

# Calcitic Marble from Thasos in the North Adriatic Basin: Ravenna, Aquileia, and Milan

---

Herrmann, John J.; Tykot, Robert H.; van den Hoek, Annewies

Source / Izvornik: **ASMOSIA XI, Interdisciplinary Studies on Ancient Stone, Proceedings of the XI International Conference of ASMOSIA, 2018, 239 - 246**

Conference paper / Rad u zborniku

Publication status / Verzija rada: **Published version / Objavljena verzija rada (izdavačev PDF)**

<https://doi.org/10.31534/XI.asmosia.2015/02.07>

Permanent link / Trajna poveznica: <https://um.nsk.hr/um:nbn:hr:123:656301>

Rights / Prava: [In copyright](#) / [Zaštićeno autorskim pravom.](#)

Download date / Datum preuzimanja: **2024-07-16**



Repository / Repozitorij:

[FCEAG Repository - Repository of the Faculty of Civil Engineering, Architecture and Geodesy, University of Split](#)





# ASMOSIA XI

Interdisciplinary Studies on Ancient Stone

## PROCEEDINGS

of the XI ASMOSIA Conference, Split 2015

Edited by Daniela Matetić Poljak and Katja Marasović



Interdisciplinary Studies on Ancient Stone  
Proceedings of the XI ASMOSIA Conference (Split 2015)

Publishers:

ARTS ACADEMY IN SPLIT  
UNIVERSITY OF SPLIT

and

UNIVERSITY OF SPLIT  
FACULTY OF CIVIL ENGINEERING,  
ARCHITECTURE AND GEODESY

Technical editor:  
Kate Bošković

English language editor:  
Graham McMaster

Computer pre-press:  
Nikola Križanac

Cover design:  
Mladen Čulić

Cover page:

*Sigma shaped mensa of pavonazzetto marble from Diocletian's palace in Split*

ISBN 978-953-6617-49-4 (Arts Academy in Split)

ISBN 978-953-6116-75-1 (Faculty of Civil Engineering, Architecture and Geodesy)

e-ISBN 978-953-6617-51-7 (Arts Academy in Split)

e-ISBN 978-953-6116-79-9 (Faculty of Civil Engineering, Architecture and Geodesy)

CIP available at the digital catalogue of the University Library in Split, no 170529005

Association for the Study of Marble & Other Stones in Antiquity

# ASMOSIA XI

## Interdisciplinary Studies of Ancient Stone

Proceedings of the Eleventh International Conference of ASMOSIA,  
Split, 18–22 May 2015

Edited by  
Daniela Matetić Poljak  
Katja Marasović



Split, 2018

**Nota bene**

All papers are subjected to an international review.

The quality of the images relies on the quality of the originals provided by the authors.

# CONTENT

<b>PRESENTATION</b> .....	15
<b>NECROLOGY: NORMAN HERZ (1923-2013) by Susan Kane</b> .....	17
<b>1. APPLICATIONS TO SPECIFIC ARCHEOLOGICAL QUESTIONS – USE OF MARBLE</b>	
Hermaphrodites and Sleeping or Reclining Maenads: Production Centres and Quarry Marks <i>Patrizio Pensabene</i> .....	25
First Remarks about the Pavement of the Newly Discovered Mithraeum of the Colored Marbles at Ostia and New Investigations on Roman and Late Roman White and Colored Marbles from Insula IV, IX <i>Massimiliano David, Stefano Succi and Marcello Turci</i> .....	33
Alabaster. Quarrying and Trade in the Roman World: Evidence from Pompeii and Herculaneum <i>Simon J. Barker and Simona Perna</i> .....	45
Recent Work on the Stone at the Villa Arianna and the Villa San Marco (Castellammare di Stabia) and Their Context within the Vesuvian Area <i>Simon J. Barker and J. Clayton Fant</i> .....	65
Marble Wall Decorations from the Imperial Mausoleum (4 <sup>th</sup> C.) and the Basilica of San Lorenzo (5 <sup>th</sup> C.) in Milan: an Update on Colored Marbles in Late Antique Milan <i>Elisabetta Neri, Roberto Bugini and Silvia Gazzoli</i> .....	79
Sarcophagus Lids Sawn from their Chests <i>Dorothy H. Abramitis and John J. Herrmann</i> .....	89
The Re-Use of Monolithic Columns in the Invention and Persistence of Roman Architecture <i>Peter D. De Staebler</i> .....	95
The Trade in Small-Size Statues in the Roman Mediterranean: a Case Study from Alexandria <i>Patrizio Pensabene and Eleonora Gasparini</i> .....	101
The Marble Dedication of Komon, Son of Asklepiades, from Egypt: Material, Provenance, and Reinforcement of Meaning <i>Patricia A. Butz</i> .....	109
Multiple Reuse of Imported Marble Pedestals at Caesarea Maritima in Israel <i>Barbara Burrell</i> .....	117
Iasos and Iasian Marble between the Late Antique and Early Byzantine Eras <i>Diego Peirano</i> .....	123

Thassos, Known Inscriptions with New Data <i>Tony Kozelj and Manuela Wurch-Kozelj</i> .....	131
The Value of Marble in Roman <i>Hispalis</i> : Contextual, Typological and Lithological Analysis of an Assemblage of Large Architectural Elements Recovered at N° 17 Goyeneta Street (Seville, Spain) <i>Ruth Taylor, Oliva Rodríguez, Esther Ontiveros, María Luisa Loza, José Beltrán and Araceli Rodríguez</i> .....	143
<i>Giallo Antico</i> in Context. Distribution, Use and Commercial Actors According to New Stratigraphic Data from the Western Mediterranean (2 <sup>nd</sup> C. Bc – Late 1 <sup>st</sup> C. Ad) <i>Stefan Ardeleanu</i> .....	155
<i>Amethystus</i> : Ancient Properties and Iconographic Selection <i>Luigi Pedroni</i> .....	167
<b>2. PROVENANCE IDENTIFICATION I: (MARBLE)</b>	
Unraveling the Carrara – Göktepe Entanglement <i>Walter Prochaska, Donato Attanasio and Matthias Bruno</i> .....	175
The Marble of Roman Imperial Portraits <i>Donato Attanasio, Matthias Bruno, Walter Prochaska and Ali Bahadır Yavuz</i> .....	185
Tracing Alabaster (Gypsum or Anhydrite) Artwork Using Trace Element Analysis and a Multi-Isotope Approach (Sr, S, O) <i>Lise Leroux, Wolfram Kloppmann, Philippe Bromblet, Catherine Guerrot, Anthony H. Cooper, Pierre-Yves Le Pogam, Dominique Vingtain and Noel Worley</i> .....	195
Roman Monolithic Fountains and Thasian Marble <i>Annewies van den Hoek, Donato Attanasio and John J. Herrmann</i> .....	207
Archaeometric Analysis of the Alabaster Thresholds of Villa A, Oplontis (Torre Annunziata, Italy) and New Sr and Pb Isotopic Data for <i>Alabastro Ghiaccione del Circeo</i> <i>Simon J. Barker, Simona Perna, J. Clayton Fant, Lorenzo Lazzarini and Igor M. Villa</i> .....	215
Roman Villas of Lake Garda and the Occurrence of Coloured Marbles in the Western Part of “Regio X Venetia et Histria” (Northern Italy) <i>Roberto Bugini, Luisa Folli and Elisabetta Roffia</i> .....	231
Calcitic Marble from Thasos in the North Adriatic Basin: Ravenna, Aquileia, and Milan <i>John J. Herrmann, Robert H. Tykot and Annewies van den Hoek</i> .....	239
Characterisation of White Marble Objects from the Temple of Apollo and the House of Augustus (Palatine Hill, Rome) <i>Francesca Giustini, Mauro Brilli, Enrico Gallochio and Patrizio Pensabene</i> .....	247
Study and Archeometric Analysis of the Marble Elements Found in the Roman Theater at Aeclanum (Mirabella Eclano, Avellino - Italy) <i>Antonio Mesisca, Lorenzo Lazzarini, Stefano Cancelliere and Monica Salvadori</i> .....	255



Two Imperial Monuments in Puteoli: Use of Proconnesian Marble in the Domitianic and Trajanic Periods in Campania <i>Irene Bald Romano, Hans Rupprecht Goette, Donato Attanasio and Walter Prochaska</i> .....	267
Coloured Marbles in the Neapolitan Pavements (16 <sup>th</sup> And 17 <sup>th</sup> Centuries): the Church of <i>Santi Severino e Sossio</i> <i>Roberto Bugini, Luisa Folli and Martino Solito</i> .....	275
Roman and Early Byzantine Sarcophagi of Calcitic Marble from Thasos in Italy: Ostia and Siracusa <i>Donato Attanasio, John J. Herrmann, Robert H. Tykot and Annewies van den Hoek</i> .....	281
Revisiting the Origin and Destination of the Late Antique Marzamemi 'Church Wreck' Cargo <i>Justin Leidwanger, Scott H. Pike and Andrew Donnelly</i> .....	291
The Marbles of the Sculptures of Felix Romuliana in Serbia <i>Walter Prochaska and Maja Živić</i> .....	301
Calcitic Marble from Thasos and Proconnesos in Nea Anchialos (Thessaly) and Thessaloniki (Macedonia) <i>Vincent Barbin, John J. Herrmann, Aristotle Mentzos and Annewies van den Hoek</i> .....	311
Architectural Decoration of the Imperial Agora's Porticoes at Iasos <i>Fulvia Bianchi, Donato Attanasio and Walter Prochaska</i> .....	321
The Winged Victory of Samothrace - New Data on the Different Marbles Used for the Monument from the Sanctuary of the Great Gods <i>Annie Blanc, Philippe Blanc and Ludovic Laugier</i> .....	331
Polychrome Marbles from the Theatre of the Sanctuary of Apollo Pythios in Gortyna (Crete) <i>Jacopo Bonetto, Nicolò Mareso and Michele Bueno</i> .....	337
Paul the Silentiary, Hagia Sophia, Onyx, Lydia, and Breccia Corallina <i>John J. Herrmann and Annewies van den Hoek</i> .....	345
Incrustations from Colonia Ulpia Traiana (Near Modern Xanten, Germany) <i>Vilma Ruppiniè and Ulrich Schüssler</i> .....	351
Stone Objects from Vindobona (Austria) – Petrological Characterization and Provenance of Local Stone in a Historico-Economical Setting <i>Andreas Rohatsch, Michaela Kronberger, Sophie Insulander, Martin Mosser and Barbara Hodits</i> .....	363
Marbles Discovered on the Site of the Forum of Vaison-la-Romaine (Vaucluse, France): Preliminary Results <i>Elsa Roux, Jean-Marc Mignon, Philippe Blanc and Annie Blanc</i> .....	373
Updated Characterisation of White Saint-Béat Marble. Discrimination Parameters from Classical Marbles <i>Hernando Royo Plumed, Pilar Lapeunte, José Antonio Cuchí, Mauro Brillì and Marie-Claire Savin</i> .....	379

Grey and Greyish Banded Marbles from the Estremoz Anticline in Lusitania <i>Pilar Lapuente, Trinidad Nogales-Basarrate, Hernando Royo Plumed, Mauro Brilli and Marie-Claire Savin</i> .....	391
New Data on Spanish Marbles: the Case of <i>Gallaecia</i> (NW Spain) <i>Anna Gutiérrez García-M., Hernando Royo Plumed and Silvia González Soutelo</i> .....	401
A New Roman Imperial Relief Said to Be from Southern Spain: Problems of Style, Iconography, and Marble Type in Determining Provenance <i>John Pollini, Pilar Lapuente, Trinidad Nogales-Basarrate and Jerry Podany</i> .....	413
Reuse of the <i>Marmorata</i> from the Late Roman Palatial Building at Carranque (Toledo, Spain) in the Visigothic Necropolis <i>Virginia García-Entero, Anna Gutiérrez García-M. and Sergio Vidal Álvarez</i> .....	427
Imperial Porphyry in Roman Britain <i>David F. Williams</i> .....	435
Recycling of Marble: Apollonia/Sozousa/Arsuf (Israel) as a Case Study <i>Moshe Fischer, Dimitris Tambakopoulos and Yannis Maniatis</i> .....	443
Thasian Connections Overseas: Sculpture in the Cyrene Museum (Libya) Made of Dolomitic Marble from Thasos <i>John J. Herrmann and Donato Attanasio</i> .....	457
Marble on Rome's Southwestern Frontier: Thamugadi and Lambaesis <i>Robert H. Tykot, Ouahiba Bouzidi, John J. Herrmann and Annewies van den Hoek</i> .....	467
Marble and Sculpture at Lepcis Magna (Tripolitania, Libya): a Preliminary Study Concerning Origin and Workshops <i>Luisa Musso, Laura Buccino, Matthias Bruno, Donato Attanasio and Walter Prochaska</i> .....	481
The Pentelic Marble in the Carnegie Museum of Art Hall of Sculpture, Pittsburgh, Pennsylvania <i>Albert D. Kollar</i> .....	491
Analysis of Classical Marble Sculptures in the Michael C. Carlos Museum, Emory University, Atlanta <i>Robert H. Tykot, John J. Herrmann, Renée Stein, Jasper Gaunt, Susan Blevins and Anne R. Skinner</i> .....	501
<b>3. PROVENANCE IDENTIFICATION II: (OTHER STONES)</b>	
Aphrodisias and the Regional Marble Trade. The <i>Scaenae Frons</i> of the Theatre at Nysa <i>Natalia Toma</i> .....	513
The Stones of Felix Romuliana (Gamzigrad, Serbia) <i>Bojan Djurić, Divna Jovanović, Stefan Pop Lazić and Walter Prochaska</i> .....	523
Aspects of Characterisation of Stone Monuments from Southern Pannonia <i>Branka Migotti</i> .....	537

The Budakalász Travertine Production <i>Bojan Djurić, Sándor Kele and Igor Rižnar</i> .....	545
Stone Monuments from Carnuntum and Surrounding Areas (Austria) – Petrological Characterization and Quarry Location in a Historical Context <i>Gabrielle Kremer, Isabella Kitz, Beatrix Moshhammer, Maria Heinrich and Erich Draganits</i> .....	557
Espejón Limestone and Conglomerate (Soria, Spain): Archaeometric Characterization, Quarrying and Use in Roman Times <i>Virginia García-Entero, Anna Gutiérrez García-M, Sergio Vidal Álvarez, María J. Peréx Agorreta and Eva Zarco Martínez</i> .....	567
The Use of Alcover Stone in Roman Times ( <i>Tarraco, Hispania Citerior</i> ). Contributions to the <i>Officina Lapidaria Tarraconensis</i> <i>Diana Gorostidi Pi, Jordi López Vilar and Anna Gutiérrez García-M.</i> .....	577
<b>4. ADVANCES IN PROVENANCE TECHNIQUES, METHODOLOGIES AND DATABASES</b>	
Grainautline – a Supervised Grain Boundary Extraction Tool Supported by Image Processing and Pattern Recognition <i>Kristóf Csorba, Lilla Barancsuk, Balázs Székely and Judit Zöldföldi</i> .....	587
A Database and GIS Project about Quarrying, Circulation and Use of Stone During the Roman Age in <i>Regio X - Venetia et Histria</i> . The Case Study of the Euganean Trachyte <i>Caterine Previato and Arturo Zara</i> .....	597
<b>5. QUARRIES AND GEOLOGY</b>	
The Distribution of Troad Granite Columns as Evidence for Reconstructing the Management of Their Production <i>Patrizio Pensabene, Javier Á. Domingo and Isabel Rodà</i> .....	613
Ancient Quarries and Stonemasonry in Northern Choria Considiana <i>Hale Güney</i> .....	621
Polychromy in Larisaeon Quarries and its Relation to Architectural Conception <i>Gizem Mater and Ertunç Denктаş</i> .....	633
Euromos of Caria: the Origin of an Hitherto Unknown Grey Veined Stepped Marble of Roman Antiquity <i>Matthias Bruno, Donato Attanasio, Walter Prochaska and Ali Bahadır Yavuz</i> .....	639
Unknown Painted Quarry Inscriptions from Bacakale at <i>Docimium</i> (Turkey) <i>Matthias Bruno</i> .....	651
The Green Schist Marble Stone of Jebel El Hairech (North West of Tunisia): a Multi-Analytical Approach and its Uses in Antiquity <i>Ameur Younès, Mohamed Gaied and Wissem Gallala</i> .....	659
Building Materials and the Ancient Quarries at <i>Thamugadi</i> (East of Algeria), Case Study: Sandstone and Limestone <i>Younès Rezkallah and Ramdane Marmi</i> .....	673

The Local Quarries of the Ancient Roman City of <i>Valeria</i> (Cuenca, Spain) <i>Javier Atienza Fuente</i> .....	683
The Stone and Ancient Quarries of Montjuïc Mountain (Barcelona, Spain) <i>Aureli Álvarez</i> .....	693
<i>Notae Lapidinarum</i> : Preliminary Considerations about the Quarry Marks from the Provincial Forum of <i>Tarraco</i> <i>Maria Serena Vinci</i> .....	699
The Different Steps of the Rough-Hewing on a Monumental Sculpture at the Greek Archaic Period: the Unfinished Kouros of Thasos <i>Danièle Braunstein</i> .....	711
A Review of Copying Techniques in Greco-Roman Sculpture <i>Séverine Moureaud</i> .....	717
Labour Forces at Imperial Quarries <i>Ben Russell</i> .....	733
Social Position of Craftsmen inside the Stone and Marble Processing Trades in the Light of Diocletian's Edict on Prices <i>Krešimir Bosnić and Branko Matulić</i> .....	741
<b>6. STONE PROPERTIES, WEATHERING EFFECTS AND RESTORATION, AS RELATED TO DIAGNOSIS PROBLEMS, MATCHING OF STONE FRAGMENTS AND AUTHENTICITY</b>	
Methods of Consolidation and Protection of Pentelic Marble <i>Maria Apostolopoulou, Elissavet Drakopoulou, Maria Karoglou and Asterios Bakolas</i> .....	749
<b>7. PIGMENTS AND PAINTINGS ON MARBLE</b>	
Painting and Sculpture Conservation in Two Gallo-Roman Temples in Picardy (France): Champlieu and Pont-Sainte-Maxence <i>Véronique Brunet-Gaston and Christophe Gaston</i> .....	763
The Use of Colour on Roman Marble Sarcophagi <i>Eliana Siotto</i> .....	773
New Evidence for Ancient Gilding and Historic Restorations on a Portrait of Antinous in the San Antonio Museum of Art <i>Jessica Powers, Mark Abbe, Michelle Bushey and Scott H. Pike</i> .....	783
Schists and Pigments from Ancient Swat (Khyber Pukhtunkhwa, Pakistan) <i>Francesco Mariottini, Gianluca Vignaroli, Maurizio Mariottini and Mauro Roma</i> .....	793
<b>8. SPECIAL THEME SESSION: „THE USE OF MARBLE AND LIMESTONE IN THE ADRIATIC BASIN IN ANTIQUITY”</b>	
Marble Sarcophagi of Roman Dalmatia Material – Provenance – Workmanship <i>Guntram Koch</i> .....	809

Funerary Monuments and Quarry Management in Middle Dalmatia <i>Nenad Cambi</i> .....	827
Marble Revetments of Diocletian's Palace <i>Katja Marasović and Vinka Marinković</i> .....	839
The Use of Limestones as Construction Materials for the Mosaics of Diocletian's Palace <i>Branko Matulić, Domagoj Mudronja and Krešimir Bosnić</i> .....	855
Restoration of the Peristyle of Diocletian's Palace in Split <i>Goran Nikšić</i> .....	863
Marble Slabs Used at the Archaeological Site of Sorna near Poreč Istria – Croatia <i>Đeni Gobić-Bravar</i> .....	871
Ancient Marbles from the Villa in Verige Bay, Brijuni Island, Croatia <i>Mira Pavletić and Đeni Gobić-Bravar</i> .....	879
Notes on Early Christian Ambos and Altars in the Light of some Fragments from the Islands of Pag and Rab <i>Mirja Jarak</i> .....	887
The Marbles in the Chapel of the Blessed John of Trogir in the Cathedral of St. Lawrence at Trogir <i>Đeni Gobić-Bravar and Daniela Matetić Poljak</i> .....	899
The Use of Limestone in the Roman Province of Dalmatia <i>Edisa Lozić and Igor Rižnar</i> .....	915
The Extraction and Use of Limestone in Istria in Antiquity <i>Klara Buršić-Matijašić and Robert Matijašić</i> .....	925
Aurisina Limestone in the Roman Age: from Karst Quarries to the Cities of the Adriatic Basin <i>Caterina Previato</i> .....	933
The Remains of Infrastructural Facilities of the Ancient Quarries on Zadar Islands (Croatia) <i>Mate Parica</i> .....	941
The Impact of Local Geomorphological and Geological Features of the Area for the Construction of the Burnum Amphitheatre <i>Miroslav Glavičić and Uroš Stepišnik</i> .....	951
Roman Quarry Klis Kosa near Salona <i>Ivan Alduk</i> .....	957
Marmore Lavdata Brattia <i>Miona Miliša and Vinka Marinković</i> .....	963
Quarries of the Lumbarda Archipelago <i>Ivka Lipanović and Vinka Marinković</i> .....	979

Island of Korčula – Importer and Exporter of Stone in Antiquity <i>Mate Parica and Igor Borzić</i> .....	985
Faux Marbling Motifs in Early Christian Frescoes in Central and South Dalmatia: Preliminary Report <i>Tonči Borovac, Antonija Gluhan and Nikola Radošević</i> .....	995
<b>INDEX OF AUTHORS</b> .....	1009

# CALCITIC MARBLE FROM THASOS IN THE NORTH ADRIATIC BASIN: RAVENNA, AQUILEIA, AND MILAN

John J. Herrmann<sup>1</sup>, Robert H. Tykot<sup>2</sup> and Annewies van den Hoek<sup>3</sup>

<sup>1</sup> Museum of Fine Arts, Boston, Massachusetts, United States (jherrmannjr@gmail.com)

<sup>2</sup> Department of Anthropology, University of South Florida, Tampa, Florida, United States (rtykot@usf.edu)

<sup>3</sup> Harvard University, Cambridge, Massachusetts, United States (annewies\_vandenhoek@harvard.edu)

## Abstract

Macroscopic examination is used as a guide for selecting candidates for testing in a search for Thasian marble artifacts in the north Adriatic region. Five Roman and Early Byzantine artifacts could be sampled in Ravenna, Aquileia, and Milan: three sarcophagi, a pulpit, and a column shaft. Grain size was measured in some cases. Four of the five candidates clearly proved to be marble from Thasos, and the other seemed more likely to be Thasian than Proconnesian.

## Keywords

Late Antique, stable isotopes, X-ray fluorescence, Early Byzantine, sarcophagi, ambo

## Macroscopic evidence for Proconnesian and Thasian marble in the North Adriatic/Po Valley region and sampling

On a macroscopic basis, it has long been evident that the quarries of Proconnesus near Constantinople had a dominant position in the Adriatic region, as they did throughout the Eastern Mediterranean.<sup>1</sup> Grayish marble with long, dark gray bands typical of Proconnesus is widespread throughout the region.<sup>2</sup> Fernando Rebecchi has pointed out the dominance of Proconnesian marble in sarcophagi produced at Ravenna during the second and third centuries, although a few products from Attica, Ephesus, and Assos also reached the region.<sup>3</sup> Proconnesian dominance of the market for marble in the North Aegean continued during the Early Christian period. Stylistically,



Fig. 1. Schematic (semifinished) Ionic capital from Thasos, untested, 380-410, Aquileia Museum

most architectural decoration in Ravenna, the most important city of the region in Early Byzantine times, has close parallels in Constantinople, and F. W. Deichmann has affirmed that most of the marble used in Ravenna was Proconnesian.<sup>4</sup> Yuri Marano has collected literary sources that speak of or allude to the importation of Proconnesian marble products to Ravenna in the sixth century.<sup>5</sup>

Traditional art-historical methods, however, have shown that marble products from the Aegean island of Thasos also managed on rare occasions to reach the northern Adriatic. Semi-finished Ionic capitals of a kind produced during the fourth century in the quarries of calcitic marble at Aliko on Thasos have appeared at Aquileia. One is in the Archaeological Museum (Fig. 1),<sup>6</sup> and another, which was redecorated in the Middle Ages, is in Aquileia Cathedral.<sup>7</sup> Macroscopic examination of the marble reinforces these identifications. Archaeometric study has shown that the maximum grain size (MGS) of calcitic marble from Thasos is usually substantially

1 REBECCHI 1978; MARANO 2008A; MARANO 2008B; LAZZARINI 2015.

2 For the properties of Proconnesian marble, see LAZZARINI 2015.

3 REBECCHI 1978, 251, 255, 257, fig. 5.

4 DEICHMANN 1969, 64.

5 MARANO 2008A, 59-60, 190-191; MARANO 2008B, 164.

6 HERRMANN, SODINI 1977, 490, fig. 32; HERRMANN 1988, 84, 92; MARANO 2008A, 199.

7 CUSCITO 2008, 382-383, fig. 5, ascribed to the project of Bishop Cromazio (388-408).



Fig. 2. Column shaft, calcitic marble from Aliko, Thasos, fourth century, perhaps 380-410, Aquileia, Museum. USF 19901

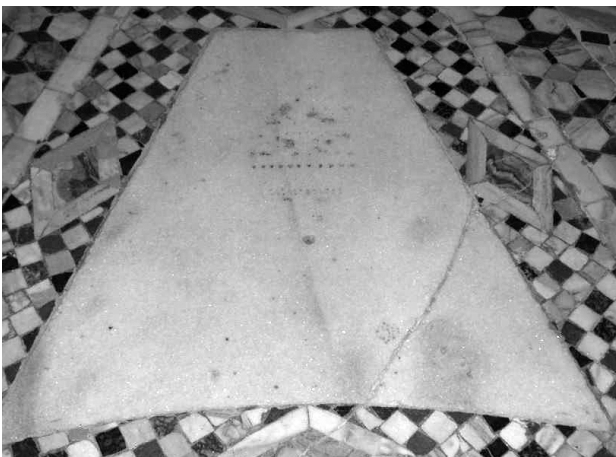


Fig. 3. Pavement of central octagon of S. Vitale, Ravenna, marble slab probably from Thasos, untested, 6<sup>th</sup> century, reused in medieval pavement



Fig. 4. Quarries of Aliko, Thasos

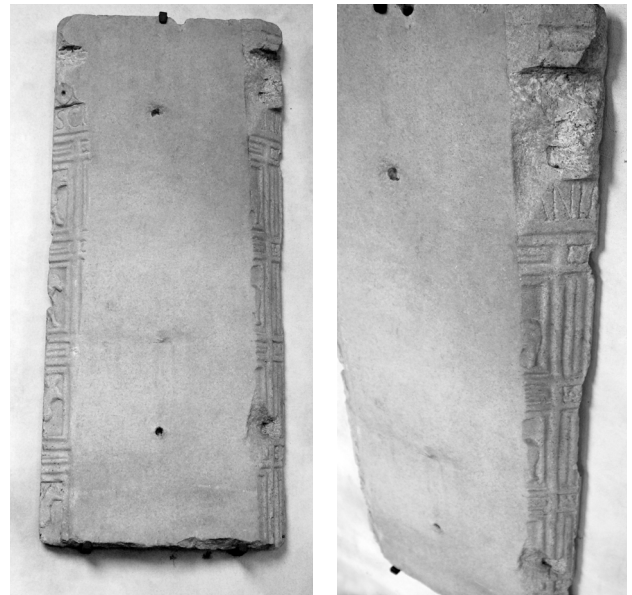


Fig. 5. Part of an ambo recut as a slab, inscribed SCO...NI/, marble from Aliko, Thasos. Ravenna, Museo Nazionale, inv. 620. USF19898, late 6<sup>th</sup>/early 7<sup>th</sup> century

greater than that from Proconnesus,<sup>8</sup> and Thasian calcite tends to have softer or more rounded markings than typical Proconnesian marble. On an optical basis, Patrizio Pensabene has also identified a large column shaft (Fig. 2) and four fragmentary shafts at Aquileia as Thasian.<sup>9</sup> Marble from Thasos also appears to be present in Ravenna as well as Aquileia. The most striking Thasian-looking pieces there are several coarse-grained, spotted slabs in the pavement of the mid-sixth century church of San Vitale (Fig. 3); their markings can be closely matched in the quarries at Aliko on Thasos (Fig. 4).

The pavement of S. Vitale could not be sampled to check the macroscopic evidence, but a few other Thasian-looking objects in Ravenna could be. Small chips were taken from a fragmentary ambo (pulpit) (Fig. 5) and two sarcophagi (Figs. 6-7). At Aquileia, a tiny chip could be taken from the large Thasian-looking column shaft (Fig. 2). A sarcophagus at Milan also appeared to be Thasian, and a tiny chip was taken there too (Fig. 8). The Sarcophagus of the Wine Merchant in the Archaeological Museum in Ancona also appears to be Thasian calcite, but permission for a sample has not been granted (Fig. 10).<sup>10</sup>

8 ATTANASIO 2003, 110, fig. 5.3.

9 PENSABENE 2015, 613, fig. 6.

10 PROFUMO 2005.



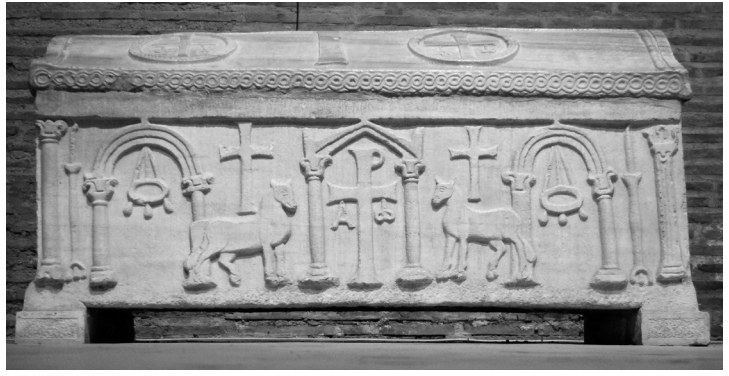


Fig. 6. Sarcophagus of Archbishop Felix (†725), marble from Alikí, Thasos, ca. 3<sup>rd</sup> century, reused 8<sup>th</sup> century. S. Apollinare in Classe. USF 19899.



Fig. 7. Crucifer Lamb Sarcophagus, marble probably from the acropolis quarry, Thasos, possibly quarried in the 5<sup>th</sup> century and decorated in the 7<sup>th</sup> century. S. Apollinare in Classe. USF 19900



Fig. 8. Christian Sarcophagus, excavated in Milan, marble from Alikí, Thasos, early fourth century. Castello Sforzesco, Milan. USF 8455

## Methodology and analysis

The samples were analyzed at the University of South Florida (USF). The ratios of stable isotopes of carbon and oxygen were measured, and three of the five samples were large enough to permit measurement of the maximum grain size (MGS). A portable X-ray fluorescence spectrometer (pXRF) was used to measure levels of the trace elements manganese (Mn) and strontium (Sr). Differences in Mn can also be determined with cathodoluminescence (CL) and, above all, with paramagnetic resonance spectrography (EPR), for which there are extensive quantitative results.<sup>11</sup> With CL and EPR, the intensity of the response corresponds to the level of Mn<sup>++</sup>. In pXRF the Mn response reflects the differences in both Mn<sup>++</sup> in the crystal lattice and Mn in trace elements. The Mn levels of Thasian calcitic marble tend to be high, and those of Proconnesian are low.<sup>12</sup>

## Results of testing

The isotopic ratios of four of the five samples found their only match in the calcitic marble quarries at Aliko, Thasos (USF19898-9, 19901, 8455) (Table 1, Fig. 9). Three of these four samples could also be studied with pXRF, and all had relatively high levels of Mn, confirming their origin from Aliko, Thasos (USF 19898-9, 19901). Proconnesian marble, on the contrary, tends to have low levels of Mn.<sup>13</sup>

One sample (USF 19900) had isotopic ratios that fell in another part of the field for Aliko and in the fields of many quarries of Asia Minor and Greece (Fig. 9).<sup>14</sup> Most of the non-Thasian quarries can be eliminated for historical reasons; the quarries of Paros probably did not produce fresh marble during Late Antiquity,<sup>15</sup> the fine-grained marble of Mt. Hymettus is unlike the marble used in Ravenna, and no gray-white marble from Asiatic sites other than Proconnesus is known in the North Adriatic. Proconnesus, however, is a good possibility isotopically, as are other quarries on Thasos: those on Cape Fanari and on the Acropolis. The very coarse grain of USF19900 (mgs = 4mm), however, tends to exclude Proconnesus (Table II). Since USF19900, on the other hand, has low Mn, it probably does not stem from Aliko or Cape Fanari,

marble from which characteristically has high levels of Mn<sup>++</sup> (that is, high intensity of EPR response) (Table II). The Acropolis Quarry on Thasos, however, often has very low intensity/low Mn comparable to the median value of Proconnesus 1 (Table 2). Since USF 19900 lacks the long, sharp dark veins typical of Proconnesian marble and has very large MGS, it is likely to be a product of this small Thasian quarry of calcitic marble.

In different ways, all three of the analyzed sarcophagi are typical of the North Adriatic basin and have been ascribed to Ravenna, where the imported chests and lids were decorated. Two have the familiar local scheme of three niches framed by a lintel and corner pilasters. The example in Milan dates from around 300 (USF8455, Fig. 8). The sarcophagus of Archbishop Felix (709-725) was given its three-niche scheme in the eighth century, but the chest was quarried much earlier; a fragment of an S-curve molding (*cyma*) along the right end survives from its first phase (USF19899, Fig. 6a). Moldings along the end are features of Ravennate sarcophagi of the second and third centuries.<sup>16</sup> The Crucifer Lamb Sarcophagus (USF19900) (Fig. 7), whose figures probably date from the eighth century, is also a recut older piece. Its unusual projecting molding above recalls a sarcophagus of the fifth century at Ravenna.<sup>17</sup> One of the capitals in Aquileia has plausibly been ascribed to the rebuilding of the cathedral between 388 and 408, and the other capital and the column shaft there could well date from that time as well (Figs. 1-2, USF19901). The slabs in the S. Vitale pavement are reused in the Medieval pavement, but they probably stem from the original pavement of around 540 (Fig. 3). The ambo fragment (Fig. 5, USF19898) belongs to the late sixth or early seventh century.

The untested sarcophagus-front with three niches found in Ancona also appears to be Thasian calcite; the "sarcophagus of the wine merchant" (il Sarcofago del vinaio) in the Museo Archeologico of Ancona has the coarse grain, grayish color, and short, soft dark-gray streaks typical of Aliko or Fanari (Fig. 10). The sarcophagus has been dated to the mid-third century and has also been attributed to a workshop of Ravenna.<sup>18</sup> On the basis of this group of tests, it seems likely that the third century was the main period of importation of quarry-rough Thasian sarcophagi to the north Aegean.

11 ATTANASIO *et al.* in this volume.

12 VAN KEUREN *et al.* 2012, 349-351, table 1, lines 7-9.

13 ATTANASIO 2003, database diskette; ATTANASIO *et al.* 2006, 139, figs. 2.11a.

14 ATTANASIO *et al.* 2006, 140, table 2.11a; MANIATIS *et al.* 2009, 268, fig. 5; MANIATIS *et al.* 2010, 53, fig. 7.

15 HERRMANN *et al.* 2009, 732.

16 GABELMANN 1973.

17 VALENTI ZUCCHINI, BUCCI 1968, cat. no. 25 (2<sup>nd</sup> half 5<sup>th</sup> century); KOLLWITZ, HERDEJURGEN 1979, cat. no. B 11, pl. 60-63 (late 5<sup>th</sup> century).

18 PROFUMO 2005. The stone is called limestone.

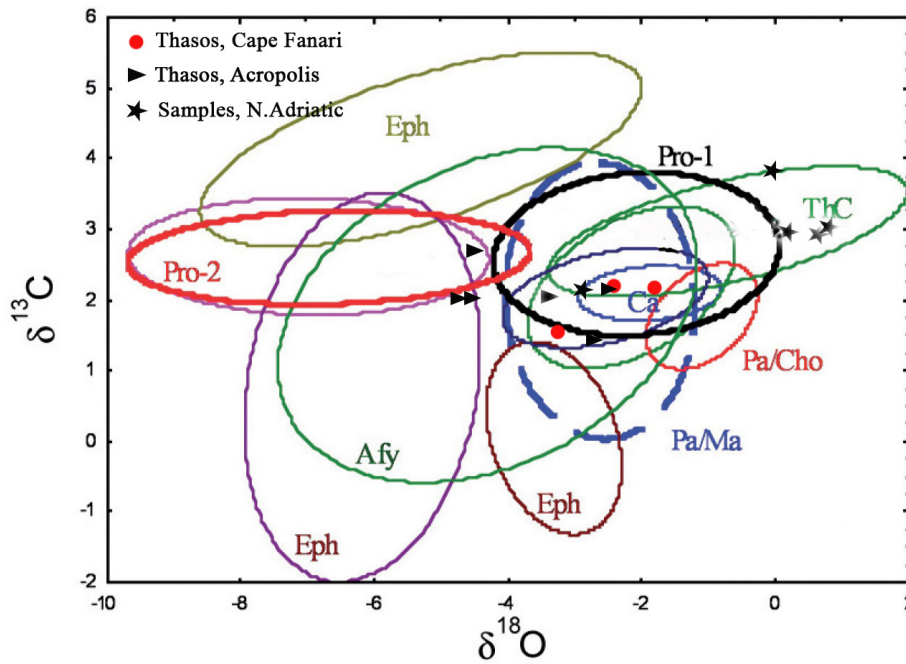


Fig. 9. Isotopic ratios of North Adriatic samples (diagram from VAN KEUREN *et al.* 2012) Table 1. Afy = Afyon; Ca = Carrara; Eph = Ephesus; Pa/Cho = Paros, Marathi; Pro = Proconnesus; ThC = Thasos, calcitic quarries (Alik)

USF #	Site	description	Mn	Sr	δ13C	δ18O	MGS	Quarry: preferred <u>underlined</u>
19898	Ravenna, Museo Nazionale, inv.620	Slab from ambo inscribed SCO...NI <sup>19</sup>	High	low	3.2	0.6	3-4 mm	<u>Th-Al</u> , Proc
19899	S. Apollinare in Classe (Ravenna)	Sarcophagus of Archbishop Felix <sup>20</sup>	High	low	3.3	0.0	3-4 mm	<u>Th-Al</u> , Proc
19900	S. Apollinare in Classe (Ravenna)	Crucifer Lamb Sarcophagus <sup>21</sup>	Low	low	2.4	-2.9	4 mm	Af; Aphro; Hym; Paros; Proc; Th-F; <u>Th-Acr</u>
19901	Aquileia, Museo Archeologico	Tall column shaft in front of old facade <sup>22</sup>	High	low	3.4	0.7	-	<u>Th-Al</u> , Proc
8455	Milan, Castello Sforzesco, inv. 203	Tetrarchic sarcophagus <sup>23</sup>	--	--	3.9	0.1	-	<u>Th-Al</u> , Proc

Af = Afyon; Aphro = Aphrodisias; Hym = Hymettos; Paros = Paros, Marathi, Lychnites; Proc = Proconnesus; Th-Al = Thasos, Alik; Th-Ph = Thasos, Phanari; Th-Acr = Thasos, Acropolis

Table 1. Analysis of Thasian-looking objects in Ravenna, Aquileia, and Milan

- 19 ANGIOLINI MARTINELLI 1968, cat. no. 20 (2<sup>nd</sup> half 6<sup>th</sup> century); DEICHMANN 1969, 73, 280, fig. 101. Compare ambo of Marinianus (595-606): DEICHMANN 1969, 73, fig. 98, 102-102.
- 20 Felix died in 724: LAWRENCE 1945, 3, 40-41, 48-49, fig. 73; VALENTI ZUCCHINI, BUCCI 1968, cat. no. 58; DEICHMANN 1969, 86, fig. 175; KOLLWITZ, HERDEJURGEN 1979, 169-170, pl. 85.2, 86.3, 89.8.
- 21 LAWRENCE 1945, 37, 39, 41, 44, fig. 69 (7<sup>th</sup> century); VALENTI ZUCCHINI, BUCCI 1968, cat. no. 59 (8<sup>th</sup> century); DEICHMANN 1969, 86; KOLLWITZ, HERDEJURGEN 1979, 170-171, pl. 85.4 (early 8<sup>th</sup> century).
- 22 PENSABENE 2015, fig. 5.
- 23 GABELMANN 1973, 98, 102, 110, 116-117, 119, 158-162, 168, 175, 190, 218, cat. 74, pl. 40; REBECCHI 1978, 269, fig. 14.

Figure-decorated sarcophagi of dolomitic (rather than calcitic) marble from Thasos, notable for its whiteness, are well known from Rome. Shipwrecked cargoes of unfinished sarcophagi of both white dolomitic and grayish calcitic marble from Thasos have been recovered off the southern coast of Italy,<sup>24</sup> but Thasian calcitic sarcophagi were previously unknown from *terra firma*. As shown elsewhere in this volume, it is now also possible to document the presence of sarcophagi of Thasian calcitic marble on the western shores of Italy, in Ostia and Siracusa.<sup>25</sup> The third century may have been the main period for importation of Thasian calcitic sarcophagi to

24 CALIA *et al.* 2009; GABELLONE *et al.* 2009.

25 HERRMANN *et al.* in this volume.



Fig. 10. Sarcophagus of the Wine Dealer, probably marble from Aliko, excavated in Ancona, mid-third century

sample	Quarry	D13 C	D18O	Intens (Mn++)	MGS
Th_AT1	Acropolis	2.66	-4.52	0.053	3.5
Th_AT2	Acropolis	2.08	-4.56	1.057	3.4
Th_AC1	Acropolis	1.89	-2.96	0.072	3.8
Th_AC2	Acropolis	2.07	-4.74	0.274	3.3
Th_AC3	Acropolis	2.25	-2.46	0.110	3.7
Th_AC4	Acropolis	2.10	-3.20	0.612	4.0
Th_P1	Cape Fanari	1.50	-3.30	0.244	6.0
Th_P2	Cape Fanari	2.31	-2.36	0.508	6.5
Th_P3	Cape Fanari	2.26	-1.91	0.428	7.5
Several hundred	Proconnesus 1	2.65	-2.07	0.06	1.71

Table 2.  
Quarry data for  
Acropolis and  
Cape Fanari,  
Thasos (Attanasio  
2006, Table 2.11a);  
compared with  
averages for  
Proconnesus 1  
(VAN KEUREN  
*et al.* 2012 Table 1)

the northern Adriatic and to Ostia, but importation continued or was resumed at the end of the sixth century, as demonstrated by the sarcophagus of around 600 in Siracusa. The ambo of Aliko marble in Ravenna was both quarried and sculpted around 600 and forms a chronological parallel to the late sarcophagus in Siracusa.

## Conclusions

Macroscopic examination of marble objects at several sites in the North Adriatic made it possible to distinguish the calcitic marble of Thasos from that of Proconnesus with considerable success; five Thasian-looking sculptures at Aquileia, Ravenna, and Milan could be sampled, and isotopic analysis, measurements of MGS, and analysis with pXRF confirmed that at least four of the five pieces were certainly from the Aliko quarries on

Thasos. The fifth piece seems to be marble from Acropolis quarry on Thasos (Fig. 7).

On the basis of these analyses, it appears that calcitic marble from Thasos made sporadic appearances in the Central and North Adriatic region from the third through the sixth century. The marble appears to have arrived in the region roughly shaped and been finished locally. Columns and Thasian-type Ionic capitals were imported to Aquileia (as they were to Rome) from Thasos in the late fourth century. Pavement slabs seem to have been imported in the time of Justinian. An ambo was imported in post-Justinianic times. For the first time, sarcophagi of Thasian marble can be identified in the Adriatic region; three of the five artifacts sampled were sarcophagi, and two of them came to Italy in the third or early fourth centuries.

The apparent rarity of Thasian marble artifacts found so far in the North Adriatic indicates that Thasos

was a very junior partner to Proconnesus in supplying grayish, coarse-grained calcitic marble to the region. In this respect, the situation is similar to what is seen in the Early Byzantine Eastern Mediterranean, where Thasian marble had a marginal presence in the architectural market alongside Proconnesian.<sup>26</sup> In fourth- and early-fifth century Rome, on the other hand, Thasian calcite was a fairly consistent presence.<sup>27</sup> Future larger-scale studies at Ravenna and elsewhere in the North Aegean are needed to provide a fuller picture of the Thasian share of the market there, but this pilot project demonstrates that, at least, it did have a presence.

#### ACKNOWLEDGMENTS

We are grateful for the cooperation of Arch. Antonella Ranaldi and the Soprintendenza per i Beni Architettonici e Paesaggistici per le province di Ravenna, Ferrara, Forlì-Cesena, Rimini; Dr. Angelo Maria Ardivino, Ministero per i Beni Culturali e Ambientali, Soprintendenza Archeologica, Milano.

#### BIBLIOGRAPHY

- AL-NADDAF M., AL-BASHAIREH K., AL-WAKED F. 2010: "Characterization and provenance of marble chancel screens, northern Jordan", *Mediterranean Archaeology and Archaeometry* 10.2, 75-83.
- ANGIOLINI MARTINELLI P. 1968: *Corpus della scultura paleocristiana bizantina ed altomedioevale di Ravenna*, 1: Altari, amboni, cibori, cornici, plutei con figure di animali e con intrecci, transenne e frammenti vari, Roma.
- ATTANASIO D. 2003: *Ancient White Marbles: Analysis and Identification by Paramagnetic Resonance Spectroscopy*, Rome.
- ATTANASIO D., BRILLI M., OGLE N. 2006: *The Isotopic Signature of Classical Marbles*, Rome.
- ATTANASIO D., BRILLI M., ROCCHI P. 2008: "The marbles of two early Christian churches at Latrun (Cyrenaica, Libya)", *Journal of Archaeological Science* 35, 1040-1048.
- ATTANASIO D., HERRMANN J., TYKOT R., VAN DEN HOEK A. in this volume: "Roman and Early Byzantine sarcophagi of calcitic marble from Thasos in Italy", in *ASMOSIA XI*.
- CALIA A., GIANNOTTA M. T., LAZZARINI L., QUARTA G. 2009: "The Torre Sgarrata Wreck (South-Italy): Characterization and provenance of marbles", in *ASMOSIA VII*, 319-331.
- CUSCITO G. 2008: "Il gruppo episcopale di Aquileia", in PIUSSI S. (ed.): *Cromazio di Aquileia 388-409*, Milano, 380-385.
- DEICHMANN F. W. 1969: *Ravenna, Hauptstadt des spätantiken Abendlandes, I: Geschichte und Monumente*, Wiesbaden.
- DRESKEN-WEILAND J. 1998: „Überlegungen zur weströmischen Plastik des späten 5. und 6. Jh.“, in N. CAMBI, E. MARIN (eds.): *Acta XIII Congressus Internationalis Archaeologiae Christianae*, Split-Poreč, 283-301.
- GABELLONE F., GIANNOTTA M. T., ALESSIO A. 2009: "The Torre Sgarrata Wreck (South-Italy): Marble Artefacts in the Cargo", in *ASMOSIA VII*, 319-331.
- GABELMANN H. 1973: *Die Werkstattgruppen der oberitalischen Sarkophage*, Bonn.
- HERRMANN J., SODINI J.-P. 1977: "Exportations de marbre thasien à l'époque paléochrétienne : le cas des chapiteaux ioniques", *Bulletin de correspondance hellénique* 101, 471-511.
- HERRMANN J. 1988: *The Ionic Capital in Late Antique Rome*, Rome.
- HERRMANN J., TYKOT R., VAN DEN HOEK A. 2009: "Parian marble in Early Christian times", in *ASMOSIA VIII*, 723-737.

26 ATTANASIO, *et al.* 2008, 10048; AL-NADDAF *et al.* 2010, 81.

27 HERRMANN 1988, 79-92, 179-181.

- KOCH G. 1982: *Römische Sarkophage*, Munich.
- KOLLWITZ J., HERDEJURGEN H. 1979: *Die Sarkophage der westlichen Gebiete des Imperium Romanum*, 2: *Die ravennatischen Sarkophage*, Berlin.
- LAWRENCE M. 1945: *The Sarcophagi of Ravenna*, New York.
- LAZZARINI L. 2015: "Il reimpiego del marmo proconnesio a Venezia", in M. CENTANNI, L. SPERTI (eds.), *Pietre di Venezia: Spolia in se spolia in re*, Roma, 134-157.
- MANIATIS Y., TAMBAKOPOULOS D., DOTSIKA E., WESCOAT B., MATSAS D. 2012: "The Sanctuary of the Great Gods on Samothrace, Greece: An extended marble provenance study", in *ASMOSIA IX*, 263-278.
- MANIATIS Y., TAMBAKOPOULOS D., DOTSIKA E., STEFANIDOU-TIVERIOU T. 2010: "Marble provenance investigation of Roman sarcophagi from Thessaloniki", *Archaeometry* 52.1, 45-58.
- MARANO Y. 2008A: *Il commercio del marmo nell'Adriatico tardoantico (IV – VI secolo d.C.). Scambi, maestranze, committenze*, thesis, Università di Padova.
- MARANO Y. 2008B: "Il commercio del marmo nell'Adriatico tardoantico (IV – VI secolo d.C.)", in S. COLLODO, G. L. FONTANA (eds.): *Eredità culturali dell'Adriatico. Archeologia, storia, lingua e letteratura*, Roma, 159-174.
- PENSABENE P. 2015: "Blocks and quarry marks in the Museum of Aquileia", in *ASMOSIA X*, 611-614.
- PROFUMO M. C. 2005: "Fronte di sarcofago detta 'sarcofago del vinaio'", in G. DE MARINIS (ed.): *Arte romana nei musei delle Marche*, Ancona, 266, cat. no. 143.
- REBECCHI F. 1978. "Cronologia e fasi di fabbricazione dei sarcophagi pagani dell'officina di Ravenna," *Studi romagnoli* 29, 247-275.
- SODINI J-P., BARSANTI C., GUIGLIA GUIDOBALDI A. 1998: "La sculpture architecturale en marbre au VI<sup>e</sup> siècle à Constantinople et dans les régions sous influence constantinopolitaine", in N. CAMBI, E. MARIN (eds.): *Acta XIII Congressus Internationalis Archaeologiae Christianae*, Split-Poreč, 301-376.
- VALENTI ZUCCHINI G., BUCCI M. 1968: *Corpus della scultura paleocristiana bizantina ed altomedioevale di Ravenna*, 2: *I sarcophagi a figure e a carattere simbolico*, Roma.
- VAN KEUREN F., ATTANASIO D., HERRMANN J., HIPOL S., COX J., GROMET L. P., ABRAMITIS D. 2012: "Three Fragments of a Marsyas Sarcophagus: Multimethod Marble Analyses", in *ASMOSIA IX*, 344-354.