

# Aurisina Limestone in the Roman Age: from Karst Quarries to the Cities of the Adriatic Basin

---

Previato, Caterina

Source / Izvornik: **ASMOSIA XI, Interdisciplinary Studies on Ancient Stone, Proceedings of the XI International Conference of ASMOSIA, 2018, 933 - 939**

Conference paper / Rad u zborniku

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

<https://doi.org/10.31534/XI.asmosia.2015/08.12>

Permanent link / Trajna poveznica: <https://um.nsk.hr/um:nbn:hr:123:205217>

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

Download date / Datum preuzimanja: **2024-07-24**



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 Bahadir 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

# AURISINA LIMESTONE IN THE ROMAN AGE: FROM KARST QUARRIES TO THE CITIES OF THE ADRIATIC BASIN

Caterina Previato

Dipartimento dei Beni Culturali: Archeologia, Storia dell'Arte del Cinema e della Musica,  
Università degli Studi di Padova, Padua, Italy (caterina.previato@unipd.it)

## Abstract

Aurisina limestone is a type of stone extracted in the Karst region, just a few kilometers away from Trieste (north-eastern Italy), which was much used in the Roman Age. The Aurisina quarries belonged to the territory of Aquileia and were exploited at least from the 2<sup>nd</sup> century BC. In ancient times they provided huge quantities of stone, that was used to realize buildings and infrastructure as well as artifacts (e.g. statues, inscriptions, weights, etc.), and was exported to the north of Italy, along the Adriatic coasts and their inland regions.

This paper aims at reconstructing the different steps of the production process of Aurisina limestone, analyzing different topics: the quarrying, transportation, diffusion and use of this stone in the Roman Age.

## Keywords

Aurisina, quarries, Roman Age

---

Aurisina limestone is a stone extracted in the north-eastern part of Italy, in the Karst region. This stone was much used in the Roman Age because of its aesthetic and physical qualities. The quarries, still active, are situated in Aurisina, a small town in the Karst, 20 km from Trieste (Italy). They are located not far from the coast (less than 1 km), but they are separated from it by a difference in altitude of about 150 m (Fig. 1).

In this area different kinds of pure, compact and homogeneous limestone, which are commonly known with their commercial names, such as “Aurisina Chiara”, “Aurisina Granitello”, “Roman Stone” and “Aurisina Fiorita”, crop out. They all have a gray or light gray ground color, but they differ in the dimension and orientation of the organic fraction<sup>1</sup> (Fig. 2). All these limestones have

excellent petrographic, chemical, mineralogical, physical and mechanical properties. They are compact, durable and wear-resistant, and they are suitable for use both indoors and outdoors, as well as for carving.

Recently the Aurisina extraction basin has been involved in a research project of the University of Padua focused on the quarrying, the circulation and the use of the stones extracted in the *Regio X (Venetia et Histria)* during the Roman Age. Within the project, particular attention was paid to the use of the stone in Aquileia, a city in the north-east of Italy that was a very important urban centre in the Roman Age. Aiming at identifying the lithotypes used in the buildings of Aquileia as well as their provenience, the extraction basins surrounding the city have been studied and surveyed, trying to identify the quarries exploited in ancient times<sup>2</sup>. Therefore, the research focused on the Aurisina quarries, which are just 30 km away from Aquileia and were in the Roman Age part of its territory.

The survey was interested in both active and inactive quarries, located by means of satellite images (Fig. 3). During the survey in each quarry, stone samples were taken to be compared with stone samples taken from Aquileia's structures. Moreover, all the data collected regarding quarries and stone samples were entered in a database specifically created for this research project, which is linked to a geographical information system (*Ancient Quarries Database*)<sup>3</sup>. As a result, at present we can dispose of a sort of catalogue of the extraction sites and stone sources of this area.

By means of the available data, we can assume that the exploitation of the Aurisina extraction district started in the Roman Age, as suggested by different clues. Indeed, in one of the active quarries, significantly called “Cava Romana”, two unfinished boundary stones were found (Fig. 4). In another quarry, called “Caharjia

---

1 See CARULLI, ONOFRI 1960; *I marmi del Carso triestino* 1985, 88-90. In the Aurisina basin there are also outcrops of a polygenic conglomerate, “Breccia di Slivia”, and two kinds of alabaster, “Stalattite Gialla” and “Stalattite Rossa”.

2 BONETTO, PREVIATO 2013; PREVIATO *et al.* 2014; PREVIATO 2015a, 411-457; PREVIATO, VENTURA [in press].

3 About the database, see the paper of C. Previato e A. Zara in these proceedings.



Fig. 1. Map showing the position of the Aurisina quarries (north-eastern Italy), which in the Roman Age were situated in territory belonging to the city of Aquileia

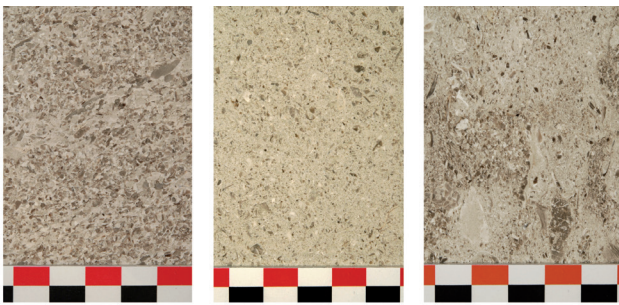


Fig. 2. Macroscopic aspect of different kinds of limestone extracted in the Aurisina quarries. From left to right: “Aurisina granitello”, “Aurisina roman stone”, “Aurisina fiorita”

quarry”, other unfinished artifacts were unearthed. This is why one of the limestones extracted in the area is called “Roman stone”<sup>4</sup>.

The exploitation of this extraction basin in the Roman Age is proved also by numerous artifacts and structural elements made of Aurisina limestone found in the cities of Northern Italy.

At present we do not know exactly when the exploitation began, but we can suppose that it started in the 2<sup>nd</sup> century BC. In fact, the most ancient artifact made of Aurisina limestone known so far is the milestone of Spurio Postumio Albino, dated to 148 BC<sup>5</sup>.

We do not know which of the quarries was exploited in the Roman Age, but probably some of the active quarries do correspond to the ancient ones. Indeed, a recent survey in the Aurisina quarries showed that in some of them pick extraction signs are visible on the upper part of the quarry walls.

In addition, in the territory surrounding the quarries many Roman structures and artifacts were found or identified. The most interesting site is that of a Roman *villa* dating back to the 1<sup>st</sup> century BC and located right in front of a quarry, along the road between Sistiana and Aurisina<sup>6</sup>. At this site some blocks and unfinished drums made of Aurisina limestone, as well as some iron slag, were found. These findings have been considered as proof of the connection between the *villa* and the extraction activity.

5 GROSSI 2003, 198.

6 MASELLI SCOTTI 1976; MASELLI SCOTTI 1979, 358-361; MASELLI SCOTTI 1982.

4 PREVIATO 2015a, 417-418. About the “Cava Romana”, D’AMBROSI, SONZOGNO 1962.





Fig. 3. Map of the quarries situated in the Aurisina extraction basin which have been identified and surveyed (base map CTR 1:5000 n. 109042, Sistiana)

The Aurisina quarries were exploited for a long period, at least until the beginning of the 6<sup>th</sup> century, when the great monolith covering the Mausoleum of Teodorico in Ravenna, which is made of Aurisina limestone, was extracted<sup>7</sup>.

Regarding the Middle Ages, there are fewer elements proving the exploitation of this extraction basin, but some architectural elements and well-curbs made of Aurisina limestone found in the city of Venice lead to the hypothesis that the quarries remained active until the 13<sup>th</sup> century<sup>8</sup>. Later, the exploitation of this basin seems to cease.

Only in the 18<sup>th</sup> and 19<sup>th</sup> centuries were the quarries exploited again by the Habsburg Empire, for the extraction of stone materials to be employed in the Südbahn, the railway between Trieste and Vienna, and in the buildings of Vienna, Budapest and other cities of the Empire<sup>9</sup>.

In the Roman Age, the Aurisina extraction basin was situated in Aquileia's territory, and we can hypothesize that the quarries were controlled directly by the colony, which was situated at a distance of just 30 km. The city and the quarries were connected by the road between Aquileia and Trieste. This road was certainly used to carry the stones to Aquileia and Trieste, and then, by means of other roads, to further sites. Despite this, most of the stone trade probably conducted by sea, as usually happened in ancient times.

But how was the stone extracted transported from the quarries to the sea? As mentioned above, between the quarries and the sea there is a difference in altitude of about 150 m (Fig. 5).

According to Ireneo della Croce, an historian of the 17<sup>th</sup> century, the difference in altitude was overcome through slides excavated in the rock and covered with lead<sup>10</sup>. These slides are not visible anymore, but the plausibility of this story is proven by the fact that a similar

7 POZZETTO 1985; BEVILACQUA *et al.* 2003.

8 FABIANI PADOVINI 1985, 37; LAZZARINI 1986, 93.

9 CARULLI, ONOFRI 1960, 17-19.

10 See PREVIATO 2015a, 419 (footnote n. 20).



Fig. 4. Aurisina (Trieste, Italy). The Cava Romana quarry. On the right, the tunnel exploited in ancient times. On the left, the active quarry

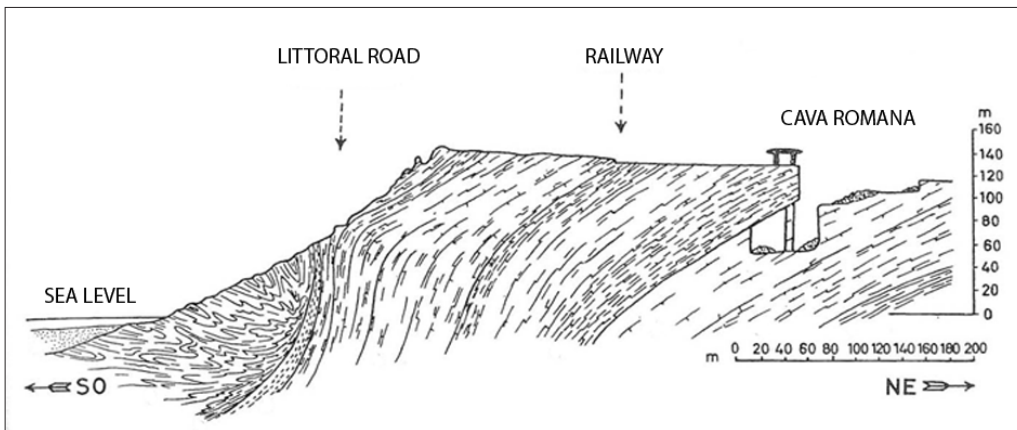


Fig. 5. Aurisina (Trieste, Italy). Section showing the difference in height between the Cava Romana quarry and the sea (reworked image from ZEZZA 1982)



Fig. 6. A slide used at the beginning of the 20<sup>th</sup> century to move stone chips and blocks from the quarries to the sea (from: FLEGO, RUPEL, ZUPANČIČ 2001)



Fig. 7. Map showing the cities where Roman structures or artifacts made of Aurisina limestone have been found

solution was adopted at the end of the 19<sup>th</sup> century by a modern company to move stone chippings and blocks from the quarries to the sea (Fig. 6). Other scholars believed that the tunnel of the Cava Romana was not only an extraction site, but also a gallery that linked the quarry to the sea, used in ancient times for the transfer of stones, but there is no evidence to support this hypothesis.

After reaching the seaside, the stones were loaded onto ships. The port of shipment has not been identified. Some scholars believe that it was in Canovella de' Zoppoli, a site located along the coast, near Aurisina, where, according to P. Kandler, there are the remains of a Roman harbor<sup>11</sup>. Other scholars believe that the quarries' port was that of Sistiana, because a dock and other maritime structures have been recognized in the bay<sup>12</sup>. Although we cannot identify exactly the starting point of the route, we can suppose that the stone extracted in the quarries was transported by sea to the Roman cities situated along the coast of the Adriatic Sea (Aquileia, Adria, Altino, Rimini, Ravenna), from which it was transported in the hinterland by means of rivers and roads.

In the Roman Age, the Aurisina quarries provided huge quantities of stone, which was used for the construction of buildings and infrastructure in the

form of masonry blocks, slabs and columns, but also for the production of decorative elements and artifacts, such as capitals, statues, inscriptions, weights and milestones. Based only on published data, it is difficult to determine the diffusion of Aurisina limestone, because the identification of this stone is not always reliable and petrographical analyses have been carried out only in a few cases. Indeed, there is also a terminological problem, because in the 20<sup>th</sup> century, when the city of Aurisina was not part of Italy, the stone was sometimes called "pietra d'Istria".

Based on the available data, it seems clear that Aurisina limestone was widespread in the Roman Age, in the north of Italy as well as along the Adriatic coasts and in their inland regions<sup>13</sup> (Fig. 7).

This stone was largely exported to cities located near the quarries, like Aquileia and Trieste, but also further away. By land, the stone was transported northward and reached some inland sites like Emona and Nauportos, where some Aurisina limestone artifacts were found<sup>14</sup>.

Structures and artifacts made of Aurisina limestone have also been found in many cities of *Regio X*, such as Concordia Sagittaria, Oderzo, Altino, Padua, Verona, Brescia, Cremona, Piacenza and Mantua. In this case, the stone was probably first transported by sea to the cities situated along the Adriatic coast, and then circulated in the hinterland by means of rivers, primarily

11 FLEGO, RUPEL, ZUPANČIČ 2001, 166-168. The presence of a harbor at this site is not certain (see the results of recent underwater research: AURIEMMA *et al.* 2008, 17).

12 DEGRASSI 1957, 29; BERTACCHI 1995, 118; AURIEMMA *et al.* 2008, 108-110.

13 See LAZZARINI, VAN MOLLE 2015, 700; PREVIATO 2015b, 36-37.

14 SASEL-KOS 1997.



Fig. 8. Aquileia (Udine, Italy). The forum of the colony, entirely constructed in Aurisina limestone. For the square's paving 1500 m<sup>3</sup> of limestone was used



Fig. 9. Aquileia (Udine, Italy). Plinth in Aurisina limestone decorated with the head of Medusa from the forum

the Po and its tributaries. Thus, it could reach some cities of *Regio XI* situated at a distance of about 400 km from the quarries, like Milano and Pavia. Probably in the same way, the stone reached also some cities of *Regio VIII*, like Modena and Reggio Emilia. By sea, Aurisina limestone also reached some more distant cities situated along the Adriatic coasts, like Ravenna, Rimini and Fano.

In the cities located near the quarries, Aurisina limestone was employed a great deal. In Aquileia, for example, this stone was used in both public and private buildings to produce masonry blocks, columns and slabs. Huge quantities of Aurisina limestone were employed for example in the *forum* (Fig. 8). In the city Aurisina limestone was used also for paving some streets<sup>15</sup>. In Aquileia, indeed, many kinds of architectural elements like capitals and lintels, as well as artifacts, like statues, inscriptions, reliefs, weights and urns, were made of this kind of limestone (Fig. 9). The same situation occurs in Trieste, where Aurisina limestone was employed in numerous buildings, like for example the *Capitolium*, the Basilica and the Arco di Riccardo, and was also used for the production of architectonic and decorative elements<sup>16</sup>.

In inland sites further away from the quarries, Aurisina limestone was less used as a building material, and more frequently imported in the shape of architectural elements, such as columns, capitals and cornices, or artifacts, like statue bases, urns, altars and funerary monuments or sacred inscriptions. On the other hand, in the cities situated along the coast or not far from it, this stone was employed in buildings and infrastructures as well. In Rimini for example, Aurisina limestone was used to build the bridge of Augustus.

All things considered, we can notice that the wide spread of the Aurisina stone in the Roman age is really remarkable, and the dynamics of extraction and trade of this material can somehow be compared to that of the precious and famous Mediterranean marbles. Although more studies and archaeometric analyses are necessary to have a complete picture of the distribution of this stone in ancient times and to define the chronology of the phenomenon, in light of the available data, we can assert that the Aurisina quarries were heavily exploited in the Roman age, and must have constituted a huge source of profit.

15 About the use of Aurisina limestone in Aquileia, see PREVIATO 2015, 424-425.

16 See MASELLI SCOTTI 1985.

## BIBLIOGRAPHY

- AURIEMMA *et al.* 2008 = AURIEMMA R., DEGRASSI V., DONAT P., GADDI D., MAURO S., ORIOLO F., RICCOBONO D. 2008: "Terre di mare. Paesaggi costieri dal Timavo alla penisola muggesana", in R. AURIEMMA, S. KARINJA (eds.): Terre di mare. L'archeologia dei paesaggi costieri e le variazioni climatiche, Atti del Convegno Internazionale di Studi (Trieste, 8-10 novembre 2007), 75-211.
- BERTACCHI L. 1995: "I porti romani dell'Istria e la loro economia", *Aquileia Nostra*, LXVI, 113-132.
- BEVILACQUA *et al.* 2003 = BEVILACQUA F., FABRI R., GRILLINI G.C., IANNUCCI A.M. 2003: "Il mausoleo di Teodorico: la pietra di Aurisina. Tecniche e strumenti di lavorazione", in F. LENZI (ed.): L'archeologia dell'Adriatico dalla Preistoria al Medioevo, Atti del Convegno (Ravenna 7-8-9 giugno 2001), 572-580.
- BONETTO J., PREVIATO C. 2013: "Trasformazioni del paesaggio e trasformazioni della città: le cave di pietra per Aquileia", in G. CUSCITO (ed.): Le modificazioni del paesaggio nell'altoadriatico tra pre-protostoria e medioevo, *Antichità Altoadriatiche* LXXVI, Trieste, 141-162.
- CARULLI G.B., ONOFRI R. 1960: *I marmi del Carso*, Udine.
- D'AMBROSI C., SONZOGNO G. 1962: *La cava romana: marmi e pietre del Carso e dell'Istria*, Trieste.
- DEGRASSI A. 1957: "I porti romani dell'Istria", *Atti e memorie della società istriana di archeologia e storia patria* V, 24-81.
- FABIANI PADOVINI R. 1985: "L'impiego a Venezia e a Trieste fino alla metà del XIX secolo", in *I marmi del Carso triestino* 1985, 37-41.
- FLEGO S., RUPEL L., ZUPANČIČ M. 2001: "Contributo alla conoscenza dei siti archeologici sul declivio tra Sistiana e Grignano", *Annales. Series Historia et Sociologia* 11, 1, 157-180.
- GROSSI P. 2003: "Miliari romani nel Nord Italia: materiali, provenienza, lavorazione. L' esempio dell'area Veneta e Friulana", *Quaderni di Archeologia del Veneto* XIX, 192-202.
- I marmi del Carso triestino* 1985 = F. CUCCHI, S. GERDOL (eds.): *I marmi del Carso triestino*, Trieste 1985.
- LAZZARINI L. 1986: "I materiali lapidei dell'edilizia storica veneziana", *Restauro e città* II, 3-4, 84-100.
- LAZZARINI L., VAN MOLLE M. 2015: "Local and imported lithotypes in Roman times in the Southern part of the X *Regio Augustea Venetia et Histria*", in *ASMOSIA* X, 699-711.
- MASELLI SCOTTI F. 1976: "Lo scavo di un edificio romano ad Aurisina", *Atti e memorie della società istriana di archeologia e storia patria* LXXVI, 63-80.
- MASELLI SCOTTI F. 1979: "Il territorio sudorientale di Aquileia", in *Il territorio di Aquileia nell'antichità, Antichità Altoadriatiche* XV/I, Udine, 345-381.
- MASELLI SCOTTI F. 1982: "Villa rustica (scavo 1976) - Aurisina, Duino Aurisina (Trieste)", in *Ritrovamenti archeologici recenti e recentissimi nel Friuli Venezia Giulia*, Trieste, 75-80.
- MASELLI SCOTTI F. 1985, "L'impiego a Trieste e nel suo territorio", in *I marmi del Carso triestino* 1985, 29-33.
- POZZETTO M. 1985: "Un significativo impiego in età postromana: il Mausoleo di Teodorico", in *I marmi del Carso triestino* 1985, 34-36.
- PREVIATO C. 2015a: *Aquileia. Materiali, forme e sistemi costruttivi dall'età repubblicana alla tarda età imperiale*, *Antenor Quaderni* 32, Padova.
- PREVIATO C. 2015b: "Tra monti, fiumi e mare: l'estrazione e il commercio della pietra nella *Regio X - Venetia et Histria*", in F. CAMBI, G. DE VENUTO, R. GOFFREDO (eds.): *I pascoli, i campi, il mare. Paesaggi d'altura e di pianura in Italia dall'Età del Bronzo al Medioevo*, *Storia e Archeologia Globale* 2, Bari, 31-49.
- PREVIATO *et al.* 2014 = PREVIATO C., BONETTO J., MAZZOLI C., MARITAN L. 2014: "Aquileia e le cave delle regioni alto-adriatiche: il caso della trachite euganea", in J. BONETTO, S. CAMPOREALE, A. PIZZO (eds.): *Arqueología de la Construcción IV - Le cave nel mondo antico: sistemi di sfruttamento e processi produttivi*, *Anejos de archivo español de Arqueología* LXIX, Merida, 149-166.
- PREVIATO C., VENTURA P. [in press]: "Archeologia dell'edilizia ad Aquileia. L'approvvigionamento del materiale lapideo e il suo impiego all'interno della città", in *Atti del II Forum sulla ricerca archeologica in Friuli Venezia Giulia* (Udine, 30-31 gennaio 2014).
- SASEL-KOS M. 1997: "Roman Inscriptions in the National Museum of Slovenia. The provenance of the stone", *Histria Antiqua* 3, 57-68.
- ZEZZA M. G. 1982: "I materiali lapidei locali impiegati in età romana nell'area compresa tra il Ticino e il Minicio", *Atti della Società Italiana di Scienze Naturali e del Museo Civico di Storia Naturale di Milano* 123, 1, 3-188.