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CONSIDERING NEW FUNCTIONS IN THERMAL BATH BUILDINGS: THE SINGULAR HEATING WATER SYSTEM FROM THE ROMAN SPA OF TERMAS DE SÃO VICENTE (PENAFIEL, PORTUGAL)

Nuevos indicios sobre las infraestructuras hidráulicas en los edificios de baños romanos: El ejemplo del balneario romano de Termas de São Vicente (Penafiel, Portugal)

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Abstract: The archaeological research we carried out between 2020-2023 (PIPA BAL-SAOVICENTE) in the Roman Spa of Termas de São Vicente, in Penafiel, Portugal, in order obtain a better understanding of this archaeological site preserved in the park of the modern spa, provided us with the opportunity to study a singular water heating system, using a piece of bronze discovered in situ at the beginning of 20th century.

In this article, we present the results of the research through the formal, analytical and functional study of this object and its archaeological context, which shed light on a new type of structure used in thermal buildings to heat and evaporate the mineral water used in these Roman mineral-medicinal bath complexes.

Key words: Roman Bronze Bowl; Archaeometry; mineral-medicinal Water; Thermalism; Hypocaust; Hydraulic Infrastructures.

Resumen: En el contexto del proyecto arqueológico llevado a cabo entre 2020-2023 (PIPA BAL-SAOVICENTE) en el balneario romano de Termas de São Vicente, en Penafiel, Portugal, la reexcavación de parte de las salas preservadas del edificio, así como el análisis de una pieza excepcional de bronce descubierta *in situ* a principios del s. XX y preservada en el Museo Municipal de Penafiel, nos ha permitido identificar un singular sistema de calentamiento de agua dentro del edificio de baños de época romana preservado en este lugar.

En este artículo, presentamos la detallada investigación llevada a cabo sobre esta infraestructura, a partir del estudio formal, analítico y functional del recipiente de bronce recuperado, así como de su contexto arqueológico, investigación que nos han permitido reconocer un nuevo modelo de infraestructura utilizada en los edificios termales de época romana.

Palabras clave: recipiente de bronce romano; arqueometría; aguas minero-medicinales; termalismo; hipocausto; infraestructuras hidráulicas.

1. Origin and context

During the work to locate and prepare the catchment of mineral-medicinal waters from the São Vicente thermal springs carried out in 1901 on the site known as Lameiro dos Lodos, in Termas de São Vicente parish, Penafiel, Portugal, the remains of a Roman spa were discovered, buried under a thick and heavy layer of mud and earth (Fortes, 1902).

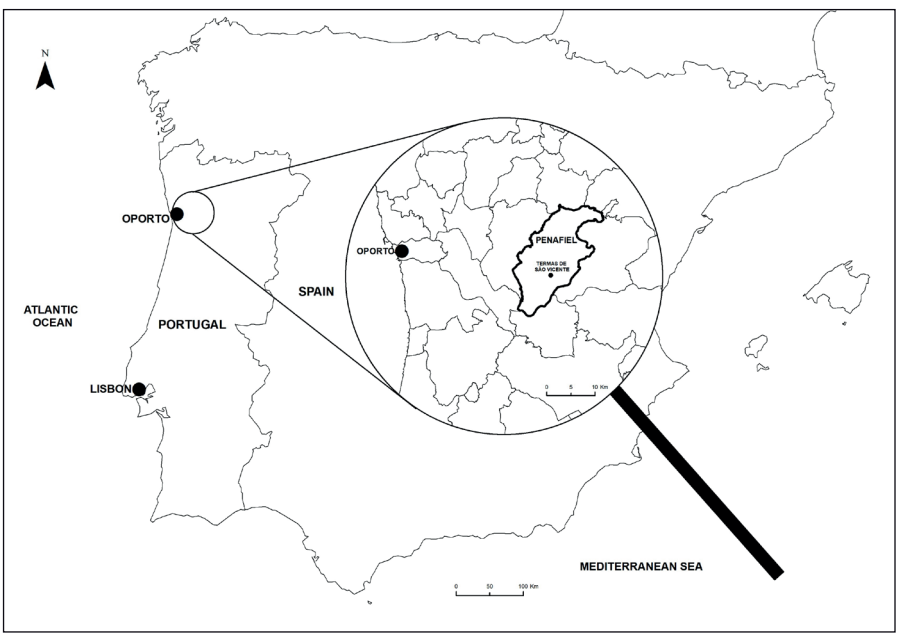


Fig. 1. *Location of Termas de São Vicente parish, in Penafiel, Portugal.*

Fortunately, the site has been relatively well preserved since its discovery and is open to visitors in the grounds of the current spa-hotel, the Palace Hotel & Spa Termas de São Vicente. The archaeological site has been conserved in an excavated area, rectangular in shape, bounded by a retaining wall that supports the surrounding, as the archaeological remains are located considerably lower than the surrounding terrain –-2.80 m–.

Following its discovery, the baths were excavated almost in their entirety and consist of a small building –approx. 400 m^2– standing in a space with abundant outcrops of cold sulphurous water[1]. The site's main spring, around which the Roman structures and remains of canals were found, emerges at "… less than 7.5 m in a perpendicular line…" (Fortes, 1902: 22) and has been reused by the present-day spa.

The building comprises 11 partially conserved rooms (Fig. 2a) built around a central enclosure –c, courtyard or hall?– paved with large granite slabs. Two of these rooms have been identified as reception rooms, changing rooms or multi-purpose rooms –a and b– and a further two rooms each have a pool –d and e–. There is another room whose specific use is unknown –f– and another two heated rooms –h and i–, each with a furnace and which were accessed from the exterior via an adjacent service area –Rooms j and k–.

However, although the description and plan published by J. Fortes (1902) stand out for their depth of detail and quality, particularly considering

[1] Sulphur, bicarbonate, sodium, fluoride waters 18.6 ºC (Cruz, 1992: 75)

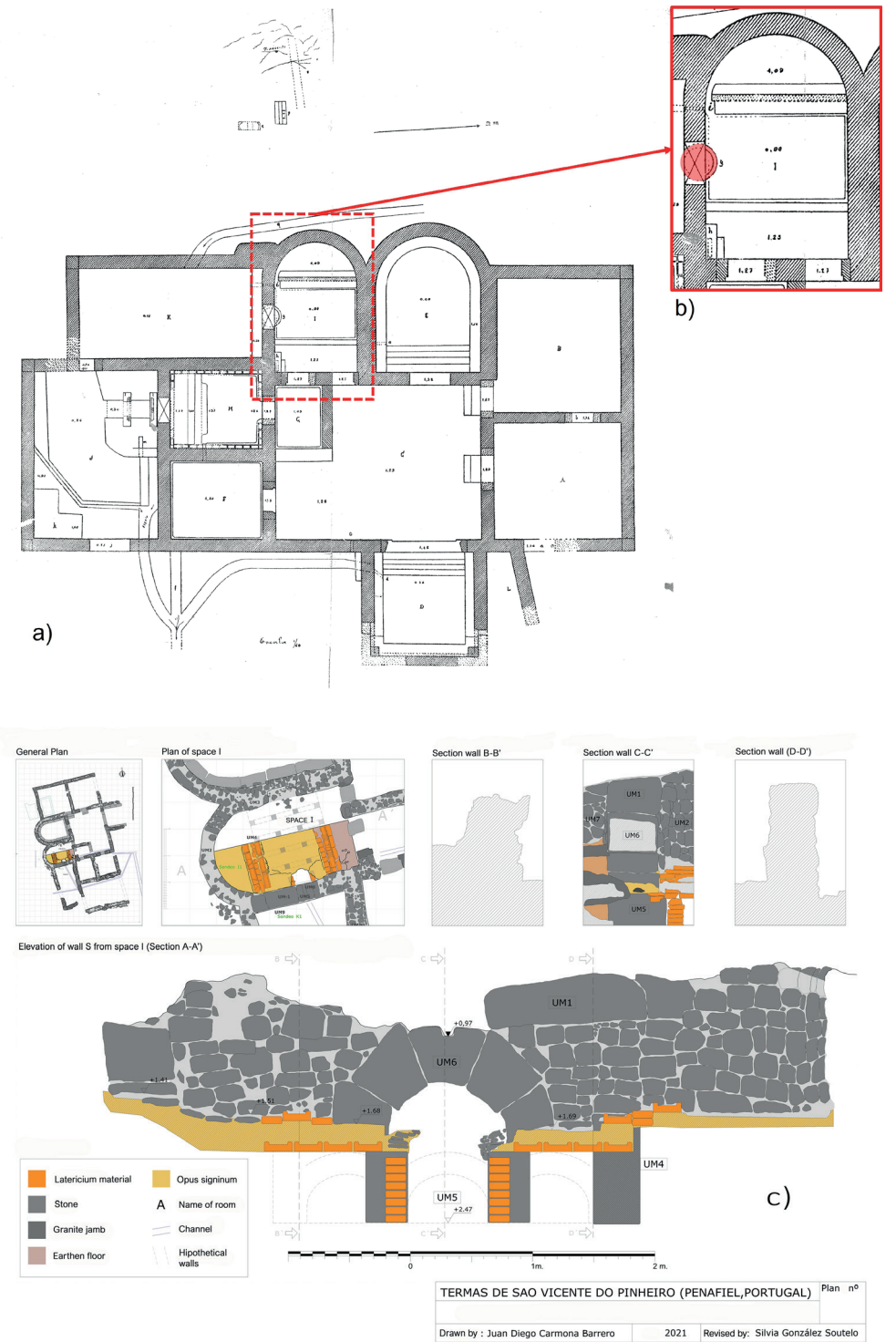


Fig. 2. *a) Detailed plan of the excavation work and the remains discovered, published by J. Fortes (Fortes, 1902); b) detail of the room where the basin was found, indicating its original location; c) new plan including a section of space I (Plan: J. D. Carmona Barrero).*

when this work was carried out, it has a number of major shortcomings in terms of understanding and interpretation. The answer to many of the questions surrounding this site remain unresolved as since it was discovered, no scientific actions have been carried out that have allowed the re-excavation and cleaning of its pavements, a review of the stratigraphy or the analysis and interpretation of the wall phases, all essential steps for a new interpretation of the site.

Until such a review is possible, and within the framework of our archaeological review of the spa –DGPC = PIPA BALN-SAOVICENTE 2020-2023– (González Soutelo *et al.*, 2023), this study will focus on one of the objects discovered during the early 20th-century intervention, which remained in the modern spa until 2004, when it was finally moved to Penafiel Municipal Museum. We consider that the exceptional nature of this object –in terms of its state of conservation as well as its functionality and singularity– is sufficient justification for this publication[2].

The bronze object analysed here was found in the room assigned letter I by its discoverer. This room is located in the SW of the building and is adjacent to service Room K, with an opening for the mouth of one of the spa's two *praefurnia* (Fig. 2b).

In the description and the plan published by Fortes (1902: 20), this room[3] is rectangular in shape and terminated by an apse on the west side, featuring a tripartite north-south division that articulates the space on three levels. Indeed, the heights recorded on the plan show that the threshold –with a height of 1,27 m– opens out onto an initial space –a height of 1,23 m–, following on to a lower central section –0,91 m–, before rising again along the foundations of steps –?– made of brick and tegula clad with mortar leading to the apsidal space that terminates the room –at a height of 1,09 m–[4].

The floor was undoubtedly laid over a space with a hypocaust heating system, as we were able to confirm during the 2021 archaeological campaign. It would therefore be one of the warmest rooms on the site, given its proximity to the furnace in Room K (Fortes, 1902: 20)[5].

The presence of the bronze item that is the object of our study clearly conditions the interpretation of the function of this room: as will be shown, and according to J. Fortes' description, the basin was part of the site's basic and functional furniture (Fig. 3).

[2] This research has been possible thanks to the support of the UAM/MIAS and the 'Tomás y Valiente' Project: *Healing spas in Antiquity*; as well as by the financial support from the Special Programme for Archaeology Projects of Portugal's General Directorate for Cultural Heritage (2021), essential to complete the analytical aspects of this research; and recently, by the support of the Spanish Ministry of Science and Innovation in the context of the project PID2022-138809NB-I00: *THERMASCAPE. The thermal landscape in Hispania. The role of thermal resources in the Iberian Peninsula since Roman times* (2023-2027). We would like to thank the material support of the Museu de Penafiel, and specially to its director M.ª J. Santos, and the archaeologist and colleagues H. Bernardo and J. Sampaio, as well as to M. Ribeiro and R. Oliveira; also, our gratitude to the direction of the Termas de São Vicente Palace Spa and to L. Gomes for the possibility to carry out this research. Finally, we would like to thank to the SECYR team, for their support and help in the analytical research, as well as to Dr. J. Sanjurjo of the UDC, for his crucial collaboration.

[3] During the work carried out as part of the multi-year PIPA BALN-SAOVICENTE Project (2021-2023), it was possible to partially examine the pavement. The bottom of the room was covered by an extensive layer of water, earth, deliberately placed rubble and vegetation that made it flat/level and covered practically the entire opening of the furnace mouth (2021). This fill, right down to the bottom, included 20th century building materials from the remodelling of the contemporary spa.

[4] In line with the findings in other buildings, in all likelihood this space may have contained an *alveus* or small pool-bath for the use of these waters, heated to a suitable temperature, as they were usually positioned over a hypocaust heating system. In this case, it is surprising that the furnace mouth is located in the centre of one of the long sides of the room at a height that is visible to the eye, and with no direct connection to the apsidal space.

[5] … na camara sotoposta, que tambem tem… (Fortes, 1902: 20).

Fig. 3. *Postcard showing the basin amid other objects collected during the excavation work. Postcard Carta postal, Edición del Bazar Turco, circulated in 1909.*

2. Description of the object

It is a vessel or basin –similar in style to a traditional wash bowl– made of bronze[6]. Following the excavation work on the building, this vessel was removed from the place it was found and displayed and later put away in the storerooms of the new spa. It was eventually handed over by the family of the first owner and discoverer of the site to Penafiel Municipal Museum in 2004, where it is listed as MMPNF-TSV 2004/0180 (Figs. 4a-b).

Described by Fortes as a *vasa aena* (1902: 20), this object has little in keeping with the art and skill of a coppersmith. Featuring an irregular circular shape, it has an inner diameter of ± 61.5 cm, which would rise to ± 76 cm if we take the outer edge as a reference. It has an average inner height of 8 cm and an outer height of 9.2 -9.7 cm.

The circle that forms the base was cut out from a thick bronze sheet –3-4 mm–, with discontinuous and fairly imprecise strokes. The base is entirely separate from the sides and is slightly dented –convex on the inside– and thinner in the centre.

The sides also display similar imperfections, as to complete the object it was necessary to join three sections made of rectangular sheets –6.5 x 13.5-14.5 cm–, which were embossed and bent at a right angle just over halfway up to form the rim –6.5-6.7 cm wide–. Poor compensation meant that the rim was too thin, and this defective stretching of the metal caused cracks to appear. The rectangular marks left by the successive blows of the embossing hammer can still be seen on the upper section of the rim (Fig. 5a).

[6] See section 4 for the results of the analyses.

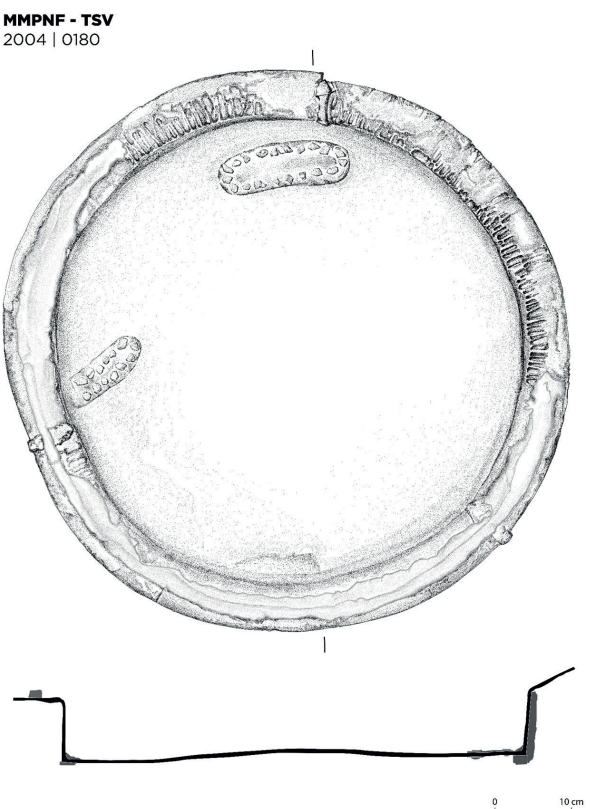


Fig. 4. *a) General view of the object under study (MMPNF; photograph by M. Ribeiro); b) sketch showing details of the object (drawing by Rui Oliveira).*

The three elements were juxtaposed in simple butt joints in order to shape the vessel, although, as can be seen in the joint that is opened, they were not secured[7]. To strengthen the object, a large strip made of a lead-rich alloy –±2.6 cm wide x 0.5-1 cm high– was used to seal the upper side of the rim to the lower edge, running around the outer side –±2.6 x 1.3 cm– (Fig. 5b).

The same precarious technique was used to join the side to the base, again using a liquid lead alloy to cover the join which also acted as a sealant and insulation. In turn, the base is covered by a bulky and irregular band of the same metal –projecting 1 cm and 2.5-2.8 cm wide– applied around the contour forming a protruding base (Fig. 5c).

The base features two repairs to the cracks and progressive wear and tear: the smallest of these, which is perpendicular to the side, repaired a barely noticeable crack. It consists of the application of a fingerprint-shaped sheet that measures up to 12 cm, affixed with 14 irregular-shaped rivets (Fig. 5d).

The largest repair, which is next to and parallel to the side, measures as much as 18.4 cm on the upper side and consists of a fingerprint-shaped sheet-plate secured with 20 irregular-shaped rivets. The underside

[7] The point where the material of this object was studied using X-ray fluorescence.

of the object reveals another fine sheet measuring 18 x 5 cm which also formed part of the repair work and was attached to the other sheet by rivets. This is due to the considerable size of the crack and loss of material, consisting of an L-shaped 0.8 cm-wide rent of up to 14.2 cm by 2.8 cm on the shortest side (Figs. 6a-b).

Turning to the lead alloy additions –perpendicular– that seal the joints of the rim, the remains of another lead seal can be seen over a large section of the rim. This is a large cord, with an irregular rectangular cross-section and flattened ends. To ensure better adherence to the bronze, the surface was smoothed and picked to make it rough. At 143 cm long, it corresponds to about 2/3 of the perimeter. Its function seems to be unrelated to the solidity of the vessel, but it may have been intended to facilitate the vertical attachment of some other plate, in line with the functionality discussed later in this text. The section of the rim with no traces of lead is in a different state of conservation and is smoother, as if water had flowed over it (Fig. 7).

The object weighs approximately 28,5 kg, mainly due to the large amount of lead it contains. It has a capacity for some 21 l of water –Pi x radius^2 x height, confirmed by direct measurement–, which, considering the large diameter and surface for exposure to fire, together with its reduced height, would allow the water to be heated quickly, thereby speeding up the evaporation process. This would allow the inhalation of the sulphur vapour, in line with the traditional use of this thermal spring in the modern-day spa (Soeiro, 1984: 74).

The underneath of the object has layers of charcoal and burn stains, indicating that it was exposed to fire for a prolonged period of time, as suggested by J. Fortes (1902: 20). This is in line with its original location, supported by the iron bars that identified at the mouth of the *praefurnium* (Fig. 8).

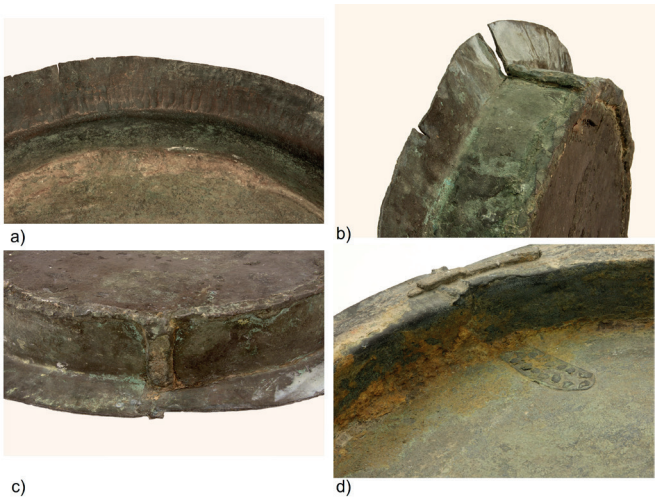


Fig. 5. *Close-up: a) showing the edge or rim of the object; b) of the rim on the outer side; c) of the base and the outer side joint of the object; d) of the repair work (MMPNF; photographs by M. Ribeiro).*

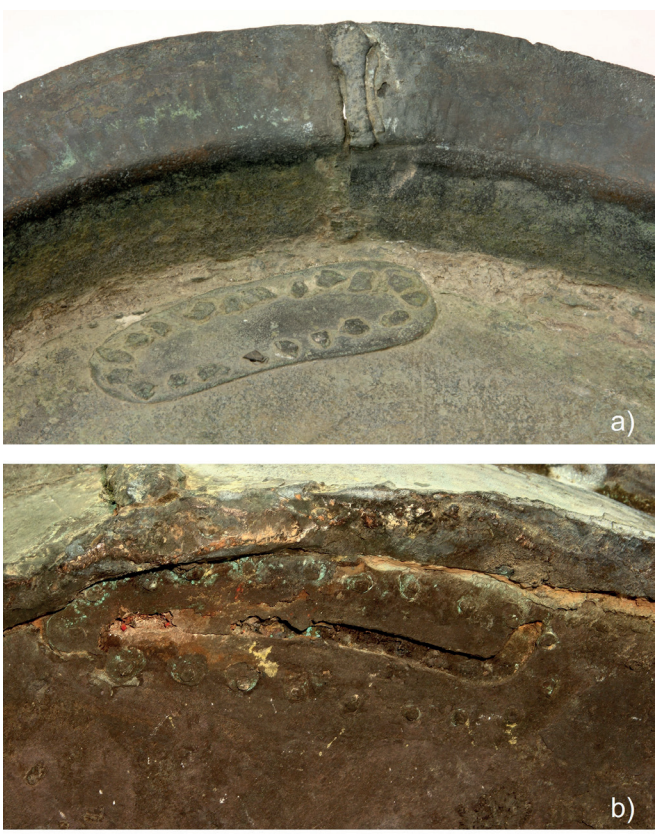


Fig. 6. *Close-up of the base: a) top side; b) bottom side, showing the second repair (MMPNF; photographs by M. Ribeiro).*

Fig. 7. *General view showing the lead edge over the object's rim (MMPNF; photograph by M. Ribeiro).*

Fig. 8. *A) Drilling work carried out in the early 20th century on the suspensura in Room I, under the arch of the mouth of the* praefurnium *in order to remove the bronze basin. The supporting elements consisting of brick piers, the rabbets on the stone and the initial sections of iron bars (photograph by the authors in 2022, after the reexcavation of this Room I); B) detail of the place where the bronze vessel would have been located before its removal in 1902, under the* praefurnium *arch and on top of a well-preserved brick-arched hypocaust.*

3. Analytical study of the object

In our opinion, an exhaustive study of this object requires various analyses of its composition, which will open up new lines of research in terms of its fabrication, use and state of conservation[8].

In order to carry out these analyses[9], five micro-samples were taken from various sections of the vessel (Figs. 9a, 10a and 16a) which were examined using a HITACHI S-3000N scanning electron microscope –SEM–, coupled to a Quantax EDS EDX analyser, Bruker model XFlash 6130, at the Autonomous Univ. of Madrid's Scanning Electron Microscopy, Field Emission and Nanolithography Laboratory, part of the Interdepartmental Research Service. The studies were conducted in a high vacuum environment, with a voltage of 20 kV, currents of around 150 µA and working distances of some 15 mm.

The initial results can be summarised as follows:

a) The dispersive X-ray analysis –EDX– showed that the object is composed of a ternary bronze ally made up of copper (Cu), tin (Sn) and lead (Pb). The elemental distribution map of an area of a sample taken from the base shows the typical metallographic structure of alloys of this type, in which the Pb forms segregates in the Cu matrix (Fig. 9), due to their non-miscibility in a solid state (Scott, 1992: 23-24).

   The high variability of the semi-quantitative elemental results obtained (Figs. 9-e, 10-d and 11-d) prevents a precise estimate of the proportions in which the three alloy elements are present. Yet it is also a reflection of the manner in which the piece was formed, namely with various fragments joined by joints or welds.

b) On the other hand, the evident segregation of the metals and the location of porous structures (Fig. 9b) and bubbles (Fig. 10c) are evidence of a rapid cooling of the molten alloy in an uncontrolled atmosphere in which gases escape and diffuse through the mixture itself, leaving these marks (García Romero, 2002: 435-441; Monroe, 2005: 519-546). It can therefore be assumed that a rustic metallurgical process was carried out with few means and materials. Such processes result in greater structural fragility and would hence explain the need for successive repairs.

c) As for the corrosion products, the low chloride levels and the predominance of sulphide compounds found (Fig. 11) are consistent with anaerobic burial conditions in soils rich in organic matter and with the presence of sulphate-reducing bacteria, such as, for example, those produced in waterlogged soils or adjacent to hot springs. In several of the samples, golden chalcopyrite crusts (CuFeS2) were identified –analyses 13, 14 and 17 in Fig. 11–, a compound found in objects exposed to such conditions and in contact with iron objects or remains, although the way they are formed is still unknown (Scott, 2002: 229-230).

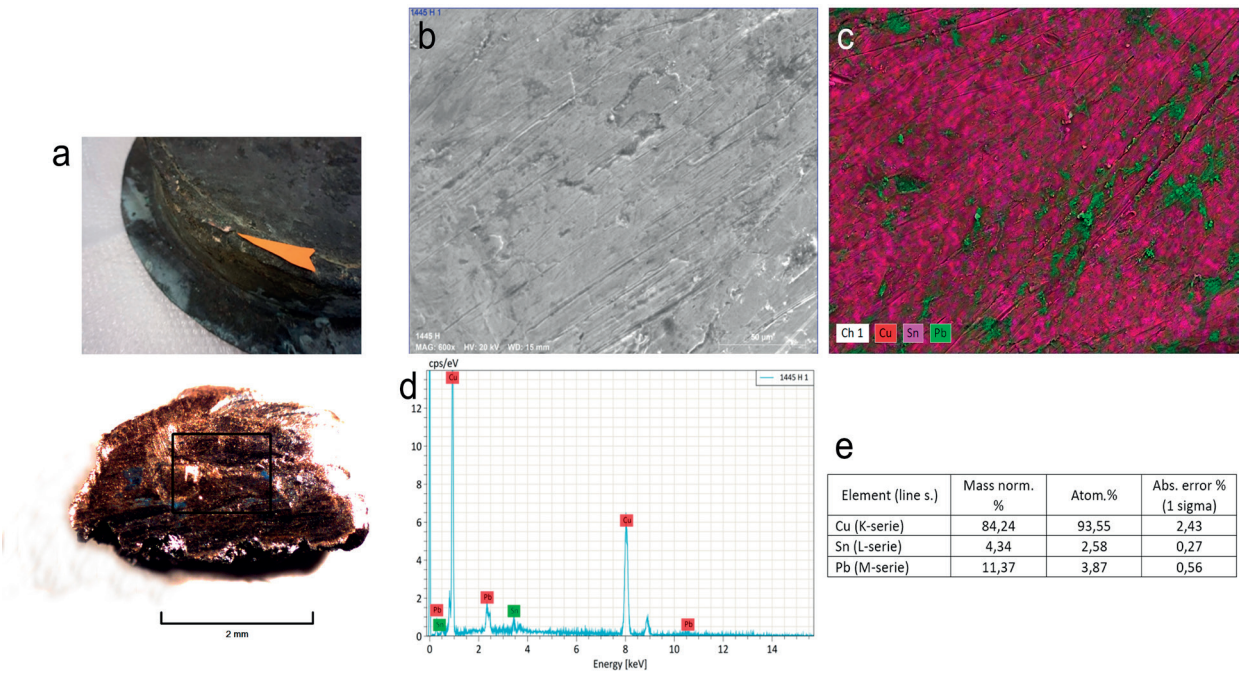
4. Similar finds and interpretation proposal

The first similar find we have identified comes from the town of Künzing (Germany)[10] and was studied by E. Brödner (1960; 1992: figs. 79 a-b). It was linked to the alkaline and sulphurous waters on the site of the *Römerbad Quintana* spa –also known

[8] The study was carried out in collaboration with the SECYR team at the UAM. We particularly wish to thank Inmaculada Donate, the lab technician, for her careful analysis of all the samples provided, as well as the lab coordinator, Dr. M. C. Medina, and the director of SECYR, Professor Dr. J. Barrio, for their support in this study. Thanks also go to the technician Dr. M. Blanco, for his suggestions and revisions. The XRF analytical composition studies were also completed at INCIPIT-CSIC in Santiago de Compostela, thanks to the kindness of the Senior Scientist X. L. Armada.

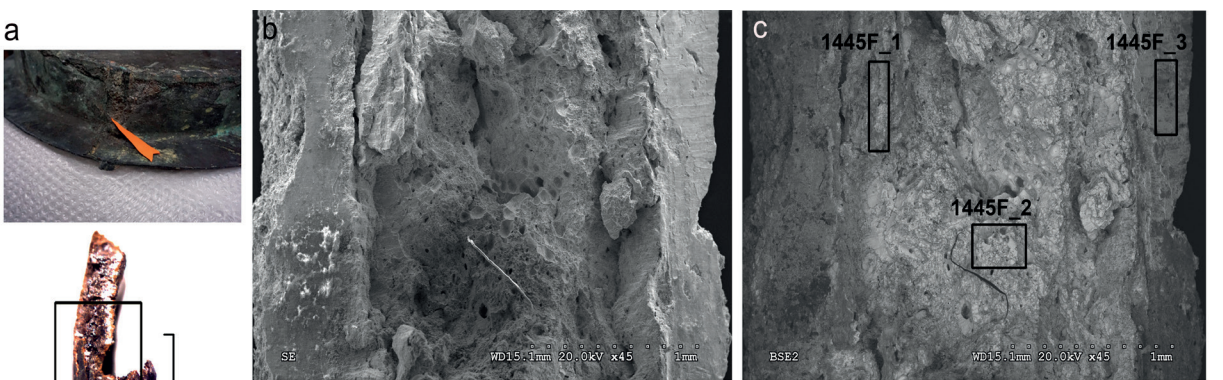
[9] Thanks to funding from the Special Programme for Archaeology Projects of Portugal's General Directorate for Cultural Heritage (2021).

[10] A town known for the *Quintanis* archaeological site of a former Roman military camp on the *limes Germanicus* on the banks of the Danube, which had its own thermal baths and other facilities.



Element (line s.)	Mass norm. %	Atom.%	Abs. error % (1 sigma)
Cu (K-serie)	84,24	93,55	2,43
Sn (L-serie)	4,34	2,58	0,27
Pb (M-serie)	11,37	3,87	0,56

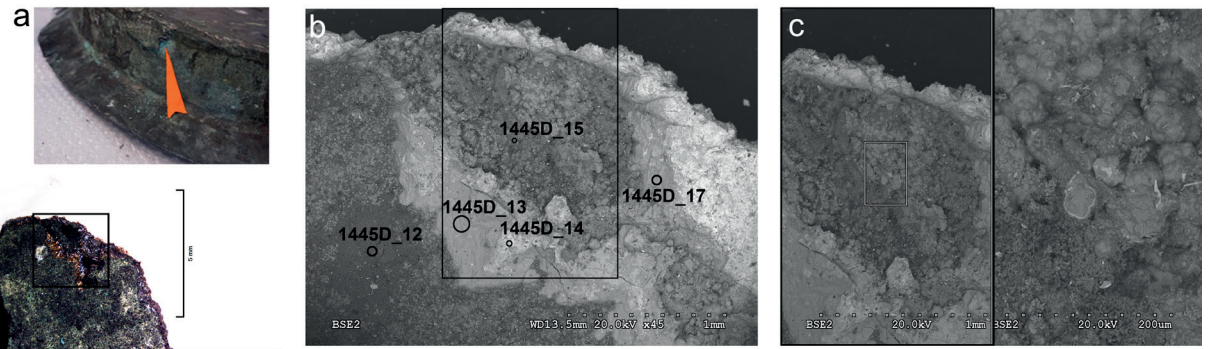
Fig. 9. *SEM/EDX study results of the SECYR 1445 H sample taken from the base of the recipient: a) sampling zone and photomicrograph of the sample marking the examined area; b) backscattered electron image; c) elemental distribution map; d) spectrum of EDX analysis and e) the semiquantitative data from it, which show the ternary composition of the alloy: Cu, Sn and Pb.*



d

Atom. %	Al-K	Cu-K	Sn-L	Pb-M
1445F_1	-	80,47	2,24	17,30
1445F_2	-	42,11	1,24	56,65
1445F_3	25,64	44,99	0,81	28,57

Fig. 10. *SEM/EDX study results of sample SECYR 1445 F taken from an exterior lateral joint of the recipient: a) sampling zone and photomicrograph of the sample marking the examined area; b) secondary electron image showing porosity; c) backscattered electron image and d) semiquantitative data in atomic % of the EDX analyses carried out in the squared areas in image c, that indicate the high variability of alloy element concentrations.*



d

Atom. %	Al-K	Si-K	S-K	Cl-K	K-K	Ca-K	Fe-L	Cu-M	Sn-L	Pb-M
1445D_12	7,39	6,98	34,69	0,33	0,68	39,71	1,80	8,43	-	-
1445D_13	-	-	44,70	-	-	-	23,59	31,71	-	-
1445F_14	1,06	-	33,31	-	-	-	16,38	35,85	3,51	9,90
1445F_15	5,87	4,96	19,51	-	0,76	10,81	6,91	50,04	-	1,13
1445F_17	-	-	43,88	-	-	-	15,84	40,19	-	-

Fig. 11. *SEM/EDX study results of sample SECYR 1445 D taken from the side of the recipient: a) sampling zone, photomicrograph of the sample marking the examined area and magnified detail of it, in which a golden crust is observed; b) backscattered electron image; c) enlarged detail showing bubble structures and d) semiquantitative data in atomic % of the EDX analyses carried out in the circled areas in the image b. Analyses 13, 14 and 17 in the golden crust indicate the presence of chalcopyrite ($CuFeS_2$), while analyses 12 and 15 show elements of earthy deposits and sulphide corrosion.*

as Salzbrunnen or 'Salt Well'–[11], which stands 500 m away from where the object was found.

The discovery was made by chance, in 1955, and allowed the recovery of two bronze vessels used for heating water in a thermal spa building. The object is of a similar shape and size to that found in São Vicente do Pinheiro –a maximum diameter of 75 cm and weighing 11,6 kg– although the sides are taller –24.5 cm– and it is made from a single piece (Fig. 12).

Just like the object in question, this vessel showed signs of repair work on the surface of the base, consisting of a plate with rivets, as well as traces of tin on the inner rim. However, greater care was taken over the fabrication of this item, made from a single piece of bronze –as would be expected of a skilled coppersmith– and therefore there are no joints or reinforcement elements that would increase its weight and compromise its watertightness. As in the case of the São Vicente vessel, evidence of soot remained on the base, indicating it was placed over fire to heat its contents. The interpretation proposed for this object is that of a *labrum* or basin for ablutions or washing the hands and face with heated mineral water (Brödner, 1960: 382).

The second find also shares similarities with that located at the São Vicente de Pinheiro thermal springs, although it appeared in a different context.

It comes from the public Baths of Trajan in Cyrene, Libya (Garbrecht and Manderscheid, 1994: vol. B, 83; vol. C, 116) and is noteworthy as it was found *in situ* (Fig. 13) during the archaeological dig.

Although the information from the actual excavation is scant and merely identifies the object as a *grossa caldaia piatta* associated with the *praefurnium* from the *caldarium* (Oliviero, 1930: 148-149), the study by Garbrecht and Manderscheid includes a description and photograph. Measuring 1,3 m in diameter and 0,29 m in height, they believed it

[11] A spa founded in 1911 and later used as a home for the elderly. Several authors uphold that the thermal spring was known in Roman times, based on the discovery of various materials dating back to that period in the area, mainly ceramics. The earliest documented references to the thermal spring date back to the 8th century (Brödner, 1960: note 1).

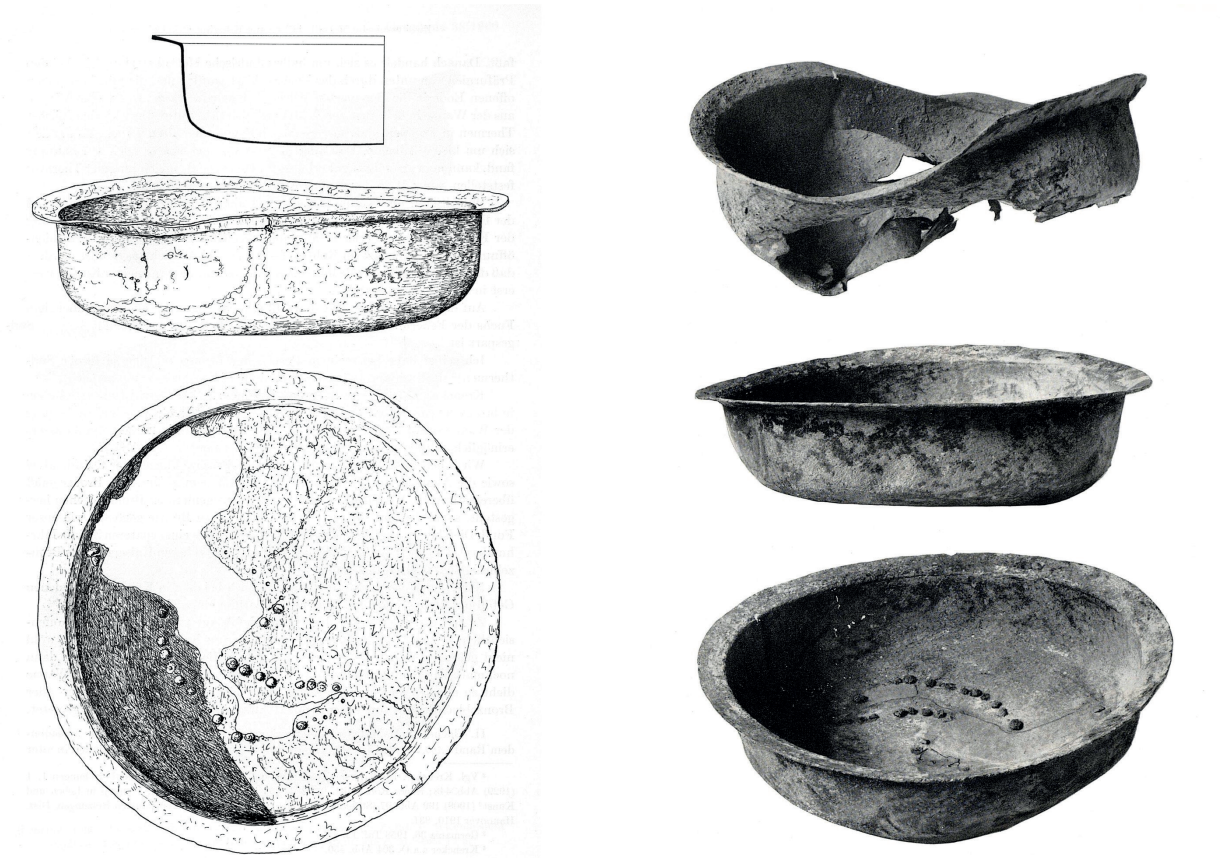


Fig. 12. *Sketches and photographs of the object found in Künzing (Brödner. 1960: tav. 51 and p. 384).*

could have been the base of a furnace[12] (1994: vol B, 158-161).

However, given its original position, the object of our study could not have been put to a similar use, and therefore it can be identified with the *testudo alvei* models described in a number of studies (*cf.* Maréchal 2017, among others). Given that the object from the Termas de São Vicente does not appear to be linked to an identifiable structure such as a pool, it may be that the vessel was used to supply the room with water, as a kind of *labrum* or vessel used for ablutions, which probably received the water from a channel located above the arch of the *praefurnium*, to provide the room with running water and steam[13].

[12] A description by Oliviero (1930: 149 and 165), who named this room *stanza della caldaia*. An alternative description for objects of this type is given by Thébert (2003: 399), in relation to the bronze section that would be positioned below the *miliarium*, possibly for the conservation of the furnace itself (which was often made of lead) and to prevent it from coming into direct contact with the flames and also allow the distribution of heat and maintenance of the structure.

[13] During the revision of this article, we have found information on another example of this type of objects, albeit smaller (about 30 cm according to the image), in the collection of the Louvre Museum, Département des Antiquités Orientales (n. AS 4850). It is described as a 'grand bassin de basse époque', made of bronze and dated to the 5th century, with no indication of provenance. Permalink: https://collections.louvre.fr/ark:/53355/cl010370863.

Fig. 13. *Photograph showing where the bronze vessel was found, in the* caldarium *of the Baths of Trajan or Terme della Myrtusa de Cirene, Libya (Oliviero, 1930: fig. 8, in Garbrecht and Maderscheid, 1994: vol. c, fig. 116).*

with baths of –cold?– sulphurous waters, as in the case of Termas de São Vicente –17.8 ºC–. This allows us to draw an initial hypothesis that it could be related in some way with the salutary treatments associated with these cold mineral-medicinal waters. The second similar find, although linked to baths used for hygiene, is equally significant, as interpretations point to its possible connection with the furnace infrastructure created to supply water for the *caldarium*. In this sense, although it is likely that the part of the São Vicente vessel that would have been used to heat water is missing –hence the soot stains on this object, which would have been the base or support–, heating these mineral-medicinal waters would clearly have allowed for use to be made of their composition and function to treat skin and respiratory ailments by evaporating the water for inhalation.

The layout of the room the object was found in –Room i– is in line with this hypothesis. According to J. Fortes, it would have featured steps for sitting on and enjoying the characteristics of these waters at a hot temperature. This basin would therefore have been used to heat the water for washing and inhaling, provided that a constant supply was available, as indicated by the appearance of a *fistula plumbei* running horizontally along one of the walls where this object was found –as can be seen in the photograph of the material collected, Fig. 4 and drawn in Soeiro, 1984: 71, no longer in existence–. The result would be a type of heated

5. Conclusions

Despite the difficulty involved in its interpretation, the unique nature and excellent state of conservation of the object justifies the interest in its study. It is significant that, at least in the case of the first similar object identified, it can be associated

room with a *testudo alvei* or hot water basin –in the style of a *labrum*– placed on the floor of the room that served as a kind of *laconicum* –or steam room– within the area used for treatments on the site.

Further proof of the association between this object and water lies in the fact that the joints have been reinforced with layers of lead, a suitable mineral for ensuring the insulation and watertightness of objects linked to water, as in the case of the *fistulae plumbei*, as well as other materials.

Harder to ascertain is the position of the vessel at the mouth of the *praefurnium* and in relation to the floor of the room despite J. Fortes' highly illustrative description (Fortes, 1902: 20). Indeed, as documented by this author and verified by our fieldwork (2021), the object would have been positioned at the furnace opening, inserted in the *suspensura* and above the *praefurnium* channel (Fig. 14). Indeed, this space bears the possible marks or anchoring elements, such as the initial sections of what were possibly iron bars.

This layout could be explained by the need to heat the contents and may have been reinforced or raised on the wall from the edge from the far rim, as indicated by the traces of lead that can be observed on much of the surface area. The result would therefore be a *testudo alvei*, whose wall would prevent the entrance of fumes or air from Room K and would retain and direct the water or steam produced towards Room I.

Given its located in the *praefurnium* gap –just below the conserved arch–, it could not have been used to support a water storage item such as a *miliaria* or cistern (Degbomont, 1984; Bouet, 2003), and therefore the flow of water would be low –in line with the channel described by Fortes (1902: 20-21)–, and suitable for the rapid production of steam or easy heating of water.

We are therefore faced with a Roman bronze object, made from several embossed sheets joined by a lead seal, which would have been placed over the mouth of the *praefurnium* as part of the function of this area, possibly acting as a vessel to hold water for distribution or evaporation.

At all events, although we have located at least one similar type of object, which also is associated

Fig. 14. *Model recreating the proposed position of the basin at the Termas de São Vicente under the mouth of the* praefurnium *(drawing by J. D. Carmona).*

with another possible cold mineral-medicinal water facility in Künzing, Germany, it is necessary to extend our search to other sites and periods in order to determine whether cold mineral-medicinal waters were used in Roman baths for a specific purpose (inhalation?) or whether this was an exceptional or infrequent solution, adapted to the specific characteristics of this building as a means of promoting salutary treatments based on the use of mineral-medicinal waters.

For the time being, dating must be limited to the historical context in which it was used, and is therefore a mere proposal, as there are no elements that allow us to pinpoint the precise time of installation, although it did remain *in situ* until the time of its discovery. The dating of certain Roman materials found on the site, as well as the nature and technique employed in the construction of the hypocaust system, indicate that the original building could well date back to the late 1st century AD and early 2nd century AD, based on the provisional dating results obtained using OSL and TL techniques[14]. In this sense, we can place this building in the Flavian-Trajanic period, although we do not know when the object was taken to the thermal complex, or when it was eventually abandoned, possibly as late as the 5th or 6th centuries AD.

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