breathing out fire, fog or rain. In Chinese legend nine different types are known as the sons of the dragon, each one with its own attributes and individual physical characteristics. Generally they represent the forces of nature, protection and were associated with the imperial family, especially the five-clawed dragon which in the Ming and Qing dynasties was commonly reserved to the emperor's family and high rank officials. It is associated with male *yang* forces, and depicted with a phoenix it is part of the conjugal pairing often used for weddings[39].

Dragonfly (Pinyin: *qīngtíng* or *qing* = clear or pure) – is a symbol of summer, but also of "delicacy", "transiency", and "instability". During the late Ming period dragonflies floating above lotus ponds (*hé* signifying lotus as well as peace) was a popular decoration symbolizing "political stability" or "clear, peaceful waters"[40].

Present on: 2.1.3., 2.1.5., 2.2.1., and 2.2.4.

Duck (Pinyin: *jiǎ* or *yā* = the best, first, class) – represent the first class level in the mandarin hierarchy. The Mandarin duck (Pinyin: *yuānyang* = couple united by marriage vows) symbolizes "conjugal harmony". Often ducks are accompanied by lotus flowers or peonies, suggesting a "happy and harmonious relationship or union". If there is additionally a lotus seed pot depicted, the combination expresses the "wish for descendants"[41].

[38] Welch (2008, p.71), Osselt (2011, p.58).

[39] Welch (2008, pp.121-27).

[40] Welch (2008, p.96), Osselt (2011, pp.180-81).

[41] Welch (2008, p.71-72), Osselt (2011, pp.76, 182-183).

The presence of lotus (*lian* = to be attached to) expresses the idea of "being linked to one another forever". Ducks playing among lotus flowers is a way of invoking "peace" and "happiness". Both together express desire for "uninterrupted advancement". Two male ducks = stand for social advancement. Reed surrounding them is homophone for "ceremony of investiture" and "emoluments", or expresses a "wishing for positive examination results"[42].

Present on: 2.4.1., 2.2.1., 2.2.4., and 2.4.1.

Fungus of immortality (*Glossy ganoderma*) (Pinyin: *língzhī, ruìzhī*) – known as the "sacred fungus" or "plant of immortality". The fungus has a long history in Chinese culture and its traditional medicine, where it is thought to cure and prolong life. The head of a *rúyi* scepter is of the shape of a stylized fungus and expresses "nobility" and "rank". It also represents the expression "according to your wish" or "as you wish". When it is stylized within a border it can easily be confused with the shape of bat or cloud pattern[43].

Gold (Pinyin: *jin*) – Symbol of prosperity and wealth[44].

Grapes and grapevines (Pinyin: *táo*) – Grapes are a symbol of autumn. Both, grapes and vines, represent "abundance", "fecundity" and "heirs". Together with squirrels ("pine-tree-rat") they transmit the wish for a "long life". The presence of the vines (*wàn* or *màn*) in a composition intensifies this wish, as *wàn* is homophone to the word meaning 10000, while *mán* is homophone to the word meaning "completely, entirely, or very", which can add the wish of "completely, unbroken" to a composition, as vines are also an continuous, unbroken growth.

The combination of grapevines and squirrels became a motif especially popular during the mid-Qing period[45].

Present on: 2.1.1., 2.1.3., 2.1.4., and 2.4.1.

---

[42] Osselt (2011, p.76).

[43] Welch (2008, p.50).

[44] Osselt (2011, pp.184-185).

[45] Welch (2008, pp.40, 53, 144), Osselt (2011, pp.184-185).

Hare/ Rabbit (Pinyin: *tou*, meaning head, beginning, start) – Hares and rabbits are not distinguished. The hare is one of the signs of the zodiac, and is as a Daoist symbol associated with the moon, "importability" and hence "longevity"[46].

Present on: 2.2.1.

Heron (Pinyin: *cānglù* or *lù*) – There are a number of homophones, including "official salary", "road, path, or way". Herons and egrets are confused in China, as their names are virtually identical. Depicted together with lotus flowers they express the Confucian ideal of a "virtuous official" or may express the wish for a "positive future, success in ones' doing", "may remuneration increase regularly", or "repeated success along the way". Egrets or herons depicted with fish are an auspicious combination expressing "official salary in abundance" (fish *yú* = abundant). As they represent the ruling élite, they were also used on rank badges of imperial China. Moreover it is a symbol of "purity", and "longevity", and the "incorruptibility of an imperial official". They are distinguishable from cranes or storks by their s-shaped necks when flying[47].

Present on: 2.1.2., 2.2.1., and 2.3.1.

Insects (Pinyin: chong = repeatedly, to multiply) – also symbols of fertility[48]

Kingfisher (Pinyin: *cuìniǎo*) – symbolizes "peace", "prosperity" and is generally a popular emblem of "beauty". The species Ceryle varia is native to Fuzhou, the Capital of the Fujian province. Combined with lotus or iris it is associated with summer[49].

Present on: 2.4.1.

Leopard (Pinyin: bào) – is one of the four animals of "power" and "energy". This animal expresses "bravery" and "martial ferocity". Together with the tiger it is used as a

[46] Welch (2008, p.142).

[47] Welch (2008, p.74), Osselt (2011, pp.100, 184-185).

[48] Osselt (2011, pp.186-187).

[49] Williams (1976, pp.240-41), Welch (2008, p.77).

rank designation and an emblem of military officials or the fourth grade[50]. The word is homophonous to "to announce" (bao xi)[51].

Present on: 2.2.1.

Lobster (Pinyin: *lóng xiā*) – means regeneration, resoluteness (similar to crab).

Present on: 2.2.3.

Lotus (*Nebula nucifera*) (Pinyin: *héhuā* or *liánhuā*) – The lotus is a sacred flower of Buddhism, one of the Eight Buddhist Emblems and therefore embodies "purity" and "perfection" as it grows from the mud bearing ripe seeds in their seed buds, while flowering. In Chinese culture and agriculture the lotus is an important flower and all parts have their own names and purposes. It is also a symbol of "summer" and "fruitfulness".

There are a lot of lotus representations and stylized scrolls, in which the flower sometimes looks more like a peony. Its eight-petalled stylized flower bud stands for the "eight fold path of Buddha's teachings". In Buddhism it is also an attribute to the goddess of mercy *Gaūnyīn*, which used to be depicted holding a lotus.

It is further related with "longevity", "nobility", "elegance", "curative powers", and when depicted with seed buds a symbol for "marriage" and "fertility". Homophony adds a number of other possible meanings or messages, especially in combination with other flowers, insects or animals. (*hé* = join, combine; *lián* = "to link, to connect"; "long for, fell attached to", "successive"; *lian* = "without interruption", "peace", "marriage", "wealth", "glory", "incorruptibility" of "officials"; leaf = flourishing business; seed pot = fertility[52].

Fish and lotus, more specific, carp and lotus, represent "surplus", "profit", and "wealth". New Year gifts with this combination express the wish: "may abundance reign year after year". If there are peonies growing along the pond the hope is for "abundant wealth and fame". A carp leaping out of the water can also be an emblem of "social advancement"[53].

---

[50] Welch (2008, pp.111, 135).

[51] Osselt (2011, pp.186-187).

[52] Williams (1976, pp.255-258), Welch (2008, p.27), Ossel (2011, pp.188-189).

[53] Osselt (2011, p.120).

Present on: 2.1.2., 2.2.1., 2.2.4., 2.3.1., 2.4.1., and 2.5.1.

Lozenge (Pinyin: *fāngshèng*) – the "victorious square" symbolizes the wish: "may wealth arrive"[54]. It is one of the Eight Precious Things[55].

Lychee (Pinyin: *lìzhī*) – can symbolize "profit", "business", "benefits", and "business". Due to its red shell lychee is an auspicious summer fruit, as well as a feminine symbol of "romance" and "love", and a pair of lychee symbolizes "fertility". Its morpheme *li* is present in many other names and alludes to other fruits or animals and their respective meanings (pear, plum, carp…) and symbolizes also "strength" and "profit or benefits". A tree bearing 100 lychee means "may this company be very profitable"[56].

Eventually present on: 2.2.2.

Magpie (Pinyin: *què, xǐ* or *xǐquè*) – attracts "joy" connected with "unity of people"; symbolizes "stability", "celebration", "happy occasions", or "great happiness". As they share the morpheme for happiness (*xǐ*), they are considered as „good fortune birds" and were believed to herald "good fortune" and being "messengers of good news". Flying or sitting they signal "impending good news". A pair of magpies means "double happiness" while a group of five magpies can symbolize the Five Happinesses (wealth, health, virtue, longevity, natural death), equally to the depiction of five bats. They can also present "marriage and happiness", and thus a pair of magpies represents "conjugal bliss and fidelity". Because they are considered messengers of good news, they are frequently added to a composition to add the hope "to come"[57].

Present on: 2.1.1.- 2.1.5., 2.2.1., 2.2.4., 2.3.1., 2.4.1., 2.5.1.- 2.5.3., and 2.7.1.- 2.7.4.

Monkey (Pinyin: *hóu*) – is homophonous to "nobleman or high official", rank in the hierarchy, and as it is identified with reproduction it is associated with "descendants"

[54] Osselt (2011, pp.188-189).

[55] Welch (2008, p.213).

[56] Welch (2008, p.54).

[57] Eberhard (2004, pp.74-75), Welch (2008, p.77), Osselt (2011, pp.188-89).

(*hòu*). Monkeys have an important role in Chinese culture and folk art and are associated with "intelligence"[58].

Present on: 2.5.3.

Orchid (Pinyin: *lán, lánhuā,* or *shānlán* or *yōulán*) – can symbolize either "abundance", "jade", "person of exemplary conduct and irreproachable morality", or "grandson". There are many local varieties that represent local mythology or icons. Due to their fragrance they are associated with "elegance", "women", "love", "beauty", "fertility", "virtue", "moral", and "excellence"[59].

Present on: 2.2.2.

Peach (Pinyin: *táozi*) – the blossoms of a peach tree are another important symbol of "longevity" in Chinese culture, and simultaneously symbolize "good luck" and "happiness". The fruits are related to immortality due to an ancient legend. They are also related to young female beauty. It is one of the most important symbols of Chinese culture and in traditional Chinese medicine all parts of the tree are used. Paired with lotus flowers (*lián* = interlinked) they symbolize "glory and rank", "power and wealth" interlinked[60].

Present on: 2.7.3.

Peacock (Pinyin: *kǒngquè*) – is admired for its "elegance" or "beauty", and communicates "rank", "wealth" and "power". If it is spreading its tail (*kāipíng*) this indicates that "more magnificence is yet to come" or "significant fortune is awaiting you" (*kǒngquè kāipíng*). A peacock is symbol of third- and forth-rank civil servants during early Ming. Further this bird is associated with the goddess *Guānyīn*[61].

Peony (Pinyin: *fùguíhuā*; *huā* = flower, *fù* = wealth, *guì* = rank or "riches and honor") – is very popular in Chinese culture where it symbolizes "prosperity" and "prestige", as a

[58] Welch (2008, p.137), Osselt (2011, pp.190-91).

[59] Eberhard (1986, pp.219-220), Williams (1976, p.301), Welch (2008, p.3), Osselt (2011, pp.194-195).

[60] Eberhard (2004, pp. 224-226), Welch (2008, pp.34, 55).

[61] Welch (2008, p.78-79).

flower of "wealth", "royalty" and "rank", "status" and "nobility", or the season spring. It also represents "female beauty" and "erotic lushness".

There are two types of peonies, those which belong to the herbaceous family (*Peonia albiflora,* Pinyin: *sháoyao*), and tree peonies (*Paeonia arborea*, Pinyin: *mǔdānhuā*). The latter ones bear large pink red ruffled flowers and are known as the King of Flowers.

In combination with lotus flowers (*lián*) they symbolize "glory" and "rank", "connected power and wealth"[62].

Present on: 2.1.1.- 2.1.3., 2.2.1.- 2.2.4., 2.3.1., and 2.5.1.

Pheasant (Pinyin: *zhì*) – The pheasant is a common emblem for "beauty" and "good fortune", and "literary refinement". Many different varieties are native to China. In the early Ming dynasty, the golden pheasant (Pinyin: *jīnjī*) for instance was used on rank badges or first and second-rank civil servants, while the silver pheasant (Pinyin: *báixián*) designated a fifth rank civil official. Further these birds are strongly associated with women. The pheasant (Pinyin: *huá chóng*) is one of the Twelve Imperial Symbols of Sovereignty representing "literary refinement". Due to its long tail, it is related to a "long reign" (*chang zhi*). It can also stand for: "making something beautiful even more splendid". The most common species is the ring-necked pheasant. Pheasants are sometimes used instead of the phoenix[63].

Present on: 2.2.2., and 2.2.4.

Phoenix (Pinyin: *fèng huáng*) – symbolizes "virtue", "duty", "correct behavior", "humanity", "reliability" (one of the Five Human Qualities), "strength", "resilience", "good fortune", "opportunity", "luck", and has a strong link to Daoism. Pheasants are considered to be the most important of those winged animals standing for the female *yin* energy. This mythical bird is associated with warmth and the sun. When coupled with a dragon (associated with the emperor) it takes the female part of the empress, or of *yīn yáng*.

---

[62] Williams (1976, p.320), Eberhard (1986, pp.231-232), Welch (2008, pp.34, 36), Osselt (2011, pp.92, 196-197).

[63] Williams (1976, p.322), Welch (2008, p.80). Osselt (2011, pp.196-197).

Fèng means "salary". When depicted with peonies, the phoenix own "high rank" and "honor" are enhanced, as together they represent "prosperity" and "righteousness"[64].

Present on: 2.2.2., and 2.3.1.

Pine – Pine (Pinyin: *sōng*) and Cypress (Pinyin: *bái*) trees as hardy, evergreen plants and stand for "longevity" and "endurance". Pine has no homophone, but Cypress is homophone for the word that means "100" (*bǎi*)[65].

Present on: 2.1.5., 2.2.1., 2.2.2., 2.2.4., and 2.4.1.

Plum (Pinyin: *méi* or *méihuā*) – is a long-lived plant with five rounded or lightly heart shaped petals, suggestive for the "Five Happinesses", and associated with "beautiful woman". Combined with magpie it symbolizes "joy" or "arrival of happiness". The plum is also a symbol of the end of winter and the dawning of spring[66].

Present on: 2.1.5., 2.5.2., 2.5.3., 2.7.1., 2.7.2., and 2.7.3.

Pomegranate (Pinyin: *shíliú*) – Due to its many seeds the pomegranate symbolizes "fecundity" and "abundant offspring". Additionally *shíliú* is homophonous with *shí* which means "generations" and reinforces the visual suggestion[67].

Present on: 2.7.1., 2.7.3., and 2.7.6.

Pondweed (Pinyin: *zǎo*) – aquatic plants generally are depicted to symbolize stagnant water[68].

Present on: 2.1.2., 2.2.4., 2.3.1., and 2.4.1.

Prawn (pinyin: *jia/ xia*) – announces the arrival of good things. The Cantonese, the term *ha* resembles the onomatopoeic sound of laughter (ha,ha..). Like craps, prawns have shell (*jia*) which puns on the word for the rungs of the mandarin hierarchy[69].

---

[64] Eberhard (2004, pp.227-229), Welch (2008, pp.80-83), Osselt (2011, pp.196-197).

[65] Eberhard (1986, pp.237-238), Welch (2008, pp.36-37), Osselt (2011, pp.196-197).

[66] Welch (2008, pp.38-39).

[67] Welch (2008, pp.57-58).

[68] Welch (2008, pp.231-232).

[69] Osselt (2011, pp.198-199).

Quail (Pinyin: *ānchún, chê-ku*) – is homophonous with *ān*, which means "peace". In China it is admired for its fighting spirit and courage, and generally featured on the badges of varying ranks of civil servants during Ming dynasty. It is associated with fire and *yāng* principle, therefore a pair of quails (pinyin: *shuāng ān*) can be read as "peace and prosperity". If any chrysanthemum is present (*jú*) the verb "to wish" can be read and the whole can signify the wish "living together in peace"[70].

Present on: 2.9.2.

Reeds (Pinyin: *lú*) – The presence of reed in a painting may refer to the civil service examinations in imperial China and a candidate's success in it, especially if there are ducks swimming among the reeds. But when the principal motifs are fishes swimming among reeds, the reeds were applied for aesthetic reasons to display the fish in a natural environment[71].

Present on: 2.2.4., 2.3.1., 2.7.4., and 2.9.2.

Rocks and stones: Stones or rocks (*guàishí*) were admired as objects of beauty by the educated élite from the Tang dynasty onward. Rocks denote "permanence" and "solidarity". They present a microcosm of the universe, thus representing "longevity" as "longevity stones" (*shòushí*)[72].

Present on: 2.1.2., 2.1.5., 2.2.1., 2.2.4., 2.3.1., 2.4.1., and 2.9.2.

Shrimp (*xiā*) – is a popular motif symbolizing a "long life" as it is homophone for "advanced age"[73].

Snake (*shé*) – stands for "women", "supernatural power", and "being cunning". The snake is one of the animals of the Chinese Zodiac and one of the Five Poisonous Creatures. This symbol protects against evil[74].

---

[70] Eberhard (1986, p.244), Williams (1976, p.336), Welch (2008, p.84), Osselt (2011, pp.198-199).

[71] Welch (2008, p.39).

[72] Welch (2008, p.64), Osselt (2011, pp.188-189).

[73] Welch (2008, p.102).

[74] Eberhard (2004, pp.254-256), Welch (2008, p.103), Osselt (2011, pp.202-203).

Present on: 2.4.1., and 2.5.3.

Squirrel (Pinyin: *sōngshǔ*, literally pine tree rat/ mice) – are usually employed for featuring "pine" to symbolize "longevity". The depiction amongst grapes (Pinyin: *táo*) intensifies this meaning, as this in turn is a homophone for peaches (Pinyin: *táozi*), which is just another symbol of "longevity"[75].

Present on: 2.1.1.- 2.1.4., 2.2.1., 2.2.2., 2.3.1., 2.4.1., 2.5.3., and 2.7.2.

Tiger (Pinyin: *lǎohǔ,* or simply *hǔ*) – A magnificent creature in Chinese folk art were it symbolizes "courage", "bravery", and "strength". The (white) tiger is one of the four spiritual entities and it is guarding the West. It is one of the animals of the Chinese Zodiac. It is regarded as protector and guardian, and is symbol for the feminine *yīn* and of the earth. It is homophone to "protect" (*hǔ*), and associated with "wealth". The Chinese consider the tiger as the king of the wild beasts. It is taken as an emblem of "magisterial dignity", and "stringency", "courage and savagery", and its presence is synonymous with "danger" and "terror". Additionally it symbolizes "military powers"[76].

The Three Friends of Winter (Pinyin: *suìhán sānyǒu*) – is a symbolic group consisting of pine, plum, and bamboo; all stable and hardy plants which withstand a harsh winter. It symbolizes "longevity". This group also represents the virtues expected from a gentleman: being Confucian in his career, Daoist in his private life and Buddhist when his death is imminent[77].

Present on: 2.1.5.

Water caltrop (*Trapa natans* and *Trapa bicornis*) (Pinyin: *língjiǎo*) – The shape of the nutty fruits resembles a bat's silhouette, symbolizing likewise "happiness" and "good fortune".

Present on: 2.4.1., and 2.7.3.

---

[75] Welch (2008, pp.53, 144).

[76] Williams (1976, pp.398-400), Welch (2008, p.145).

[77] Eberhard (1986, p.30), Welch (2008, pp.37, 41, 225), Osselt (2011, p.70).

Wisteria (Pinyin: *zǐténg*) – It literally means "purple vine" and has no other known specific meaning or hidden message. In turn its purple color is generally associated with the emperor and the imperial family. In China depictions are rare. However wisteria features on a painting of 1530, but commonly the motif is thought to have been depicted more frequently from the 17th century onward (possibly this shows another influence of Japanese *Nanban* decorations on Chinese art)[78].

For example present on: 2.6.2.

[78] Welch (2008, p.41).

III Glossary of Lacquer Related Chinese and Japanese Terms

English	Chinese	Japanese
Abalone	-	*awabi*, also called *aogai (*meaning blue shell)
Animal glue	-	*nikawa*
Carved lacquer	*qidiao*	-
Coating	-	*nuri*
Filled-in lacquer technique	*tianqi*	-
Flakes (metal) “pear skin”	*pian*	*nashiji*
Fragments	*xie*	-
Gold	*jin*	-
Gold foil	*jinbo*	*haku*
Gold leaf	*tiejinqi*	*haku*
Gold leaf painting	-	*hakue*
Gold painting	*miaojin*	-
Gold painted lacquer (shell gold)	*nijin huaqi*	*keshifun makie?*
Incised golden lines	*qiangjin*	*chinkin, chinkin bori*
Incised silver lines	*qiangyin*	-
Inner drawings of motifs with lines left uncoated	-	*kakiwari*
Inner drawings or contour lines of motifs in *makie* technique	-	*tsukegaki*
Lacquer	*qi*	*urushi*
Lacquer tree (T. Vernicifera)	*gi shu*	*urushi no ki*
Lacquerware	-	*shikki*
Lead white powder	*hufen*	*gofun*

Appendix III

English	**Chinese**	**Japanese**
Litharge oil painting	*miaoyou*	*mitsudae*
Metal leaf/ foil	*bo*	*haku*
Mother-of-pearl inlay	*luotian*	*raden, aogai (blue shell), kaizuri*
Mud	*ni*	-
Needle drawing	*zhuihua*	*harigaki*
Rice starch	-	*nori*
Shell gold	*nijin*	*keshifun/hakufun*
Silver	*yin*	*gin*
"Sprinkled picture", sprinkled metal powder decoration	*(saijin?)*	*makie* *hiramakie* – flat design *takamakie* – raised design *togidashi makie* – subsequently coated and polished
Sprinkled crushed shell	-	*makigai* or *aogai nuri* (blue shell)
Outlines painted in *makie*	-	*tsukegaki*
Pine charchoal	-	*sho en*
Powder (metal)	*fu*	*fun*
Ray- or sharkskin	-	*same* *samekawa nuri* – coated and polished rayskin *togidashi same nuri* – sprinkled rayskin grains, coated and then polished
Relief decoration of colored lacquer putty (Ryūkyū)	-	*tsuikin*
Wire	*xian*	-

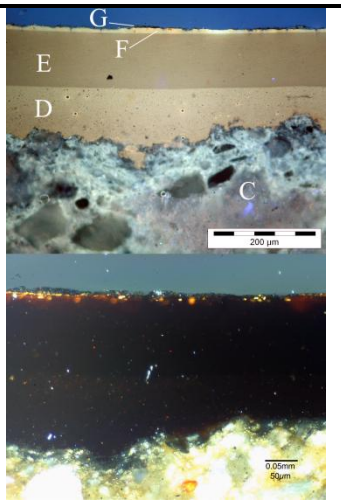
IV Datasheets of the individual specimens with detailed analysis results

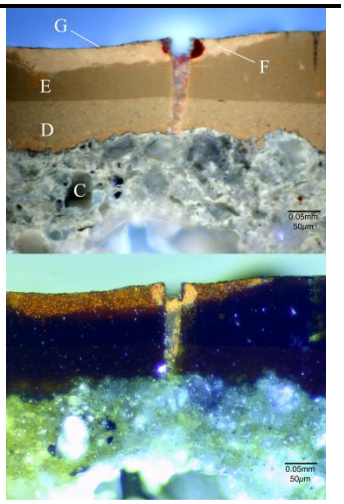
SAMPLE LOCATION

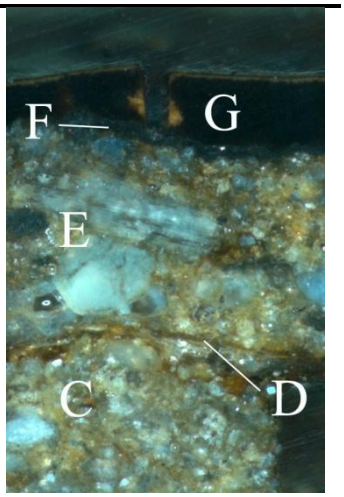
2.1.1. (I_01) **OBJECT:** Shield **SAMPLING:** José Carlos Frade, Ulrike Körber (2007, 2009)

I_01_03

SAMPLE NO.	DESCRIPTION
I_01_01	Front, loose particle, black lacquer
I_01_02	Front, loose particle, gilded black lacquer
I_01_03	Front, decoration of gilded incised lines (*qiangjin*)
I_01_04	Rear, sample with two ground layers and an intermediate layer of organic fibers, close to the edge of the overlapping leather

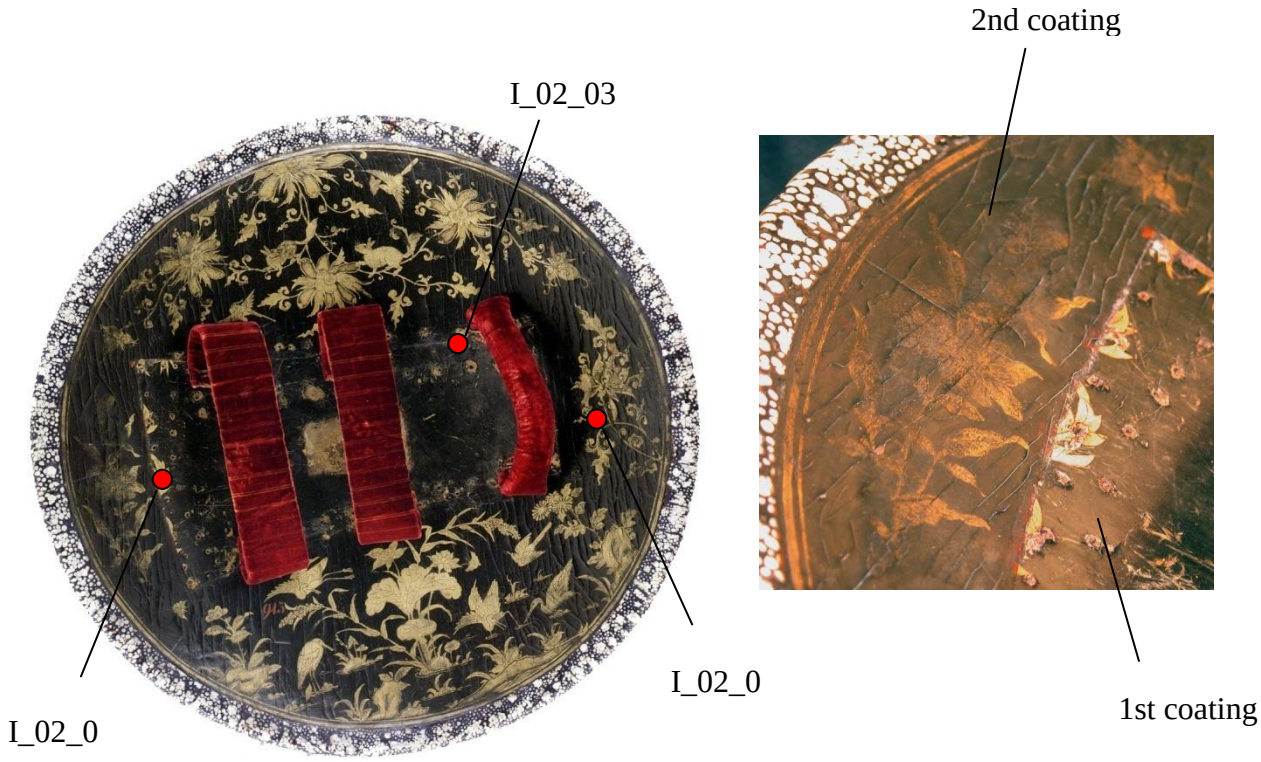
SAMPLE I_01_02	LAYER COMPOSITION TMH-PY-GC/MS/ FTIR	SEM-EDX, XRF	MICROGRAPH (UV, VIS)
G: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf) **XRF:** Fe, Ca, K, Au, Mn, Ti, S, Cl	
F: Bole layer	-	**SEM-EDX:** As, S (Orpiment)	
E: Lacquer	Laccol (Arlenic acid, C_{17}), Perilla oil (Glycerol, A/P 0.25, P/S 1.74), Trace protein (Protein markers)		
D: Lacquer	Laccol (Arlenic acid, C_{17}), Perilla oil (Glycerol, A/P 0.60, P/S 1.73), Trace protein (Protein markers), Soot (Soot markers)	**SEM-EDX:** P, Ca (Animal black)	
C: Ground	Blood (Markers for blood, sulfur compounds, sterols and non-specific protein markers for blood), Tung oil (Glycerol, A/P 4.98, P/S 0.93), Starch (Schellmannose)	**SEM-EDX:** Al, Si, Ca, Fe, O, S, K, Mg, Na, Ti	

SAMPLE I_01_03	LAYER COMPOSITION TMH-PY-GC/MS	SEM-EDX, XRD	MICROGRAPH (UV, VIS)
G: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf)	
F: Bole layer in incised lines	-	**SEM-EDX:** Fe, O, Al, Ca, K, Cl (Red iron oxide, earth material)	
E: Lacquer	Same as I_01_02 E		
D: Lacquer	Same as I_01_02 D		
C: Ground	Same as I_01_02 C		

SAMPLE	LAYER COMPOSITION		
I_01_04	**PY-GC/MS**	**SEM-EDX, XRD**	**MICROGRAPH** (VIS)
G: Lacquer	Laccol lacquer and drying oil	-	
F: Thin black layer	Organic composition, charcoal	-	
E: Ground	Same composition as layer C?	-	
D: Organic fibers	Rag paper, different organic fibers (flax or hemp). Contamination with binding material complicated the identification of fibers with certainty.	-	
C: Ground	Same as I_01_02 C? **Note:** Tested by José Carlos Frade at the LJF in Lisbon, 2007.	-	

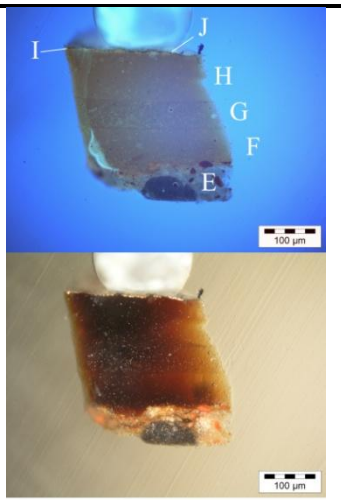
SAMPLE LOCATION

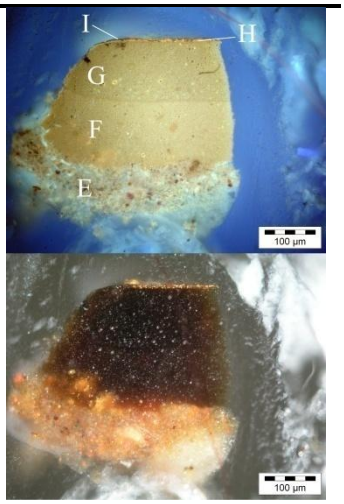
2.1.2. (I_02) **OBJECT:** SHIELD **SAMPLING:** Ulrike Körber

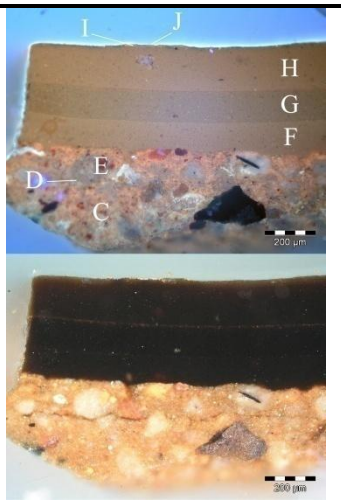


Note: Front decoration consists of a rayskin covering, subsequently lacquered (*same nuri*) and additionally decorated with sprinkled rayskin grains (*togidashi same*). Lacquer analyses performed by José Carlos Frade at the José de Figueiredo laboratory identified

SAMPLE NO.	DESCRIPTION
I_02_01	Rear, gilded lacquer, 2nd coating
I_02_02	Rear, gilded lacquer 1st coating
I_02_03	Rear, black lacquer 1st coating
I_02_04	Rear, gilded black lacquer, 2nd coating, loose flake

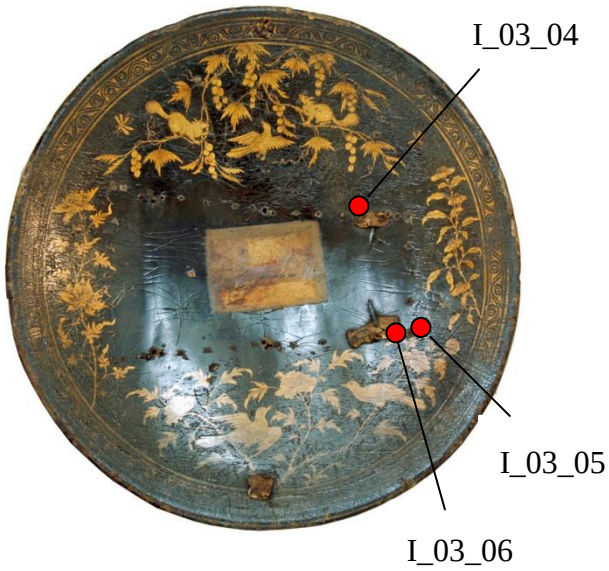
SAMPLE	LAYER COMPOSITION		
I_02_01	**TMH-PY-GC/MS**	**SEM-EDX**	**MICROGRAPH** (UV, VIS)
J: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf and shell gold)	
I: Bole layer	-	**SEM-EDX:** As, S (Orpiment)	
H: Lacquer 2nd coating	Same as I_02_04 H		
G: Lacquer 1st coating	Same as I_02_04 G		
F: Lacquer	Same as I_02_04 F		
E: Ground	Same as I_02_04 E		

SAMPLE	LAYER COMPOSITION		
I_02_02	**TMH-PY-GC/MS**	**SEM-EDX/ XRD**	**MICROGRAPH** (UV, VIS)
I: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf)	
H: Bole layer	-	**SEM-EDX:** As, S (Orpiment)	
G: Lacquer layer, first coating	Same as I_02_04 G		
F: Lacquer layer, first coating	Same as I_02_04 F		
E: Ground	Perilla oil (Glycerol, A/P 0.53, P/S 1.58), Blood (Markers for blood, non-specific protein markers for blood)	**SEM-EDX:** Al, Si, Fe, O, K, Ca, Mg **FTIR:** Kaolin, other silicates, calcium carbonate **XRD:** Quartz, moscovite, hematite, calcite, gesso, anastase	

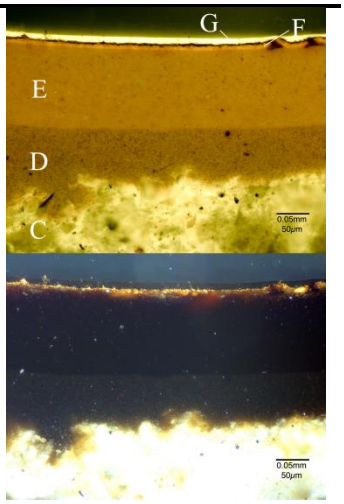
SAMPLE	**LAYER COMPOSITION**		
I_02_04	**TMH-PY-GC/MS**	**SEM-EDX, XRD**	**MICROGRAPH** (UV, VIS)
J: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf)	
I: Bole layer	-	**SEM-EDX:** As, S (Orpiment)	
H: Lacquer, second coating	Laccol (Arlenic acid, C_{17}), Tung or perilla oil (Glycerol, A/P 0.74, P/S 1.55), Protein (Pyrrole, protein markers), Tannins (Markers for tannins)	.	
G/H: Gilding between the two coatings	-	**SEM-EDX:** Au, Ag, Cu (Traces of gold) (I_02_04 ponto1)	
G: Lacquer, first coating	Laccol (Arlenic acid, C_{17}), Tung or perilla oil (Glycerol, A/P 0.60, P/S 1.52), Protein (Pyrrole, protein markers), Tannins (Markers for tannins)	-	
F: Lacquer, first coating	Laccol (Arlenic acid, C17), Tung or perilla oil (Glycerol, A/P 0.66, P/S 1.38), Protein (Pyrrole, protein markers)	-	
E: Ground	Same as I_02_02 E		
D: Fibers	Rag paper composed of pure cellulose fibers of different origins. Not possible to identify with certainty.		
C: Ground	Perilla oil (Glycerol, A/P 0.41, P/S 1.57), Blood (Sterols, markers for blood, non-specific protein markers for blood), Markers for gum benzoin and sulfur compounds (from the leather?)	**SEM-EDX:** Al, Si, Fe, O, K, Ca, Mg **FTIR:** Kaolin, other silicates, calcium carbonate **XRD:** Quartz, moscovite, hematite, calcite, anastase	

SAMPLE LOCATION

2.1.3. (I_03) **OBJECT:** Shield **SAMPLING:** Daniel Bone (2013)

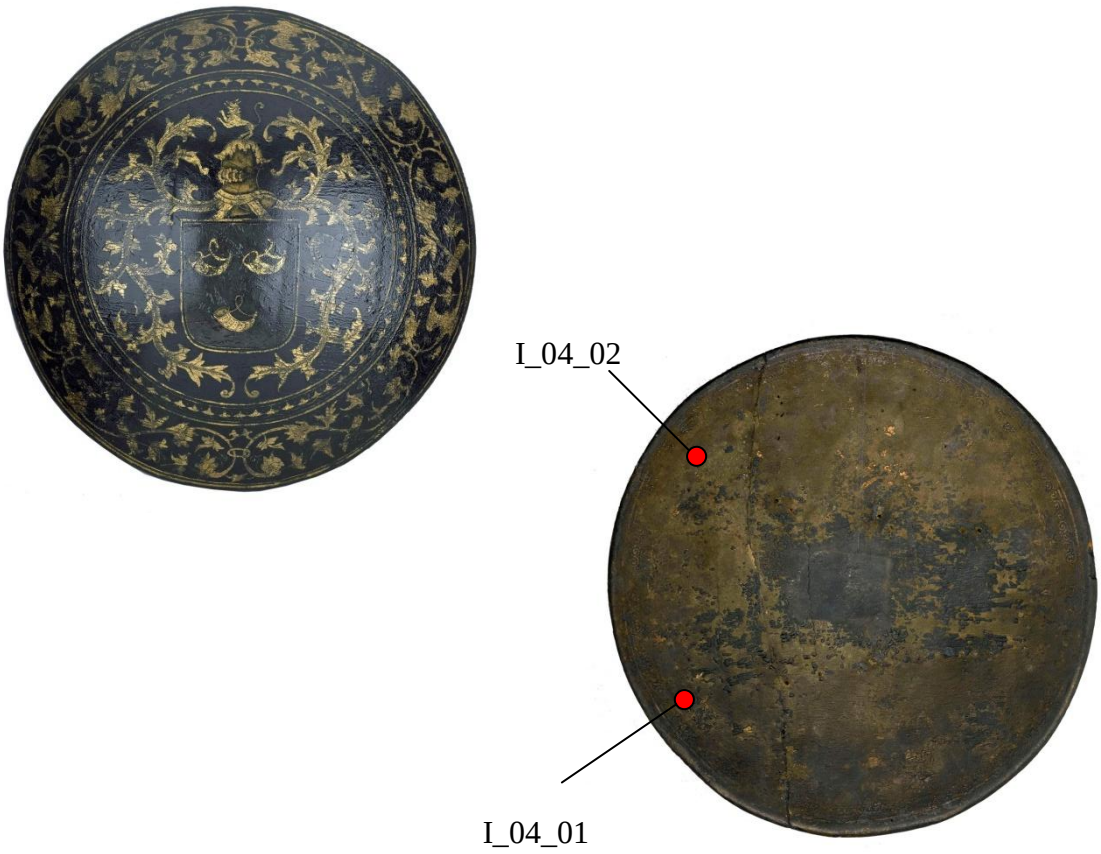


SAMPLE NO.	DESCRIPTION
I_03_01	Front, dark lacquer from bottom edge
I_03_02	Front, gilded area from bottom edge
I_03_03	Front, dark lacquer along edge
I_03_04	Back, dark lacquer next to fixing
I_03_05	Back, gilded area next to fixing
I_03_06	Back, gilded area next to fixing

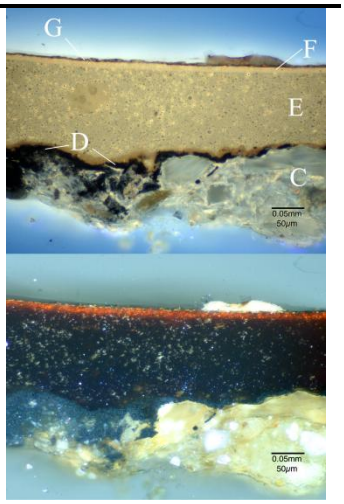
SAMPLE	LAYER COMPOSITION		
I_03_02/05	**TMH-PY-GC/MS, ELISA**	**SEM-EDX**	**MICROGRAPH** (BL, VIS)
G: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf)	
F: Bole layer	-	**SEM-EDX:** As, S (Orpiment)	
E: Lacquer	Laccol (Arlenic acid, C_{17}), Tung or perilla oil (Glycerol, A/P 0.55, P/S 1.68), Tannins (Markers for tannins), Sulfur compounds (Dimethyl sulfate, from layer F?) from contamination?	**SEM-EDX:** Charcoal (No Ca or P)	
D: Lacquer	Laccol (Arlenic acid, C_{17}), Tung or perilla oil (Glycerol, A/P 0.50, P/S 1.40), Tannins (Markers for tannins)	**SEM-EDX:** Charcoal (No Ca or P)	
C: Ground	Blood (Markers for blood, non-specific protein markers for blood), Tung oil (Glycerol, A/P 2.77, P/S 0.91), Sulfur compounds (Dimethyl sulfate, from the leather fibers or contamination), Phosphate (Trimethyl phosphate)	**SEM-EDX:** Al, Si, Ca, Fe, K, Cl, Ti	

SAMPLE LOCATION

2.1.4. (I_04) **OBJECT:** Shield **SAMPLING:** Ulrike Körber (2011)

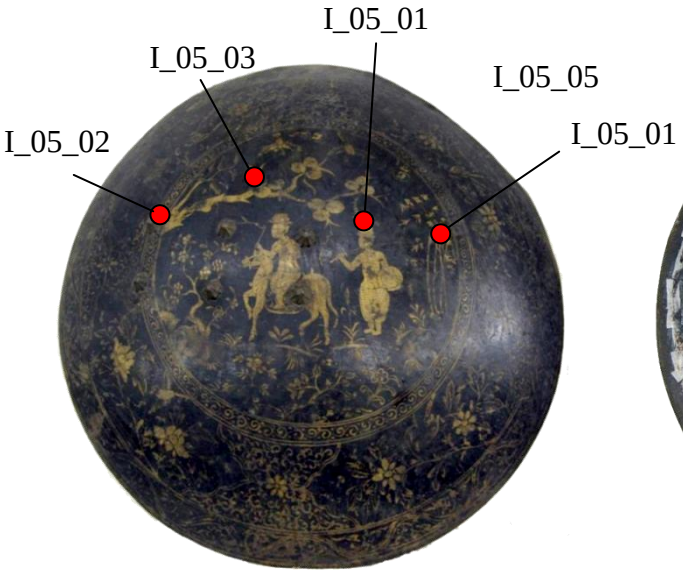


SAMPLE NO.	DESCRIPTION
I_04_01	Rear, black lacquer
I_04_02	Rear, gilded black lacquer

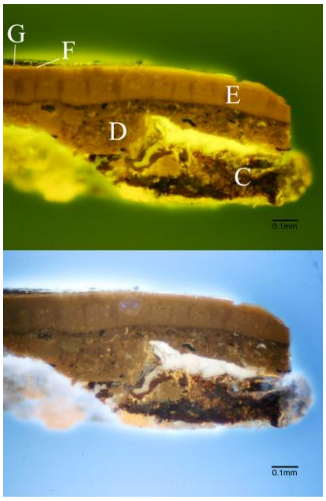
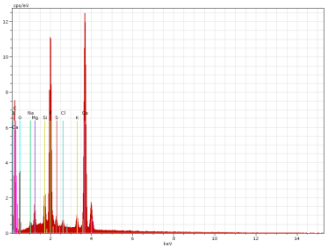
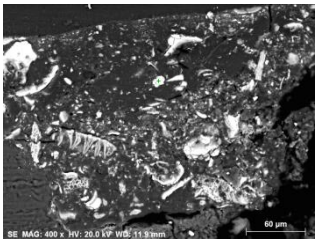
SAMPLE	**LAYER COMPOSITION**		
I_04_02	**TMH-PY-GC/MS**	**SEM-EDX**	**MICROGRAPH** (UV, VIS)
G: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf)	
F: Bole layer	-	**SEM-EDX:** Fe, O (Red iron oxide)	
E: Lacquer	Laccol (Arlenic acid, C_{17}), Perilla oil (Glycerol, A/P 0.47, P/S 2.13), Protein (Pyrrole, protein markers), Tannins (Markers for tannins), Soot (Soot markers)	**SEM-EDX:** Charcoal (No Ca or P)	
D: Thin black layer	Laccol (Arlenic acid, C_{17}), Drying oil (Dicarboxylic fatty acids), Trace protein (Markers for blood, non-specific protein markers for blood, glue markers), Wax (Long-chain alcohols and alkanes), Tannins (Markers for tannins), Soot (Soot markers)	**SEM-EDX:** Charcoal (No Ca or P)	
C: Ground	Blood (Markers for blood, non-specific protein markers for blood), Drying oil (Dicarboxylic fatty acids), Wax (Long-chain alcohols and alkanes), Trace laccol (Anacard carbohydrates)	**SEM-EDX:** Al, Si, O, Fe, Ti, K, Ca, Mg	

SAMPLE LOCATION

2.1.5. (I_05) **OBJECT:** Shield **SAMPLING:** 01-05 Jaap Boonstra (2013); 06-08 Ulrike Körber (2015)



SAMPLE NO.	DESCRIPTION
I_05_01	Front side, gilded black lacquer
I_05_02	Front side, gilded black lacquer
I_05_03	Front side, black lacquer with leather fibers
I_05_04	Rear side, black lacquer
I_05_05	Front side, gilded black lacquer
I_05_06	Front side, scraped sample, bole layer (F)
I_05_07	Front side, gilded black lacquer (F)
I_05_08	Front side, gilded black lacquer (F)

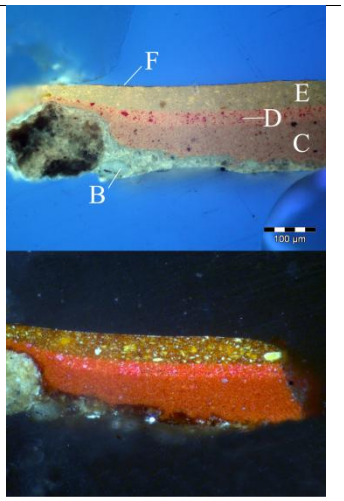
SAMPLE	**LAYER COMPOSITION**		
I_05_01	**TMH-PY-GC/MS**	**SEM-EDX**	**MICROGRAPH** (BL,VIS)
G: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf/shell-gold)	
F: Bole layer (I_05_06)	Tung oil (Glycerol, A/P 2.43, P/S 0.92), Urushiol (Mazzeic acid, C_{15}) and laccol (a slightly higher amount of Arlenic acid suggests that laccol may be present), oxidized thitsiol (Alkyl benzenes, phenyl catechols, Mazzeic acid, C_{15}) from layer E with a trace Dipterocarpus (Dipterocarp markers), Markers for arsenic pigments, sulfur compounds and phosphate (Trimethyl phosphate)	**SEM-EDX:** As, S, Ca (Realgar, gypsum)	
E: Lacquer	Thitsiol (Alkyl benzenes, phenyl catechols, mazzeic acid, C_{15}), Trace laccol (Arlenic acid, laccol carbohydrates, C_{17}), Tung oil (Glycerol, A/P 1.96, P/S 1.07), Dipterocarpus (wood oil) (Dipterocarp markers, consistent with some thitsi formulations)	**SEM-EDX:** Charcoal (No Ca or P)	
D: Ground	Thitsiol (Alkyl benzenes, phenyl catechols, mazzeic acid, C_{15}), Drying oil (Glycerol, A/P 0.84, P/S 1.80), protein (Protein markers), Dipterocarpus (Dipterocarp markers, consistent with some thitsi formulations), Trace shellac, Gum benzoin , Sulfur compounds (Dimethyl sulfide, dimethyl sulfate), Phosphate (Dimethyl phosphate), Caffeine	**SEM-EDX:** Animal black (Ca, P) (I_05_01, ponto 3) Si, Mg, Ca, S, K, Cl, Na	 
C: Coarse ground with leather fibers	Thitsiol (Alkyl benzenes, phenyl catechols, mazzeic acid, C_{15}), Tung oil (Glycerol, A/P 2.26, P/S 1.33), Protein (Protein markers), Dipterocarpus (Dipterocarp markers, consistent with some thitsi formulations), Pine resin (Pinaceae markers), Gum benzoin (Gum benzoe markers), Soot (Soot markers), Trace shellac (Markers for shellac, restoration?), Sulfur compounds (Dimethyl disulfide, Dimethyl sulfate, from the leather fibers?), Phosphate (Trimethyl phosphate)	**SEM-EDX:** Organic composition, Pine charcoal?	

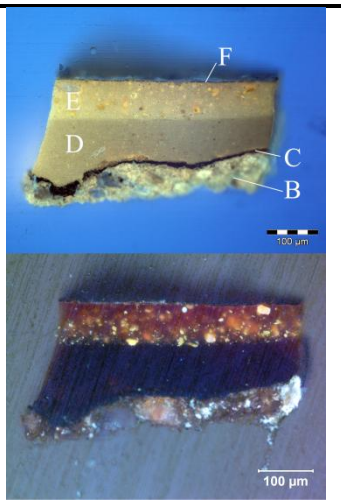
Note: The leather source (I_05-03) has been identified by Daniel Kirby at the Havard Art Museums Cambridge via peptide mass fingerprinting as originating from the Asian water buffalo (*Bubalus bubalis*).

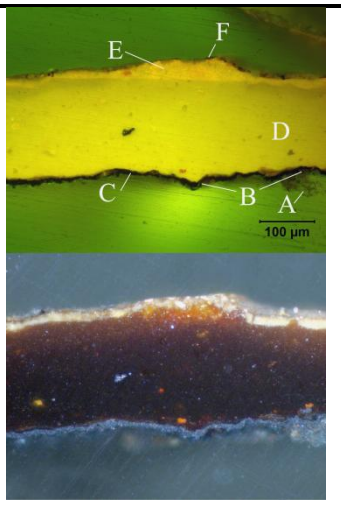
SAMPLE LOCATION

2.2.1. (I_06) **OBJECT:** Chest **SAMPLING:** Silvia Miklin-Kniefacz (2000)

SAMPLE NO.	DESCRIPTION
I_06_01	Interior of the lid, gilded red lacquer, loose flake
I_06_02	Interior of the lid, corner, red lacquer
I_06_03	Exterior carvings , gilded black lacquer
I_06_04	Exterior, gilded dots on black lacquer

SAMPLE	LAYER COMPOSITION		
I_06_01/2	**TMH-PY-GC/MS**	**SEM-EDX, XRD**	**MICROGRAPH** (UV, VIS)
F: Gold decoration		**SEM-EDX:** Au, Ag, Cu (Gold leaf) and shell gold	
E: Bole layer	Laccol (Arlenic acid, C_{17}), Small amount thitsiol (12-phenyldodecyl catechol peak from thitsi), Tung oil (Glycerol, A/P 1.96, P/S 1.1), Trace blood (Markers for blood, non-specific protein markers for blood, glue markers), Arsenic, Dipterocarpus (Dipterocarp markers, a component or ingredient of thitsi lacquer?), Tannins (Markers for tannins)	**SEM-EDX:** As, S, Si, Ca (Pigment: Orpiment, Filler: Gypsum) **XRD:** Quartz, Orpiment, Calcium sulfate	
D: Red lacquer	Laccol (Arlenic acid, C_{17}), Perilla or tung oil (Glycerol, A/P 1.1, P/S 1.1), Trace protein (Pyrrole, protein markers), Sulfur compounds, Tannins (Markers for tannins)	**SEM-EDX:** Hg, S (Cinnabar) **XRD:** Cinnabar	
C: Red lacquer	Laccol (Arlenic acid, C_{17}), Perilla or tung oil (Glycerol, A/P 1.65, P/S 1.52), Trace protein (Pyrrole, protein markers), Tannins (markers for tannins)	**SEM-EDX:** Fe, O (Red iron oxide) **XRD:** Hematite	
B: Ground	Tung oil (Glycerol, A/P 1.15, P/S 1.2), Blood (Markers for blood, non-specific protein markers for blood, glue markers), Trace laccol (Anacard carbohydrates), Trace gum benzoin (Markers for gum benzoin)	**SEM-EDX:** Al, Si, Ca, Cl, Ba, Fe, K, O, Mg, Na, P **FTIR:** Kaolin, other silicates, calcium carbonate, calcium sulfate **XRD:** Quartz, calcite, gypsum, hematite, muscovite, dolomite	

SAMPLE	LAYER COMPOSITION		
I_06_03	**TMH-PY-GC/MS**	**SEM-EDX, XRD**	**MICROGRAPH** (UV, VIS)
F: Gold decoration	Same as I_06_01/02 F	-	
E: Bole layer	Same as I_06_01/02 E	-	
D: Lacquer	Same as I_06_04 D	-	
C: Thin black layer	Same as I_06_04 C	-	
B: Ground	Same as I_06_01/02 B		

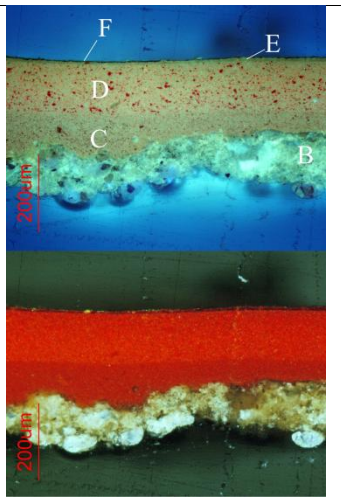
SAMPLE	LAYER COMPOSITION		
I_06_04	**TMH-PY-GC/MS**	**SEM-EDX, XRD**	**MICROGRAPH** (BL, VIS)
F: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf)	
E: Bole layer	-	**SEM-EDX:** As, S (Orpiment)	
D: Lacquer	Laccol (Arlenic acid, C_{17}), Perilla oil (Glycerol, A/P 0.48, P/S 1.4), Trace protein (Pyrrole, protein markers), Soot (Soot markers)	**SEM-EDX:** Charcoal	
C: Thin black layer	Laccol (Arlenic acid, C_{17}), Perilla oil (Glycerol, A/P 0.3, P/S 1.46), Soot (Soot markers), Trace protein (Pyrrole, protein markers), Sulfur, Trace starch (Schellmannose, Furfural)	**SEM-EDX:** Charcoal	
B: Ground	Traces of ground material, same as I_06_01/2 B?	**SEM-EDX:** Al, Si, Ca, S, Mg	

SAMPLE LOCATION

2.2.2. (I_07) **OBJECT:** Chest **SAMPLING:** Ulrike Körber (2012)

I_07_01

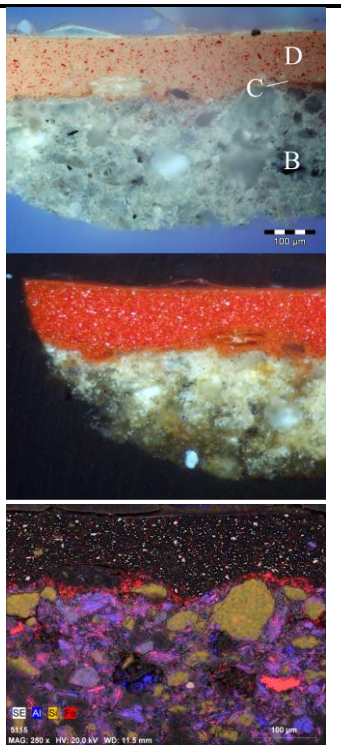
SAMPLE NO.	DESCRIPTION
I_07_01	Lid's interior, gilded red lacquer
I_07_02	Red lacquer, loose flake

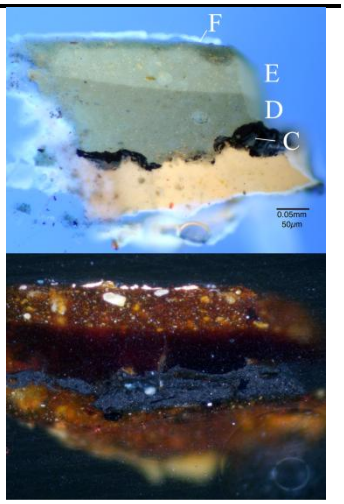
SAMPLE	LAYER COMPOSITION		
I_07_01	**TMH-PY-GC/MS, ELISA**	**SEM-EDX, XRD**	**MICROGRAPH** (UV, VIS)
F: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf)	
E: Bole layer	Laccol (Arlenic acid, C_{17}), Tung or perilla oil (Glycerol, A/P 4.02, P/S 1.37), Camphor with borneol (Markers for camphor and borneol), Sulfur compounds	**SEM-EDX:** As, S (Orpiment)	
D: Red lacquer	Urushiol (Mazzeic acid, C_{15}), Perilla or tallow tree oil (A/P 0.08, P/S 2.97), Soot (Soot markers)	**SEM-EDX:** Hg, S, Ba (Pigment: cinnabar, filler: barite)	
C: Red lacquer	Laccol (Arlenic acid, C_{17}), Tung oil (Glycerol, A/P 3.59, P/S 1.16), Large amount of camphor with borneol (Markers for camphor and borneol), Protein (Pyrrole, protein markers), Tannins (Markers for tannins), Soot (Soot markers)	**SEM-EDX:** Fe, O (Red iron oxide)	
B: Ground	Tung oil (Glycerol, A/P 1.15, P/S 1.29), Blood (Markers for blood, non-specific protein markers for blood, glue markers), Pine resin (Pinaceae markers), Gum benzoin (Markers for gum benzoin)	**SEM-EDX:** Al, Si, Ca, Fe, K, Mg, O, Ti	

SAMPLE LOCATION

2.2.3. (II_01) **OBJECT:** Chest **SAMPLING:** José Carlos Frade (2010)

SAMPLE NO.	DESCRIPTION
II_01_01	Interior of the right drawer, red lacquer
II_01_02	Front of the right drawer, gilded red lacquer

SAMPLE	LAYER COMPOSITION		
II_01_01	**TMH-PY-GC/MS**	**SEM-EDX, XRD**	**MICROGRAPH** (UV, VIS)
D: Red lacquer	Laccol (Arlenic acid, C_{17}), Tung or linseed oil (Glycerol, A/P 1.43, P/S 1.25), Tannins (Markers for tannins), Sulfur compounds (Dimethyl disulfide from cinnabar)	**SEM-EDX:** Hg, S, Ba (Cinnabar, barite) **XRD:** Cinnabar, calcite, quartz	
C: Thin red layer	- (Residue from rubbing with brick stone powder?)	**SEM-EDX:** Fe, O (Red iron oxide)	
B: Ground	Tung or perilla oil (Glycerol, A/P 1.46, P/S 1.32), Blood (Markers for blood, non-specific protein markers for blood), Sulfur compounds (Dimethyl sulfide), Phosphate (Trimethyl phosphate)	**SEM-EDX:** Al, Si, Zr, Fe, O, K, P, Ti, Ca, S **XRD:** Quartz, calcite, gypsum, goethite	

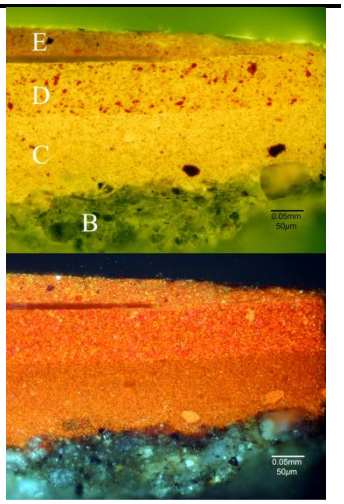
SAMPLE	LAYER COMPOSITION		
II_01_02	**TMH-PY-GC/MS**	**SEM-EDX, XRD**	**MICROGRAPH** (UV, VIS)
F: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf)	
E: Bole layer	-	**SEM-EDX:** As, S (Orpiment) **XRD:** Quartz, calcite	
D: Lacquer	-	-	
C: Black layer	-	**SEM-EDX:** Charcoal (No Ca or P)	
B: Layer from Consolidation	-	-	

SAMPLE LOCATION

2.2.4. (II_02)	**OBJECT:** Chest	**SAMPLING:** Pedro Cancela de Abreu (2010)

II_02_01

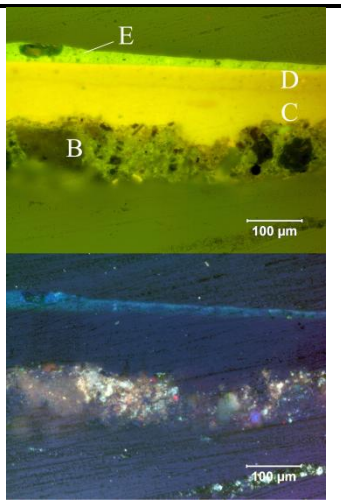
SAMPLE NO.	DESCRIPTION
II_02_01	Interior, lower edge, red lacquer

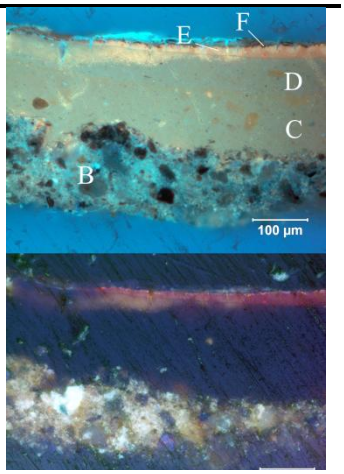
SAMPLE	LAYER COMPOSITION		
II_02_01	**TMH-PY-GC/MS**	**SEM-EDX, XRD**	**MICROGRAPH** (BL, VIS)
E: Red layer (not original)	Linseed oil (Glycerol, A/P 1.13, P/S 1.55), Pine resin (Pinaceae markers), Dammar, Soot (Soot markers), Sulfur compounds (Dimethyl sulfate)	**SEM-EDX:** Pb, O, Ba, S (Minium, barite) **XRD:** Minium, barite	
D: Red lacquer	Laccol (Arlenic acid, C_{17}), Tung oil (Glycerol, A/P 3.7, P/S 1.07), Sulfur compounds (Dimethyl disulfide from cinnabar), Tannins (Markers for tannins)	**SEM-EDX:** Hg, S (Cinnabar) **XRD:** Cinnabar	
C: Red lacquer (dark)	Laccol (Arlenic acid, C_{17}), Tung or linseed oil (Glycerol, A/P 4.33, P/S 1.37), Tannins (Markers for tannins)	**SEM-EDX:** Fe, O (Red iron oxide) **XRD:** Hematite	
B: Ground	Tung or perilla oil (Glycerol, A/P 1.28, P/S 1.27), Blood (Blood and non-specific protein markers for blood), Starch (Schellmannose), Phosphate (Trimethyl phosphate) and sulfur compounds (Dimethyl sulfide)	**SEM-EDX:** Al, Si, Fe, O, K, Ba, Ca, Ti **XRD:** Quartz, calcite, gypsum, hematite, moscovite	

SAMPLE LOCATION

2.4.1. (I_08) **OBJECT:** Tabletop **SAMPLING:** Nanke Schellmann (2013)

SAMPLE NO.	DESCRIPTION
I_08_01	Black lacquer with ground material
I_08_02	Scraped sample of ground layer
I_08_03	Dark blue coating, whole cross-section
I_08_04	Dark blue coating, whole cross-section
I_08_05	Black lacquer with gold decoration, whole cross-section
I_08_06	Black lacquer with gold decoration

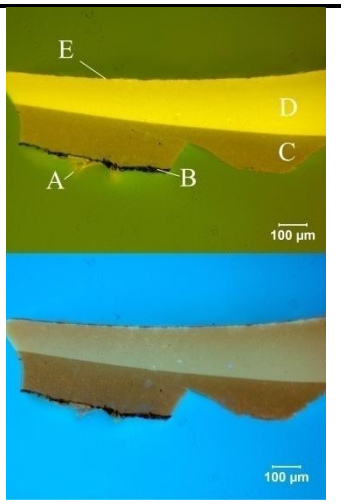
SAMPLE	LAYER COMPOSITION		
I_08_03	**TMH-PY-GC/MS, FTIR**	**SEM-EDX, XRD**	**MICROGRAPH** (BL, VIS)
E: Blue coating	Tung oil (Glycerol, A/P 2.3, P/S 1.05), Indigo (Indigo markers), Protein (Glue markers) **FTIR:** Lead monoxide, calcium oxalate, indigo	**SEM-EDX:** Pb, O, Ca (Lead monoxide)	
D: Lacquer	Laccol (Arlenic acid, C_{17}), Tung or perilla oil (Glycerol, A/P 0.73, P/S 1.38), Trace protein (Pyrrole, glue markers), Tannins (Markers for tannins), Indigo (Indigo markers, from layer E)	**SEM-EDX:** Ca, Si within bubble-like formations	
C: Lacquer	Laccol (Arlenic acid, C_{17}), Tung or perilla oil (Glycerol, A/P 0.63, P/S 1.37), Trace protein (Pyrrole, glue markers), Starch (Furfural), Tannins (Markers for tannins)	**SEM-EDX:** Ca, Si within bubble-like formations	
B: Ground	Tung oil (Glycerol, A/P 3.13, P/S 1.14), Blood (Markers for blood, non-specific protein markers for blood, sterols), Trace laccol (Anacard carbohydrates), Gum benzoin (Markers for gum benzoin), Sulfur compounds (Absence of soot markers may result from small sample amount)	**SEM-EDX:** Al, Si, Fe, O, Ca, P, K, Mg, Ti, Na (Earth material, and possibly animal black)	

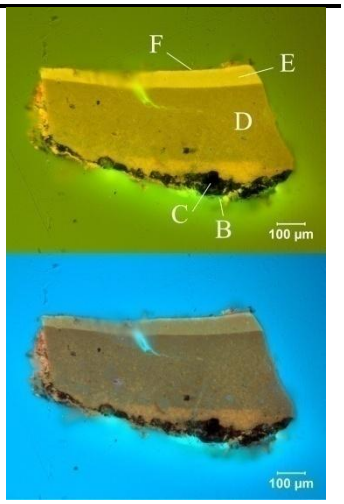
SAMPLE	LAYER COMPOSITION		
I_08_06	**TMH-PY-GC/MS**	**SEM-EDX, XRD**	**MICROGRAPH** (UV, VIS)
F: Gold decoration		**SEM-EDX:** Au, Ag, Cu (Gold leaf)	
E: Bole layer	Laccol (Arlenic acid, C_{17}), Perilla oil (glycerol, A/P 0.86, P/S 2.05), Trace protein (Protein markers), Trace starch (Schellmannose)	**SEM-EDX:** Fe, O (Red iron oxide)	
D: Lacquer	Same as I_08_03 D		
C: Lacquer	Same as I_08_03 C		
B: Ground	Same as I_08_03 B		

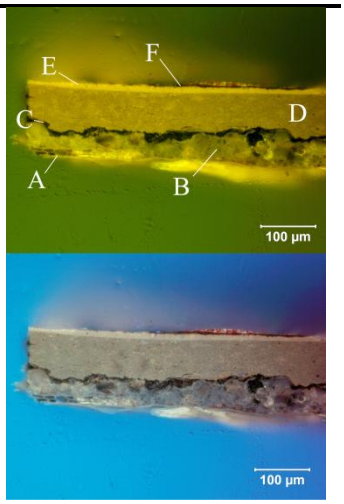
SAMPLE LOCATION

2.4.2. (II_04) **OBJECT:** Tabletop **SAMPLING:** José Carlos Frade (2013)

SAMPLE NO.	DESCRIPTION
II_04_01	Central carved area, gilded lacquer
II_04_02	Carved frieze, gilded lacquer
II_04_03	Gilded decoration on flat black lacquer

SAMPLE	LAYER COMPOSITION		
II_04_01	**TMH-PY-GC/MS**	**SEM-EDX**	**MICROGRAPH** (BL, UV)
E: Gold decoration	-	-	
D: Lacquer	Equall to II_04_02 E?	-	
C: Lacquer	Equall to II_04_02 D?	-	
B: Black layer	Equall to II_04_02 C?	-	
A: Wood	unidentified		

SAMPLE	LAYER COMPOSITION		
II_04_02	**TMH-PY-GC/MS**	**SEM-EDX**	**MICROGRAPH** (BL, UV)
F: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf)	
E: Lacquer	Laccol (Arlenic acid, C_{17}), Tung or perilla oil (Glycerol, A/P 1.09, P/S 1.59), Trace protein (Small, non-specific protein markers), Tannins (Markers for tannins)	-	
D: Lacquer (from snap-shot file)	Laccol (Arlenic acid, C_{17}), Tung or perilla oil (Glycerol, A/P 0.5, P/S 1.33), Trace protein (Pyrrole, non-specific protein markers), Soot (Soot markers), Tannins (Markers for tannins)	**SEM-EDX:** Charcoal (No Ca or P)	
C: Black layer	Laccol (Arlenic acid, C_{17}), Perilla oil (Glycerol, A/P 0.9, P/S 1.62), Blood (Blood markers, one glue marker and a higher percentage of non-specific protein markers), Starch (Schellmannose), Tannins (Markers for tannins)	**SEM-EDX:** Charcoal (No Ca or P)	
B: Trace ground material	Equal to II_04_03 B?	**SEM-EDX:** Al, Si, Ca, K, Fe, O, Mg, Ti	

SAMPLE	LAYER COMPOSITION		
II_04_03	**TMH-PY-GC/MS**	**SEM-EDX**	**MICROGRAPH** (BL, UV)
F: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf)	
E: Bole layer	-	**SEM-EDX:** Hg, S (Cinnabar)	
D: Lacquer	Equal to II_04_02 D?		
C: Black layer	Equal to II_04_02 C?		
B: Ground	Tung or perilla oil (Glycerol, A/P 0.63, P/S 1.37), Blood (Blood and glue marker, non-specific protein markers for blood), Trace laccol (Anacard carbohydrates), Phosphate (Trimethyl phosphate), One indigo marker (contamination?)	**SEM-EDX:** Al, Si, Ca, K, Fe, O, Mg, Ti, P	
A: Wood	Not identified		

S A M P L E L O C A T I O N

2.5.1. (I_10) **OBJECT:** Tray **SAMPLING:** José Carlos Frade, Ulrike Körber (2010-2011)

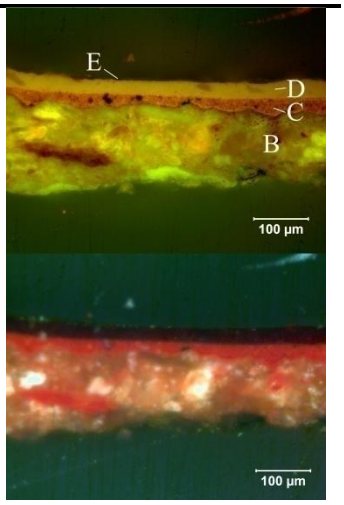
I_10_01a

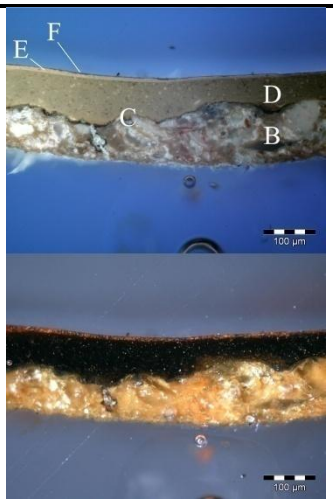
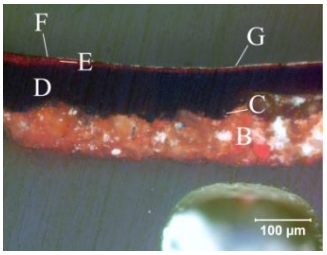
I_10_02

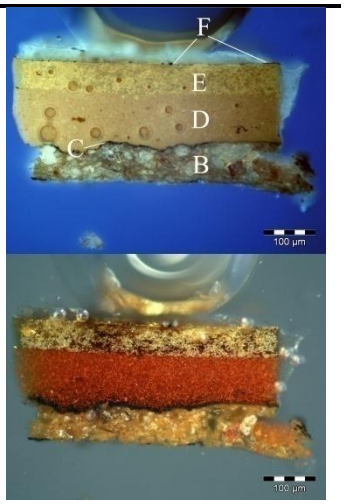
I_10_03

I_10_04

SAMPLE NO.	DESCRIPTION
I_10_01 a	Rear side of the sloping sides, decorative band
I_10_01 b	Rear side, red lacquer
I_10_02	Top bottom, gilded black lacquer
I_10_03	Top bottom, black lacquer
I_10_04	Top, close to the rim, gilded brownish lacquer

SAMPLE	LAYER COMPOSITION		
I_10_01a	**TMH-PY-GC/MS**	**SEM-EDX, XRD**	**MICROGRAPH** (BL, VIS)
E: Decorative band	-	**SEM-EDX:** Ag, Cl, S (Silver leaf)	
D: Transparent layer	Laccol (Arlenic acid, C_{17}); Slightly bodied tung oil (Glycerol, A/P 1.71, P/S 1.05), Trace protein (Pyrrole, protein markers), Tannins (Markers for tannins), Soot (Soot marker)		
C: Red lacquer		**SEM-EDX:** Fe, O (Red iron oxide) **XRD:** Hematite	
B: Ground (I_10_03 B)	Blood (Markers for blood, non-specific protein markers for blood), Drying oil (Dicarboxylic fatty acids), Wax (A/P 0.06, P/S 10.26, long-chain alcohols and alkanes), Pine resin (Pinaceae markers), Trace laccol (Anacard carbohydrates)	**SEM-EDX:** Al, Si, Fe, Ti, K, Ca, O, Ba **XRD:** Kaolinite, calcite, hematite, gesso, quartz	

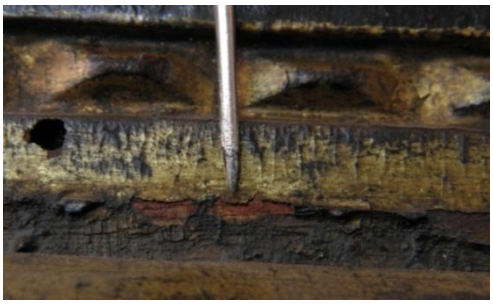
SAMPLE	LAYER COMPOSITION		
I_10_02	**TMH-PY-GC/MS**	**SEM-EDX, XRD**	**MICROGRAPH** (UV, VIS, CP)
F: Gold decoration	-	**SEM-EDX:** Ag, S (Silver leaf)	 
E: Bole layer	-	**SEM-EDX:** Fe, O, Al, Si, Ca, Pb, S (Red iron oxide, minium, fillers?) **XRD:** Hematite, calcite, minium, gypsum	
D: Black lacquer (I_10_03 D)	Laccol (Arlenic acid, C_{17}), Perilla oil (Glycerol, A/P 0.50, P/S 1.91), Trace protein (Pyrrole, protein markers), Tannins (Markers for tannins), Soot (Soot markers)	Organic particles, charcoal	
C: Thin black layer	Same as I_10_04 C?	**SEM-EDX:** Charcoal, no P or Ca	
B: Ground (I_10_03 B)	Blood (Markers for blood, non-specific protein markers for blood), Drying oil (Dicarboxylic fatty acids), Wax (A/P 0.06, P/S 10.26, long-chain alcohols and alkanes), Pine resin (Pinaceae markers), Trace laccol (Anacard carbohydrates)	**SEM-EDX:** Al, Si, Fe, Ti, K, Ca, O, Ba **XRD:** Kaolinite, calcite, hematite, gesso, quartz	

SAMPLE	LAYER COMPOSITION		
I_10_04	**TMH-PY-GC/MS**	**SEM-EDX, XRD**	**MICROGRAPH** (UV, VIS)
F: Gold decoration	-	Gold leaf	
E: Brown lacquer layer	Laccol (Arlenic acid, C_{17}), Tung oil (Glycerol, A/P 1.09, P/S 1.57), Tannins (Markers for tannins)	-	
D: Brownish, red lacquer	Laccol (Arlenic acid, C_{17}), Tung oil (Glycerol, A/P 1.2, P/S 1.04), Tannins (Markers for tannins), Soot (Soot markers)	**SEM-EDX:** Fe, O (Red iron oxide)	
C: Thin black layer	Blood (Protein markers for blood, glue marker, non-specific protein markers for blood), Drying oil (Dicarboxylic fatty acids), Starch (Schellmannose), Trace pine resin (Pinaceae markers), Trace laccol (Arlenic acid, C_{17}, Anacard carbohydrates), Phosphate (Phosphate marker), Wax (A/P 0.16, P/S 4.6, long-chain alcohols and alkanes)	**SEM-EDX:** Charcoal (No Ca or P)	
B: Ground	Same as I_10_01 B (I_10_03 B)		

S A M P L E L O C A T I O N

2.5.2. (I_11) **OBJECT:** Tray **SAMPLING:** José Carlos Frade, Ulrike Körber (2010-2011)

I_11_01



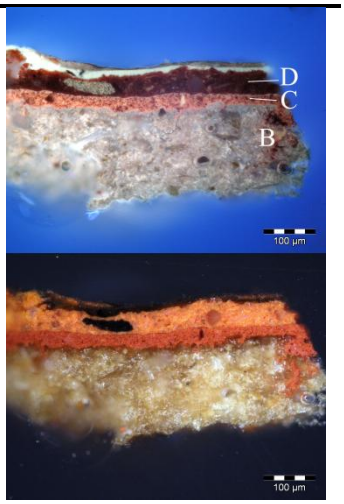
I_11_02/06

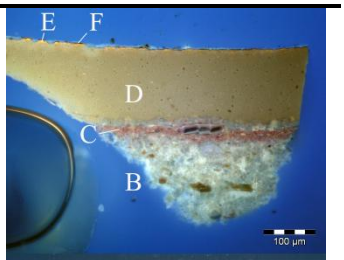
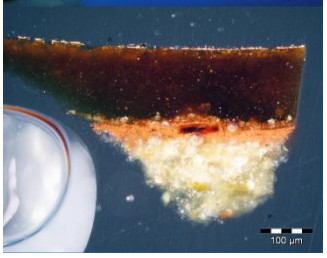
I_11_03

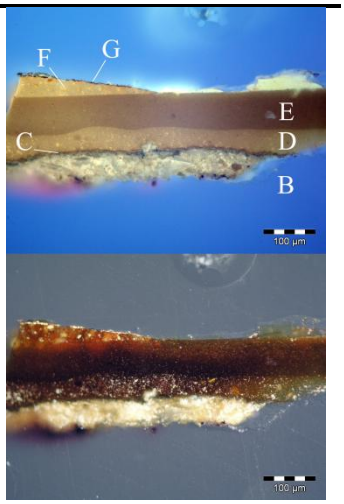
I_11_04

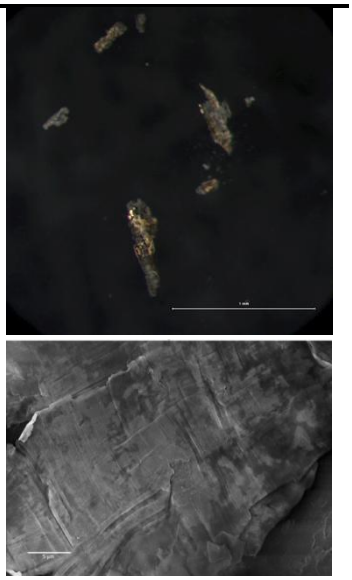
I_11_05

SAMPLE NO.	DESCRIPTION
I_11_01	Rear side, red lacquer and red coating
I_11_02	Top bottom, gilded carving and gilded brownish lacquer at the edge
I_11_03	Top bottom, gilded black lacquer
I_11_04	Top bottom, gilded lines on top of mother-of-pearl inlay
I_11_05	Top bottom, black lacquer
I_11_06	Top bottom, gilded carving and gilded brownish lacquer at the edge

SAMPLE	LAYER COMPOSITION		
I_11_01	**TMH-PY-GC/MS**	**SEM-EDX, XRD**	**MICROGRAPH** (UV, VIS)
D: Red coating	No lacquer. Drying oil (Dicarboxylic acids), Trace protein (Pyrrole), Various natural resins (Markers for ambar, copal, sandarac, larch turpentine, pine resin), Trace starch (Schellmannose), Beeswax	**SEM-EDX:** Fe, Pb, Ba, Si, Al, K, Ca (Mix of red iron oxide, minium and feldspar)	
C: Red lacquer	(Result missing due to an electricity crash at the GCI.)	**SEM-EDX:** Fe, O (Red iron oxide)	
B: Ground layer	- Same as I_11_03 B		

SAMPLE	LAYER COMPOSITION		
I_11_02	**TMH-PY-GC/MS**	**SEM-EDX, XRD**	**MICROGRAPH** (UV, VIS)
F: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf)	
E: Bole layer	-	**SEM-EDX:** Al, Si, Fe, O, Ca (Red iron oxide, fillers) **XRD:** Hematite, calcite, quartz	
D: Brownish lacquer	Laccol (Arlenic acid, C_{17}), Slightly bodied perilla oil (Glycerol, A/P 0.92, P/S 2.3), Trace protein (Pyrrole, protein markers), Tannins (Markers for tannins)	-	
C: Thin red layer	**Earlier results, before AMDIS, file missing now:** Slightly bodied perilla oil (Glycerol, A/P 0.49, P/S 4.02), Blood (Pyrrole, trace sterols), Trace phosphate	**SEM-EDX:** Fe, O (Red iron oxide)	
B: Ground	- Same as I_11_03 B		

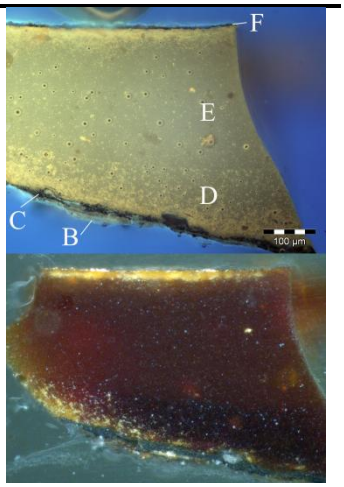
SAMPLE	LAYER COMPOSITION		
I_11_03	**TMH-PY-GC/MS**	**SEM-EDX, XRD**	**MICROGRAPH** (UV, VIS)
G: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf)	
F: Bole layer	- to small sample amount	**SEM-EDX:** As, S (Orpiment), Ca **XRD:** Kaolinite, calcite, hematite, quartz, weddelite	
E: Lacquer	Laccol (Arlenic acid, C_{17}), Tallow tree oil (Glycerol, A/P 0.43, P/S 3.54), Trace protein (Pyrrole, protein markers), Tannins (Markers for tannins)	-	
D: Lacquer		-	
C: Thin black layer	Perilla oil with wax (Glycerol, A/P 2.38, P/S 2.19, dicarboxylic fatty acids), Blood (Blood markers, glue and non specific protein markers for blood), Trace pine resin (Pinaceae markers)	**SEM-EDX:** Charcoal (No Ca or P)	
B: Ground	Drying oil (Dicarboxylic fatty acids), Blood (Blood, glue markers and non-specific protein markers for blood), Phosphate, Trace pine resin (Pinaceae markers), Bitumen (Markers for bitumen), Gum benzoin (3 of 6 markers for gum benzoin are present), Wax (A/P 0.28, P/S 4.9)	**SEM-EDX:** Al, Si, Ca, Fe, O, K, Cl, Ba, P	

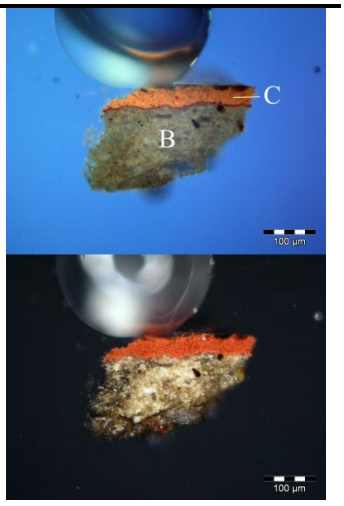
SAMPLE	LAYER COMPOSITION		
I_11_04	**FTIR**	**SEM-EDX**	**MICROGRAPH** (VIS, BW)
F: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf)	
E: Bole layer	- Sample amount to small for Py-GC/MS. **FTIR:** Only detected acrylic and waxy media (all from conservation treatment)	**SEM-EDX:** Fe, O (Ca, Si, Al, Ba, S) (Red iron oxide and fillers)	

SAMPLE LOCATION

2.5.3. (I_12) **OBJECT:** Tray **SAMPLING:** José Carlos Frade, Ulrike Körber (2010)

SAMPLE NO.	DESCRIPTION
I_12_01	Top bottom, gilded black lacquer
I_12_02	Rear side, red lacquer

SAMPLE	LAYER COMPOSITION		
I_12_01	**TMH-PY-GC/MS**	**SEM-EDX**	**MICROGRAPH** (UV, VIS)
F: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf)	
E: Lacquer **D:** Lacquer	Laccol (Arlenic acid, C_{17}), Tung or perilla oil (Glycerol, A/P 1.08, P/S 1.33), Trace protein (Pyrrole, protein markers), Tannins (Markers for tannins)	- Organic particles visible in both layers	
C: Thin black layer	-	**SEM-EDX:** Charcoal (No Ca or P)	
B: Ground	Traces of ground material and wooden substrate, equal to I_12_02 B?	-	

SAMPLE	LAYER COMPOSITION		
I_12_02	**TMH-PY-GC/MS**	**SEM-EDX, XRD**	**MICROGRAPH** (UV, VIS)
C: Red lacquer	Tung or perilla oil (Glycerol, A/P 0.45, P/S 1.55), Trace laccol (Anacard carbohydrates detected, but no catechols), Trace protein (Protein markers), Trace pine resin (Pinaceae markers)	**SEM-EDX:** Fe, O (Red iron oxide)	
B: Ground	Perilla oil (Glycerol, A/P 0.27, P/S 2.18), Blood (Markers for blood and glue, non-specific protein markers for blood), Trace laccol (Anacard carbohydrates)	**SEM-EDX:** Al, Si, Fe, O, Ca, K, Na, Ba **XRD:** Quartz, goethite, kaolinite, calcite	

S A M P L E L O C A T I O N

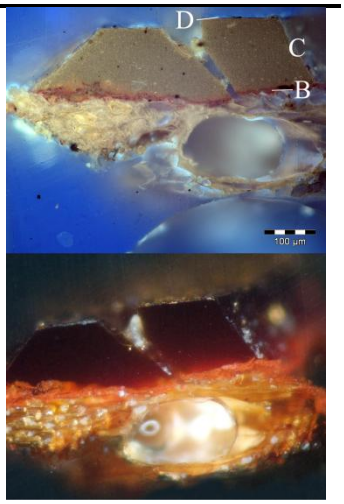
2.6.1. (II_03) **OBJECT:** Oratory **SAMPLING:** José Carlos Frade (2010)

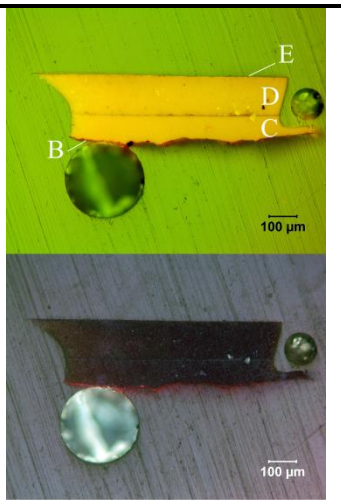
II_03_01

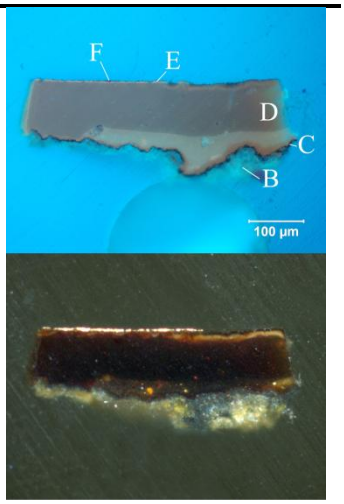
II_03_02

II_03_03

SAMPLE NO.	DESCRIPTION
II_03_01	Front, right door panel, gilded lacquer on carvings
II_03_02	Front, middle door panel, gilded lacquer
II_03_03	Rear, right door panel, gilded decoration on black lacquer

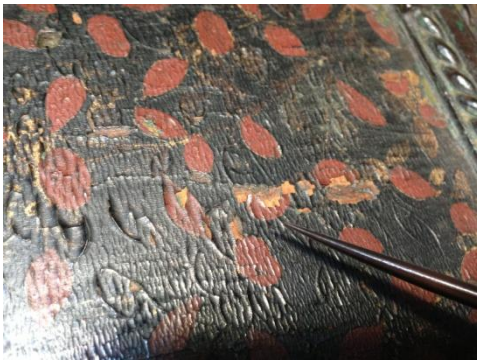
SAMPLE	LAYER COMPOSITION		
II_03_01	**TMH-PY-GC/MS**	**SEM-EDX, XRD**	**MICROGRAPH** (UV, VIS)
D: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf)	
C: Lacquer	-	-	
B: Red layer/ ground	Laccol (Arlenic acid, C_{17}), Tung oil (Glycerol, A/P 0.31, P/S 1.37, unusual high P/S may result from native fatty acids), Blood (Blood, glue and non-specific protein markers for blood), Trace starch (Schellmannose)	**SEM-EDX:** Al, Si, Fe, O, Ca, (Red iron oxide, Red earth, iron containing clay) **XRD:** Hematite	

SAMPLE	LAYER COMPOSITION		
II_03_02	**TMH-PY-GC/MS**	**SEM-EDX, XRD**	**MICROGRAPH** (BL, VIS)
E: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf)	
D: Lacquer	Laccol (Arlenic acid, C_{17}), Tung or perilla oil (Glycerol, A/P 0.9, P/S 1.53), Trace starch (Schellmannose), Trace protein (Protein markers), Tannins (Markers for tannins), Soot (Soot markers)		
C: Lacquer	Laccol (Arlenic acid, C_{17}) and small amount of thitsi (12-phenuldodecyl catechol), Tung or perilla oil (Glycerol, A/P 1.02, P/S 1.5), Trace blood (Blood markers and non-specific protein markers for blood- may originate from layer B), Tannins (Markers for tannins), Soot (Soot markers)	**SEM-EDX:** Charcoal (no Ca or P)	
B: Red layer	Equal to II_03_01 B!	**SEM-EDX:** Al, Si, Fe, O, Mg, Ca	

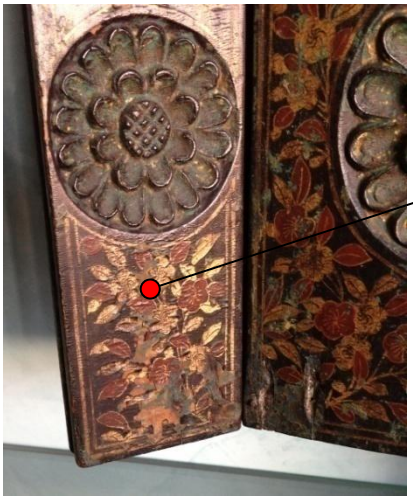
SAMPLE	LAYER COMPOSITION		
II_03_03	**TMH-PY-GC/MS**	**SEM-EDX, XRD**	**MICROGRAPH** (UV, VIS)
F: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf)	
E: Bole layer	Laccol (Arlenic acid, C_{17}), Perilla oil (Glycerol, A/P 1.15, P/S 1.75), Trace blood (Blood markers, non-specific protein markers for blood), Starch (Schellmannose), Tannins (Markers for tannins), Soot (Soot markers)	**SEM-EDX:** As, S (Orpiment)	
D: Lacquer	Probably the same composition as II_03_02 C or D. (Unverified if the brighter part is a phenomenon within the lacquer or an individual layer)	-	
C: Thin black layer	-	**SEM-EDX:** Charcoal	
B: Ground	-	**SEM-EDX:** Al, Si, Fe, O, K **XRD:** Quartz, muscovite, kaolinite, calcite, gypsum	

SAMPLE LOCATION

2.6.2. (II_07) **OBJECT:** Oratory **SAMPLING:** Pedro Aguiar Branco (2013)



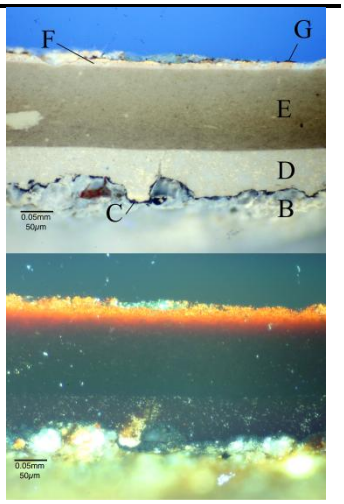
II_07_01



II_07_02

II_07_03

SAMPLE NO.	DESCRIPTION
II_07_01	Exterior, right door, right panel, gilded black lacquer
II_07_02	Interior of left door, left panel, gilded black lacquer
II_07_03	Interior of right door, left panel, gilded decoration on black lacquer

SAMPLE	**LAYER COMPOSITION**		
II_07_01	**TMH-PY-GC/MS**	**SEM-EDX**	**MICROGRAPH** (UV, VIS)
G: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf)	
F: Bole layer	Laccol (Arlenci acid, C_{17}), Drying oil (Dicarboxylic fatty acids), Protein (Protein markers), Waxes (beeswax and ester type waxes, restoration)	**SEM-EDX:** Fe, O, Ba, S (Red iron oxide, barite)	
E: Lacquer	Laccol (Arlenic acid, C_{17}), Perilla oil (Glycerol, A/P 0.84, P/S 1.62), Protein (Protein markers), Tannins (Markers for tannins), Trace pine resin (Pinaceae markers), Soot (Soot markers), Sulfur compounds	**SEM-EDX:** Charcoal (No Ca or P)	
D: Lacquer	Laccol (Arlenic acid, C_{17}), Perilla oil (Glycerol, A/P 1.41, P/S 1.74), Tannins (Markers for tannins), Soot (Soot markers), Protein (Protein markers), Arsenic (Marker for arsenic pigment, contamination?)	**SEM-EDX:** Charcoal (No Ca or P)	
C: Thin black layer	Trace laccol (Anacard carbohydrates), Drying oil (Dicarboxylic fatty acids), Blood (Blood markers, non-specific protein markers), Gall (Markers for animal gall, possible source for phosphate/sulfate), Pine resin (Pinaceae markers), Tannins (Markers for tannins), Phosphate (Trimethyl phosphate), Sulfur compounds (Dimethyl sulfate)	**SEM-EDX:** Charcoal (No P or Ca)	
B: Ground		**SEM-EDX:** Al, Si, Ca, K, Mg, Na, Fe, O	

SAMPLE LOCATION

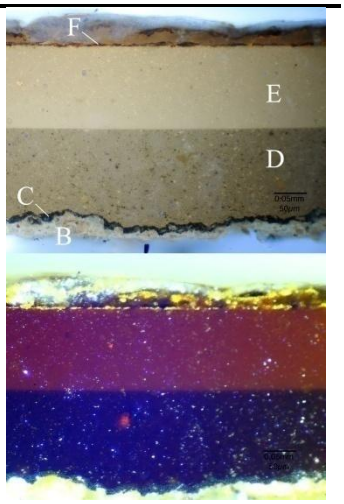
2.8.1. (II_05) **OBJECT:** Chair **SAMPLING:** Ulrike Körber (2013)

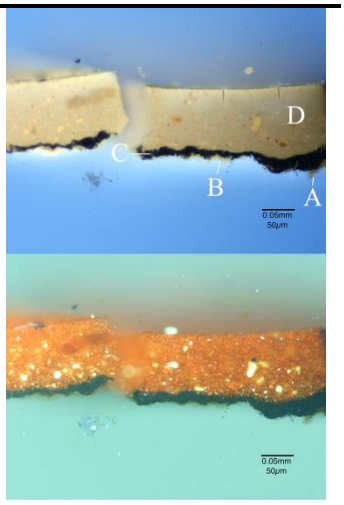
II_05_01

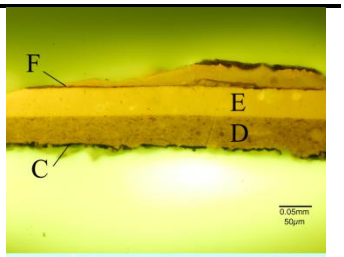
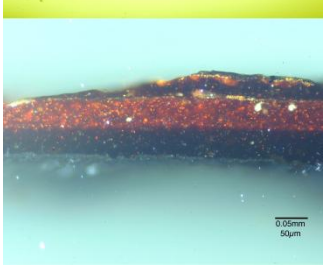
II_05_02

II_05_03

SAMPLE NO.	DESCRIPTION
II_05_01	Right rear leg, gilded carved lacquer
II_05_02	Back rest front side, red lacquer
II_05_03	Back rest rear side, gilded black lacquer

SAMPLE	LAYER COMPOSITION		
II_05_01	**TMH-PY-GC/MS**	**SEM-EDX**	**MICROGRAPH** (UV, VIS)
F: Gold decoration	-	**SEM-EDX:** Au, Ag, Cu (Gold leaf)	
E: Brownish lacquer	Laccol (Arlenic acid, C_{17}), Tung oil (Glycerol, A/P 1.44, P/S 1.14), Protein (Pyrrole and protein markers), Tannins (Markers for tannins), Soot (Soot markers)	**SEM-EDX:** Charcoal (No Ca or P)	
D: Black lacquer	Laccol (Arlenic acid, C_{17}), Tung oil (Glycerol, A/P 1.18, P/S 1.13), Starch (Schellmannose), Portein (Pyrrole, protein markers), (No Ca or P), Soot (Soot markers)	**SEM-EDX:** Charcoal (No Ca or P)	
C: Black layer	- Equal to II_05_02 C?	**SEM-EDX:** Charcoal (No Ca or P)	
B: Traces of ground material	- Tiny sample material	**SEM-EDX:** Al, Si, Ca, K, Mg, Fe, O, Cl..	

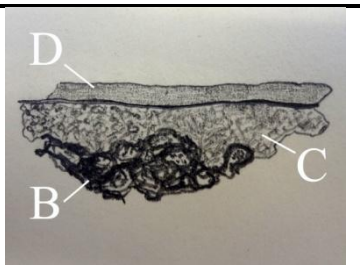
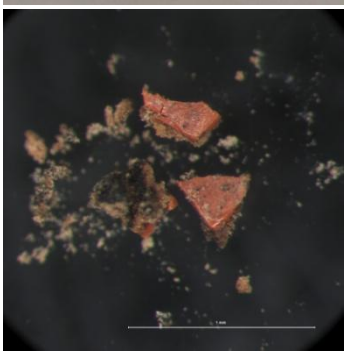
SAMPLE	LAYER COMPOSITION		
II_05_02	**TMH-PY-GC/MS**	**SEM-EDX**	**MICROGRAPH** (UV, VIS)
D: Red lacquer	Laccol (Arlenic acid, C_{17}), Tung oil (Glycerol, A/P 2.03, P/S 1.37), Protein (Pyrrole and protein markers), Tannins (Markers for tannins), Soot (Soot markers), Markers for arsenic and sulfide	**SEM-EDX:** As, S, Fe, O (orpiment, red iron oxide)	
C: Black layer	- Analyses report lost.	**SEM-EDX:** Charcoal (No Ca or P)	
B: Traces of inorganic material	-	**SEM-EDX:** Al, Si, O, Ca	
A: Wood	Not identified.	-	

SAMPLE	LAYER COMPOSITION		
II_05_03	**TMH-PY-GC/MS**	**SEM-EDX, XRD**	**MICROGRAPH** (BL, VIS)
F: Gold decoration	-	-	
E: Bole layer	- Equal to II_05_02 D?	-	
D: Black lacquer	- Equall to II_05_01 D?	-	
C: Black layer	- Equall to II_05_02 C?	-	

SAMPLE LOCATION

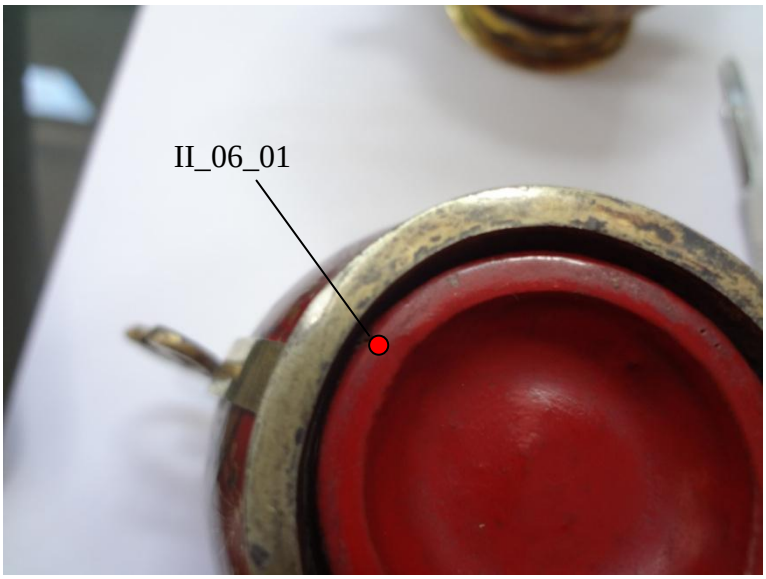
2.9.1. (I_09) **OBJECT:** Bowl **SAMPLING:** Ulrike Körber (2013)

SAMPLE NO.	DESCRIPTION
I_09_01	Interior of the bowl, red lacquer

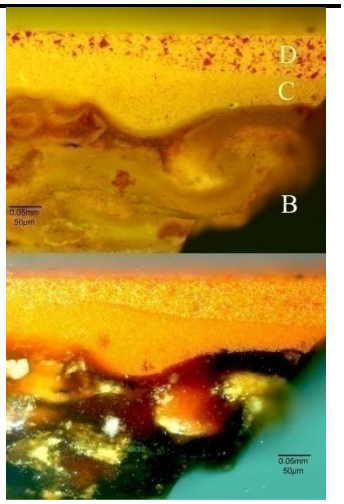
SAMPLE	LAYER COMPOSITION		
I_09_01	**TMH-PY-GC/MS**	**SEM-EDX**	**SCETCH/MICROGRAPH** (VIS)
D: Red lacquer	Whole sample with all three layers: Urushiol (Mazzeic acid, C_{15}), Perilla oil (Glycerol, A/P 0.63, P/S 2.07), Trace protein (Blood, protein and glue markers), Starch (Two carbohydrate markers, one anacard and one starch marker), Sulfur compounds (Cinnabar)	- (Pigment: Only cinnabar detected, HgS)	
C: Fine, lighter ground layer		-	
B: Coarse, darker ground layer		-	

SAMPLE LOCATION

2.9.2. (II_06) **OBJECT:** Cup **SAMPLING:** Ulrike Körber (2013)



SAMPLE NO.	DESCRIPTION
II_06_01	Underside, red lacquer

SAMPLE	LAYER COMPOSITION		
II_06_01	**TMH-PY-GC/MS**	**SEM-EDX**	**MICROGRAPH** (BL, VIS)
D: Red lacquer	Laccol (Arlenic acid, C_{17}), Perilla oil (Glycerol, A/P 0.68, P/S 2.71), Protein (pyrrole and protein markers), Starch (Schellmannose), Tannins (Markers for tannins), Soot (Soot markers), Arsenic (restoration?), Sulfur compounds (Dimethyl disulfide, dimethyl sulfate), Shellack (restoration)	**SEM-EDX:** Hg, S (Cinnabar)	
C: Red lacquer (Dark)		**SEM-EDX:** Fe, O (Red iron oxide)	
B: Ground	Laccol (Arlenic acid, C_{17}), Perilla oil (Glycerol, A/P 1.1, P/S 1.88), Starch (Schellmannose), Blood and protein (Blood marker, one glue marker and non-specific protein markers), Tannins (Markers for tannins), Soot (Soot markers), Arsenic (Restoration) and sulfur compounds (Contamination from layer D?)	**SEM-EDX:** Al, Si, Ca, Fe, O, K, Mg, O	