

ABSTRACT BOOK  
OF THE INTERNATIONAL CONFERENCE  
TONGEREN 2016

RAPPORTS  
ARCHÉOLOGIE | 2

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Patrimoine

# ROMAN ORNAMENTAL STONES

IN NORTH-WESTERN EUROPE

TONGEREN 20~22 APRIL '16







Patrimoine

# RAPPORTS ARCHÉOLOGIE

# 2

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Détail de la mosaïque découverte lors des fouilles  
menées dans la Hondstraat à Tongres.

Detail of the mosaic floor discovered during  
excavations in the Hondstraat, Tongeren.

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# ABSTRACT BOOK OF THE INTERNATIONAL CONFERENCE "ROMAN ORNAMENTAL STONES IN NORTH-WESTERN EUROPE. NATURAL RESOURCES, MANUFACTURING, SUPPLY, LIFE & AFTER-LIFE" TONGEREN 2016

# 2

Catherine Coquelet – Guido Creemers  
Roland Dreesen – Éric Goemaere (coord.)

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# INTRODUCTION

## INTRODUCTION

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### PREFACE

### PRÉFACE

Carmen WILLEMS & Igor PHILTJENS<sup>1</sup>

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The Gallo-Roman Museum in Tongeren is the perfect place to present research results to a wide and varied audience, which is why we are extremely pleased to host this important conference on the theme of "Roman Ornamental Stones".

Each study helps us to understand more about our past. The knowledge we derive from this research allows us to better document stories about the distant past and make for more fascinating storytelling.

The large-scale study of rocks that was launched three years ago under the supervision of Roland Dreesen and Catherine Coquelet has already yielded several interesting results. We now know that the Romans used rocks from dozens of Belgian and French quarries to build their monumental buildings in Tongeren and the region as well as rocks from further abroad, including quarries in the Mediterranean.

In recent years, research into the origin of Roman rocks in North-Western Europe has experienced a new impetus. Currently researchers are studying the entire territory of the *Civitas Tungrorum* as well as Roman centres and cities such as Xanten, Maastricht, Trier and Cologne among others, establishing a new network of specialists who have developed an interesting research dynamic together.

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<sup>1</sup> Carmen Willems, Director of the Gallo-Roman Museum  
Igor Philtjens, Deputy of the Province of Limbourg

We are very honoured to organise an international conference on research into the origin of Roman ornamental stones. Specialists from the Mediterranean will discuss their findings with specialists from the northern borders of the Roman Empire.

This conference is an open invitation to all specialists to share their knowledge. Because ultimately, the only way to supplement and rewrite part of our own history is by exchanging ideas and research results.

Our thanks go to everyone who has made this possible.

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### THE GALLO-ROMAN MUSEUM OF TONGEREN

### LE MUSÉE GALLO-ROMAIN DE TONGRES

Guido Creemers<sup>2</sup>

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Tongeren is the oldest city of Belgium. It was founded around 10 BC, during the Roman period. In that time, it was the capital of the *Civitas Tungrorum*, which comprised almost half of the territory (the oriental part) of Belgium. Archaeological research already started during the 16<sup>th</sup> century with rewarded literati like Abraham Ortelius. The museum itself has its antecedents in the middle of the 19<sup>th</sup> century, when the **Royal Tongeren Historical and Archaeological Society** began collecting archaeological finds. The objects were put on public display in various locations in the city from 1854 on.

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<sup>2</sup> Guido Creemers, Senior Archaeologist, Curator, Gallo-Roman Museum, Tongeren, Belgium

1954 saw the launch of **the first real museum initiative**. Important archaeological finds from the region were collected and shown in the Gallo-Roman Museum in Tongeren. The collection continued to grow, not least thanks to excavations carried out by the museum itself and by the National Archaeological Services.

In 1994, a ‘new-style’ museum was inaugurated. Its attractions included the contemporary presentation of the collection, scientifically-based educational activities and an accessible exhibition policy. The collection grew systematically. For example, there was the hoard of bronze axes from Heppeneert, the Celtic hoard of gold coins and necklaces from Beringen and the ‘Ambiorix coin hoard’, gold coins belonging to (among others) the Eburones.

However, the new museum soon became a victim of its own success. Almost 150,000 people visited the ‘Neanderthals in Europe’ exhibition in 2004-2005. The galleries were unable to cope with such large numbers of visitors. The provincial council gave the go-ahead for a new extension. This new museum was inaugurated in 2009. It nowadays is **one of the most important archaeological museums in Europe**.

The Gallo-Roman Museum’s collection comprises around **170,000 objects**. **The permanent exhibition** contains 2300 items. We selected those which best illustrate the multifaceted story of our permanent exhibition.

You will see **flint tools** belonging to the Neanderthals and the first Homo sapiens: tangible evidence of their cultures. You will see fragile **earthenware pots** which testify to a stable farming community – a way of life which was introduced in this region in 5300 BC. **Bronze swords, urns and gold coins** illustrate the social stratification which became visible during the Iron Age. Finally, our core collection shows that a unique regional Roman culture began to emerge at the beginning of the Christian Era. It comprises **massive architectural fragments, sophisticated jewellery, bronze objects** and a rich collection of glass and ceramic objects.

The public tends to associate the Gallo-Roman Museum with its permanent and temporary exhibitions and all kinds of events. The museum also has **a scientific wing**. Though less visible than the services to the public, it is just as important because scientific research underlies a quality service to the public. After all, the content of the exhibitions and educational programs must be up-to-date and correct.

The museum was designed by architects De Gregorio & Partners. The building has a logical structure which allows us to operate in a professional manner. Its **spaciousness**

(**12,600 m<sup>2</sup>, with 2600 m<sup>2</sup> exhibition of the permanent collection and 1300 m<sup>2</sup> temporary exhibition**) gives an agreeable sense to the visitor, and the museum nowadays attracts some 100,000 – 150,000 visitors.

The architecture is enclosed but the occasional opening provides fragmented views of the city. Indeed the building was designed to reflect Tongeren’s urban identity. Or as architect De Gregorio put it: *“Tongeren requires sober, no-nonsense buildings with little detailing, ideally built of rustic, natural materials. Those materials gradually acquire a nice patina which make for harmony with the whole.”* Take your time, look at the building and decide for yourself.

In 2011, the Museum won the prestigious ‘European Museum of the Year Award’, followed by the ‘Museum Award’ in 2014, being the best museum of Flanders. The museum is also rewarded for temporary exhibitions like Ambiorix (2009 – 2010), Sagalassos (2011 – 2012), Etruscans (2013), Vikings (2014 – 2015) and Gladiators (2015 – 2016).



# CHAPTER 1: PRESENTATION OF THE INTERNATIONAL CONFERENCE

## CHAPITRE 1: PRÉSENTATION DU COLLOQUE INTERNATIONAL

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### ORGANIZING & SCIENTIFIC COMMITTEES *COMITÉ D'ORGANISATION & COMITÉ SCIENTIFIQUE*

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#### ORGANISING COMMITTEE

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Gallo-Roman Museum of Tongeren, Belgium

## VENUE:

Gallo-Roman Museum - Kielenstraat 15, B-3700 Tongeren, Belgium

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**AIMS OF THE CONFERENCE**  
**OBJECTIFS DU COLLOQUE**

During Roman times particular rock types have been selected for the manufacturing of religious and funeral sculptures, others have been carefully chosen for composing architectural and ornamental pieces. The latter were restricted to public buildings or the largest private houses. This taste for ornamental stones, part of which were derived from the Mediterranean area, has generated an important supply activity of products derived from provincial quarries. Where are these materials coming from? What is their geographical distribution? What kind of social and economic mechanisms are playing here? What kind of decorative elements have they been used for? What happened after abandonment of the buildings? Have the quarries still been active during post-Roman times? What is the importance of recycling?

The conference offers an interdisciplinary and international exchange platform for archaeologists, geologists and (art)historians, heritage and restoration specialists, ... interested in the provenance and distribution of ornamental stones, their extraction, processing and recycling in the Roman provinces of North-Western Europe. It will be held at the Gallo-Roman Museum in Tongeren (BE), winner of the European Museum of the Year Award in 2011. You will have the opportunity to visit the Gallo-Roman Museum's permanent exhibition.

The presentations reflect recent archaeological findings of decorative units or unpublished studies of ancient collections, where geological characteristics and provenances have been taken into account. Preference will be given to review papers with a regional character or to studies showing a diachronous overview. This will allow to feed reflections on the possible links between production and consumption areas through time.

A special session will be devoted to the presentations of young researchers such as young graduates, Ph.D. students

and post-doc researchers. They are invited to submit the results of ongoing research in order to exchange information and stimulate discussions with professionals.

Authors are also invited to bring along samples of historical building rocks or ornamental stones to be shown during the stone workshop in order to stimulate further discussions and exchange mutual experiences.

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**THEMES OF THE CONFERENCE**  
**THÉMATIQUES ABORDÉES**


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**Theme 1: Origin and provenance of the raw materials**

Key-note speaker: Lorenzo Lazzarini (Italy)

Here the raw material is the central issue. Although certain Mediterranean rock varieties are well known, the stones extracted in North-Western Europe are not so easy to identify because of the large spectrum of available local rock types, the lower frequency of their use and their wider pattern of distribution. In order to pinpoint their origin it is therefore essential to establish the mineralogical fingerprint or "identity card" for each of the used rock types. This will allow to properly assess their exact geological provenance and to locate probable extraction areas.

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**Theme 2: Socio-economics of stone extraction and distribution**

Key-note speaker: Ben RUSSELL (UK)

We want to focus on the different issues related to the import or extraction of stones. The study of their diffusion will help to better figure out the chronology of the extraction of the resources, the place this activity occupies within the economy of the Roman towns and the commercial networks. This will allow to suggest particular scenarios dealing with the supply to and from the workshops or consumption areas, taken into account the various (fluvial, marine and road) transport routes and modes. Amongst the identified stone varieties, some will have a larger distribution than others within the studied areas whereas others have still been extracted during medieval times: in what conditions and for which uses?

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Theme 3: Carving the stone

Key-note speaker: Jean-Claude Bessac (France)

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This theme will concentrate of the variety of the encountered decorations and on the conditions of their manufacturing: to locate the workshops, to understand the know-how of the quarry craftsmen and sculptors, to unravel the applied mechanical processing (not only the stone dressing techniques but also the use of protecting coatings or paintings) depending on the destination of the stone materials. What is the decorative spectrum of the identified stone types within the consumption areas and what is their frequency within a same decorative production?

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Theme 4: Use and re-use: the life and after-life of stones

Key-note speaker: Catherine Coquelet *et al.* (BE)

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Particular attention will be paid to the final destination of the sculptured/dressed pieces and to the identification of their public/private consumers. Even if the different geological aspects of the raw materials and their use within a particular sculpture or decorative element, will allow to define the esthetical preferences and the wealth of the sponsors, their retrieval and further recycling, correspond to completely different contingencies. Moreover, the buildings in which they have been re-used, represent additional information sources: under which form do these recycled materials occur within the new constructions? Why and how have the materials been recycled and who are the "new consumers"?

# CHAPTER 2: PROGRAM

## CHAPITRE 2: PROGRAMME

### THE INTERNATIONAL CONFERENCE "ROMAN ORNAMENTAL STONES IN NORTH-WESTERN EUROPE 2016

THE GALLO-ROMAN MUSEUM OF TONGEREN

#### WEDNESDAY 20 APRIL

08:00	Registration and coffee
09:00	Welcome by Dir. Carmen Willems & Introduction by Laurent Verlslype (UCL, Belgium)
09:20	<b>Theme 1: Origin and provenance of the raw materials</b>
09:20	<b>The most important decorative stones of ancient Greece: use, distribution, quarries, characterization and archaeometric problems</b> , Key-lecture by Lorenzo LAZZARINI (Italy)
10:20	<b>Black, grey and red Belgian marbles: varieties, provenances and Roman uses</b> by Roland DREESEN (Belgium), Vilma RUPPIENÉ (Germany) & Florence PELTIER (Belgium)
10:40	Coffee break
11:00	<b>The ornamental stones used in the villa from Damblain (Lorraine, France)</b> by Jean-Michel MECHLING (France), Vincent BARBIN, Véronique BRUNET-GASTON & Karine BOULANGER
11:20	<b>The geographic origins of the decorative stones in the ancient agglomeration of Grand (Vosges, France)</b> by Nadine NIKIFOROFF (France)
11:40	<b>Revetments from <i>Colonia Ulpia Traiana</i>, Xanten (Germany)</b> by Vilma RUPPIENÉ (Germany)
12:00	<b>Provenance analysis of Roman limestone via Neutron Activation: Research of Johannes Gutenberg-Universität Mainz (Germany)</b> by Jan PATRICK NEUMANN (Germany), Christian STIEGHORST & Hans-Peter KUHNEN
12:20	<b>The geological source of the earliest tombstones and architectural fragments from southern Britannia: A petrological and geochemical investigation of stone from Claudian Colchester</b> by Kevin HAYWARD (United Kingdom)
12:40	Lunch & posters
14:00	<b>Stone workshops followed by the coffee break. Looking at reference samples of building stones and ornamental stones</b> Marleen DE CEUKELAIRE, Roland DREESEN, Gilles FRONTEAU & Éric GOEMAERE <b>Stone dressing demonstrations</b> by Frans DOPERÉ, Else HARTOCH, Hendrik TOLBOOM & Jean-Claude BESSAC
15:30	<b>A concise overview of Roman dimension stones in The Netherlands</b> by Timo NIJLAND (The Netherlands), C. Wim DUBELAAR & Jan DRÖGE
15:50	<b>Geological provenance of the Nehalennia votive altars from Colijnsplaat (province of Zeeland, The Netherlands) preliminary results</b> by Sven VAN HAELEST (Belgium), Wim DE CLERCQ & Roland DREESEN
16:10	<b>From the Tuff Mine to the Roman Major Construction Sites. An archaeometric investigation on selected roman monuments of Cologne</b> by Jutta GEISWEID (Germany), Holger SCHAAFF & Alfred SCHÄFER

- 
- 16:30 **The Trier diabase: a possible regional source rock for Roman “green porphyry”** by Vilma RUPPIENÉ (Germany), Tatjana GLUHAK & Roland DREESEN (Belgium)
- 
- 16:50 **Provenance and use of Miocene sedimentary rocks in Roman Vindobona and Carnuntum** by Barbara HODITS (Austria) & Andreas ROHATSCH
- 
- 17:20 Free visit to the Gallo-Roman Museum
- 
- 18:30 Evening reception
- 

## THURSDAY 21 APRIL

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- 08:30 Registration and coffee
- 
- 08:50 Announcements
- 
- 09:00 **Theme 2: Socio-economics of stone extraction and distribution**
- 
- 09:00 **The regional and inter-regional stone trade beyond the Mediterranean.** Key-lecture by Ben RUSSELL (United Kingdom)
- 
- 09:50 **The trade in ornamental rocks during the Roman period in the Mid-Ebro Valley (Spain) in light of fresh investigation** by Miguel CISNEROS (Spain)
- 
- 10:10 **The roman sandstone quarry at Hersberg (Luxembourg)** by Matthias PAULKE (Grand-Duchy of Luxembourg)
- 
- 10:30 **Stone objects from Vindobona (Austria) – Provenance of local Stone in a historico-economical setting** by Sophie INSULANDER (Austria), Erich DRAGANITS, Michaela KRONBERGER, Beatrix MOSHAMMER & Martin MOSSER
- 
- 11:00 Coffee break
- 
- 11:20 **Theme 3: Carving the stone**
- 
- 11:20 **From functional to decorative: interpretation and origin of the technical aspects of quarrying and dressing ancient stones.** Key-lecture by Jean-Claude BESSAC (France)
- 
- 12:00 **Stone operational chain and workshops in the *Civitas Aeduarum*** by Pierre-Antoine LAMY (France)
- 
- 12:20 **The workshops of Pont-Sainte-Maxence (Oise, Picardie, France)** by Véronique BRUNET-GASTON (France), Christophe GASTON, Annie BLANC & Philippe BLANC
- 
- 12:40 **Workshop, stones and craftsmens in Mandeuve (Franche-Comté, France)** by Séverine BLIN (France & Germany)
- 
- 13:00 Lunch & posters
- 
- 14:30 **Theme 4: Use and re-use: the life and after-life of stones**
- 
- 14:30 **Life and after-life of the Roman ornamental stones within the *civitas Tungrorum (Germania inferior)*** Key-lecture by Catherine COQUELET (Belgium), Guido CREEMERS, Roland DREESEN & Éric GOEMAERE
- 
- 15:10 **The use and reuse of local-regional and imported decorative stones in a Roman urban quarter and early medieval church in *Atuatuca Tungrorum /Tongeren, Belgium*** by Alain VANDERHOEVEN (Belgium), Titus PANHUYSEN (The Netherlands) & Roland DREESEN
- 
- 15:30 **Re-use of Roman stone in London city-walls and the England’s South-East** by Simon BARKER (France), Penny COOMBE (UK) & Simona PERNA (Italy)
- 
- 15:50 **Use and re-uses of marbles and ornamental stones in Reims (France)** by Gilles FRONTEAU (France), Cyrille VAN LYNDEN & Vincent BARBIN
- 
- 16:10 Coffee break
- 
- 16:30 **Marbles and other building-stones from Aventicum (CH)** by Sophie DELBARRE-BÄRTSCHI (Switzerland) & Thomas HUFSCHEID
- 
- 16:50 **Picture and Ornament – Funerary monuments from Treves seen as media ensembles** by Karl-Uwe MAHLER (Germany), Anja KLÖCKNER & Michaela STARK
- 
- 17:10 **Re-used Roman stones in the region of the Odenwald and the lower Main-valley, Germania Superior** by Alexander REIS (Germany)
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17:30 **Use and re-use of Roman stone monuments in Carnuntum and its surrounding area** by Gabrielle KREMER (Austria) & Isabella KITZ

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17:50 **Wrap up by Wim De Clercq (UGent, Belgium)**

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### FRIDAY 22 APRIL

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09:30 **Morning session**

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09:30 **Guided city walk intra muros: visit of historical buildings and monuments exhibiting in situ or recycled local and regional Roman building materials.** Duration: 2h30. Leaders: Guido CREEMERS & Roland DREESEN

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12:00 **Lunch time**

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14:00 **Afternoon session**

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14:00 **Guided visit to museum collections, the subterranean crypt of Our Lady Basilica and stone fragments of archaeological excavations underneath the Basilica.** Duration: 2h30. Leaders: Catherine COQUELET, Alain VANDERHOEVEN & Titus PANHUYSEN

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# CHAPTER 3: ORAL SESSION – ABSTRACTS (KEYNOTES AND ORAL PRESENTATIONS)

## CHAPITRE 3 : CONFÉRENCES & COMMUNICATIONS ORALES

### THEME 1: ORIGIN AND PROVENANCE OF THE RAW MATERIALS

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#### THE MOST IMPORTANT DECORATIVE STONES OF ANCIENT GREECE: USE, DISTRIBUTION, QUARRIES, CHARACTERIZATION AND ARCHAEOMETRIC PROBLEMS

Key-note speaker: Lorenzo Lazzarini

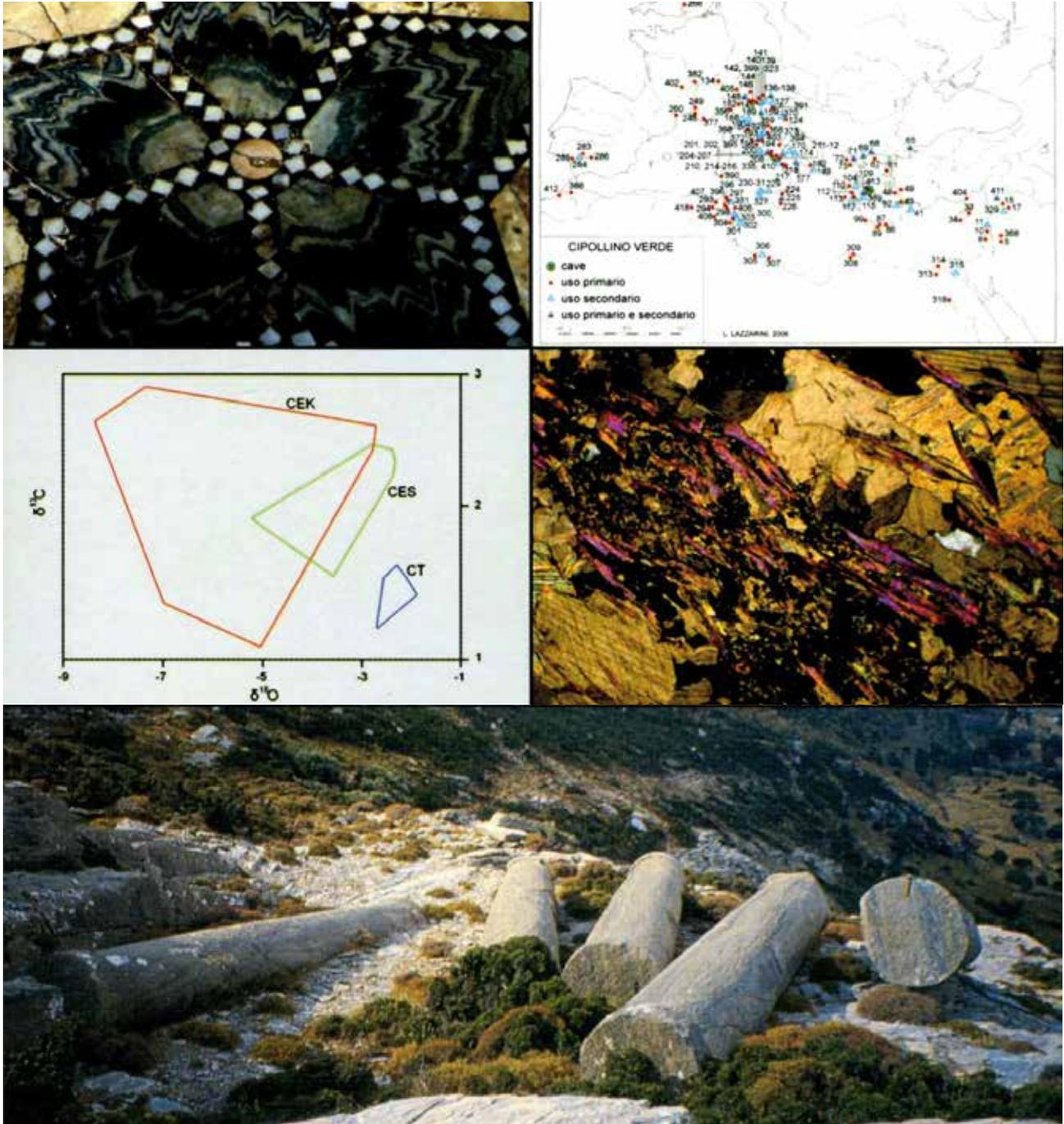
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Almost two centuries have passed since the Roman lawyer Faustino Corsi published *Delle pietre antiche* (Rome, 1828). In many ways the treatise was, and still is, of fundamental significance, especially as regards the interpretation of ancient sources that speak of marble and other stones. One mark of the work's importance is the number of editions that have appeared: three in the 19<sup>th</sup> century (1828, 1833 and 1845) and at least as many since, including a very recent and magnificently illustrated volume (NAPOLIONE, 2001); a second is the echo it had in the other key contribution to the study of ancient marbles, *Marmora Romana* by Raniero Gnoli, of which there have been two editions (Rome, 1971 and 1988) and which remains one of the first to be consulted for anyone tackling the subject dealt with here. Gnoli's great strengths were that he based his approach to the study of ancient marbles on Corsi's scientifically accurate treatment of the Latin and Greek literary sources and on personal visits to many ancient quarries and monuments, from which he derived a great deal of extremely important information. At the same time, however, he conditioned an entire generation of students and keen scholars with his erudite, antiquarian approach. That this influence was not always positive is clear in much of the work of his followers

who, for the most part, pay no attention to the more strictly scientific aspects of the subject (geological, minero-petrological, geochemical, etc.) and fail to acknowledge the new contributions through which science can improve "material knowledge" and enable more exact determinations of the origins of marbles to be made (and thereby enhance their historical investigations too). The result is that mistakes (some of them glaring, that were first made by Roman stonecutters, often unwittingly systematized by Corsi and then taken up by Gnoli and his successors), and approximations (sometimes verging on macroscopic inaccuracies, concerning the origins of many kinds of stone, which are now determined with certainty on the basis of on-site geological investigations followed by laboratory characterizations) often continue inexplicably and unacceptably to be perpetuated, even in works as recent as the new edition of Corsi mentioned above. Another prominent personality in the field was John Bryan Ward-Perkins who, together with Gnoli, founded the Committee for the Study of Marble and Similar Stones in Antiquity in 1965 (MONNA, 1988), and who made excellent archaeological contributions to the study of marble and marble trading in classical antiquity; he was followed in the same area of investigation by Patrizio Pensabene, currently the leading archaeologist specializing in this particular field of the archaeological sciences to which he recently contributed with an important volume (PENSABENE, 2014). The heir to the earlier Committee, ASMOSIA (Association for the Study of Marbles and Other Stones in Antiquity), was created in 1988 (HERZ, 1999) and continues to bear abundant fruit. The society, whose mission is to promote a multi-disciplinary approach to research into stone materials, the only way of achieving in-depth knowledge of the subject, has over three hundred members, including historians, archaeologists, architects, art historians, chemists, physicists, geologists and others, and has so far organized eleven International Conferences, the published proceedings of which have milestones and

set new standards for application of the various disciplines to the study of ancient marbles. Of all these disciplines, the earth sciences, and most of all petrography and geo-chemistry, have played a leading role, as indeed one might

expect given the nature of the focus materials. The most important contributions have in fact come from laboratory research, together with field studies, the starting point for determination of the provenance of ancient lithotypes,



**Fig. 1.** Example of study of a Greek marble: marmor carystium / marmor styrium (cipollino verde euboico) from Eubea (top-to bottom, and left-to right):  
 – detail of a star decorating the floor of the Cà d'Oro, Venice (Italy);  
 – distribution map of cipollino's artifacts: green dot = quarries' location; red dots = primary (Roman & Byzantine) used; blue triangles = later re-uses;

– reference isotopic diagrams for cipollino verde from Karystos (CEK), from Styra (CES), and of cipollino tenario from Cape Tenaron (Peloponnesus);  
 – photomicrograph of a thin section showing foliation with chlorite and phengite trains- the quarry of Kilindri near Karystos with five abandoned ancient columns.

both in terms of identifying quarries from which various otherwise unknown species were extracted and as regards sculpted or architectural artefacts *in situ* or in museum collections.

The hunt for marble quarries used in the past for structural and decorative materials, pursued above all by archaeologists and geologists, has been considerably intensified over the last three decades on a geographical base. Egypt has been thoroughly investigated by James Harrell (his much sought after monograph is in preparation) and by Rosemarie and Dietrich Klemm (2008). Asia Minor (Turkey) has been explored by a much larger number of researchers that considered in many scientific papers also the complex archaeometry of its white marbles versus that of the Greek and other Mediterranean ones. The present writer concentrated on the most important polychrome marbles exploited in Greece especially in Roman times considering most of their aspects, from history of use to geographic distribution, quarries, geological setting, laboratory characterization, archaeometry and deterioration problems (LAZZARINI, 2007). The lithotypes that will be presented here (with the results of recent investigations) are seven and among the most widely used in antiquity, almost ubiquitous in Roman towns: they include *porfido verde antico* (a meta-andesite) and *rosso antico* (an hematite-marble), both from Peloponnesus and used since Minoan times, *portasanta* (a carbonatic tectonic breccia) from the island of Chios with artefacts dating from the Classical period on, *cipollino verde* (a chlorite-marble) and *fior di pesco* (a cataclastic limestone) from Eubea introduced in the Hellenistic period, *breccia di settebasi* (a carbonatic meta-breccia) from the island of Skyros and *verde antico* (an ophicarbonatic breccia) from Thessaly, that were discovered in Augustan and Hadrianic times, respectively.

#### References

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## ON THE ROMAN USE OF BELGIAN MARBLES

Roland DREESSEN, Vilma RUPPIENÉ & Florence PELTIER

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The Romans used a broad spectrum of decorative stones within the *civitas Tungrorum*: most of them were local and regional, such as the Lower Carboniferous limestones (e.g. Pierre de Meuse) but a significant part was imported from adjacent civitates, e.g. cream-coloured to white limestones from the Lorraine area (Jurassic, N-France). Moreover, for the most prestigious projects, polychrome stones were imported from the Mediterranean realm. The Romans discovered and used almost all varieties of the actually known decorative stone resources in Belgium, among which the famous black, grey and red Belgian marbles. The latter represent fossiliferous limestones, they are all Palaeozoic in age and they have all been extracted from underground or open-air quarries, within the borders of the *civitas Tungrorum*. Unfortunately, due to post-Roman extraction no traces have been left from earlier Roman quarrying activities. Grey and red Belgian marbles represent fossiliferous limestones corresponding to various sedimentary facies within Late Devonian mudmound complexes. Numerous varieties exist that received different commercial names. The Romans were especially fond of the intensely white-veined grey Belgian marble (e.g. the Gris des Ardennes). Coarse-grained calcite veins in the latter have locally been used as good alternatives or substitutes for white Mediterranean metamorphic marbles. Highly fossiliferous cherry-red Belgian marbles of Frasnian age, including the red marble of Rance, have frequently been identified in our Belgian archaeological collections.

Apparently, the Belgian red marbles have also been commercialized by the Romans: they have been transported to neighbouring areas of the province of *Germania Inferior*, including Xanten (*Colonia Ulpia Traiana*), Cologne (*Colonia Claudia Ara Agrippinensium*) and some private rural settlements. They have also been found in some Roman buildings of the province of *Gallia Belgica*, in Trier (*Augusta Treverorum*), in Grand (*civitas Leucorum*) and in Bavay (*Bagacum Nerviorum*). Furthermore, in Xanten, the Roman use of another type of Belgian red marble – the Red marble of Baelen (of Mid – Famennian age) – has been recorded for the first time. The latter comes from the area of Limbourg, in the Vesdre valley (Eastern Belgium). Belgian marbles have essentially been used for decorating public (e.g. temples) and private houses (e.g. Roman private settlements), including marble veneers and floor decorations. The black Belgian marbles include different types of very fine-grained and spotless black limestones, that give a real nice polish. They represent either lagoonal or

deeper-marine carbonate deposits that are Late Devonian or Early Carboniferous in age. Black Belgian marbles have been used as small tesserae in polychrome Roman floor mosaics (e.g. black marble of Namur, in Tongeren). Black Belgian marbles have also been recorded outside the *civitas Tungrorum*, such as in floor mosaics of Roman villae in the surroundings of Trier, e.g. in Echternach (Luxemburg).

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### THE ORNAMENTAL STONES USED IN THE VILLA FROM DAMBLAIN (LORRAINE, FRANCE)

Jean-Michel MECHLING, Vincent BARBIN,  
Véronique BRUNET-GASTON & Karine BOULANGER

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An important Gallo-Roman villa was discovered in 2007 near the city of Damblain (Lorraine – France) at the boundaries of the Lingones and Leuques antique Provinces. Archaeological excavations permitted the release of the entire building structures (about 230x100m; 100x60m for the “pars urbana” area) and revealed the presence of a remarkably well conserved private thermal spa, covering more than 80m<sup>2</sup>. The main characteristics (in exception of hypocaust systems, etc.) of this thermal spa were a massive (warm) bath casted in a one piece of lime concrete mixed with broken tile, an “opus sectile” multicolor stones pavement, as well as walls covered with stone slabs and a parietal mosaic. Otherwise, the great quality (and quantity) of the different mortars and concretes is striking.

Fourteen types of raw stone materials have been described on this site. All of them were used for decorative purposes (grading from large pieces used for pavements and wall slabs to small pieces punctually used as *tesserae*). They have been classified according to their geographical origins: local, regional and remote. Local rocks have been logically used for the structural parts of the buildings (foundations, crushed stones, etc.) because of costs and time requirements. But they were also used, as much as possible, for many visually attractive (white, dark blue, brown) uses such as pavement stones, wall slabs and tesserae. Specific fine-coloured limestones were also probably extracted from local quarries for the production of brown, pale brown and yellow tesserae. Because of the proximity of Burgundy, regional stones essentially came from famous calcareous geological formations like Premeaux, Givry, and possibly Autun (Black shale). Unlike the prestigious Gallo-Roman villa of Andilly-en-Bassigny (Champagne-Ardenne, France) situated about 25km to the south-east of Damblain, the stones with a more remote provenance used here are less frequent here and their origins are also less prestigious, except for the presence of the pink-violet

Greek marble from Eretria. Two breccia-like stones have been identified as coming from the Pyrenees mountains (Yellow Lez Breccia, Green Campan Cipolino Marble) and they have probably been used as an alternative for some more prestigious stones. Three stone types used in this site still have an enigmatic origin: two marbles (white and pinkish) have not yet been clearly identified despite cathodoluminescence analysis. However, well known Mediterranean quarries can already be excluded and an origin from the Morvan mountains (Burgundy) is not excluded. Moreover, the origin of translucent slabs made of calcite, has not been clearly identified as well.

This study could finally show an optimization of the stones ornamental aspects in the villa of Damblain focusing on the use of local or regional origin. Red calcareous stone from Givry could for example advantageously replace the more prestigious Red Marbles from the Mediterranean basin. A similar reasoning could explain the use of marbles from the Pyrenees. In comparison to the nearby villa of Andilly, where a lot of prestigious antique colored stones and marbles have been used, the ornamental approach here is very different.

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### THE GEOGRAPHIC ORIGINS OF THE DECORATIVE STONES IN THE ANCIENT AGGLOMERATION OF GRAND (VOSGES, FRANCE)

Nadine NIKIFOROFF

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Using stone building is one of the most significant and visible contributions among the changes brought by the Romans in our regions. The materials of the architectural decoration, including the decorative stones, then became desired products and their trade intensified throughout the Mediterranean area and later throughout the Roman Empire. To meet these needs, new quarries then opened in places where no extractive activity had been done before.

Since the discovery of its fabulous mosaic in 1883, Grand has been considered as a major Gallo-Roman site in France. Camille Julian had seen there an important shrine dedicated to the God Apollo. Today, new issues seek to demonstrate that Grand was primarily a secondary agglomeration with main public buildings, proper to Roman architecture and Roman life. These monuments were particularly richly decorated with marbles and other decorative stones. Among them, we can recognize stones from the Mediterranean area (porphyry from Egypt or from Greece, etc.). However, other stones seem to be either of local origin, extracted about fifty km away from Grand,

such as the Vosges sandstone and light limestone, or of “regional origin”. By “regional origin” we mean a territory whose variable extent is determined by some economic activity (extraction and exploitation of decorative stones). The rocks derived from quarries in Belgium, Burgundy, the Alps or the Pyrenees, found in Grand, would fall into this latter category. However, local and regional stones are much harder to study, not only because of their large lithological spectrum but also because most of the ancient quarries, from which they are extracted, are now unknown, due to a lack of remains. Microscopic analyses are essential to determine their geographical origins.

Despite these uncertainties, the origins of the stones and their uses reveal a mastery of natural resources and means of transport, as well as economic goals. Thus, the white, grey or colored marbles of the Pyrenees discovered in Grand appear to have been substitutes to prestigious Italian, Greek or Oriental marbles, which were probably more difficult to get and certainly more expensive to buy. Meanwhile, the presence of these Pyrenean stones in Grand reveals a wide use, which has been unknown or poorly documented so far.

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### REVTMENTS FROM COLONIA ULPIA TRAIANA, XANTEN (GERMANY)

Vilma RUPPIENÉ

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Colonia Ulpia Traiana (CUT) was founded at the beginning of the 2<sup>nd</sup> century AD by the emperor Trajan. Administratively it belonged to the Roman province Germania Inferior. In the ruins of different public buildings and private homes of CUT ca. 3250 fragments of former wall and floor revetments were discovered. The major share of slabs originates from the area of Harbour temple, Capitolium, public baths, forum. Only a few fragments were discovered in private homes.

Since CUT has no local quarries producing decorative stones, its needs for stones had to be covered by import from regional or foreign sources. Therefore, the first aim of this study was to characterize and to determine the types of stones used in the buildings of CUT with the help of petrographic (thin sections, XRD), chemical (XRF spectroscopy) and isotopic analysis ( $\delta^{18}\text{O}$  and  $\delta^{13}\text{C}$ ), in order to identify their provenance.

The other goal was to document the variety of stones used for incrustations. Was there differentiated in the choice of material in the buildings of CUT? Were public

and private buildings decorated with the same stone types as the public buildings of Rome? Or were there preferably regional stones used in order to save high transportation costs?

The investigations revealed, that more than 40 different types of decorative stones were used in CUT. Most of the stones (83%) originate from Mediterranean sources. The most common are Fior di pesco, Breccia di Sciro, Cipollino verde, Pavonazzetto, Rosso antico, Rosso Iassense, Verde antico, Porfido verde antico, Porfido rosso, Breccia corallina, Greco scritto, pentelic, carrara, proconnesian, dolomitic thassian marble and others. Few types of stone were imported from French quarries: Lutetian limestone, Jurassic limestone from the Norroy quarries, Rose de Premeaux and Pierre de Pouillenay.

Also regional stones were exploited and used by the romans for decorative purpose, but to a lesser extent than Mediterranean stones: course grained marble from Odenwald, trachytes from Drachenfels near Bonn and from Berkum/Wachtberg, Diabas from Trier, red Belgian limestones, Kohlenkalk from Aachen and some Belgian sources.

The choice of decorative stones was clearly different concerning particular public buildings. Every building was embellished with a varying spectrum of marbles. In some objects like forum the assortment of stones was chosen based on examples from Rome (preferred use of Pavonazzetto). Unlike the forum, Harbour temple was preferably decorated with Fior di Pesco, which isn't affirmed in either public building of Rome. Incrustations in the baths of CUT consisted primarily of regional Kohlenkalk, lutetian Limestone and pentelic marble.

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### PROVENANCE ANALYSIS OF ROMAN LIMESTONE VIA NEUTRON ACTIVATION: RESEARCH OF JOHANNES GUTENBERG-UNIVERSITÄT MAINZ (GERMANY)

Jan Patrick NEUMANN, Christian STIEGHORST & Hans-Peter KUHNEN

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The most common stone material for ornamental craftwork during the 1<sup>st</sup> century BC in Northwest Europe was a fine white Jurassic limestone. Since the 19<sup>th</sup> century archaeologists believe that the quarries of this stone were located in the upper valley of the river Moselle near the city of Metz at the village Norroy-Lès-Pont-à-Mousson. Geological investigations proved that the Lorraine Limestone was widely used in the Roman cities of the provinces of Germania Inferior and Gallia Belgica. Inspired by the successful NAA project of the Metropolitan Museum on medieval

limestone from France a research project was formed 2009 at the Johannes-Gutenberg-University in Mainz to apply NAA on Roman limestones. It was accomplished at the TRIGA research reactor at the institute of nuclear chemistry in cooperation with the institute of archaeology at the JGU Mainz. The method was adapted and optimized by a team of researchers from the Institutes of nuclear chemistry and archaeology.

Via neutron radiation within a sample artificial radioactive isotopes are generated. The NAA measures the subsequently emitted gamma radiation. This radiation has a unique spectrum for every nuclide and provides qualitative and quantitative information about the composition of the sample. The advantages of the neutron activation analysis are a very small sample size, a wide range of simultaneously detectable elements, proper detection limits and high precision. Especially the very little size of sample material and the comparatively small amounts of destruction for sampling make the NAA suitable for provenance analysis of archaeological artifacts.

The focus of the project in Mainz was set on the Lorraine Limestone. Therefore stone samples from the quarry site at Norroy and from a second ancient quarry near the village Maidières 2 km south of Norroy were taken for analysis. These samples were compared with archaeological material from a Roman bridge and a villa rustica near Metz, samples from Tongeren analyzed by D. Dreesen and material from a modern quarry at Hahnstätten in Germany. The stones were drilled and the powder was used for analysis. The main focus during sampling was set on avoiding contamination of the sample material. The final samples were radiated and measured with gamma ray detectors. The processed data material resulted in a chemical fingerprint of every stone. Bivariate and multivariate analysis methods were used for the comparison between the different samples.

The examination of the different stone samples provided several results:

- The samples from Hahnstätten could easily be separated from the other samples. The other samples performed a single group - the Lorraine limestones.
- The separation of the two quarries at Norroy and Maidières was difficult, but possible with the concentration of Samarium. This is confirmed by multivariate statistical analysis.
- Most samples from the Roman bridge also fit into the group of Norroy-limestone, although there are several exceptions.
- The stones from the villa rustica do not belong to one of the sampled quarries.
- All stone samples from Tongeren except one show a very high resemblance to the samples from the quarry site at Norroy. The similarities of quarry samples from quarrying context are especially high, so it seems that we can identify the limestone layers extracted by the Roman stonecutters.

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## THE GEOLOGICAL SOURCE OF THE EARLIEST TOMBSTONES AND ARCHITECTURAL FRAGMENTS FROM SOUTHERN BRITANNIA: A PETROLOGICAL AND GEOCHEMICAL INVESTIGATION OF STONE FROM CLAUDIAN COLCHESTER

Kevin HAYWARD

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In a province without a pre-existing tradition of fine carving and inscription in stone, where were the Romans quarrying and supplying their stone from to embellish the earliest funerary monuments and monumental architecture at centres in south-east Britannia? Was a single source responsible for the supply of stone to Colchester, London, and Silchester? Or was the whole process in fact a far more complex picture involving a mix of opportunistic and centralised quarrying operations.

In order to answer these questions limestone samples obtained from 60 first to early 2<sup>nd</sup> century tombstones and architectural fragments were prepared and analysed using a more rigorous, considered scientific approach than before. A series of complimentary geological tests (thin-section petrography; X-Ray Diffraction; X-Ray Fluorescence and stable isotope geochemistry (carbon and oxygen) were used to identify different limestone types. Comparison was then made with over 100 Jurassic and Tertiary outcrop samples from northern France and south-central England prepared and analysed in a similar way.

The results completely alter our understanding of where these materials were being quarried from and refute initial identification that all this material was being supplied from Bath.

Using Claudian Colchester as a case study, with specific reference to two early Roman tombstones Facilis and Longinus I will present the petrological and geochemical findings that not only show how much influence the premier early Roman centre in the province had on stone resources but begin to understand who may have been responsible for the prospecting, quarrying, supply and carving of these materials.

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## A CONCISE OVERVIEW OF ROMAN DIMENSION STONES IN THE NETHERLANDS

Timo G. Nijland, C. Wim Dubelaar & Jan Dröge

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A concise overview of Roman dimension stones in the Netherlands, with special emphasis on Kunrade limestone and Nivelstein sandstone

Roman use of dimension stones in the present-day Netherlands involved both local and imported stones. Local stones include Cretaceous Maastricht and Kunrade limestone from the south of the Dutch province of Limburg, Carboniferous sandstone from the Euregio Limburg-Aachen-Liège and Miocene Nivelstein (Herzogenrath) sandstone from Herzogenrath, just east of the present-day border with Germany. Imported Roman dimension stones notably are so-called Römer tuff from the Eifel and basalts from the Siebengebirge and Eifel regions in Germany and (oolithic) limestones from the Lorraine in France. More rarely, Buntsandstein sandstone from the southern Eifel and sandstones of yet undetermined provenance (possible from the Palatinate) and Carboniferous limestone from Belgium are encountered. The paper gives a concise overview of their use, with special emphasis on Kunrade limestone and Nivelstein sandstone. Geological occurrence and petrographic details of these stones will be described. Nivelstein sandstone has been used for a range of purposes, including funeral monuments and milestones, whereas Kunrade limestone had mainly been used as building stone. Some salient examples of secondary use of Roman stones will be highlighted.

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## GEOLOGICAL PROVENANCE OF THE NEHALENNIA VOTIVE ALTARS FROM COLIJNSPLAAT (PROVINCE OF ZEELAND, THE NETHERLANDS): PRELIMINARY RESULTS

Sven Van Haelst, Wim De Clercq & Roland Dreesen

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On April 14th 1970 a fisherman, trawling in a 25m to 30m deep gully in the Eastern Scheldt off Colijnsplaat (province of Zeeland, SW Netherlands) hauled up some stone fragments. One of them bore a Latin inscription, the others showed a very weathered figure of a seated women. Piet Stuart from the Rijksmuseum van Oudheden in Leiden recognized them as pieces of Roman votive altars dedicated to *Nehalennia*, an indigenous goddess of prosperity and regeneration and a protectress of seamen, fishermen

and merchants. Already in 1647 similar altars were found within a sanctuary, close to the present village of Domburg, some 25km west of Colijnsplaat, pointing to the presence of at least two and nearby Roman-period sanctuaries near the sea-mouth of the river Scheldt.

During investigations (fishing and diving) since the '70ies, more than 400 votive altars, as well as ceramics and Roman building materials (such as roof tiles, blocks of volcanic tuff and masonry) were found on the bottom of this tidal inlet. The large number of votive altars testifies to the presence of a sanctuary for *Nehalennia*. The latter originally stood at the banks of the Roman Scheldt but disappeared later under the waves due to storm surges and coastal erosion. The inscriptions on the votive altars mention merchants in ceramics, wine, salt, garum (fish sauce) originating from Trier, Cologne, August, Nijmegen and other cities. These point out that the harbor connected to this sanctuary functioned as a transshipment site from riverboats to sea-going vessels and as a hub, linking traders from the Moesel and Rhine areas with those from the Gaulish and the British coasts during the Middle-Roman period (as some of the altars are dated, 188, 193, 223, and 227 AD).

Although the epigraphy and the iconography of the altars have already been thoroughly studied and published (Stuart & Bogaers, 2001), less attention has been paid so far to the geological identification and provenance of the stones. Geologist C.J. Overweel started the lithological identification of some 320 altar pieces. Unfortunately he died in 1996 hence leaving the job unfinished. The provenance of the different stone types, which all had to be imported, was assumed based on the fact that they showed quite good analogies with decorative stones found in Roman Maastricht (Panhuysen, 1996). Anderson and Groessens (1996) pointed already out that some of the altars made in black limestone, could be assigned to the "Pierre de Meuse" (Visean limestones) instead of the earlier presumed Tournai limestone. However, until now a thorough and systematic study of the decorative stone materials has never been carried out.

Therefore, renewed investigation of this material aims at systematically stating the lithological identity and the probable geological provenance of both the votive altars and the building materials found at Colijnsplaat, using macroscopical and petrographical analysis. This will provide us with a better idea of their geological and geographical provenance, their probable supply/transport routes and the related socio-economic aspects. The first preliminary results of this project are reported here. Later on, the provenance of the stone types used for the altars, will be assessed in relationship with the origin of the dedicants mentioned on the votive stones. Furthermore,

the study of the ceramics might give us a better idea of when the place was inhabited and when it was abandoned, while it can also shed light upon trade networks. The latter has been demonstrated for another sanctuary along the Scheldt estuary at Bergen-op-Zoom, which was probably linked to the transshipment of Spanish olive oil amphorae (VERMUNT, DE CLERCQ & DEGRYSE, 2009).

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## FROM THE TUFF MINE TO THE ROMAN MAJOR CONSTRUCTION SITES. AN ARCHAEO-METRIC INVESTIGATION ON SELECTED ROMAN MONUMENTS OF COLOGNE

Jutta GEISWEID, Holger SCHAFF & Alfred SCHÄFER

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The landscape of the East Eifel (Germany) was created and formed by numerous intensive volcanic events during the Quaternary. Two prominent complexes are well known for their emplacement of tuff and tephra layers furthermore their importance of influencing the technical evolution of mankind in the Rhineland:

(1) The Riedener Caldera in the western part of the East Eifel volcanic field is represented by intrusions, domes, tuff and widespread tephra fallout. In the area near the villages of Rieden, Weibern and Ettringen historical as well as recent tuff quarries evidence different sources of tuff stones. The so called Riedener, Weiberer and Ettringer tuff varieties are nowadays mainly used as replacement stones, in particular for restoration.

(2) The eruption of the Laacher See Volcano, west of the Neuwied tectonic basin, produced about 5 km<sup>3</sup> of phonolitic material, exclusively as pyroclastic. In addition to fallout pumice and ash deposits which covered the landscape like a blanket, pyroclastic ash flows filled mainly the valleys around the Laacher Lake and partly consolidated by the interaction of ground or meteoric water to tuff. In particular, worth mentioning here are the ancient mining areas of the Krufter Bach near the villages of Kruft, Kretz and Plaidt as well as the Brohlbach valley which show remarkable archaeological evidence for Roman mining sites. The importance of these places as Roman extraction sites is documented by the discovery of tuff altars dedicated to Hercules Saxanus established by legions of the Roman Empire.

Volcanic tuffs have been used only subordinately as decorative stones but mainly as constructional elements in many countries. Tuff blocks represent a major component of the building mass of ancient monuments in Italy, Germany, the Netherlands, Belgium and Denmark. Tuff, well known by the Romans as a building raw material, was appreciated because of its availability in the Eifel, its lightness and resistance to physical weathering. Their knowledge of the Neapolitan Yellow Tuff and its similarity to the Rhenish tuff in particular, as well as the need of building material for the conquered provinces, probably caused the extensive exploitation of the tuff deposits in the East Eifel. Besides, the proximity to the Rhine River favoured the easy transportation and further distribution of the tuff blocks in the Roman Empire. Important Roman monuments like the Ubier tower, the Harbour Gate, the Praetorium as well as the Roman castrum Divitia in Cologne as well as technical innovations like a water pipeline through the Eifel panelled with tuff stone are only a few examples to express the Roman creativity.

According to the increasing archaeological interest in investigating the excavated Roman tuff mining areas (Meurin, Kruft) and the distribution network in Roman times, it was helpful to find a way to distinguish the tuff properties of the different exploitation sites in order to develop a method for provenance analysis of unknown tuff building elements from ancient monuments.

Consequently, the two prominent volcanic complexes of the East Eifel with their economically most important tuff deposits were taken into consideration. Hence, samples of provable historical deposits were examined according to their (1) petrographic and (2) geochemical composition as well as (3) the zeolitization of the tuff as a tracer for the diagenetic evolution abundant at the different sites. By means of the distinguishing features and with additional multivariate data analysis it was possible to determine the origin of the tuff blocks used in Roman architecture in Cologne.

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## THE TRIER DIABASE: A POSSIBLE REGIONAL SOURCE ROCK FOR ROMAN "GREEN PORPHYRY"

Vilma RUPPIENÉ, Tatjana GLUHAK & Roland DREESEN

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Together with the monumental architecture also the fashion to incrust the walls and floors with decorative stones was transferred by the Romans to the northern provinces Germania Inferior and Gallia Belgica. A great variety of decorative stones originating from different Mediterranean sources were imported to embellish the interior in public and private buildings.

Probably to save high transportation costs but also to substitute the spectrum of decorative stones a high number of regional stone varieties were discovered and exploited by the Romans. The most appreciated and sought after regional stones were black and grey limestones from Wallonia in Belgium and from Aachen in Germany, red Devonian limestones with white and grey veins from Wallonia in Belgium, Odenwälder marble (Germany) and Lutetian limestone from Paris. In a lesser scale also trachytes from Drachenfels and Berkum in Germany were used for decorative purposes.

There was also a dark green stone variety with yellow to whitish tiny needles or sprinkles often used for incrustations in roman public buildings, private houses and villae. Fragments of incrustations of this stone were found in Colonia Ulpia Traiana (Xanten), Atuatuca Tungrorum (Tongeren), Colonia Ara Agrippinensium (Köln), Augusta Treverorum (Trier) and in numerous villae rusticae in Germania Inferior and Gallia Belgica. This stone remotely resembles the very appreciated and one of the most expensive Roman decorative stones *porfido verde antico* from Greece and was possibly used as substitute for this stone.

Numerous sources providing green to gray coloured diabases (metabasalt) are situated in the area around Trier. They lie in shape of passageways and summits of various sizes in Hunsrück slate from the Devonian era. They are situated on both banks of the river Saar and in the south of the upper Moselle. A number of diabas deposits (near Kürenz, Pluwig, Hockweiler and Saarburg) were sampled and analysed petrographic and geochemically and compared with archaeological specimens to pinpoint the origin of green roman stones. No roman quarrying traces could be observed in any sampled deposit.

According to geochemical data and macroscopic characteristics two deposits near Kürenz can be excluded as an origin of green decorative stone used by the romans. Four

other sampled sources show a good accordance in their geochemistry with archaeological samples and may be regarded as possible supplier of green decorative stone. In contrary to geochemistry, all geological samples show lower or greater deviation from archaeological samples in their petrography (content of quartz, calcite, opaque inclusions and the grade of alteration of feldspar and amphibole). Macroscopically the diabases originating from the deposits near Hockweiler and Pluwig show the closest resemblance too archaeological specimens, than again vary from them petrographically.

More sampling in further deposits near Trier is being carried out at the moment in order to find the supplying source of the green stone variety so often and widely used by the romans.

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## PROVENANCE AND USE OF MIOCENE SEDIMENTARY ROCKS IN ROMAN VINDOBONA AND CARNUNTUM

Barbara HODITS & Andreas ROHATSCH

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The authors want to present the current research project of the PhD thesis of Barbara Hodits, carried out within the framework of the interdisciplinary project "Stone monuments and stone quarrying in the Carnuntum - Vindobona area" (FWF Project P 26368).

Approximately 600 archaeological stone objects from *Vindobona* and *Carnuntum* were selected for studying the various lithotypes used in Roman architecture, sacred objects and sculptures. An important requirement for archaeological research is that all investigated objects have to be described in detail, dated and placed within a proper context, based on archaeological excavation methods. By following these basic requirements, a meaningful interpretation of trading networks, resource management, economic and social history can be achieved.

The geo-scientific focus of this multidisciplinary research is put on the unravelling of the petrological properties of the Roman carved stones made of (bio)clastic Miocene sedimentary rocks, compared with analogue sediments from abandoned quarries. These quarries are distributed in the Leitha Mountains, the Rust Hills and the Hainburg Mountains as well as at the Western Margin of the Vienna Basin. From a total of about 300 quarries, the selection of the most relevant ones was based on topographical evaluation of historical maps from the 18th and 19th centuries, on high resolution airborne laser scans and geological maps, supplemented by archaeological data from the target

areas. In these selected quarries, lithological logs have been recorded and representative samples for microscopic, petro-physical, and geochemical analysis have been taken. Specimens have been tested in the field to assess certain fundamental physical properties, such as strength (using a rebound hammer), and apparent density (by measuring the ultrasonic velocity). These data are compared with samples tested in the laboratory according to the relevant standards. The lithological classification was done by standard macro- and microscopic investigation of the structural and textural properties. Additionally, handheld XRF-spectrometry has been carried out in order to measure certain major and trace elements for a geochemical characterization. The combination of all analyses allows the classification of the different rock types of the investigated stone objects.

One of the future aims of this study, besides the correct classification of lithotypes, is the evaluation of a statistically relevant number of samples from the 1st to the 4<sup>th</sup> century of *Carnuntum* and *Vindobona*, to find out if at any time certain lithotypes were preferred. Some of the geological problems, that should be tackled during the project and the Phd thesis, are for example the possibility of correlating certain, well- defined lithological sequences between different quarries, with the focus on a detailed reconstruction of the environmental situation at the former coastline and last but not least, the influence of neotectonic activity on sedimentation processes and landscape evolution.

## THEME 2: SOCIO-ECONOMICS OF STONE EXTRACTION AND DISTRIBUTION

### THE REGIONAL AND INTER-REGIONAL STONE TRADE BEYOND THE MEDITERRANEA

Key-note speaker: Ben RUSSELL

The distribution of polychrome marbles from the largest quarries of the Mediterranean region, and the range of contexts in which these are found, shows that demand for exotic stone in the Roman empire was widespread and, in aggregate terms, enormous. The peak of this demand was between the late first- and early third-centuries CE. Distribution of these materials was not uniform: transport costs and, in the case of some materials from imperial-administered quarries, perhaps also availability played a role in shaping what materials were consumed where. Stone is a heavy material and, as a result, the medium- and

long-distance stone trade was by and large a maritime phenomenon. There is a clear drop-off in the quantity of marble of Mediterranean origin, as well the size of individual marble elements in these materials, as one moves into inland North Africa, Spain, the Levant or up into the north-western provinces. Despite this, consumers were often able to acquire supplies of materials from extremely distant sources, even if only in small quantities.

While the distribution of decorative stones of Mediterranean origin provides an insight into the lengths consumers were prepared to go to acquire specific prestigious materials, patterns of localized stone exploitation are also indicative of the spread of knowledge of these materials, even in areas where they were not often imported. This is particularly clear in the case of so-called 'substitution' marbles (*marmi di sostituzione*). This term is typically applied to the range of stones of various types that were quarried apparently because of their similarity to the widely distributed polychrome marbles of Mediterranean origin. The range of locally-occurring polychrome, as well as white, stones that stoneworkers were able to acquire, especially from the late 1<sup>st</sup> century CE, seems to suggest that deliberate prospecting took place.

Alongside these materials that were targeted for their very specific decorative characteristics, a range of other lithotypes were exploited across the Roman empire for building or more everyday carving projects. Numerous quarries serving an extremely localized market sprung up in the first to third centuries CE, mostly providing building stone – limestone, sandstone, tuff, among other stone types (Fig. 2). These quarries are testament to increasing demand for stone-built structures of Roman type, which itself plays into important discussions of patterns of cultural exchange, especially in the north-western provinces. While most stones extracted across the Roman world were moved only very short distances, the better quality marbles, limestones (Fig.2) and sandstones – materials valued for their hardness or their workability – were also distributed regionally, and in some case very long distances: the limestone from Norroy is a case in point, as are the white marbles of the eastern Alps. These stones were not valued on a pan-imperial market like the famous polychrome and white Mediterranean marbles, but they did meet the demand of customers in more remote or inland regions, who could not easily access Mediterranean transport networks.

The first half of this paper will focus on these overlapping and occasionally intersecting levels of the Roman stone trade: the local, the regional and the inter-regional. It will consider, in particular, the roles played by geography and transport logistics in determining the observable distribution patterns of different stone types. The second

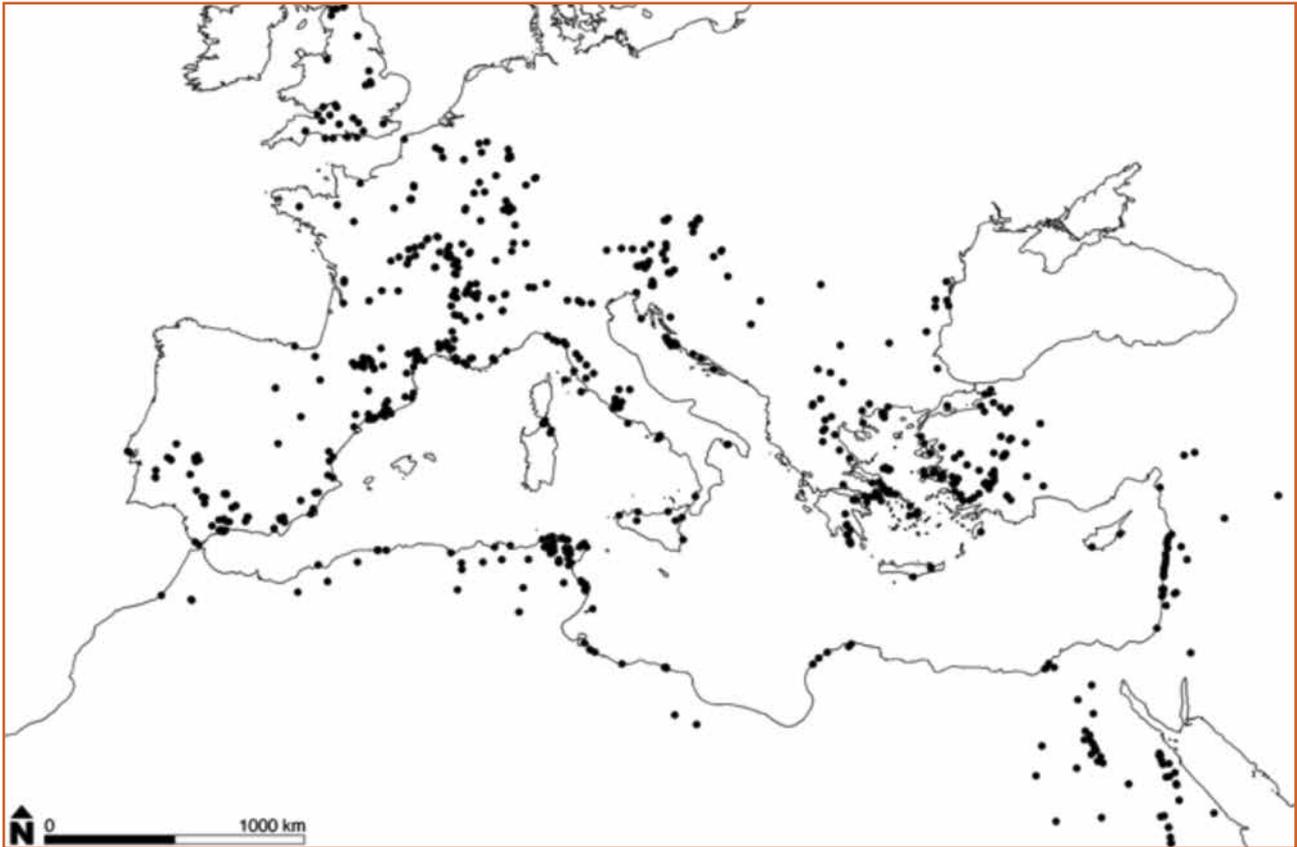


Fig. 2. Stone quarries of the Roman empire (source: Oxford Roman Economy Project).

half of this paper will move away from considering the distribution of stone types more generally to examine the evidence provided by specific carved stone objects. Sarcophagi and statuary, in particular, were produced, bought and consumed differently from either pre-carved architectural elements or stone that was traded as a raw material. Distribution patterns of prominent sarcophagus types shows that these objects were valued according to a different set of criteria than other stone objects (Fig. 3). Equally, an analysis of the materials used for statuary production at different sites reveals important differences in consumer choice when compared to materials used for architectural projects.

The overall aim of this paper is to consider the interplay between various forms of demand for stone on a local and regional level and how this demand was met. While evidence from the north-western provinces will be drawn on, comparisons with other areas of the Roman empire will also be made, to examine important similarities and differences between this region and others.

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### THE TRADE IN ORNAMENTAL ROCKS DURING THE ROMAN PERIOD IN THE MID-EBRO VALLEY (SPAIN) IN LIGHT OF FRESH INVESTIGATION

Miguel CISNEROS

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Our knowledge of the use and trade in ornamental rocks during the Roman period in the mid-Ebro valley (modern region of Aragon, Spain) has changed in the last few years as investigations have progressed. Thus, the almost total predominance of imperial marbles or marbles imported from the Mediterranean area has evolved towards a boom in marbles from Hispania. Nonetheless, the principal cities respond differently to this phenomenon, a reflection, perhaps, of various underlying causes. Thus, in *Colonia Caesar Augusta* (modern Zaragoza), the capital of *Conventus Caesaraugustanus*, both sides of the issue can be found: in the theatre, white Pyrenean marbles and marbles from imperial quarries are prevalent while other ornamental rocks (from Hispania and coloured rocks from the Mediterranean area) are less used. On the other hand, in the area of the temple in the Forum, white Pyrenean marbles and ornamental rocks from Hispania predominate, imperial marbles and marbles from the Mediterranean being scarce. Conversely, in *Municipium Bilbilis* (modern Calatayud, province of

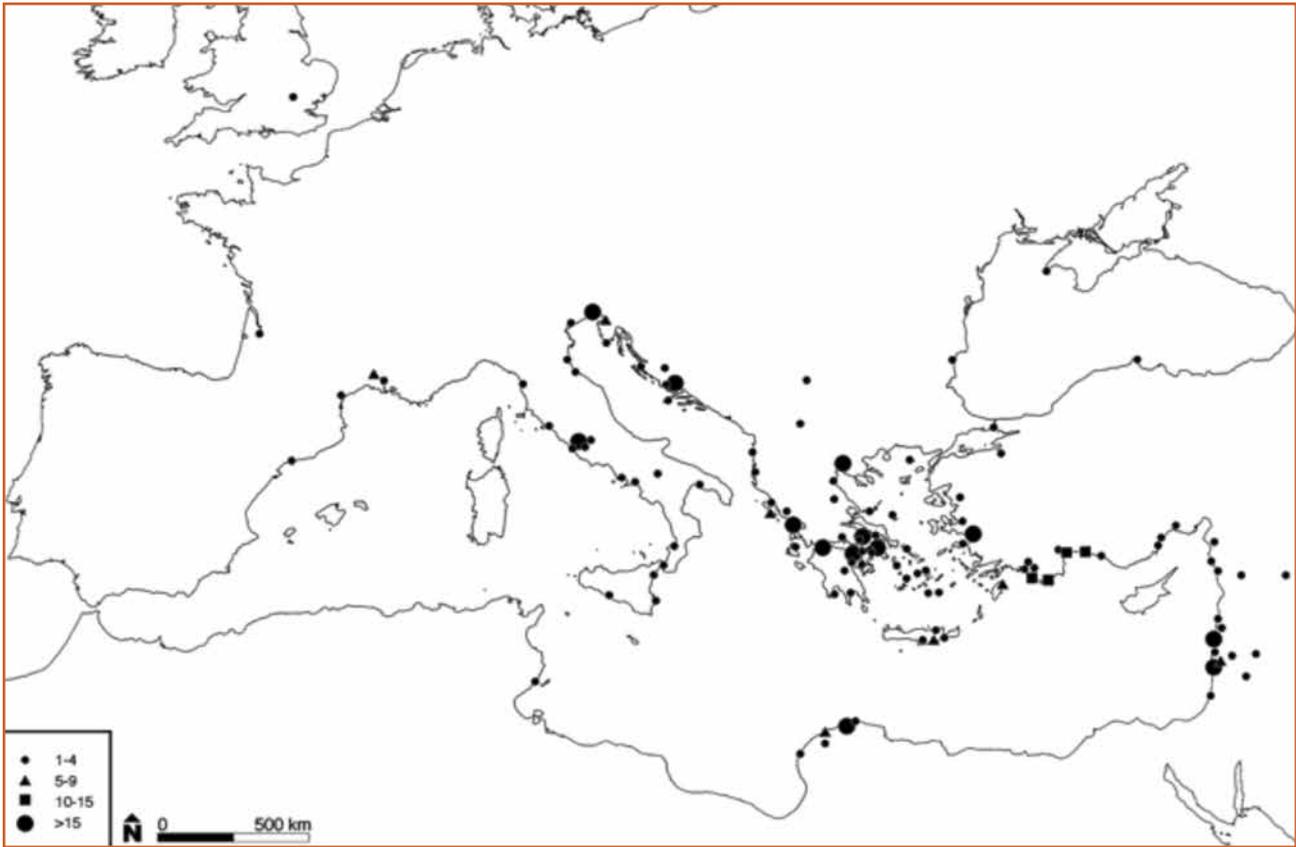


Fig. 3. Distribution of Attic sarcophagi.

Zaragoza) imperial marbles prevail, followed by coloured marbles from the Mediterranean area while local ornamental rocks and rocks from Hispania are extremely scarce; in the *Municipium Labitolosanum* (modern La Puebla de Castro, province of Huesca) ornamental rocks from Hispania and local limestones are used exclusively.

The chronology of construction of the buildings revolves around the Julio-Claudian era and early 2<sup>nd</sup> century A.D.—or at least this is the time when buildings whose earliest construction phases go back to the Augustan period underwent major remodelling. The use of one material instead of another is due to a variety of reasons. In the case of *Caesar Augusta*, the explanation given so far has been either fashion or availability of materials, accepting the hypothesis that a marble distribution centre may have been located in the city availing of its strategic position at a crossroads by the river Ebro—a vital junction for all communications between the North-eastern corner of the Peninsula and the rest of Hispania, Gallia and Italia—and of the existence of a river port in the city. However, in Labitolosa, the explanation given for this phenomenon has been based not only on its location in the pre-Pyrenees in Aragon but also on the economic affordability for local elites, which would account for the almost exclusive use of ornamental rocks from Hispania in the Baths and of

local limestones in the Curia. As regards *Bilbilis*, located by the river Jalón, which links the Ebro valley to the Meseta, the lack of local materials which do appear in both geographical zones calls for a different answer: ornamental rocks could have been traded through already established routes, used earlier for the distribution of other products, as has been suggested regarding the diffusion of “Buixarró” limestone, which would prompt an analysis into distribution circuits beyond the mere geographical location of cities.

Fresh data originating mostly from *Caesar Augusta* and *Bilbilis* shall be contrasted with data originating from other sites within this zone.

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### A ROMAN SANDSTONE QUARRY NEAR HERSBERG (LUXEMBOURG)

Matthias PAULKE

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Historic quarries are always – regardless of their age – an important archaeological evidence of the history of technology. Several of these quarries still remain. In many places their stone was used as building material by the

surrounding villages and homesteads until the 20<sup>th</sup> century. A very well preserved example is the roman quarry of Hersberg. It is unique in Luxembourg with regard to its size and preservation. In the past decades the quarry went unheeded and there were no scientific studies. The traces of quarrying remain on a length of at least 130 meters, and flanks the hiking trail along the natural cliff edge of the hill crest "Kasselt". Singular channels, wedge holes as well as the vertical remove of stone point to an organized running of the quarry. A detailed scientific study including a graphical acquisition of this unique monument remains to be done.

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### STONE OBJECTS FROM VINDOBONA (AUSTRIA) – PROVENANCE OF LOCAL STONE IN A HISTORICO- ECONOMICAL SETTING

Sophie INSULANDER, Erich DRAGANITS, Michaela KRONBERGER,  
Beatrix MOSHAMMER & Martin MOSSER

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The interdisciplinary project „Stone monuments and Stone Quarrying in the *Carnuntum – Vindobona Area*“ (FWF P 26368-G21) aims to acquire new knowledge about Roman economic and settlement history, art, quarrying and infrastructure through the integration and analysis of archaeological and geological data. Preliminary examination of about a half of the approximately 350 Roman stone objects, including all types of artefacts from art works to plain building materials, suggests that three quarrying areas were significant for the supply of stones to ancient Vienna. Based on historical maps and airborne laser scans, as in the case of the parallel Carnuntum project, potential quarrying regions around the Roman city and legionary camp of Vindobona were selected and representative samples taken. Evaluating the geological results from an archaeological point of view, the following conclusions can be made: It seems that as a first step after the installation of the Roman legionary garrison, the building material was quarried from the margin of the Alpine region, including the Vindobona vicinity. Moreover, algal limestones from the Leitha area played an important role as raw material for sculptured stone monuments, such as gravestones, altars, etc.

GIS-mapping of all known archaeological sites between Vindobona and Carnuntum, as well as the analysis of aerial photographs and airborne laser scans should pinpoint potential quarries and highlight their necessary infrastructure. Equally important is the consideration of possible transportation routes. Interactions with *Carnuntum*, the provincial capital of *Pannonia superior*, in terms of exchange of goods as well as cultural or artistic transfer, are exciting sets of issues.

## THEME 3: CARVING THE STONE

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### FROM FUNCTIONAL TO DECORATIVE: INTREPRETATION AND ORIGIN OF TECHNICAL ASPECTS OF QUARRYING AND DRESSING ANCIENT STONES

Key-note speaker: Jean-Claude BESSAC

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Carved stones whose aspect would have been restricted to strictly functional and economic usages, have sometimes been re-employed or transformed for decorative uses. Besides ornamental sculpturing and profiling in stone production, decorations do exist that are linked to different color hues, textures and especially to the treatment of sidings or even to their implementation. The former two items and the last one, depend on the choice of the supervisors or ordering parties and are quite easy to identify. However, the study of the aspect of the finishing of the visible surface of the stones is more complex: first in its actual technical and esthetical interpretation, secondly in the search of the factors or motivations of the craftsman or of the group that made it. In Northwestern Europe, like elsewhere, archaeology and art history almost never tackle this subject. Moreover, in the rare case where it was done, it still remained locked up in the straitjacket of existing ideas. Therefore, it is crucial to widen the geography and the chronology of this research to the whole of the area of Greek-Roman cultural influences, in order to identify possible regional particularities of these decorative skills.



Fig. 4. Rustic bossages of the Pont du Gard (Gard department, France).

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Fig. 5. Bossages « en table » of the Maison Carrée (Nîmes, Gard department, France).

The main objective here, is to identify a few landmarks outside the academical banalities and to propose, without restriction, the archaeological view - without exclusivity - of a stone professional. Besides the esthaetical perception, this approach takes into account not only the technical-economical parameters but also the antropological ones. Meanwhile it wants to avoid the pitfalls of ethnocentric reflexes resulting in an accelerated loss of the visions, the gestures and the traditional know-hows in the stone professions. Firstly, it is important to recognize those aspects that result naturally from a logic of provisioning economic of stones and from the natural gestures of the craft for adapting the blocs to the monument. From there on, we have to look for the possible technical and economic supplements leading to the production of a particular final esthaetical aspect. For instance, it should be possible for everybody to define the functional nature of the rustic bossages of a civil engineering project, like the Pont du Gard (Fig. 4) and to distinguish these from the decorative bossages of an adjacent cult monument like the Maison Carrée (Nîmes) (Fig. 5). However, the technical and aesthetical parentage between both types of presentations of the cladding is much more complex to unravel. Its analysis depends on numerous intermediate steps representing an equal large number of increasing degrees of decorative intentions and imaginations related to at times important work investments. Amongst the decorative cuttings, small

fantasies exist that only require a little additional work, compared to that of a strictly functional cutting. This is the case for instance of the « finition rugueuse au ciseau grain d'orge » of the base of a bas-relief whose carved motifs are finely smoothed. The striae left by the teeth of the hand tools are slightly darkening the background of the work, highlighting in this way, with few additional cost, the valorisation of the main subject. The tools, and especially the way how it is used, are thus critical in this approach.

In the whole of the area of Greek-Roman technical influence, the basical practices of stone cutting and implementation, vary only on a few details. But what about the decorative evolutions and their regional and chronological particularities? A few analyses have already been made of the southern and oriental sectors of the Roman empire, but these still remain embryonic. Apparently, the study of the Roman products in Northwestern Europe has not yet been started. True, this study will be much more complex to conduct, not only because of the greater rareness of the lapidary complexes in these areas, but also because of the rudeness of the climate that has often modified or eroded the external aspect of the stones. Nevertheless, this is an important research topic offering great opportunities for innovation.

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### STONE OPERATIONAL CHAIN AND WORKSHOPS IN THE CIVITAS AEDUORUM BETWEEN THE 1<sup>ST</sup> AND 4<sup>TH</sup> CENTURIES AD

Pierre-Antoine LAMY

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An inventory of 2361 non-architectural stone sculptures discovered in the *civitas Aeduorum*, realized for my PhD, reveals the prosperity of stone-carving in this territory, as well as specific concentrations: the north-eastern part represents more than 80 % of the finds, whereas very few discoveries were made in the southern part. Stone supply was indeed easier North of the civitas, where quality sandstones could be found. About 20 ancient quarries have also been identified there. Thanks to their study, besides an analysis of the carving techniques, styles and references of the sculptors, it is now possible to have a better understanding of the stone operational chain in the area. Stone supply was mostly local, but some long distance transports have been seen – of Italian and Greek marbles mostly. Sculptors have elaborated a craft where the material was no longer a constraint: they could carve in limestone as well as in sandstone and granite, adapting their technique and their tools to the rock type. Some specificities have been put to light, such as a peculiar iconography, especially when

it comes to tombstones – an original type was elaborated by the sculptors –, a neglect for portraits and a marked taste for small-scale divinities. Henceforth, we can discuss stone-craft in this *civitas* from a macroscopic perspective. This allows an analysis of the spatial distribution as well as the presentation of new data regarding ancient techniques, iconography and style. Combining those points has led to the identification of 33 workshops and 50 isolated sculptors, active from the 1<sup>st</sup> century to the 4<sup>th</sup> century AD. Stone sculpture has mostly developed during the Flavian dynasty, reached its peak during the second half of the 2<sup>nd</sup> century AD before a downfall in the 3<sup>rd</sup> century. Studying the activity of the workshops has shown that in the *civitas Aeduorum*, stone carving was not an urban phenomenon, and some high-skilled sculptors were active in several pagi, sanctuaries and small settlements. Links between the workshops have also been found. They reveal local traditions, like the use of specific tools, or iconographic habits that can be seen as identity markers. Some cases of competition between sculptors have been discovered, in the capital, *Augustodunum*, and also in the sanctuary of Sources de la Seine. Some workshops have notably expanded, and some of their sculptors may have founded new *officinae*. Finally, it seems that the *civitas Aeduorum* was above all open to northern influences – Lingones, Senones and even Treviri – and fewer exchanges and artistic relations have occurred with the other *civitates*.

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### THE WORKSHOPS OF PONT-SAINTE-MAXENCE (OISE, PICARDIE, FRANCE)

Véronique BRUNET-GASTON, Christophe GASTON, Annie BLANC & Philippe BLANC

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The sanctuary of St-Maxence (Oise, Picardie, France) is exceptionally well preserved and offers some nice examples of unfinished sculptures and of specific implementation techniques. Colors have been well preserved on some of the larger blocks and more especially on fragments, showing the “signature» of the artists as well as a number of preparation tool marks.

Two workshops seem to have been active simultaneously on the construction site: a Rhine team responsible for the geometric decorations and a team specialized in micrasiatic cartoons and mythological scenes.

With respect to the materials choice, we can state that the rocks have been derived from local quarries (Lutetian limestones of the Oise area, such as the St.Leu and St.Maximin limestone varieties), besides local decorative rocks (such as

the Liais Senlis), rocks of regional provenance (such as the Chatelperron marble) and rocks of Mediterranean origin. The latter have obviously been the object of extensive restoration.

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### WORKSHOP, STONES AND CRAFTSMEN IN MANDEURE (FRANCHE-COMTÉ, FRANCE)

Séverine BLIN

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In Eastern Gaul and Germanies, several monuments still standing witness of the quantity and the quality of public buildings in *lingon*, *aeduan*, *leuquan*, *sequan*, *raurac* and *helvet* territory during the Imperial period. Our knowledge of this monumental architecture and their workshops remains however very incomplete. In Mandeure, where the largest sequani civic sanctuary was located, the recent study of collection of architectural pieces belonging to the monumental ornamentation revealed an important workshop for those provinces, which is connected with a limestone career. We suggest examining on the one hand the evolution of the practices and the question of the origin of craftsmen, and on the other hand how the use of this material influenced the processes inside the workshop.

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## THEME 4: USE AND RE-USE: THE LIFE AND AFTER-LIFE OF STONES

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### LIFE AND AFTER-LIFE OF THE ROMAN ORNAMENTAL STONES WITHIN THE CIVITAS TUNGRORUM (GERMANIA INFERIOR)

Key-note speakers:

Catherine COQUELET, Guido CREEMERS, Roland DREESEN & Éric GOEMAERE

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Since 2012, an interdisciplinary research project is focusing on Roman ornamental stones discovered within the *civitas Tungrorum*. Its main objective is to identify the geological provenances, to investigate the style of the sculptures and of the architectural decoration and finally, to define their use in an archaeological context.

Up to now, about thirty different stone types have been identified within the archaeological collections of urban and rural sites in the *civitas*, the most important site of which

is the capital *Atuatuca Tungrorum*. Various types of limestones, sandstones, metamorphic marbles and igneous rocks have been lithologically and petrographically characterized and their geographical-geological provenances unravelled.

Fourteen Mediterranean white and coloured marble types are present in rather small quantities. Besides the famous white Italian Carrara marble, a various number of polychrome marbles have been imported from Greece, including Breccia di Settebasi, Fior di Pesco, Portasanta, Verde antico, and also Cippolino verde, Rosso antico and the white Pentelic marble. Other stones have been imported from Turkey, including Pavonazzetto, Breccia Corallina, Giallo antico and Proconnesian marble. Finally, igneous rock types such as Granito verde (?) and Granito bianco e nero have possibly been derived from Egyptian quarries (although a more nearby geological source such as that of the diabase of Trier is more plausible).

The most frequent ornamental stone types are limestones quarried on French territory, in a large exploitation area around the banks of the Meuse and the Moselle rivers. The latter limestones, identified as stones of Norroy, Chémery, Euville and Dom-le-Mesnil stones, are grouped under the name of « white stones ». Their colours vary from white, cream-coloured to yellow ochre. Besides this specific group, other analogous French limestones occasionally occur, including the stones of Caen and Marquise (research in progress) and the Lutetian limestones. A French breccia-like grey marble, preliminary identified as Gris Antique (from the Pyrenees) exceptionally occurs as well.

Another large part of the lithic decorative material includes local, Belgian stones, disseminated in small quantities throughout many sites. They consist mainly of Meuse (lime) stone and Belgian grey marble (Gris des Ardennes), Belgian red marble (e.g. from Rance) and Belgian black marble (from Namur). Additionally, Famennian micaceous sandstones, the so-called Psammites du Condroz, commonly occurs but only the wine-red variety has been used. Finally, several pieces made of a Dutch ash-grey sandstone, called Nivelstein and of a German stone, the green diabase of Trier (research in progress), complete this collection.

This broad lithological and geological spectrum reflects the evolution of the economy of the ornamental stones within the *civitas Tungrorum*, subdivided into Mediterranean imports, Gallo-Roman imports and local productions. However, even if the stone variety is quite similar for each of the former three groups, the volumes of the stones carved in Northern Gaul are much more important than those derived from the Mediterranean realm.

« White stones » are mainly used in the architectural decoration of public buildings and monuments. Moreover, they also represent the almost unique stone resource for religious and funeral sculptures. For all these reasons, their omnipresence in the collections of the capital (Tongeren) is not surprising (Fig. 6 : 1-3). Otherwise, in the *civitas*, the latter «white stones» are especially used for the decoration of urban and rural sanctuaries and for some funeral monuments built in the periphery of urban settlements such as Braives and Clavier-Vervoz (Fig. 7).

Architectural decorations, like *opus sectile* and marble veneers, use the wide colour spectrum of the Mediterranean marbles. This chromatic scale is completed with that of the black, grey and red Belgian marbles and that of the green Trier diabase. This large range of colours found in floor decorations and in the lower part of the wall decorations, is in sharp contrast with the more homogeneous colours of the upper part of the wall ornaments. The former marble veneers, made in Belgian grey and black marbles, are in fact copies of the public decorations carved in « white stones ». The integration of pieces carved in other white limestone types, eventually in « real » white marbles, still recalls those white materials. Finally, local and regional stones are used also in mosaics. However, this rather common decoration type is restricted to private houses. The most simple geometrical patterns are based on two different colours, comprising black Belgian marbles and «white stones» or analogous limestones. More complicated geometrical and vegetable patterns incorporate recycled red ceramic pieces, such as *terra sigillata*.

Therefore, the most complex decoration patterns, combining *opus sectile* and marble veneers, are allocated to official or public buildings of the capital, such as the Northern temple and the early Christian basilica of the church of Our Lady in Tongeren. However, similar complex decorations have also been encountered inside private buildings in Tongeren : here, their presence reflects rich properties of elites, such as houses discovered on the archaeological sites of Elf Novemberwal and the Hondstraat (Fig. 6 : 4, 7). In the *civitas*, a few sanctuaries and about ten rural settlements contain stone ornaments. Some pieces of Mediterranean and Belgian marbles found in rural settlements mainly point to the use of *opus sectile* and/of marble veneering on the lower part of the walls, at least. But in the Roman villa located on the Place Saint-Lambert in Liège and in the villa of Onhaye/Anthée, marble veneers were discovered that rather belong to a capital and a pilaster. Such marble veneers occur also in an important sanctuary of the *civitas*, called Fontaine-Valmont (Fig. 7).



Fig. 6. Distribution of the finds of ornamental stones within the capital Tongeren (after VANVINCKENROYE W., 1985. *Tongeren. Romeinse stad*, Tongeren). Excavation sites - Official buildings: 1. North temple, 2. Our Lady Basilica, 3. *Horrea*; Private houses: 4. Hondsstraat, 5. Agnetenklooster, 6. Elisabethwal, 7. Elf Novemberwal, 8. Kielenstraat, 9. Museum site, 10. Clarissenstraat, 11. Romeinse Kassei, 12. Vrijthof, 13. Hemelingenstraat. Late Roman town walls: 14. Vermeulenstraat.

The capital Tongeren (*Atuatuca Tungrorum*) is the best site to observe the recycling techniques of ornamental stones during the Late Antiquity. « White stones » are the first victims of these practices. Their disappearance is mainly linked to the recuperation of public building materials, with the objective to erect the late Roman town walls. Except for rare evidences of reinvestment of « white stones » in funeral or private constructions, the disappearance of these « white stones » is a symbol of rupture with the architecture of the High Roman Empire. But it is also one of the proofs of vitality of the late Roman town. In other small towns in the *civitas*, recycling « white stones » is an activity conducted by the civil people and/or the army. For example, in Jupille-sur-Meuse, a temporary workshop

settled down in the urban sanctuary in order to reuse stone ornaments as building stones. With the surrender of the religious site, from the end of the 2<sup>nd</sup> century AD, we can conclude that this work is made by the local inhabitants. Conversely, in Liberchies, the destruction of the urban sanctuary coincides with the building of the *castellum* by the army.

However, some architectural ornaments have been also recycled with an aesthetic aim. In Tongeren, the similarities between the marble veneers used in the Northern temple and those in the early Christian church, would suggest that the decoration of the pagan temple has been partially transferred to the new christian site. This practice is also visible in the late Roman sanctuary of Clavier-Vervoz. These decorations probably use more ancient ornaments that first belonged to another ancient building, such as a public building of the urban settlement of Clavier-Vervoz, or perhaps to a private rural settlement established not far from it.

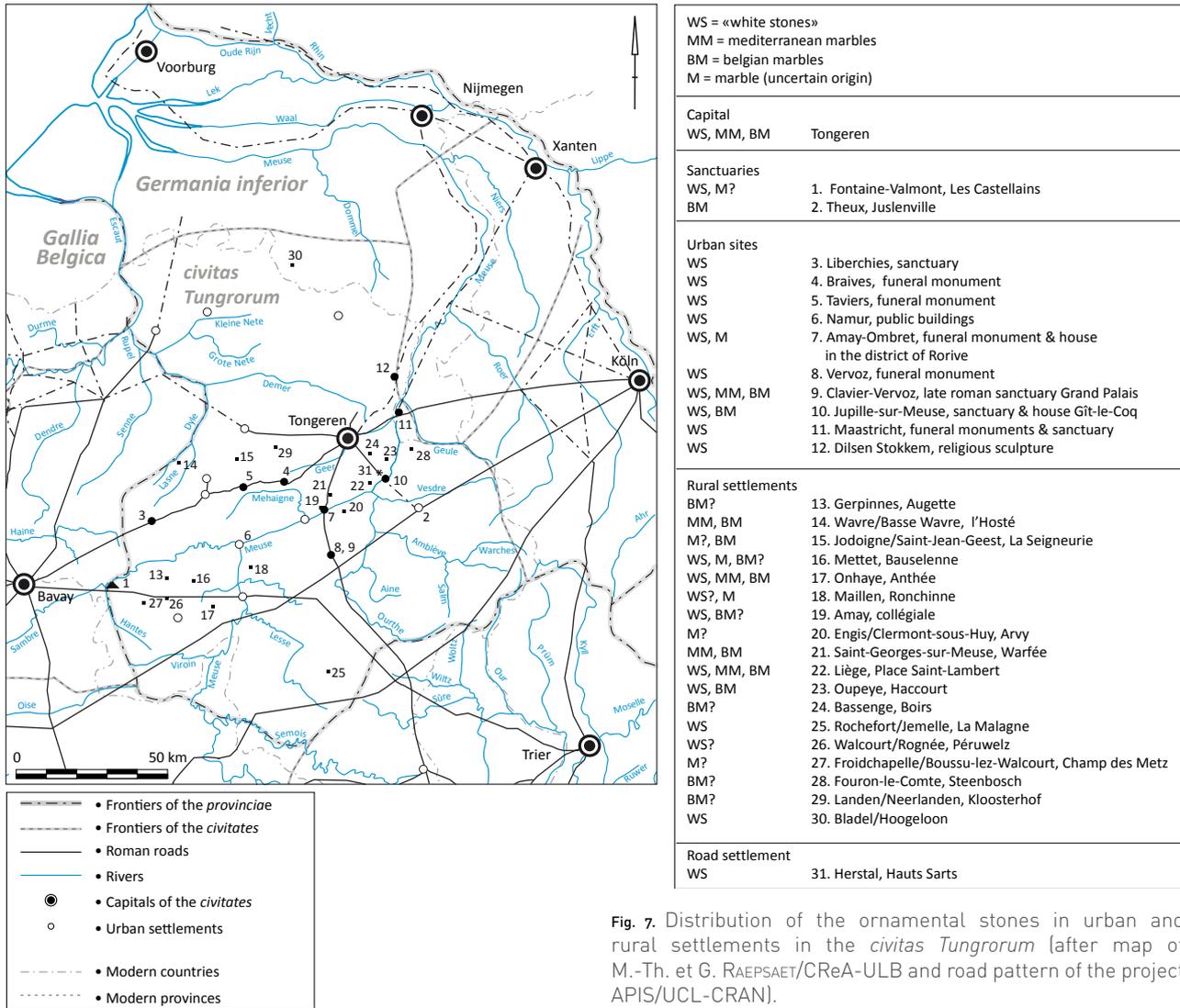


Fig. 7. Distribution of the ornamental stones in urban and rural settlements in the *civitas Tungrorum* [after map of M.-Th. et G. RAEPSAET/CRéA-ULB and road pattern of the project APIS/UCL-CRAN].

During medieval times, « white stones » (essentially Jurassic limestones) are still discretely integrated in the facing walls of some churches and castles built in the actual Belgian provinces of Liège, Namur and Limburg. The chapel of Saint-Hilaire of Namur, just like the churches of Jupille and Herstal established along the Meuse, and the church of Berg, near Tongeren, contain small blocks of carved Roman « white stones ». Some of these even served as modern liturgical furniture (e. g. altars), such as a shaft of a roman column incorporated in the altar of the church of Vieuxville in the province of Liège.

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THE USE AND REUSE OF LOCAL/REGIONAL AND IMPORTED DECORATIVE STONES IN A ROMAN URBAN QUARTER AND EARLY MEDIEVAL CHURCH IN TONGEREN (*ATUATUCA TUNGRORUM*, BELGIUM)

Alain VANDERHOEVEN, Titus PANHUYSEN & Roland DREESEN

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Archaeological excavations as a result of restoration and renovation works (underfloor heating) in Our Lady Basilica of Tongeren (*Atuatuca Tungrorum*, Belgium), revealed the presence of several closely succeeding historical building phases, showing the use and re-use of different types of decorative stones. The latter appear for the first time during the second half of the 1<sup>st</sup> century AD but they were most common from the 2<sup>nd</sup> stone-building Roman phase onwards (second half of the 2<sup>nd</sup> century and 3<sup>rd</sup> century AD). However, most of the decorative stones appear to have been recycled during the building of the late Roman basilica (4<sup>th</sup> century AD) and the succeeding Merovingian church. The largest Roman architectonic elements (e.g. columns) and sculptures have been carved in rather soft stones of local origin (such as the pale-yellow Maastrichtian Limestone and the ash-grey Nivelsteiner sandstone, both quarried nearby) or in stones imported from adjacent provinces (cream-coloured to white Jurassic limestones from the Lorraine area, Northern France, such as the pseudo-oolitic Norroy and Chémery limestones and the encrinitic Euville limestone). The latter pale limestones might well have represented good alternatives or substitutes for the white metamorphic marbles of the Mediterranean realm. On the other hand, the majority of the wall and floor decorations have been manufactured in dark-grey Lower Carboniferous limestones (e.g. Pierre de Meuse) or dark-grey coral-bearing Devonian reef limestones and in calcite-veined grey marbles (grey Belgian and French marbles), all quarried within the *Civitas Tungrorum*. Cherry-red fossiliferous Belgian marbles (Frasnian reefoid limestones) have been locally used as marble veneers and floor tiles. Finally, small fragments of more exotic white and polychrome marbles have frequently been observed, pointing to import from more remote areas (cream-coloured Lutetian limestone, Caen limestone, both from France; dark-green Trier diabase? from Germany) or even from exotic, Mediterranean sources (Rosso antico, Giallo antico, Verde antico, Pavonazzetto, Fior di Pesco, and various white saccharoid “true” marbles). Some of the latter coloured stones show good evidence for having been used as *opus sectile* marble inlays in floor or wall decorations.

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RE-USE OF ROMAN STONE IN LONDON CITY-WALLS AND THE ENGLAND'S SOUTH-EAST

Simon BARKER, Penny COOMBE & Simona PERNA

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This paper examines the recycling of Roman funerary and architectural materials in the defences of *Londinium* and compares this to other recycling of Roman material in the South-East of England. Over 200 pieces of stone statuary survive from the region and have been recently published as the *Corpus Signorum Imperii Romani GB* vol. I, fascicule 10. A number of pieces were found reused in the late Roman defences of London: recycled funerary monuments were incorporated in several of the 4<sup>th</sup> century bastions (especially at Trinity Place, Bevis Marks, Castle Street, Crosswall, Goring Street and Camomile Street), additions to the city wall, while the lower courses of the 3<sup>rd</sup> century riverside wall contained blocks from two major structures, a monumental arch and screen decorated with figures of deities. We must consider both how and why materials were chosen for re-use. Such reuse could be explained in practical terms: as funerary and public monuments fell into disrepair or lost resonance with viewers, the limestone was put to use in the latest structures, underlining the relative paucity of local outcrops of good carve-able freestone in the region. However, the demolition of public monuments and creation of new defences represents a drastic intervention in the urban fabric. Moments of threat and the need for security have traditionally provided explanation, but the new structures may function not only as security but also as symbols of urban prestige. We see this as deliberate and careful recycling, on a scale and of such a character that cannot simply be explained by lack of funds or moment of crisis. Could there, for instance, be an element of iconoclasm in the dismantling of the arch and screen of gods? Yet, iconoclasm does not explain the reverential treatment of an officialis tomb statue, found in one of the bastions with head carefully placed beneath his feet, mimicking contemporary 4<sup>th</sup> century burial practices. How was reuse carried out and what does this tell us? Was it with high technical effort and careful execution? What systems of salvage were at work? Parts of the same monument have been identified in two different bastions, numbers 8 and 10, some distance apart: does this imply blocks were stockpiled before use? What role was played by central or imperial administration in the use of second-hand material or shaping of the city space?

The evidence for recycling in London's defences will be examined against recent archaeological evidence for the transformation of the cityscape, and more broadly, against the backdrop of the growing research on recycling in late Roman city walls (DE STAEBLER, 2008; DEY, 2011; WITSCHHEL, 2013). Such research has shown that the building of and recycling in city walls cannot be explained by crisis and invasion, but the results of a range of political, ideological and military factors and interactions. These theories will be considered here.

Comparison will also be made with recycling in other parts of the south-east. In some cases, stonework may have been deliberately redisplayed, perhaps because of its apparent *Romanitas*. At Richborough, for instance, an earlier sculpture of a lion was set prominently into the defensive wall of the Saxon Shore Fort as a talisman, and Roman stone spolia were left visible in later Christian sites in the south-east. An imbricated column was reused in the chapel of the Holy Innocents in the crypt of Canterbury Cathedral as a Christussaule, while Valerius Amandinus' Westminster sarcophagus with Latin inscription was recut with an early Medieval splayed cross. However, there are other instances of demolition and concealment of earlier material: earlier mythological carvings were used in building the luxurious villa at Stanwick, near Peterborough. The latter case is particularly interesting given the proximity of the site to fresh stone from the Lincolnshire limestone outcrop and is the subject of new research.

This paper will thus provide new insights into reuse in London and the South-East and a new perspective on Roman recycling.

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### USE AND RE-USES OF MARBLES AND ORNAMENTAL STONES IN REIMS (FRANCE)

Gilles FRONTEAU, Cyrille VAN LYNDEN & Vincent BARBIN

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The geological surroundings of Reims are particularly poor in good building stones, and even more in ornamental stones. But, over time, from the roman period through medieval times, the needs were important because this city had a prestigious function: capital of Gallia Belgica during the roman period, City of the King Coronation during medieval and modern periods.

Recent studies of ornamental stones in Reims, including museum collections, monuments and archaeological excavations show, as usually observed in the north-east of France and in Belgium, the use of extra-regional white or coloured marbles and of regional black massive limestones from the Ardenne Massif, mixed with white to beige limestones. In addition of these "marbles" and analogue stones, the use of various local or regional Lutetian limestones, is also common: soft porous marine limestones for the carved bas-relief, pillar and columns, and more robust "hard" continental limestones for the basements, door frames, pavements... This latter category of stones was probably used with a coating of render or plaster (and possibly even paintings?). The widespread use of the latter limestones is not only probably linked to the difficulties of supplying marbles for the various buildings, but perhaps also to the pre-existence of a local expertise, attested by the large amount of Gallic millstones in the same facies. In a same way, a discussion about the re-use of these stones leads to two questions: was the re-use of the stones in Rheims dictated by economic reasons or did this re-use correspond to a real will of stressing the link with a prestigious past?

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### MARBLES AND OTHER BUILDING-STONES FROM AVENTICUM (CH)

Sophie DELBARRE-BARTSCHI & Thomas HUFSCHMID

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This paper will first present the decorative and the building stones of Aventicum, the ancient capital of the celtic tribe of the Helvetii, in the western part of Switzerland. An overview will be shown of the actual state of the research concerning ornamental stones and stone facings from early imperial times until the late roman period.

In the second part, the idea of polychrome stone decoration in roman architecture will be presented in a broader sense, showing examples with a regional character, where the decorative aspect has been created by the use of different coloured building stones. Thus, an architectural decoration is created, putting on stage local stone materials and underlining the static structure of the monuments. The provenance of the latter local stones, that represent in certain cases substitutes for imported marbles, is briefly discussed and the quarries are presented as far as they have been located.

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## PICTURE AND ORNAMENT – FUNERARY MONUMENTS FROM TREVES SEEN AS MEDIA ENSEMBLES

Karl-Uwe MAHLER, Anja KLÖCKNER & Michaela STARK

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Treves' funerary monuments, especially the well-known examples from Neumagen, have consistently been the main object of different investigations. Thereby, studies focused either on the typology and chronology of buildings or on their architectural decoration – the iconography of reliefs or the architectural ornamentation. In doing so, the funerary monuments' effect as media ensembles, initiating a communicative process between originator and recipient through the sum of addressed aspects, was mainly neglected. Particularly due to their specific interconnectedness of elements, which differs from those of other regions, they communicate social values and conventions.

The joint project of the Justus-Liebig-Universität, the University of Applied Sciences Mainz, the Rheinische Landesmuseum Trier and the Römisch-Germanisches Zentralmuseum Mainz, funded by the Deutsche Forschungsgemeinschaft, deals with exactly this problem. For instance, the relationship between the architectural ornamentation and figurative reliefs is examined in detail for the first time. It is necessary to investigate in how far there are repeating combinations of motives, or if a specific décor was chosen respectively for the main and the subsidiary sides. Furthermore, it should be examined if a reading direction can be determined in the "hierarchy" of the ornamentation, in which case the decorative system would not only correspond to a visual order but would also implicitly depict a social aspect. Any attempt to discuss the latter aspects on the basis of the architectural ornamentation alone would soon meet the intrinsic limitations of the genre. Only the collaboration of the project areas relief and architectural ornamentation creates a solid means of monitoring, since there might be a chance to provide evidence of an interconnectedness of visual themes in regard to context in the case of architectural ornamentation as well. It seems imaginable that certain figural representations can be connected to fixed combinations in architectural ornamentation. Since the project is still at its very beginning, mainly problems and methodology of the new approach will be presented.

In addition, the use and re-use of ornamental stones for the construction of fortifications in late antiquity will be discussed. The spolia from about 40 grave monuments used for the construction of Neumagen castle are a highly instructive example for the selection process of building material and for the organization of masonry workshops.

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## RE-USED ROMAN STONES IN THE REGION OF THE ODENWALD AND THE LOWER MAIN-VALLEY, GERMANIA SUPERIOR

Alexander REIS

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In the region of the Odenwald and the lower Main-valley red sandstone is easily quarried. The texture of the stone allows fine sculptural works. From the medieval period to the 20<sup>th</sup> century most of the stone buildings of Frankfurt and Mainz were erected with the sandstone from this region, incorporating Roman stones.

The antique stonework in the medieval buildings allows us to look at different aspects of this re-use, such as the *interpretatio christiana* or the visualization of the history of towns and villages. In some cases even sequences of the afterlife of such stones can be traced.

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## USE AND RE-USE OF ROMAN STONE MONUMENTS IN CARNUNTUM AND ITS SURROUNDING AREA

Gabrielle KREMER & Isabella KITZ

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The Roman stone monuments from *Carnuntum* (*Pannonia superior*) and its surrounding area are being recorded and evaluated under various interdisciplinary aspects by several current research projects at the Austrian Academy of Sciences, mainly in the framework of *Corpus signorum imperii romani* (CSIR) and a geo-/archaeological project focusing on local quarries, stone production and use in Roman times (CarVin). The overview of this extremely rich material also allows to forward new ideas regarding the recycling of stone material in this area. Re-use may be observed at different times, for different purposes and using various techniques. Recent excavations have revealed new evidence for large-scale re-use of stone monuments during the 4<sup>th</sup> century, which might be related to a presumed earthquake in this region. Different techniques of compiling and re-carving have been recorded. New questions concerning the division of labour, the organisation and the skills operated in the stone mason workshops of this period arise.

The situation in the metropolis *Carnuntum* will be complemented by the evidence of stone recycling in the so-called hinterland of *Carnuntum*, the Leitha region, where the local limestone quarries are located. Selected archaeological finds and records will be presented and discussed. An overview of the contexts and the chronology of recycled stone material may contribute to highlight the duration and organisation of quarrying activities in this region.

# CHAPTER 4: POSTER SESSION - ABSTRACTS

## CHAPITRE 4: POSTERS

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### SCULPTURED AND ARCHITECTONIC STONES FRAGMENTS FOUND IN THE ROMAN VILLA OF BRUYELLE (HAINAUT PROVINCE, BELGIUM)

Cécile ANSIEAU

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Many sculptured and architectonic fragments in marble or limestone were found during succeeding archaeological excavations between 1991 and 1997.

The diversity of this important set is a quite rare discovery in a part of country as well northern as Menapian City. Indeed, large series of sculptures known from Belgium are in relation with funeral themes or in connection with sanctuaries.

The fragments found in the Bruyelle villa belong to a structural part of the building or to its decoration: sculptures, high and bas reliefs, wall veneers.

All those elements were used in the villa during the 2<sup>nd</sup> century or the first part of the 3<sup>rd</sup> century AD, based on evidences from different contexts of the fillings where they were found (cellar, garbage dump and wells).

The quantity and variety of the elements testify of the quality of the works and the search of monumentality. Indeed, the examples of embedded columns, sculptures or groups are essentially found in rich and luxurious *villae* especially in the southern region of Gaul.

Although the material is too fragmentary for a detailed stylistic study, some possible lines of thought can be forwarded here.

The tracks of tools can define the degree of finish of sculpture and determine the (in)visible part of the pieces.

The study of the origin and provenance of the limestones is still in progress. A rapid comparison with sporadic pieces found in other roman villae in Belgium shows that a systematic inventory needs to be done.

Based on the examination of the pieces of Bruyelle, some interpretations can already be proposed: the “Fortuna” belongs to a domestic altar containing a possible column with a Jupiter group and an ornamental ensemble of thermal baths with mythological scene.

Maybe the presence of a rural sanctuary can be suggested here?

Hopefully, future finds on other sites will bring new evidences and will increase our knowledge of sculptures and their importance in Gaul during the 2<sup>nd</sup> and 3<sup>rd</sup> centuries AD.

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### THE ORNAMENTAL STONES AT THE “CHAMP DE SAINT-ÉLOI” VILLA IN MERBES-LE-CHÂTEAU (HAINAUT PROVINCE, BELGIUM)

Nicolas AUTHOM, Nicolas PARIDAENS & Gaëlle DUMONT

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Excavations of the Gallo-Roman villa of Merbes-le-Château, carried out between 2006 and 2009, yielded a considerable quantity of fragmented ornamental stones, in addition to a few mosaics, dating from the 2<sup>nd</sup> century AD.

Material studies revealed that the stones were both local (grey marble from the Sambre and Meuse region, red

marble from Rance, black marble from Dinant) and foreign (white marble from France and Italy, stones from various countries around the Mediterranean).

The pieces include *opus sectile*, panels of trapezoidal section, and rods and plaques, both moulded and plain. The mural decoration of the villa must have consisted in marble facings and painted panels punctuated by marble panels and embellished in places with designs in *opus sectile*.

Two column drums made with local stone (Avesnes stone) give an insight into what the villa's architectural decoration must have looked like.

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### THE POSITION OF ENGRAVED GEMS FROM INDIA IN THE INDIAN OCEAN NETWORKS

Gautam BONDADA

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The proposed paper aims to look into the evidence of engraved gems in the Indian subcontinent from the early centuries of the Common Era when commercial ties with the Roman Empire were active. A long indigenous tradition of mining and processing gemstones prior to these cross-cultural connections is well established and also acknowledged in the western classical accounts on India. Whereas this ancient industry primarily engaged in the manufacture of beads, interaction with the Hellenistic world followed by connections with the Roman Empire, prompted new artefact forms and attributes to be gradually incorporated into the native repertoire as witnessed in the archaeological record. This includes debitage from the production of cameos as well as finds of engraved gems and signet rings that initially portrayed icons common to the Graeco-Roman counterparts but gradually shifted towards representing locally popular icons and scripts. Ancient Indian literature, epics and plays, captured the local uses of this new class of objects that now became a part of the local culture but were soon to bridge areas further from the Roman world that were part of the nexus of networks that linked India and Southeast Asia.

In the so-called 'Indo-Roman trade' studies, however, unlike coins and specific ceramic categories such as amphorae and terra sigillata that are relatively easily identifiable Roman imports into India, engraved gemstones have received little attention. This perhaps is due to the small scale of tangible evidence as well as their local material and stylistic composition. Previous studies have tended to explain similarities in type and style among artefacts found in the Mediterranean region and South Asia, including

engraved gems, in terms of waves of acculturation i.e. Roman influence upon India and likewise the Indianisation of Southeast Asia. These simplistic models of cultural change have been rightly contested as insufficient and often biased accounts of cross-cultural interaction encouraging instead a review of recipient cultures as producers of new meanings of the same objects and therefore active agents in shaping culture. In understanding the nature of Indo-Mediterranean contact, a shift is also warranted from a primarily economic approach to incorporating the role of non-economic factors that might also had a bearing on these ties.

In the present paper, therefore, I seek to explore the variability in type and spatial distribution of the available evidence of engraved gems in the Indian subcontinent with reference to other markers of interaction with the Roman Empire to understand the cultural background which facilitated and sustained ancient Indo-Mediterranean interaction.

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### ROOFING SLATES USED DURING ROMAN TIMES: SOME RECENT DISCOVERIES MADE IN THE ARDENNES DEPARTMENT (FRANCE)

Gaël CARTRON

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In recent excavations made in the Ardennes department (France), many fragments of roman slates were discovered, several of which probably correspond to roofing material. This has led us to study this particular building material, which has for too long been neglected by researchers. Indeed, while baked clay tiles are commonly considered as the usual roofing material during Roman times, slates are often considered as a second choice material used by people with more limited means.

Although slate roofs are rarely found in Roman archaeological sites in the Western part of actual France, they were widely used in the Ardennes department, as well as in other French departments (Nord, Aisne, Meuse and Moselle) and in Belgium, Luxemburg and Germany. This kind of roofing is reticulated, like the type mainly discovered in the territories occupied by the Tricasses and the Lingones, who used sawn limestone slabs. In both cases, the basic element is a square slab positioned in horizontal rows with its pointed tip facing downwards. The lateral angles of the slate were carved in the shape of shoulders. The lower and upper ends of each side of the roof were covered with triangular slates, a shape which derived from the initial module, the former with the tips pointing upwards, the latter with the tips facing downwards.

These slates were nailed down and could vary in size (between 22 and 46 cm for ordinary ones) even within a single site. Their thickness generally varies between 1 and 2 cm. This type of roofing can be found in the residential parts or the outbuildings of *villae* as well as in temples or in smaller structures such as cellars, parts of thermal baths, wells or watch towers. Known as early as the first two centuries A.D., they became more common during the next two centuries, occasionally showing changes made to the original structures.

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### ROMAN ORNAMENTAL STONES IN THE COLLECTION GEOLOGY OF THE RBINS

Marleen DE CEUKELAIRE, Tommy D'HEUVAERT, Erik VAN DE GEHUCHTE

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The geology collection of the Royal Belgium Institute of Natural Sciences (RBINS) contains an extensive selection of natural and ornamental stones. The samples were collected by different scientists over a period of approximately 100 years. They originate from Belgium as well as from foreign countries. The quality of the collected samples largely depends on the interest of the researchers present at that moment.

The last year the focus was mainly on the inventory, identification and valorisation of this extensive collection. Moreover, the geology collection is still being enriched by new samples. Extra attention is paid to the provenance of the samples (e.g. extraction sites). Besides commercial and building stones, we collect as much as possible stones (major types and varieties) directly from the quarry.

Also ornamental and building stones used in Belgium during the Gallo-Roman period are part of the collection. These can be used as reference material for research and further analysis. Research can confirm the identification of a certain stone, by comparing the studied sample with a well-known sample of the collection. Some analyses can be useful to know the characteristics of the stone and so an explanation of a certain use. Besides these stone samples, also many thin sections are available. A visitor can ask a digital view of a thin section of a specific ornamental stone or even loan the slide. If related publications exist, we link them with the samples of our collection. Furthermore, technical reports on mineralogical-geochemical analyses are also available.

Visiting the collection is possible upon request as well. A virtual visit to a number of samples is also possible via the website of the RBINS in the Conabus application

(<http://mars.naturalsciences.be/geology>). On this website the different natural stones can be selected based on their major colour. If possible, additional information will be offered through the RBINS database "DaRWIN" (<http://darwin.naturalsciences.be/>).

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### PODPEČ LIMESTONE FOR COLONIA IULIA EMONA (REGIO X, VENETIA AND HISTRIA)

Bojan DJURIĆ, Luka GALE, Igor RIŽNAR, Snježana MILETIĆ

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The Podpeč limestone is a Lower Jurassic thin to very thick bedded limestone deposited in a Lower Jurassic lagoon and outcropping in central Slovenia. The individual beds range from decimetres to several meters thick light grey oolitic limestone to dark grey and almost black dense and thin- to medium-thick bedded limestone. The dark colour of these thinner beds is in strong contrast with usually white recrystallized mollusks, especially lithotid bivalves' shells, making it an attractive ornamental, as well as architectural stone. The limestone was first excavated by Romans at the beginning of the 1<sup>st</sup> century AD at the place of the modern village of Podpeč. It was transported to the Roman outpost Emona (present Ljubljana) via the Ljubljana River, where it was used for various architectural elements, sepulchral monuments, revetment plates, mosaic tesserae etc. In the main public buildings (civic basilica) the stone was used for revetment plates in combination with imported Mediterranean bigio marble.

After the fall of Emona in the 5<sup>th</sup> century, the Podpeč quarry was abandoned, until the Middle Ages, when limited production of stone blocks again took place. The old quarries were largely expanded during the early 20<sup>th</sup> century after the earthquake of 1896 shook Ljubljana and after the natural beauty of the Podpeč limestone was rediscovered. These later excavations, however, obliterated the original Roman quarry, leaving us a challenge of locating the original Roman quarry and the geological predispositions, which made this particular location attractive for excavation.

Our current results show that the steep dip of the strata, the naturally exposed rock face, and the possibility of the river transport were the crucial elements. The various uses of stone were probably further governed by the bed-thickness and/or density of clayey emersion surfaces and cleavage.

Finally, although the importance of the Podpeč limestone seems regional, it is nevertheless possible, that some of its products were transported and used outside Emona as well.

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## RUPTURE OR CONTINUITY IN THE STONE SUPPLY BETWEEN THE ROMAN AND EARLY MEDIEVAL TIMES? ORIGIN AND DISTRIBUTION OF LIMESTONE SARCOPHAGI IN NORTHERN GAUL AND RE-USE OF ROMAN ORNAMENTAL STONES

Laure-Anne FINOULST

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In the Roman period, many different stone types were employed in Northern Gaul (Meuse, Moselle and Rhine valleys) for several purposes: (monumental) buildings, sculptures and burials. On the contrary, in Early Middle Ages (Late 6<sup>th</sup> and 7<sup>th</sup> century), the uses and the types of rocks are both more restricted. Except some sculptures, most quarry stones were extracted to make sarcophagi or funeral elements.

The early medieval sarcophagi have a specific shape: they are monolithic, trapezoidal and usually undecorated. They were carved in limestones from the Lorraine area (France). Three different types of limestones are identified. The most represented stone is a Tithonian oolitic vacuolar limestone extracted in the Savonnières-en-Perthois area (Southern Meuse Department), also known as “stone of Savonnières”. A few sarcophagi are in a Bajocian limestone with bioclastic elements or biodetrital with sparitic cement extracted in both the French-Belgian border and the Metz region also known as Grandcourt, Dom, Donchéry or Jaumont stone for example. Some other sarcophagi are occasionally made of an Oxfordian or Bathonian biodetrital crinoidal limestone from the Meuse’s banks (Verdun) also known as Euville stone for example.

The diffusion of these limestone sarcophagi occurs by various modes and transports: waterways (Meuse, Moselle and Rhine) and roads (likely the roman roads), from the quarries in Southern Lorraine to the places of use in Alsace-Lorraine, Belgium, the Netherlands and Western Rhine area in Germany. The Tithonian limestones were extensively diffused in all this area. However, except for a few cases, the other types of limestone were more locally distributed.

Not only these rocks seem to have been used in the Roman period but they varied in proportions according to the areas. For example, the Tithonian limestone is identified in Grand (Vosges) for buildings and sculptures but is not diffused to the North, unless in an occasional way. In Early Middle Ages, this limestone was no more employed around Grand but was distributed to the North by the Meuse. The commercial networks or the economic purposes seem to have been different during these two periods.

In the early medieval period, most of blocks were extracted in quarries especially to make sarcophagi. Some Roman ornamental stones were opportunistically re-used as elements from buildings, but also to make sarcophagi. These blocks are recognizable thanks to their shapes as well as by their decorations or the presence of mortise on the stone surface. These re-used blocks can be of a different stone nature compared to other sarcophagi.

Whereas the stones have the same or a similar origin in both the periods, networks or supply methods do not seem to meet the same patterns. There is not a real rupture or continuity, but simply a change in the use of stones, supply networks or traditions.

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## BUILDING STONES IN A NEWLY DISCOVERED RESIDENTIAL-WORKSHOP AREA IN OROLAUNUM VICUS (ARLON, BELGIUM)

Denis HENROTAY & ÉRIC GOEMAERE

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*Orolaunum vicus (Civitas Treuerorum)* was located in the crossing of two important Roman roads: the one which led of *Durocortorum* (Reims) to *Augusta Treverorum* (Trèves), the second from *Divodurum Mediomatricorum* (Metz) to *Atuatuca Tungrorum* (Tongeren). Established during the 1<sup>st</sup> century AD, the vicus expanded during the next two centuries but at the end of the 3<sup>rd</sup> century AD, further to the multiplication of the raids of Germans, the vicus was transformed in a fortified city, with the destruction of funeral monuments and the reuse of ornamental stones in the fortifications. Since the beginning of the 21<sup>st</sup> century, excavations conducted by the archaeologists of the Province of Luxembourg (Public Service of Wallonia) allowed to double the surface known for the vicus in the roman time and to bring precision on the everyday life, the craft activities and the sources of supply of the inhabitants of *Orolaunum*. Provenance study (geological and geographical sources) of building stones is an important focus of archaeometric sciences requiring co-operation between archaeologists and geologists. Geologically, the vicus is implanted at the north-western border of the Paris Basin (exposing Triassic to Lower and Middle Jurassic sands, sandy marls, yellow “soft” sandstones, yellowish sandy limestones so called “white stones”...) and not very far from the Ardenne massifs (consisting of Lower Devonian “hard” sandstones, grey and white quartzites, dark grey roof slates,). The poster will present the building stones found in the settlements discovered along the Roman road coming from *Durocortorum*.

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### RETRIEVAL OF OPUS SECTILE COMPONENTS BY CRAFTSMEN IN THE VICUS OF ARLON (BELGIUM)

Denis HENROTAY & Éric GOEMAERE

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As part of a rescue archaeological operation, a large area (11,000 m<sup>2</sup>) was investigated by the Archaeology service of the Public Service of Wallonia. This sector is localised alongside the current rue de la Semois, in Arlon, nearby the recently discovered remains of the vicus.

Several houses-workshops were unearthed. They are arranged besides a road that was excavated for more than 55 m. Traces of antique craft activity were numerous, just like elsewhere. Three pottery kilns were discovered this way. They date back to the 3<sup>rd</sup> century.

A cellar located at the back of one of the six dwellings was filled in with fire debris. A fire indeed destroyed the whole neighbourhood circa 270. The embankments of breakdown contained fragments of polished stones from a decor in *opus sectile*.

They are gabbro discs measuring more than 40 cm in diameter. These luxurious decor items do not belong to the humble house but were probably retrieved from an important monument in the vicus.

These imported green and black-coloured stones were re-used to manufacture makeup instruments, as suggested by the presence of an eyeshadow palette made from the same material.

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### STONE MONUMENTS AND STONE QUARRING IN THE CARNUNTUM-VINDOBONA AREA – AN INTERDISCIPLINARY EVALUATION OF AN ARCHAEOLOGICAL FIND CATEGORY

Gabrielle KREMER, Isabella KITZ, Sophie INSULADER, Christian GUGL & Michaela KRONBERGER, Martin MOSSER, Andreas ROHATSCH, Barbara HODITS, Beatrix MOSHAMMER, Maria HEINRICH, Erich DRAGANITS & Michael DONEUS

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The poster is presenting the ongoing interdisciplinary research project «Stone Monuments and Stone Quarring in the Carnuntum – Vindobona Area. An interdisciplinary Evaluation of an Archaeological Find Category» (FWF P 26368-G21). The objective of our project is the scientific recording and revision of Roman-period stone monuments from the Carnuntum–Vindobona area, as well as their comprehensive analysis using an interdisciplinary approach. On the one hand, the fullest possible state of historically significant monuments is being detected. On the other hand, historico-cultural value is added to this source material by cross-linked research results from different disciplines. A major focus is the geological determination of the provenance of local stone from the Vienna Basin and the Leitha area.

High resolution airborne laser scans in combination with georeferenced historical maps are being evaluated to detect historic quarries. This approach promises to provide new knowledge about the history and relation of economy, settlements, transportation network and stonemason workshops in the Carnuntum – Vindobona region. The expected results should also create new data-sets in the fields of museology and conservation, such as for the detection of forgeries or the possible development of alternative sources of rock material for restoration.

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## FUNERARY MONUMENTS FROM WESTERN CIVITAS TREVERORUM IN AN INTERREGIONAL CONTEXT

Gabrielle KREMER, Andrea BINSFELD & Christine RUPPERT

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The poster presents a starting international and interdisciplinary project concerning Roman period funerary monuments and their components in a defined region of Gallia Belgica. The research approach aims at a cross-cultural evaluation of the material in its historical context. It includes the analysis of typological, chronological, iconographic and sociological questions as well as the provenance of raw materials and the organisation of workshops.

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## STONE OINTMENT PALETTES IN THE NORTHWESTERN PART OF GALLIA BELGICA : PROVENANCE, TRADE AND USE

Sibrecht RENIERE, Devi Taelman, Éric GOEMAERE & Wim De Clercq

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This poster presents the first systematic study of Roman ointment, cosmetic or medical palettes from northwestern Gallia Belgica, a region that extends over the current Belgian provinces of East- and West-Flanders and the Dutch province of Zeeland. Geologically, the area is characterized by the near absence of natural stone outcrops, which implies that these objects (either as raw material or (semi-)finished product) had to be imported. Ointment, cosmetic or medical palettes were used for grinding minerals and/or herbs that were mixed with oil for preparing cosmetic or pharmaceutical products. Apart from this purely functional use, these palettes could also have had a distinct social function. Some objects were manufactured from expensive decorative stones that were traded over long distances. These objects, therefore, can be seen as expensive luxury goods used by the Roman elite to showcase wealth and prestige. A study of these personal belongings, that are part of a material culture that is traditionally linked with a Mediterranean-style of living, can inform us on the processes and dynamics of Romanization for northwestern Gallia Belgica.

In this poster, we focus on the archaeological context of these objects, the characterization of the raw materials, and the geological and geographical provenance and their distribution. These palettes are almost exclusively found in urban contexts, military contexts or villa contexts. Nevertheless some examples are known from rural sites. The identified stone types include limestones, fine-grained

sandstones and porphyries derived from different geological strata and geographical areas. Examples from local/regional stones as well as more exotic ones are Tournai limestone and quartzitic tertiary sandstone from Belgium and Northern France, breccia corallina from Turkey, cipollino verde mandolato from the French Pyrenees and porfido rosso from Egypt.

The research presented in the poster is part of an ongoing PhD project that focuses on the material culture of stone artefacts (millstones, whetstones, ointment palettes) during the Roman period in the Civitas Menapiorum, situated on the northern border of the Roman province of Gallia Belgica.

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## STONE MORTARS: A BADLY KNOWN ASPECT OF THE ROMAN MATERIAL CULTURE

Geert VERBRUGHE

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As part of a research conducted on medieval stone mortars, several reports pointed out stone mortar finds from the late Iron Age onwards in Roman Gaul. Indeed, these mortars have not received a detailed account, despite a study by Dunning (1968) on the results of excavations in the fort of Richborough (England.). And in despite of the research on mortars in Purbeck Marble, Cool (2005), stated the scarcity of available synthetic data on the numerous English discoveries. The English call finds echo in more general studies in roman Aquitaine (France) (BERTRAND & TENDRON, 2012) and in Italy (CAFFINI 2010). These studies can be completed by Iron Age finds, not only on urbanized sites, like Lattes (FEUGÈRE, 1992) and Bibracte (BOYER & FARGET, 2008), but also in rural settlements (JACCOTTEY *et al.*, 2011). This study reveals, among others, a production of mortars in basalt at the end of the Iron Age, with a distribution up to Charente Maritime, where it is present next to mortars in different stone types, including marble. In accordance with the recommendations of Pliny the Elder in his «Natural History», the discoveries of Roman Aquitaine include indeed a large number of examples in this material. Two archaeological contexts now attest medical preparations: one in an Aquitaine burial of an ophthalmologist, the other in the finds of the fired domus of a surgeon moved to Rimini (Italy), where nine mortars in marble and other stones have been found (ORTALLI, 2014). For England, the cited survey point out a particularly dense distribution of stone mortars in the southwest, both from extraction and consumer sites. Their manufacturing does not take model on imported marble mortars only, that are rather

rare and restricted to major city sites. In France, studies on millstone finds in Champagne-Ardenne also reveal the first examples of a parallel production of mortars in sandstone from the north-east of Paris in the 3<sup>rd</sup> century (LEPAREUX-COUTURIER, 2013) or in vaugn rite, a magmatic rock from Burgundy (for a find in the south of Champagne (JACCOTTEY, in progress). In Belgium, the above Aquitaine study has led to the re-discovery of finds in collections of archaeological sites like Tavieres, Liberchies and Namur (VILVORDER, 2013). In the Belgian coastal fort of Oudenburg a late roman find has been inventoried (VANHOUTTE *et al.*, 2009). Furthermore, the discoveries in the portus of Dorestad (Netherlands) document the reuse of roman imported building stones (KARS & BROEKMAN, 1981).

These data clearly show the potential of the study of mortars, a badly known part of the roman material culture. Their petrographic analysis most probably will deliver interesting socio-economic data on romanisation, not only regarding the adoption and the diffusion of ways how to grind ingredients in culinary preparations, but also in medical or cosmetic preparations.

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# CHAPTER 5: THE APPLICATION OF STONE AS A BUILDING OR DECORATIVE MATERIAL IN ROMAN AND MEDIEVAL TONGEREN. A GEOLOGICAL-HISTORICAL WALKING TOUR *INTRA MUROS*

## *CHAPITRE 5 : LES PIERRES DANS LE GROS-ŒUVRE ET LES DÉCORS DES BÂTIMENTS ROMAINS ET MÉDIÉVAUX DE TONGRES. UNE PROMENADE GÉOLOGIQUE-HISTORIQUE DANS LE PÉRIMÈTRE INTRA MUROS DE LA VILLE*

Roland DREESSEN & Guido CREEMERS

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This excursion will take us to a selection of monuments dealing with the Roman and Medieval history of the town. The Romans used huge amounts of building materials, derived from local, regional or more remote geological sources: for instance, Pleistocene loam to build their aqueduct, Tertiary sands for leveling purposes, Tertiary clay for pottery making and various natural rocks as building or decorative stones. The latter have been derived from sources within the *Civitas* or they have been imported from adjacent provinces. Recycling of building stones started from the 4<sup>th</sup> century AD onwards and became common practice, especially during Medieval times. This is certainly one of the reasons why so little Roman buildings have been preserved. Moreover, tons of decorative Roman stones including fancy local and exotic marbles, have been burnt for lime production, supplying the post-Roman building projects (DREESSEN *et al.*, 2015). Interestingly, most Medieval buildings in Tongeren are made with recycled Roman building stones, using the Roman constructions as real stone quarries. Our walking-tour within the modern city of Tongeren will take us to some relicts of Roman Tongeren (*Atuatuca Tungrorum*) and will show us some nice examples of Medieval re-use or recycling. The different stops of our walking-tour are plotted on a street map of modern Tongeren (see Fig. 8) whereas Fig. 9 gives you a good impression of the extension of the Roman city of Tongeren (*Atuatuca Tungrorum*, see Fig. 9). Start of our walking-tour is the Gallo-Roman Museum (M on the map Fig. 8).

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### 1. ROMAN CITY WALL, CAESARLAAN

The oldest Roman wall was built during the 2<sup>nd</sup> century AD. It was approximately 6 m high and 2 m wide. Its length was in total 4544 m. On the outside it was surrounded by 3 monumental ditches. In surface, Tongeren was one of the largest Cities in Northwestern Europe. A much shorter second Roman wall was built during the 4<sup>th</sup> century AD, with a total length of 2.6 km and a width of 3 m. The location and extent of both Roman walls are shown in Fig. 9. The walls were not really intended as a defensive construction, but rather as a symbol of the administrative position of the Roman city, namely the Municipium. The Roman walls have been conserved at different spots. The original vestment of the walls has disappeared almost everywhere. Where it is still preserved, it is faced with regularly hewed flint blocks. What we nowadays see is the interior part of the wall, and eventually some Medieval vestment parts. The walls are standing on a dry foundation of flint nodules. Locally, in marshy areas, they were built on wooden piles. During Medieval times, the walls were used as stone quarries. The Medieval walls, and most of the Medieval monuments within and outside the City of Tongeren, were built with construction materials of these walls. The flint was found on the surface (so-called eluvial or residual flint, left after erosion of the enveloping Upper Cretaceous limestone – the so-called Maastricht Limestone) or possibly quarried in underground quarries (maybe simultaneously with the Maastricht limestone: either for building purposes or as natural fertilizer).

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## 2. THE TEMPLE

At the end of the 1<sup>st</sup> century, or possibly during the 2<sup>nd</sup> century, a temple with partly Gaulish / partly Roman elements (sometimes defined as Gallo-Roman temples) was built at the highest point of the City, at the Eastern fringe, just at the interior side of the walls. Its core existed of a small square cella, surrounded by a peristylum with steps at the front side. It was centrally situated within a large rectangular space with porticos. Just outside the walls, there are some wells, which can be one of the reasons for the emplacement of the temple. It is not known to which divinity the temple was devoted. The foundations of the walls surrounding the temple were made of nicely hewn or sawn blocks of Upper Carboniferous sandstone, Upper Cretaceous flint and Holocene calcareous tufa. In the cella, relicts were also found of building stones imported from the Eifel area, such as volcanic tufa. In the peristylum, columns were present that have been made out of white Jurassic limestones imported from the Lorraine area (Northern France) (COQUELET *et al.*, 2013). The floor decoration consisted of wine-red Famennian micaceous sandstones (flagstones) derived from local sources (Condroz area). Decorative elements consisted of different local and imported marbles, the most frequently occurring stones of which were local Lower Carboniferous limestones (DREESEN & COQUELET 2013; COQUELET *et al.*, 2014).

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## 3. ROMAN CELLAR, CLARISSENSTRAAT

This cellar that is still conserved in a subterranean parking lot, was part of a 2<sup>nd</sup> – 3<sup>th</sup> century residential house. The cellar has known some alterations, which was visible on the foundations during the excavation. It lost its function during the 3<sup>th</sup> century. There were four niches. The cellar is constructed, using different layers of building materials, including Cretaceous flint, Upper Carboniferous sandstone, and Holocene calcareous tufa. Generally, such cellars contained niches or cavities, lined with white limestone (local Maastricht Limestone or Jurassic Limestone imported from Northern France).

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## 4. ROMAN & MEDIEVAL WALLS, LEOPOLDWAL

Between 1241 and 1290, the Medieval walls were constructed, but the long list of restoration phases begins already in 1347 and they are still continuing. Since the Roman City was more extensive than the Medieval town, the walls are not always built at the same spot. At this particular place, they are running together: the Medieval walls are built above the Roman ones, using partially Roman building materials from elsewhere. At some spots, the Roman foundation is still

visible, like here. The walls were made of recycled Roman building materials taken from the underlying Roman wall and nearby Roman public or private constructions.

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## 5. MOERENPOORT

The Moerenpoort is the only Medieval towngate - originally there were six such gates - that has been conserved. It was already mentioned in 1241, but the building parts that we see at the present day were constructed in 1379. In 1673, French troops caused serious damage to the forefront. In this towngate we can find some nice examples of Upper Devonian and Lower Carboniferous limestone blocks (lower part). The upper part of the gate is made in yellow Maastricht limestone. On both sides of the gate we can observe nice examples of recycled Roman building stones in the wall, sometimes consisting of complete rows of calcareous tufa (beige), Upper Carboniferous sandstone (brown) and flint (light grey).

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## 6. THE JEKER

Tongeren was a place where the Roman road between Cologne and Boulogne-sur-Mer did pass. The Jeker river probably played an important role in the choice of the Civitas capital's location. It is supposed that the river was navigable up to this point. Most Civitas capitals were located near a river. The harbor of Roman Tongeren was supposedly situated in this area. Building materials were transported by ship (with flat bottom) on the River Meuse and its affluent, the Jeker, to the docks. The presence of such a port could explain the arrival of large amounts of building and ornamental stones in Tongeren, imported from the Eifel area (W-Germany) and the Lorraine area (N- France) by fluvial transport (Moselle, Meuse, Rhine and their tributaries).

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## 7. THE LAKENMAKERSTOREN

The Lakemakerstoren (clothiers tower) was incorporated in the Medieval ramparts along the river Jeker. The city disposed of 16 such towers. In Medieval times, each guild was responsible for the defense of a tower, which declares its name. The hemispheric construction dates from the 13<sup>th</sup> century. Only the lower parts of the tower are conserved. Here again, recycled Roman building materials can be observed.

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## 8. SAINT CATHARINA CHURCH

In the middle of the 13<sup>th</sup> century, the beguinage was founded as 'a town within the town'. It is one of the oldest and

best conserved beguinages in Flanders. In 1322, there were already 51 beguinage houses. In such a house, two or three women lived together. Since 1998, it has been recognized as a World Heritage Site by UNESCO. The church of Saint-Catherine is incorporated within the beguinage. It is an Early Gothic church, dating from 1294. It underwent several structural modifications. The church is of the pseudo-basilica type, constructed more or less like a Roman basilica with a higher central nave with windows, which is the most important difference with a Romanesque church. Most of the used building material is recycled Roman stone. French limestones have been used as replacement stones during historical restorations.

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#### 9. AGNETENKLOOSTER

Tongeren was always a religious centre, and it disposed of several monasteries. The 15<sup>th</sup> century Agnetenklooster is one of the few monasteries that have been preserved. In 1545, there was a fire that devastated the church and some other buildings. The church was soon rebuilt, but at the beginning of the 19<sup>th</sup> century, when the whole complex came in private hands, the church was pulled down. We will see some particular building stones, e.g. Upper Devonian reefal limestones with nice fossil coral colonies.

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#### 10. THE BASILICA OF OUR LADY & THE CLOISTER GARDEN

It took more than 300 years to build the Gothic church and bell tower of the Basilica of Our Lady. The construction of the Gothic church began in 1240, but the church has predecessors up to the Roman period. In 1213, the Romanesque church became heavily damaged during the siege of the duke of Brabant, which was the sign for a complete new building program. The church is almost completely built in yellow Maastricht limestone. Historical and recent restoration phases used import French limestones as replacement stones. The Romanesque cloister garden originates from the 12<sup>th</sup> century. Only a few of the capitals, made by an artist who worked also in Schwarzhof around the middle of the century, are still original and are reintegrated in the gallery after a fire in 1180. The original material was a weathering-sensitive Upper Carboniferous sandstone. The cloister garden was enlarged and rebuilt during the 13<sup>th</sup> century, with adaptations in the 14<sup>th</sup> and 15<sup>th</sup> century. During the 13<sup>th</sup> century, the Medieval monastery had to disappear, in order to enlarge the Gothic choir of the basilica. The Romanesque cloister garden is considered as one of the most important monuments of Romanesque architecture in Belgium. We can still admire the rich lithological spectrum of recycled Roman building materials in its walls. Between 1999 and 2008 an important excavation

project has been realized under the Basilica, leading to the discovery of several successive building phases, including luxury Roman private and public houses, an early Christian basilica, early Medieval, Romanesque and gothic churches (ERVYNCK *et al.*, 2014). The brand new “archaeological Cellar” under the basilica, offers a fascinating look at this historical stratification of Tongeren.

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#### 11. STATUE OF AMBIORIX

During the 19<sup>th</sup> century, people believed that Ambiorix, the king of the tribe of the Eburonians, has once lived in Tongeren, and that the Roman city was built above the chieftains central place. Ambiorix was, and still is an important person in Belgian history. Caesar described his rebellion against the Roman army, and by acting so he introduced our region in history. The statue, made by Jules Bertin in 1866, represents him as a Germanic hero. He is proudly standing in the middle of the market place of the city. The pedestal represents a prehistoric dolmen, which in time doesn't go together with our national hero. It has been made in pink-red Buntsandstein, a popular German building stone imported from the Triassic of the Eifel area.

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Fig. 8. Street map of modern Tongeren, with the locations of the successive stops of the geological-historical walking tour. Start of our tour is the Gallo-Roman Museum (M) near the Basilica of Our Lady. Note presence of several remnants of the Roman and medieval walls.

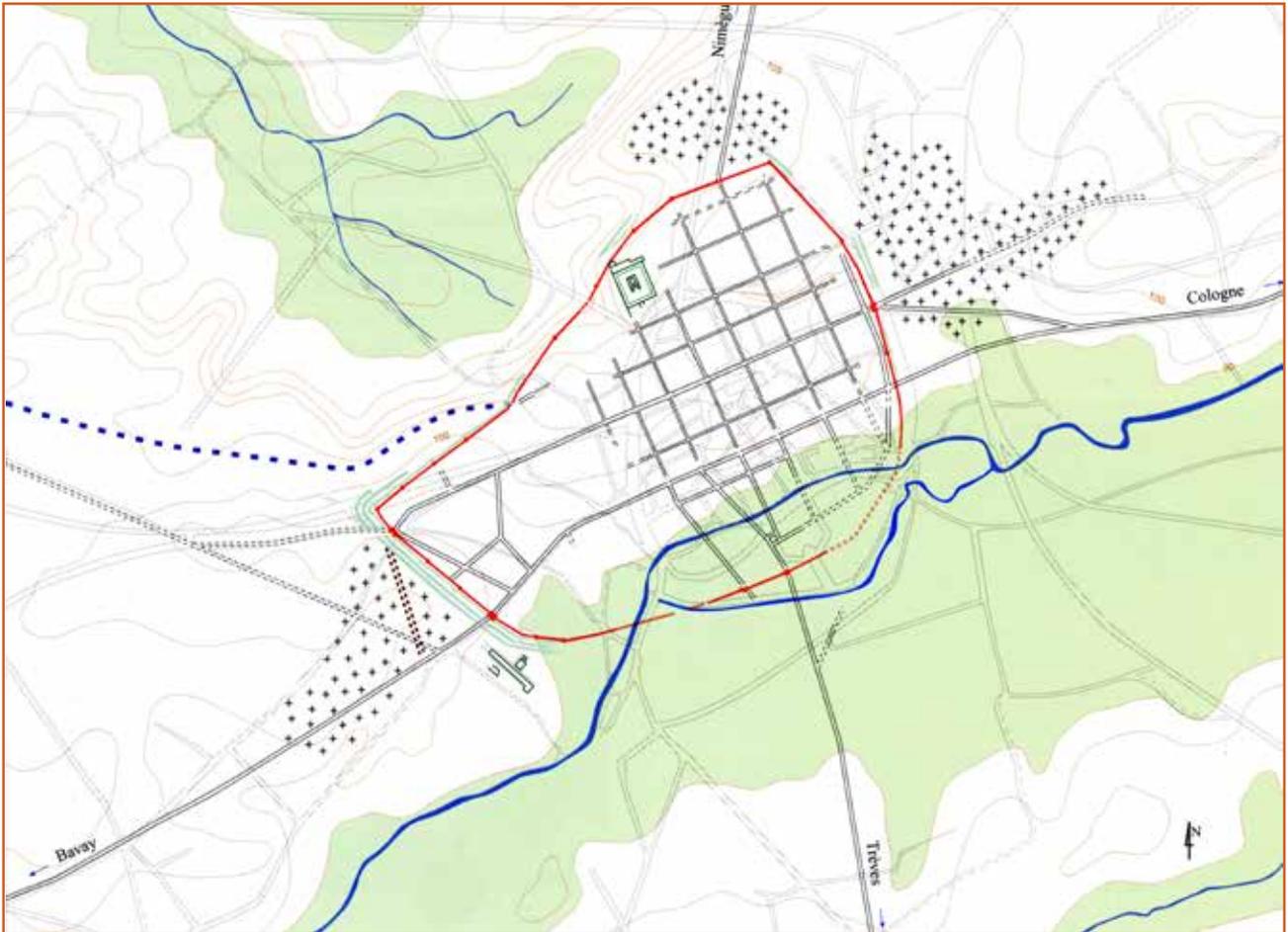


Fig. 9. Map of Roman Tongeren. Note presence of second century walls, the conspicuous street pattern, the location of the Roman road from Bavay to Cologne and that of the temple in the North [© A. Vanderhoeven, after W. Vanvinckenroye, 1985] .

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