

Characterisation of White Marble Objects from the Temple of Apollo and the House of Augustus (Palatine Hill, Rome)

Giustini, Francesca; Brilli, Mauro; Gallochio, Enrico; Pensabene, Patrizio

Source / Izvornik: **ASMOSIA XI, Interdisciplinary Studies on Ancient Stone, Proceedings of the XI International Conference of ASMOSIA, 2018, 247 - 253**

Conference paper / Rad u zborniku

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

<https://doi.org/10.31534/XI.asmosia.2015/02.08>

Permanent link / Trajna poveznica: <https://urn.nsk.hr/urn:nbn:hr:123:181285>

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

Download date / Datum preuzimanja: **2024-05-19**



Repository / Repozitorij:

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



UNIVERSITY OF SPLIT


DIGITALNI AKADEMSKI ARHIVI I REPOZITORIJI



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

| | |
|---|-----|
| PRESENTATION | 15 |
| NECROLOGY: NORMAN HERZ (1923-2013) by Susan Kane | 17 |
| 1. APPLICATIONS TO SPECIFIC ARCHEOLOGICAL QUESTIONS – USE OF MARBLE | |
| 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 th C.) and the Basilica of San Lorenzo (5 th 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 nd C. Bc – Late 1 st C. Ad) <i>Stefan Ardeleanu</i> | 155 |
| <i>Amethystus</i> : Ancient Properties and Iconographic Selection <i>Luigi Pedroni</i> | 167 |
| 2. PROVENANCE IDENTIFICATION I: (MARBLE) | |
| 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 th And 17 th 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 Ruppinić 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 Brilli 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>Marmora</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 |
| 3. PROVENANCE IDENTIFICATION II: (OTHER STONES) | |
| 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. Peréz 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 |
| 4. ADVANCES IN PROVENANCE TECHNIQUES, METHODOLOGIES AND DATABASES | |
| Grainautline – a Supervised Grain Boundary Extraction Tool Supported by Image Processing and Pattern Recognition <i>Kristóf Csorba, Lilla Barancsik, 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 Prevato and Arturo Zara</i> | 597 |
| 5. QUARRIES AND GEOLOGY | |
| 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 Denktaş</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 |
| 6. STONE PROPERTIES, WEATHERING EFFECTS AND RESTORATION, AS RELATED TO DIAGNOSIS PROBLEMS, MATCHING OF STONE FRAGMENTS AND AUTHENTICITY | |
| Methods of Consolidation and Protection of Pentelic Marble <i>Maria Apostolopoulou, Elissavet Drakopoulou, Maria Karoglou and Asterios Bakolas</i> | 749 |
| 7. PIGMENTS AND PAINTINGS ON MARBLE | |
| 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 |
| 8. SPECIAL THEME SESSION: „THE USE OF MARBLE AND LIMESTONE IN THE ADRIATIC BASIN IN ANTIQUITY” | |
| 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 |
| INDEX OF AUTHORS | 1009 |

CHARACTERISATION OF WHITE MARBLE OBJECTS FROM THE TEMPLE OF APOLLO AND THE HOUSE OF AUGUSTUS (PALATINE HILL, ROME)

Francesca Giustini¹, Mauro Brilli¹, Enrico Gallochio² and Patrizio Pensabene²

¹ Istituto di Geologia Ambientale e Geoingegneria, CNR, Area della Ricerca Roma1, Rome, Italy (francesca.giustini@igag.cnr.it; mauro.brilli@igag.cnr.it)

² Dipartimento di Scienze Archeologiche, Università La Sapienza, Roma, Italy (enricogallochio@gmail.com; patrizio.pensabene@uniroma1.it)

Abstract

The provenance of the marbles of eleven artefacts collected in the temple of Apollo and the house of Augustus at the Palatine Hill archaeological excavations in Rome has been determined using a multi-method approach that includes petrography and isotopes of carbon and oxygen. Two samples are from fragments of statues, one of which is likely the Apollo statuary representation; the other samples are from architectural elements (columns, capitals, plates and cornices). The marbles of the Augustan complex represent the first example of a change in the taste for building materials of monumental architecture at the Palatine Hill in the Augustan age; their introduction started the “marmorisation” process in the area. In this transition, it is especially important to determine if the marble artefacts that were subjects of a religious cult were originals from Greece or copies that were carved during the building of the Augustan complex. In order to discriminate between these two possibilities, it is necessary to identify the geographic location at which the marbles considered were quarried.

In our selection of samples, isotopic and petrographic results indicate that most of the architectural elements are quite unambiguously made of marble of Italic provenance (i.e. Carrara marble), while the fragments of statues, which have a relation to a religious cult, seem to have Greek origin.

Keywords

white marble, provenance, Palatine Hill

and the renovation of the whole area at the time of the construction of the Temple of Apollo (36–28 BC)¹.

Augustus, in his 50 years of uninterrupted government, carried out a policy of *nova magnificentia*, which consisted of the construction of new buildings in marble or the use of marble as a decoration applied to a Roman concrete construction (the “marmorisation” process of the main monuments of Rome). The new buildings’ exterior let Augustus say before his death, “I found Rome brick, and left it marble” (“Urbem ... sit gloriatus marmoream se relinquere, quam latericiam accepisset”; Svetonio, Libro 2 (Divus Augustus) Paragrafo 28). However, in addition to the use of marbles for the public buildings (*publica magnificentia*), Augustus directed his aspirations to *privata luxuria*, expressed not least by the use of marbles.

During the archaeological excavations between 1957 and 1974 on the complex of Augustus at the Palatine Hill, several items, most of them in white marble, were unearthed. Many objects are architectural elements such as columns, capitals, plates and cornices in different states of preservation. A certain number are fragments of statues, and one of them may be the representation of *Apollo Palatinus*.

The Carrara provenance of the marbles of the Augustan complex was previously determined by several authors² on the basis of ancient classical texts; Servius (ad Aen. 8.720: “de solido marmore effecto, quod adlatum fuerat de portu Lunae”) informs us that the temple was built in Carrara marble. An archaeometric characterisation of the main monuments of the Augustan period, including a few samples from the house of Augustus and the temple of Apollo, has actually documented the extensive use of Carrara marble³.

Introduction

The complex of Augustus on the Palatine Hill has been the subject of many recent studies that have aimed at reconstructing the changes of the first house of Augustus, also known as the house of Octavian (41–36 BC),

1 HEKSTER, RICH 2006; ZINK 2008; 2012; ZINK, PIENING 2009; PENSABENE, GALLOCHIO 2011, 2013.

2 LUGLI 1952; BAUER 1969; CARETTONI 1966–1967; GROS 1993.

3 BRUNO *et al.* 2002.

Other historical sources inform us of the origin of the great statue of *Apollo Palatinus*, probably placed inside the *cella* of the temple, which was probably brought to Rome by Octavian after the victory of Actium (31 BC); the sculpture was attributed to Scopas “the Parian” and, therefore, must have been carved in a Greek marble. No archaeometric data of this marble existed previously in the relevant literature.

The present study aims to characterise a selection of white marble artefacts collected in the temple of Apollo and the house of Augustus at the Palatine Hill archaeological excavations. The identification of the marble provenance was carried out using a multi-method approach that includes petrography and carbon and oxygen stable isotope analysis, which is considered an effective way for determining the origin of ancient marbles, as the relevant archaeometric literature has largely demonstrated. The results shed light on the use of marble during the beginning of the “marmorisation” process in Rome.

The complex of Augustus on the Palatine Hill: historical setting

Recently, the Augustus Complex in the Palatine Hill has been the subject of much research aimed at distinguishing the stages of development of the first house of Augustus, the so-called house of Octavian (41–36 BC), and the restructuring of the area as a whole at the time of construction of the temple of Apollo (36–28 BC). The archaeological study of this area during the great excavations of Carettoni (about 1957–1974) revealed four groups of white marble items, whose sampling was designed to show the use of the marble in private/public contexts, such as the house of Octavian, and public ones, such as the Temple of Apollo and the Portico of the Danaids.

The first group of remains found in excavations consists of small architectural elements, belonging to a mixed Corinthian-Doric architectural order, which we have attributed to the facade of the house of Augustus in its first realisation. The facade of the Octavian house was organised around three main doors and two minor doors in the typical patterns of the late-Hellenistic theatre scenes. It was possible to reconstruct an architectural prospect articulated in indentations, in correspondence with the doors, and in ledges, in correspondence with the pilasters and columns to the sides of the doors. It has two floors; the first, with Doric cornices and Ionic elements, and the second, with only Ionic cornices. The walls had to be covered with slabs on which was engraved an isodomic structure. The excavations brought to light small entablature elements that likely belong to this feature. Of these, we have sampled an element of an Ionic frame (CA_4 and CA_5), a ceiling plate with a rhombus-shaped decoration (CA_3), a cladding slab

with an engraved isodomic structure (CA_7) and a covering plate with a lintel (CA_9).

The second group consists of hundreds of fragments of statues; this collection includes two fragments of heads (one of which is 44 cm high, and retains the left eye and part of the hair), a foot and many fragments of drapery (one of which belongs to a left shoulder). We know from the literature (Prop. 2.31.15–16) that in the temple of Apollo there were three cult statues clothed in a long chiton: the statue of Apollo (work by Scopas – Plin., Nat. Hist., 36.25, perhaps coming from the sanctuary of Apollo Rhamnus in Attica), the statue of Diana with the torch (by Thimoteos) and their mother Leto (by Kephisodotos). These were gigantic sculptures, around 4.80 m high, which were brought to Rome as spoils of war. There were other statues in the temple; one of Sybilla squatting in front of Latona, another of Apollo behind the altar and probably many more, including sculptures from the fronton (according to Pliny, Nat. Hist., 36.13, Parian marble works of the archaic sculptors Bupalos and Athenis from Chios) and acroterium (including the *quadriga del Sol*), probably made of different materials, marble or gilded bronze. The temple was gigantic – pseudo-peripteral with six columns on the front 14 m high, built on a high podium. The ancient sources inform us that that Luni marble was used for such a temple. This can provide evidence that the extraction of gigantic blocks in the quarries for the construction of temples occurred from the first Augustan period. So we are able to contend that the management of the quarries of Luni was under the control of the state in the early Augustan age. The largest fragment of the head and the fragment of the foot, which may belong to the statue of Apollo, are exhibited in the Museo Palatino⁴. Their marble has been identified in the history of the studies as Parian and Pentelic, respectively. Hundreds more fragments of statues lie piled in a warehouse under the projecting foot of the temple.

Large fragments of the third group (17 at least) come from the filling of the subterranean compartments of the temple of Apollo and from neighbouring areas. They belong to the higher part of the architecture: fragments of bases, capitals, grooved drums, a large cornice with shelves, a lintel and the portal frame; they were attributed to the temple⁵. We sampled an element of an angular column from this group (CA_1).

The fourth group is related to a few large fragments of fluted columns in Giallo Antico and fragments of Ionic capitals that we can attribute to the Portico of the Danaids. Furthermore, a fragment of large cornice, which probably comes from the Aedes Caesarum on the west side of the temple of Apollo, may be considered part of this group. A

4 TOMEI 1997, 47, Nos. 26, 27.

5 CARETTONI in TOMEI 2014, 305–306.

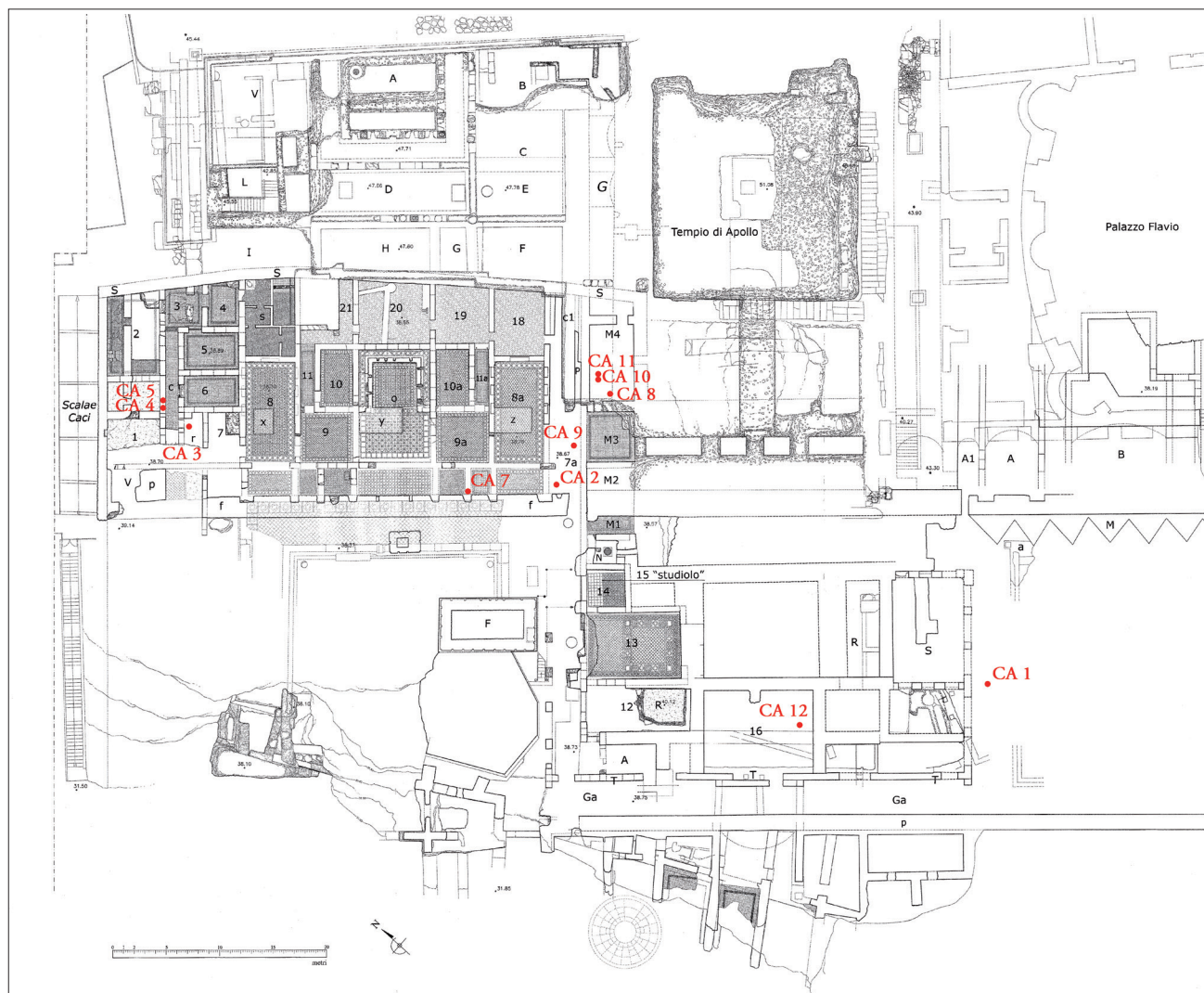


Fig. 1. Detail of the planimetry of the Palatine complex and location of samples (modified from TOMEI 2014)

large colonnaded square adjoined the temple, on whose eastern flank faced the Greek and Latin libraries. In the square, we recognised the porticus Danaidum known by sources and reproduced in the Sorrento Base, from which we know that it was equipped with Ionic colonnades. We attributed to the portico one fragment of fluted shaft in Giallo Antico and two fragments of ancient Ionic capitals, which we found in the warehouses (CA_10, CA_11).

Materials and methods

A total of 11 white marble objects representing the four groups mentioned were sampled (Figs. 1 and 2). A multi-method approach based on petrography and isotopes was applied to characterise these samples. Petrography, carbon and oxygen isotopes are the most frequently used and useful techniques for discriminating the provenance of white marble. A diffractometer Bruker model Advance D8 operating in Bragg-Brentano

geometry and equipped with a solid-state detector Sol-X was used to determine the mineralogical composition of the samples. Marble samples were thin sectioned to study the texture and the crystal boundary shape and to determine the maximum grain size under a polarising microscope (Nikon Mod. Eclipse LV 100 POL). Carbon ($\delta^{13}\text{C}$) and oxygen ($\delta^{18}\text{O}$) isotope ratios of marble were obtained from ~0.2 mg powder samples using the modified phosphoric acid method⁶. A Finnigan Kiel II Carbonate Device interfaced with a Finnigan MAT 252 mass spectrometer was used for the analysis. Isotope analyses on calcite are reported in the usual delta (δ) notation, which represents the relative deviation in part per mil (‰) with respect to an international standard (VPDB for both the carbon and oxygen isotopes). The analytical error is $\pm 0.1\%$.

6 MCCREA 1950.



Fig. 2.
Pictures of the archaeological objects examined in this study: CA_1 Column of the eastern peristyle; CA_2 Fragment of statue; CA_3 Ceiling slab; CA_4 Frieze; CA_5 Frieze; CA_7 Imitation of *opus sectile*; CA_8 Moulding; CA_9 Erratic; CA_10 Capital; CA_11 Capital; CA_12 Fragment of statue (of Apollo)

Results and discussion

Table 1 summarises the experimental results by listing, for each sample, the macroscopic description, mineralogical-petrographical features, and oxygen and carbon isotope data of marble archaeological samples. Petrographic and mineralogical characterisation is displayed according to the commonly used indicators that facilitate provenance discrimination among white marbles. A selection of microphotographs in crossed polarised light is also shown in Fig. 3. All samples are pure calcitic white marbles with the presence, revealed in just a few samples, of traces of quartz as the main accessory mineral. The petrographic observation on the thin sections reveals that the artefacts are fine-grained marbles (MGS generally lower than or around 1 mm) with both a heteroblastic and homeoblastic grain-size distribution. The boundaries between grains are curved to straight or embayed, and four samples show some triple junctions. The marble presents a mosaic fabric, lineated or weakly lineated in the samples from the fragments of statues (CA_2 and CA_12). In these samples, some mica flakes were observed with the naked eye, but they were not observed in the thin sections. The stable

isotope data are plotted in the diagram of Fig. 4, including the 90% probability ellipses of the most relevant quarries exploited in antiquity with fine grain size (<2mm)⁷. Carbon isotope compositions of the samples are relatively homogeneous, varying from +1.89 and +2.79‰ VPDB, whereas the oxygen isotopes display a wider range of values, from -4.77 to -1.13‰ VPDB. In particular, in the scatterplot diagram, the samples split into two different groups; one is located on the right part of the diagram, falling into the isotopic field of Carrara marble and consisting of the samples from the architectural elements. The second group consists of the samples from the fragments of statues; they show an oxygen isotope composition that is more negative than the other samples, falling into the isotopic fields of Docimian and Pentelic marbles.

It is evident that the architectural elements and the fragments of the statue have a different provenance; the former show the isotopic values and the petrographic features typical of Carrara marble; the archaeometric analyses, therefore, seem to confirm the previous attribution that

7 ATTANASIO, BRILLI, OGLE 2006.

| Sample | Description | color | Q | Cal | Dol | Texture | Fabric | Calcite crystal boundaries | MGS | $\delta^{13}\text{C}$ PDB | $\delta^{18}\text{O}$ PDB |
|--------|----------------------------------|-------|---------|------|-----|---------|-------------------|--|-----|---------------------------|---------------------------|
| CA_1 | Column of the eastern peristyle | white | \pm | only | | HO | polygonal mosaic | curved \pm straight | 0.8 | 2.29 | -2.15 |
| CA_2 | Fragment of statue | white | ++ + | only | | HE | lineated, mosaic | curved \pm embayed | 0.7 | 2.68 | -4.77 |
| CA_3 | Ceiling slab | white | | only | | HE | polygonal mosaic | curved \pm straight, triple junctions | 0.9 | 1.96 | -2.74 |
| CA_4 | Frieze | white | | only | | | | | | 2.09 | -1.47 |
| CA_5 | Frieze | white | | only | | | | | | 2.57 | -1.26 |
| CA_7 | Imitation of <i>opus sectile</i> | white | | only | | HO | polygonal mosaic | curved \pm straight, frequent triple junctions | 0.5 | 2.15 | -1.13 |
| CA_8 | Molding | white | | only | | HO | polygonal mosaic | curved \pm straight, triple junctions | 1.0 | 2.45 | -1.23 |
| CA_9 | Erratic | gray | | only | | HE | polygonal mosaic | polygonal with triple junctions, straight | 0.8 | 2.17 | -2.03 |
| CA_10 | Capital | white | | only | | HO | polygonal mosaic | curved \pm straight | 0.8 | 2.24 | -1.66 |
| CA_11 | Capital | white | + | only | | HO | polygonal mosaic | curved, sutured \pm embayed | 0.8 | 1.89 | -1.88 |
| CA_12 | Fragment of statue (of Apollo) | white | + | only | | HE | mosaic/w-lineated | curved \pm straight \pm embayed | 1.0 | 2.79 | -4.70 |

Table 1. Macroscopic description, mineralogical-petrographical features, and oxygen and carbon isotope data of marble archaeological samples.

Key: Q = quartz, Cal = calcite and Dol = dolomite (detected by XRD), HE = texture heteroblastic, HO = texture homeoblastic, W = weakly, MGS = maximum grain size (mm)

was based on historical considerations. The latter marbles, the fragments of statues (samples CA_2 and CA_12), are ambiguously identified as Pentelic and Docimian marbles; the overlap between the isotopic signature of such marbles can be partially solved taking into account petrographic data and historical-archaeological context; Docimian marble is fine-grained, as is Pentelic, but its fabric is completely different; the crystal boundaries are often sutured and include strained, often kinked, crystals indicating unstable conditions reached after quite brief metamorphic events⁸. However, the lineated or weakly-lineated fabric and the mica flakes observed in our samples are typical features of Pentelic marble and point to such an origin.

Conclusion

The elements of the entablature in white marble of the facade of the house of Octavian, petrographically and isotopically characterised in the present paper, and the columns in coloured marble placed in the peristyle of the house, offer one of the most ancient archaeological testimonies of marble use in residential construction, which is, so far, only documented for the 1st century BC by the relevant literature.

This study on the provenance of samples of white marble artefacts collected from the complex of Augustus on the Palatine Hill revealed that all of the marbles used for architectural elements (columns, capitals, plates and cornices) have the Carrara quarry district as the provenance of high probability, while the fragments of statues probably have a Greek origin.

The use of Carrara marble was introduced by Caesar's prefect Mamurra around the middle of the first century BC, but only under Augustus did it rapidly become a common building stone, especially for public edifices. This marble was also employed in private monuments; in Rome the oldest known artefacts made of Carrara marble are the Gaio Cestio pyramid (12 BC)⁹ and the *Ara Pacis*¹⁰, a monument erected in 9 BC by order of Augustus. The results of the present study seem to show that the use of Carrara marble in residential construction started just in the house of Augustus, so far documented primarily for the end of the 1st century BC. Afterwards, Carrara became one of the main marbles employed by the Roman aristocracy for sculpture and building purposes, following the example of the emperor. The extensive use of Carrara marble in the first house of Augustus

9 STEINBY 1999; GORGONI *et al.* 2002b.

10 AMADORI *et al.* 1988.

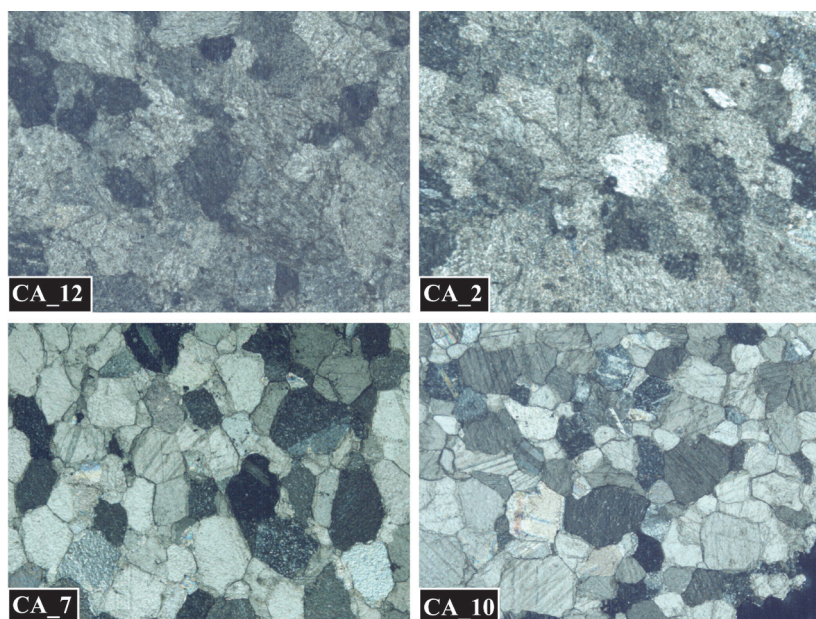


Fig. 3.
Microphotographs in crossed
polarized light of thin sections of
selected samples

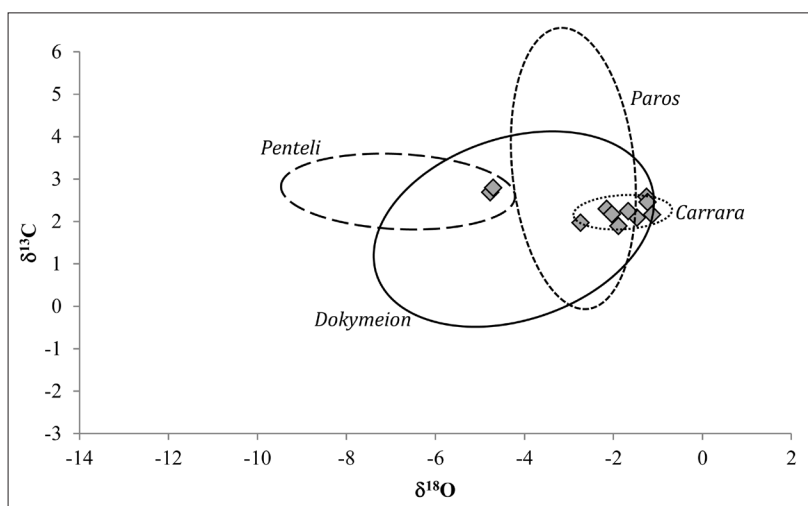


Fig. 4.
Scatterplot of the carbon and oxygen
isotopic compositions (vs. VPDB
standard) of the samples from the
house of Octavian and Temple of
Apollo, including the 90% probability
ellipses of the most important quarries
of the fine-grained marble varieties
(ATTANASIO, BRILLI, OGLE 2006)

also confirms the hypothesis of direct imperial management of the quarries¹¹, which had probably been set up since the beginning of the Augustan period, on the basis of our findings.

The samples collected from the fragments of statues are probably composed of Pentelic marble.

During the Augustan period, both Pentelic and Docimian marbles seem to have been employed in Rome for propaganda purposes. As a consequence, the Greek origin for the fragments of statues may be more consistent with the archaeological information because, as previously mentioned, the statue of Apollo was perhaps considered a work by Scopas coming from the sanctuary of Apollo Rhamnus in Attica and brought to Rome as spoils of war.

11 PENSABENE 1998.

REFERENCES

- AMADORI M. L., LAZZARINI L., MARIOTTINI M., PECORARO M., PENSABENE P. 1998: "Determinazione della provenienza dei marmi usati per alcuni monumenti antichi di Roma", in: P. PENSABENE (ed.): *Marmi antichi II*, Studi miscelanei 31, 45-56. L'Erma Di Bretschneider, Roma.
- ATTANASIO D., BRILLI M., OGLE N. 2006: The isotopic signatures of classical marbles, *L'Erma di Bretschneider*, Roma.
- BAUER H. 1969: "Das Kapitell des Apollo Palatinus-Tempels", *RomMitt* 76, 183-204.
- BRUNO M., CANCELLIERE S., GORGONI C., LAZZARINI L., PALLANTE P., PENSABENE P. 2002: "Provenance and distribution of white marbles in temples and public buildings of Imperial Rome", in *ASMOSIA V*, 289-300.
- CARETTONI G. 1966-1967: "I problemi della zona augustea del Palatino alla luce dei recenti scavi", *Rend. Pont. Acc.* 39, 55-75.
- GORGONI C., LAZZARINI L., PALLANTE P., TURI B. 2002a: "An updated and detailed mineropetrographic and C-O stable isotopic reference database for the main Mediterranean marbles used in antiquity", in *ASMOSIA V*, 115-131.
- GORGONI C., FILETICI M. G., LAZZARINI L., PALLANTE P., PENSABENE P. 2002b: "Archaeometry of two important marble monuments of the Republican and Early Imperial periods in Rome: the Tempio Rotondo and the Pyramid of Cestius", in *ASMOSIA V*, 308-315.
- GROS P. 1993: *Apollo Palatinus*. *Lexicon Topographicum Urbis Romae* 1: 54-57.
- HEKSTER O., RICH J. 2006: Octavian and the Thunderbolt: The Temple of Apollo Palatinus and Roman Traditions of Temple Building. *The Classical Quarterly* (New Series), 56, 149-168.
- LUGLI G. 1952: "Il tempio di Apollo Aziaco e il Gruppo Augusteo sul Palatino", *Ann. Acc. San Luca* 1, 26-55.
- MCCREA J. M. 1950: "On the isotopic chemistry of carbonates and a paleotemperature scale", *Journal of Chemical Physics* 18, 849-857.
- PENSABENE P. 1998: "Il fenomeno del marmo nella Roma tardo-repubblicana e imperiale", in: P. PENSABENE (ed.): *Marmi antichi II*. Studi miscelanei 31, 333-390. L'Erma Di Bretschneider, Roma.
- PENSABENE P., GALLOCCHIO E. 2011: "Contributo alla discussione sul complesso augusteo palatino", *Archeologia Classica* LXII, 475-487.
- PENSABENE P., GALLOCCHIO E. 2013: "Alcuni interrogativi sul complesso augusteo palatino", *Archeologia Classica* LXIV, 557-582.
- STEINBY E. M. 1999: *Lexicon Topographicum Urbis Romae*. 4, Edizioni Quasar, Roma, 278.
- TOMEI M. A. 1997: *Museo Palatino*, Electra Mondadori, Milano, 160.
- TOMEI M. A. 2014: *Augusto sul Palatino*. Gli scavi di Gianfilippo Carettoni. Appunti inediti (1955-1984). Electra Mondadori, Milano.
- ZINK S. 2008: "Reconstructing the Palatine temple of Apollo: a case study in early Augustan temple design", *Journal of Roman Archaeology* 21, 47-63.
- ZINK S. 2012: "Old and new archaeological evidence for the plan of the Palatine temple of Apollo", *Journal of Roman Archaeology* 25, 387-402.
- ZINK S., PIENING H. 2009: "Haec aurea templa: the Palatine temple of Apollo and its polychromy", *Journal of Roman Archaeology* 22, 109-116.