

Interdisciplinary Studies on Ancient Stone

ASMOSIA X

Proceedings of the Tenth International Conference of ASMOSIA
Association for the Study of Marble & Other Stones in Antiquity
Rome, 21-26 May 2012

P. PENSABENE, E. GASPARINI (eds.)

«L'ERMA» di BRETSCHNEIDER

INDEX

<i>Presentation</i>	XI
---------------------------	----

I VOLUME

1. APPLICATION TO SPECIFIC ARCHAEOLOGICAL QUESTIONS - USE OF MARBLE	
Architecture with concave and convex rhythms and its decoration in Hadrian age: the Maritime Theatre and the Southern pavilion of Piazza d'Oro in Hadrian's Villa, <i>B. Adembri, S. Di Tondo, F. Fantini</i>	3
Imported marbles found in three Roman cities of the territory of "Cinco Villas" (Zaragoza), north of Hispania Citerior, <i>J. Andreu Pintado, H. Royo Plumed, P. Lapuente, M. Brilli</i>	13
Pentelic marble in the Severan Complex in Leptis Magna (Tripolitania, Libya), <i>F. Bianchi, M. Bruno, S. Pike</i>	23
The limestone quarries of Wadi Gadatza in the territory of Leptis Magna, <i>M. Bruno, F. Bianchi</i>	35
Provenance and distribution of white marbles in the arches of Titus and Septimius Severus in Rome, <i>M. Bruno, C. Gorgoni, P. Pallante</i>	43
The imitation of coloured marbles in a first style wall painting from the Etruscan-Roman town of Populonia (LI – Italy), <i>F. Cavari, F. Droghini, M. Giamello, C. Mascione, A. Scala</i> .	55
Small Euboean quarries. The local community markets, <i>M. Chidiroglou</i>	63
Lumachella at Cosa: late Republican?, <i>J. Collins-Clinton</i>	73
Ancientmarbles.org: an open community for sharing knowledge about ancient marble from different approaches, <i>S. Costa, F. Marri</i>	81
The use of marble in Lusitania between Rome and Islam, <i>M. Cruz Villalón</i>	85
"Marmora Ostiensa". New results from the Ostia Marina Project, <i>M. David, S. Succi, M. Turci</i>	93
A column shaft in 'verde rana ondato' from the archaeological excavations in Palazzo Altamps, <i>M. De Angelis d'Ossat, S. Violante, M. Gomez Serito</i>	103
The exploitation of coralline breccia of the Gargano in the Roman and late antique periods, <i>A. De Stefano</i>	113
Ships lapidariae and the wreck, with <i>marmor numidicum</i> , discovered in Camarina: hypothesis of route, <i>G. Di Stefano</i>	119

INDEX

The use of marble in the roman architecture of Lugdunum (Lyon, France), <i>D. Fellague, H. Savay-Guerraz, F. Masino, G. Sobrà</i>	125
Marmora and other stones in the architectural decoration of early imperial Barcino (Barcelona, Spain), <i>A. Garrido, A. Álvarez, A. Doménech, A. Gutiérrez Garcia-M., I. Rodà, H. Royo</i>	135
Provenance of the Roman marble sarcophagi of the San Pietro in Bevagna Wreck, <i>M. T. Giannotta, G. Quarta, A. Alessio, A. Pennetta</i>	143
Thasian Exports Of Prefabricated Statuettes, <i>J. J. Herrmann, Jr., D. Attanasio, A. van den Hoek</i>	155
Multimethod marble identification for figural sculpture in Hippo Regius (Annaba, Algeria), <i>J. J. Herrmann, Jr., R. H. Tykot, A. van den Hoek, P. Blanc</i>	163
Awaiting identity: Copenhagen’s “diskophoros” and its auxiliary support, <i>M. B. Hollinshead</i>	171
Provenance, distribution and trade of the local building materials in the Sarno river plain (Campania) from the 6th century BC to AD 79, <i>P. Kastenmeier, G. Balassone, M. Boni, G. di Maio, M. Joachimski</i>	179
White and coloured marble on Pantelleria, <i>T. Lappi</i>	185
Local stones and marbles found in the territory of “Alto Aragon” (Hispania), in Roman times, <i>P. Lapuente, H. Royo, J.A. Cuchi, J. Justes, M. Preite-Martinez</i>	191
The Marmor Lesbium reconsidered and other stones of Lesbos, <i>E. Leka, G. Zachos</i>	201
The marbles from the Villa of Trajan at Arcinazzo Romano (Roma), <i>Z. Mari</i>	213
The introduction of marble in the cavea of the Theatre of Hierapolis: building process and patronage, <i>F. Masino</i>	225
Shipwrecks with sarcophagi in the Eastern Adriatic, <i>I. Mihajlović, I. Mihaljek</i>	233
The marble decoration of the peristyle building in the SW quarter of Palmyra (Pal.M.A.I.S. Mission), <i>S. Nava</i>	241
Stone materials in Lusitania reflecting the process of romanization, <i>T. Nogales-Basarrate, P. Lapuente, H. Royo, M. Preite-Martinez</i>	253
A uotorum nuncupatio from Colonia Augusta Firma. An analytical approach, <i>S. Ordóñez, R. Taylor, O. Rodríguez, E. Ontiveros, S. García-Dils, J. Beltrán, J. C. Saquete</i>	263
The Muses in the Prado Museum and the pentelic marble of the Odeon in Hadrian’s villa: workshops and statuary programmes. Preliminary report, <i>A. Ottati</i>	269
Local workshops of the Roman imperial age. A contribution to the study of the production of Campanian Sarcophagi, <i>A. Palmentieri</i>	283
Ceraunia and <i>lapis obsianus</i> in Pliny, <i>L. Pedroni</i>	295
Marbles from the Domus of ‘Bestie ferite’ and from the Domus of ‘Tito Macro’ in Aquileia (UD), Italy, <i>C. Previato, N. Mareso</i>	299
Production and distribution of Troad granite, both public and private, <i>P. Pensabene, I. Rodà, J. Domingo</i>	311
The use of Almadén de la Plata marble in the public programs of Colonia Augusta Firma – Astigi (Écija, Seville, Spain), <i>O. Rodríguez, R. Taylor, J. Beltrán, S. García-Dils, E. Ontiveros, S. Ordóñez</i>	323

INDEX

Architectural elements of the Peristyle Building of the SW quarter of Palmyra (PAL.M.A.I.S. (PAL.M.A.I.S. Mission), <i>G. Rossi</i>	339
Casa del Rilievo di Telefo and <i>opus sectile</i> at Herculaneum, <i>A. Savalli, P. Pesaresi, L. Lazzarini</i>	349
The use of marble in Roman Pula, <i>A. Starac</i>	363
Architectural decoration of the episcopal church of Rhodiapolis in Lycia, <i>A. Tiryaki</i>	377
Byzantine carved marble slabs from Çanakkale Archaeology Museum, <i>A. Turker</i>	385
First preliminary results on the marmora of the late roman villa of Noheda (Cuenca, Spain), <i>M. A. Valero Tévar, A. Gutiérrez García-M., I. Rodà de Llanza</i>	393
Parian lychnites and the Badminton Sarcophagus in New York, <i>F. Van Keuren, J. E. Cox, D. Attanasio, W. Prochaska, J. J. Herrmann, Jr., D. H. Abramitis</i>	403
The use of Estremoz marble in Late Antique Sculpture of Hispania: new data from the petrographic and cathodoluminescence analyses, <i>S. Vidal, V. Garcia-Entero</i>	413
Montegrotto Terme (Padova) – Marble and other stone used in architectonic decoration of the Roman villa, <i>P. Zanovello, C. Destro, M. Bressan</i>	421
2. PROVENANCE IDENTIFICATION I: MARBLE	
The monument landscape and associated geology at the sanctuary of Zeus on mt. Lykaion, <i>I. Bald Romano, G. H. Davis, D. G. Romano</i>	429
Marbles of the Aracena Massif (Ossa-Morena zone, Spain): aspects of their exploitation and use in roman times, <i>J. Beltrán Fortes, M. L. Loza Azuaga, E. Ontiveros Ortega, J. A. Pérez Macías, O. Rodríguez Gutiérrez, R. Taylor</i>	437
Isotopic analysis of marble from the Stoa of Attalos in the Athenian Agora and the Hellenistic quarries of Mount Pentelikon, <i>S. Bernard, S. Pike</i>	451
An update on the use and distribution of white and black Göktepe marbles from the first century AD to Late Antiquity, <i>M. Bruno, D. Attanasio, W. Prochaska, A.B. Yavuz</i>	461
The use of coloured marbles in the neapolitan Baroque: the work of Cosimo Fanzago (1591-1678), <i>R. Bugini, L. Cinquegrana</i>	469
The imitation of coloured marbles in the Venetian Renaissance painting, <i>R. Bugini, L. Folli</i>	475
Stones and ancient marbles of the ‘Francesco Belli’ Collection: archaeological, art-historical, antiquarian, geological - technical and petrographical aspects, <i>R. Conte, A. D’Elia, E. Delluniversità, G. Fioretti, E. Florio, M. C. Navarra</i>	485
Provenance investigation of a marble sculptures from Lyon Museum, <i>M.P. Darblade-Audoin, D. Tambakopoulos, Y. Maniatis</i>	503
The limestone quarries of the Karaburum peninsula (southern Albania), <i>A. De Stefano</i> ...	513
The main quarries of the central part of Dardania (present Kosova) during the Roman period: their usage in funerary and cult monuments, <i>E. Dobruna-Salibu</i>	519
The use of marble in Hispanic Visigothic architectural decoration, <i>J.A. Domingo Magaña</i> .	527
Preliminary study of Los Bermejales, a new roman quarry discovered in the province of Cádiz, Southwestern Spain, <i>S. Domínguez-Bella, M. Montañés, A. Ocaña, J. M. Carrascal, J. Martínez, A. Durante, J. Rendón Aragón, J. Rios</i>	537

INDEX

Marble pavements from the house of Jason Magnus in Cyrene, <i>E. Gasparini, E. Gallocchio</i>	545
The Portoro of Portovenere: notes about a limestone, <i>S. Gazzoli, G. Tedeschi Grisanti</i>	555
Saw cuts on marble sarcophagi: New York and Ostia, <i>J. J. Herrmann, Jr., M. Bruno, A. van den Hoek</i>	559
The basalt of the sacred caves at Ajanta (India): characterization and conservation, <i>F. Mariottini, M. Mariottini</i>	565
Marble and stones used in the central eastern Alpine area and in the northern area of Benacus: topographical reconstruction of trade routes and aspects of use in the Roman Era, <i>A. Mosca</i>	575
Life of Nora (Province of Cagliari - South Sardinia). Roman quarries and their organization in the rural landscape, <i>C. Nervi</i>	585
Naxian or parian? Preliminary examination of the Sounion and Dipylon kouroi marble, <i>O. Palagia, Y. Maniatis</i>	593
Analysis of the stony materials in the Arucci city, <i>E. Pascual, J. Bermejo, J. M. Campos</i>	601
Blocks and quarry marks in the Museum of Aquileia, <i>P. Pensabene</i>	611
Archaeology and archaeometry of the marble sculptures found in the “Villa di Poppea” at Oplontis (Torre Annunziata, Naples), <i>P. Pensabene, F. Antonelli, S. Cancelliere, L. Lazzarini</i>	615
“Marmo di Cottanello” (Sabina, Italy): quarry survey and data on its distribution, <i>P. Pensabene, E. Gasparini, E. Gallocchio, M. Brilli</i>	629
A quantitative and qualitative study on marble revetments of service area in the Villa del Casale at Piazza Armerina, <i>P. Pensabene, L. Gonzalez De Andrés, J. Atienza Fuente</i>	641
Quarry-marks or masonry-marks at Palmyra: some comparisons with the Phoenician-Punic documentation, <i>D. Piacentini</i>	651
Fine-grained dolomitic marble of high sculptural quality used in antiquity, <i>W. Prochaska</i> . .	661
Discriminating criteria of Pyrenean Arties marble (Aran Valley, Catalonia) from Saint-Béat marbles: evidence of Roman use, <i>H. Royo, P. Lapuente, E. Ros, M. Preite-Martinez, J. A. Cuchí</i>	671

II VOLUME

3. PROVENANCE IDENTIFICATION II: OTHER STONES

The stone architecture of Palmyra (Syria): from the quarry to the building, <i>R. Bugini, L. Folli</i>	683
Quarries in rural landscapes of North Africa, <i>M. De Vos Raaijmakers, R. Attoui</i>	689
Local and imported lithotypes in Roman times in the Southern part of the X Regio Augusta Venetia et Histria, <i>L. Lazzarini, M. Van Molle</i>	699
Preliminary study of the stone tesserae of Albanian mosaics. Materials identification, <i>E. Omari</i>	713

4. ADVANCES IN PROVENANCE TECHNIQUES METHODOLOGIES AND DATABASES

Provenance investigation of some funeral marble sculptures from ancient Vienna (France), <i>V. Gaggadis-Robin, J.-L. Prisset, D. Tambakopoulos, Y. Maniatis</i>	725
---	-----

INDEX

Isotopic testing of marble for figural sculpture at Guelma, Algeria, <i>J. J. Herrmann, Jr., R. H. Tykot, D. Attanasio, P. Blanc, A. van den Hoek</i>	739
5. QUARRIES AND GEOLOGY	
Analysis and discrimination of Phrygian and other Pavonazzetto-like marbles, <i>D. Attanasio, M. Bruno, W. Prochaska, A. B. Yavuz</i>	753
Roman stone-carvers and re-carving: ingenuity in recycling, <i>S. J. Barker, C. A. Ward</i>	765
Can a fire broaden our understanding of a Roman quarry? The case of el Mèdol (Tarragona, Spain), <i>A. Gutiérrez García-M., S. Huelin, J. López Vilar, I. Rodà De Llanza</i>	779
The Roman marble quarries of Aliko Bay and of the islets of Rinia and Koulouri (Skyros, Greece), <i>M. Karambinis, Lorenzo Lazzarini</i>	791
The splendor of Andesite. quarrying and constructing in Larisa (Buruncuk) Aeolis, <i>T. Sener, U. Almaç</i>	805
Carving a corinthian capital. New technical aspects regarding the carving process, <i>N. Toma</i> .	811
New evidence on ancient quarrying activity at the Mani Peninsula, <i>M.P. Tsouli</i>	823
Ancient lithic naval cargos around Sicily, <i>S. Tusa</i>	831
An unusual Roman stone cinerary urn from London, <i>D.F. Williams, R. Hobbs</i>	843
Presenting and interpreting the processes of stone carving: <i>The Art Of Making In Antiquity</i> Project, <i>W. Wooton, B. Russell</i>	851
The Roman Mio-Pliocene underground quarries at Ksour Essaf (Tunisia), <i>A. Younès, M. Gaied, W. Gallala</i>	861
6. STONES PROPERTIES, WEATHERING EFFECTS AND RESTORATION	
A strigilated sarcophagus in providence: ancient, modern or both?, <i>G. E. Borromeo, M. B. Hollinshead, S. Pike</i>	871
Art historical and scientific perspectives on the nature of the orange-red patina of the Parthenon, <i>O. Palagia, S. Pike</i>	881
7. PIGMENTS AND PAINTINGS ON MARBLE	
The polychromy of Roman polished marble portraits, <i>A. Skovmøller, R. H. Therkildsen</i> ..	891
Some observations on the use of color on ancient sculpture, contemporary scientific exploration, and exhibition displays, <i>J. Pollini</i>	901
The Ulpia Domnina's sarcophagus: preliminary report about the use of digital 3d model for the study and reconstruction of the polychromy, <i>E.Siotto, M. Callieri, M. Dellepiane, R. Scopigno</i>	911
8. SPECIAL THEME SESSION: ORDERS, REPERTOIRES AND MEANING OF MARBLE WITHIN THE PUBLIC AND THE DOMESTIC CIRCLE FROM ANTIQUITY TILL POST-ANTIQUITY TIME	
Marbles from the theatre of Colonia Caesar Augusta (provincia Hispania Citerior), <i>M. Beltrán, M. Cisneros, J. Á. Paz</i>	923

INDEX

Calculating the cost of columns: the case of the Temple of Apollo at Didyma, <i>P. Barresi</i> . . .	933
The decorative stoneworks in the east and center of Roman Gaul: recent data of the archaeological operations, <i>V. Brunet-Gaston</i>	941
Colored columns and cult of the emperors in Rome, <i>B. Burrell</i>	947
Roman sculpture in Pannonia between imports and local production, <i>M. Buzov</i>	955
A New Julio-Claudian Statuary cycle from Copia Thuri. Brief remarks on quality and methods of extraction and processing of marble used for the sculptures, <i>A. D'Alessio</i>	969
Stone in the decorative programs of Villa A (So-Called Villa Of Poppaea) at Oplontis, <i>J. C. Fant, S. J. Barker</i>	977
Stable isotope analysis of Torano valley, Carrara, marble used in 18th-century french sculpture, <i>K. Holbrow, C. Hayward</i>	987
Cassiodorus on marble, <i>Y.A. Marano</i>	997
Colored marbles of Diocletian's Palace in Split, <i>K. Marasović, D. Matetić Poljak, Đ. Gobić Bravar</i>	1003
<i>Fabri Luxuriae</i> . Production and consumption of coloured stone vases in the Roman Period, <i>S. Perna</i>	1021
Porphyry bathtubs in the sacred space, <i>O. Senior-Niv</i>	1031
Mythological sculptures in late antique domus and villas: some examples from Italy, <i>C. Sfameni</i>	1039
Architectural language and diffusion of decorative models: a group of unpublished figured capitals from Hierapolis in Phrygia, <i>G. Sobrà</i>	1049

IMPORTED MARBLES FOUND IN THREE ROMAN CITIES OF THE TERRITORY OF “CINCO VILLAS” (ZARAGOZA), NORTH OF *HISPANIA CITERIOR*

J. Andreu Pintado¹, H. Royo Plumed², P. Lapuente³, M. Brillì⁴

Abstract

The archaeological remains of three Roman cities placed in the most northern part of the *Hispania Citerior* province, in the demarcation of the ancient Augustan colony of Caesar Augusta, are currently under a multi-disciplinary study. Located along the road that once connected the Ebro valley with the Pyrenees, they include Los Bañales (Uncastillo) and the small municipalities of Campo Real (Sos del Rey Católico) and Cabezo Ladrero (Sofuentes), all in the modern province of Zaragoza. By Augustan times, they probably started to become monumental, and became municipia in the Flavian period. The reopening of the recent archaeological research carried out in the mentioned area together with the implementation of a multi-method archaeometric study have provided a better knowledge of the stone resources and about the selection of imported marbles for special goods. Apart from varieties of the nearby Saint-Beat marbles, the attested catalogue includes other well known quarry sources like Carrara, Paros and Docimium.

Keywords

Roman marbles, urban development and architecture, Archaeometry

Archaeological overview

The recently archaeological research carried out in the current territory of “Cinco Villas” (Aragón, region) has lightened the existence of different Roman cities. This territory is located on the northwest area of the Zaragoza province right in the place where the native *Vascones* lived (BELTRÁN LLORIS 2001), in the North of the *conuentus Caesaraugustanus*. These Roman towns were emplaced along the way of the Roman road that

connected Caesar Augusta (Zaragoza) with Pompelo (Pamplona). This Roman road was, in fact, part of a main route that connected the Mediterranean coast with the Cantabric Sea and the Ebro valley with the Pyrenees. This route from Tarraco (Tarragona) to Oiasso (Irún) (MORENO 2009) was operative from the 1st century BC to the end of the 4th century AD.

One of these Roman towns was “Los Bañales” (near the current village of Uncastillo), whose name probably was Tarraca in ancient literature (ANDREU 2012a). A second was Cabezo Ladrero (modern Sofuentes) (JORDÁN *et al.* 2010) and the last one considered in this paper, was situated in Campo Real (current Sos del Rey Católico and probably ancient Arsaos) (ANDREU *et al.* 2008) (Fig. 1). The territory was scattered with other Roman emplacements such as that settled in the modern Ejea de los Caballeros, possibly named Segia in the latin sources (CABELLO y PAZ 2006), or those like “Santacrís” (Eslava) and Ilumberi (Lumbier) – both in Navarre region –. All of them were promoted by the Romans from native towns just by the time of Augustus, between 15 and 9 BC. The territory lived its *floruit* from the end of the 1st century BC to the end of the 2nd century AD and began to decline after the urban convulsions of the 3rd century AD. During that prosperous time all of these cities seem to become Flavian municipalities and developed an intense process of urbanization from which only is well known that concerns to the city of Los Bañales, thanks to the results of the archaeological campaigns developed in the last four years (ANDREU 2012b, 29-49)⁵.

One of the topics in this archaeological research is the supply of raw material to achieve the process of urbanism. In Los Bañales, local Miocene sandstone was widely exploited for building and infrastructure purposes as is evidenced not only by the large quantity of architectural elements found *in situ*, but also by the vestiges of exploitation as quarry faces and marks of ancient

1. Fundación Uncastillo, Plan de Investigación de Los Bañales (Uncastillo, Zaragoza, Spain) / Universidad Nacional de Educación a Distancia-UNED, Facultad de Geografía e Historia (Madrid, Spain). jandreu@geo.uned.es

2. Área de Petrología y Geoquímica, Departamento de Ciencias de la Tierra, Universidad de Zaragoza-UZ (Zaragoza, Spain). hroyopl@unizar.es / plapuent@unizar.es

3. Unitat d'Estudis Arqueomètrics-UEA, Institut Català d'Arqueologia Clàssica-ICAC (Tarragona, Spain). hroyo@icac.cat

4. Istituto di Geologia Ambientale e Geoingegneria-IGAG, Consiglia Nazionale delle Ricerche-CNR (Roma, Italy). mauro.brilli@igag.cnr.it

5. A research project led by Fundación Uncastillo with the permission of Dirección General de Patrimonio of the Aragon Government. For further details: <http://www.losbanales.es>.

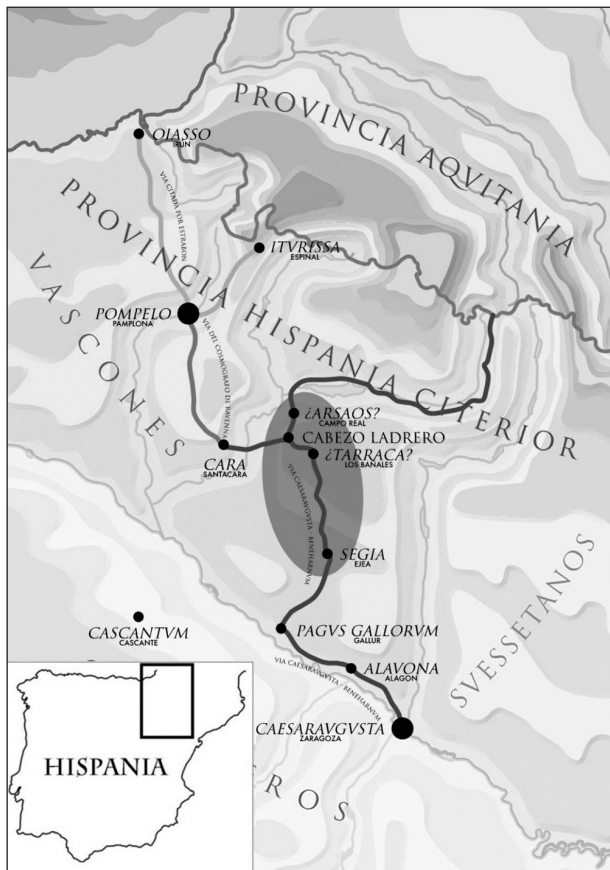


Fig. 1. Historical and geographical context with the general location of the territory of Cinco Villas (ellipse area) and the major Roman cities from where the pieces under study were found: Los Bañales/Tarraca, Campo Real/Arsaos and Cabezo Ladrero.

works found in the surroundings (GUTIÉRREZ GARCIA-M. *et al.* 2012, 653-654). Concerning noble stones, white marbles and coloured varieties were also identified in different architectural-decorative elements (LAPUENTE *et al.* 2012b, 281-286). To better understand the use of selected marbles in this territory, this paper is focused on the marble identification of different artifacts recently found in the archaeological remains of three emplacements of the “Cinco Villas” territory: Los Bañales, Campo Real and Cabezo Ladrero.

The studied samples

From the coloured *Marmora*, nineteen were found in Los Bañales and one additional piece comes from Campo Real. Most of them correspond to slabs fragments, but there are also one molding fragment and one small cosmetic plate (Fig. 2).

Regarding white pieces from architectural elements and statuary, 13 samples were studied, all in diverse

state of fragmentation. The list of material is displayed in Fig. 3 and they are shown in Fig. 4.

During the 2009 campaign of archaeological excavation in Los Bañales focused on the area near the bath complex building, a small molding marble piece was found (no. 1).

In the southern part of the city, close to the fields down to the bath area, slabs fragments for pavements were found several years ago⁶ (nos. 2, 3, 4, 5, 9). With respect to the statuary, the studied samples from Los Bañales were discovered during the 2011 campaign of the archaeological excavations carried out in the Forum which probably was built at the end of the 1st century BC. They were found in a level of abandoned structural material (*spolia*) used for closing the ancient street of the city, before the junction with the access to the Forum. These pieces are two fragments of fingers, a foot with the evidence of a shoe (*calliga*), two pieces of the clothing (*paludamentum*) of a sculpture (nos. 6 and 7), one of them with an arm and both with evidences of been colored with red pigment, as was usual in Roman sculpture (BENDALA 2009). Finally, a right hand without fingers (sample no. 8) completes the list of analyzed white marbles from Los Bañales.

Recently, in the 2012 campaign, more fragmented pieces were recuperated from a pile supposed to be ready for their destruction and conversion into lime. They were originally from the decorative program of the Forum and include part of the decoration of a *thoracatus*, some attributes, a finger, some drapes and clothes and an additionally hand of another sculpture⁷. They will be the aim of future analyses.

In Campo Real, located right on the limits of the current municipalities of Sos del Rey Católico (Zaragoza) and Sangüesa (Navarra), a beautiful marble artifact which seems to be the top part of a *cornucopia* (no. 12), were analyzed. The spectacular *cornucopia* carved with the use of the drill, seems to be part of an imperial or religious statue of monumental size. It was found in the area of Baratiñones, where probably an ancient rural settlement related with the Roman city of Campo Real was emplaced (ANDREU *et al.* 2011).

Finally a fragmented inscription plate (no. 13) found in Cabezo Ladrero constitutes the list of studied samples. This last piece was found exactly in a possibly *uicus* of its rural territory, “La Pardina de Vico”, which seems to be a previous indigenous city, evolved in Roman times for economic purposes (ANDREU *et al.* 2010, 126-127).

In order to complete the inventory of the marble artefacts recently discovered in this territory, two small columns shafts (nos. 10 and 11) probably from the same piece, have also included in this paper, in spite of have been aimed in previous papers (ANDREU *et al.* 2010,

6. Thanks to J. Planas for the sampling facilities.

7. M. Laita, a private neighbor, found it by chance.



Fig. 2. Selection of archaeological elements in different coloured stones found in the Cinco Villas territory. Green and Mixed Campan (France), Giallo antico and Lumachella orientale (Tunisia), Rosso antico, Verde antico and Cipollino verde (Greece), and *Luculleum* (Turkey). The fragments shown were specifically found in Los Bañales.

184; ROYO 2012). Both small columns (20/22 x 20/11 cm) founded by some privates in the area close to the ancient cemetery of the city of Campo Real and could be part of an ancient *lararium* for domestic cult.

Archaeometrical study

The characterization and identification of white and coloured *marmora* varieties have been carried out separately since their methodological approach is different. Among the latter, lithological varieties are well visually recognized through their colour and patterns by the presence of veins or bands which facilitates the comparison with pictures of *marmora* exploited in ancient times, published elsewhere⁸ and also with an extensive collection of breccias and other rocks⁹ commonly used in antiquity. The list of the identified provenance of the slab fragments is as follows: Two in Green and Mixed Campan, one in Giallo Antico, one in Lumachella Orientale, one in Rosso Antico, two in Verde Antico, ten in Cipollino Verde, and one small cosmetic plate or *coticalae* in *Luculleum* (Andreu in press). The moulding fragment was carved in Lumachella Orientale, and the slab

fragment from Campo Real in Green Campan. A selection of the most representative *marmora* fragments is shown in figure 2.

Additionally, the study of white marbles involves the application of various analytical techniques. Optical Microscopy¹⁰, Cathodoluminescence (CL)¹¹ and for C and O isotopic determination¹² were applied to thirteen marble artifacts discovered in the 2011 campaign. The multi-method carried out provides a great reliability to the results of the provenance marble sources, as numerous works have been demonstrated. The marble quarry was assigned after the comparative study with, not only Hispanic marble quarry samples but also with those from the most important quarries in the Mediterranean area. One of the main problems in the study of white marble is the similarity of their visual appearance, however in impure white marbles the presence of any peculiar feature, even the odor when are broken, can help in their identification. The microscopic description paid special attention to the mineral composition, texture, fabric, maximum grain size (MGS) and grain boundary shape (GBS). Complementary, CL provides a better resolution on the marble provenance studies. The combination of both, petrography and CL, has been success-

8. Among others: Mielsch 1985; Gnoli 1988; Borghini 1992; Dubarry de Lassale 2000; Álvarez *et al.* 2009.

9. The comparison was made with the *marmora* collections of the Área de Petrología y Geoquímica of the Universidad de Zaragoza (UZ), the Laboratory for the study of stone materials (LEMLA) of the Universitat Autònoma de Barcelona (UAB) and the Unitat d'estudis arqueomètrics (UEA) of the Institut Català d'Arqueologia Clàssica (ICAC).

10. Petrographic microscope OLYMPUS AX-70, of Departamento de Ciencias de la Tierra, Universidad de Zaragoza (Zaragoza).

11. Cathodoluminescence device CL8200 Mk5-1, coupled to petrographic microscope NIKON Eclipse 50iPOL of the Institut Català d'Arqueologia Clàssica-ICAC (Tarragona).

12. As can be seen in: Barbin *et al.* 1989, 1992.

Archaeological site	Object	Sample No.	Accessory minerals	MGS mm	GBS	Fabric	Type of fabric	CL fabric	CL intensity	$\delta^{18}\text{O}$ ‰	$\delta^{13}\text{C}$ ‰	Probable provenance
Los Bañales	Moulding	1	Qtz (-) / Ms (-)	0.6	CV/ST	HO	Polygonal mosaic	HO	Medium	-1.56	1.96	Carrara (Italy)
	Slab	2	Qtz (±) / Ms (-)	2.9	CV/SU	HE	Interlocked mosaic	HO	Faint	-1.70	2.86	Saint-Béat (France)
	Slab	3	Qtz (±) / Ms (-)	4.0	CV/SU	HE	Mosaic / Mortar	HO	Medium	-1.80	3.13	Saint-Béat (France)
	Slab	4	Qtz (±) / Ms (-)	3.5	CV/SU	HE	Mosaic / Mortar	HO	Medium	-2.96	4.18	Saint-Béat (France)
	Slab	5	-	0.5	SU	HO	Interlocked mosaic	HO	Strong	-	-	Pyrenean unspecified
	Toga	6	-	1.5	CV/EN	HE	Mosaic	HO	Very faint	-	-	Paros?
	Arm	7	-	1.8	CV/EN	HE	Mosaic	HO	Very faint	-	-	Paros?
	Right hand	8	-	1.4	CV/EN	HE	Mosaic	HO	Very faint	-	-	Paros?
	Slab	9	Qtz (±) / Ms (-)	2.6	CV/EN/SU	HE	Interlocked mosaic	HO	Faint	-1.65	4.05	Saint-Béat (France)
	Column shaft	10	Op (-)	0.9	CV/EN/SU	HE	Lineated	HE	Strong	-4.57	-0.86	Docimium (Turkey)
	Column shaft	11	Op (±)	0.7	CV/EN/SU	HE	Mosaic slight lineated	HE	Strong	-4.57	-0.15	Docimium (Turkey)
	Cornucopia	12	-	2.0	CV/EN	HE	Mosaic	HO	Very faint	-3.46	1.86	Paros (Greece)
	Inscription	13	-	1.0	SU	HO	Interlocked mosaic	HO	Strong	-1.80	2.07	Pyrenean unspecified
Cabezo Ladrero												

Fig. 3 Data table with the results of the analysis performed in the Roman artifacts studied from the Cinco Villas territory. Accessory minerals: Qtz (quartz), Ms (muscovite), Op (opaque minerals), GBS: ST (straight), CV (curved), EM (embayed), SU (sutured). Fabric: HO (homeoblastic), HE (heteroblastic), HE (heterogeneous), HE (heterogeneous), HE (heterogeneous).

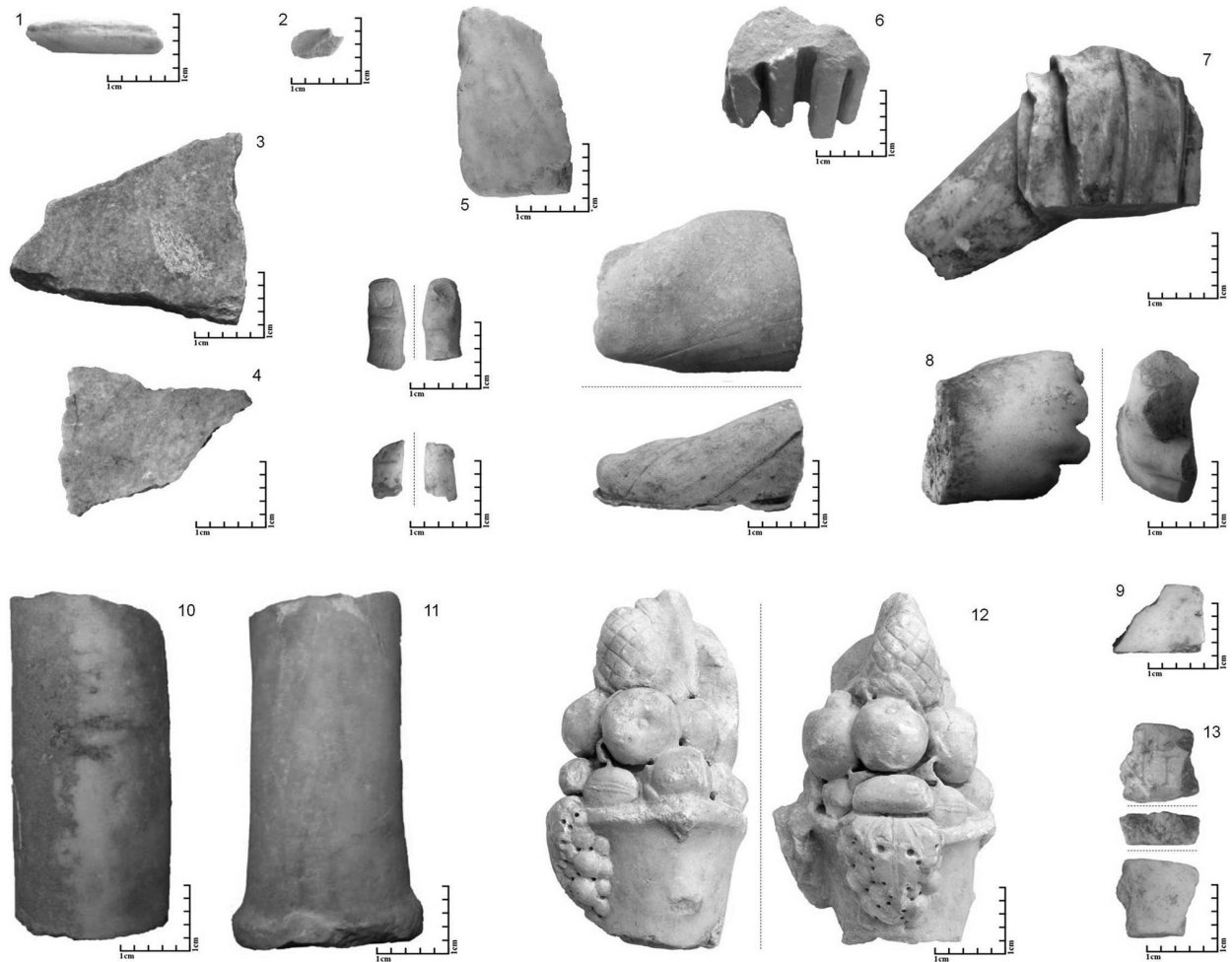


Fig. 4. Archaeological artifacts sampled from Cinco Villas. Los Bañales: nos. 1 to 9. Campo Real: nos. 10, 11 and 12. Cabezo Ladrero: no. 13.

fully applied to various areas of classical quarries¹³ and is particularly useful when overlapping isotopic ratios of different quarries (LAPUENTE *et al.* 2012a). Several authors (MOENS *et al.* 1992; GORGONI *et al.* 2002; ATTANASIO *et al.* 2006, LAPUENTE *et al.* 2000) have developed a set of databases that compile the relative abundances of the ¹³C and ¹⁸O isotopes from the most important marbles used in antiquity.

A short description of the white marble artifacts found in Cinco Villas with their inventory numbers and data obtained from the different analysis have been sorted in a table (Fig. 3), with the marble source inferred from the combination of results. The visual aspect of the artifacts under study is shown in Figure 4.

To facilitate the comparisons, photomicrographs were taken under crossed polarized light (Fig. 5, on the left). The CL-patterns with a particular intensity and distribution of the photon emissions in the carbonate

minerals were also photographically registered (Fig. 5, on the right).

The isotope marble quarry databases allow the comparison with those values of the analyzed archaeological samples (Fig. 6). The results are expressed in terms of ¹³C and ¹⁸O, in ‰ relative to the international reference standard PDB (Pee Dee Belemnite) (MCCREA 1950).

MARBLE PROVENANCE

In los Bañales, the varieties of *marmora* attested are quite diverse, as was usual on the *sectile* pavements. From the French Pyrenees, Campan (Green and Mixed) along with different varieties of Saint-Béat marbles were recognized in samples nos. 2, 3, 4 and 9, probably in the slab fragment (no. 5) and in the inscription plate of Cabezo Ladrero (no. 11), whose specific marble

13. Isotopic ratio mass spectrometer-IRMS FINIGAN MAT 252, of the Dipartimento di Scienze della Terra dell'Università "La Sapienza" (Roma).

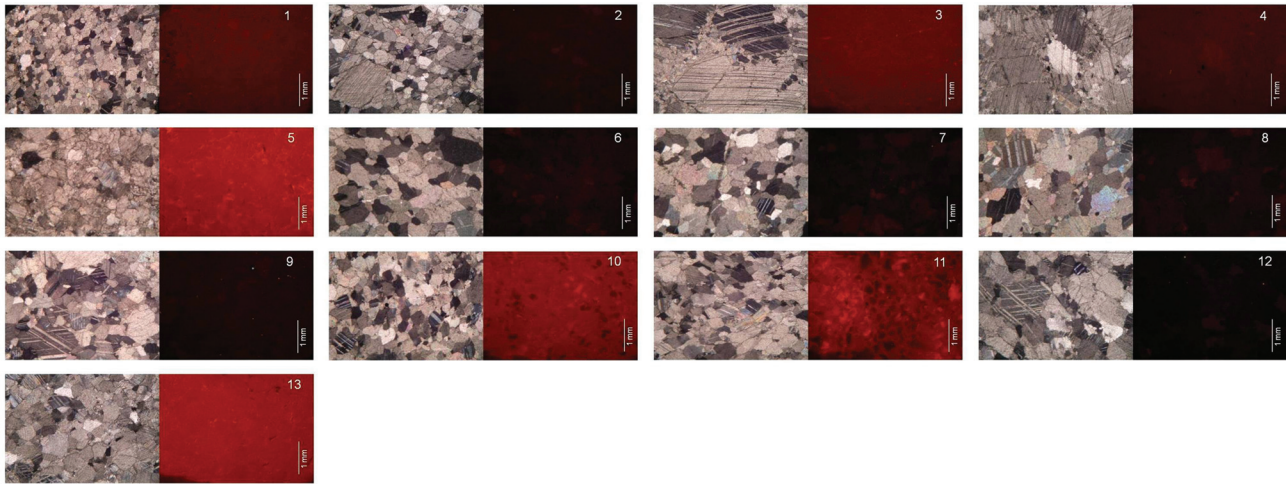


Fig. 5. Photomicrographs of the white calcitic marble samples analyzed, under cross polarized light on the left, and CL on the right.

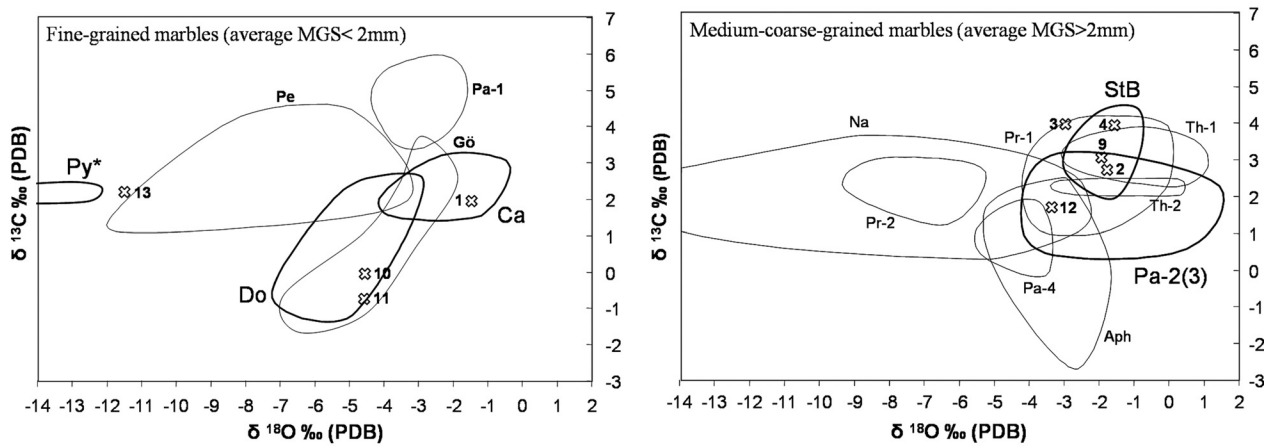


Fig. 6. Isotopic graphs with the distribution fields of the Classical white marble according to similar, MGS < 2mm and MGS > 2mm, respectively (Gorgoni *et al.* 2002; Attanasio *et al.* 2009, 2013; Royo *et al.* in this volume). Carrara (Ca), Göktepe (Gö), Paros (Pa), Penteli (Pe), Docimium (Do), Proconnesos (Pr), Thasos (Tha), Naxos (Na), Aphrodisias (Aph), Saint-Béat (StB) and Pyrenean unspecified (Py*).

quarry provenance remains uncertain. Giallo Antico and Lumachella Orientale – from the North of Africa – and Rosso Antico, Verde Antico, Cipollino Verde and *marmor luculleum* (Andreu in press), complete the list of coloured stones. Regarding other Classical quarrying marble sources, Carrara has been detected in the moulding piece no. 1. It is not the first time that this Italian marble source has been recognized in archaeological pieces of this territory, since was already attested in the paleochristian sarcophagus of Castiliscar (Zaragoza), dated in the 4th century AD (LAPUENTE *et al.* 1996). The identification of those pieces of sculpture nos. 6, 7 and 8 – as the same type of fine-grained marble, very well crystallized, with high translucency and a very low cathodoluminescence – makes us doubt between statuary Carrara marble and *lychnites* Parian mar-

ble. To determine its origin is necessary, at least, a geochemical analysis and isotopic ratios of C and O which would corroborate the identification¹⁴. Even so, its Mediterranean origin is clear. Both types of marble considered are very common in the sculptures of the Roman Empire, leads us to think that were all parts of a Roman imperial statue probably dedicated to the imperial cult and erected with an alive emperor, as the *calliga* of one of the fragments evidences.

In the place of Campo Real, it is not surprised the identification of marble of the island of Paros in the *cornucopia* piece (no. 12), in accordance with its fine style and since there were attested more statuary pieces carved from this Classical quarry source. This Parian variety is originally from the Chorodaki valley in the southwest of Marathi locality. Along with these marble

14. The isotopic analysis of C and O to complete the identification of these fragments is being carried out at the laboratory of the *Istituto di Geologia Ambientale e Geoingegneria-IGAG (CNR)* in Rome (Italy).

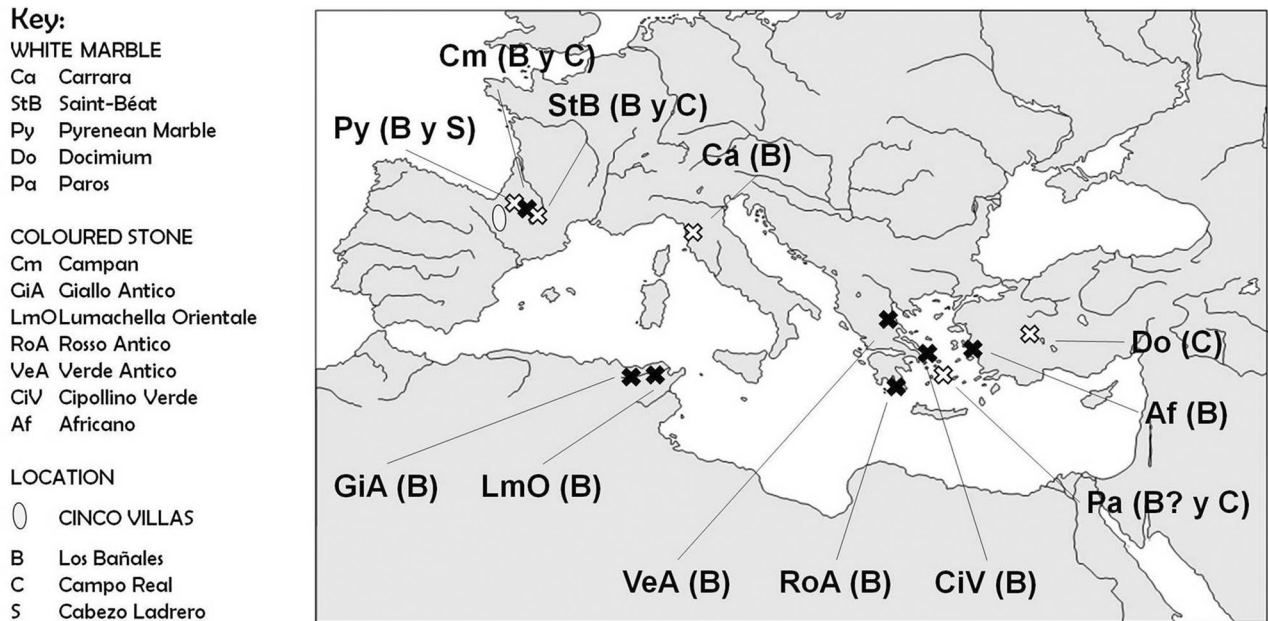


Fig. 7. Location map of the provenance quarries of the varieties mentioned in the text, along with the location of the studied area.

artifacts have been found two slabs fragments elaborated in Green Campan and Saint-Béat marble respectively. As well as the two small columns (samples nos. 10, 11) carved in white Docimium.

The piece no. 13 of the catalogue, though of uncertain Pyrenean origin, is also remarkable because not only is the first attestation of Roman marble in the *territorium* of Cabezo Ladrero, but also due to the epigraphic character of the piece, which could be part of a plate used in a burial. Until today, is the only epigraphic evidence in marble attested in the increasing epigraphic catalogue of this territory (JORDÁN 2009).

Conclusions

As usually occurs, the studied *marmora* fragments found in the Cinco Villas territory are of diverse provenance (Fig. 7). The number of pieces of colored *marmora* is sparse but exhibits a high diversity: Green Campan, Mixed Campan, Giallo Antico, Lumachella Orientale, Rosso Antico, Verde Antico, Cipollino Verde and *Luculleum*. In turn, their origin is diverse and in some cases remarkably exotic: Campan (France), Chemtou and Djebel Oust¹⁵ (Tunisia), Cape Taenaro, Larisa and Euboea (Greece), and Teos (Turkey). It seems to have a jointly trade of Campan varieties and Saint-Béat marbles, directly distributed from the quarry areas, while the rest could be marketed through Rome. Despite a small number of pieces has been studied, they provide a better understanding of the prosperity of these archaeological

sites, aspects that help to complete their socio-economic outlook.

The finding of a set of statuary fragments from the Forum of Los Bañales and a *cornucopia* from Campo Real elaborate on classical imported marbles confirm the importance of these Roman settlements which, until recently, have been considered as communities established in a marginal and secondary territory. It has been proved the use of Saint-Béat marbles in ornamental elements from Los Bañales and Campo Real, expanding its distribution map over the Roman *conventus Caesar-Augustanus* where they had been widely recognized, in particular in the nearby Caesar Augusta Colony (LAPUENTE *et al.* 2009), especially for architectural and decorative purposes, epigraphy and sculpture.

The presence of *marmor lunensis* from Carrara in a moulding fragment of Los Bañales and Docimium marble in two column shafts of Campo Real highlights the rich decoration of certain rooms, for which were chosen especial imported noble material instead other options such as Saint-Béat marble which was relatively more accessible.

Currently, several Pyrenean marble outcrops¹⁶ are being studied to better know their discriminate fingerprints and to determine the specific origin of different artifacts found in Cinco Villas – as slab fragment from Los Bañales or inscription from Cabezo Ladrero – whose chemical and physical characteristics do not match any other well known marble source, but probably were carved in Pyrenean marble.

15. In Lazzarini and Mariottini 2012, 446 justified the change of provenance of this variety of lumachella which traditionally had been assigned a provenance from Henchir el-Kasbat.

16. Diverse Pyrenean marble outcrops are being studied as part of the PhD Thesis being carried out by H. Royo, one of the authors of this paper.

All the imported *marmora* and white marbles here recognized, had also been attested in the colony of Caesar Augusta and many of them in the nearby territory of Alto Aragón (LAPUENTE *et al.* in this volume). The evidence reported in this study, along with more recent testimonies found in other local Roman cities like Pompelo or Santacrís, provide a better perspective of this territory, which shares the ornamental and sculptural habits attested in other emplacements of the Ebro valley, following the Roman taste widely distributed around the Empire.

Acknowledgments

This paper presents the work undertaken within the Plan de Investigación de Los Bañales, funded by the Education and Culture Dept. (DGPC) of the Aragón Government (CONAID). It was also carried out into the frame of the research projects I+D+I HAR2008-04600 and I+D+I HAR2011-25011, funded by the Ministerio de Ciencia e Innovación of the Spanish Government. Our thanks to the Caja Inmaculada (Europa XXI program) the Aragón Government and European Social Fund (Group E-95).

Bibliography

- ÀLVAREZ A., DOMÈNECH A., LAPUENTE P., PITARCH À., ROYO H. 2009: *Marbles and stones of Hispania. Exhibition catalogue Asmosia IX Internacional Conference*, Institut Català d'Arqueologia Clàssica. Tarragona, 143.
- ANDREU J.: “De mundo muliebre. Sobre tres coticulae romanas procedentes de Los Bañales (Uncastillo, Zaragoza)”, *Turiaso*, 22, [In press]
- ANDREU J. (ed.) 2012a: *La ciudad romana de Los Bañales. Entre la historia, la arqueología y la historiografía. Caesaraugusta*, 82, Zaragoza, 440.
- ANDREU J. 2012b: “La ciudad romana de Los Bañales (Uncastillo, Zaragoza) en las fuentes históricas”, in J. Andreu (ed.), *La ciudad romana de Los Bañales. Entre la historia, la arqueología y la historiografía. Caesaraugusta*, 82, Zaragoza, 19-100.
- ANDREU J., ARMENDÁRIZ J., OZCÁRIZ P., GARCÍA-BARBERENA M., JORDÁN Á. A. 2008: “Una ciudad de los Vascones en el yacimiento de Campo Real/Fillera (Sos del Rey Católico-Sangüesa)”, *AESpA*, 81, 75-100.
- ANDREU J., JORDÁN Á. A., ARMENDÁRIZ J. 2010: “Nuevas aportaciones a la epigrafía de Campo Real/Fillera (Sos del Rey Católico/Sangüesa)”, *Zephyrus*, 65, 179-198.
- ANDREU J., URIBE P., JORDÁN Á. A. 2010: “Poblamiento rural y organización territorial en torno a la ciuitas de Los Bañales”, *TAN*, 22, 115-162.
- ANDREU J., ZUAZÚA N., ARMENDÁRIZ J., ROYO H. 2011: “A propósito de una cornucopia romana en mármol procedente del territorio de la ciudad romana de Campo Real/Fillera (Sangüesa, Navarra)”, *Príncipe de Viana*, 253, 71-93
- ATTANASIO D., BRILLI M., OGLE N. 2006: *The isotopic signature of classical marbles*, L'Érma di Bretschneider, Studia Archaeologica, Roma, 145.
- ATTANASIO D., BRUNO M., YAVUZ A. B. 2009: “Quarries in the region of Aphrodisias: the black and White marbles of Göktepe (Mu la)”, *Journal of Roman Archaeology*, 22, 312-348.
- ATTANASIO D., BRUNO M., PORCHASKA W., YAVUZ A. B. 2013: A Multi-Method Database of the Black and White Marbles of Göktepe (Aphrodisias), Including Isotopic, EPR, Trace and Petrographic Data. *Archaeometry*. doi: 10.1111/arcm.12076.
- BARBIN V., RAMSEYER K., DÉCROUEZ D., HERB R., 1989: “Marbres blancs: caractérisation par cathodoluminescence”, *Comptes Rendus de l'Académie des Sciences Paris*, t. 308, série II, 861-866.
- BARBIN V., RAMSEYER K., DÉCROUEZ D., BURNS S. J., CHAMAY J., MAIER J. L., 1992: “Cathodoluminescence of white marbles: an overview”, *Archaeometry*, 34, 175-183.
- BELTRÁN LLORIS F. 2001: “Hacia un replanteamiento del mapa cultural y étnico del Norte de Aragón”, in F. Villar, M^a P. Fernández (eds.), *Religión, lengua y cultura prerromanas de Hispania*, Salamanca, 61-82.
- BENDALA M. (ed.) 2009: *El color de los dioses. El colorido de la estatuaria antigua*, Madrid.
- BORGHINI G. (ed.) 1992: *Marmi antichi*, Edizioni de Luca, Roma, 342.
- CABELLO J., PAZ J. Á. (eds.) 2006: *ArquEJEALogía. Ejea de los Caballeros y las Cinco Villas de la Prehistoria a la Antigüedad Tardía*, Ejea de los Caballeros.
- DUBARRY DE LASSALE J. 2000: *Identification of marbles*, Ed. H. Vial, Dourdan.
- GNOLI R. 1988: *Marmora Romana*. 2^a ed, edizioni dell'Elefante. Roma, 183.
- 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”, in ASMOSIA 5, 115-131.
- GUTIÉRREZ GARCÍA-M A., ANDREU J., ROYO H. 2012: “The Roman Quarries of the Town and Territory of Los Bañales (Uncastillo, Zaragoza)”, in ASMOSIA 9, 651-656.
- JORDÁN Á. 2009: “Ritmos epigráficos en el área nororiental del solar vascón: las Cinco Villas de Aragón”, in J. Andreu (ed.), *Los Vascones de las fuentes antiguas. En torno a una etnia de la Antigüedad Peninsular*, Barcelona, 513-526.
- JORDÁN Á. A., ANDREU, J., BIENES J. J. 2010: “Epigrafía romana de Sofuentes”, *Epigráfica*, 72, 191-246.
- LAZZARINI L., MARIOTTINI M. 2012: “A first study of some lumachelle (fossiliferous stones) used in Roman Antiquity”, in ASMOSIA 9, 445-451.
- LAPUENTE P., LEÓN P., NOGALES-BASARRATE T., ROYO H., PREITE-MARTINEZ M., BLANC PH. 2012a: “White sculptural materials from Villa Adriana: Study of provenance”, in ASMOSIA 9, 364-375.
- LAPUENTE P., ROYO H., CUCHÍ J. A., JUSTES J., PREITE-MARTINEZ M.: “Roman stones and marbles found in the “Alto Aragón” territorio (Hispania)”, [in this volume]
- LAPUENTE P., ROYO H., GUTIÉRREZ GARCÍA-M. A. 2012b: “Un aspecto de la monumentalización de Los Bañales: caracterización de materiales pétreos y fuentes de aprovisionamiento”, in J. Andreu (ed.), *La ciudad romana de Los Bañales. Entre la historia, la arqueología y la historiografía. Caesaraugusta*, 82, Zaragoza, 261-286.
- LAPUENTE P., TURI B., BLANC PH. 2000: “Marbles from Roman Hispania: stable isotope and cathodoluminescence characterization”. *Applied Geochemistry*, 15, 1469-1493.
- Lapuente P., Turi B., Blanc Ph. 2009: “Marbles and coloured

- stones from the Theatre of Caesar Augusta (Hispania): preliminary study”, in *ASMOSIA* 7, 509-522.
- LAPUENTE P., TURI B., LAZZARINI L., MOSTALAC A. 1996: “Provenance determination of marbles of three Paleochristian Sarcophagi from Aragón (Spain)”, in G. Summers (ed.), *Archeometry*, 1994, Ankara, 127-132.
- MIELSCH H. 1985: *Buntmarmore aus Rom im Antikenmuseum Berlin*. Staatliche Museen Preussischer Kulturbesitz. Berlin, 85, nn. 585-595, tav. 17.
- MCCREA J. M. 1950: “On the isotopic chemistry of carbonates and a paleotemperature scale”, *Journal of Chemical Physics*, 18, 849-857.
- MOENS L., DE PAEPE P., WAELEKENS M. 1992: “Multidisciplinary research and cooperation: keys to a successful provenance determination of white marble”, in *ASMOSIA* 2, 247-254.
- MORENO I. 2009: *Item a Caesarea Augusta Benebarno. La carretera romana de Zaragoza al Bearn*, Ejea de los Caballeros.
- ROYO H. 2010: “Estudio arqueométrico de tres piezas pétreas de Campo Real/Fillera (Sos del Rey Católico/Sangüesa)”, *Zephyrus*, 65, 199-203.
- ROYO H., LAPUENTE P., ROS E., PREITE-MARTINEZ M., CUCHÍ J. A.: “Discriminating criteria of Pyrenean Arties marble (Aran Valley, Catalonia) from Saint-Béat marbles: evidence of Roman use”, [in this volume]

