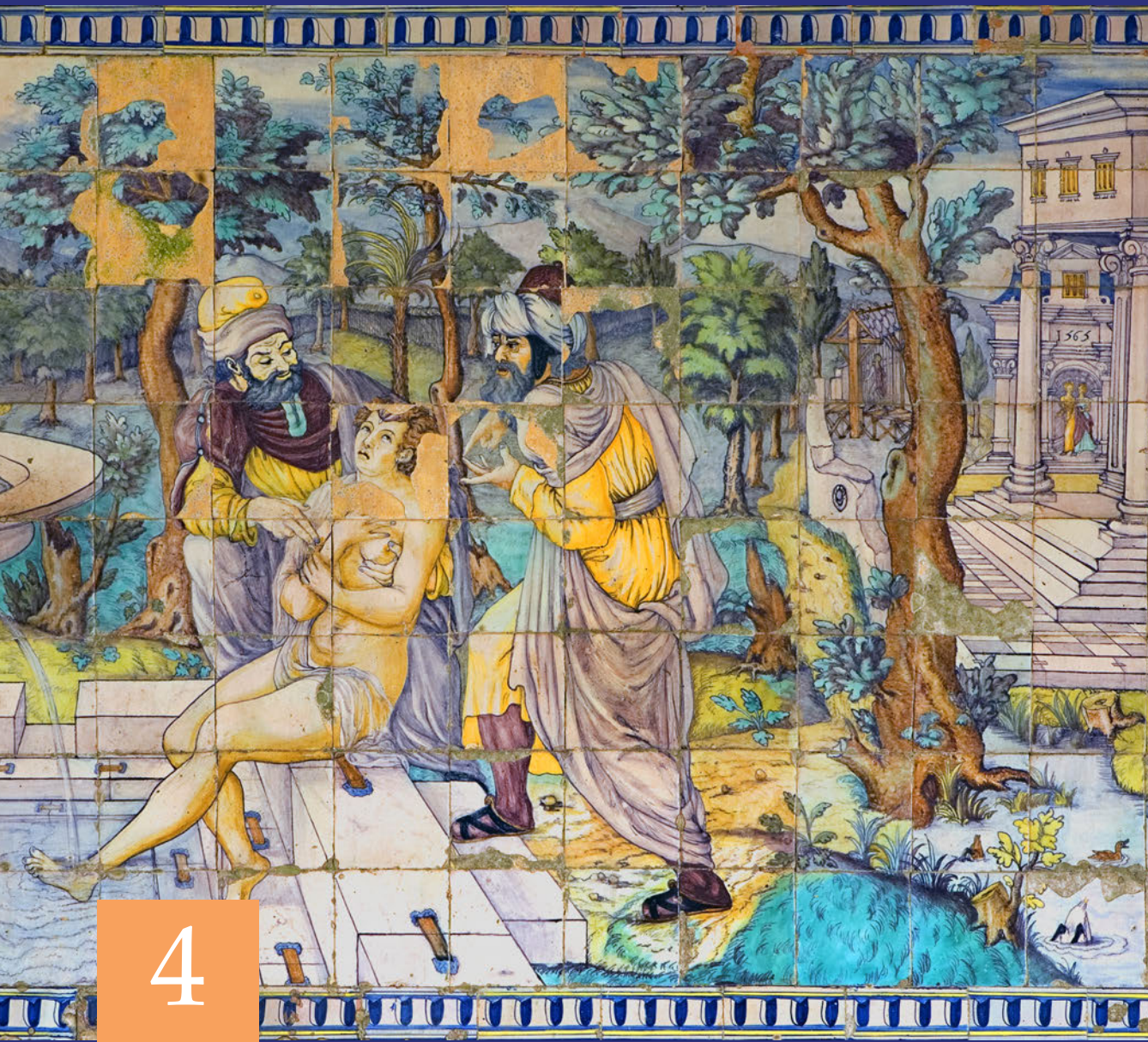


# Studies in Heritage Glazed Ceramics

The majolica azulejo heritage  
of *Quinta da Bacalhôa*



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Volume II



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## PREFACE

This is the second of a special series of four volumes of *Studies in Heritage Glazed Ceramics* dedicated to the renaissance majolica azulejo heritage of *Palácio e Quinta da Bacalhôa* in Azeitão, Portugal.

The azulejos of Bacalhôa have a legendary status in the studies of renaissance majolica in the Iberian Peninsula in general, because of their extraordinary variety and quality and the fact that its most mythical panel, representing the biblical episode of *Susanna and the Elders*, is dated “1565” – a chronology hardly compatible with the then-recent production of azulejos in Portugal. Several hypotheses were advanced over the years to cope with this seemingly impossibility, almost always involving Flemish potters immigrated to the Peninsula which the present study finally confirmed.

The first volume of the series dedicated to Bacalhôa, issued in December 2021, published three papers that established the pillars supporting the subsequent detailed study of the panels and patterned tiles: a study of the estate, locating its 16th century majolica azulejos; a study of the career and productions of Jan Floris de Vriendt of Antwerp (known in Spain as *Juan Flores*) who, according to the results, was likely the main potter, painter and pattern designer connected with the lining of Bacalhôa with majolica azulejos around 1565; and finally a systematization of the main types of 16th century majolica azulejos still extant in the Palace, the Pleasure House by the lake and the garden. That first volume was complemented by a study of the panels and tiles that, according to the previous results, had been manufactured in Talavera (Spain) and imported to Portugal, probably the earliest painted majolica to be applied at Bacalhôa.

This second volume of the series starts the presentation of the research results connected to panels and patterned tiles that were mostly produced in Portugal. The four articles cover in detail: the central room of the Pleasure House, where *Susanna and the Elders* is applied; the five panels of the *Loggia of the River Gods*; the very interesting and often belittled *Rape of Europa*; and the according to our knowledge until now unpublished floor of the oratory of the *piano nobile* of the Palace.

The scientific production stands on several pillars, one of them the peer-reviewers of the authors’ papers, whose names are often unknown but whose importance in the final output is singular. The editors wish to heartily thank the reviewers for this number: Doctor Alexandre Nobre Pais, Director of *Museu Nacional do Azulejo* and Doctor António dos Santos Silva of *Laboratório Nacional de Engenharia Civil* (LNEC) who have graciously accepted the hardship of the revisions.

Two more numbers of the journal dedicated to the azulejo heritage of Bacalhôa, with four new research papers in each, are expected to be published over the next 12 months.

LNEC thus presents No. 4 of *Studies in Heritage Glazed Ceramics*. Its 108 pages condense an important part of the results obtained over 20 months of multidisciplinary research, as befits the aims of this journal, aiming to clarify the early diffusion of majolica azulejos in Portugal.

The Editors

## EDITORS

João Manuel Mimoso (LNEC), Alexandre Nobre Pais (MNAz), José Delgado Rodrigues (LNEC) & Sílvia R. M. Pereira (HERCULES & LNEC)

## SCOPE

*Studies in Heritage Glazed Ceramics* is dedicated to the results of scientific studies in the field with a particular emphasis on analytical results, conservation issues and historical studies and very specially to multidisciplinary research in the domain.

The contents will include:

- Archaeometry studies, namely the application of analytic methods to the identification of materials and the establishment of technologies, provenance or the setting of chronologies;
- The artistic and historical context of productions, materials and evolving technologies, as well as the origin, preparation and trade routes of pigments and other raw materials;
- Decay of glazed ceramics, techniques and materials for conservation;
- Other innovative research results in the field.



# The 16th century majolica azulejo heritage of *Quinta da Bacalhôa*: the central room of the Pleasure House

*Alfonso Pleguezuelo, João Manuel Mimoso, Maria Augusta Antunes, Sílvia Pereira, Álvaro Silva*

## ABSTRACT

The Pleasure House by the lake in the Bacalhôa estate is quite unique for its five successive rooms tiled from the floor to the ceiling with 16th century azulejos. Its pinnacle is the central room, wholly lined with majolica tiles, from which stand out three figurative panels. One of these panels, representing the biblical episode of Susanna surprised at her bath and dated “1565”, is the only one that survived basically intact in the room.

The whole lining is constituted, besides the three panels with their frame tiles, by the patterned tiles that clad the walls and by the two-tile high continuous skirting, interrupted only by the doors.

The present paper examines the panels and the remaining elements of the lining from the iconographical, stylistic and technical points of view to support a conclusion on their provenance and authorship.

## RESUMO

A Casa de Prazer junto ao lago da Quinta da Bacalhôa é única pelas suas cinco divisões revestidas do pavimento até ao tecto com azulejos do século XVI. O ápice é a sala central, totalmente forrada a azulejos de faiança, da qual se destacam três painéis figurativos. Um desses painéis, que representa o episódio bíblico de Susana surpreendida no banho e datado de “1565”, é o único que sobreviveu praticamente intacto.

Além dos três painéis com as suas molduras, o revestimento é completado pelos azulejos de padrão renascentista que cobrem as paredes e pelo rodapé contínuo, com dois azulejos de altura, interrompido apenas pelas portas.

O presente artigo examina os painéis e os restantes elementos do revestimento do ponto de vista iconográfico, estilístico e técnico para fundamentar uma conclusão sobre a sua proveniência e autoria.

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**KEYWORDS:** Renaissance majolica; Azulejos; Palace of Bacalhôa; João de Góis; Jan Floris; Juan Flores

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We are thankful to Mr. Joe Berardo and to Mr. Renato Berardo, who authorised the sampling of the unique azulejo heritage of *Palácio e Quinta da Bacalhôa*; and to *Associação de Coleções | The Berardo Collection* and *Bacalhôa Vinhos de Portugal* for their support to this project.

Sections 1 and 2 translated from the Spanish by Judith Wilcock.

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## 1. INTRODUCTION

*... how rare and delightful it would be to clad the walls of a study or a garden portico, or another room with such work. For if an azulejo panel or wall in Spain is a great adornment for a chamber... how much greater it would be to have all the walls lined with azulejos forming the pleasant design of a poem or famous story on fine encaustic from Faenza or Pisa. [1: fol. 37]*

The above words come from a manuscript book that was dedicated to Philip II of Spain (1527-1598) by his chronicler and art adviser Felipe de Guevara (Brussels ca. 1500-Madrid, 1563) [2]. In this paragraph, the author expresses his preference for the new style of narrative azulejos that had become fashionable in Italy, comparing them with the traditional Hispano-Moresque tiles in Spain that he describes in no uncertain terms as “vulgar”. But above all, the remarks clearly reveal the new aesthetic conception, distinctly erudite and influenced by Renaissance painting, which the Spanish cultural elite demanded of the ceramic claddings for the classicist architecture of their profane spaces.<sup>1</sup>

While it is possible that in the 16th century another space in the Iberian Peninsula may have been decorated with azulejos in this style, the central room in the Pleasure House at the *Quinta da Bacalhôa* [3] is, to date, the only known example that literally embodies the aesthetic preference expressed by Felipe de Guevara in the above paragraph. The vast majority of the azulejo works created in the following decades were destined for religious spaces and most of them did not belong to the category of profane or religious narrative painting that would be revived in Portugal at the beginning of the 18th century, but were either simple hagiographic panels or, more commonly, grotesques and numerous versions of patterned tiles. Besides, if Philip II did enjoy any panels of this type painted for his palaces by Juan Flores during the years in which he worked for the king (1562-1567), they subsequently disappeared. Neither do we know of anything similar among the few works which this same artist made before he settled in Talavera; all the extant works from that period are patterned tiles and azulejos depicting heraldic or religious themes [4]. All of which confirms the enormous importance of the majolica azulejos at the *Quinta da Bacalhôa*, especially the ones adorning the central room in the pavilion by the lake. Gazing at the azulejos in the Pleasure House today, it is easy to imagine, bearing in mind their content and significance, that the lines Felipe de Guevara wrote circa 1560 could just as well have been penned around the same time by Brás [Afonso] de Albuquerque before he commissioned the decoration for his country estate at Vila Fresca de Azeitão around 1565.

The arrival of the imported tiles at Bacalhôa must have coincided with the arrival of their author, presumably Juan Flores [4], accompanied by his personal tools and a certain number of plain biscuits, ready to fulfil his client’s assignment aided by a few collaborators. This second phase of the works must therefore have been undertaken in the presence and with the participation of the painter chosen by Albuquerque to oversee the operation, designing and painting the most important elements himself and instructing his collaborators on how to execute the decoration. We do not know whether Flores painted any azulejos during his presumed first stay in Lisbon circa 1555 [5, pp. 102-103] because to date no evidence has come to light about such work. Besides, we have no

1 Before he lived in Madrid, where he died, Guevara spent many years in Flanders where his father, Diego de Guevara (ca. 1450-1520), had been the Spanish crown’s ambassador since the days of Emperor Charles I of Spain and V of Germany (1500-1558).

idea of the length of that supposed stay, and we must not forget that Juan Flores was also a master easel painter, a trade he practised in Spain and possibly Portugal as well. Consequently, we do not know whether during that presumed first stay he had occasion to apply on Portuguese clay the tile painting procedures he had learned in Antwerp. However, the results of the analyses performed suggest that while the author of the finest azulejos at Bacalhôa had acquired that previous experience, he may have had lingering doubts about the compatibility between his procedures and the clay commonly used in Lisbon [6]. That may explain why on this occasion he not only brought some painted tiles with him but a considerable number of biscuits probably made with the clay he was accustomed to using in his workshop, destined for the most critical works that awaited him at Bacalhôa. It is logical to think that this would have enabled him to avoid risks when firing in Lisbon the more delicate figurative panels that he had been commissioned to make during his initial works at the Pleasure House, for which he had to deploy the full extent of his expressive skills and invest an enormous amount of time. It is equally understandable that the painter began his work in that particular building because it demanded the direct intervention of the most skilful artist of the team, and because of his deferred work for Philip II [4] may well have been thinking that he could not extend his stay in Portugal indefinitely.

However, it would appear that he was not the only painter who worked on the azulejos in this space. If we analyse the pictorial style and the skilfulness of the painting, it becomes apparent that there were at least two authors. The most highly qualified artist, possibly Flores, painted the two narrative panels and may have participated in the painting of the patterned azulejos that surround the scenes and line most of the walls in this room. A second painter appears to have authored the panel depicting the River Tagus.

The work process must have been planned very carefully because the central room was the most important space in the Pleasure House. In addition to its location at the axis of symmetry, it fulfilled a special function as the space where the palace residents and their guests were able to access the lake, whether to bathe, fish for carp or take a boat out on the water. We do not know if this space was also used as a changing room for the bathers.<sup>2</sup>

We can deduce the importance of this room from the aesthetic emphasis of the decoration, notably the iconography of the three pictorial panels included in the mural ornamentation which allude to water, wine-induced excesses and the exaltation of the virtue of chastity. The first panel, which presides over the room, features the River Tagus allegory. The second panel, situated on the left wall above a door, represents the scene of the *Abduction of Hippodamia* by an inebriated centaur, and on the opposite wall, above the other door, we see the third panel, which depicts *Susanna and the Elders*. The remaining wall surfaces are lined with patterned tiles and a high skirting board of the same material runs around the entire perimeter of the room. We do not know what motifs decorated the stucco ceiling, now lost, or what the original paving looked like, although it was probably considerably more delicate than what we see today. The only extant elements today, therefore, are large parts of the wall decoration, executed with azulejos featuring repetitive motifs probably intended to resemble rich fabrics, and three majolica panels with their frames, which look like paintings on wood panel, hanging on the three available walls.

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2 The two wooden doors that prevented access to this space from the two adjacent galleries have been lost. Only the hinge holes in the thresholds remain today. The doorway that opens onto the lake never had a door, although we do not know if it had a curtain.

## 2. ICONOGRAPHIC AND STYLISTIC NOTES

### 2.1. The River Tagus allegory

Adorning the rear wall is the allegorical figure of the River Tagus, a logical choice because the waters of its minor tributary, the São Simão stream, feed the lake in front of the pavilion, and in turn those waters are used to irrigate the plants in the kitchen garden and the orchard.<sup>3</sup> The Tagus allegory is therefore a symbolic tribute to the element to which the estate owes its fertility, cool temperatures and the pleasures of bathing (Figure 1).



**Figure 1.** The remains of the River Tagus allegory (image © Associação de Coleções | The Berardo Collection)

This is not the only fluvial allegory painted on azulejos at Bacalhôa. In fact, the estate boasts a veritable collection comprising another six such panels. One represents the River Tagus, like this one, and is today on display in the *Museu do Palácio da Bacalhôa*, although we are not sure where it was located originally [3, p. 27]. That second allegory of the Tagus has reached us in a fragmentary state, like the one in the Pleasure House, but its stylistic characteristics are very different from the panel that interests us here. By contrast, the other five river allegories are all in good condition and in all likelihood they have always adorned the palace loggia that faces west and opens onto the Boxwood Garden.

Fluvial allegories became very common in the Renaissance after the colossal sculptural group of the River Nile, carved out of white marble, was discovered by chance in 1515 at the Campo Marzio in Rome. By all accounts, it adorned the *Serapeum Campense* dedicated to the Egyptian deities Serapis and Isis. Today, this sculptural group is thought to be a Roman copy of a Greek work of the Hellenistic school of Alexandria. Some scholars

3 It is important to note that the flow rate of this tributary must have gradually diminished because there is no trace of the river bed today, although the area it occupies is rich in underground waters from the north face of the Sierra de Arrábida.



believe the marble version may have been inspired by another work in black basalt, which Pliny the Elder described as being in the Forum of Peace. Nowadays on display in the Vatican Museums, for centuries the famous marble version graced the Vatican's Belvedere Courtyard, which is known to have been frequented by the artists of the Renaissance who visited the Eternal City to complete their training. In fact, a great painter from Antwerp, Maarten van Hemskerck (1498-1574), is the author of a drawing, now preserved at the British Museum, in which he depicted for the first time, circa 1532-33, the exact place in the Belvedere Courtyard where the famous Hellenistic allegory of the Nile and another of the Tiber were situated, face to face, near the Laocoön Group (inv. 1949.0713.639). The drawing must have returned with the painter to the Netherlands after his stay in Rome, dated between 1532 and 1537. Circumstances such as this led to the spread of the iconographic model throughout Europe, where it was adopted by many cities built on the banks of a river. Lisbon was one such city and the River Tagus, the source of its commercial prosperity, could not be an exception in this popular phenomenon. Rome did the same with the Tiber, Seville with the former Betis, now Guadalquivir, and even Madrid had its allegory of the modest River Manzanares, a tributary of the Jarama which in turn flows into the River Tagus.

As well as the emblematic river of Lisbon, the Tagus subsequently played a very special symbolic role during the days when the kingdom of Portugal was united to that of Castile by virtue of the physical fact of being a shared watercourse and a direct trade route between the two courts. In 1619, Philip II of Portugal and III of Spain visited the great Portuguese city and the details of the event were recorded in a book by João Baptista Lavanha (1555-1624), the famous mathematician and cosmographer of Genoese roots who served both crowns [7]. Published in 1622, the book's frontispiece features an allegorical image of the River TAGVS engraved by the Flemish artist Joan Schorquens, who was born in Antwerp in the late 16th century (Figure 2) [8].



**Figure 2.** Top of the frontispiece of the book by João Baptista Lavanha (1622) (image: Biblioteca Nacional de Portugal PURL 28507, through Wikimedia Commons).

Although we have not found a specific illustration that may have served as the model for the Tagus allegory in the Pleasure House, we have identified a similar one from the Flemish art circle of Juan Flores (Figure 3). It is a river allegory engraved by Abraham de Bruyn (1539-1587), an artist who worked in Antwerp for the printing house of Cristophe Plantin, where the best editions promoted by Philip II were printed. We know that the members of the Floris family maintained close ties with Plantin and they undoubtedly used numerous illustrations produced at his printing house.



**Figure 3.** River allegory by Abraham de Bruyn (1540-1587) (image: National Gallery of Art, Washington, A. Nr. 1950.2.5).



Unfortunately, only 46 of the 91 original azulejos in the allegorical panel of the River Tagus in the Pleasure House have survived and it is therefore difficult to gain an idea of the exact original appearance of the central scene, but it probably featured the conventional allegorical figure of the river set within a landscape of cattails with a large ceramic or metal vase from which the water poured. By contrast, it would be very easy to reconstruct the cartouche that frames the scene because its composition coincides literally with one of the two patterns adopted in the five river allegories in the palace loggia that opens onto the Boxwood Garden, which were analysed on another occasion [9]. Specifically, the model followed here is the same as the one that frames the EVPHRATES and DOVRO rivers. This is not the only coincidence we find between this panel and those in the Gallery of the River Gods, as the loggia is called today: the size of the azulejos, the dimensions of the panel itself (7 x 13 azulejos), the composition of the biscuit and the type of glaze are all almost identical. Unlike most of the other tiles in this room, even the pictorial style of the panel suggests that its author may have participated in the aforementioned set of panels in the loggia. In fact, all the panels may have been made at the same time and at the same workshop. If so, that would mean that this first panel was the only one of the three in this room that was not painted by Juan Flores but by one of his collaborators. We do not know what may have motivated this decision, but it clearly demonstrates that even in this special place the work was undertaken by several painters.

## 2.2. *The Abduction of Hippodamia*

The panel depicting the abduction of Hippodamia is in a similarly poor condition because of the 112 original azulejos barely 58 have survived, some of them intact but many others only as fragments. Azulejos that depict faces are known to be greatly coveted by looters of this type of work, and the multitudinous nature of this scene probably held a particular appeal for predators. The original panel would have included numerous complete faces but only three remain today, all broken due to failed attempts to remove them.

Despite the fact that many pieces are missing, we can perceive from the extant ones that the author of this panel was a highly skilled artist, on a par with the author of the *Susanna and the Elders* panel. They may even have been the same person. Unlike the river allegories, these scenes are not framed by elaborate *feronnerie* cartouches, frequently found around wall paintings, but instead have a simple border of glyphs in the manner that became popular in paintings on wood panel during the classicist Renaissance period.

The episode we know as the *Abduction of Hippodamia* or the *Battle of the Lapiths and Centaurs* is a well-known tale from classical mythology which Ovid described in Book XII of his *Metamorphoses*. Hippodamia was the daughter of the king of Argos and famed for her beauty. When she married Pirithous, king of the Lapiths, the monarch invited all the inhabitants in his kingdom to the wedding banquet, including the centaurs. Unaccustomed to drinking wine, these mythical creatures, part man and part horse, became inebriated during the feast. Under the effects of the alcohol, Eurytus, the chief, abducted the beautiful Hippodamia and his fellow centaurs seized the other women and even some of the young men. This led to a fierce battle in which the Lapiths finally managed to rescue the victims and punish their savage guests for their debauchery. In the struggle, Pirithous was aided by his friend Theseus. Ovid's text describes one of the moments of the battle as follows: "For savage Eurytus, wildest of the wild centaurs, now inflamed with sudden envy, drunkenness and lust, upset the tables and made havoc there so dreadful that the banquet suddenly was changed from love to uproar. Seized

by the hair, the bride was violently dragged away. When Eurytus caught up *Hippodame* each one of all the centaurs took at will the maid or matron that he longed for most. The palace, seeming like a captured town, resounded with the affrighted shrieks of the women.”

The azulejo panel does not describe the moment of the battle but the episode that triggered it, in which Eurytus attempts to abduct Hippodamia by prising her from the grasp of her husband Pirithous, who tries to prevent it while simultaneously looking over his shoulder to call for assistance from his friend Theseus, who responds immediately by unsheathing his sword (Figure 4). Luckily, parts of these three figures escaped the brutal destruction of the panel, especially Theseus who is missing his head and a foot.



**Figure 4.** *The Abduction of Hippodamia* (image © Associação de Coleções | The Berardo Collection).

However, unlike the River Tagus allegory, in this case we do know of an engraving that may have inspired the panel: a print made in Rome in 1542 by Enea Vico (1523-1567)-Figure 5. Santos Simões referred to this possibility advised by Mrs. Scoville, then owner of the estate, who had found a copy from this series in the collections of the National Gallery in Washington [10, p. 105- note 27].

There is no objective reason to doubt that the painter of the Bacalhôa panel, most probably executed ca. 1565, followed the print by Vico, however it should be borne in mind that this print was neither the only one to reproduce this iconographic model nor the first to do so, as can be deduced from certain depictions prior to its date. For example, a maiolica plate attributed to the so-called “Painter of the Apollo basin” depicts the same scene with the arms of the Vitelli family (Figure 6a).<sup>4</sup> The painter dated his work on the back

4 The plate was auctioned at Sotheby’s on 19 January 2016 (lot 166) and was attributed by John Mallet. See Mallet, “Il Pittore del Bacile di Apollo”, in Gian Carlo Bojani (ed.), *La Maiolica Italiana del Cinquecento, Il Lustrò Eugubino e l’Istoriato del Ducato di Urbino*, Florence, 2002, pp. 89-90.



of the piece, indicating on a *tabula ansata* the year 1[5]33, when Vico (who only began his activity following his arrival in Rome in 1540) was ten years old.



**Figure 5.** *The Abduction of Hippodamia*, Enea Vico, Rome, 1542 (image: [www.lacma.com](http://www.lacma.com) M.88.91.235).

A ceramic work of higher quality is a plate in the Victoria and Albert Museum, in London, depicting a similar scene, reasonably attributed to Nicola da Urbino (1480-1537/38). Despite being a similar scene to the present one, the work was purchased in auction as *The Rape of Helen* and was originally presented as such (Figure 6b).<sup>5</sup> It is dated by experts to ca. 1533 and, in any case, if it was by Nicola da Urbino it would have to predate his death in 1537/38<sup>6</sup> and that of Frederick II Gonzaga whose heraldic arms appear on the plate and died in 1540. Other ceramic works reproduced the same subject at less certain dates but with very similar iconography. An anonymous plate is in the *Palazzo Madama* in Turin; another, in the collections of the *Kunstgewerbemuseum* in Berlin, is attributed to Orazio Fontana (1510-1571); and a large bowl is in the Metropolitan Museum in New York.

5 On the back of the plate the artist wrote: “Chrono paris Rapi elena al tenpio”, although it is clear that this is a personal contribution by the artist, as it does not appear in any of the known prints.

6 Date given in Gordon Campbell’s “The Oxford Dictionary of the Renaissance”, Oxford University Press, 2003.



**Figure 6.** Maiolica plates with similar depictions of the abduction of Hippodamia. Left side (6a): dated “1[5]33” and attributed to the “Painter of the Apollo basin”; Right side (6b): 1535-1538, attributed to Nicola da Urbino (image © Victoria & Albert Museum C-2246. 1910).

From the date of those two maiolica plates it can be inferred that there were probably other prints prior to Vico's that reproduced the same composition of this subject, although none of the several we have found so far is dated before 1542. What is certain is that Vico's print and others of similar appearance - of which we have identified up to eight - were extremely successful and hence the existence of numerous works that reflect compositions very similar to the prints. There are known versions in wall paintings, such as one by an anonymous Italian artist (ca. 1580) that decorates the *Palazzo Besta* in Teglio (Lombardy); a panel by an anonymous Dutch artist from the second half of the 16th century (Inv. 436) in the *Staatliche Kunsthalle* of Karlsruhe (Inv. 436); an oil on canvas, also anonymous, in the *Musée Magnin* in Dijon; and an oil on panel in the Vienna trade (Dorotheum, 14 April 2005).<sup>7</sup>

Although it is very possible that the painter of the Bacalhôa panel used Vico's print of 1542 as a source, even though there must have been earlier prints of possibly higher quality of the same composition, it is not so clear that all these works reproduced one by Rosso Fiorentino. The attribution is due to Giorgio Vasari,<sup>8</sup> but there are several arguments that point in another direction. In principle, some of the engravings that reproduce it, in particular the Lebas print (1803), indicate that the composition is by Raphael. Despite this, in “Le Peintre Graveur” Adam Bartsch takes up Vasari's attribution, thus encouraging other later authors to maintain it. However, if we look at the style of all the prints and the works that they inspire, none of them points to Rosso's very personal style, and yet all of them reflect the style of Raphael or of his most close disciples. Other authors have suggested Salviati and also Perino del Vaga. The latter is suggested in the painting's file in the *Musée Magnin*. Indeed, the style followed in these paintings, ceramics and prints

7 This painting was subsequently auctioned at Christie's in London on 9 June 2010 (lot 212).

8 “Enea Vico da Parma, il quale [...] intagliò in rame il ratto d'Elena del Rosso” (Enea Vico from Parma who engraved in copper the abduction of Helen, by Rosso) Vite, volume 7, Sienna 1792, p. 157.

is close to the work of Raphael's pupils in Rome, and not so much to the Mannerists of Fontainebleau. Incidentally, it should also be noted that all the versions of this work, whatever their medium, differ markedly from the only interpretation of this subject documented as a work by Rosso: his fresco decorating the Gallery of Francis I of France at Fontainebleau, painted c. 1533-1539.

The signature on the Vico illustration (Figure 5) appears in a small cartouche at the foot of the composition: "ENEA/VICCO/FACIEBA/T/1542". On the right, we see the abbreviated signature "TOM. BARL. EXC", which must refer to the printer Tommaso Barlacchi.<sup>9</sup> We do not know whether the author of the Bacalhôa panel used a similar cartouche to insert his signature and the date, now lost, but it seems unlikely because the proportions of the rectangle on the illustration do not coincide with those of the azulejo panel, which is more horizontal. The painter of this panel did not change the arrangement of the figures but simply cut off the bottom of the composition in the illustration, eliminating part of the ground. With the same intention, he increased the distance between Pirithous and Theseus, extending the size of the banquet table by exactly one tile length and adding a plate at its left side, next to the lying jug that appears in the print, an object that must have been a personal contribution by the panel's author as it does not appear in any of the known engravings. But the fact that, by removing a column of tiles, the panel and print may be superimposed (Figure 7) suggests that the stencil he used to paint the scene must have been taken literally from the illustration, on which he would have created a grid to transfer the composition to the panel, making the scale slightly larger than the original.

There is some debate about the identification of the episode depicted on the illustration because Vasari, who was familiar with it, interpreted it as the Abduction of Helen, and some modern authors who do not recognise the centaur in the scene have accepted this hypothesis. However, it is plain to see that the figure that abducts Hippodamia is a centaur with long ears, a vine wreath on his head in reference to wine and his inebriation, and the body of a horse. We cannot see the front legs because they are concealed by his body and the clothes of the abducted woman, and also because he is depicted in the prancing position, resting only on his back hooves.<sup>10</sup>

The choice of this episode, inspired by a classical text that enjoyed great popularity during the Renaissance, is probably related to the banquets that the Albuquerque-Noronha couple offered to guests at their Azeitão retreat. The Hippodamia episode, represented in this precise location, may be interpreted as a type of veiled warning to guests about the risks of immoderate drinking and the uncontrolled erotic appetites that could ensue if the diners did not exercise caution during the feast. It is well-known that "moderation", the virtue which the Greek *paideia* called "sophrosyne", was one of the guiding principles in the education of virtuous citizens in classical Greece. The term, and the concept it describes, is equivalent to the Latin "temperantia" (temperance), which

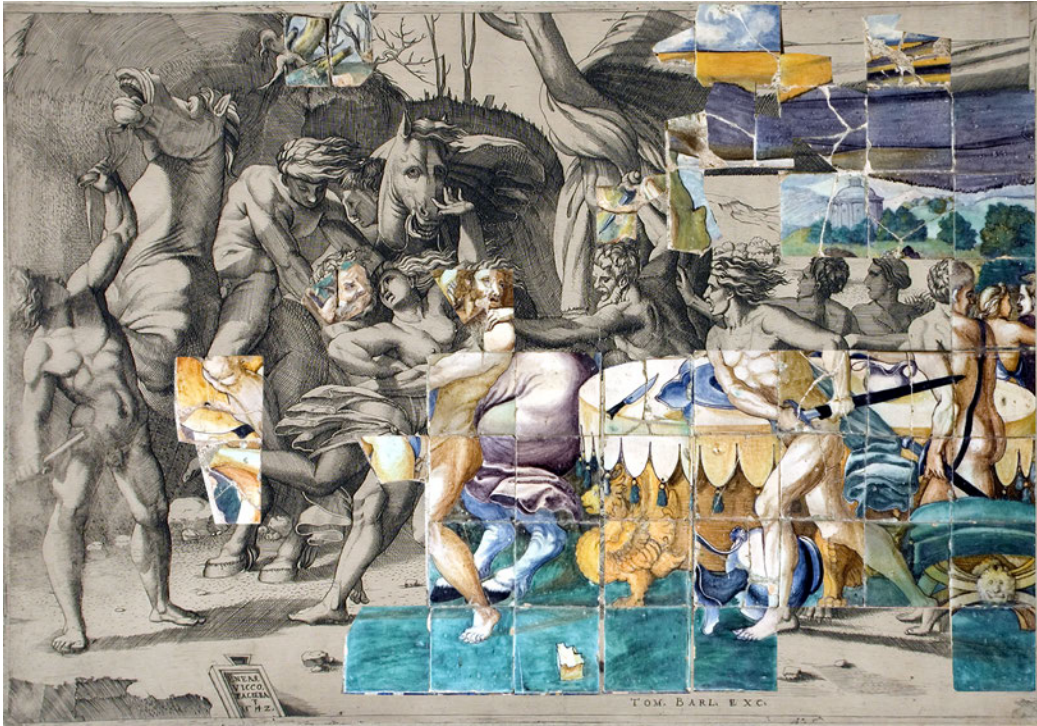
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9 We are grateful to Dr. Juan Antonio Gómez for his assistance with the aspects surrounding the issues prompted by the Vico illustration and its subsequent influence.

10 The known scenes of the *Abduction of Helen* do not include centaurs and the action usually unfolds by the sea, suggesting the voyage between Sparta and Troy, or at least boats or their sails are visible behind the figures. We will not deal on this occasion with the different titles that could be given to this scene, which probably served the artists with minor modifications - or without them - to apply to the various abductions of women narrated in classical myths. The two most frequent titles applied to this scene are the abductions of either Hippodamia or Helen, although there were also other more forced ones.



incidentally is mentioned along with the other cardinal virtues in the azulejo cartouche above a door in the room adjacent to the place where this panel is located.



**Figure 7.** Superposition of the remainder of the panel, minus the column of tiles that make up the extra length, over the print (image © Associação de Coleções | The Berardo Collection).

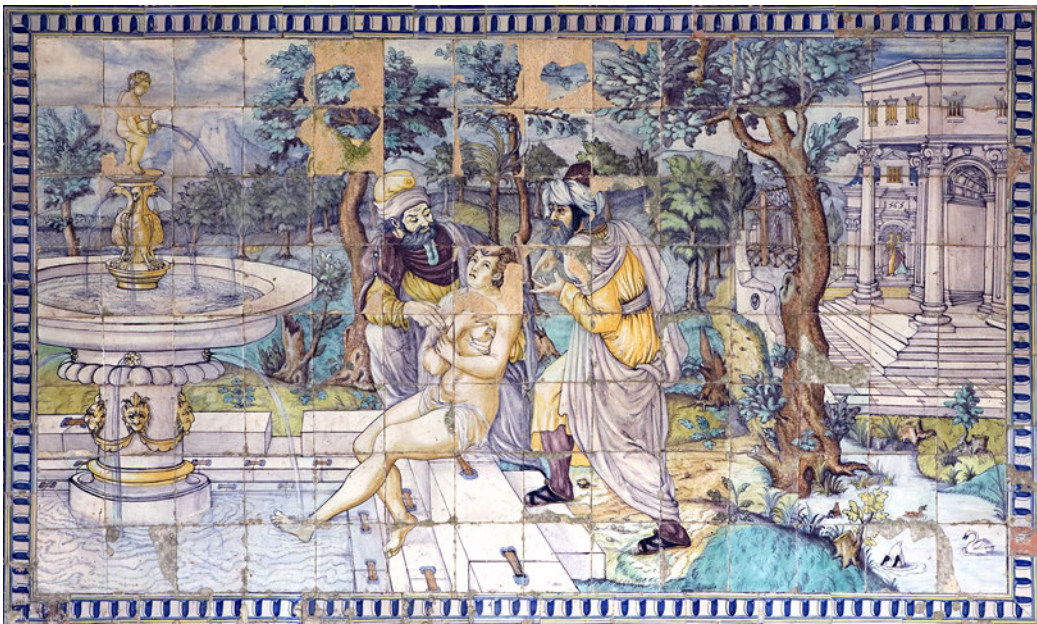
### 2.3. *Susanna and the Elders*

Several factors have contributed to make this panel (Figure 8) the most famous image at Bacalhôa, not least its sheer beauty and the relatively good condition in which it has reached us. The fact that it is still largely intact is astonishing because the central motif – an almost completely naked figure being sexually harassed – could have severely challenged modesty and conventional morality. Indeed, it is remarkable that it has never been censored in any of the waves of puritanism that have swept across Catholic Europe since 1565 to the present day.

The panel was painted by an artist with excellent academic training who attempted to reproduce with a ceramic procedure the same degree of reality that painting achieved in the 16th century in Italy and Flanders. Contemplating this “istoria insigne”, as the humanist Felipe de Guevara would have described it, we can imagine the paintings that must have graced the interior walls of Brás [Afonso] de Albuquerque’s country estate.

The story of Susanna is one of the episodes in the Book of Daniel (Ch. 13) that was incorporated into the Bible at a very early date, perhaps in its Greek and Latin versions in the first century BCE. Its propaedeutic message is related to the heroic defence of female

chastity. Susanna was the wife of Joakim, who lived in exile in Babylon and, according to some scholars, was a wealthy Jew. Two elders conspire to lie in wait for Susanna and rape her, and an occasion arises when the beautiful young woman is applying oils before bathing at the fountain in her husband's lush garden. The panel depicts the moment when Susanna is accosted by the lustful elders. When she rejects them, they plot their revenge by accusing her of having committed adultery with a young man they have seen lurking nearby. Defenceless before the false accusation, Susanna cries in despair, silently begging for divine protection. After a hasty and controversial trial that condemns her to death, she is led to the place where she will be stoned. However, the prophet Daniel unexpectedly halts the group before they reach their destination and accuses the judges of having reached their verdict without full knowledge of the facts. He proposes interrogating the two elders separately, and when this course of action is pursued the accusers offer contradictory versions of the event, making their lie plain to all the observers. Daniel was still a young apprentice in the art of counsel – or the legal sciences, as we call it today – at the court of Nebuchadnezzar. The teaching behind the story presents the young Daniel as a defender of justice and Susanna as a virtuous woman and the victim of vengeful slander who is saved at the last minute by the divine justice exercised through the intervention of the prophet Daniel.



**Figure 8.** Panel of *Susanna and the Elders* (image © Associação de Coleções | The Berardo Collection)

As in the case of the *Abduction of Hippodamia*, the painter of these azulejos may have drawn inspiration from an illustration but unfortunately we have not found the source. The theme must have been very well known at the time because it was interpreted in countless ways by Italian and Flemish painters and sculptors. Abraham de Bruyn (ca. 1539-1587), the aforementioned engraver from Antwerp, made a series of different scenes from the story of Susanna, some of them signed and dated in 1570, so Flores must have drawn inspiration for this work from an earlier source. The great Flemish painter



Maarten van Heemskerck (1498-1574) made a series of drawings on this same theme which were engraved by Cornelis Cort in 1566, which also rules him out as a possible source of inspiration [11].

Irrespective of the graphic source that may have inspired the composition of this ceramic panel, two aspects draw our attention: the quality of its pictorial execution and its distinctly Flemish air. The first aspect is observed in the firm drawing made with fine black lines by a confident hand. The palette is broad and nuanced, including as many as seven different hues: deep black, purple-black, grey, chestnut ochre, golden ochre and two shades of green. Some of the traits of the work betray the author's Flemish training, such as the depiction of the animals scattered around the landscape, the creative freedom with which he interprets the Doric order and his minute attention to the details. The white marble and gilt bronze fountain where Susanna prepares to bathe acquires a special prominence. At its apex, a boy pours water from a jug, while the four eagles that form the pedestal of its base expel water through their open beaks, filling the fountain's upper basin. Beneath it, water spouts from four bronze jets to fill the lower tank in which Susanna has already introduced a foot when she is accosted by the elders. Another interesting detail is the close attention which the painter paid to the system that was used to join the blocks of marble in fountains to prevent the loss of water: holes were made in the blocks and gilded bronze cramps with their ends turned down were inserted in the orifices which were then filled with molten lead.

Equally remarkable is the detailed depiction of the two garden pavilions on the right-hand side of the scene. The larger of the two is a *distyle-in-antis* portico with Composite order columns and pilasters raised on a stylobate accessed by three steps and covered by an entablature in which the triglyphs appear to be suspended as simple ornaments of the frieze. The rear of the portico leads to a passageway covered by a coffered barrel vault. Above the semicircular arch of the doorway we see a small spherical aeolipile or fire-blower, a motif that was frequently used in classicist architecture and appears in Renaissance architecture treatises.

The pavilion in the background is an *aedicula* with pilasters on a facade that culminates in a mansard with a pediment that stands out against a dark grey slate roof like the one that originally covered the rooms of the Pleasure House. The plain frieze is inscribed with the date 1565, denoting the painter's desire to indicate the year when this panel was made and, in all likelihood, the other azulejos in the room in which it is located. Two ladies emerge from the pavilion door, about to commence their stroll but oblivious to the elders harassing the chaste Susanna. Near the two women, a young man crosses a stream via a wooden bridge with a little fish-scale slate roof, possibly alluding to the passer-by who served as the excuse for the elders to make their accusation of adultery.

In terms of symbolism, the panel contains curious details which at first sight seem insignificant but may well hold hidden meanings. It is important to remember that the act which the lascivious elders interrupt is the bath, something which today we understand as a simple hygiene practice or an instinctive act that we share with many other living species. These species are possibly referenced by the group of ducks and swans swimming and plunging their heads into the waters of the little lake that occupies the bottom right-hand corner of the scene. However, in the 16th century, Christianity – and nearly every other religion since antiquity – viewed bathing as an important ritual act to purify the mortal body inclined by its human nature to commit sin. Our attention is drawn to the unusual, although perhaps intentional, location of the palm tree; a common

vegetal element in depictions of this theme, on this occasion it appears just behind Susanna, as if sprouting from her back. Compared with the other trees, the palm adopts a much smaller, almost symbolic scale, suggesting that it serves a metaphorical purpose here. After all, this was the plant that provided the Holy Family with sustenance on their flight to Egypt, and for Christians it has always represented the tree that bears fruit in the desert where the divine word is revealed to the prophets. It is also mentioned in the *Litaniae Lauretanae*, which compare Mary's purity with natural elements: "quasi palma exaltata sum", the phrase which in Christian theology recalls her victory over original sin. The palm tree in this scene is therefore probably a symbol of Susanna's carnal purity. Behind the oaks, palm and other trees we see the hedge that delimits the garden, perhaps recalling another of the metaphorical praises which the Song of Songs dedicates to Mary's purity and virginity by comparing her with a "hortus conclusus", an enclosed garden where the trees of a miniature paradise grow and bear fruit.

The symbolic dimension of the biblical story of Susanna is deeply rooted and begins with her name. Susanna is derived from the Hebrew word for the Madonna lily, which since antiquity has signified purity. The figure of Susanna is the biblical and mortal version of pagan deities like Demeter, Ceres and Pomona, all goddesses of the fertility of the land and marriage. According to legend, Pomona was constantly harassed by and had to defend herself from woodland fauns, the same fauns that populate the landscaped area in front of the rooms in the Pleasure House at this estate. In the biblical story, Susanna was not a goddess but a well-to-do mortal married to a wealthy man. Susanna's presence in the Pleasure House is evidently explained by the relationship with *María de Noronha*, wife of Brás [Afonso] de Albuquerque: like her biblical counterpart, she would have bathed in the lake that irrigates her husband's splendid garden and may have been secretly observed by anyone peering over the high wall that shelters the lake, possibly as an element of visual protection.

There is one final symbol which we can perhaps discover in a detail of the vegetation in this delightful garden at *Vila Fresca*. Flemish and subsequently Dutch painters were frequently experts in landscapes and vases, benefitting from the enormous advances in botany that were achieved in the Netherlands from the 15th century onwards. In the foreground of this particular scene of *Susanna and the Elders* we see three leafy holm oaks depicted in their usual greyish-green colour with thick, gnarled trunks in a much darker tone. Another two trunks of the same species – a withered one on the right and another sprouting afresh on the left – flank the protagonists. Holm oaks, emblematic trees of the Iberian Peninsula, are designated in Latin, like oaks, cork oaks and gall oaks, with the generic term "Arbor quercus", and it is perhaps no coincidence this is precisely the name from which *Alburquerque* in Spanish and *Albuquerque* in Portuguese are derived, the surname of the person who commissioned all of these azulejos.

## 2.4. The patterned azulejos in the central room

The pictorial panels described above perform the same role in this garden room as the oil paintings on wood panel in the interior rooms of the palace. Similarly, the ornamental repeated motifs that line the walls on which these panels hang (Figure 9) imitate the ornamental fabrics or embossed, gilded and polychrome-painted leathers that covered the walls of the interior spaces in the 16th century.



**Figure 9.** Patterned azulejos in the central room of the Pleasure House (image © Associação de Coleções | The Berardo Collection).

In this case, the motif chosen to decorate the patterned tiles in the room is what is generically termed “de lazo y follaxe” (loop and foliage) in the documents commissioning patterned tiles from Juan Flores in the 16th century. It is an apt name for this product because it mentions the two essential elements. The “loop” is formed by white bands that generate two interlocking patterns: one with quatrefoil medallions that resemble ironwork and, set within them, wheels with eight spokes that simulate the sails of a windmill. Four of the sails sit in front of the quatrefoil and four behind it. Extensions emerge from the quatrefoils forming the secondary motif, which is smaller and has four stylised vegetal finials that form the “foliage”. The vegetal element is completed with multi-petal flowers that appear in the centre of the main motif on the blank reserve, highlighted against a golden yellow ground. At their centre, the secondary motifs also have white flowers, somewhat simpler, set against a black ground. The white bands of the loops stand out against a deep blue ground. The brighter of the two shades of green used in the narrative panels serves here to fill in the background of four of the eight sails. The ornamental effect of this motif is truly remarkable and its execution demonstrates great command of the technique, although on some of the azulejos the painter forgot to trace the ochre outline around the shadows cast by the bands on the yellow grounds, or perhaps this omission evidences the intervention of a less skilled assistant.



## 2.5. The skirting

Lastly, the cladding in this room is completed by a skirting (Figure 10) which in our opinion contains several unusual stylistic characteristics. The first is the format, which differs from the skirting in the other two rooms in the Pleasure House where it is resolved with rectangular pieces placed horizontally and the special dimensions of ca. 26 x 13 cm. In the case of this central room, the azulejos are square and have the common dimensions of ca. 13 x 13 cm. Besides, the skirting here is formed by two azulejos placed one on top of the other, with the result that it is considerably higher than the skirting in the end rooms. A third and even more remarkable difference is that this skirting, unlike the ones we see in the end rooms, is made of simple patterned azulejos when the importance of this space would have suggested figurative tiles of the finest quality. Besides, the background is mainly white, which is highly unusual in the patterned tiles designed by Flores.



**Figure 10.** Skirting in the central room of the Pleasure House (image © Associação de Coleções | The Berardo Collection).

These differences would have made this skirting much cheaper to execute than the skirting boards in the secondary rooms, which seems contradictory. Lastly, most striking of all is the inferior quality of the design, execution and colours. We can infer this at a glance by comparing the azulejos in the skirting with the patterned ones above them. In this case, the drawing is far less assured, the blues are not as deep, the greens greatly evaporated during the firing have contaminated the immediately adjacent white background, and we can even discern unexpected confusions of colour between the yellow and ochre elements.

Although we have no clear explanation for this apparent anomaly, it certainly raises questions. If this central room is the most important one in the Pleasure House, as its position at the axis of symmetry, architectural function and decoration would appear to confirm, why does the skirting reveal an inferior artistic quality than the skirting boards in the end rooms, which were presumably less important? If this room was where

bathers changed, could the lower part of the wall have been semi-concealed by a bench for their clothes? Inevitably, another unknown quantity springs to mind, if only as a reflection: which room was the intended destination of the skirting tiles with children's scenes that were discovered in the subsoil outside their original context [3, Figure 37] and are currently held in the *Museu do Palácio da Bacalhôa*?

### 3. ANALYTICAL CHARACTERIZATION BY SEM-EDS

#### 3.1. Samples

The panels, patterned tiles and skirting tiles were sampled from *in situ*, to which were added samples of the Tagus river god panel, patterned wall tiles and skirting band taken from fragments conserved at the reserves of the *Museu do Palácio da Bacalhôa*. Figure 11 illustrates some sampling spots and the codes attributed through which the samples will be referenced. Sampling was done with a scalpel, in areas already damaged.

Table 1 includes data on each sample studied. The first column (Identification) includes the name of the panel or other similar exclusive labelling, by which the object will be identified. The second column (Sample References) includes the technical reference of the items prepared for observations and analyses. The last column indicates how many measurements were averaged in the semi-quantification of the chemical composition of each.

**Table 1.** Name of items with short-name underlined, sample references, and number of analytical results averaged

Identification	Sample References	Total no. of results
<u>Susanna and the Elders</u>	Bac001/01; -/02; -/03; -/04	5 (glaze); 3 (biscuit)
<u>Abduction of Hippodamia</u>	Bac024/01; -/02	3 (glaze); 2 (biscuit)
<u>Tagus river god</u>	Bac006; Bac017/01; -/03; Bac083/01	9 (glaze); 9 (biscuit)
<u>Wall patterned tiles</u>	Bac003/01; -/02; -/03; Bac040/01; -/02; Bac078; Bac142	9 (glaze); 6 (biscuit)
<u>Skirting band tiles</u>	Bac075/02; -/03; Bac114; Bac136; Bac161	4 (glaze); 5 (biscuit)
<u>Susanna frame tiles</u>	Bac096/01; -/02	4 (glaze); 4(biscuit)
<u>Hippodamia frame tiles</u>	Bac074	1 (glaze); 1 (biscuit)
<u>Tagus frame tiles</u>	Bac064	2 (glaze); 1 (biscuit)

*Susanna and the Elders* (Bac001/01)



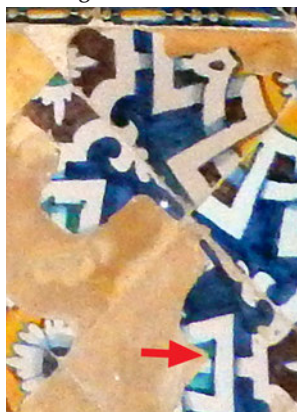
*Abduction of Hippodamia* (Bac024/01)



Tagus river god (Bac017/01)



Wall patterned tiles under the Tagus frame (Bac003/01)



Susanna frame tile (Bac096)



Tagus frame tile (Bac064)



**Figure 11.** Examples of sampling spots on previously damaged areas of the panels and patterned tiles addressed by this paper (images © Associação de Coleções | The Berardo Collection).

### 3.2. Methods and instrumental means

The azulejo samples were stabilised in epoxy resin, lapped and polished to obtain a flat cross-section for observation and analysis by scanning-electron microscopy coupled with an X-ray energy-dispersive spectrometer (SEM-EDS).

SEM observations and EDS analyses were made at LNEC using a TESCAN MIRA 3 field-emission microscope combined with a BRUKER XFlash 6|30 EDS system. The samples

were uncoated and the observations were made in backscattered electrons mode (BSE), with a chamber pressure of typically 10 Pa, at an accelerating voltage of 20kV with the sample sections at a distance of  $14 \pm 1$  mm from the detector. SEM images were typically acquired at magnifications of 350 x and 700 x for the glaze and 1,000 x or over for inclusions in the biscuit.

The selection of areas for EDS quantification avoided large inclusions in the glaze or biscuit representing more than ca. 5% of the full selected area. From our previous experience, the adequate minimum measurement areas are  $200 \times 200 \mu\text{m}$  for glazes and  $500 \times 500 \mu\text{m}$  for biscuits. In general, multiple measurements were made and in such case the results are averages and smaller non-overlapping areas may be used to the same effect. Whenever possible, the analyses were performed on white glazes to avoid interference from elements diffused from the blue, green or violet pigments which, when present, were neglected. The yellow pigments remain at the surface and therefore do not entail the same problem. Still, in the case of zinc-bearing yellow pigments, the analyses must be performed at a safe distance from the colour.

Minor elements, usually representing less than 1% of the compositions, such as magnesium (Mg) and iron (Fe) in the glazes, or titanium (Ti) in the biscuits were not included in the tables of results.

The quantification of tin (Sn) in the glazes may be problematic because the aggregation of crystals often results in a large variance. That problem was dealt with by using larger areas whenever aggregation was visually detected in the SEM images or, when that was not possible, averaging the results of multiple analyses on different areas.

The amount of oxygen (O) was calculated through the remaining elements stoichiometry of their most commonly considered oxides ( $\text{Na}_2\text{O}$ ,  $\text{MgO}$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2$ ,  $\text{K}_2\text{O}$ ,  $\text{CaO}$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{SnO}_2$ ,  $\text{PbO}$ ) and the result was normalised to 100 %.

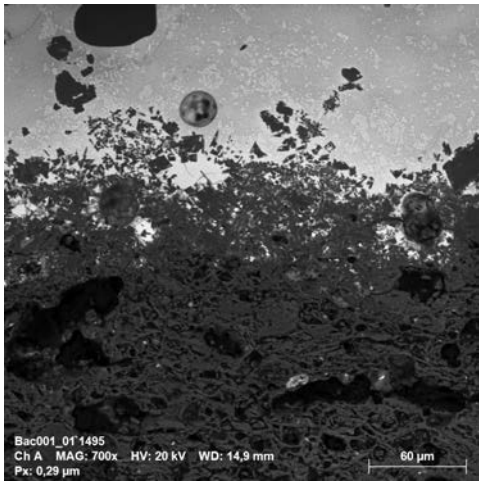
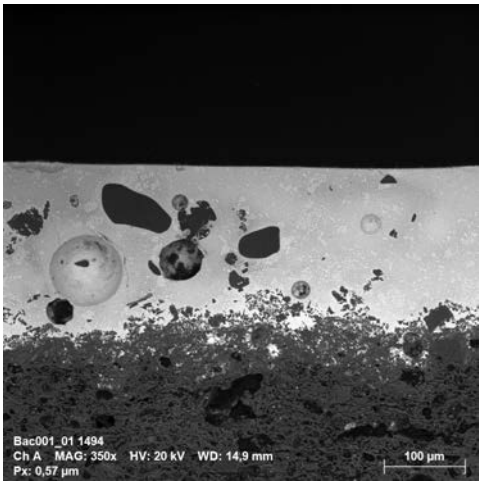
### 3.3. Results

#### 3.3.1. Morphology of the glazes

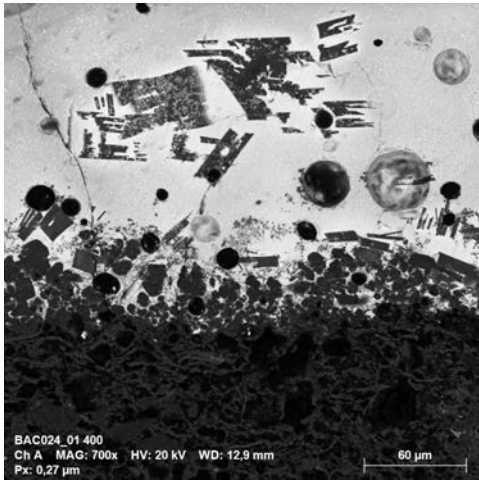
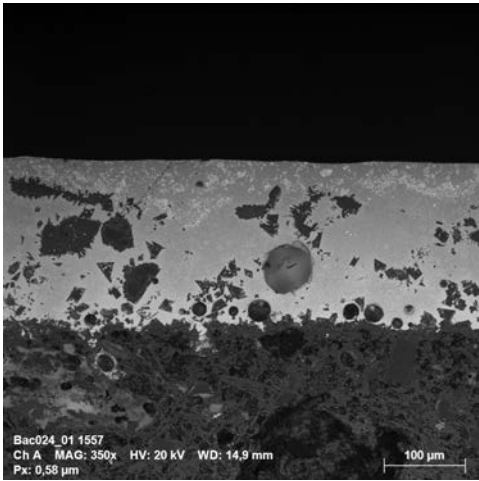
Figure 12 depicts, at the same magnifications for comparison purposes, sectional SEM images of the samples showing the main micro-morphological characteristics generally associated with the glazes and their interfaces. The light grey area on top is the glaze, while the dark grey area corresponds to the biscuit. Because of its colour, the inclusions in the glaze are conspicuous: gas bubbles retained in the glass, grains of sand (larger compact dark inclusions, usually with rounded edges) and bits of feldspars, often in disaggregation. The white spots in the midst of the glaze are crystals of the opacifier (tin oxide) while a continuity of similar white spots near the surface of Bac 024/01 and Bac017/01 corresponds to the lead-rich yellow pigments. It will be noticed that *coperta* (a layer of sprinkled transparent glaze) may have been applied over the yellow colour in those two cases but its presence is doubtful because what is seen may result from the yellow pigment being painted already dispersed in glaze without tin. On the other side, optical images of samples from the wall patterned tiles, skirting tiles and frame tiles, in which the yellow pigment was applied in a denser layer, show that in the tiles sampled representing these cases *coperta* was clearly absent.



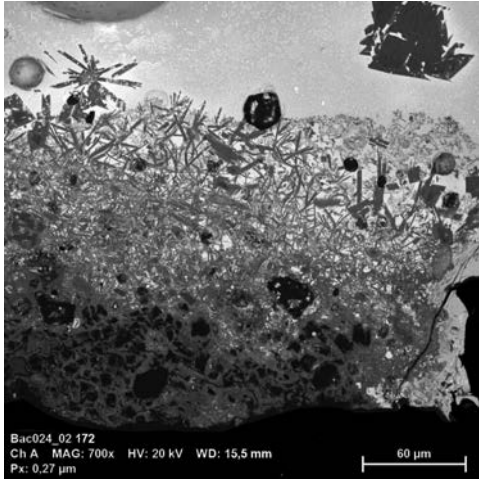
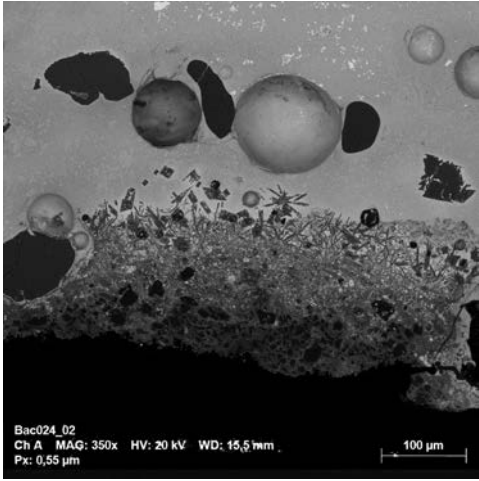
Bac001/01 (*Susanna and the Elders*)



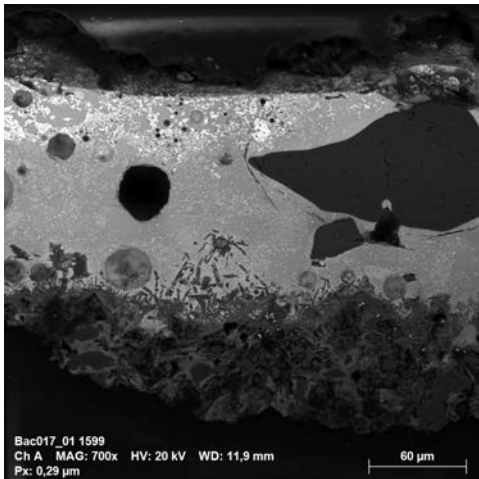
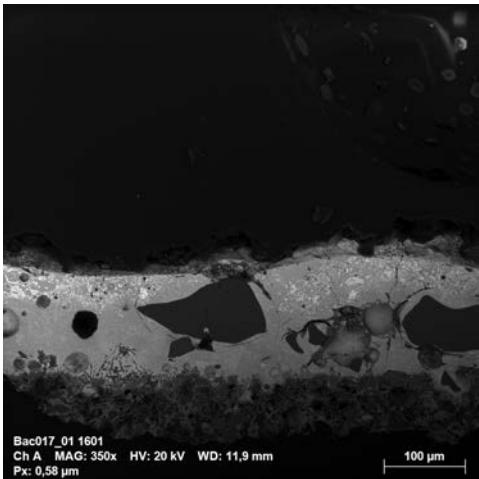
Bac024/01 (*Abduction of Hippodamia*)



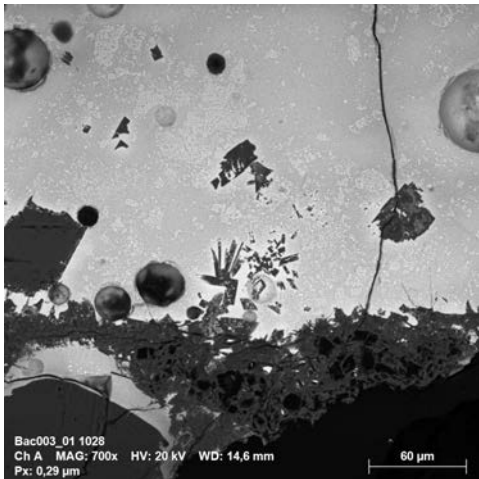
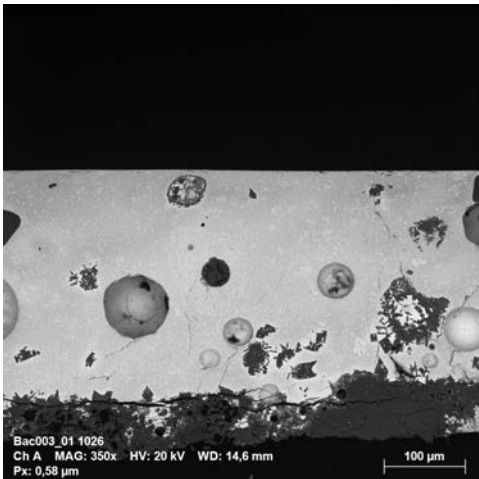
Bac024/02 (*Abduction of Hippodamia*)



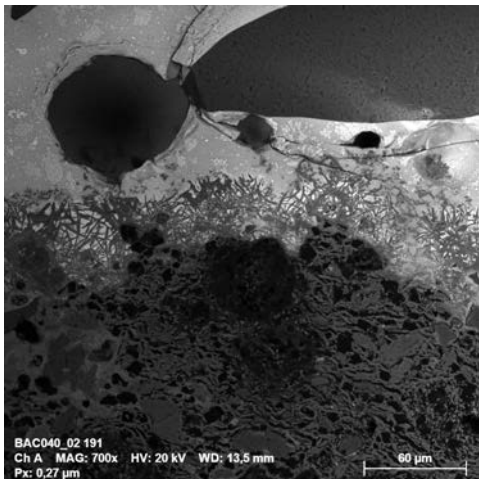
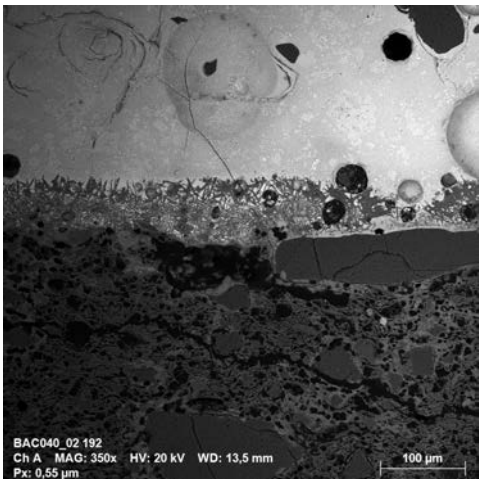
Bac017/01 (Tagus river god)



Bac003/01 (Wall pattern)

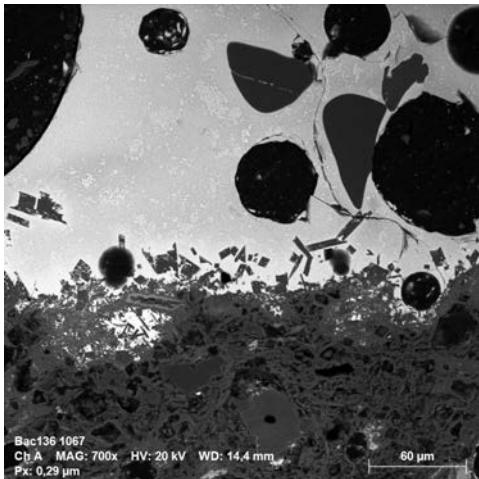
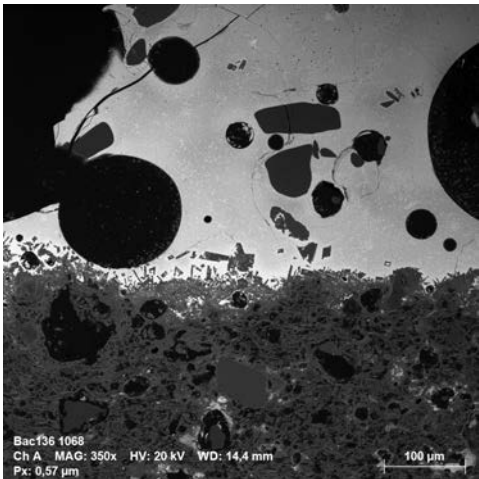


Bac040/02 (Wall pattern)

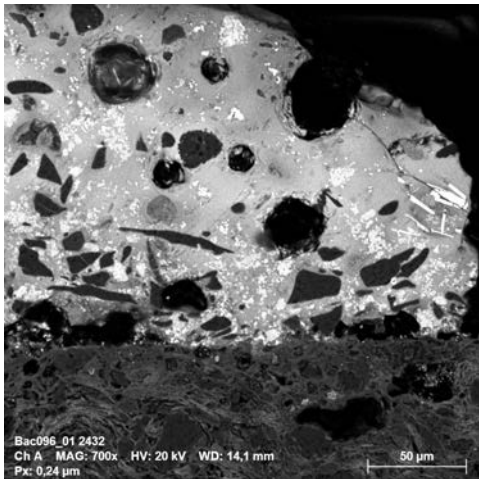
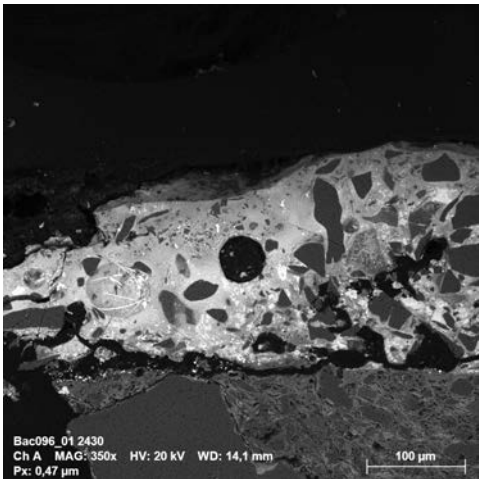




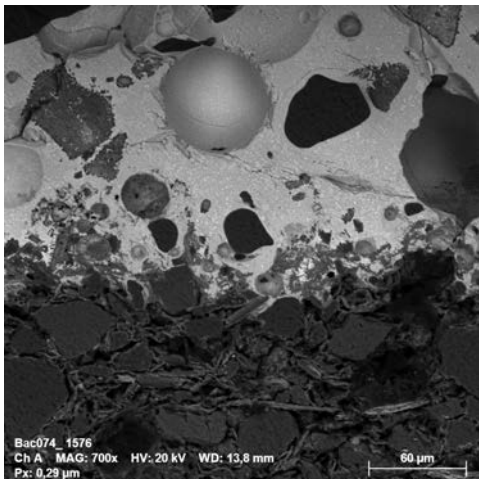
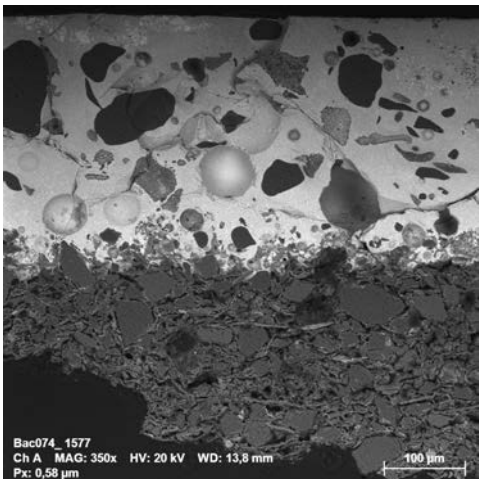
Bac136 (Skirting pattern)

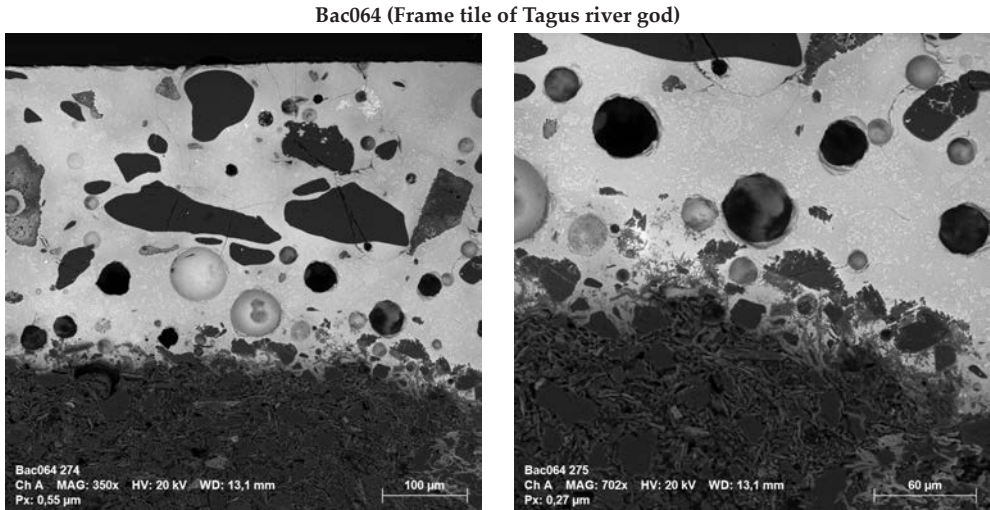


Bac096 (Frame tile of *Susanna and the Elders*)



Bac074 (Frame tile of *The Abduction of Hippodamia*)





**Figure 12.** SEM-BSE images showing the main micro-morphological characteristics of azulejos of the central room of the Pleasure House of Bacalhôa. Left side: glaze section at 350 x; Right side: detail of the biscuit-glaze interfaces at 700 x (images LNEC).

### 3.3.2. Composition of the glazes

Table 2 includes the semi-quantitative results of analyses of the glazes by EDS in weight %. The distinctive silica to lead ratios (Si/Pb), that determine the minimum temperature at which the glazes may be properly fired, have been evaluated and are included in the table.

**Table 2.** Semi-quantitative composition of the glazes of the tiles studied, determined by EDS (values in wt. % with oxygen obtained by stoichiometry and sum of all elements normalised to 100%) with Si/Pb ratios included

Sample		O	Na	Al	Si	K	Sn	Pb	Si/Pb
<i>Susanna and the Elders</i>	average	30.50	1.19	2.26	19.41	3.14	10.18	33.32	0.58
	st. deviation	--	0.16	0.36	2.00	0.32	1.82	4.02	
<i>Abduction of Hippodamia</i>	average	29.58	1.42	3.14	17.95	2.46	9.54	35.91	0.50
	st. deviation	--	0.10	0.27	0.91	0.35	0.93	2.84	
Tagus river god	average	29.23	1.21	2.10	18.27	2.70	10.28	36.21	0.50
	st. deviation	--	0.53	0.24	1.61	0.74	3.16	4.02	
Wall patterned tiles	average	30.74	1.64	2.41	19.16	2.76	11.86	31.43	0.61
	st. deviation	--	0.50	0.74	1.62	0.66	2.57	5.88	
Skirting band tiles	average	30.69	0.89	2.30	19.89	3.79	8.48	33.96	0.59
	st. deviation	--	0.24	0.21	1.28	0.37	1.27	3.31	
Susanna frame tile	average	43.15	2.61	4.14	31.01	5.53	5.48	8.08	3.84
	st. deviation	--	0.80	0.25	1.97	0.65	5.36	1.82	
Hippodamia frame tile	-	28.65	1.09	2.19	17.38	1.07	12.89	36.72	0.47
Tagus frame tile	average	30.95	1.46	2.67	19.06	1.11	13.92	30.84	0.62
	st. deviation	--	0.01	0.11	0.23	0.02	3.21	3.54	

### 3.3.3. Composition of the biscuits

Table 3 includes the semi-quantitative results of analyses of the biscuits by EDS in weight %. Lead occurs in most cases, deriving from percolation into the biscuit when the raw glaze is applied. Its content was determined but not considered because it is not part of the natural composition of the biscuit and depends on the proximity to the interface. The presence of lead renders the quantification of sulphur doubtful because of a superposition of spectrographic peaks and therefore it too was not considered, as well as elements of contents often below 1% such as phosphorus, chlorine and titanium. The calcium to silicon ratios (Ca/Si), that may be used to characterize a clay and are related with its aptitude for tin-glazing, have been evaluated and are included in the table.

**Table 3.** Semi-quantitative composition of the biscuits of the tiles studied, determined by EDS (values in wt. % with oxygen obtained by stoichiometry and sum of all elements normalised to 100%), with Ca/Si ratios included

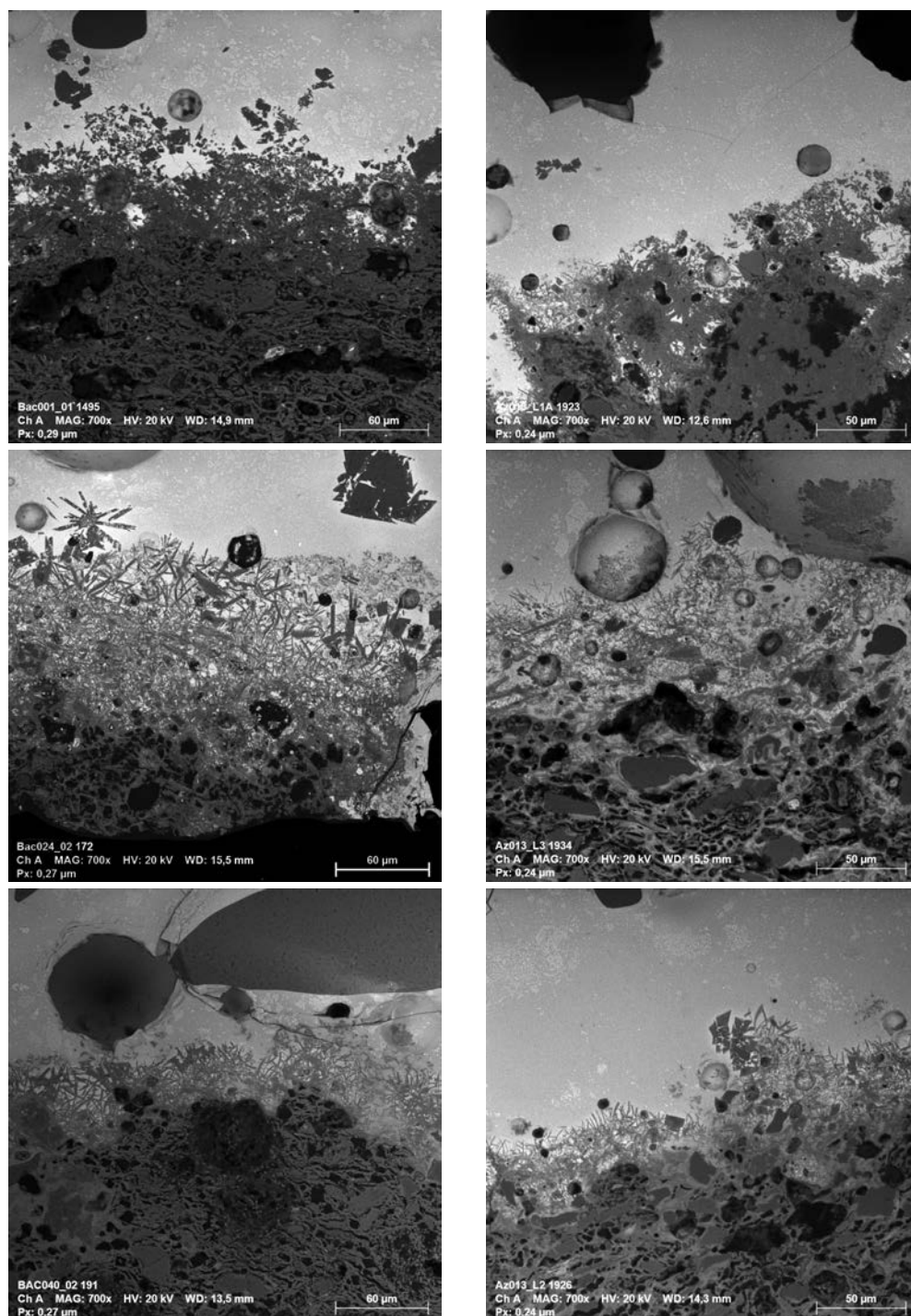
Sample		O	Na	Mg	Al	Si	K	Ca	Fe	Ca/Si
<i>Susanna and the Elders</i>	average	43.89	1.83	4.71	8.02	22.37	1.23	13.88	4.07	0.62
	st. deviation	--	0.67	0.10	0.49	0.57	0.34	0.60	0.50	
<i>Abduction of Hippodamia</i>	average	43.26	1.09	4.73	9.40	20.28	1.64	15.16	4.45	0.75
	st. deviation	--	0.04	1.93	0.53	0.38	0.03	2.19	0.23	
Tagus river god	average	43.99	1.14	4.75	8.89	22.18	2.30	12.60	4.15	0.57
	st. deviation	--	0.39	1.40	0.75	1.61	0.43	1.89	0.43	
Wall patterned tiles	average	43.69	1.03	4.24	9.13	21.38	1.37	14.97	4.21	0.70
	st. deviation	--	0.30	0.81	1.53	1.79	0.36	1.24	0.44	
Skirting band tiles	average	42.42	1.07	3.95	7.78	20.08	1.70	19.09	3.91	0.95
	st. deviation	--	0.58	0.67	0.95	1.85	0.85	6.57	0.92	
Susanna frame tile	average	46.40	1.31	2.02	9.28	27.72	3.30	6.09	3.89	0.22
	st. deviation	--	0.09	0.13	0.51	1.14	0.33	0.73	0.35	
Hippodamia frame tile	-	46.83	1.33	1.13	7.86	29.66	2.78	6.64	3.79	0.22
Tagus frame tile	-	46.34	1.01	0.95	7.97	28.67	2.75	8.29	4.02	0.29

## 4. DISCUSSION OF THE INSTRUMENTAL RESULTS

The samples, except for the frame of *Susanna and the Elders* (Bac096), present interfaces with easily noticeable crystalline outgrowths, often remarkably wide and it is interesting to note that in the same sort of tile (samples Bac003 and Bac040 of the patterned tiles) or indeed in the same panel (samples Bac024/01 and Bac024/02 of *The Abduction of Hippodamia*) there is a considerable variation in the development and morphology of the interfaces, possibly caused by uneven heating or cooling conditions inside the kiln where the glazes were fired.

Figure 13 compares the morphologies in Figure 12 with samples of known provenance from the productions of the workshops of Lisbon in the 16th century that we designated by “the circle of João de Góis” [12; 13]. The morphology of most glazes, and particularly the development of the interfaces, are compatible with the productions of that technical circle. It may be verified that, on the other side, they are not compatible with the contemporary majolica productions attributed to Juan Flores in Spain [4], nor with the Bacalhôa panels and tiles that were determined to have likely been imported [14].





**Figure 13.** Comparison at the same magnification of glaze sections of tiles from the central room of the Pleasure House of Bacalhôa (left side) with similar morphologies in tiles with the monogram of João de Góis at Igreja da Graça (right side). From top to bottom: Bac001/01 (Susanna) vs. Az013/L1; Bac024/02 (Hippodamia) vs. Az013/L3; Bac040/02 (patterned wall tile) vs. Az013/L2 (images: LNEC).

Considering the Si/Pb ratios in Table 2, it will be seen that all ratios are within a small region from 0.47 to 0.62, except sample Bac096 from one of the frame tiles of the panel of *Susanna*, for which Si/Pb= 3.84. That ratio is derived from the low content in lead which might also result from a lixiviation suggested by the decayed condition of the tile. However, the composition of the tile also differs from all the others by the high contents in sodium and potassium, which are not compatible with a lixiviation process, and low content in tin. All these are incongruous with the contemporary productions of the workshops of Lisbon known to us [12] but consistent with a recipe possibly aimed at being cheaper at the cost of being fired at a higher temperature and probably for a longer time.

Table 4 compares the results in Table 2 with the average glaze composition of tiles of the circle of João de Góis [12, p.40], and the imported panel with the Albuquerque coat-of-arms, also in the Pleasure House [14]. The frame tile of the *Susanna and the Elders* panel is clearly different from all the other tiles sampled from the room and from the glazes of the circle of João de Góis by its higher contents in K and lower in Sn and Pb (the most expensive raw materials) resulting in a high Si/Pb ratio. The Albuquerque coat-of-arms also differs on the same counts, although the differences are not as remarkable. Both are enhanced against coloured backgrounds in Table 4.

**Table 4.** Comparison of the average glaze semi-quantitative compositions by EDS of the panels in the central room of the Bacalhôa Pleasure House with the characteristic average composition of the circle of João de Góis and the Albuquerque coat-of-arms panel

Sample	O	Na	Al	Si	K	Sn	Pb	Si/Pb
<i>Susanna and the Elders</i>	30.50	1.19	2.26	19.41	3.14	10.18	33.32	0.58
<i>Abduction of Hippodamia</i>	29.58	1.42	3.14	17.95	2.46	9.54	35.91	0.50
<b>Tagus river god</b>	29.23	1.21	2.10	18.27	2.70	10.28	36.21	0.50
<b>Wall patterned tiles</b>	30.74	1.64	2.41	19.16	2.76	11.86	31.43	0.61
<b>Skirting band tiles</b>	30.69	0.89	2.30	19.89	3.79	8.48	33.96	0.59
<b>Susanna frame tile</b>	43.15	2.61	4.14	31.01	<b>5.53</b>	<b>5.48</b>	<b>8.08</b>	<b>3.84</b>
<b>Hippodamia frame tile</b>	28.65	1.09	2.19	17.38	1.07	12.89	36.72	0.47
<b>Tagus frame tile</b>	30.95	1.46	2.67	19.06	1.11	13.92	30.84	0.62
<b>Circle of João de Góis</b>	29,10	1.10	2.80	17.80	1.40	N.D.	47.80	0.40
<b>Albuquerque coat-of-arms</b>	36.76	2.87	3.21	25.12	<b>5.64</b>	<b>5.66</b>	<b>20.74</b>	<b>1.21</b>

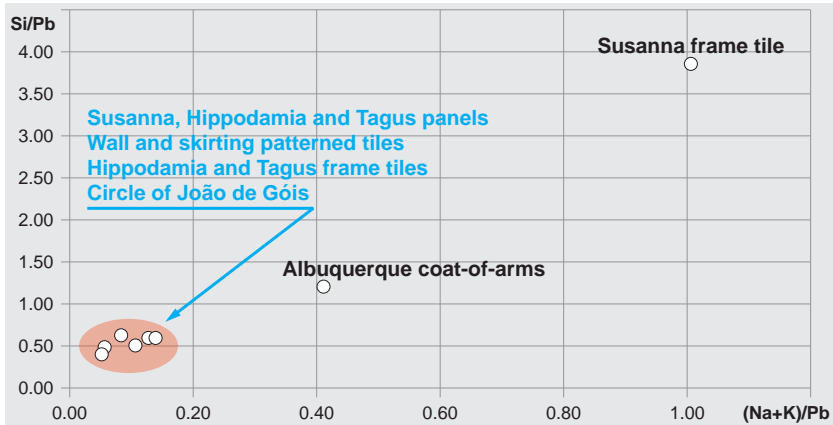
Note: For technical reasons the contents in Sn could not be determined accurately when the research on the circle of João de Góis was first made [12], and for that reason the element has been omitted (N.D.), resulting in an increase of up to 10% in the other contents, but leaving the Si/Pb ratio unchanged

The most relevant elements to define a workshop provenance should be those that are integrated by the potter according to a personal recipe: silicon (Si), the main element in a glass, integrated as sand; lead, the main fusing agent, integrated as an oxide; sodium and potassium, alkaline fusing agents integrated, respectively, as sea salt and ashes of potassium-rich organic materials; and tin, integrated also as an oxide. To offer a simplified visualization of the contents in Table 4, Figure 14 depicts a scatter chart in which the horizontal axis (X axis) represents the (Na+K)/Pb ratio and the vertical axis (Y



axis) represents the Si/Pb ratio. The normalization to the content in lead makes the other contents relative to it, rendering irrelevant the fact that for one of the cases the content in tin is unknown because it is not considered in the ratios.

The graphic representation in Figure 14 clearly separates the Susanna frame tile and the Albuquerque coat-of-arms from the rest. The panels, wall linings, and the two remaining frame tiles may be clustered together with the circle of João de Góis, as seen from the chart. This cluster can be further detailed by sorting the samples according to the ratio of the alkaline fusing agents to lead (Table 5), suggesting a difference in this respect between a group formed by the João de Góis circle and the frame tiles of the Hippodamia and Tagus panels vis-à-vis the remaining samples clustered together in the plot of Figure 14.



**Figure 14.** Graphic representation of the contents in the alkalines fusing agents (Na+K) and of silicon (Si), both normalised to the content in lead (Pb) in a X-Y scatter chart.

**Table 5.** Panels and tiles clustered in the plot of Figure 14 sorted by the ratio of fusing agents

Panel / tile	Circle João de Góis	Hippodamia frame	Tagus frame	Tagus panel	Hippodamia panel	Susanna panel	Skirting tiles	Wall tiles
(Na+K) / Pb	0.05	0.06	0.08	0.11	0.11	0.13	0.14	0.14

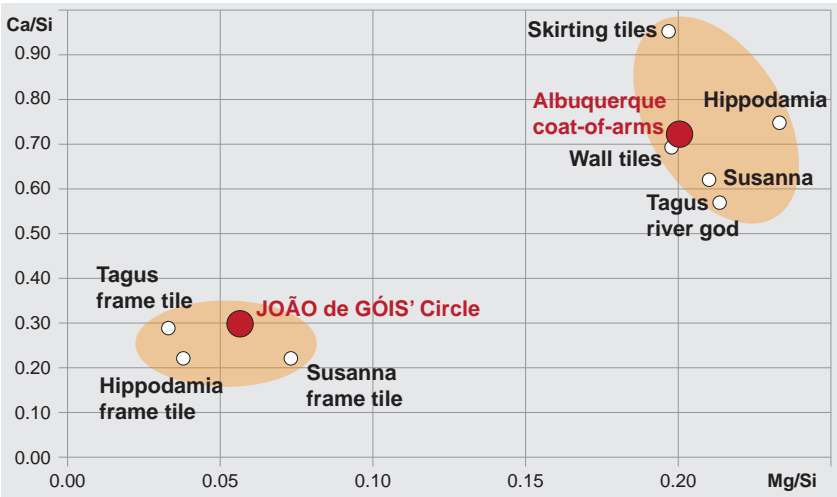
Table 6 compares the results in Table 3 with the average biscuit composition of tiles of the circle of João de Góis [12, p.41], and the imported panel with the Albuquerque coat-of-arms [14]. There are two clearly different groups, one of which with low magnesium (Mg) and calcium (Ca) contents, resulting in Ca/Si ratios of 0.30 or lower, and higher potassium (K) (highlighted against a green background). These features correspond to what might be expected from Miocene clays of the region of Lisbon used by potters since ancient times.<sup>11</sup> The other group corresponds to biscuits of a clay with characteristics unknown from the region of Lisbon at this time suggesting they were likely imported [6; 14].

<sup>11</sup> A study made by us on the calcium-poor Miocene clay layers of the region of Lisbon has shown that the composition of some sublayers matches the composition of the biscuits used by the João de Góis circle, leading us to believe that for most of the 16th century the Lisbon azulejo workshops likely used the same red clays long used by potters (to be published).

**Table 6.** Comparison of the average biscuit semi-quantitative compositions by EDS of the panels, frames and patterned linings in the central room of the Pleasure House with the characteristic average composition of the circle of João de Góis and the Albuquerque coat-of-arms panel

Sample	O	Na	Mg	Al	Si	K	Ca	Fe	Ca/Si
<i>Susanna and the Elders</i>	43.89	1.83	4.71	8.02	22.37	1.23	13.88	4.07	0.62
<i>Abduction of Hippodamia</i>	43.26	1.09	4.73	9.4	20.28	1.64	15.16	4.45	0.75
Tagus river god	43.99	1.14	4.75	8.89	22.18	2.30	12.6	4.15	0.57
Wall patterned tiles	43.69	1.03	4.24	9.13	21.38	1.37	14.97	4.21	0.70
Skirting band tiles	42.42	1.07	3.95	7.78	20.08	1.70	19.09	3.91	0.95
Susanna frame tile	46.40	1.31	2.02	9.28	27.72	3.30	6.09	3.89	0.22
Hippodamia frame tile	46.83	1.33	1.13	7.86	29.66	2.78	6.64	3.79	0.22
Tagus frame tile	46.34	1.01	0.95	7.97	28.67	2.75	8.29	4.02	0.29
Circle of João de Góis	45.70	1.20	1.50	8.60	26.80	3.10	8.90	4.20	0.30
Albuquerque coat-of-arms	43.69	0.86	4.44	7.69	22.23	1.22	15.91	3.95	0.72

The chart in Figure 15 offers a two-dimensional representation of two of the most determining elements in Table 6, the contents in Mg and Ca, normalized to the content in silicon. The graphic representation is again very clear, separating the items in two groups and clustering all frame tiles with the circle of João de Góis, while the panels, wall patterned tiles and skirting band, cluster with the Albuquerque coat-of-arms panel.



**Figure 15.** Graphic representation of the contents in calcium (Ca) vs the content in magnesium (Mg), normalised to the content in silicon (Si).

## 5. CONCLUSION

The samples collected from all the panels, frame tiles, wall lining and skirting band of the central room of the Pleasure House of Bacalhôa do not, in general, differ substantially in terms of morphology. The only exception is a single tile of the frame of *Susanna and the Elders* that does not show, at the scale studied, any crystalline interfacial outgrowths.

In stylistic terms, the panels *Susanna and the Elders* and *The Abduction of Hippodamia* are the work of a highly skilled painter and may be tentatively attributed to Juan Flores. The Tagus river god is too incomplete for a definitive conclusion, but may be from a different hand. Likewise, the patterned tiles lining the wall show a high artistic acumen of the designer and are homogeneously painted with a considerable technical quality. On the other side, the skirting band represents an inferior effort on both counts.

Excepting the single tile sampled from the frame of *Susanna and the Elders*, the morphological and compositional compatibility of the remaining glazes with the glazes used shortly after this time at *Igreja da Graça* [15], as well as later, by João de Góis and his technical circle [12; 13], and the differences on both counts from contemporary panels by Juan Flores extant in Spain or presumably imported from there [4; 14], suggest that all the tiles lining the Central Room of the Pleasure House were glazed, painted and fired in Portugal. The absence of a clearly perceivable *coperta* over the yellow, also vouches against a production in Spain because most panels and tiles that were presumably imported from there, clearly depict a transparent *coperta* layer sprinkled over the yellow pigment [14].

As pertains to the ceramics, the composition of the biscuits of the panels, of the patterned tiles, and of the skirting band, are compatible with the composition of the imported panels, as exemplified by the Albuquerque coat-of-arms. This result suggests that the biscuits were imported unglazed, presumably from Talavera where Juan Flores had his workshop at the time [4]. The biscuits of the frame tiles, however, use a different clay, compatible with the clays used by the circle of João de Góis around this time and into the 1580s. This is likely clay from the region of Lisbon, probably from a calcium-poor Miocene layer that fires to a varying shade of dark orange to red in oxidation atmospheres [13, Figures 4 and 12].

The case of the *Susanna* frame tile is very interesting. Its design is simpler than the design of the *Hippodamia* and the *Tagus* frame tiles, which are identical (both types are depicted in Figure 11). Since the results point to the use of local clay also in the *Susanna* frame tile with an odd glaze composition, then it too must have been manufactured in Lisbon. This case could easily be dismissed on the basis that it corresponds to a single tile and it may represent an anomalous result, except for the fact that in our research we found several similar cases, all corresponding to presumably unimportant frame tiles in which the lower content in expensive lead – often with Si/Pb ratios of 2.5 or higher – is compensated by higher contents in the cheaper fusing agents: sodium and potassium. The same tiles also have low contents in the other expensive raw material: tin (typically less than 6%), and their biscuits are often in the early stages of vitrification, meaning that they were fired to a higher temperature and maybe for a longer time than normal for the lead-rich glazes. This suggests that these tiles were made by a potter other than Flores (because such high Si/Pb ratios are unknown from his productions in Spain [4]), either as a test, or, more likely, to satisfy a commission for frame tiles. He may have fired the tiles in a smaller kiln in which higher temperatures could be attained. It is maybe fortunate that his recipe was not used in more important work, because if the temperature was insufficient, then the

adhesion between the glaze and the biscuit would likely be impaired, eventually leading to a separation exactly as seen in the image of Bac096 at 350x in Figure 12, in which the glaze is seen to be clearly detached from the biscuit.

Although the Flemish potters João and Filipe de Góis must have been connected with the production of at least part of the majolica tiles of Bacalhôa, as demonstrated by the more than likely commission by Brás [Afonso] de Albuquerque of the panels for *Igreja da Graça*, one of which signed with the monogram of João de Góis [15], the nature of such connection remains uncertain. Did they supply the glazes? Did they take care of part of the painting? The morphology of the glaze/biscuit interfaces is very similar to the interfaces found in productions connected with the Góis brothers [13] and it is likely that these tiles were fired in the same kiln in Lisbon, near the Boavista beach [16] and in that case they were probably glazed and painted somewhere nearby. But the glazes of the panels and patterned tiles in the central room of the Pleasure House, albeit very similar to those used by João de Góis, with which they may be clustered (Figure 14) are still somewhat different in the contents in alkaline fusing agents, which are characteristically low in the productions of João de Góis (Table 5). On the other side, the same table shows that the contents in potassium of the frame tiles of the Hippodamia and the Tagus panels are compatible with the productions of João de Góis, and these same tiles also have characteristically high contents in tin, suggesting that in them we may have a production of lesser responsibility that was fully entrusted to his workshop.

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