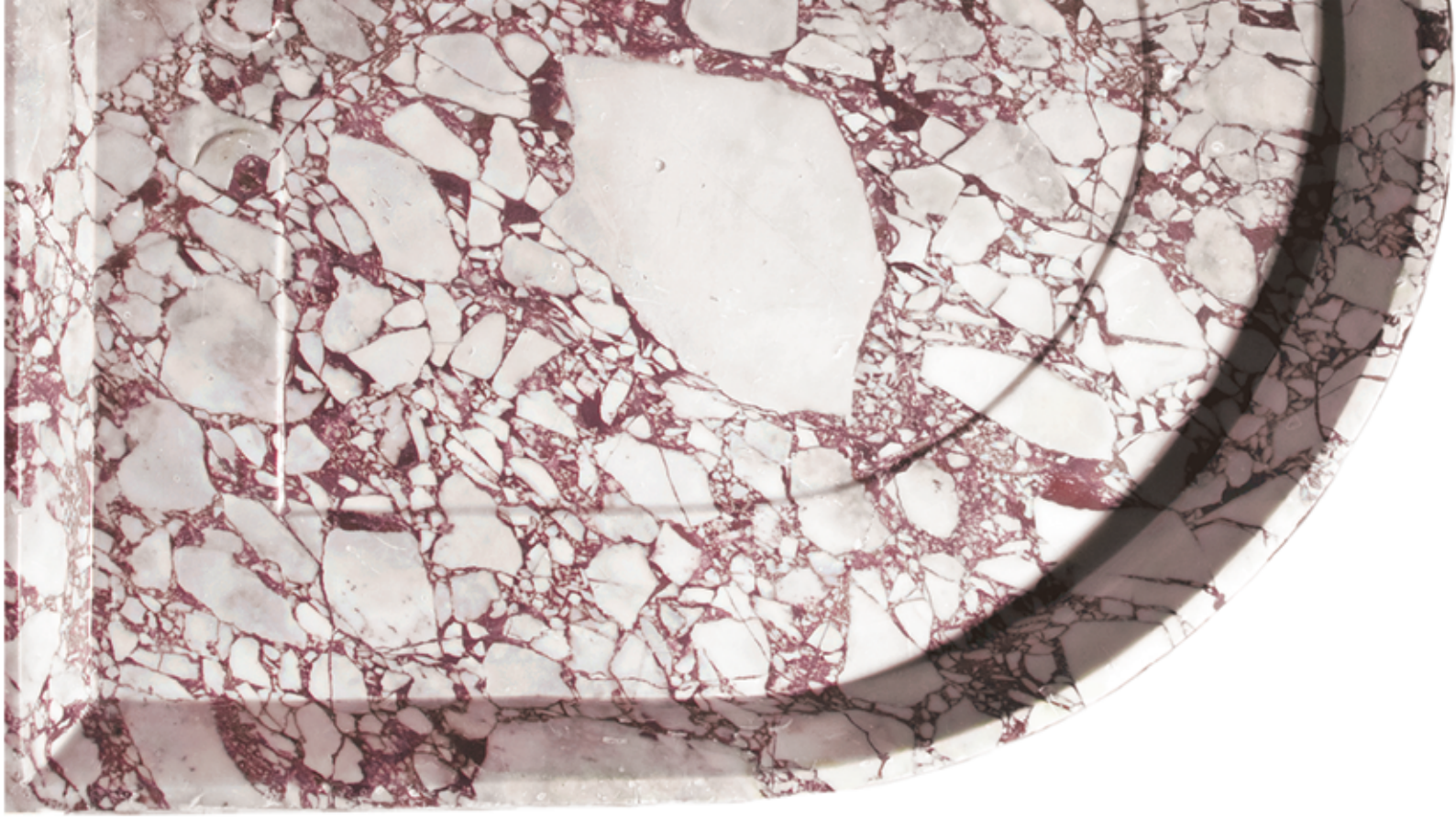
Study and Archeometric Analysis of the Marble Elements Found in the Roman Theater at Aeclanum (Mirabella Eclano, Avellino - Italy)

Mesisca, Antonio; Lazzarini, Lorenzo; Cancelliere, Stefano; Salvadori, Monica



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CONTENT

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STUDY AND ARCHEOMETRIC ANALYSIS OF THE MARBLE ELEMENTS FOUND IN THE ROMAN THEATER AT AECLANUM (MIRABELLA ECLANO, AVELLINO – ITALY)

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Abstract

Marble finds relative to the statuary, architectural features and inscriptions unearthed during the archaeological investigation of the public area in the Roman town of *Aeclanum* (Province of Avellino, Campania-Italy), offered an opportunity to undertake an archaeometric study in order to determine their constituent marble species and the sites where they were quarried, so to be able to delineate the socio-economic dynamics closely linked to the circulation of marble and its supply to centres in the hinterland of Campania in Roman times. The techniques used in the study included minero-petrographic (OM on thin section and XRD on powders) and isotopic analyses (SIRA, on powders). The combined petrographic-isotopic analyses showed a clear prevalence of Lunense marble in architectural structures, in floor and wall facings, in inscriptions and in statuary, with the sole exception of the armoured statue of Emperor M. Aurelius, of the corresponding *paludamentum* in Pentelic marble, and finally of the fragment of a female portrait sculpture in Parian marble. The conspicuous presence of Lunense marble is in effect associated with two clear phases, the first linked to building activities carried out in *Aeclanum* in the Augustan Age, after the territory belonging to the town became part of the *patrimonium principis*, and the second linked to its development in the Antonine Age, following the upgrading of the town to *Colonia Aelia Augusta Aeclanensium*.

Keywords
Campania, Aeclanum, (Mirabella Eclano, Avellino-Italy)
Roman marbles, archaeometry

Introduction

This contribution reports on the systematic study of stone finds unearthed from the archaeological layers relating to various stages in the life, abandonment and subsequent despoliation of the theater in the town of *Aeclanum* in ancient Irpinia, now within the municipal area of Mirabella Eclano in the Province of Avellino. The ancient settlement of *Aeclanum* lies on a natural, approximately triangular terrace, pointing S-SE towards the wide Fontanelle valley, at an altitude of around 390 m a.s.l.

The monumental remains that still make up the urban fabric date from the last phase of the town's life, i.e. to the period following the 346 AD earthquake, of which there are clearly visible traces, until the urban area was abandoned, fell into disrepair and suffered complete transformation.

The materials investigated for this research came from the excavations carried out by the archaeologist R. Esposito, which began in August 2006 and continued until December 2009. The campaign documented evidence of an imposing monumental complex close to the forum area, a *scaena frons* built on a rectangular plan with a façade featuring alternately spaced semicircular and rectangular niches faced with marble.

The abundance and variety of marble species found in *Aeclanum* are certainly a consequence of the fact that it lay approximately halfway along the much-used Appian Way and of the high level of wealth achieved by the town's élite.

The evidence gathered from a systematic and global examination of all the marble remains documented for the town of *Aeclanum* and the typological elements that enable the remains to be placed within a precise chronological framework show that the town enjoyed a period of considerable prosperity, especially from the Augustan Age onwards. This was due to several different factors, including its favourable position on a thoroughfare of primary importance, the only made-up road between Rome and the port of Brindisi and therefore inescapably the route to Greece and the Orient, and doubtless also its proximity to the strategic commercial crossroads of *Beneventum* during the Imperial Age.

Fig. 1. A portion of curvilinear Ionic sub-cornice

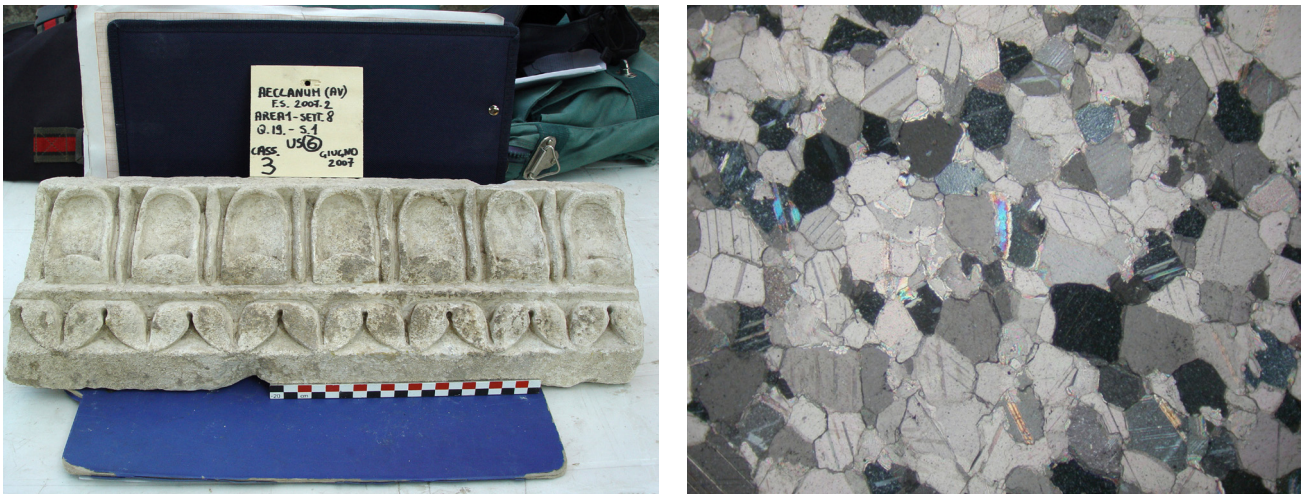


Fig. 2. A fragment of a cornice with a rounded pod-shaped decoration

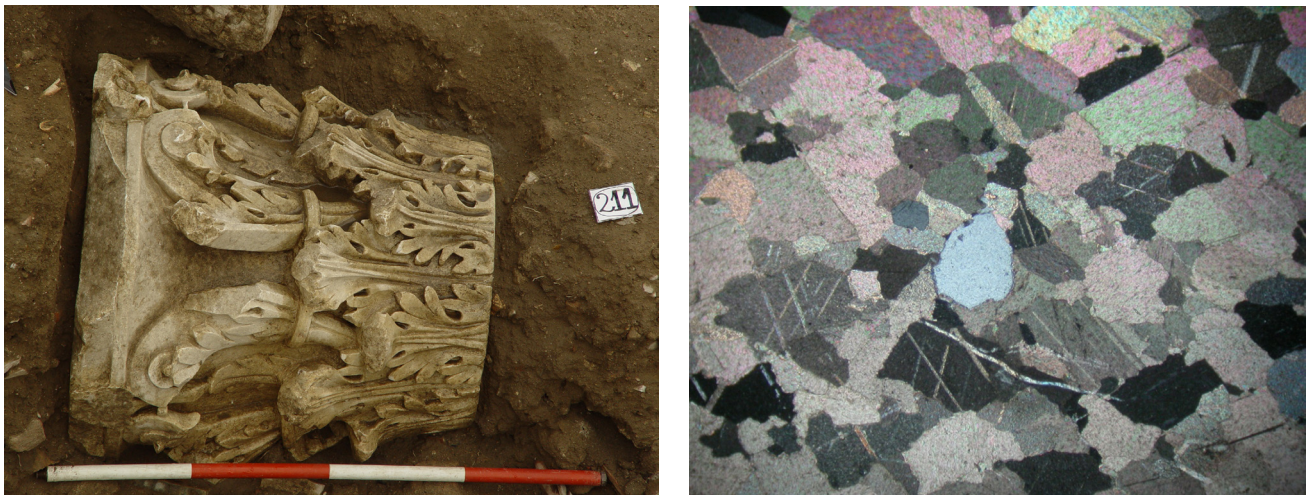


Fig. 3. A Corinthian capital

The materials examined

The systematic archaeological and archaeometric study of the stone remains found in layers pertinent to the site of *Aeclanum* was undertaken not only in order to accumulate as much information as possible about the stones themselves but also in the conviction that the results would contribute to a more general reconstruction of the socio-economic dynamics associated with the trade in stone materials, with the methods for sorting and distributing them and with the symbolic meaning connected with the use of particular lithotypes.

The research took into consideration architectural elements, statuary and stone used to face walls, pave floors and bear inscriptions.

The architectural elements comprise:

– a portion of a curvilinear Ionic sub-cornice (inv. AEC200701) (Fig. 1), the upper band featuring a continuous Ionic cyma containing a succession of egg (ovolo) mouldings set in concave shell elements, alternating with dart-shaped separators; the middle band features a row of dentils which are longer than they are wide and the bottommost moulding has a trilobate Lesbian cyma with viola flowers linked by trilobate arcuate elements containing a lanceolate, single-ribbon leaf; the piece can be dated to the Julio-Claudian period;
– a fragment of a cornice (Fig. 2) with a rounded pod-shaped decoration (inv. AEC200702), composed of adjacent vertical concave arched elements, with an intermediate element separating them from a continuous Lesbian cyma with butterfly-wing mouldings; the piece can again be dated to the Julio-Claudian period;
– a Corinthian capital (inv. AEC200704) with two orders of acanthus leaves (Fig. 3) featuring the typical late-Augustan motif (STRONG 1963; PENSABENE 2007); the acanthus has small ogival leaves, their lobes, like those of the calyxes, separated by elongated drop-shaped hollowed out recesses. The lobes have rounded leaf-ends, the upper ones superimposed on the lower leaves of the inner row. Above these a third row of stems is slightly inclined and surmounted by a convex upper fillet, from which rise the leaves of the calyxes that support the volutes and the helixes. An ogival leaf replaces the calyx of the stem that terminates in the flower of the abacus, which is no longer visible. This type can be dated to the Late Augustan-Tiberian period, 10 – 30 A.D.;
– a cornice bracket (inv. AEC200705) (Fig. 4), with an ogival acanthus leaf, the lobes of which feature elongated drop-shaped hollowed out recesses; the top of the leaf is concave and at its tip there is a fasces motif carved in relief; the piece can be dated to the Julio-Claudian period.

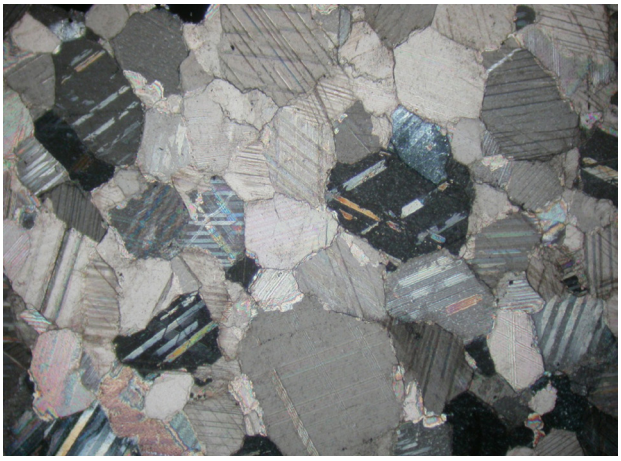


Fig. 4. A cornice bracket

The facing elements comprise:

– the curved cornice of a niche (inv. AEC200706) (Fig. 5) the front face of which has a smoothly finished cavetto moulding, *cyma recta* terminating with a narrow fillet;
– a fragment from a pilaster (inv. AEC200707) (Fig. 6) framed on both sides by a fillet (MATHEA FÖRTSCH 1999; MESOLELLA 2007), and decorated with clusters of tulips and wreaths of five-petalled lotus flowers and frontal-view open leaves;

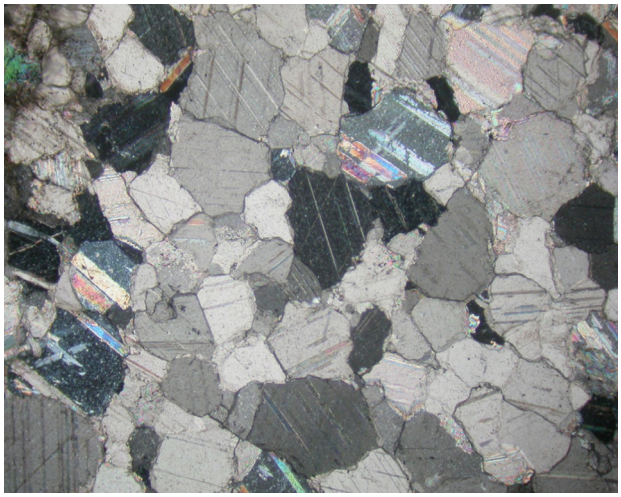


Fig. 5. The curved cornice of a niche

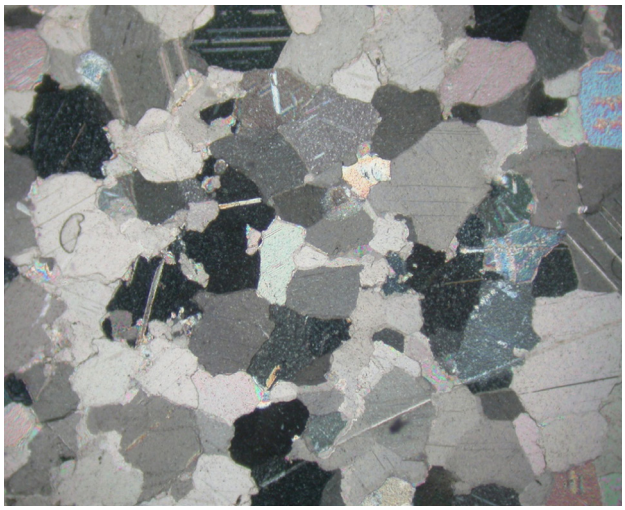
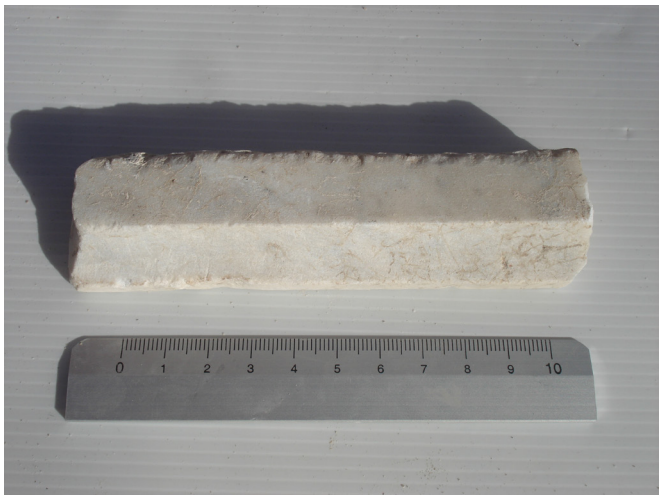


Fig. 6. A fragment from a pilaster



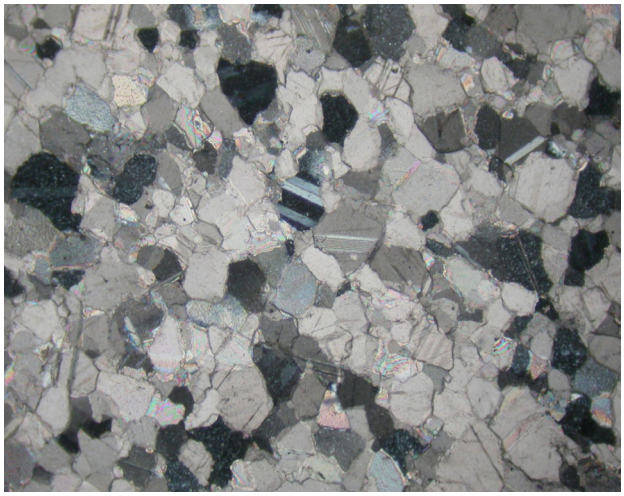


Fig. 7. A fragment of a straight coping element

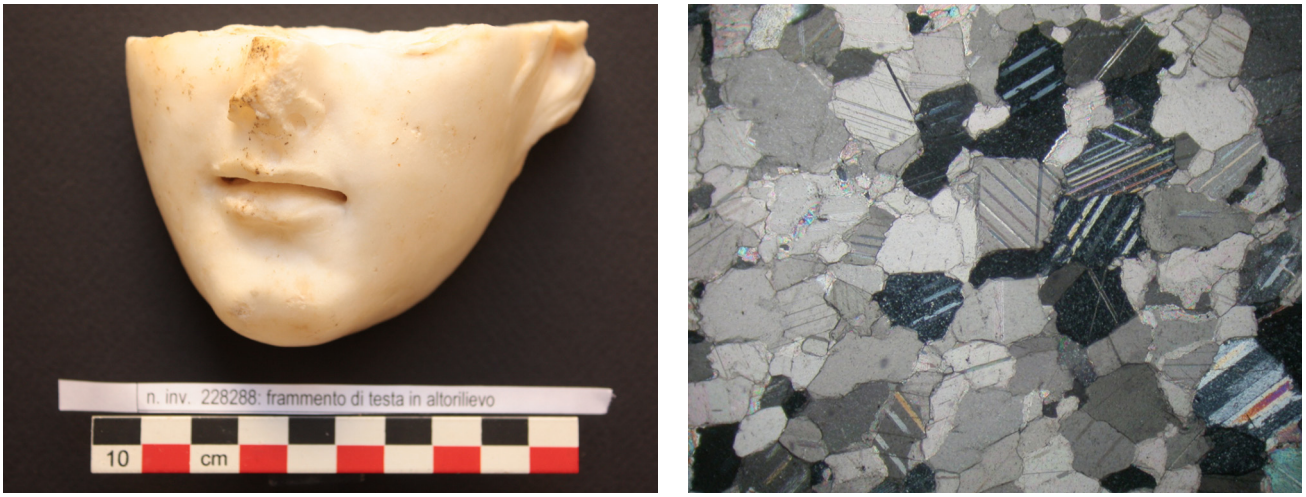


Fig. 8. A fragmentary portrait

Fig. 9. A headless loricate statue

- a fragment of a straight coping element (inv. AEC200708) (Fig. 7), rectangular in shape but with a square cross-section, with smooth moulding.

Samples were also taken from items of statuary, including:

- a fragmentary portrait (inv. AEC200709 - 228288) (Fig. 8) with facial features (nose, chin, lips and part of an ear) associated with typically classicist sculptural styles (STEWART 2003; SCHOLLMEYER 2007).
- a headless loricate statue (inv. AEC200711) (Fig. 9) with a gorgon decorating the breastplate top centre, shoulder plates and a *paludamentum* cape with well-defined folds (inv. AEC200710) (Fig. 10); the central part of the breastplate features two winged Victories flanking a trophy resting on a reversed palm motif and coils of narrow ribbons; hanging from the breastplate are two rows of elongated, figured pendants with rounded terminations (BABELON 1886; STUART JONES 1912; BERNOULLI 1889-1891; STRONG 1969; STEWART 2003; SCHOLLMEYER 2007). The statue is attributed to the Emperor M. Aurelius because of the distinctive decoration of the breastplate (*lorica*), which is a frequent feature of coins issued during his reign (BABELON 1886; COHEN 1892);
- a fragment from a portrait of a female figure (inv. AEC200712) (Fig. 11), whose hairstyle and a portion of a heavily marked eyebrow enable the sculpture to be dated to the end of the Flavian or the beginning of the Antonine period (STRONG 1969; STEWART 2003; SCHOLLMEYER 2007).

The sampled materials subjected to archaeometric analysis also included epigraphic supports, such as a fragment of a public inscription (inv. AEC200713) (Fig. 12) containing a reference to the civic institution of the IIII VIRI. The presence of this mention enables the piece to be placed between the town's designation as a

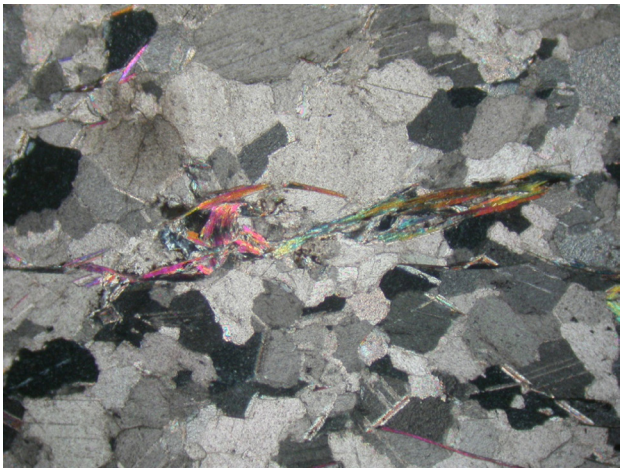


Fig. 10. A *paludamentum* cape

municipium (1st century B.C) and its elevation to *colonia* status (in the course of the 2nd century A.D.). Another fragment of a public inscription bearing a *titulus pictus* or merchant's mark (inv. AEC200714) (Fig. 13) can be dated to the end of the 1st cent. B.C. and the second half of the 1st century A.D.

Mineralogical-petrographic analyses

As is well known, the ability to identify, on the basis of scientifically obtained evidence, the quarry of provenance and the exact nature of the stone used in a sculpture or a building, in facing or as the support for an inscription, can assume various kinds of archaeological importance. It can lead to information about the studio where the piece was produced, it can help in attributing finds to a specific school, and it can provide useful leads in efforts to map the chronological and geographical distribution of a given lithotype, to the reconstruction of land trade routes and thence to information about storage and supply centres, in the present case for the hinterland of Campania.

Thin section of the samples of all the lithotypes found in the roman theater were studied under a polarizing microscope in order to determine their mineralogical composition and petro-fabric to ensure correct petrographic classification. Non-marble items, including both those made of imported ornamental stone and those of locally quarried lithotypes, will be covered in a future publication.

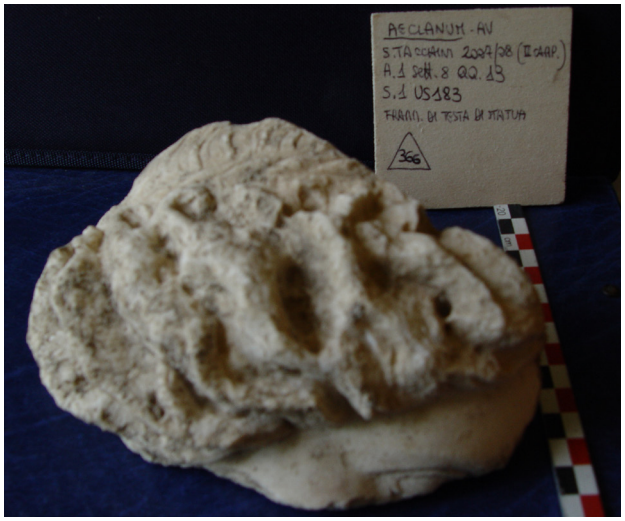
The samples of crystalline marbles were studied in greater detail, and in order to ensure they could be identified with certainty, they were also subjected to analysis of the stable isotopes of carbon and oxygen using dedicated mass spectometry.

The following characteristics of each marble were noted when it was examined in thin section under the microscope:

– its fabric, an important parameter in that this relates directly to the type and grade of metamorphism undergone by the marble;
– the outline shape of the grains of calcite; this too relates directly to the type of metamorphic genesis undergone by each marble;
– the maximum dimension of the largest grain of calcite (MGS = maximum grain size), given its considerable importance for diagnostic purposes (MOENS *et al.*, 1988);
– the presence and quantity of accessory minerals (other than calcite and/or dolomite).

The quarry from which each marble was sourced was identified by comparing the results obtained with the petrographic-isotopic data bank of reference (LAZZARINI *et al.* 1980; GORGONI *et al.* 2002; LAZZARINI 2004; ANTONELLI, LAZZARINI 2015).

Isotopic analyses were carried out on the CO_2 produced by addition of superpure phosphoric acid at a temperature of 25°C, on a sample quantity of 20-30 mg of sample powder in a special vacuum line according to the procedure suggested by McCrea (McCREA 1950).



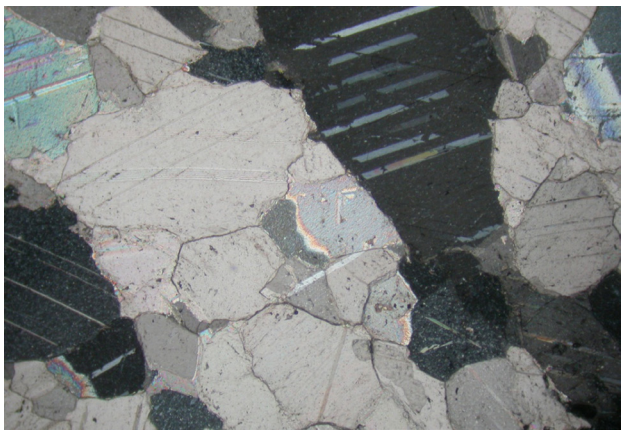


Fig. 11. A fragment from a portrait of a female figure

This CO_2 was then analysed in a mass spectrometer equipped with a triple collector, which enabled simultaneous measurements to be made of the isotopic ratios $^{13}C/^{12}C$ and $^{18}O/^{16}O$.

The results thus obtained were expressed as per convention in δ units (parts per thousand) according to the equation:

$$\delta = \left[\frac{Rcamp}{R\ std} - 1 \right] X\ 1000$$

in which Rcamp and Rstd stand respectively for the isotopic ratio of the carbon and the oxygen in the sample and in the reference standard. The standard adopted for both the carbon and the oxygen was PDB (based on the Cretaceous marine fossil, *Belemnitella americana*, from the Pee Dee Formation in South Carolina (CRAIG 1957)). For isotopic identification of the marbles, reference was made to the Herz database and to the isotopic diagram of Gorgoni (GORGONI *et al.* 2002; ATTANASIO *et al.* 2006; ANTONELLI, LAZZARINI 2015).

Finally, the samples were also subjected to a standard diffractometric analysis (radiation CuKa/Ni, at 40 Kv, 20 mA), to ascertain whether they contained any dolomitic fractions.

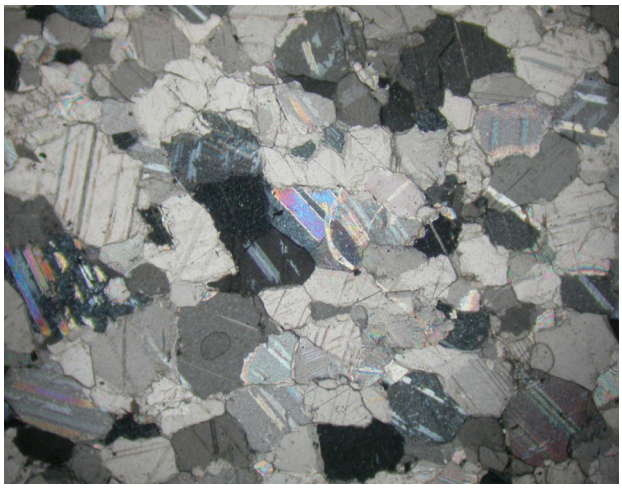


Fig. 12. A fragment of a public inscription

Results and discussion

This research project focused on a total of 13 samples subjected to archaeometric analysis. The samples were divided into four groups: architectural and facing elements, statuary and inscriptions. As Table 1 shows, the results obtained from the petrographic analyses are in large part sufficient to determine that most of the marbles examined were quarried in the Apuan Alps. The isotopic analyses (Tab. 1) confirmed this clear prevalence of Carrara marble in all four groups; indeed, all the Carrara marble samples seem to have come from the same quarry (Fig.14), with the sole exception of the

Fig. 13. A public inscription bearing a *titulus pictus*

fragment of decorated pilaster. The only samples shown not to be Carrara marble were the loricate statue and its *paludamentum* cape; these are made of Pentelic marble and the similarity of the relative isotopic readings shows that both were cut from the same block of marble. The fragment of a striking female portrait is made of the famous Parian *lychnites* marble, which came from the cave-quarries in what is now Stephani.

On the basis of the data currently available to us it may reasonably be assumed that a late-Republican phase characterised by the use of local limestones and sandstones quarried locally, or at least in the Campanian area, as is the case with the town walls and their facing in *opus reticulatum*, was probably succeeded, from the reign of Augustus in the early imperial period, by extensive use of Carrara marble and the probable employment of skilled workers in connection with projects sponsored by the emperor (PENSABENE 2005). This imported labour would appear to be evident, for example, in the fine workmanship seen in the Corinthian capital, and in the sub-cornice with dentils, Ionic *cyma* and trilobite Lesbian *cyma*, though local workshops may also have played a marginal, albeit still undocumented role.

The abundance of Carrara marble must be associated with the urbanizationundertaken in the centre of *Aeclanum* in the Augustan period, when the town became part of the *patrimonium principis* and (CIL, IX, 1105; CIL, X, 1117) later in the Antonine period following its elevation to *Colonia Aelia Augusta Aeclanensium* governed by *duoviri*.

The loricate statue with its *paludamentum*, in Pentelic marble, requires separate consideration; the care lavished on the details in the decoration at the centre of the breastplate suggests that the work was not done by local craftsmen but by specialists, probably itinerant, in the representation of imperial power. That the emperor in this case was Marcus Aurelius (CIL, IX, 1111) is clear from the fact, as mentioned earlier, that the motif of two winged victories and a trophy occurs frequently on coins issued during his reign. It is difficult to establish from the meagre data available whether the sculpture was finished *in loco* or whether work on it was already complete when it reached *Aeclanum*.

The female head is also of considerable interest given that it is made of a costly marble and so must have been commissioned by an especially wealthy person.

Supply and circulation of marbles

Many questions still remain to be answered concerning the distribution of marbles in the various centres of the empire, in particular whether they were first transported to Ostia or Rome and stored there before being forwarded to their final destination, or whether they were carried directly from the embarkation port to the end-user. It may well be that both alternatives occurred, depending on historical period, the nature of the commission, the role of the state in sponsoring the construction of certain public buildings and the role of the local aristocracy in the bestowal of private wealth for public good.

Admittedly there is no systematic overall survey of all the documented marble items found in *Aeclanum* and of typological elements allowing us to create a sound chronological framework of reference; but we need only to take account of the town's proximity to the Appian Way, the only route between Rome and the port of Brindisi, and thence to Greece and the Orient, and it

ARTEFACT	Camp N° AEC	FABRIC		Outline of Calcite/ Dolomite crystals	M.G.S.	Quartz	K-mica	Chlorite	Plagioclase	Apatite	Opaque mins.	Carbon./ Graphite Subst.	Dolomite (XRD)	d ^{18}O PDB (-)	d ^{13}C PDB (+)	PROBABLE PROVENANCE
Ionic frieze	12	HO	mosaic	Embayed	0,86							++	-	1,61	2,33	Apuan Alps (Carrara, Italy)
Cornice	9	HO	mosaic	Curved	0,64	±	±				± P, Hm	++	-	1,52	2,12	Apuan Alps (Carrara, Italy)
Corinthian capital	3	HO	Mosaic, slightly foliated	Curved	0,96	+						++	-	1,94	2,04	Apuan Alps (Carrara, Italy)
Bracket	6	HO	mosaic	Curved	1,20	±			±		±	++	-	1,96	2,14	Apuan Alps (Carrara, Italy)
Niche cornice	8	HO	mosaic	Curved	0,56							+	-	1,52	2,12	Apuan Alps (Carrara, Italy)
Fragment of pilaster with plant dec.	4	HE	mosaic	Embayed	1,16	+++	±					+++	+	1,52	1,59	Apuan Alps (Carrara, Italy)
Coping element	10	HO	mosaic	Curved	0,58		±				± P	++	-	1,87	2,03	Apuan Alps (Carrara, Italy)
High-relief head	13	HO	mosaic	Embayed	0,86							++	-	1,61	2.23	Apuan Alps (Carrara, Italy)
Paludamentum of a statue	1	HO	Mosaic, well foliated	Embayed	0,80	++	++					++	-	5,87	2,62	Mount Pentelicus (Athens, Greece)
Statue of Marcus Aurelius	2	HO	Mosaic, well foliated	Embayed	1,22	+	++	±				++	-	5,70	2,44	Mount Pentelicus (Athens, Greece)
Female statue	5	HE	mosaic	Curved / Embayed	1,46							++	-	3,97	4,97	Stephani (Island of Paros, Greece)
Inscription IIII Vir	11	HO	mosaic	Curved	1,04						± P, Hm	++	-	1,60	2, 05	Apuan Alps (Carrara, Italy)
Inscription with titulus pictus	14	HO	mosaic	Embayed	0,72						± P, Hm	++	-	1,69	2,13	Apuan Alps (Carrara, Italy)

Table 1. Summary of the results of minero-petrographic and isotopic analyses (HO, homeoblastic; HE, heteroblastic; +++, very abundant; ++, abundant; +, present; ±, traces; P, Pyrite; Hm, Hematite)

becomes possible to speculate that the marbles may have arrived as early as the I century AD, and in any case well before the campaign of rebuilding and renovation undertaken during the rule of the Emperor Hadrian.

In the light of this chronology, we should not exclude the possibility that marble artefacts may have reached *Aeclanum* from both Adriatic and Tyrrhrenian ports, together with commodities and fine crockery. In this connection it is important to stress how the advantageous position of Campania compared with the rest of Italy, and even more importantly the direct efforts of the emperor, from the beginning of his reign, in the construction and restoration of monumental works, offer clear pointers to the primary importancethe towns and cities of Campania had in the context of the establishment of the empire and the exceptional economic, commercial and strategic importance of roads, harbours and extensive imperial properties in both ports and hinterland centres.

The economic and political scenario in the internal parts of Campania seems to have changed with Trajan's decision to alter part of the route taken by the Appian Way, which stayed unchanged as far as Beneventto but then by-passed the Irpinian section in order to expedite and facilitate the transport of goods from Rome to Brindisi in a period of considerable building activity and military expansionism (JOHANNOWSKY 1994).

The construction of Trajan's new section of the Appian Way - the via Appia Traiana – led inevitably to seriously disadvantageous consequences for the town of *Aeclanum*, which now found itself excluded as a trading

centre. So to prevent the marginalization of such areas of the interior a link road was built between *Aeclanum* and *Herdonia* (Ordona) CIL, III, 1456), an important trading post on the Via Appia Trainana in Puglia, whose prosperity received a considerable boost by virtue of its position on this important new road (GOFFREDO, FICCO 2009). The *Via Aurelia Aeclanensis*, as it was called, guaranteed *Aeclanum* and its markets a rapid and efficient link to the centres on the Via Appia Traiana and to the Adriatic coast, especially for goods passing through the port of Brindisi; similarities in style and the use of materials underline that the relationship between the two centres must have been close, and there were instances of *gentes* of *Aeclanum* owning vast estates in *Apulia*.

The work to restructure the *Beneventum-Aeclanum* section, carried out first by Hadrian (CIL, IX, 6072, 6074, 6075) and later by Marcus Aurelius (CIL, IX, 1111), shows that, despite its distance from the Via Appia Traiana, *Aeclanum* tried to ensure that its link with *Beneventum* stayed speedy and straightforward because it was strategically crucial as regards traffic and trade, not only along land routes but also via water (GANGEMI 1987) given the access it provided to a river port at the confluence of the Rivers Sabato and Calore (EBANISTA *et al.* 2006). Precisely because of the presence of facilities relating to a river port, it would be useful to build up a picture of which goods and commodities reached *Beneventum* via the River Calore, which joins the River Volturno at Amorosi and flows on through Capua and finally enters the Tyrrhenian Sea at Castel Volturno.

Just as we know happened for *Minturnae*, where the navigability of the River Liri enabled supplies to reach centres in the interior and links to be maintained with the road system until the Middle Ages, it can be assumed that the River Volturno, considering its size and flow, enabled foodstuffs and other materials (Liv., XXIII, 15, 3, 4; XXIII, 17, 10) to be transported towards the centres of *Capua* and *Allifae* and finally along the River Calore to the important colony of *Beneventum*.

As things stand at the moment, we do not have sufficient evidence to support the theory that the River Calore was wholly navigable beyond *Beneventum*; what does appear indisputable is the role of the Samnite town in the Late-Republican period in the distribution of commodities and other goods, which probably included stone materials, to and from the neighbouring centres including *Aeclanum*, so we may suppose that there was both a land link along the Appian Way and along the River Calore, which was navigable at least as far as Ponte Rotto in the district of Morroni in the town of Apice.

The results of the archaeometric analyses carried out, together with archaeological data concerning style and provenance, enable us to state that the supply of commodities and other goods including stone, by land or river, was connected with internal factors in the town such as the evergetism and munificence of the ruling classes, but also with external factors including the town's participation in imperial schemes or direct action on the part of the central powers.

In conclusion, it is probable, taking into account the purchasers, the provenance and the logistics of the goods in question, that they were transported overland from the late-Republican period until the rule of Augustus, whereas from the Julio-Claudian period, when the river port at Benevento was created or expanded (GIAMPAOLA 1991; CIPRIANO, DE FABRIZIO 1996; EBANISTA 2006), and with the construction of the Via Traiana in the II century, the River Calore was also used.

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