THE WORLDS of MARCO POLO

The Journey of a Venetian Merchant from the 13th Century

edited by
Giovanni Curatola
Chiara Squarcina

Magonza

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I did not
write half of
what I saw.

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Porcelain in China: Ideal Combination of Raw Materials and Ingenuity

Sabrina Rastelli

Vase
Tang dynasty (618-907), 7th-8th century, glazed porcelain, New York, Metropolitan Museum of Art, inv. 2013.231

In the *Devisement dou monde* Marco Polo thus describes the white and translucent ceramic made in "Tinugiu": the most beautiful imaginable, of great finesse, exported all over the world, excellent and of indescribable beauty.[1] The term "porcelain" was already in use in medieval Europe, when, however, it denoted typically white and transparent mother-of-pearl objects; the Venetian traveler, therefore, did not invent it, but applied it to the special ceramic material then unknown in the West, whose whiteness recalled that of mother-of-pearl.[2]

But what exactly is porcelain? According to the Western definition, it is a type of ceramic made with pure refractory ingredients which, when fired at high temperatures, vitrify, transforming into a white, hard, dense, resonant and translucent material. This description reflects the qualities of the porcelain which was manufactured in southern China and reached Europe in significant quantities only starting from the 16th century, after the exploration of the sea routes that connected Europe to China (and Japan) circumnavigating Africa. However, the production of porcelain in China dates back to the years around the turn of the 7th century, when northern potters rediscovered deposits of pure clays and began to experiment with them.[3] The different geological history of northern and southern China has meant that the materials resulting in white ceramic bodies have different mineralogical characteristics, so products originating from northern kilns are rarely translucent (Kerr and Wood 2004, pp. 41-52). In the Chinese language the problem does not arise: the term in fact denotes all types of ceramics made with refractory materials, both pure (which will become white once fired) and impure (which will produce gray or buff-colored bodies of various shades depending on the firing atmosphere); both macro-typologies are characterized by dense and resonant bodies. Western terminology, however, distinguishes hard-paste ceramics into porcelain (white) and stoneware (various shades of gray and buff).

In the field of ceramic production, China has always been at the forefront, with the creation of glazed stoneware starting from the 13th century BC and porcelain in the Sui era (581-618), i.e. 1100 years before Europe. However, as Nigel Wood pointed out (Kerr and Wood 2004, p. 146), porcelain was not so much an invention, but rather a discovery or, better yet, an "emergence": during the Northern Qi period (550-577), northern potters, in particular those active along the eastern slope of the Taihang mountains, in Henan and Hebei province, in search of refractory clays (used effectively in the south for about 18 centuries) came across clays that produced very pale bodies. The geographical position of these ceramic centers is not accidental: at the foot of the Taihang mountain

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1. As for the *Devisement dou monde*, I consulted the digital edition by Eusebi and Burgio from 2018 (https://edizionicafoscari.unive.it/it/edizioni4/libri/978-88-6969-224-6/); the citation is in chapter CLVI [11-13]. For the identification of Tinugiu, see below and the essay by Marco Guglielminotti Trivel in this catalogue.
2. Etymologically, "porcelain" was the name that in the Middle Ages designated several species of mollusks of the *Cypraea* genus and their shells (also known as "Venus shells") by virtue of the similarity of their shape with the vulva of the slut, whose diminutive in Italian is "porcella". Since ancient times, cowrie shells have been used in ornamental works and the term "porcelain" has been adopted to indicate various art and luxury objects made with mother-of-pearl, i.e. the lamellar layer coming from another type of shell, but always white and lucid (Bonomi 2004-2008).
3. White clay had already been used in the Neolithic age and subsequently during the late Shang dynasty (1250/1200-1045 BC) to model objects with peculiar shapes, but the kilns of the time were not able to reach the necessary temperatures to transform this highly refractory material into porcelain.
4. Kaolin is the essential ingredient to make porcelain; the term derives from the mispronunciation in Western languages of the Chinese Gaoling (literally "high ridge"), the toponym of the hills north-east of Jingdezhen (Jiangxi) exploited for the extraction of porcelain stone destined for the by then enormous production center of Jingdezhen since the Qing dynasty (1644-1911). This demonstrates the enormous influence the Chinese porcelain industry exerted on Western terminology once Europeans gained access to the great Qing empire. For a discussion of the Jingdezhen kilns see below.
5. "Reduction firing" means that the atmosphere inside the kiln is poor in oxygen and the air is smoky; in these conditions, the iron oxides take on cold shades, while when the atmosphere is oxidizing they turn towards warm shades.
6. In nature these clays actually come in different colors, even very dark ones, and it is only after firing that the bodies appear white: the term "white clays" is therefore inappropriate, but it is used here for the sake of brevity.
7. In addition to the porcelain of various qualities for which they are known, the Xing kilns also produced monochrome and polychrome lead-glazed wares, ceramics with black or yellowish-brown glaze, and stoneware with a gray body covered by a layer of white slip. The Ding kilns (see below) will produce the same genres.

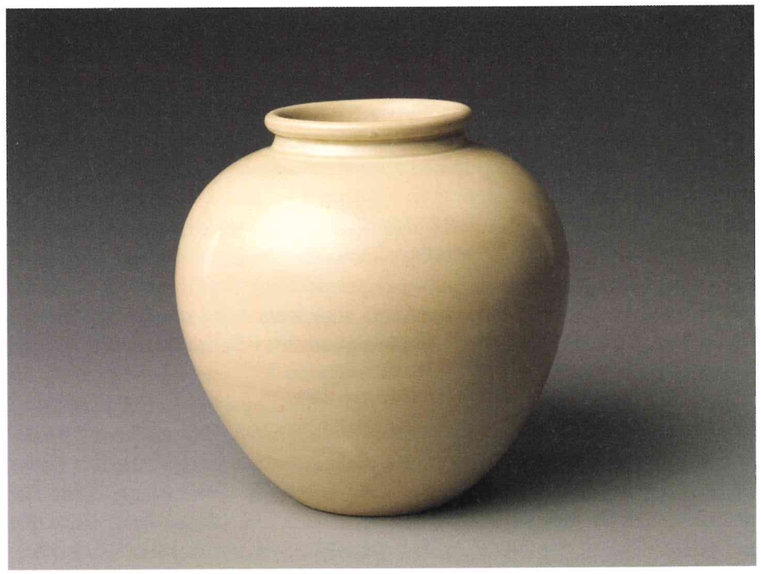
range, the layer of löss characterizing the landscape of northern China thins and the deposits are more easily accessible.

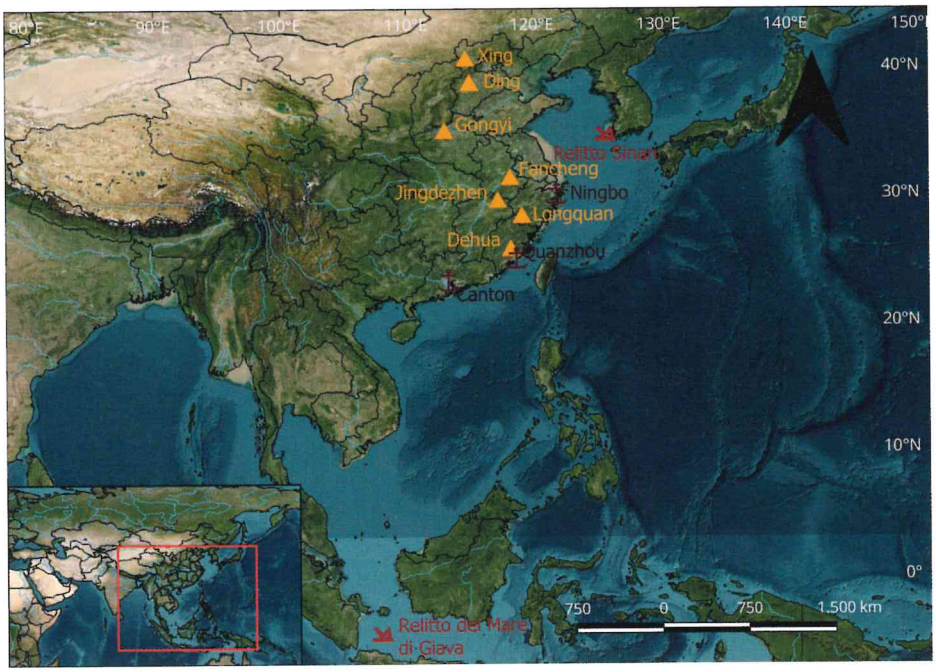
These clays can be classified as secondary kaolin, i.e. pure and refractory clays, rich in kaolinite, eroded, transported and deposited far from the parent rock.[4] Their chemical composition varies slightly according to the combination with other elements during the sedimentation process: the purest kaolins (i.e. those containing less iron and titanium oxides, the main and most effective colorants in clays) and the most refractory ones (due to the low content of fluxes and the high alumina content), vitrify when fired at the appropriate temperature, transforming into real porcelain with an appreciable degree of translucency. The less pure ones, especially if fired in reducing atmosphere,[5] produce clear but not translucent bodies, therefore, technically, they are to be classified as stoneware. The similarities between the two types of secondary kaolin make the boundary between this "white stoneware" and real porcelain very unstable and not always perceptible to the naked eye.

Northern porcelain

Among the first to experiment with "white clays"[6] were the potters of Gongxian (now Gongyi), in Henan province, starting from the last quarter of the 6th century. Most of their white-bodied ceramics were made from the less pure variety of secondary kaolin, which produced opaque bodies that were not perfectly white due to the presence of iron and titanium oxides. However, a very modest quantity of objects shows white, harder and translucent bodies, evidently made with a secondary kaolin characterized by a lower percentage of iron and titanium oxides, a higher content of alumina and very high levels of alkali.

The primacy of the production of real porcelain is usually ascribed to the Xing kilns, in Hebei province (approximately 400 kilometers north of Gongxian), which, after the first experiments at the turn of the 7th century, produced excellent-quality porcelain during the Tang dynasty (618-907).[7] In comparison with Gongxian, the secondary kaolin accessible around Xing is purer (it contains less iron and titanium oxides) and more refractory; particularly pure deposits were exploited during the Tang dynasty (Kerr and Wood 2004, pp. 151-157). Two types of excellent white ceramics can be distinguished according to their chemical composition: one more widespread, not perfectly pure or translucent, and





Map of the main Chinese sites

the other rarer, white and semi-transparent due to the high content of potassia and soda (effective fluxes of the body at high temperatures) and very low levels of iron and titanium oxides. Recent studies (Huang 2022) have confirmed the high percentage of potassium oxide in the translucent fragments and have shown that the Xing (and Gongxian) potters combined secondary kaolin with potassium feldspar to achieve this result, creating a binary compound. The glaze recipe was also perfected in the Tang period, combining kaolin with very low titania content, albitic quartz-feldspar rock, dolomite and wood ash. Before this modification, the highly refractory body did not reach maturity, while the glaze matured too early, tended to run and craze. By decreasing the quantity of fluxes in the glaze (especially calcia), the body and glaze matured at the same time, adhering well to each other, and the glaze was resistant, uniform and smooth. Despite the decrease in calcia levels, the Xing glaze remained of the lime-type, though rich in magnesia, useful for preventing crazing. The presence of phosphorus reveals that, despite the addition of dolomite, a small amount of wood ash continued to be used (Kerr and Wood 2004, pp. 540-542). Two other important achievements by the Xing potters during the Tang dynasty were the raising of the temperature inside the kilns and the firing of the more valuable pieces in special protective containers (saggers) where they were placed individually, so as to avoid the scars left by the tips of the spacers used to separate stacked objects. As in Gongxian (and the remaining northern China), Xing ceramics were fired in reducing atmosphere in single-chamber, domed kilns fired with wood at a temperature of around 1300 °C.[8]

In a short time, Xing porcelains became the most coveted in the country, appreciated in various daily activities by the wealthy classes and even by the imperial house: official documents and inscriptions attest that they were admitted into the tribute system. Admired at home, they were at the same time exported in surprising large quantities to neighboring countries, South-East Asia, Central Asia and even Egypt.

However, their primacy began to be undermined by a new center established in Ding county, also in Hebei province, by the Taihang Mountains, 180 kilometers to the north. In the 10th century, for reasons still unclear, the Ding kilns eclipsed those of Xing, becoming the most technically advanced and influential porcelain manufacturer in the country. While it is difficult to distinguish Ding porcelains made at the end of the Tang dynasty from those produced in Xing,

during the 10th century Ding potters became independent, developing their own style. The adoption of coal to replace wood to power the *mantou* kilns between the end of the 10th and the beginning of the 11th century marked the transition from reduction to oxidation firing, at temperatures of around 1320 °C, giving Ding porcelain that characteristic ivory tone. From a compositional point of view, both the bodies and the glazes of Ding porcelains are similar to those of Xing. In a very recent study, Nigel Wood (2024) has shown that Ding potters adopted the same approach as their Xing colleagues (at least up to and including the Northern Song dynasty, 960-1127) by resorting to a binary mix for the body recipe which included a percentage of the main glaze ingredient: siliceous feldspathic rock. In this way the bodies were whiter and less refractory and the adhesion of the glaze to the body was ideal. Thus, the correspondence between the products of the two factories demonstrates not only the use of similar raw materials due to geological continuity, but also a technological transfer from the potters of Xing to those of Ding.

A peculiar Ding technique, invented in the 11th century probably to counteract the problem of the deformation of objects during firing, is the positioning of objects (cups, bowls and plates) upside down (*fushao* in Chinese) with the edge of the mouth resting on a ring support. The various rings were arranged one on top of the other and then placed in a sagger before being loaded in the kiln. In this way, the weight of each item was distributed more widely, and at the same time precious space was saved, allowing a greater number of items to be fired in the same batch. The disadvantage was that the lip remained unglazed (to prevent it from sticking to the support) and therefore had to be covered with a metal finish. The supporting rings were made of the same material as the pieces they sustained, so that the contraction during firing corresponded and no distortion of the shape occurred; once fired, the supports could not be reused with consequent waste of precious raw materials.[9] A similar practice required millimetric precision in every phase of manufacturing the artefacts, from the preparation of the raw materials to the firing, so the craftsmen specialized more and more, reaching excellent standards.

After the interruption caused by the wars of conquest between the Song and Jin dynasties (1115-1234), the Ding factories resumed production, but with slightly lower results compared to the previous period, attributable to the exploitation of less pure clays and changes to the glaze recipe (Wood 2024; Ma *et alii* 2021; Cui *et alii* 2012). With the incursions of the Mongol federation at the beginning of the 13th century, the Ding kilns entered a phase of irreversible decline. 203, 204

Southern porcelain

The success of Tang dynasty northern porcelains was such that it stimulated some southern factories to try their hand at manufacturing this special kind of ceramics in the Five Dynasties period (907-960). In the 10th century, the Jingdezhen kilns, in Jiangxi province, abandoned the production of celadon to specialize in porcelain, like other kilns in the south, including Fanchang in Anhui province. However, Jingdezhen soon emerged as the main manufacturer (from both a qualitative and quantitative point of view) and established itself as the undisputed world capital of porcelain during the Mongol domination until at least the 18th century.

The type of porcelain produced in Jingdezhen from the second half of the 10th century does not go by the name of the locality, as is the case of Xing and Ding, but rather by the name of *qingbai*, literally "white" (*bai*) "blue" (*qing*), from the bluish shade of the glazing.[10] The body of *qingbai* porcelain is white, translucent and sugary, different from that of northern porcelain both to the sight and to the 241, 242

8. Just because of their compact and rounded shape, in China they are known as *mantou* kilns, that is, steamed buns.

9. In addition to the *fushao* method, there was another, *guashao*, in which objects were placed straight up "hanging" from the edge of the mouth. For a complete explanation of the evolution of stepped spacers see Kerr and Wood 2004, pp. 158-159, 345-346.

10. This term came into use during the Southern Song dynasty (1127-1279) (David 1955, pp. 52-53). At the beginning of the 20th century, connoisseurs adopted the term *yingqing*, i.e. "veiled/shaded (*ying*) blue (*qing*)", but then the name *qingbai* prevailed. The toponym "Jingdezhen" was established in the first year of the Jingde era (1004-1007) at the behest of Emperor Song Zhenzong (r. 998-1022). Before that date, the town was called Changnan and was included in Fuliang county, in turn administered by Rao prefecture (Raozhou). For a detailed account of the terminology relating to *qingbai* ceramics and the toponym Jingdezhen, see David 1955, pp. 52-53; Osaka 1994, p. 1; Niklès 2002, pp. 234-235; Kerr and Wood 2004, pp. 185-186.

touch. The discrepancy depends on the different geological nature of the two macro-areas mentioned at the beginning of this essay. The main ingredient of *qingbai* porcelain body is kaolinized porcelain stone, which is a primary material, consisting of a natural mixture of quartz, secondary mica (rich in potassia), primary clays and a small amount of sodium feldspar, derived from acidic rocks.[11] The high silica content is the cause of the sugary appearance of the body, while the high percentage of potassium oxide is responsible for the translucency and the low level of titania guarantees the whiteness. Firing in reducing atmosphere also contributes to the purity of the color, necessary to inhibit the yellowing effect of the iron which, although in minimal quantities, is still present. The big advantage of porcelain stone, in addition to its abundance and accessibility in a large area of southern China, lies in the fact that, thanks to the plastic qualities of the secondary mica and the high content of fluxes (compared to the secondary kaolin of the north), it did not have to be combined with other ingredients to produce porcelain bodies.[12] However, since it was a primary material, once extracted, it had to be subjected to a long process of pulverization and smoothing, before it could be mixed and modelled.[13] Since once refined porcelain stone was "packaged" in the form of bricks to be easily transported from the processing site to the potter's workshop, Chinese literary sources refer to this material as *baidunzi* or "white bricks", from which the word *petuntse* used in Western languages derives.

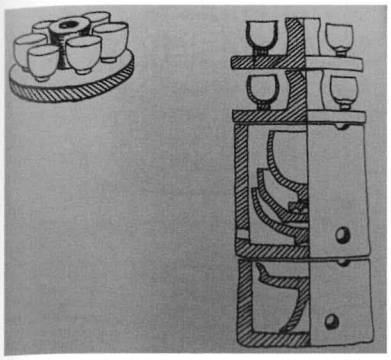
The *qingbai* glaze was prepared following the "southern" approach, in use for centuries for Yue-type celadons, which consisted of combining the clay used for the body with wood ash. In the case of *qingbai* glazes, the clay was porcelain stone, while the flux, rather than wood ash, was made up of *youhui*, literally "glaze ash", or crushed limestone, calcined and burned together with shrubs which, once levigated (to remove plant ash), was added to the porcelain stone (Kerr and Wood 2004, pp. 553-554; Rastelli 2004, p. 179). This formula had been devised as early as the Five Dynasties period, when Jingdezhen potters began making the first porcelains. The difference between the two eras (Five Dynasties and Song) lies in the increase in the quantity of "glaze ash" which went from twenty to thirty percent, and consequently in the increase in calcium oxide (comparable to that of celadon glaze of southern China), which however did not affect the color and glass-like appearance, typical of *qingbai* ware (Kerr and Wood 2004, pp. 550-558).

Judging from the chemical composition, the glaze recipe was modified towards the end of the 13th century, when the micaceous porcelain stone, exploited until then, was replaced with another one rich in albite, as revealed by the high content of sodium oxide compared to the percentage present in the body (Kerr and Wood 2004, pp. 555-558). The new approach to creating the glaze coincided with the modification of the recipe of the body, now composed of albitic porcelain stone and primary kaolin, an aspect to which we will return later.

The firing of the pottery took place inside the so-called "dragon" kiln,[14] fueled with wood, in reducing atmosphere, at a temperature between 1220 and 1260 °C. The influence of Ding production is evident not only in shapes and decorative motifs, but also in the adoption of the upside-down firing method towards the middle of the Southern Song Dynasty (1127-1279), when the bodies became thinner. To be able to stack bowls and plates close together with the lip resting on the steps inside the protective container, the height of the feet was reduced (Pierson 2002, p. 16). The unglazed edge of the mouth was inevitable with this technique, but it can also be seen on specimens fired regularly standing on the foot. The motivation for this choice is uncertain: regardless of the positioning in the firing, the metal edge was fashionable and applied in both cases, though the metal finish did not require the removal of the glaze.

Although Jingdezhen had established itself as the main producer of the *qing-*

Drawing of various ways of placing objects in the kiln. Inside saggers (lower right of the drawing), objects can be arranged individually or stacked



bai genre in the Song dynasty, it was not the only one: many factories scattered in the southern provinces of Jiangxi, Fujian, Guangdong, Guangxi, Zhejiang and Anhui produced ceramics of this type with local variations due to small compositional differences in the raw materials. The fact that statistically a limited number of *qingbai* objects from other regions emerged from excavations in China, compared to those from Jingdezhen, led to the conclusion that the kilns in Fujian and Guangdong in particular worked mainly for the foreign market (Kerr and Wood 2004, p. 557).[15] If it is very likely that production in these provinces was stimulated by intense maritime traffic – it is no coincidence that two of the main ports were Quanzhou in Fujian and Guangzhou (Canton) in Guangdong – we cannot exclude a domestic market, perhaps less demanding, of which few traces remain. The substantial export of Qingbai pottery from the "provincial" kilns is attested by the discovery of numerous wrecks, among the most striking of which are the "Nanhai 1", which sank off the coast of Guangdong in the 1280s with over 180,000 pieces of various ceramic types; the "Java Sea wreck", which probably sank in 1162 (Niziolek *et alii* 2018) with its cargo of over 100,000 artefacts; the "Sinan wreck", which set sail in 1323 from the port of Ningbo, in Zhejiang, in the direction of today's Fukuoka and shipwrecked off the Korean coast close to the Sinan archipelago, with 20,661 ceramic pieces, of which over 12,000 Longquan celadons and the remaining *qingbai* objects made in Jingdezhen and Fujian and ceramics from the Jizhou kilns.[16]

Among the *qingbai* ceramic factories in Fujian, the one of Dehua is the best and most influential, so much so that a Dehua style can be distinguished within the wide *qingbai* family, shared with the factories present in Quanzhou, Anxi, Yongchun and Putian.[17] The properties of Dehua porcelain stone make it even superior to that of Jingdezhen, since it contains even less iron and more potassium oxides, therefore the bodies are even whiter and more transparent to the eye and chalky to the touch. The reduced plasticity of Dehua porcelain made shaping on the potter's wheel difficult, so many objects were made using hollow molds, especially in the Yuan period (1271-1368). The main difference between the *qingbai* of Dehua and those of Jingdezhen lies in the glaze: containing less calcium oxide, the Dehua glaze appears more viscous and neutral. The color is also affected by oxidation firing and greater uniformity in temperature, guaranteed by an ingenious modification of the structure of the dragon kilns by the craftsmen of Dehua: the division of the long firing chamber into sections separated by a perforated wall, so as to slow down the flow of hot air without blocking it (Kerr and Wood 2004, p. 557).

The so-called "Marco Polo jar", preserved in the Tesoro della Basilica di San Marco, comes from the Dehua kilns. Resting on a low ring-shaped foot, the vessel extends upwards to the bulging shoulders, surmounted by a short, slightly tapering neck with four eyelets on the collar at the base of the neck, corresponding to the same number of indentations that divide the body into four lobes. The decoration, made in a mold when the jar was formed, is divided into four horizontal levels, made up, from top to bottom, of a double collar of lotus petals, vegetal scrolls on the central bands and a collar of sketchy petals around the foot. The glaze covers the external surface down to the foot, where some drops have dripped; the buff color of the body in this area is due to the dirt that has accumulated over time: where it is protected by the transparent glaze, in fact, the color appears white. The crazing and mottling on a large area of the surface are due to external causes that occurred after manufacturing.[18] Many similar specimens have been found in the Philippines, Indonesia, as well as in Hormuz (Iran).

The small container brings us back to the question of the type of porcelain to which Marco Polo refers and to the identification of Tinugiu. As already noted, in the last quarter of the 13th century, when the Polos were in China, the most

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11. The term "acidic" defines rocks rich in silicon dioxide, i.e. quartz.
12. Wood 1999, p. 48; Li 1998, pp. 319-321.
13. For a detailed description of porcelain stone refining techniques in Jingdezhen see Kerr and Wood 2004, p. 226.
14. The dragon kilns (*long* in Chinese) appear as long tunnels built along the slopes of a hill to make the draft more efficient.
15. Catherine Teo (2002, p. 245) found that, to correct the trade imbalance with foreign countries and stop the drain of copper, in 1216 and 1219 the Southern Song government issued two decrees encouraging offsetting of imports of spices, ivory, rhinoceros horns, tortoise shells and other precious goods with silk, porcelain and lacquer. One of the results of these policies was the increase in the number of kilns established in southern China, also encouraged by merchants who realized the earning potential in the export of *qingbai* porcelain.
16. The literature on shipwrecks between the 10th and 14th centuries is endless. For the "Nanhai 1" see Guojia Wenwuju 2017 and Guojia Wenwuju 2018; the discovery of coins from the Chunxi era (1174-1189) and a *qingbai* porcelain jar from Dehua kilns, in Fujian, with the date 1183 written on the base made it possible to establish the date of the shipwreck. For the "Java Sea wreck" see Mathers and Flecker 1997 and Flecker 2009. For the "Sinan wreck" see National Museum of Korea 1977 and Kim 1986. This wreck is also very important for the dating of blue and white porcelains, see below, note no. 25. In general, for wrecks found along the Chinese coasts see Sun 2022.
17. Dehua kilns, located about 500 kilometers south of Jingdezhen, are known in the West above all for the statuettes and vessels produced from the 16th century and exported to Europe where, in the 19th century, they were classified with the French term *blanc de Chine*, to underline the monochrome white color of the objects. In Chinese, this type is known as *zhuyoubai* or "white pig lard", or as *xiangyabai*, literally "white elephant tusk", i.e. "ivory". However, their activity dates back to the 12th century (Lin and Zhang 1992; Lin and Ran 2018).
18. Identical jars emerged from the "Nanhai 1" wreck (for images see https://www.koh-antique.com/history/historyyuan.htm).

important porcelain manufactures in the country were those of Jingdezhen, imitated by other kilns widespread in the provinces of Fujian, Guangdong, Anhui and Zhejiang. Marco Polo's description of Chinese porcelain in the chapter dedicated to Fujian and the fact that the jar is a product of the Dehua kilns may lead one to conclude that the Venetian merchant had come across objects manufactured in this region, however there is no tangible evidence that the container was brought back home by him: the connection, in fact, was suggested in 1932 by Oscar Raphael on a visit to Venice (Raphael 1932), on the basis of the origin and dating of the specimen.[19] Although not mediocre, the jar is not of the best quality of porcelain in circulation at the end of the 13th century and it is surprising that Marco Polo did not notice this. The identification of Tinugiu remains controversial:[20] the fact that the sentence begins by stating that "in this province there is a city called Tinugiu" suggests that it is located in Fujian and therefore cannot be Jingdezhen. The Latin Z version consulted by Ramusio describes the clay preparation phase in which the collected material is left outdoors for years, so that the action of atmospheric agents disintegrates the grains and increases their plasticity.[21] This procedure is common to all manufacturers, therefore it does not reveal the geographical position of Tinugiu.[22] Furthermore, one may wonder how it is possible that Marco Polo only noticed porcelain in Fujian, perhaps when he saw it in large quantities before it was loaded onto boats in the port of Quanzhou to be exported to South-East Asia and Western Asia. Should we perhaps reconsider the impact that porcelain, then produced only in China, had on the Venetian merchant despite the fact that he described it in enthusiastic tones?

Marco Polo certainly never saw the so-called "blue and white" porcelain (in Chinese *qinghuaci*, "refractory ceramic painted in blue") because it had not been created yet when he left China. However, it is not possible to talk about Yuan ceramics without mentioning them, also because their production and export reveal important information on the approach of the Mongol rulers towards porcelain production and trade.

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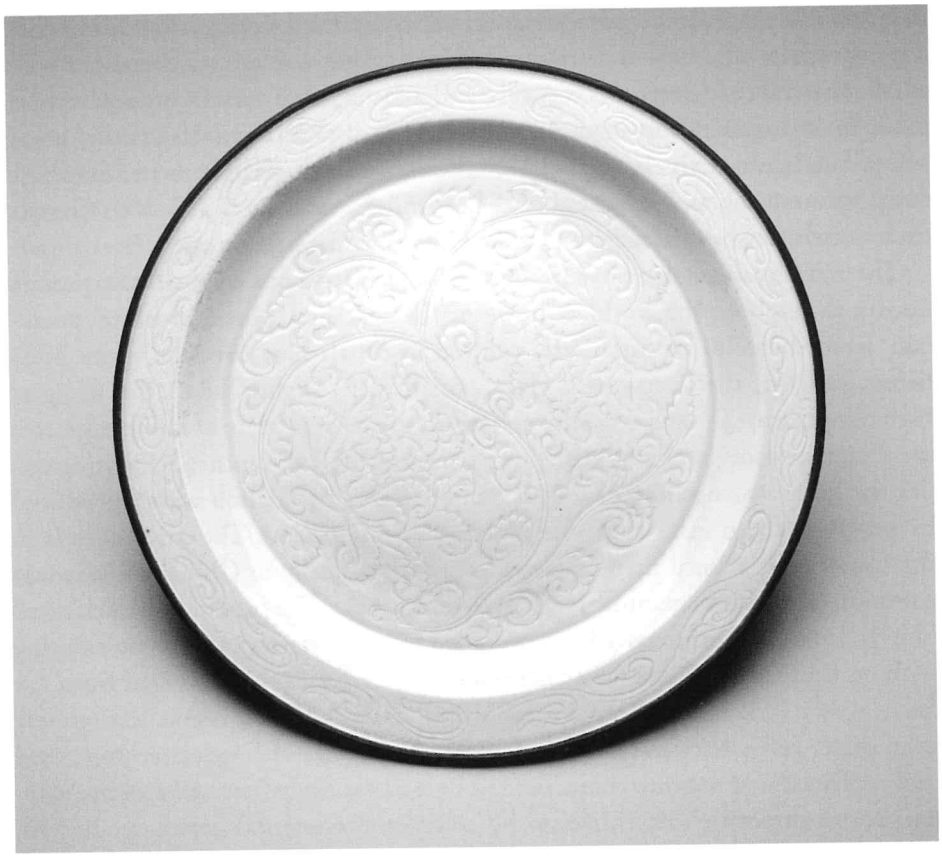
The Mongol confederation had subjugated northern China (dominated by another foreign dynasty – that of the Jin) in 1234, while the conquest of southern China, ruled by the Southern Song dynasty, was completed only in 1279. The Jingdezhen area had been subdued the previous year and the new dynasty immediately established the Fuliang Porcelain Bureau, headed by a high-ranking state official[23] to supervise the production of porcelain objects and hats made of lacquered horsehair, palm fiber and reed. The first commissioner was from Nepal and those appointed subsequently had Central-Asian origin. In 1295 the Office was expanded and then absorbed by the tax agency in 1324, and in 1328 the management of the imperial kilns was entrusted to the governor of the region. In 1352, when the area was sacked by the rebels who rose up in many areas of the empire following a series of natural disasters and famines, the kilns ceased their activity: we have to wait until 1369, by which time the Mongols had been defeated and on the throne of China sat the founder of the Ming dynasty (1368-1644), for the restoration of the imperial manufactures (Harrison-Hall 2001, p. 51; Kerr and Wood 2004, pp. 184-188; Barnes 2010, pp. 362-364).

As briefly mentioned above, chemical analyzes show that in the last quarter of the 13th century Jingdezhen potters modified both the body and the glaze recipe of their porcelains: they introduced albitic porcelain stone and added primary kaolin[24] to the body ingredients, and replaced the previously used micaceous porcelain stone with one rich in albite in the glaze. According to Jessica Harrison-Hall (2001, p. 52), it is very likely that the variation was dictated by the exhaustion of the porcelain stone deposits exploited up to that point and the raw material now available needed to be modified to be usable. Nigel Wood (Kerr and Wood 2004, pp. 232-233, 560) instead reflects on two possible scenarios: in the first,

Dish decorated with a peony branch motif and metal-covered mouth
Northern Song Dynasty (960-1127), 11th century, glazed porcelain, Chicago, Art Institute, Lucy Maud Buckingham Collection, inv. 1924.325



Yuan potters would have introduced sodium-rich albitic rocks to make the *qingbai* glaze and, trying to use the same material for the body, realized that as the only ingredient, it was not very plastic and not very refractory, so they resorted to adding kaolin. The second scenario is instead linked to the birth of a new genre, at the beginning of the 14th century, known as *luanbai* or *shufu*. The literal meaning of *luanbai* – "[cooked] egg white" – immediately suggests the look of the new variety, characterized by a superficially shiny but not transparent glaze. The effect was obtained by reducing the quantity of glaze ash from thirty to ten percent, thus decreasing the supply of calcia, that is flux: in this way the glaze was more viscous and could be applied in a thicker layer. According to Wood, Jingdezhen potters may have been led to formulate the *luanbai* glaze to cover bodies richer in titanium and iron oxides, and therefore less pure than those of *qingbai* porcelains. However, another plausible motivation is the Mongols' predilection for the white color: already in 1206, when Temüjin (1162-1227) assumed the honorific title of Chinggis Khan, a white banner with nine fringes was created, one for each of the Mongol tribes; the ceramics used to officiate the sacrifices aimed at Heaven were strictly white and only those who reached the most noble position (*beiqi*) had the privilege of riding white horses and wearing white robes (Barnes 2010, pp. 363-364). The white color was also associated with the Buddhist religion – the Mongols favored Lamaism – and in fact most sculptures depicting the Buddha or the bodhisattva Guanyin are in *qingbai* porcelain.

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The characters *shu* ("pivot", "indispensable") and *fu* ("treasure, department") appear on the wall of some *luanbai* dishes, bowls and stemcups. They are usually understood as a reference to the "Private Council" whose official name, however, was Shumi yuan or Ministry of Military and Civil Affairs (Macintosh 1984, p. 39; Harrison-Hall 2001, p. 52; Barnes 2010, p. 367). The characters *tai xi*, which appear on some of the best *luanbai* pieces, also seem to relate this genre to the government, in particular to the Taixi Zongyin Yuan – the general office established in 1329 to manage ritual sacrifices (Barnes 2010, p. 367). The findings in South-East Asia (especially in the Philippines) and in Japan (the *Sinan* wreck)

19. A recent study by Lin and Ran (2018) examined the "Marco Polo jar" from an archaeological perspective and, by crossing the data from the excavations of the kilns with those obtained from the findings of this ceramic typology in sites and in wrecks along the maritime routes that connected the port of Quanzhou to the Persian Gulf and East Africa, confirmed that the vessel was manufactured in Dehua between the end of the 13th and the first years of the 14th century and that the route followed by Marco Polo between 1292 and 1295 to return to Venice is compatible with the distribution of these products from South-East Asia to the Persian Gulf. However, it remains impossible to prove that the jar actually belonged to Marco Polo.

20. I thank Alvise Andreose and Eugenio Burgio for generously sharing their knowledge on the issue. On this topic, see also the essay by Marco Guglielminotti Trivel in this catalogue.

21. I consulted the digital edition by E. Burgio, M. Buzzoni and A. Ghersetti, which compares Ramusio's text with the various versions from which he drew inspiration: http://virgo.unive.it/ ecf-workflow/books/Ramusio/main/index.html. This excerpt is found in book II, chapter 77 (R, II 77, 10-13), http://virgo.unive.it/ecfworkflow/books/Ramusio/commenti/R_II_77-main.html and in the Latin Z version reported opposite (Z, 90, 13 and 20-26).

22. Ramusio's text specifies that Tinugiu is located near the source of the river that passes through Quinsai (Hangzhou?), a branch of which rushes to Quanzhou. The current orography has no correspondence in Ramusio's narrative, while the description of the method of collecting and preparing the clay to make porcelain contains a significant detail, absent both in the *Devisement* and in the Latin Z version, and therefore we are not sure of its reliability: "[11] They collect a certain ground as if from a mine and make great mountains of it." In Jingdezhen (as in other areas of southern China), porcelain stone was extracted from quarries in the area and reduced to pieces of about 5 cm with hand pickaxes before being pulverized with water hammers (Kerr and Wood 2004, pp. 225- 226).

23. The exact rank was ninth superior and the definition was commissioner; Harrison-Hall 2011, p. 51.

24. Primary or residual kaolin is a very refractory clay with very low-plasticity which, added to porcelain stone in quantities between ten and twenty percent, forms an extremely versatile compound (Rastelli 2004, p. 24). Chemical analyzes suggest that Yuan-dynasty potters began adding kaolin to the body recipe to compensate for the lower amount of clay present in albitic porcelain stone (Kerr and Wood 2004, p. 238).

demonstrate that *luanbai* porcelains were also exported in large quantities: they were mostly small objects, often molded in sections, sometimes decorated with small rust-colored (iron) spots. A rare and very valuable variant of *luanbai* porcelain is the one which involves the execution of decorative motifs in relief using colored and gold enamels applied over the transparent glaze after the first high temperature firing and subjected to the second fire at around 700-800 °C to fix the enamels: the bowl illustrated in plate 245 is a magnificent example.

The most emblematic product of the Jingdezhen kilns in the Yuan period, known throughout the world, is however the so-called "blue and white" porcelain, from the color of the motifs painted in cobalt blue over the white body before applying the transparent glaze, which turns slightly blue after firing at high temperature in reducing atmosphere. In the current state of knowledge, this combination dates back to the second quarter of the 14th century.[25] Painting under the glaze was nothing new – as demonstrated by Cizhou wares, produced by many northern kilns since the Northern Song period. The originality is in the use of cobalt, until then employed only sporadically in China, while it was common on ceramics manufactured in Western Asia. The production of classical blue and white seems to have been preceded by some attempts made by painting with an iron-rich pigment, as evidenced by some dishes that emerged from the *Sinan* wreck (1323) and from a tomb dated 1319.[26] Thus it seems that, in less than thirty years, between 1323 and 1352, the potters of Jingdezhen conceived and perfected a new genre characterized by a dense body (the same as the *luanbai*) and a smooth glaze, enlivened by complex ornamental motifs made with cobaltite imported from Western and Southern Asia. Since the body contains higher levels of iron and titanium oxides than those present in *qingbai* ware, the areas not protected by the glaze (foot and base) often appear red-orange in color because they have reoxidized at the end of firing. This effect, however, is only superficial, so much so that sometimes the objects have been abraded to reveal the underlying white body (Kerr and Wood 2004, p. 232). To make the blue patterns clearly legible, the glaze recipe saw an increase in the "glaze ash" (about fifteen percent) compared to *luanbai* ware (about ten percent), but still far from the thirty percent of *qingbai* ware. As regards cobalt, deposits of this material were also accessible in China, where however the mineral contains a lot of manganese, which makes the color gray and dull. Imported cobalt (cobaltite), on the other hand, is characterized by high levels of iron and low levels of manganese, so the blue is more intense and brilliant. As attested by the use of cobalt, some decorative motifs and certain shapes, blue and white porcelain is the grandiose result of the combination of cultural interconnections, typical of the Yuan multicultural context. Traditional Chinese historiography has been implacable with the Mongols, considered uncivilized and crude, yet it is precisely under their rule that not only the economy, but also the arts reached heights rarely equaled in the following centuries. Attentive to the market, but equally sensitive to beauty and splendor, Mongol nobles surrounded themselves with luxurious objects in gold, jade, lacquer, porcelain and magnificent fabrics, with ornamental shapes and motifs often borrowed from one material to another.

We have often wondered what triggered the invention of blue and white, and the taste of Muslim officials and merchants in the Yuan empire has often been cited as one of the most significant catalysts. However, the numerous finds have widely demonstrated that this genre was welcomed both by the Mongol nobles as well as by the native population. The theory circulating until not long ago, according to which blue and white porcelain was perceived as inelegant by the Chinese elite, is part of that anti-Mongol attitude widespread at the time and fueled in subsequent centuries. Proof of this is the fact that, when the country returned to being governed by a Chinese dynasty (that of the Ming), production not only

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Upside down firing technique on overlapping ring supports; waste from the Ding kiln, Beijing Art Museum

did not cease, but was actually expanded and improved, and blue and white porcelains were exported all over the world. Furthermore, many kilns attempted to imitate them with the materials they had available. In Italy, the efforts made by Francesco I de' Medici (1541-1587) are well known: he managed to produce white bodies, though not made of porcelain. For that we will have to wait for the experiments of Johann F. Böttger (1682-1719) in Maissen, under the auspices of Augustus the Strong of Saxony (1670-1733), who had meanwhile amassed an enormous collection of Jingdezhen porcelains.

25. The reference dates are 1323 and 1351: from the "Sinan" wreck, which sank in 1323, no blue and white porcelain emerged, demonstrating that this typology, destined to revolutionize the production of ceramics in the world, had not been manufactured yet. 1351 is the date that appears on the famous "David Vases", a pair of large altar vases collected by Sir Percival David and now on display at the British Museum (https://www.britishmuseum.org/collection/object/A_PDF- B-613). The complex and masterfully executed decoration demonstrates that, by that date, Jingdezhen potters had perfected the blue and white genre; the following year the kilns were destroyed by rebels, interrupting their production.

26. Low resolution images can be found at https://www.koh-antique.com/history/historyyuan.htm.