

## Contribution to the use of marble in Central-*Lusitania* in Roman times: The stone architectural decoration of *Ammaia* (São Salvador da Aramenha, Portugal)

### Reflexiones sobre el uso de mármol en Lusitania central en época romana: La decoración arquitectónica en piedra de Ammaia (São Salvador da Aramenha, Portugal)

Devi Taelman\*  
Ghent University

#### SUMMARY

This paper reports the results of a quantitative and qualitative study of the imported architectural decorative stone of the Roman town of *Ammaia* (São Salvador da Aramenha, Portugal), located centrally in the province of *Lusitania*. All studied ornamental stones were counted, weighed, classified and their provenance was determined.

Six types of stone were used for the architectural decoration at *Ammaia*: white marble, pink–purple limestone, grey–white marble, two marble breccias and granite. Granite was the most widely used building stone and was used for the production of columns and capitals. Previous studies have established a local source for the *Ammaia* granite (Taelman *et alii* in press). The provenance of the remaining ornamental stones is primarily regional (the southern part of the Iberian Peninsula). Only the two marble breccia varieties were imported from the Mediterranean: *africano* from Teos (Turkey) and *breccia di Sciro* from the island of Skyros also (Greece). The predominant use of regionally available stones is observed in other Roman towns located in the interior of the Iberian Peninsula, such as *Emerita Augusta*, *Asturica Augusta* and *Munigua*, and results mainly from the geographic location of the sites, remote from any seaport and/or navigable river.

#### RESUMEN

El presente trabajo presenta los resultados de una valoración cuantitativa y cualitativa de la utilización de las piedras

decorativas arquitectónicas importadas de la ciudad romana lusitana de *Ammaia* (São Salvador da Aramenha, Portugal). Todas las piedras decorativas estudiadas fueron contadas, pesadas, clasificadas y su procedencia fue determinada.

En la época romana se utilizaron seis tipos de piedra para la decoración arquitectónica de la ciudad de *Ammaia*: mármol blanco, caliza morada–rosa, mármol blanco y gris, dos brechas compuestas de fragmentos de mármol blanco y granito. El granito fue la piedra de construcción principal en *Ammaia*. Además, el granito se utilizó para la producción de columnas y capiteles. Estudios previos han establecido una fuente local para el granito de *Ammaia* (Taelman *et alii* in press). La procedencia de las otras piedras decorativas es principalmente regional (la parte meridional de la Península Ibérica). Las dos brechas son las únicas importadas y provienen del Mediterráneo: *africano* de Teos (Turquía) y *breccia di Sciro* de la isla de Skyros (Grecia). Una situación semejante con la utilización predominante de piedras regionales se puede observar en otras ciudades hispánicas localizadas en el interior de la Península, tal como *Emerita Augusta*, *Asturica Augusta* y *Munigua*. Esta se debe principalmente a su emplazamiento geográfico, distante de un puerto de mar y/o río navegable.

KEY WORDS: *Lusitania*, Portugal, *Ammaia*, Roman economy, Roman marble trade, marble provenance.

PALABRAS CLAVES: *Lusitania*, Portugal, *Ammaia*, economía romana, comercio romano del mármol, procedencia del mármol.

#### INTRODUCTION

The Roman culture is particularly known for its impressive architectural realisations. Large-scale building was common in the Roman period; it was even a major feature of this successful culture. These buildings have a high architectural and art historical value, but they also have the ability of informing us on the organisation of the construction industry,

\* The author is grateful to the *Fundação Cidade de Ammaia* for logistic support during the fieldwork and for allowing access to the excavation archive. The author would like to express his gratitude to Paul De Paepe, Marlina Elburg, Ingrid Smet and Frank Vanhaecke for their assistance in identifying the marbles. Finally, the anonymous reviewers are acknowledged for their constructive and helpful comments.

This manuscript is related to the doctoral research of the author at the Department of Archaeology at Ghent University, supervised by Prof Dr Frank Vermeulen, which is funded by the Special Research Fund (BOF) of Ghent University.

an important part of the Roman economy. For the embellishment of the architecture, high-quality and expensive stones were used that were traded throughout the Mediterranean. These stones were considered an expensive luxury good that symbolised prosperity, wealth and economic power (Fant 1988: 149-150, 1993: 146). As the value of the stone increased and when factors such as aesthetical properties, prestige, fashion and ideology were involved, accessibility and ease of obtaining became less important and more distant sources were exploited. As such, marbles and other ornamental stones were widely traded throughout the Roman world. The total expenditure involved in supplying the many architectural ornamental projects with the necessary stone must have been enormous and these monumental projects must have had an enormous impact on the Roman economy (e.g. DeLaine 1997; therefore Mattingly and Salmon 2001; Pensabene *et alii* 2012). A study of the marble trading system can therefore offer important information concerning ancient commercial relationships, trade patterns and supply routes.

Since the middle of the eighties of the 20th century, the key focus within this archaeological questionnaire has been on developing new techniques and methods for characterising and determining the provenance of ornamental stones (for a comprehensive overview, see e.g. Lazzarini 2004; Zöldföldi *et alii* 2008). As a result, scientific data on the provenance of ornamental stones of individual monuments and archaeological objects, like sculpture, are becoming increasingly available. Surprisingly, however, quantitative approaches on the use and distribution of marbles are still rare. A key problem with the study of stone is the frequent spoliation and reuse of the material already in Roman times, but surely in post-Roman times. As for ornamental stone, the highly valued and rare marbles were probably the first to be reused. In addition, marble was frequently used as raw material for lime production.

For the Iberian Peninsula, many studies have dealt with the distribution and (archaeological, petrographic and geochemical) characterisation of the ornamental stones from the main Roman exploitation centres (white and coloured marbles), such as the white marbles of Estremoz, Almadén de la Plata, Macael and Sierra de Mijas, and the coloured stones of Antequera, Sintra, Broccatello, Buixcaró, Santa Tecla and Espejon (e.g. Canto 1977-1978; Cisneros 1988, 1989-1990; Lapuente 1995; Lapuente and Turi 1995; Beltrán and Loza Azuaga 1998; Lapuente 1999; Lapuente *et alii* 2000; Lapuente and Blanc 2002; Lapuente *et alii* 2002; Fusco and Manãs Romero 2006; Morbidelli *et alii* 2007; Álvarez *et alii* 2009b; Álvarez *et alii*

2009c; Álvarez *et alii* 2009d; Domínguez Bella 2009; Mañas Romero and Fusco 2009; Nogales *et alii* 2009; Ontiveros Ortega 2009; Beltrán *et alii* 2012; Manãs Romero 2012; Rodríguez *et alii* 2012; Sálán 2012; Taelman *et alii* 2013a).

During the last decade, the use of marble in Roman times in the Iberian Peninsula has received great academic attention as well, focusing mainly on some lavishly decorated rural villae, such as Carranque, Cauca and Balazote (e.g. García-Entero and Vidal Álvarez 2007; García-Entero *et alii* 2009; García-Entero and Vidal Álvarez 2012; Pérez *et alii* 2012; Sarabia Bautista 2012), and on major urban centres such as *Tarraco* (Tarragona, Spain), *Italica* (Santiponce, Spain), *Emerita Augusta* (Mérida, Spain), *Caesaraugusta* (Zaragoza, Spain), *Colonia Patricia* (Córdoba, Spain), *Carthago Nova* (Cartagena, Spain) and *Segobriga* (Saelices, Spain) (e.g. Cisneros 1997; Mayer and Rodá 1998; Lapuente *et alii* 1999; Nogales *et alii* 1999; Cisneros 2000, 2001, 2002; Soler 2003; Cébrian 2004; Cisneros 2004; Cisneros and Martín-Bueno 2006; Álvarez *et alii* 2009a; Beltrán *et alii* 2009; Rodríguez Gutiérrez 2009; Soler 2009; Cisneros 2010; Cisneros *et alii* 2010-2011; Álvarez *et alii* 2012; Noguera and Madrid Balanza 2012; Pensabene *et alii* 2012; Soler 2012).

Despite that many studies have been carried out on the exploitation and the use of both local and imported stones, few studies have dealt with the organisation of the trade and movement of these ornamental stones in the Iberian Peninsula, especially in inland regions.

This paper presents some new ideas on the trade and mode of distribution of marbles and other ornamental stones in Central-Lusitania during the Roman Imperial period. As a case study, the Roman town of *Ammaia* (São Salvador da Aramenha, Portugal) is selected. Previous studies have already determined the use and provenance of the town's white marble and granite (Taelman 2012; Taelman *et alii* 2013b; Taelman *et alii* in press). This study focuses on the qualitative and quantitative examination of the white and coloured ornamental stones found in the town. The results for *Ammaia* are also compared with the results for other towns in the Iberian Peninsula.

## HISTORICAL AND ENVIRONMENTAL SETTING

The ancient town of *Ammaia* is located in the northeastern Alentejo region of Portugal, about 10 km west of the present-day border between Portugal and Spain (São Salvador da Aramenha, municipality of Marvão, district of Portalegre, Portugal) (Fig. 1). In Roman times, *Ammaia* was part of the province

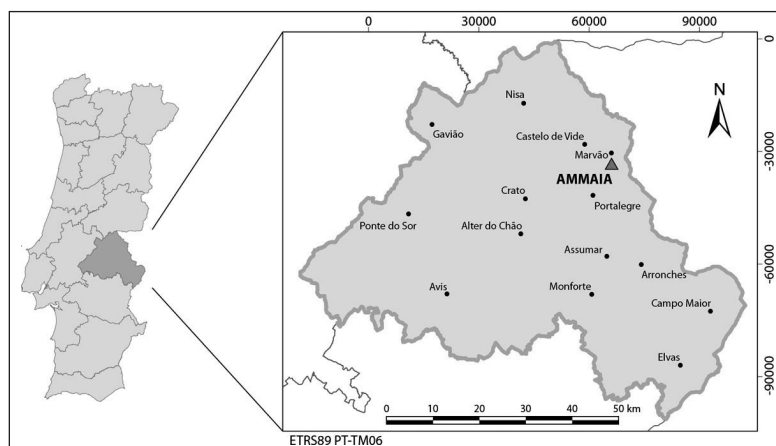


Figure 1. Location of the Roman site of Ammaia with indication of the major towns in the district of Portalegre (Portugal).

of *Lusitania*, the westernmost province of the Roman World.

Systematic archaeological research at the site began in 1994 and focused essentially on five areas (Fig. 2): (1) the forum temple and parts of the forum portico, (2) a public bath building just south of the forum, (3) the South Gate complex with a monumental square and part of the town wall, (4) a residential area in the southeastern corner of the town (*insula* 38), and (5) part of the eastern suburban area (Pereira 2005, 2009; Vermeulen and Taelman 2010). Given that only about 4500 m<sup>2</sup> has been excavated, corresponding to c. 3 % of the town area, the presented overview for *Ammaia* is only preliminary and still subject to change as archaeological research continues. Nevertheless, it is believed that the presented data provide a good overview for the town since the studied areas include public, monumental and private complexes that were occupied throughout the entire Roman history of the town, i.e. from the 1st century CE to the 4th–5th century CE.

The town was founded probably in late Augustan–Tiberian times. Like many towns in *Lusitania*, its heyday began around 50 CE and lasted until the end of the 2nd century CE (Quaresma 2010–2011: 98, 2011). During this period, the settlement evolved into a proper urban centre, with several monumental public complexes. The end of the 2nd century CE appears to have been a turning point for *Ammaia*. Fine-ware imports are relatively scarce (Quaresma 2011) and epigraphic production and building activity virtually ceased. Numismatic evidence, however, suggests a continued occupation of the town at least until the third quarter of the 4th century CE (Ruivo J., personal communication). Between the late 4th

and early 5th century CE, the town was gradually abandoned. Economic instability, demographic decline and reduced urban investment are some of the interlinked explanations for this evolution. Sometime in the first half of the 5th century CE, the site was completely deserted and covered by flood and slope deposits (Vermeulen and Taelman 2010: 313).

From a geological point of view, *Ammaia* and its ancient territory are located on the boundary of the Central-Iberian Zone (CIZ) and the Ossa–Morena Zone (OMZ), two tectonic units of the Hesperian or Iberian Massif, a geotectonic domain that forms the oldest core of the Iberian Peninsula and occupies most of the modern Portuguese territory (Pereira *et alii* 2010: 523) (Fig. 3). The site itself lies in the core of the *La Codosera Syncline*, an Ordovician to Devonian sedimentary sequence of quartzites, shales, sandstones and some dolomitic limestones that overlies the late Proterozoic rocks of the Schist–Greywacke Complex of the Central-Iberian Zone and that stands from it as the small mountain range of the *Serra de São Mamede* (Sanderson *et alii* 1991: 893). Important geological features for the study area are the large syn- to postkinematic granite plutons, such as the Lower Ordovician Carrascal (CG) and Portalegre granites (PG) and the late Hercynian Nisa–Albuquerque Batholith (NAB), that intruded the OMZ, CIZ and the CIZ–OMZ transition zone (Ramírez and Menéndez 1999: 87; Villaseca *et alii* 2008: 264; Solá *et alii* 2009: 157, 166; Pereira *et alii* 2010: 523; Solá *et alii* 2010: 282–284).

Despite this geological diversity and the abundant availability of excellent building stones, the occurrence of ornamental stones in and around the territory of Roman *Ammaia* is restricted to four geological units

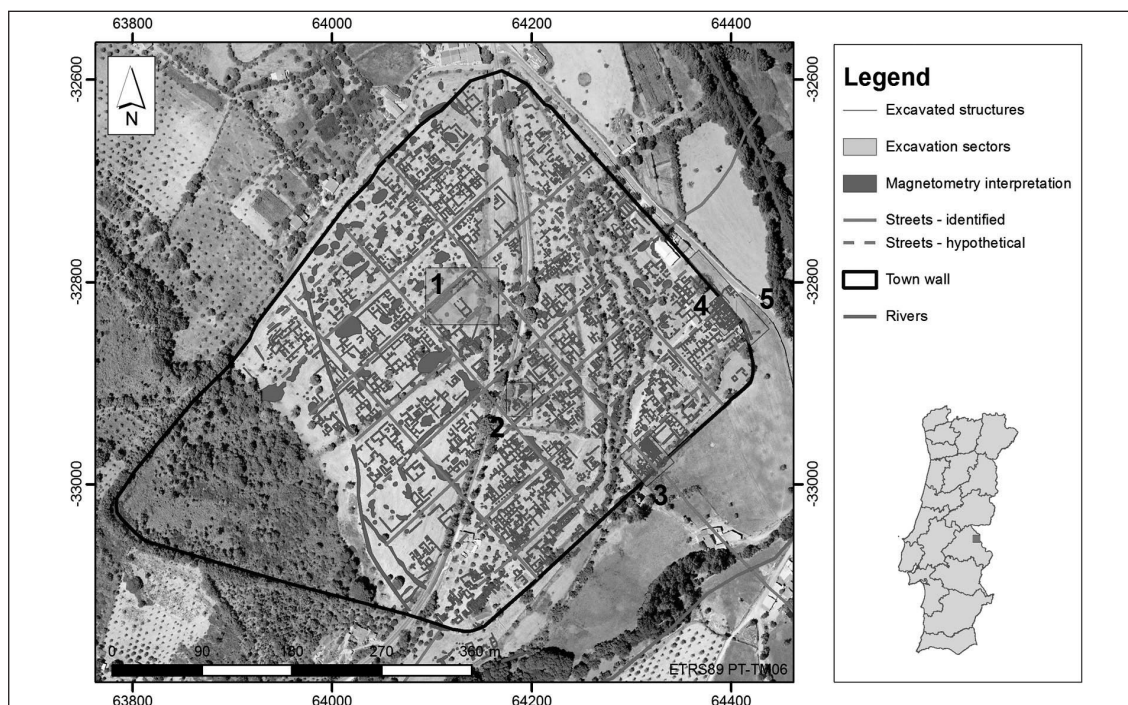


Figure 2. Map of the excavated structures and sectors (1: forum area; 2: forum baths; 3: South Gate; 4: insula 38; 5: eastern suburban area) and of the interpretation of the geophysical survey of the Roman site of Ammaia (after Corsi *et alii* 2012: 138).

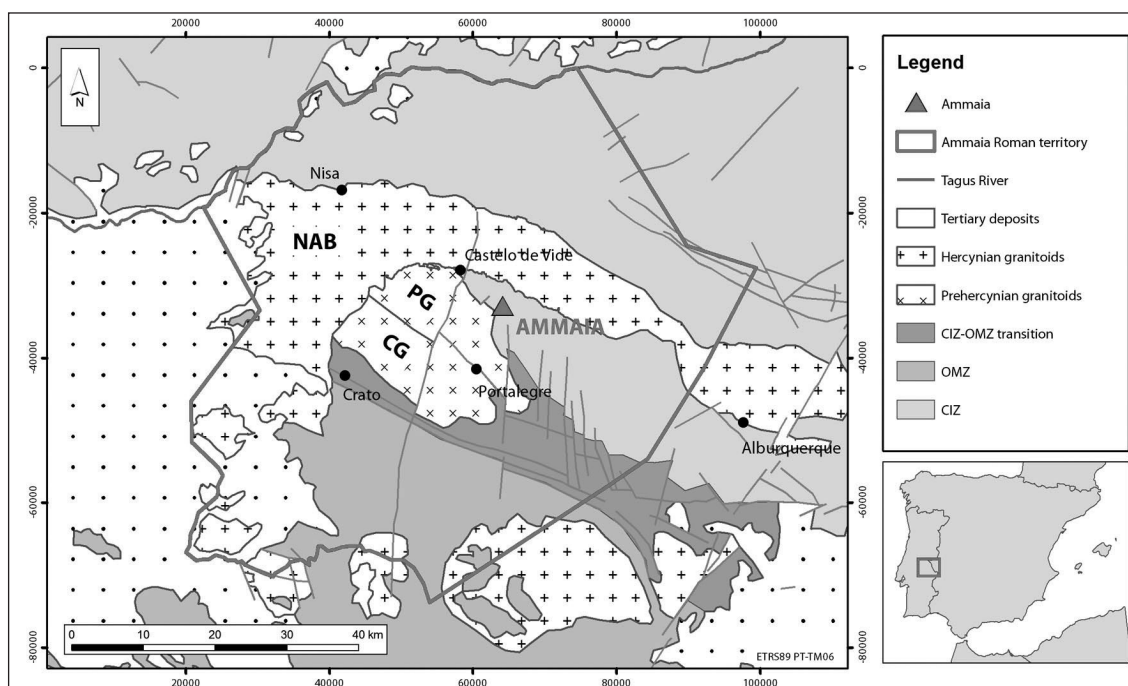


Figure 3. Geological setting of Ammaia and its ancient territory (CIZ: Central-Iberian Zone; OMZ: Ossa-Morena Zone; CIZ-OMZ transition: Central-Iberian – Ossa-Morena transition zone; NAB: Nisa-Albuquerque Batholith; PG: Portalegre granites; CG: Carrascan granites) (after Oliveira *et alii* 1991: 226; Álvaro *et alii* 1994; Menéndez *et alii* 2011: 1534).



around Alter do Chão, Assumar, Elvas and Estremoz (Manupella *et alii* 1981). The quality of the stones outcropping near Alter do Chão, Assumar and Elvas is insufficient for exploitation. Only near Estremoz (the Estremoz Anticline), high-quality marbles can be found.

## METHODOLOGY

All ornamental stones found in *Ammaia* were counted, weighed and characterised macroscopically. Using macroscopic observations, different lithotypes were identified that were sampled for further petrographic and archaeometric examination, and provenance determination.

Thin section petrographic examination was carried out using a polarising microscope. The observed rock properties were rock type, structure, colour, patterning, veining, texture, the presence of fossils or other distinctive features, the overall grain or crystal size, grain size distribution, maximum grain size, main mineralogy and hardness of the rock. For the coloured marbles, this visual and mineralogic–petrographic inspection generally sufficed to determine their provenance. For the white marbles, standard petrographic observations were combined with strontium isotopic analysis (for an in-depth discussion of the provenance methodology for the *Ammaia* white marbles, see Taelman *et alii* 2013a; Taelman *et alii* 2013b). The results of the mineralogic–petrographic and geochemical study were compared with data from the available archaeological, geomorphological and geological literature of the study area, with data gathered during the extensive geological surveys, and with data available in reference databases for the main types of ornamental stone quarried in the Roman period (see e.g. Gnoli 1988; Borghini 2004 for the coloured ornamental stones).

## MARBLE PROVENANCE AND USE IN ROMAN AMMAIA

### THE STONE ARCHITECTURAL DECORATION

Six types of stone were used for the architectural decoration at *Ammaia*: white marble, pink–purple limestone, grey–white marble, two marble breccias and granite. The fragments are almost all parts of wall and floor decoration, i.e. veneer panels and mouldings. Columns and column elements are almost exclusively carved from granite and are characterised by a plain execution, resulting from the specific working

properties of granite. Although granite presents excellent structural properties and is extremely suitable as building stone, the material does not allow for easy carving and polishing. As a result, simpler forms of decoration were used and the decorative elements were only executed roughly. Architectural elements such as columns and column elements, but also epigraphic monuments and statuary carved from marble occur only in marginal quantities.

Apart from the granite that was quarried locally (Taelman *et alii* 2012: 119; Taelman *et alii* in press), the ornamental stones do not occur in the territory of *Ammaia* and had to be brought to the town from more distant sources.

During 18 years of archaeological research, 1739 fragments or 3682 kg of white marble, pink–purple limestone, grey–white marble and marble breccia have been recovered in *Ammaia* (Fig. 4). The white marble clearly forms the principal type. Besides its general predominance, it outranks by far the other ornamental stones in all object categories and in all excavated sectors (Fig. 5). White marble was used for wall and floor revetment, epigraphic monuments and statuary. In some cases, columns and other architectural elements such as plinths, door lintels, panels for coffered ceilings were carved in white marble. Pink–purple limestone objects also occur in considerable quantities and were exclusively used for wall and floor revetment (veneer panels and plinths). Grey–white marble and marble breccia are attested only rarely, and were used solely for veneer.

In essence, the decorative programme in *Ammaia* was rather sober, with generally only white marble. The forum complex is the most sumptuous of the excavated buildings in terms of quantity and quality of ornamental stones. A prestigious, multi-coloured decorative programme combined five types of ornamentals stone. The forum complex is also the area where the highest volume of ornamental stone was recovered so far (34 % of the fragments). White marble is clearly dominant at the forum complex. In addition, a considerable amount of pink–purple limestone can be found; the rest is grey–white marble and marble breccia. Similar polychromatic effects can be found in the *frons scaenae* of the *Emerita Augusta* theatre where white marble sculpture and capitals were combined with columns of grey marble and a podium floor of pink–purple limestone panels (Fusco and Manãs Romero 2006; Nogales *et alii* 2009).

Apart from the forum area, the forum bathhouse yielded a considerable amount of ornamentals stone (32 % of the fragments). Except for five small fragments of grey–white marble, only white marble was found here, including nine *in situ* preserved wall and

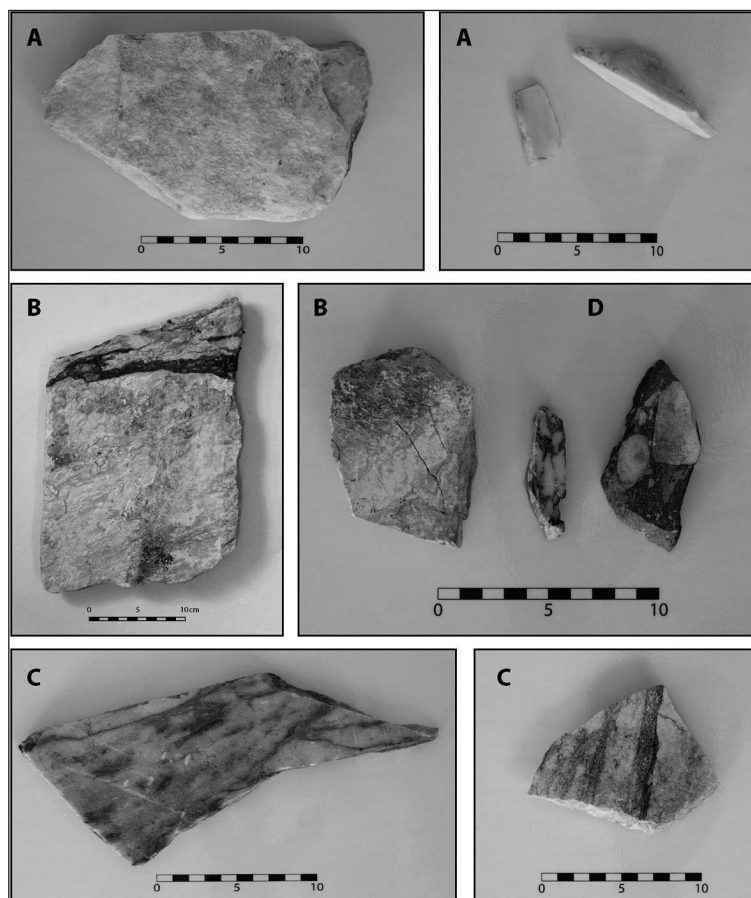


Figure 4. Overview of the different varieties of ornamental stone used in Ammaia: (A) White marble; (B) Pink–purple limestone; (C) Grey–white marble; and (D) Marble breccia.

floor veneer panels of one of the baths' pools. The excavated area of *insula* 38, the suburban area east of the town and the South Gate yielded, respectively, 5 %, 8 % and 13 % of the total amount of ornamental stone finds. The remaining 8 % are objects of which the exact archaeological provenance is not recorded.

So far, little chronological information is available for the introduction and the use of ornamental stone in *Ammaia*, mainly because of limited stratigraphic recording of the earlier excavations. While some well-dated objects such as epigraphic monuments and statuary give a rough indication, the situation for the most ornamental stone finds (mainly veneer decoration) is less clear.

The marble epigraphy and the statuary illustrate that ornamental stone, in particular white marble, was introduced in *Ammaia* at the latest in the Claudian period, not long after the foundation of the town. The earliest evidence for white marble is a commemorative inscription dedicated to the Emperor Claudius (44–45

CE) and a togate statue probably of young Nero (c. 50 CE) (Fig. 6). Other evidence for the early use of marble can be seen in the forum baths, where several pieces of white marble veneer panels were recuperated from an earlier building for the construction of the Flavian bath complex.

The use of ornamental stone was attested particularly in the Flavian and early Antonine period. In this period, the construction of the forum bath complex and the monumentalisation of the South Gate required large volumes of ornamental stone. The peak in the Flavian and early Antonine period is also illustrated by the epigraphic monuments. Most marble inscriptions are dated between the second half of the 1st century CE and the first half of the 2nd century CE.

Finally, the excavations of the residential area of *insula* 38 indicate that ornamental stone, particularly white marble, was used well into the 4th and even the beginning of the 5th century CE. It needs to be noted

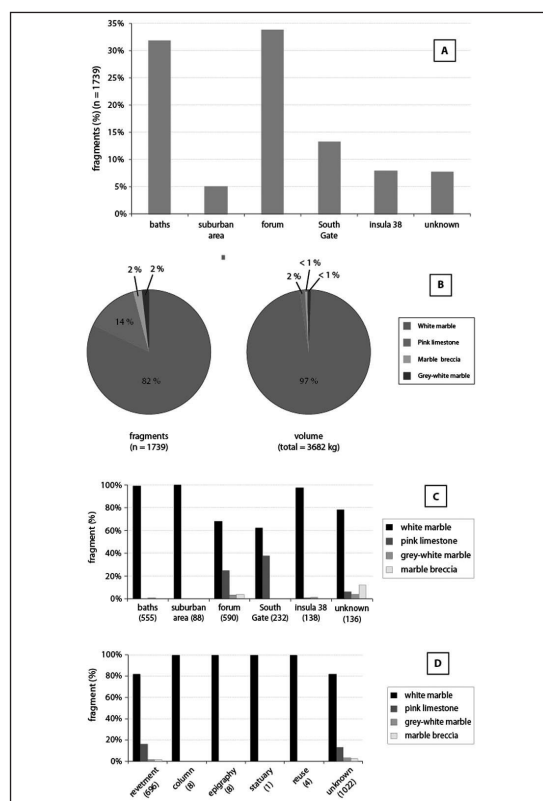


Figure 5. Result of the quantitative study of the use of ornamental stone in Roman Ammaia: (A) Distribution of ornamental stone per excavated sector; (B) Distribution of the different types of ornamental stone; (C) Proportions of ornamental stone type per excavated sector (n-value is indicated in brackets); and (D) Proportions of ornamental stone per object category (the 'unknown' category are small fragments that are difficult to classify but that are in most cases part of broken out or looted veneer) (n-value is indicated in brackets).

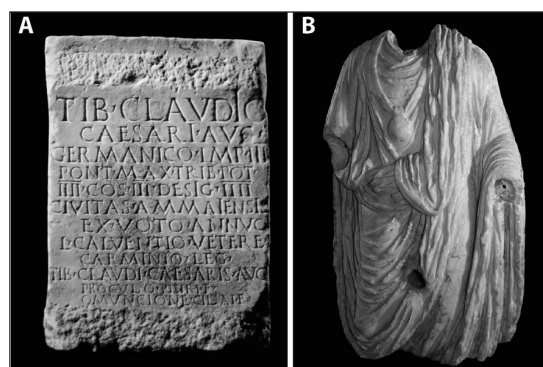


Figure 6. (A) Inscription in white marble, dedicated to the Emperor Claudius in 44–45 CE (IRCP 615), found in Ammaia in 1935 (MNAE E 7267, Museu Nacional de Arqueologia, Lisbon) (Mantas 2000: 410); (B) Togate statue of Ammaia in white marble, representing probably the 13-year-old Nero (50 CE) (Ammaia archaeological museum, São Salvador da Aramenha) (height: 91 cm).

that many finds of the last occupation phase might have been reused from earlier, abandoned buildings.

## PROVENANCE DETERMINATION

### WHITE MARBLE

The white marble is fine- to medium-grained and has a saccharoidal texture, making it ideal for high-quality carving. The colour is generally pure white or white with occasional coloured veins or streaks (red, green, brown and grey). The samples analysed<sup>1</sup> are all calcitic, sometimes with a minor presence of dolomite. The non-carbonate fraction always includes quartz (both mono- and polycrystalline) and often muscovite. Opaque minerals, iron oxides and chlorite minerals are identified in small amounts. The samples have a maximum grain size (MGS) between 0.98 mm and 1.82 mm, a heteroblastic texture, and curved to embayed calcite grain boundaries (Fig. 7) (Taelman *et alii* 2013b: 377).

Comparison of the macroscopic and petrographic properties of the *Ammaia* white marble with marbles from nearby sources (Alter do Chão, Assumar and Elvas) rules out a regional source. Both mineralogical–petrographic and geochemical data of the analysed samples from *Ammaia* were compared with existing data for five Hispanic (Estremoz, Viana do Alentejo, Almadén de la Plata, Almería and Málaga) and nine Mediterranean (Carrara, Hymettos, Naxos, Paros, Pentelicon, Thasos, Aphrodisias, Dokimeion and Proconnesos) marble sources that are known to have been exploited in ancient times (Fig. 8). Detailed information and analytical results for the petrographic and strontium isotopic analyses of the white marbles from *Ammaia* can be found in Taelman *et alii* (2013b: 377–380).

The macroscopic, petrographic and geochemical properties of the *Ammaia* white marble eliminate most Mediterranean and Hispanic sources. Because of similar properties for Estremoz, Almadén de la Plata and Pentelicon marble, a conclusive attribution of the archaeological marbles remains problematic. Notwithstanding, the analytical results strongly suggest the Estremoz quarries as the most likely source. This hypothesis is further enforced by the geographical proximity of the Estremoz district (only c. 80 km to the south) and the expensive overland transport that

<sup>1</sup> The white marble samples from *Ammaia* were analysed at the Department of Geology and Soil Science and the Department of Analytical Chemistry of Ghent University (Belgium).



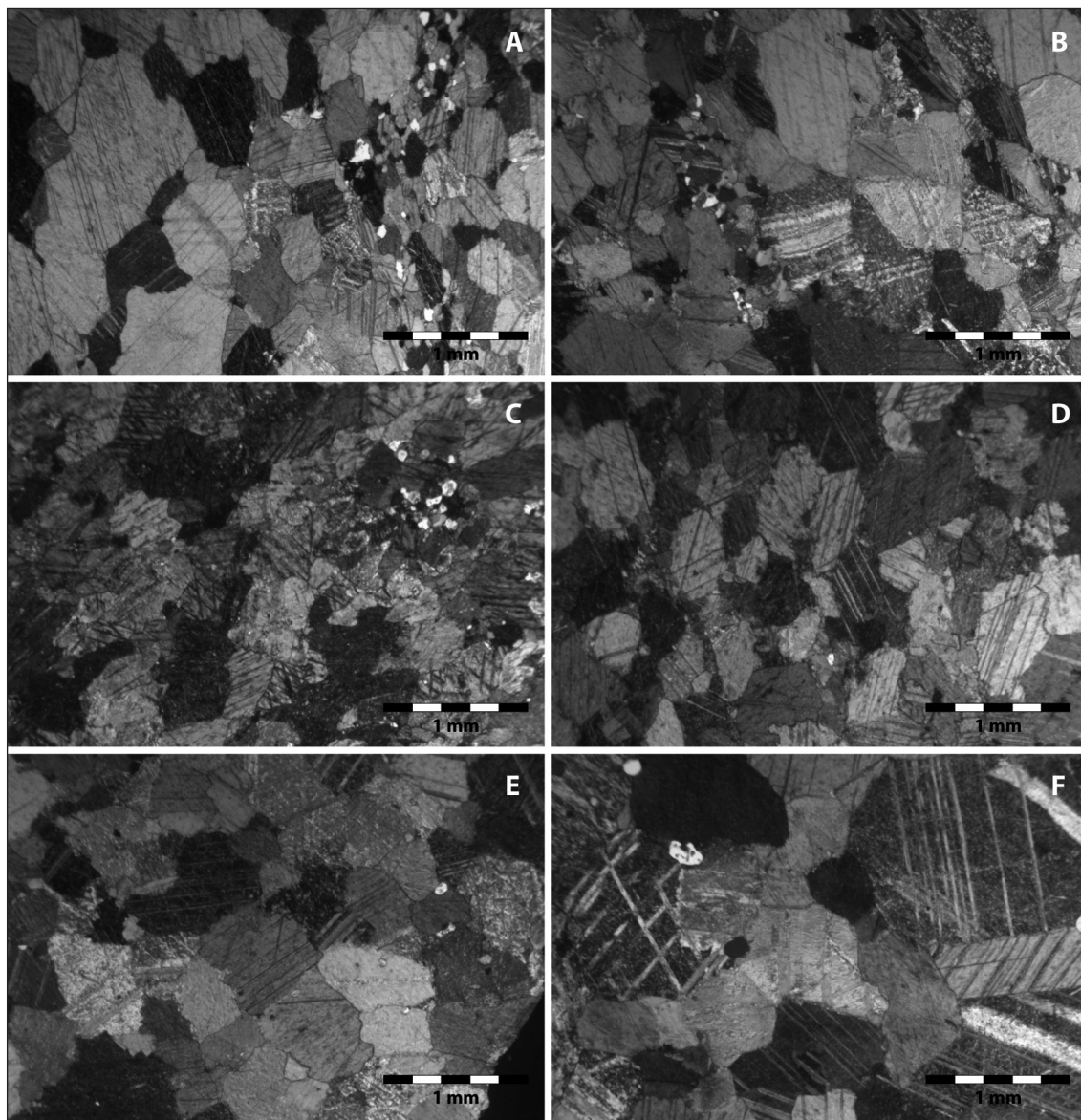


Figure 7. Microphotographs showing textural features of the marble samples (Taelman et alii 2013b: 378): (A) DT10\_AMM\_ARCH\_002, medium-grained white marble with a few grey veins, quartz, muscovite and Mg chlorite, heteroblastic texture and straight-embayed GBs; (B) DT10\_AMM\_ARCH\_019, medium-grained white marble with grey veins, minor dolomite, quartz and opaques, heteroblastic texture and curved-embayed GBs; (C) DT10\_AMM\_ARCH\_026, fine-grained white marble with a few grey veins, quartz and muscovite, heteroblastic texture and curved-embayed GBs; (D) DT10\_AMM\_ARCH\_027, medium-grained white marble with a few reddish veins, quartz, muscovite and opaques, heteroblastic texture and curved-embayed GBs; (E) DT10\_AMM\_ARCH\_033, medium-grained white marble, quartz, muscovite and opaques, homeoblastic texture and curved-embayed GBs; (F) DT10\_AMM\_ARCH\_039, medium-grained white marble, quartz, homeoblastic texture and curved GBs (photographs taken under crossed polars, scale = 1 mm).

was needed for the other marbles to reach *Ammaia*. Moreover, the high quality of the Estremoz marble, especially the variety found around Borba that can compete with the Carrara marble (Lapiente 1999:

284), and the available exploitation and administration system for the extraction of the marble for *Emerita Augusta* (Cisneros 2010: 141) certainly appealed the citizens of *Ammaia* and explains its popularity



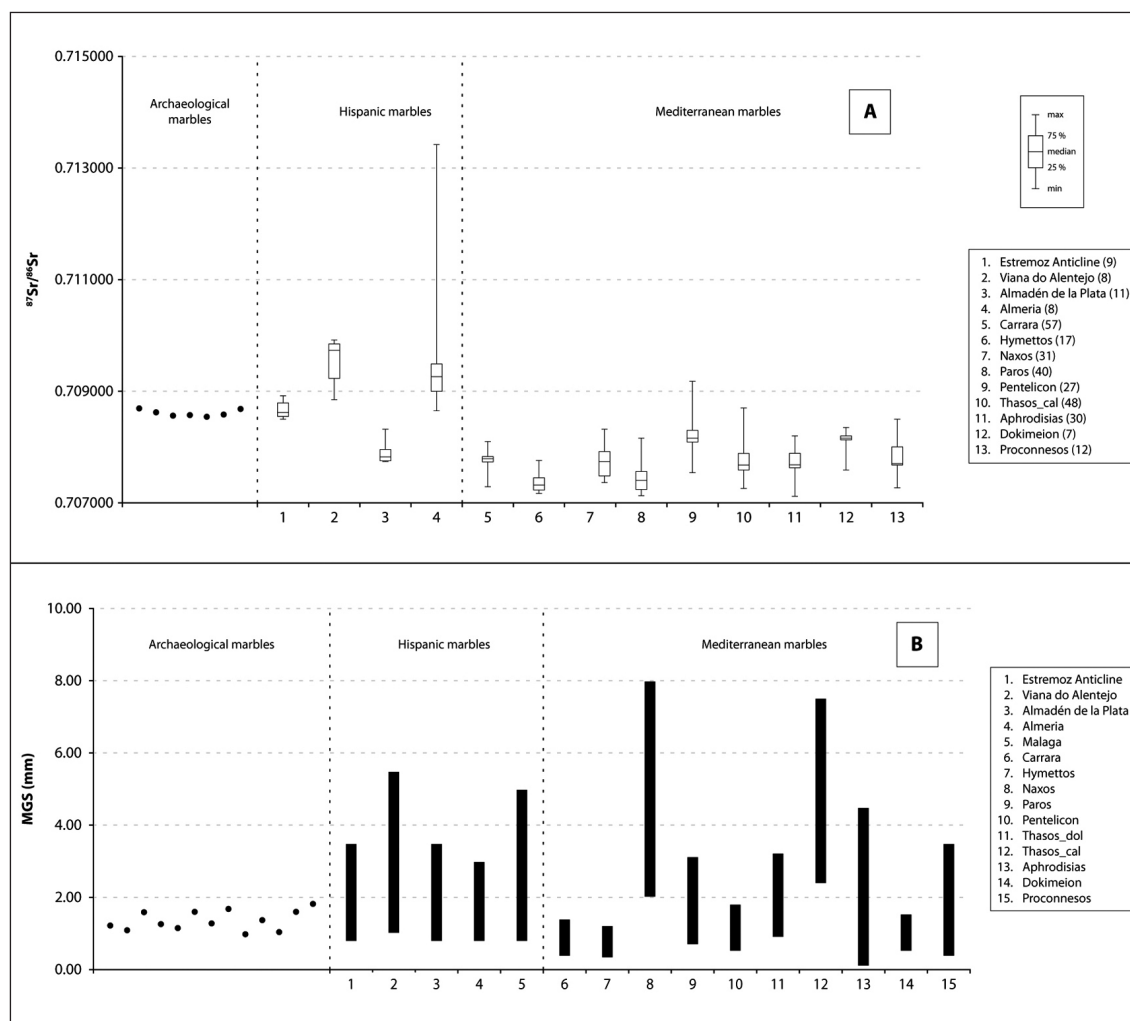


Figure 8. Sr-isotopic (A) and maximum grain size (B) comparison of the white marble samples analysed from Ammaia with the Hispanic and Mediterranean marbles (Taelman et alii 2013b: 383-384).

in the town. Nevertheless, imported marbles cannot be excluded for the more prestigious embellishment projects of the town, as has been demonstrated recently by Lapuente *et alii* (2014: 349) for *Emerita Augusta*, where white marble sculptures have been attested coming from the Estremoz Anticline, but also from Carrara, Aphrodisias, Paros and possibly also Pentelicon.

#### PINK-PURPLE LIMESTONE

The pink-purple limestone is a fine-grained limestone with a micritic texture and a heterogeneous macroscopic appearance. The dominant colour is pink with frequent white streaks and dark-coloured, car-

bon stylolites. Calcite is determined as the dominant carbonate mineral using dilute 10 % hydrochloric acid and by applying a staining technique for the thin sections using alizarin red S. Quartz is present as accessory mineral. Secondary calcite veins can be observed. No fossils or bioclasts occur in the samples.

Two formations of pink or pink-purple limestone are known to have been exploited in the western part of the Iberian Peninsula, one near Sintra (Portugal) and one near Alconera (Spain).

The Sintra limestone is microcrystalline limestone that is characterised by a pink-purple, orange or yellow colour with abundant fossils and bioclasts (Fusco and Mañas Romero 2006: 26; Coelho 2009: 533; Mañas Romero and Fusco 2009: 513; Mañas Romero 2012).

The pink–purple variety of the Alconera limestone is a fine-grained limestone with a heterogeneous and irregular colour pattern. Both intense and lighter pink–purple varieties occur, frequently with light-coloured veins. The presence of recrystallised calcite and slate is not uncommon (Fusco and Mañas Romero 2006: 29; Mañas Romero 2012). Traces of ancient exploitation have only been attested for the intense pink–purple limestone, but both types have been attested in the Roman architecture of *Emerita Augusta* (Mañas Romero 2012).

On the basis of the available descriptions for the Sintra and Alconera limestones and the absence of bioclasts and fossil remains in the *Ammaia* samples, the pink–purple limestone artefacts seem to be the lighter pink–purple limestone variety attributed to Alconera in Spain.

#### GREY–WHITE MARBLE

The grey–white marble is a medium-grained marble with saccharoidal texture. The rock is characterised by abundant (dark) grey veins alternating with white-coloured zones, giving the stone a distinctive colour palette. Tests with dilute 10 % hydrochloric acid revealed calcite as the dominant carbonate mineral. Regarding structure and texture, the grey–white marble is very similar to the white marble found in *Ammaia*. Both types differ mainly in the overall grey aspect of the rock and the density of grey veining pattern.

The nearest outcrops of grey–white marble to *Ammaia* are found in the Estremoz Anticline, about 80 km south of the Roman site. Comparison of the mineralogical–petrographic features of the archaeological samples with samples of grey–white marble taken from the outcrops (see Taelman *et alii* 2013a) revealed a high degree of resemblance, suggesting the Estremoz Anticline as the source for the grey–white marble from *Ammaia*.

Grey–white and dark grey marbles from the Estremoz Anticline, commercially known as *Azul Lagoa* and *Ruivina* (Casal Moura and Carvalho 2007: 309–311), are part of the upper deposits of the Volcano–Sedimentary Carbonate Complex of the Estremoz Anticline and occur as intercalations in the white marble deposits. In comparison with the high-quality white marbles, these dark varieties are found only in limited quantities around the villages of Pardais and Rio de Moinhos, mainly in the southeastern part of the anticline and along its flanks (Lopes 2003: 154; Henriques *et alii* 2006: 161–162; Lamberto and Sá Caetano 2009: 478).

#### MARBLE BRECCIA

The final ornamental stone is a monomict, matrix-supported breccia with poorly sorted clasts of white marble, sometimes with a light pink–red shine. The clasts have a maximum size between 0.4 cm and 8.0 cm, are angular and have sharp and clear boundaries. In some cases, the clasts are clearly sheared. The matrix is compact, fine-grained and dark brown to grey.

Comparing the features of the *Ammaia* marble breccia with the characteristics published for the main Roman marble breccia's quarried around the Mediterranean suggests *africano* from Teos in Turkey and *breccia di Sciro* (for the breccia's with sheared clasts) from the Greek island of Skyros as the most likely source.

#### MARBLE TRADE IN AMMAIA AND CENTRAL-LUSITANIA

*Ammaia* was located centrally in the province of *Lusitania*, remote from any river- or seaport – the rivers Tagus and Guadiana were largely unnavigable in Roman times. According to the *Itinerarium Antonini*, three important communication and trade routes cross this part of Central-*Lusitania*, connecting *Emerita Augusta*, the capital of the Roman province, with *Olisipo* (Lisbon, Portugal), the province's main seaport (de Saa 1956; Alarcão 1988: 56) (Figure 9). The southern route (*via XII*) passes the marble quarries of the Estremoz Anticline, Ebora (Évora, Portugal), the estuaries of the Sado and Tagus Rivers, where important fish sauce or *garum* production centres were located, and ends in *Olisipo* (Carneiro 2009: 49–58; Almeida *et alii* 2011: 193–194). The northern (*via XV*) and central route (*via XIV*) run in the direction of the Tagus River, crossing the southern part of the territory of *Ammaia*. Both roads continue along the same course probably as far as *Ad Septem Aras* (Degolados?, Portugal), passing the *vicus* of *Butua* (Bótoa, Spain). After *Ad Septem Aras*, *via XIV* passes *Matusaro* (? , Portugal), *Abelterium* and *Aritium Praetorium* (Abrantes?, Portugal). *Via XV* passes *Montobriga* (near Arronches?, Portugal), *Fraxinum* (? , Portugal) and *Tubucci* (Cazal de Várzea, Portugal). Both roads cross the Tagus River near *Scallabis* (Santarém, Portugal). The final part of both roads, from *Scallabis* to *Olisipo*, follows the same course as the important north–south axis in *Lusitania* that connected *Olisipo* with *Bracara Augusta* (Braga, Portugal) in Hispania *Tarraconensis* (Carneiro 2009: 58–76; Almeida *et alii* 2011: 382–383). In addition, a network of secondary roads ensured the communica-

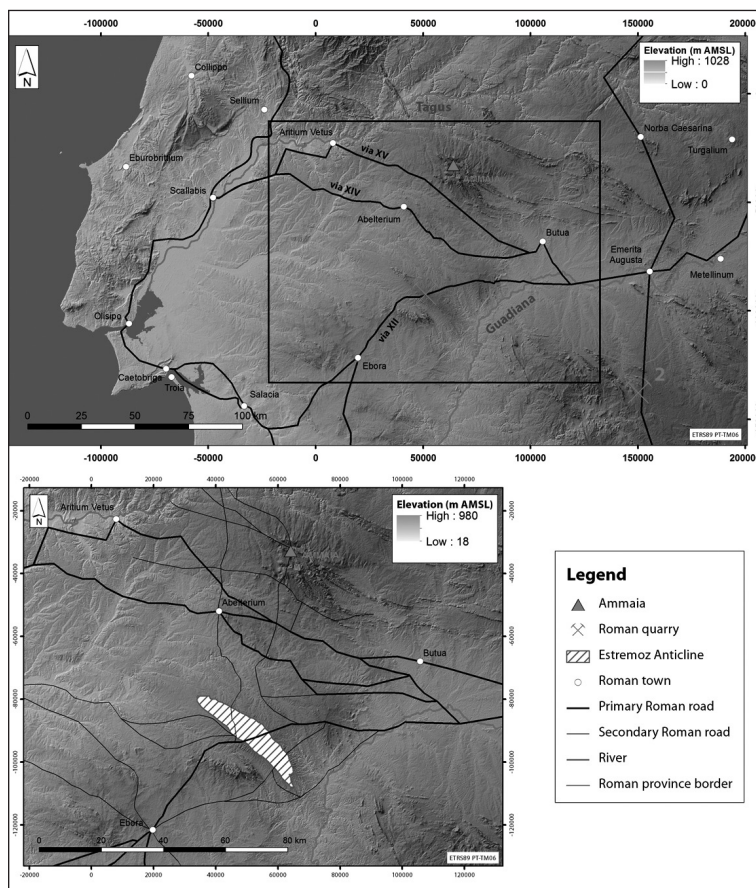


Figure 9. Location of Ammaia and of the Estremoz (1) and Alconera (2) quarries in relation to the supra-regional and regional road network (de Saa 1956; Alarcão 1988: 56-57; Carneiro 2009; Almeida *et alii* 2011).

tion between the towns and between the towns and their territory (Fig. 9).

Through this dense network of primary and secondary roads, the white and grey-white marble from Estremoz could reach *Ammaia* relatively easy after approximately 80 km. It remains, however, uncertain whether the marble was imported directly from the quarries or whether it was first brought to *Emerita Augusta*, from where it was subsequently redistributed to other towns. Even though there is no explicit evidence as for the legal status of the Estremoz quarries, the location of the quarries in the *ager Emeritensis* and the importance of the marble for *Emerita Augusta* seem to suggest that the quarries were municipal property. In this case, the town would not only have been the main consumer for the Estremoz marble, but it might also have functioned as a stockpiling and distribution centre (Cisneros 2010: 147). The presence of many roughed-out and semi-worked blocks, column shafts,

sarcophagi and statuary illustrate that the marble objects left the quarries in an unfinished state (Fusco and Mañas Romero 2006: 34-36; Nogales *et alii* 2009: 438-439). Because of the high demand for sculptural and architectural marble decoration for the monumental architecture of the town, many skilled sculptors and workshops (e.g. C. Aulus and Demetrios) settled in *Emerita Augusta* (Cisneros 1988: 46; De la Barrera 2000: 197; Creus Luque 2002: 253-254; Fusco and Mañas Romero 2006: 38; Nogales *et alii* 2009: 441).

Like for the Estremoz marbles, the limestone from Alconera had to be transported overland. The first part of the trajectory would have taken place as far as *Emerita Augusta* over the so-called *Via de la Plata*. Transport continued along the northern and central route between *Emerita Augusta* and *Olisipo* as far as *Butua* or as far as the crossroad with the road coming from the Estremoz quarries, somewhere between Crato and Assumar, where a secondary road diverted



in the direction of *Ammaia*. The total length of the route amounted to c. 175 km or 205 km, depending on the trajectory chosen (*Butua* or Crato–Assumar).

For the *africano* and *breccia di Sciro*, it is not clear whether the stone reached *Ammaia* directly from the quarries or whether it was purchased and shipped from the stockpile yards in Rome. Based on inscriptions found on quarried blocks, Fant (1989: 12, 1993: 160–162) suggests a distinction between the trade in coloured ornamental stones and white marbles. While inscriptions on blocks of white marble (e.g. marble from Carrara, Proconessos, Thasos, Carystian and Dokimeion) were related to the internal functioning of the quarry, the inscriptions on blocks in coloured ornamental stones (e.g. *africano*, *portasanta*, *giallo antico*, *pavonazzetto*, *alabastro cotognino* and *cipollino verde*) generally have a purpose for the administration outside of the quarry. Based on these observations, it is suggested that the exploitation of the coloured ornamental stones, which were highly valued in Roman times, was fully organised and monopolised by the Roman state and that the material was brought to Rome after extraction from where it was subsequently shipped to the rest of the Roman world. Pensabene (2004: 44), however, states that the mode of distribution depends on the historical period, whether the stone is for a public or private building, whether the state was involved in the construction or embellishment of the building or not, and on the role of the local elite. Regardless of the mode of distribution for the *africano* and *breccia di Sciro*, the material had to be transported partly oversea to Iberian Peninsula and partly overland from the Iberian harbours onwards. The low amount of *africano* and *breccia di Sciro* and the small size of the veneer pieces might suggest that the material were probably a surplus from a larger shipment for a nearby town like *Emerita Augusta* where the material has been attested for the embellishment of, for example, the *Portico del Foro* of the municipal forum (De la Barrera 2000: 195–197; Cisneros 2002: 96; Nogales *et alii* 2009: 435–437). It must be realised, however, that this highly-prized stone material might have been spoliated after the abandonment of *Ammaia*.

Overall, the use of ornamental stone for architectural embellishment in *Ammaia* was based mainly on regionally available stones: white and grey–white marble from Estremoz and pink–purple limestone from probably Alconera. The forum temple is the only building excavated so far where imported coloured marbles (*africano* and *breccia di Sciro*) from the Mediterranean area have been documented.

The polychromatic effect created by applying these different types of coloured ornamental stones

in combination with white marble can be considered an imitation of polychromatic veneer decoration observed in many monumental, public buildings (especially fora and theatres) in towns in the western and southern part of the Iberian Peninsula, such as *Emerita Augusta*, *Bilbilis* (Calatayud, Spain), *Colonia Patricia*, *Caesaraugusta* and *Italica*. For example, in the theatre and the *Portico del Foro* of the municipal forum of *Emerita Augusta*, white marble capitals and grey–white and grey column shafts from the Estremoz Anticline were combined with wall and floor veneer in pink–purple limestone from Alconera, *africano*, *giallo antico*, *cipollino verde*, *portasanta* and possibly also *pavonazzetto*. The *Portico del Foro* of the municipal forum was also adorned with Imperial portraits carved in white marble from Carrara (Lapuente *et alii* 1999: 112–115; De la Barrera 2000: 149, 195–196; Fusco and Mañas Romero 2006: 30; Ayerbe Vélez *et alii* 2009: 551–553, 559–560; Nogales *et alii* 2009: 435). In addition, some of the white marble cornices of the *Portico del Foro* of the municipal forum were painted red to imitate *rosso antico* or *marmor Taenarium* and to further enhance the polychromatic effect. Similar red-painted white marble cornices have been found in *Saguntum* (Sagunto, Spain) and *Carthago Nova* (Cartagena, Spain) (Cisneros 2002: 96–97; Cisneros and Martín-Bueno 2006: 498; Nogales *et alii* 2009: 436–437), and also at *Ammaia*. Besides the general purpose of architectural embellishment, the use of this particular scheme of decoration conveyed a propagandistic message for the Imperial cult of the Julio–Claudian emperors (e.g. the theatre and *Portico del Foro* of the municipal forum in *Emerita Augusta*). These buildings imitated the decoration of buildings constructed in Rome such as the forum of the Emperor Augustus (Cisneros 2002: 88–93). Even though more sober, the decorative programme for the forum temple of *Ammaia* probably propagates a similar message promoting the cult of the Julio–Claudian family. The togate statue of the young prince Nero that was found in *Ammaia* could be part of a statuary group representing the *Gens Augusta* that possibly adorned the forum square and added to the propaganda of the Imperial cult (Fig. 6B).

Despite the use of predominantly regional stones, the large volume of stone material and its presence in both public and private contexts is an index of the town's prosperity and wealth. Local elite families no doubt played an important role in the embellishment of the town. Donating marble decoration was a common form of private benefaction in Roman society, and was used for propaganda reasons by wealthy individuals to increase their social and political prestige in the local community (Fant 1988: 149; Cisneros 1997: 199–200;

Pensabene 2004: 43; Zuiderhoek 2009: 119). While the presence of a considerable amount of ornamental stone suggests that the town and its inhabitants were relatively well off, the low volume and limited range of imported stone is striking and can be explained in that the import of ornamental stones in *Ammaia* was not primarily determined by the economic power of its inhabitants but, rather, by the remote geographical location of the town and the financial burden related to the long-distance overland transport that was required to reach *Ammaia*. The importance of transport also explains the popularity of veneer in *Ammaia*. While fragile and bulky goods, such as columns and

statuary, involve great technological and practical difficulties for transporting, veneer could be brought to the town as standardised blocks that were sawn up on the construction site (Ward-Perkins 1951: 90; Dodge 1991: 37). This also explains why the local granite remained the preferred raw material for architectural elements like columns and capitals (Taelman *et alii* 2012: 119; Taelman *et alii* in press). Importing marble for these heavy and bulky goods must have been a too large financial burden.

A similar situation with mainly regional ornamental stones and only a reduced quantity of ornamental stone from the Mediterranean area can be observed in

	AFR	ALP	ALF	BAR	BNT	BIA	BRC	BRD	BRA	BRS	SEM	CIP	CM	ALE	FP	GAB	GIA	GRS	ON	LUM	MCL	TRG	MOP	OCF	PAV	POR	POV	SER	PSA	ROA	VEA	Total
<i>Ammaia</i>	x									x																					2	
<i>Asturica Augusta</i>	x												x				x						x					x			5	
<i>Bilbilis</i>	x		x				x		x	x		x					x								x				x	x	x	11
<i>Caesaraugusta</i>	x									x		x					x		x				x		x			x	x		x	10
<i>Carthago Nova</i>	x		x	x		x	x	x		x	x	x	x	x	x		x	x	x						x	x	x	x	x	x	x	22
<i>Colonia Lepida Celsa</i>	x		x						x	x		x	x			x	x		x						x				x	x		12
<i>Colonia Patricia</i>	x	x			x		x			x	x	x		x	x		x	x	x	x	x		x		x	x		x	x	x	x	21
<i>Hispalis</i>	x											x					x								x			x		x		6
<i>Italica</i>	x			x			x			x		x					x	x			x			x	x	x		x	x	x	x	15
<i>Emerita Augusta</i>	x											x					x								x				x			5
<i>Munigua</i>												x						x							x							3
<i>Rubí</i>	x											x													x			x				4
<i>Saguntum</i>	x			x			x					x					x	x							x			x	x	x		10
<i>Segobriga</i>				x								x					x							x	x	x		x	x	x		9
<i>Singilia Barba</i>	x																x	x							x			x			x	6
<i>Tarraco</i>	x						x			x		x				x	x	x	x			x		x	x	x		x	x	x	x	16
<i>Turiaso</i>																	x						x					x	x		x	5
<p>AFR = africano, ALP = alabastro a pecorella, ALF = alabastro fiorito, BAR = Bardiglio, BNT = bianco e nero tigrato, BIA = bigio antico, BRC = breccia coralina, BRD = breccia dorata, BRA = breccia di Aleppo, BRS = breccia di Sciro, SEM = semesanto, CIP = cipollino verde, CM = cipollino mandolato, ALE = yellow alabaster from Egypt, FP = fior di pesco, GAB = gabbro, GIA = giallo antico, GRS = greco scritto, ON = lapis onyx, LUM = lumachella carnina, MCL = granite from Mons Claudianus, TRG = Troad granite, MOP = granite from Mons Porphyrites, OCF = occhio di pavone, PAV = pavonazzetto, POR = porfido rosso, POV = porfido verde egiziano, SER = serpentino, PSA = portasanta, ROA = rosso antico, VEA = verde antico di Grecia</p>																																

Fig. 10. Distribution of coloured ornamental stones from the Mediterranean in urban sites in the Iberian Peninsula (after Beltrán Lloris 1990; Cisneros 1997; Mayer and Rodá 1998; Cisneros 2000; De la Barrera 2000; Cisneros 2001, 2002; Gutiérrez Deza 2002-2003; Soler 2003; Cébrian 2004; Gisbert Aguilar and Gaspar Raluy 2004; Cisneros and Martín-Bueno 2006; Álvarez *et alii* 2009a; Amores Carredano *et alii* 2009; Ayerbe Vélez *et alii* 2009; Rodríguez Gutiérrez 2009; Schattner and Ovejero Zappino 2009; Soler 2009; Cisneros *et alii* 2010-2011; Álvarez *et alii* 2012; Arola *et alii* 2012; Gutiérrez García-Moreno and López Vilar 2012; Pensabene *et alii* 2012; Soler 2012).

several towns in the interior of the Iberian Peninsula with a remote location far from any seaport or navigable river, such as *Emerita Augusta*, *Asturica Augusta* (Astorga, Spain) and *Munigua* (Castillo de Mulva, Spain). The difficult accessibility of these sites promotes the exploitation and use of stone from local and regional sources (Cisneros 1997: 202, 2002: 97, 104; Pensabene 2004: 48-49; Fusco and Mañas Romero 2006: 18, 23; Nogales *et alii* 2009: 437; Schattner and Ovejero Zappino 2009; Cisneros *et alii* 2010-2011: 110-111). In *Emerita Augusta*, for example, the Estremoz quarries provided the bulk of the white marbles. Only to a lesser extent, white marbles from Almadén de la Plata, Macael and the Mediterranean, and coloured ornamental stones from the Imperial quarries in the Mediterranean were used (Cisneros 1988: 71, 89, 103; Nogales *et alii* 1999: 339-344; De la Barrera 2000: 195-196; Cisneros 2002: 96; Fusco and Mañas Romero 2006: 18, 21, 30; Ayerbe Vélez *et alii* 2009: 454, 551-553, 560; Mañas Romero and Fusco 2009: 492, 498; Nogales *et alii* 2009: 435). It needs to be noted, however, the most provenance data for the architectural white marbles from these buildings is derived through petrographic observations only. Whereas provenance determination of the architectural white marbles is still preliminary, sculptural white marbles have already been studied in more detail. Most private portraiture was carved in Estremoz marble. For the more important sculptural programmes, such as the Imperial statuary, marble was imported from Carrara, Aphrodisias, Paros and possibly also Pentelicon (Lapuente *et alii* 1999: 112-115; Lapuente *et alii* 2000: 1491; Fusco and Mañas Romero 2006: 18; Lapuente *et alii* 2014: 349).

Unlike the towns situated in the interior of the Iberian Peninsula (e.g. *Ammaia*, *Emerita Augusta*, *Asturica Augusta* and *Munigua*), the towns along the Mediterranean coast or close to navigable rivers such as the Guadalquivir or the Ebro (e.g. *Caesaraugusta*, *Carthago Nova* and *Tarraco*) have a much wider range of imported ornamental stones (Cisneros 2001: 157, 165, 2004: 367; Nogales *et alii* 2009: 437). A notable exception is the urban site of *Segobriga* where, despite its location in inner Iberia, a large quantity and a large diversity of imported Mediterranean marbles have been detected, including *bardiglio* from Carrara, *cipollino verde*, *giallo antico*, *occhio di pavone*, *pavonazzetto*, *portasanta*, *porfido rosso*, *rosso antico* and *serpentino* (Cebrián 2004; Álvarez *et alii* 2009a; Pensabene *et alii* 2012) (Fig. 10). Similarly, the inner Iberian rural Balazote *villa* and the late Roman *villae* of Carranque, Cauca and Noheda display an extremely rich stone decoration. Especially the site of Carranque is unique from the point of view of stone

decoration. With over thirty marmora employed, the site has one of the richest assemblages of Mediterranean marbles in the Iberian Peninsula (García-Entero and Vidal Álvarez 2007; García-Entero *et alii* 2009; García-Entero and Vidal Álvarez 2012; Pérez *et alii* 2012; Sarabia Bautista 2012).

## CONCLUSIONS

Apart from a local granite that was used for columns and capitels, five types of ornamental stone were used for embellishing the architecture at *Ammaia*. White marble with occasional coloured veins clearly formed the most important ornamental stone, followed by pink-purple limestone and, in minor quantities, also grey-white marble and marble breccia. Overall, the decorative programme at *Ammaia* was rather sober with generally only white marble. The studied fragments show that for the forum complex and, to a lesser extent, for the South Gate, a polychromatic effect was created by applying different types of ornamental stones.

Macroscopic, petrographic and geochemical analyses have illustrated that most ornamental stones used for embellishing the architecture in *Ammaia* were obtained from formations in the western part of the Iberian Peninsula. White and grey-white marble were quarried from the Estremoz Anticline (Portugal), located about 80 km to the south. Pink-purple limestone seems to originate from the Alconera quarries (Spain), located about 55 km south of *Emerita Augusta*, in the ancient Roman province of *Baetica*. The only imported stone from the Mediterranean area thus far observed was *africano* from Teos in Turkey and *breccia di Sciro* from Skyros in Greece.

The situation regarding the import and use of ornamental stone in *Ammaia* is comparable with that of several other towns in the interior of the Iberian Peninsula. Similar decoration schemes with mainly regional stones can be observed, for example, in *Emerita Augusta*, *Asturica Augusta* and *Munigua*. Even though the general nature of the polychromatic decoration is comparable to that of other towns on the Iberian Peninsula, the range of imported stones in *Ammaia* is far more reduced with only low quantities of *africano* and *breccia di Sciro* as Mediterranean import.

Despite the predominance of regional ornamental stones, the ubiquitous use and the presence in both public and private contexts illustrates the prosperity and wealth of the town and its inhabitants. While the presence of a considerable amount of ornamental stone suggests that the town and its inhabitant were relatively well-off, the low volume and limited range



of imported stone is striking and could be explained by the fact that the import of ornamental stones in *Ammaia* was not primarily determined by the economic power of its inhabitants but, rather, by the remote geographical location of the town and the financial burden related to the long-distance overland transport that was required to reach *Ammaia*.

## BIBLIOGRAPHY

- Alarcão, J., de 1988: *Roman Portugal. Volume I. Introduction*, Warminster.
- Almeida, M. J., Carneiro, A., Rodríguez Martín, F. G. and Morgado, P. 2011: "De Augusta Emerita a Olisipo: proposta de traçado para o primeiro troço da via XII do Itinerário de Antonino", A. Carneiro, J. Oliveira, de, L. Rocha and P. Morgado (coords.), *Arqueologia do Norte Alentejano: comunicações das 3as Jornadas*, Lisboa, 193-201.
- Àlvarez, A., Cebrián, R. and Rodà, I. 2009a: "El mármol de Almadén de la Plata y los marmora importados del foro de Segobriga", T. Nogales and J. Beltrán (coords.), *Marmora Hispana: Explotación y uso de los materiales pétreos en la Hispania Romana*, Roma, 101-120.
- Àlvarez, A., Domènech, A., Lapuente, P., Pitarch, À. and Royo Plumed, H. 2009b: *Marbles and stones of Hispania. Exhibition catalogue*, Tarragona.
- Àlvarez, A., García-Entero, V., Gutiérrez García-Moreno, A. and Rodà, I. 2009c: *Tarraco Marmor. The Quarrying, Use and Trade of Santa Tecla Stone in Roman Times*, Hic e Nunc 6, Tarragona.
- Àlvarez, A., Gutiérrez García-Moreno, A., Lapuente, P., Pitarch, À. and Rodà, I. 2009d: "The Marmor of Tarraco or Santa Tecla Stone (Tarragona, Spain)", Ph. Jockey (coord.), *Marbres et autres roches de la Méditerranée antique: études interdisciplinaires/ Interdisciplinary Studies on Mediterranean Ancient Marble and Stones*, Paris, 129-140.
- Àlvarez, A., Macías, J. M., Muñoz, A., Pitarch, À., Teixell, I. and Menchon, J. J. 2012: "The marmora used in the imperial cult area of Tarraco (Hispania Citerior)", A. Gutiérrez García-Moreno, P. Lapuente and I. Rodà (coords.), *Interdisciplinary Studies on Ancient Stone. Proceedings of the IX Association for the Study of Marbles and Other Stones in Antiquity (ASMOSIA) Conference (Tarragona 2009)*, Tarragona, 196-203.
- Álvaro, M., Apalategui, O., Baena, J., Balcells, R., Barnolas, A., Barrera, J. L. B., F., Cueto, L. A., Díaz de Neira, A., Elízdga, E., Fernández-Gianotti, J. R., Ferreira, E., Gabaldón, V., García-Sansegundo, J., Gómez, J. A., Heredia, N., Hernández-Urroz, J., Hernández-Samaniego, A., Lendínez, A., Leyva, F., López-Olmedo, F. L., Lorenzo, S., Martín, L., Martín, D., Martín-Serrano, A., Matas, J., Monteserín, V., Nozal, F., Olive, A., Ortega, E., Piles, E., Ramírez, J. I., Robador, A., Roldán, F., Rodríguez, L. R., Ruiz, P., Ruiz, M. T., Sánchez-Carretero, R. and Teixell, A. 1994: *Mapa Geológico de la Península Ibérica, Baleares y Canarias a escala 1:1.000.000*, Madrid.
- Amores Carredano, F., Beltrán, J. and González Acuña, D. 2009: "Marmora de Hispalis. Estudio de los materiales pétreos recuperados en las excavaciones arqueológicas de 'La Encarnación' (Sevilla)", T. Nogales and J. Beltrán (coords.), *Marmora Hispana: Explotación y uso de los materiales pétreos en la Hispania Romana*, Roma, 213-229.
- Arola, R., Domingo, J. Á. and Gasull, N. 2012: "The imported marmora from the Jaume i School: an assemblage from the provincial forum of Tarraco", A. Gutiérrez García-Moreno, P. Lapuente and I. Rodà (coords.), *Interdisciplinary Studies on Ancient Stone. Proceedings of the IX Association for the Study of Marbles and Other Stones in Antiquity (ASMOSIA) Conference (Tarragona 2009)*, Tarragona, 190-195.
- Ayerbe Vélez, R., Barrientos Vera, T. and Palma García, F. 2009: *El foro de Augusta Emerita: Génesis y Evolución de sus Recintos Monumentales*, Mérida.
- Beltrán, J. and Loza Azuaga, M. L. 1998: "Explotación y uso de marmora malacitanos en época romana", *SPAL: Revista de prehistoria y arqueología de la Universidad de Sevilla* 7, 129-147.
- Beltrán, J., Corrales Aguilar, M. and Efrén Fernández Rodríguez, L. 2009: "Marmora del teatro romano de Malaca (Málaga)", T. Nogales and J. Beltrán (coords.), *Marmora Hispana: Explotación y uso de los materiales pétreos en la Hispania Romana*, Roma, 261-284.
- Beltrán, J., Loza Azuaga, M. L., Ontiveros Ortega, E., Rodríguez Gutiérrez, O. and Taylor, R. 2012: "The Quarrying and Use of Marmora in Baetica. An Archaeometry-based Research Project", *Italica* 1, 220-229.
- Beltrán Lloris, M. 1990: "El valle medio del Ebro y su monumentalización en época republicana y augustea (antecedentes, Lepida-Celsa y Caesaraugusta)", W. Trillmich and P. Zanker (coords.), *Stadt und Ideologie. Die Monumentalisierung hispanischer Städte zwischen Republik und Kaiserzeit*, München, 179-206.
- Borghini, G. 2004: *Marmi Antichi*, Roma.
- Canto, A. M. 1977-1978: "Avances sobre la explotación del mármol en la España romana", *Archivo Español de Arqueología* 50-51, 165-189.

- Carneiro, A. 2009: *Itinerários Romanos do Alentejo. Uma releitura de 'As Grandes Vias da Lusitânia - O Itinerário de Antonino Pio' de Mário Saa, cinquenta anos depois*, Lisbon.
- Casal Moura, A. and Carvalho, C. 2007: "Síntese das características dos mármore e dos calcários portugueses", A. Casal Moura (coord.), *Mármore e calcários ornamentais de Portugal*, Porto, 259-348.
- Cébrian, R. 2004: "El revestimiento marmóreo del foro y los elementos arquitectónicos", S. F. Rammallo (coord.), *La decoración arquitectónica en las ciudades romanas de occidente*, Murcia, 245-249.
- Cisneros, M. 1988: *Marmoles Hispanos: su empleo en la España romana*, Zaragoza.
- Cisneros, M. 1989-1990: "Sobre la explotación de calizas en el sur de España en época romana: canteras de Gádor (Almería), Atarfe (Granada), Antequera (Málaga) y Cabra (Córdoba)", *Caesaraugusta* 66-67, 123-142.
- Cisneros, M. 1997: "Mármoles de importación y mármoles de sustitución: su utilización en algunas ciudades hispanas", *Veleia* 14, 195-203.
- Cisneros, M. 2000: "El Empleo Privado del Mármol en el Valle del Ebro: la Colonia Victrix Iulia Lepida / Celsa (Velilla de Ebro, Zaragoza)", *Caesaraugusta* 74, 13-36.
- Cisneros, M. 2001: "El puerto de Caesaraugusta y la difusión de los mármoles imperiales en el valle medio del Ebro", G. Pascual Berlanga and J. Pérez Ballester (coords.), *Puertos Fluviales Antiguos: Ciudad, Desarrollo e Infraestructuras*, Valencia, 157-168.
- Cisneros, M. 2002: "El mármol y la propaganda ideológica: el modelo del foro de Augusto", F. Marco, F. Pina Polo and J. Remesal (coords.), *Religión y propaganda política en el mundo romano*, Barcelona, 83-104.
- Cisneros, M. 2004: "La comercialización de los marmora", M. Beltrán Lloris and J. Á. Paz Peralta (coords.), *Caesaraugusta* 76. *Las aguas sagradas del municipium Turiaso*, Zaragoza, 367-370.
- Cisneros, M. 2010: "Reflexiones sobre los mármoles hispanos: revisando la expresión 'mármoles de sustitución'", *Marmora. An international journal for archaeology, history and archaeometry of marbles and stones* 6, 135-150.
- Cisneros, M. and Martín-Bueno, M. 2006: "El programa decorativo marmóreo del Municipium Augusta Bilbilis", D. Vaquerizo and J. F. Murillo (coords.), *El Concepto de lo Provincial en el Mundo Antiguo. Homenaje a la Prof. León*, Córdoba, 485-510.
- Cisneros, M., Gisbert Aguilar, J. and Somovilla, I. A. 2010-2011: "El uso del mármol en la arquitectura de Asturica Augusta", *Anales de Arqueología Cordobesa* 21-22, 93-126.
- Coelho, C. 2009: "Colaride: a Roman quarry at the Municipium Olisiponensis", T. Nogales and J. Beltrán (coords.), *Marmora Hispana: Explotación y uso de los materiales pétreos en la Hispania Romana*, Roma, 523-543.
- Corsi, C., Johnson, P. S. and Vermeulen, F. 2012: "A geomagnetic survey of Ammaia: a contribution to understanding Roman urbanism in Lusitania", *Journal of Roman Archaeology* 25, 121-145.
- Creus Luque, M. L. 2002: "Diferentes materiales escultóricos romanos en el territorio de Augusta Emerita", T. Nogales (coord.), *Materiales y técnicas escultóricas en Augusta Emerita y otras ciudades de Hispania*, Mérida, 249-271.
- De la Barrera, J. L. 2000: *La Decoración arquitectónica de los foros de Augusta Emerita*, Roma.
- de Saa, M. 1956: *As Grandes Vias da Lusitânia - O Itinerário de Antonino Pio. Tomo I*, Lisboa.
- DeLaine, J. 1997: *The Baths of Caracalla. A study of the design, construction, and economics of large-scale building projects in imperial Rome*, Journal of Roman Archaeology. Supplementary Series Number 25, Portsmouth.
- Dodge, H. 1991: "Ancient marble studies: recent research", *Journal of Roman Archaeology* 4, 28-50.
- Domínguez Bella, S. 2009: "Huellas de cantería romana de mármol en Almadén de la Plata (Sevilla), un patrimonio a conservar", T. Nogales and J. Beltrán (coords.), *Marmora Hispana: Explotación y uso de los materiales pétreos en la Hispania Romana*, Roma, 377-390.
- Fant, J. C. 1988: "The Roman emperors in the marble business: capitalists, middlemen or philanthropists", N. Herz and M. Waelkens (coords.), *Classical Marble: Geochemistry, Technology, Trade*, Dordrecht, 147-158.
- Fant, J. C. 1989: *Cavum antrum Phrygiae: the organization and operations of the Roman imperial marble quarries in Phrygia*, British Archaeological Reports, International Series 482, Oxford.
- Fant, J. C. 1993: *Ideology, gift, and trade: a distribution model for the Roman imperial marbles*, Rome.
- Fusco, A. and Manãs Romero, I. 2006: *Mármoles de Lusitania*, Mérida.
- García-Entero, V., Salán, M. and Vidal Álvarez, S. 2009: "El marmora en el yacimiento de Carranque (Toledo). Algunas consideraciones sobre marcas de herramientas", T. Nogales and J. Beltrán (coords.), *Marmora Hispana: Explotación y uso de*

- los materiales pétreos en la Hispania Romana*, Roma, 197-211.
- García-Entero, V. and Vidal Álvarez, S. 2007: "Marmora from the Roman site of Carranque (Toledo, Spain)", *Marmora. An international journal for archaeology, history and archaeometry of marbles and stones* 3, 53-69.
- García-Entero, V. and Vidal Álvarez, S. 2012: "El uso del marmor en el yacimiento de Carranque (Toledo)", V. García-Entero (coord.), *El marmor en Hispania: explotación, uso y difusión en época romana*, Madrid, 135-153.
- Gisbert Aguilar, J. and Gaspar Raluy, S. 2004: "Geología y procedencia de los marmora", M. Beltrán Lloris and J. Á. Paz Peralta (coords.), *Caesaraugusta* 76. *Las aguas sagradas del municipium Turiaso*, Zaragoza, 345-359.
- Gnoli, R. 1988: *Marmora Romana*, Roma.
- Gutiérrez Deza, M. I. 2002-2003: "Los opera sectilia de la provincia de Córdoba", *Anales de Arqueología Cordobesa* 13-14, 67-96.
- Gutiérrez García-Moreno, A. and López Vilar, J. 2012: "Marmora at the Tarraco of the Antonines: the assemblage of Sant Pau and Santa Tecla Hospital (Tarragona, Spain)", A. Gutiérrez García-Moreno, P. Lapuente and I. Rodà (coords.), *Interdisciplinary Studies on Ancient Stone. Proceedings of the IX Association for the Study of Marbles and Other Stones in Antiquity (ASMOSIA) Conference (Tarragona 2009)*, Tarragona, 204-209.
- Henriques, P. F., Carvalho, J. M. F., Falé, P. and Luís, A. G. 2006: "Estudos Geológicos à Indústria Extractiva de Mármore no Anticlinal de Estremoz - O Caso do Núcleo de Pardais", *Comunicações Geológicas* 93, 159-184.
- Lamberto, V. and Sá Caetano, P. 2009: "Marble stones from Lusitania: the quarries of the Estremoz Anticline", T. Nogales and J. Beltrán (coords.), *Marmora Hispana: Explotación y uso de los materiales pétreos en la Hispania Romana*, Roma, 467-481.
- Lapuente, P. 1995: "Mineralogical, petrographical and geochemical characterization of white marbles from Hispania", Y. Maniatis, N. Herz and Y. Basiakos (coords.), *The Study of Marble and Other Stones Used in Antiquity*, London, 151-160.
- Lapuente, P. 1999: "Problemas petrográficos en la identificación de mármoles clásicos: diferenciación de Carrara y Borba", *Caesaraugusta* 73, 279-288.
- Lapuente, P. and Blanc, P. 2002: "Marbles from Hispania: scientific approach based on cathodoluminescence", J. J. Herrmann, Jr., N. Herz and R. Newman (coords.), *ASMOSIA 5. Interdisciplinary Studies on Ancient Stone. Proceedings of the Fifth International Conference of the Association for the Study of Marble and Other Stones in Antiquity*, Museum of Fine Arts, Boston, 1998, London, 143-151.
- Lapuente, P., Martínez, M. P., Turi, B. and Blanc, P. 2002: "Characterization of dolomitic marbles from the Malaga Province (Spain)", J. J. Herrmann, Jr., N. Herz and R. Newman (coords.), *ASMOSIA 5. Interdisciplinary Studies on Ancient Stone. Proceedings of the Fifth International Conference of the Association for the Study of Marble and Other Stones in Antiquity*, Museum of Fine Arts, Boston, 1998, London, 152-162.
- Lapuente, P., Nogales, T., Royo, H. and 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.
- Lapuente, P. and Turi, B. 1995: "Marbles from Portugal: petrographic and isotopic characterization", *Science and Technology for Cultural Heritage* 4 (2), 33-42.
- Lapuente, P., Turi, B. and Blanc, P. 2000: "Marbles from Roman Hispania: stable isotope and cathodoluminescence characterization", *Applied Geochemistry* 15 (10), 1469-1493.
- Lapuente, P., Turi, B., Lazzarini, L. and Nogales, T. 1999: "Provenance investigation of white marble sculpture from Augusta Emerita, Hispania", M. Schvoerer (coord.), *Archéomatériaux - Marbres et autres roches. Actes de la IVème Conférence internationale de l'Association pour l'étude des marbres et autres roches utilisés dans le passé, 9-13 Octobre 1995*, Bordeaux-Talence, 111-116.
- Lazzarini, L. 2004: "Archaeometric aspects of white and coloured marbles used in antiquity: the state of the art", *Periodico di Mineralogia* 73, 113-125.
- Lopes, J. L. G. 2003: *Contribuição para o conhecimento tectono-estratigráfico do Nordeste Alentejano, Transversal Terena - Elvas. Implicações económicas no aproveitamento de rochas ornamentais existentes na região (Mármore e Granitos)*, Évora.
- Mañas Romero, I. 2012: "Marmora de las canteras de Estremoz, Alconera y Sintra: su uso y difusión", V. García-Entero (coord.), *El marmor en Hispania: explotación, uso y difusión en época romana*, Madrid, 331-346.
- Mañas Romero, I. and Fusco, A. 2009: "Canteras de Lusitania. Un análisis arqueológico", T. Nogales and J. Beltrán (coords.), *Marmora Hispana: Explotación y uso de los materiales pétreos en la Hispania Romana*, Roma, 483-522.



- Mantas, V. G. 2000: "A sociedade luso-romano do município de Ammaia", J. G. Gorges and T. Nogales (coords.), *Sociedad y cultura en Lusitania romana*, Mérida, 391-420.
- Manupella, G., Moreira, J. C. B. and Romão, M. L. 1981: "Calcários Portugueses sua utilização industrial", *Boletim de Minas* 18 (4), 271-283.
- Mattingly, D. J. and Salmon, J. 2001: "The productive past. Economies beyond agriculture", D. J. Mattingly and J. Salmon (coords.), *Economies beyond agriculture in the classical world*, New York, 3-14.
- Mayer, M. and Rodà, I. 1998: "The use of marble and decorative stone in Roman Baetica", S. Keay (coord.), *The Archaeology of Early Roman Baetica*, Portsmouth, 217-234.
- Menéndez, L. G., Azor, A., Ordóñez, A. and Sánchez-Almazo, I. 2011: "The metamorphic aureole of the Nisa-Albuquerque batholith (SW Iberia): implications for deep structure and emplacement mode", *International Journal of Earth Sciences* 100, 1533-1550.
- Morbidelli, P., Tucci, P., Imperatori, C., Polvorinos, A., Preite Martinez, M., Azzaro, E. and Hernandez, M. J. 2007: "Roman quarries of the Iberian peninsula: 'Anasol' and 'Anasol'-type", *European Journal of Mineralogy* 19 (1), 125-135.
- Nogales, T., De La Barrera, J. L. and Lapuente, P. 1999: "Marbles and other stones used in Augusta Emerita, Hispania", M. Schvoerer (coord.), *Archéomatériaux - Marbres et autres roches. Actes de la IVème Conférence internationale de l'Association pour l'étude des marbres et autres roches utilisés dans le passé, 9-13 Octobre 1995*, Bordeaux-Talence, 339-345.
- Nogales, T., Gonçalves, L. J. R. and Lapuente, P. 2009: "Materiales lapídeos, mármoles y talleres en Lusitania", T. Nogales and J. Beltrán (coords.), *Marmora Hispana: Explotación y uso de los materiales pétreos en la Hispania Romana*, Roma, 407-466.
- Noguera, J. M. and Madrid Balanza, M. J. 2012: "Mármoles y marmorización arquitectónica en Nova Carthago: nuevas evidencias del Molinete", V. García-Entero (coord.), *El marmor en Hispania: explotación, uso y difusión en época romana*, Madrid, 292-252.
- Oliveira, J. T., Oliveira, V. and Piçarra, J. M. 1991: "Traços gerais da evolução tectono-estratigráfica da Zona de Ossa-Morena, em Portugal", *Caderno Lab. Xeológico de Laxe* 16, 221-250.
- Ontiveros Ortega, E. 2009: "Análisis petrográfico de los mármoles de la cantera de la Loma de los Castillejos y su aportación al estudio arqueométrico de las canteras romanas de Almadén de la Plata", T. Nogales and J. Beltrán (coords.), *Marmora Hispana: Explotación y uso de los materiales pétreos en la Hispania Romana*, Roma, 365-376.
- Pensabene, P. 2004: "Amministrazione dei marmi e sistema distributivo nel mondo romano", G. Borghini (coord.), *Marmi antichi*, Rome, 43-54.
- Pensabene, P., Mar, R. and Cebrián, R. 2012: "Funding of public buildings and calculation of the costs of the stone materials. The case of the forum of Segobriga (Cuenca, Spain)", A. Gutiérrez García-Moreno, P. Lapuente and I. Rodà (coords.), *Interdisciplinary Studies on Ancient Stone. Proceedings of the IX Association for the Study of Marbles and Other Stones in Antiquity (ASMOSIA) Conference (Tarragona 2009)*, Tarragona, 161-175.
- Pereira, S. 2005: "A Freguesia da Aramenha sob o Domínio Romano", J. Oliveira, de (coord.), *São Salvador da Aramenha. História e Memórias da Freguesia. Ibn Maruán. Revista cultural do Concelho de Marvão*, 13, Marvão, 35-61.
- Pereira, S. 2009: *A Cidade Romana de Ammaia. Escavações Arqueológicas 2000-2006*, Ibn Maruan. Revista Cultural do Concelho de Marvão, número especial II, Marvão.
- Pereira, M. F., Silva, J. B. and Ribeiro, C. 2010: "The role of bedding in the formation of fault-fold structures, Portalegre-Esperança transpressional shear zone, SW Iberia", *Geological Journal* 45, 521-535.
- Pérez, C., Reyes, O., Rodà, I., Álvarez Pérez, A., Gutiérrez García-Moreno, A., Domènech, A. and Royo, H. 2012: "Use of marmora in the ornamental program of Las Pizarras Roman site (ancient Cauca, Segovia, Spain)", A. Gutiérrez García-Moreno, P. Lapuente and I. Rodà (coords.), *Interdisciplinary Studies on Ancient Stone. Proceedings of the IX Association for the Study of Marbles and Other Stones in Antiquity (ASMOSIA) Conference (Tarragona 2009)*, Tarragona, 151-160.
- Quaresma, J. C. 2010-2011: "Ammaia (S. Salvador de Aramenha, Marvão, Portugal) no âmbito dos intercâmbios de bens e de gentes com o Norte peninsular durante o Alto-Império", *Oppidum* 6-7, 85-102.
- Quaresma, J. C. 2011: *Relatório dos materiais da Porta Sul*, São Salvador de Aramenha.
- Ramírez, J. A. and Menéndez, L.G. 1999: "A geochemical study of two peraluminous granites from south-central Iberia; the Nisa-Albuquerque and Jalama batholiths", *Mineralogical Magazine* 63 (1), 85-104.
- Rodríguez Gutiérrez, O. 2009: "Los marmora en el programa arquitectónico y decorativo del Teatro Roma-

- no de Itálica: antiguas hipótesis, nuevas propuestas y posibles certezas a la luz de las aportaciones de los análisis microscopía óptica de polarización”, T. Nogales and J. Beltrán (coords.), *Marmora Hispana: Explotación y uso de los materiales pétreos en la Hispania Romana*, Roma, 231-259.
- Rodríguez, O., Beltrán, J., López Aldana, P., Ontiveros Ortega, E. and Taylor, R. 2012: “The quarries of Almadén de la Plata (Seville, Spain): new data from the recent archaeological interventions”, A. Gutiérrez García-Moreno, P. Lapuente and I. Rodà (coords.), *Interdisciplinary Studies on Ancient Stone. Proceedings of the IX Association for the Study of Marbles and Other Stones in Antiquity (ASMOSIA) Conference (Tarragona 2009)*, Tarragona, 645-650.
- Sálán, M. 2012: “Espejón marmor and its use in Roman Hispania”, A. Gutiérrez García-Moreno, P. Lapuente and I. Rodà (coords.), *Interdisciplinary Studies on Ancient Stone. Proceedings of the IX Association for the Study of Marbles and Other Stones in Antiquity (ASMOSIA) Conference (Tarragona 2009)*, Tarragona, 146-150.
- Sanderson, D. J., Roberts, S. and McGowan, J. A. 1991: “Hercynian transpressional tectonics at the southern margin of the Central Iberian Zone, west Spain”, *Journal of the Geological Society* 148, 893-898.
- Sarabia Bautista, J. 2012: “Los marmora de la villa de Salazote (Albacete). Primeras reflexiones”, V. García-Entero (coord.), *El marmor en Hispania: explotación, uso y difusión en época romana*, Madrid, 169-191.
- Schattner, T. G. and Ovejero Zappino, G. 2009: “Mármol en Munigua”, T. Nogales and J. Beltrán (coords.), *Marmora Hispana: Explotación y uso de los materiales pétreos en la Hispania Romana*, Roma, 285-312.
- Solá, A. R., Williams, I. S., Neiva, A. M. R. and Ribeiro, M. L. 2009: “U-Th-Pb SHRIMP ages and oxygen isotope composition of zircon from two contrasting late Variscan granitoids, Nisa-Albuquerque batholith, SW Iberian Massif: Petrologic and regional implications”, *Lithos* 111 (3-4), 156-167.
- Solá, A. R., Neiva, A. M. R. and Ribeiro, M. L. 2010: “Geocronologia, petrologia e geoquímica dos granitóides do NE Alentejano (transição ZCI/ZOM): significado geodinâmico”, J. M. Coteló Neiva, A. Ribeiro, V. Mendes, F. Noronha and Magalhães Ramalho (coords.), *Ciências Geológicas - Ensino e Investigação e sua História*, 281-290.
- Soler, B. 2003: “Algunas consideraciones sobre el empleo privado del mármol en Carthago Nova”, *Mastia* 3 (149-187).
- Soler, B. 2009: “Los marmora de la Tarraconense y su difusión en Carthago Nova. Balance y perspectivas”, T. Nogales and J. Beltrán (coords.), *Marmora Hispana: Explotación y uso de los materiales pétreos en la Hispania Romana*, Roma, 121-165.
- Soler, B. 2012: “El uso de rocas ornamentales en los programas decorativos de la Carthago Nova altoimperial: edilicia pública y evergetismo”, S. F. Ramallo Asensio (coord.), *La Decoración Arquitectónica en la Ciudades Romanas de Occidente*, Murcia, 455-483.
- Taelman, D. 2012: *The Provenance, Supply and Use of Stone Material at the Roman Town of Ammaia*, (Doctoral dissertation, department of Archaeology, Ghent University, Belgium) Zelzate.
- Taelman, D., Vermeulen, F., De Dapper, M. and De Paepe, P. 2012: “The Stones of Ammaia: Use and Provenance”, A. Gutiérrez García-Moreno, P. Lapuente and I. Rodà (coords.), *Interdisciplinary Studies on Ancient Stone. Proceedings of the IX Association for the Study of Marbles and Other Stones in Antiquity (ASMOSIA) Conference (Tarragona 2009)*, Tarragona, 117-126.
- Taelman, D., Elburg, M., Smet, I., De Paepe, P., Luís, L., Vanhaecke, F. and Vermeulen, F. 2013a: “Roman Marble from Lusitania: Petrographical and Geochemical Characterisation”, *Journal of Archaeological Science* 40 (5), 2227-2236.
- Taelman, D., Elburg, M. A., Smet, I., De Paepe, P., Vanhaecke, F. and Vermeulen, F. 2013b: “White, veined marble from Roman Ammaia (Portugal): provenance and use”, *Archaeometry* 55 (3), 370-390.
- Taelman, D., Deprez, S., Vermeulen, F., De Dapper, M. and De Paepe, P. in press: “Pitaranha, a Granite Quarriescape in the Hinterland of Roman Ammaia (Alentejo, Portugal)”, Y. Tristant and M. Ghilardi (coords.), *Archéologie du paysage. L'Égypte et le monde méditerranéen, BiEtud*, Cairo.
- Vermeulen, F. and Taelman, D. 2010: “From cityscape to landscape in Roman Lusitania: the municipium of Ammaia”, C. Corsi and F. Vermeulen (coords.), *Changing Landscapes. The impact of Roman towns in the Western Mediterranean*, Bologna, 311-324.
- Villaseca, C., Pérez-Soba, C., Merino, E., Orejana, D., López-García, J. A. and Billstrom, K. 2008: “Contrasting crustal sources for peraluminous granites of the segmented Montes de Toledo Batholith (Iberian Variscan Belt)”, *Journal of Geosciences* 53, 263-280.
- Ward-Perkins, J. B. 1951: “Tripolitania and the Marble Trade”, *Journal of Roman Studies* 41, 89-104.

Zöldföldi, J., Hegedüs, P. and Székely, B. 2008: "Interdisciplinary data base of marble for archaeometric, art historian and restoration use", Ü. Yalcin, H. Özbal and G. Pasamehmetoglu (coords.), *Ancient Mining in Turkey and the Eastern Mediterranean*, Ankara, 225-251.

Zuiderhoek, A. J. 2009: *The Politics of Munificence in the Roman Empire. Citizens, Elites and Benefactors in Asia Minor*, Greek Culture in the Roman World, Cambridge.

Recibido: 13-01-2014

Aceptado: 14-04-2014