

# ASMOSIA XII

ASSOCIATION FOR THE MARBLE & OTHER STONES IN ANTIQUITY



## PROCEEDINGS

of the XII ASMOSIA INTERNATIONAL CONFERENCE, IZMIR 2018

Edited by

Ali Bahadır Yavuz - Burak Yolaçan - Matthias Bruno



DOKUZ EYLÜL UNIVERSITY - İZMİR / TÜRKİYE

Dedicated to the dear memory of

*Moshe Fischer*

ASSOCIATION FOR THE STUDY OF MARBLE & OTHER STONES IN ANTIQUITY

# **ASMOSIA XII**

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**Edited by**

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## Preface

This proceeding book includes the papers presented at the Conference of the XII. Association for the study of Marble and other stone in Antiquity (ASMOSIA XII). The conference was organized by Geological Engineering and Archaeological departments of Dokuz Eylül University, İzmir, Türkiye, on the 8<sup>th</sup> to the 14<sup>th</sup> of October. Like in the previous congresses, ASMOSIA XII was highly international and interdisciplinary. During the conference more than 100 oral and poster presentations were submitted by the participants, archaeologists, geologists, art historians, conservators, historians of Classical antiquity, architectural historians, chemists and physicist from at least 15 different nationalities.

The papers presented in this book can be grouped under 4 main headings like applications to specific archaeological questions – use of marble; provenance identification marble and other stones; advances in provenance techniques, methodologies and databases; quarries and geology: quarrying techniques, organisation, transport of stones, new quarries, stone carving and dressing, hazards and preservation of quarries; stone properties, weathering effects and restoration, as related to diagnosis problems, matching of stone fragments and authenticity and pigments and painting on marble.

In this symposium, which lasted 7 days, including five days of presentations and 2 days of field trips, important scientific discussions were made on the above-mentioned issues by the attendees from various disciplines. We believe that the proceeding book of ASMOSIA XII including the results of the important multidisciplinary works will help the researchers who work in these fields.

We would like to thank Dokuz Eylül University for it's support during the symposium and for printing this proceeding book. We would like to express our special thanks to Dr. Akın Ersoy and to the other organization committee members of the ASMOSIA XII conferences. Additionally, we also would like to thank the reviewers who gave important support during the reviewing processes of this book.

Finally, we want to dedicate this volume of the XII Asmosia Izmir Proceedings to the dear memory of Moshe Fischer. Esteemed colleague, one of the greatest scholar about roman architectural decoration in the Levant and in larger part of the Mediterranean, Moshe was fellow of Asmosia since the first Workshop held at Il Ciocco (Lucca, Italy) in 1988 and finally member of the executive Committee of Asmosia since 2015. We will never forget his friendliness and kindness, his archaeological expertise, his deep voice and his mustache.

Ali Bahadır Yavuz  
Burak Yolaçan  
Matthias Bruno

# MULTIMETHOD MARBLE IDENTIFICATION FOR THREE AUGUSTAN INSCRIPTIONS IN *EMPORIAE* (NE HISPANIA)

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## Abstract

*Emporion*, the Greek port located on the coast of northern Catalonia, received classical marbles and their associated influences. The emblematic sculpture of Asclepius-Serapis evidences marble importation dating back to the end of the 2<sup>nd</sup> century BC. Once the Roman city of *Emporiae* was established, the use of marble as epigraphic supports begins in the 1<sup>st</sup> century BC, with a remarkable boom in Augustan times. With the aim of establishing in which cases marble was imported from the Greek world or from other closer sources such as the Pyrenaean marble from Saint-Béat, three Augustan inscriptions on coarse-grained marble have been studied: a plaque dedicated to Marcus Agrippa, one to Tutela and another with the testament of Cornelia Procula. Results from a multi-method analytical approach, combining polarized-light microscopy, cathodoluminescence and IRMS with C and O stable isotope analysis helped us to identify the marble sources. Although they are macroscopically very similar, the analytical parameters obtained have served to differentiate one Saint-Béat marble from the other two with a common Cycladic origin.

**Keywords:** *Emporiae*, marble, Augustan inscriptions.

## Introduction and aim of the study

*Emporion* (Ampurias/Empúries, Northern Catalonia) was founded by Phokaian Greeks on a small island at the mouth of the river Fluvià, in a region inhabited by the Indigetes (Fig. 1A). Situated on the coastal commercial route between Massalia (Marseille) and Tartessos in the far south of Hispania, the city developed into a large economic and commercial centre as well as being the largest Greek colony in the Iberian Peninsula. During the Punic Wars, *Emporion* allied itself with Rome, and Publius Cornelius Scipio initiated the conquest of Hispania from the city in 218 BC, though it remained an independent city-state. However, in the civil war between Pompey and Julius Caesar, it opted for Pompey, and after his defeat it was stripped of its autonomy. A colony (*Emporiae*) of Roman veterans was established to control the region. Indeed, a key role was played by Julius Caesar's lieutenants, who were elected as city patrons<sup>1</sup>. From the Flavian period onwards, the city began to decline, eclipsed by the power of Tarraco (Tarragona) and Barcino (Barcelona)<sup>2</sup>.

Among the archaeological heritage of the city a splendid sculpture of the god Asclepius-Serapis stands out (Fig. 1B). Dated to the end of the 2<sup>nd</sup> century BC and made of pentelic and parian white marbles<sup>3</sup>, it documents the importation of marble at a time preceding the foundation of the Roman colony in the late 1<sup>st</sup> century BC<sup>4</sup>. The use of marble

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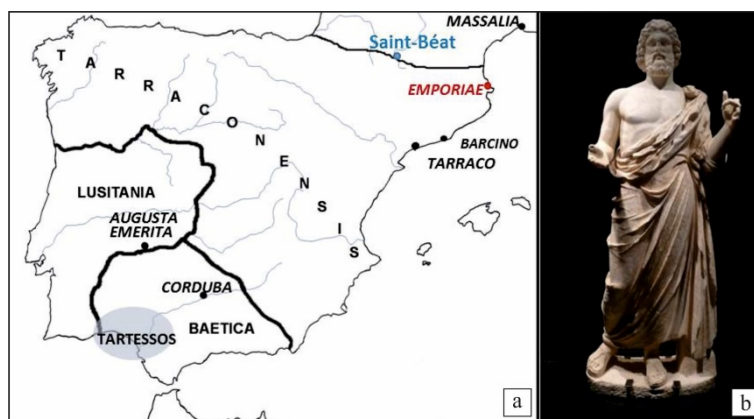
<sup>1</sup> Rodà 1986-1989.

<sup>2</sup> Aquilué (ed.) 2012, Rodà 2016.

<sup>3</sup> Provenance assigned by A. Àlvarez after unpublished petrographic analyses.

<sup>4</sup> Vv.Aa. 2007

in Roman *Emporiae* was significant. In particular, when the third volume of Catalogne's *Romaines Inscriptions* (= IRC III)<sup>5</sup>, was published in 1991, three of them of considerable size and carved on marble, drew our interest. The pieces could be dated back to the early years of the Empire, a moment of great power for the city, a fact that is further emphasized by the early use of various *marmora*<sup>6</sup>. The three inscriptions were engraved on white and coarse-grained marbles. They are IRC III 17, 24 and 36 respectively<sup>7</sup>.



**Figure 1:** a. Map of Hispania with the location of sites named in the text; b. Asclepius-Serapis from *Emporion/Emporiae* (Photo: MAC – Empúries).

At that time no archaeometric analysis was made, but macroscopically it was hypothesized that they could be marbles from Saint-Béat quarries in the French Pyrenees. Consequently, due to the archaeological relevance of these three very unique pieces, all corresponding to the public sphere and in particular to the *Emporiae* Forum, it was considered of interest to check this hypothesis in the context of the research focused on the Pyrenean marbles<sup>8</sup> and their use in ancient times<sup>9</sup>. Therefore, this paper reports their archaeometric study following a well-established multi-method analytical approach. The results are compared with the analytical database of Pyrenean (French-Iberian) and other classical marbles from the Mediterranean territories.

### The inscriptions under study

A small chip of each inscription was taken, numbered as 1, 2 and 3 in the following order:

1. The Tutela temple and statue erection, IRC III, 17, (Fig. 2).

A plaque with smooth epigraphic field but moulded cornice on the back, dedicated to Tutela. Palaeographically it is dated back at very early imperial time, and the text evidences

<sup>5</sup> Fabre *et al.* 1991.

<sup>6</sup> About the early use in *Emporiae* of diverse *marmora*, i.e., pavonazzetto (IRC III, 21, del 15-20 d.C.), see Rodà 2004, 417.

<sup>7</sup> Comes, Rodà 2002, nn. 32, 136, 34, with photographs; Fabre *et al.* 2002, 84-85.

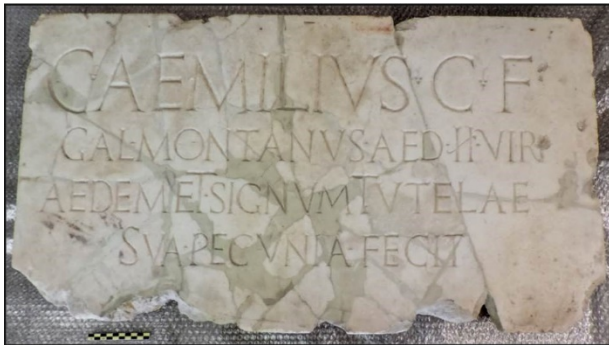
<sup>8</sup> This research is part of the objectives of the projects funded by Ministerio de Ciencia, Innovación y Universidades: Har 2015-65319-P (Mineco/Feder, UE) and PID2019-106967GB-I00 “*Sulcato marmore ferro*. Canteras, talleres, artesanos y comitentes de las producciones artísticas en piedra en la Hispania Tarraconensis”. and the Trans-Pyrenean Project “MARMOL” funded by the regional governments of Aragon-New Aquitaine.

<sup>9</sup> Royo *et al.* 2015, 2018; Royo, 2016 (Ph D Thesis, unpublished), Aguarod, Lapuente, 2020.

the erection of a temple (*aedes*) and a statue (*signum*) for the Roman goddess Tutela by the local magistrate (*IIvir*) Caius Aemilius Montanus at his own expense (*de sua pecunia*)<sup>10</sup>.

2. A dedication to Agrippa IRC III, 24, (Fig. 3).

Plaque with smooth epigraphic field but moulded cornice in its back (similar to the one described above) dedicated to Marcus Agrippa as the city patronus. It is an inscription that closes a cycle of tributes to prestigious patrons of *Emporiae*<sup>11</sup>, being the only one engraved in marble, since the others are of various local limestones<sup>12</sup>. Dated between 19 and 18 BC, this inscription is one of the oldest examples of marble use for inscriptions in this area of Hispania.



**Figure 2:** The Tutela inscription IRC III, 17, (Photo: Authors, with permission of MAC-Empúries).



**Figure 3:** The Agrippa inscription (IRC III, 24) (Photo: Authors, with permission of MAC-Girona).

3. The Cornelia Procula testamentary disposition IRC III, 36, (Fig. 4).



**Figure 4:** The Cornelia Procula inscription, IRC III, 36 (Photo: Authors, with permission of MAC-Girona).

A very fragmentary plaque – the current restoration dates to 1950, but the reading was reinterpreted later in IRC – with an epigraphic field framed by moulding commemorates Cornelia Procula. This woman funded the erection of a temple by will and testament, to which a pecuniary complement from an unknown former slave of hers (*libertus*) is added. The inscription is an outstanding evidence of female euergetism in Tarraconensis, that can be dated roughly to the first half of 1<sup>st</sup> century AD, quite plausibly under Augustus or Tiberius<sup>13</sup>.

<sup>10</sup> *C(aius) Aemilius C(ai) f(ilius) / Gal(eria tribu) Montanus aed(ilis) II(duo) vir / aedem et signum Tutelae / sua pecunia fecit.*

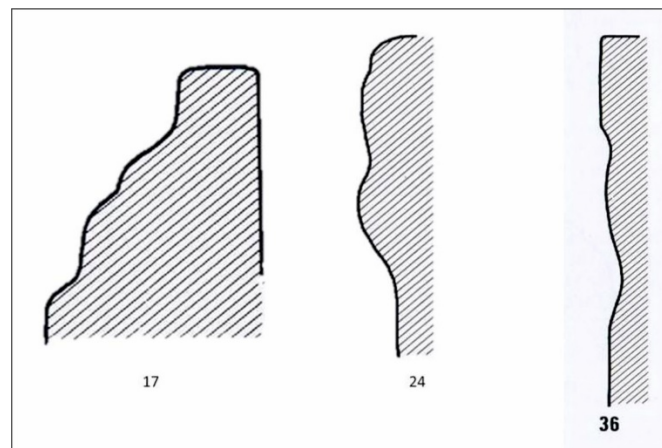
<sup>11</sup> IRC III 25 to 29, Rodà 1986-1989.

<sup>12</sup> *M(arco) [Agrip]pae / pat[rono].*

<sup>13</sup> *[Testa]mento Cornelia[e P]roc[ul]ae / [ex re]l[ic]tis HS (sestertium) N(ummis) XL (quadraginta millibus) / et ad[ic]t[is] / HS (sestertium) n(umis) V[C]CCCXCV (quinque millibus quadringentis nonaginta quinque [de suo] / [aedem] consum[m]avit --- l[ib]ertus). It is the dedication of a temple according to the testament of the private Cornelia Procula that bequeathed the amount of 40,000 sesterces to which her liberto had to add another 5,495 ones.*

The temple it refers to is of modest dimensions and could be identified with nr.7 of the Forum of *Emporiae*.

Typologically all three inscriptions are plates: that of Cornelia Procula (IRC III 36) with moulding that frames the epigraphic field (Fig. 4); though, the other two, have a very interesting formal similarity. The epigraphic field in both is not moulded, instead they have moulding on the four sides of the back, so that, once the plates are embedded in the corresponding wall, the moulding would be visible, creating a certain aerial effect (Fig. 5). As we will see below, the archaeometric analyses of the three pieces confirm, that the type of marble is the same for IRC III 17 and 24, but different for IRC III 36.



**Figure 5:** Moulding from IRC III, 17 (fig. 2, p. 11), 24 (fig. 3, p. 12) and 36 (fig. 3, p. 12).

## Methodology

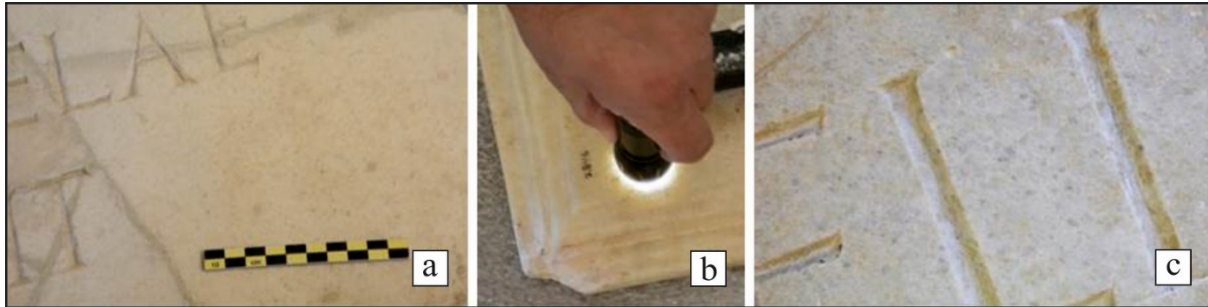
A multi-method analytical approach, combining polarized-light microscopy, optical-cathodoluminescence and IRMS with C and O stable isotope analysis has carried out to discriminate the marble sources. Experimental procedures were developed according to the methodology described elsewhere (Lapuente, 2014; Lapuente *et al.* 2014; Lapuente, Royo 2016). The polarizing microscope was systematically used for studying mineralogy and texture parameters. Particular attention was paid to fabric and grain size, measuring the Maximum Grain Size (MGS) and describing Boundary Grain Shape (BGS). Concerning CL features, their intensity, colour and distribution were observed and photographed.

## Results and discussion

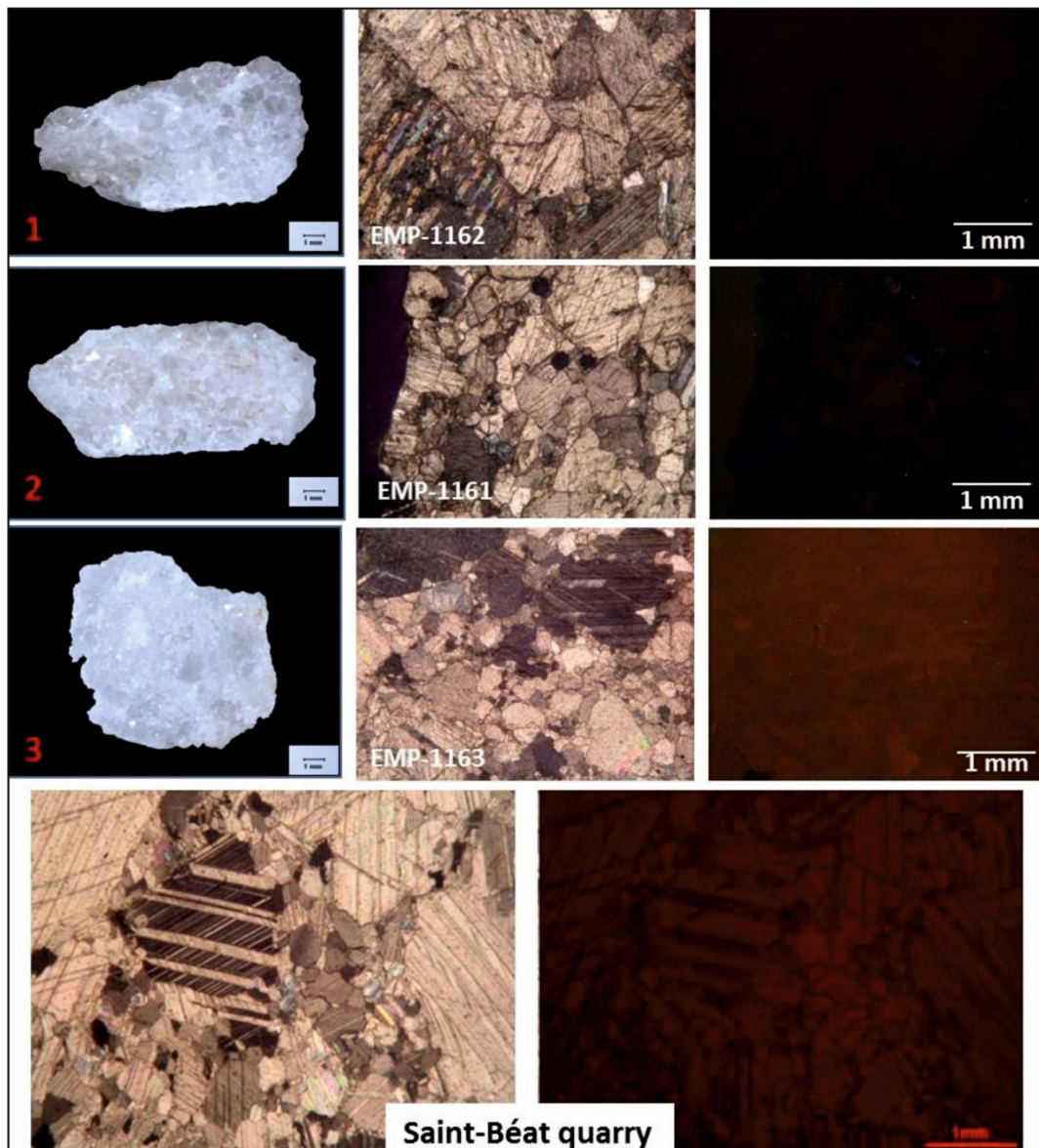
Macroscopically all are coarse-grained marbles, compact and well crystallized. Visually, the white marble in plates nr. 1 and nr. 2 look similar with a slightly yellowish tone due to the presence of a patina, more accentuated in plate nr. 2. In plate nr. 1 the presence is well visible of sporadic isolated very coarse grey grains embedded in a matrix of white crystals (Fig. 6A). The measured MGS is 4.3 mm in those sporadic grains and light-transmitting shows a medium halo around (Fig. 6B). On the contrary, in plate nr. 2 the patina prevents the MGS from being properly measured and reduces light transmission. Concerning with plate 3, the white marble exhibits a greyish tone emphasized by the presence of frequent larger grey grains, with MGS of 3,2 mm, in a clear heteroblastic texture (Fig. 6C).

Regarding petrography and CL-features (Fig. 7), all samples are pure calcitic coarse-grained marbles with isotropic fabric, slightly heteroblastic texture in samples 1 and 2, but well-defined heteroblastic texture in ‘core-mantle’, in sample 3. Sample 1 and 2 exhibit curved and slightly embayed GBS, but rare straight ones are also present. They display fine

and frequent thick twins, from tabular and occasionally lensed (types II and III after Burkhard, 1993). Their MGS, measured on the thin-sections are 2.5 mm and 2.2 mm, respectively. Their CL-patterns are quite similar with very faint intensity but seem to be heterogeneous in distribution. However, in sample 3, GBS is curved and embayed with frequent thick twins (types II, III and IV) and signs of syn-tectonic recrystallization, with a MGS of 2.9 mm. Its CL-microfacies is brownish faint intensity but homogeneous.



**Figure 6:** Different macroscopic views: **a-b.** Plate nr. 1; **c.** Plate nr.3.

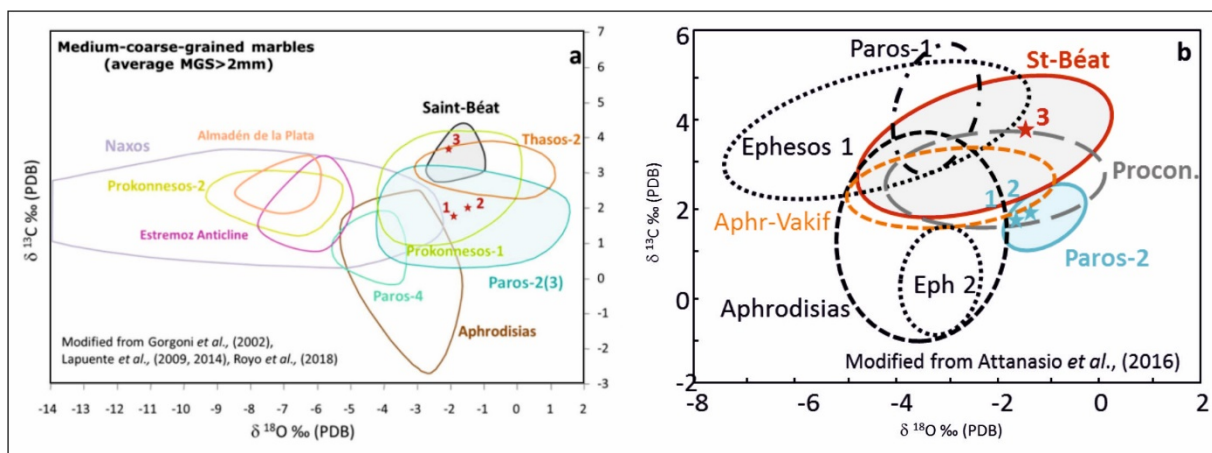


**Figure 7:** Petrographic, in crossed nicols, and CL-images of the respective analyzed samples 1, 2 and 3; and images of Saint-Béat marble quarry taken under the same analytical conditions.

Concerning the isotopic signature of samples 1 and 2 are quite similar (Fig. 8). Their C and O isotopic values, with respect to PDB, are 1.8 ‰ ( $\delta^{13}\text{C}$ ) and -1.9 ‰ ( $\delta^{18}\text{O}$ ) in sample 1, and 2.0 ‰ ( $\delta^{13}\text{C}$ ) and -1.5 ‰ ( $\delta^{18}\text{O}$ ), in sample 2. However, isotopic data in sample 3 are rather different: 3.7 ‰ ( $\delta^{13}\text{C}$ ) and -1.5 ‰ ( $\delta^{18}\text{O}$ ).

Comparing their petrography and CL-patterns with the analytical database of the Pyrenaean marble quarries, only sample 3 is compatible with the data of Saint-Béat marble (Fig. 7), while the other samples need additional parameters to be identified. However, isotopic signatures (Figs. 8a, 8b) along with MGS (Fig. 9) help to discriminate them from the classical marbles and confirm the Saint-Béat origin of sample 3.

Samples 1 and 2 fit well with data of the Paros-2(3) isotopic field and plot outside the Pyrenaean isotopic field of Saint-Béat (Royo *et al.* 2018) (Fig. 8a). They also overlap the Prokonnesos-1 isotopic field; however their petrographic and CL features serve to reject this marble source, due to their difference with the homogeneous blue CL-microfacies typical from Marmara island marble (Blanc *et al.* 2000). On the contrary, they are also compatible with those exhibited by marbles from the quarries of Paros-2(3). Concerning the isotopic data of sample 3 plots in the C and O isotopic diagram fall not only into the Saint-Béat quarry isotopic field (Fig. 8a), but also into the area commonly exhibited by other archaeological samples analyzed from Hispania and Gaul (Lapuente *et al.* 2009; Costedoat, 1995), assigned to this provenance. Furthermore, their isotopic signature has been plotted on the diagram proposed by Attanasio *et al.*, (2016), where also the same identifications are obtained. In addition, although the isotopic signatures of samples 1 and 2 are also compatible with those of Miletos or Herakleia whose  $\delta^{18}\text{O}$  ranges from -1.05 and -3.96 ‰; and  $\delta^{13}\text{C}$  from 1.18 to 3.86 ‰ (Attanasio *et al.* 2006), the MGS of this turkish aegean coast marble is considerably finer (Fig. 9), so this source must be discounted.

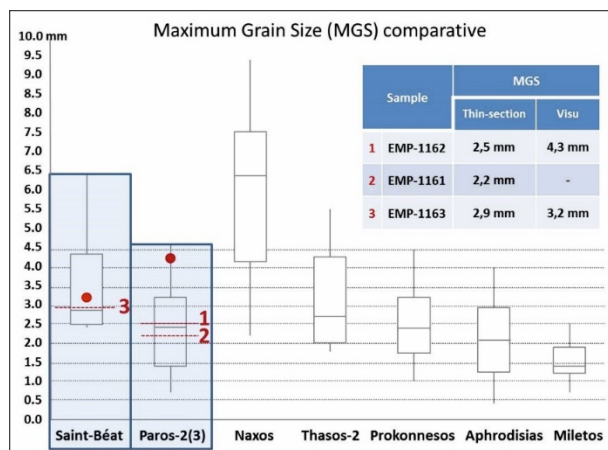


**Figure 8a:** Isotopic signature of the inscriptions plotted on the diagram for classical marbles with addition of the white Iberian marbles from the Ossa Morena and the updated Saint-Béat from the French Pyrenees.

**Figure 8b:** The same marble identifications are obtained using the isotopic diagram by Attanasio *et al.* 2016, which includes the most important quarries of Saint-Béat.

## Conclusions

Comparing the results of the multi-method analytical approach with the available database, samples 1 and 2 match well with marbles collected in quarries of the Cycladic island of Paros, in particular with those outcropping in the Chorodaki and Aghios Minas valleys, to the South of Marathi (Gorgoni *et al.* 2002). Sample 3, however, is assigned to the Gaul area quarry district of Saint-Béat.



**Figure 9:** Maximum Grain Size of samples 1 and 2 match well with the size of Paros-2(3), even the macroscopic measurement of 4,3 mm (represented by a point), however other marble source isotopically compatible such as Miletos must be discarded considering this parameter. MGS of Sample 3 is very close to the median size of the Saint-Béat quarry samples.

In both cases the identified marble source agrees with the archaeological criteria, since, according to their formal features, inscriptions nr. 1 and nr. 2 are quite similar, but nr. 3 is somewhat different in several features, such as its largest dimensions, the epigraphic field being framed by moulding and the smooth back. The common marble identification in plates dedicated to Tutela and Agrippa (nr. 1 and nr. 2), points further to the suggestion of having been manufactured in the same workshop. Furthermore, both inscriptions have a clear precise public purpose: homage to an illustrious *patronus* dedicated by the municipality (nr. 1) and a public religious building erected by a magistrate (nr. 2). So, it is quite likely that they were destined to a similar place of public exhibition. On the contrary, nr. 3 is totally a private initiative, although its precise terms are not available.

In addition, it is interesting to note that in a different Hispanic context another fragmentary inscription made in a macroscopically similar white marble has been recognized, though it has not yet been analyzed. This piece comes from *Augusta Emerita* (present-day, Mérida) and is dedicated to *Bocchus*<sup>14</sup>, most likely identifiable with the influential person *Lucius Cornelius Bocchus*, from the Tiberian period. It remains, therefore, to be corroborated that this was made from a similar marble to that of the Tutela and Agrippa since, in addition, the *emeritensis* has a similar type of moulding on the back.

Finally, once again there is a clear need to review the data of provenance made years ago in certain emblematic archaeological pieces, carried out without performing contrasting analyses with an adequate comparative database, which of course today offers accuracy thanks to the higher number of quarry samples analysed using the same methodology.

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<sup>14</sup> Stylow, Villanueva 2009, n. 11 (= *HEp* 19, 2010, 19 = *AE* 2010, 662). On Bocchus, see Cardoso; Almagro-Gorbea (eds.), 2011. The inscription is located at Museo de Arte Romano de Mérida (inv. C.M.M. Inv. 6025/342/38).



## Bibliography

- Aguarod, C., Lapuente, P. 2020: “The *marmora* ornamentation of the *natatio* in the Central Baths of *Caesaraugusta* and its provenance”, in CAPA III, Arqueología y Patrimonio de Aragón, Zaragoza. 3.1., 303-312.
- J, A, Abadías, 2012, *Empúries – Municipium Emporiae*, (Ciudades romanas de Hispania, 6), Roma.
- Attanasio, D., Brilli, M., Ogle, N. 2006: *The Isotopic Signature of Classical Marbles*, L’Erma di Bretschneider: Rome, Italy.
- Attanasio, D., Bruno, M., Prochaska, W. 2016: “The marbles of the Roman Villa of Chiragan at Martres-Tolosane (Gallia Narbonensis)”, *Archäologischer Anzeiger*, 2016/1, 169-200.
- Blanc, P., Lapuente, P., Garcia-Moreno, A.G. 2020: “A new database of the quantitative cathodoluminescence of the main quarry marbles used in antiquity”, *Minerals*, 10, 381.
- Burkhard, M. 1993: “Calcite twins, their geometry, appearance and significance as stress-strain markers and indicators of tectonic regime: a review”. *Journal of Structural Geology*. 15, 351-368.
- Cardoso, J.L., Almagro-Gorbea, M. 2011: *Lucius Cornelius Bocchus, escritor lusitano da Idade de Prata da literatura latina (colóquio Internacional de Tróia, 6-8 de outubro de 2010)*, Madrid-Lisboa, 2011.
- Comes, R., Rodà, I. (eds.) 2002: *Scripta manent. La memoria escrita de los romanos / La memòria escrita dels romans*, catálogo de la exposició, Barcelona, 2002,
- Costedoat, Ch. 1995: “Recherches sur les marbres pyrénéens”, in J. Cabanot, R. Sablayrolles, J.L. Schenk (eds.), «Les marbres blancs des Pyrénées: Approches historiques et scientifiques» *Entretiens d’Archéologie et d’Histoire*, vol. 2, Musée archéologique departementaldeSaint-Bertrand-de-Comminges,Saint-Bertrand-de-Comminges,101-118.
- Fabre, G., Mayer, M., Rodà, I. 1991: *Inscriptions romaines de Catalogne III. Gérone (= IRC III)*, Paris.
- Fabre, G., Mayer, M., Rodà, I. 2002: *Inscriptions romaines de Catalogne V. Suppléments aux volumes I-IV et instrumentum inscriptum*, Paris.
- Gorgoni, C., Lazzarini, L., Pallante, P., Turi, B. 2002: “An updated and detailed mineropetrographic and C–O stable isotopic reference database for the main Mediterranean marbles used in antiquity”, *ASMOSIA V*, 115–131.
- Lapuente, P. 2014: “Archaeometry on stones. Multi-method approach to investigate stone provenance. Studied cases from Roman Hispanic *Marmora*”. *Hungarian National Museum e-journal 2014/XI./3*, 149-158.
- Lapuente, P., Turi, B., Blanc, P. 2009: “Marbles and coloured stones from the Theatre of *Caesaraugusta* (Hispania): Preliminary study”, *ASMOSIA VII*, 509-521.
- Lapuente, P., Nogales-Basarrate, T., Royo, H., Brilli, M. 2014: “White Marble Sculptures from the National Museum of Roman Art (Mérida, Spain): Sources of Local and Imported Marbles”, *European Journal of Mineralogy*, 26, 333-354.
- Rodà, I. 1986-1989: “Els lloctinents de Juli Cèsar, primers patrons d’Empúries”, *Empúries* 48-59/II (1986-1989), 246-249.
- Rodà, I. 2004: “El mármol como soporte privilegiado en los programas ornamentales de época imperial”, in S. F. Ramallo (ed.), *La decoración arquitectónica de las ciudades de Occidente*, Murcia, 2004, 405-420.
- Royo-Plumed, H. 2016: “Mármoles de la Cordillera Pirenaica: afloramientos norpirenaicos y asociados al “Nappe des Marbres”. Caracterización y uso en época romana. Doctoral Thesis (Unpublished). Zaragoza University.
- Royo, H., Lapuente, P., Ros, E., Preite-Martinez, M., Cuchí, J.A. 2015: “Discriminating criteria of Pyrenean Arties marble (Aran Valley, Catalonia) from Saint-Béat marbles: evidence of Roman use”, *ASMOSIA X*, 613-622.

- Plumed, H.R., Lapuente, P., Cuchí, J.A., Brilli, M., Savin, M.C. 2018: “Updated characterization of White Saint-Béat marble. Discrimination parameters from classical marbles”, *ASMOSIA XI*, 379-389.
- Stylow, A.U., Villanueva, A.V. 2009: “Los hallazgos epigráficos”, in R. Ayerbe, T. Vélez, Barrientos, F. Palma (eds.), *El Foro de Augusta Emerita: Génesis y evolución de sus recintos monumentales (Anejos de Archivo Español de Arqueología 53)*, Madrid.
- VV. AA. 2007: *L’Esculapi. El retorn del déu*. Museu d’Arqueologia de Catalunya-Empúries, Barcelona.

