Conclusion

The combination of scientific methods (isotopic analysis and grain size measurements) and optical analysis illuminates the interaction of local and imported white and gray marbles in North Eastern Algeria. Each of the three Algerian sources for architectural marble dominated the market in their immediate neighborhood. Marble from Mt. Filfila and Cap de Garde was able to penetrate their neighbors’ home territories to some degree, while travertine from Mahouna apparently remained more local. Cherchel in the royal period had access to the best products of Rome and the Carrara quarries, but some architectural elements were made of Filfila marble. In the late second century Proconnesian marble was imported to Algeria, and Proconnesian designs were reproduced in the marble of Mt. Filfila.

John J. Herrmann Jr., Donato Attanasio, Robert H. Tykot, Anniewies van den Hoek
Aspects of the Trade in Colored Marbles in Algeria

Quarries and artifacts of colored marble in Algeria have been sampled and their stable isotopes of carbon and oxygen analyzed. These laboratory data have been supplemented by macroscopic observations of color and structure. In many cases it has been possible to attribute the marble of artifacts to quarries in Greece, Turkey, Tunisia, and Algeria itself. In some cases macroscopic and isotopic data contradict one another, and in others it seems possible that the marble came from currently unknown quarries.

Keywords: quarries, stable, isotopes, Mahouna, Ain Smara, alabastro a pecorella.

Background and methodology

In the nineteenth century Algeria was celebrated for its quarries of colorful marble, and these quarries have continued in use under the management of Enamambre, the Algerian national marble company. The team of Antonelli, Lazzerini, Cancelliere, and Dessandrier has provided scientific data on some of the quarries and has identified artifacts made of their marble at Djemila. We have also undertaken surveys of the Enamambre quarries, which in geological terms produce true marble, calcite-alabaster, and travertine, and have sampled artifacts in many archaeological sites and museums. Analysis of the samples is underway at the University of South Florida (USF) and the Istituto di Struttura della Materia of the Centro Nazionale di Ricerche (CNR) at Rome. The ratios of stable


isotopes of carbon and oxygen are being determined, grain size is being measured, and EPR analysis is in progress. Since testing is still incomplete, this report will be based primarily on isotopic results and will deal with sites other than Djemila. It should be noted, moreover, that optical evidence is often valuable and even decisive in identifying colored marble.

At the moment we have extensive isotopic results for the quarries of Bou Hanifia, Mahouna, and Ain Smara, and a single sample for Kristel, which is augmented by several other samples provided by Antonelli and co-workers (FIG. 1). In our isotopic diagrams we also include Norman Herz’s data on quarries of colored marble at Chenoua and Djebel Ichkeul in Northern Tunisia (FIGS. 3-4). Chenoua produced the famous giallo antico, and Djebel Ichkeul produced a somewhat similar yellow breccia, which has rarely, if ever, been identified in an ancient context. There are, however, signs of ancient work at the quarry. In general, isotopic evidence on these and most other quarries of colored marble is still in short supply, and the question of their variability has yet to be confronted. Antonelli and co-workers have questioned the reliability of carbon and oxygen isotopes for colored alabaster/travertines. Our experience so far has been that the quarries are generally consistent isotopically but can have very distant outliers.

Centers of the marble trade and quarrying

Colored marbles imported from Eastern quarries play their greatest role at Cherchel, which is conspicuous for its large, monolithic column shafts. Cherchel has shafts of africano (marmore lacusculaeum) from Teos (FIG. 1) and shafts of breccia corallina (marmore sagariumi) from Vezirhan, both in Turkey (FIG. 1). Illustrations of these and other famous types of marble are available in recent literature and on the Internet. Column shafts also came to Cherchel from Greece: portasanta (marmore chiusi) from the island of Chios, and cipollino verde (marmore carystium) from Carystos, Euboea (FIG. 1). Shafts of giallo antico brecciaio (marmore numidicum) came from Chenoua, Tunisia. A labrum of pavonazzetto (marmore docimium) from Turkey is in the Cherchel museum’s courtyard. Cherchel’s status as the capital of the Mauretanian kingdom favored by Augustus and later as capital of the province of Mauritia Caesaris undoubtedly explains the abundance of large, colorful column shafts and other prestigious artifacts found there.

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2. Ibid., pp. 582, 584, fig. 7.
3. Ibid., pp. 585, 587, fig. 10.
7. See, for example, http://www.musma.unipv.it/risultato_inv.asp?order=1.
from Vezirhan (USF 9362-3) (TAB. 1, FIG. 3)\(^{10}\). These prestigious imported marbles testify to Tebessa's importance, presumably in Severan times.

Elsewhere large colorful shafts make only sporadic appearances. Single shafts of *marmor crysolum* appear at Hippo Regius and Annouma. Shafts that seem to be *breccia corallina* appear at Skikda and Annouma, but isotopic testing indicates that neither comes from Vezirhan. The shaft in Skikda (USF 10948a-b) is a fairly good isotopic match for quarries at Kristel on the coast of Western Algeria, while the source of the Annouma shaft (USF 10859) is unknown (TAB. 1, FIG. 3)\(^{11}\). A shaft at Cherchel looks like *brecciatolone*, a variety of *marmor sagarium* from Vezirhan\(^{12}\), but its isotopes seem to contradict this (USF 9316) (TAB. 1, FIG. 3). If the isotopic evidence can be trusted, these shafts may have been quarried in North Africa as substitutes for the famous Asiatic stones.

In spite of Algeria's proximity to Chentou, *marmor numidicum* column shafts are rare, and this scarcity testifies to the tight imperial control over these prestigious products. In addition to the examples at Cherchel, shafts traditionally identified as *giallo antico* are found in a temple in Khemissa, where they appear in the unusual form of drums rather than monoliths (USF 10851) (TAB. 1, FIG. 3)\(^{13}\). There is not a close isotopic match with Chentou, but this may be due to a lack of quarry data. *Marmor numidicum* is used for the earliest known artifact in colored marble in Algeria: a Corinthian capital found at Constantine, datable about 130-50 BCE\(^{14}\).

Most colored marble in Algeria takes the form of facings for


\(^{11}\) A few broken plaques of marble from Kristel seem to appear in the courtyard of the Cherchel museum.


Table 1: Architectural decoration in colored marble in Algeria: *breccia corallina*, *giallo antico*, and similar*.

<table>
<thead>
<tr>
<th>USF lab #</th>
<th>δ¹³C</th>
<th>δ¹⁸O</th>
<th>MOS</th>
<th>Probable quarries</th>
<th>Location</th>
<th>Inv. #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9376</td>
<td>-3.0</td>
<td>-13.3</td>
<td></td>
<td>Unknown</td>
<td>Cherchel, Place des Martyres</td>
<td></td>
<td><em>Brocatellone</em> column shaft</td>
</tr>
<tr>
<td>9362</td>
<td>1.3</td>
<td>-4.3</td>
<td></td>
<td>Vezzirhan (breccia corallina)</td>
<td>Tebessa, Basilica</td>
<td></td>
<td><em>Breccia corallina</em> shaft, south colonnade, 3rd from east</td>
</tr>
<tr>
<td>9363</td>
<td>1.2</td>
<td>-3.6</td>
<td></td>
<td>Vezzirhan (breccia corallina) (exterior)</td>
<td>Tebessa, Museum</td>
<td>JH #9</td>
<td>Fragmentary column shaft of <em>breccia corallina</em></td>
</tr>
<tr>
<td>10831</td>
<td>-1.6</td>
<td>-9.1</td>
<td>0.2 mm</td>
<td>Ain Smara, Chemtou 1</td>
<td>Khemissa, Old Forum, temple at west</td>
<td></td>
<td>Uniform yellow column drum</td>
</tr>
<tr>
<td>10839</td>
<td>5.4</td>
<td>-11.8</td>
<td>1.0 mm</td>
<td>Unknown</td>
<td>Announa, deposit below S. Church</td>
<td></td>
<td><em>Breccia corallina</em> type shaft, Ø 46.5 cm</td>
</tr>
<tr>
<td>10948a</td>
<td>2.0</td>
<td>-9.1</td>
<td>4.0 mm</td>
<td>Kristel</td>
<td>Skikda, Theatre</td>
<td>Col. 38</td>
<td><em>Breccia corallina</em> type: angular grayish clasts in red matrix</td>
</tr>
<tr>
<td>10948b</td>
<td>2.3</td>
<td>-9.2</td>
<td>4.0 mm</td>
<td>Kristel</td>
<td>Skikda, Theatre</td>
<td>Col. 38</td>
<td><em>Breccia corallina</em> type: angular grayish clasts in red matrix</td>
</tr>
<tr>
<td>10982</td>
<td>2.4</td>
<td>-5.5</td>
<td>very fine</td>
<td>Chemtou 1, D. Ichkeul, Kristel</td>
<td>Cherchel, route Nationale, route Revolution</td>
<td></td>
<td><em>Giallo antico breccia</em></td>
</tr>
</tbody>
</table>

* Abbreviations in the tables: MOS = maximum grain size; JH = J. Herrmann list of samples; USF = University of South Florida. Preferred quarries are underlined.

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Table 2: Architectural decoration in colored marble in Algeria: various marbles.

<table>
<thead>
<tr>
<th>USF lab #</th>
<th>δ¹³C</th>
<th>δ¹⁸O</th>
<th>MOS</th>
<th>Probable quarries</th>
<th>Location</th>
<th>Inv. #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9348a</td>
<td>-0.8</td>
<td>-13.4</td>
<td></td>
<td>Mahouna</td>
<td>Hippo Regius, seafront villa, basin</td>
<td></td>
<td>Red alabaster revetment panel in fountain</td>
</tr>
<tr>
<td>9348b</td>
<td>-0.8</td>
<td>-13.2</td>
<td></td>
<td>Mahouna</td>
<td>Hippo Regius, seafront villa, basin</td>
<td></td>
<td>Red alabaster revetment panel in fountain</td>
</tr>
<tr>
<td>9351</td>
<td>0.9</td>
<td>-15.1</td>
<td></td>
<td>Mahouna</td>
<td>Announa, Temple with huge capitals</td>
<td></td>
<td>Red-orange plaque lying next to a revetment plaque in situ</td>
</tr>
<tr>
<td>9368</td>
<td>2.6</td>
<td>-2.0</td>
<td></td>
<td>Carytoss (cipollino)</td>
<td>Tebessa, Temple, SE column shaft</td>
<td></td>
<td>Green layered marble with tan weathering layer (cipollino)</td>
</tr>
<tr>
<td>10844</td>
<td>1.3</td>
<td>-3.7</td>
<td>0.3 mm</td>
<td>Tissoua? Vezzirhan?</td>
<td>Khemissa, Temple of Neptune</td>
<td>JH #2</td>
<td>Revetement plaque at base of wall, pink and white marble</td>
</tr>
<tr>
<td>10853</td>
<td>1.7</td>
<td>-12.2</td>
<td>0.6 mm</td>
<td>Bou Hanifa</td>
<td>Khemissa, Baths by New Forum</td>
<td>JH #11</td>
<td>Triangular rose and white plaque, &quot;calciretta metamorphique&quot;</td>
</tr>
<tr>
<td>10891</td>
<td>-2.1</td>
<td>-9.8</td>
<td>1.5 mm</td>
<td>Unknown rosso breccia</td>
<td>Lambése, Capitoline, podium</td>
<td></td>
<td>Red marble plaque speckled with white and black</td>
</tr>
<tr>
<td>10895</td>
<td>-0.9</td>
<td>-9.5</td>
<td>1.5 mm</td>
<td>Unknown rosso breccia</td>
<td>Lambése, near Aesculapius Temple</td>
<td></td>
<td>Thin red marble plaque speckled with white and black</td>
</tr>
<tr>
<td>10992</td>
<td>1.0</td>
<td>-4.9</td>
<td>fine</td>
<td>Chemtou 1, D. Ichkeul, Krist.</td>
<td>Hippo Regius, seafront villa</td>
<td>JH #2</td>
<td>Yellow panel in 10-column courtyard, Quartier des Villas</td>
</tr>
<tr>
<td>10993</td>
<td>-0.3</td>
<td>-18.4</td>
<td>1 mm?</td>
<td>Mahouna</td>
<td>Hippo Regius, seafront villa</td>
<td>JH #3</td>
<td>Yellow and white panel in 10-column courtyard, Quartier des Villas</td>
</tr>
</tbody>
</table>

* Abbreviations in the tables: MOS = maximum grain size; JH = J. Herrmann list of samples; USF = University of South Florida. Preferred quarries are underlined.
pavements and walls. Facing slabs of *giallo antico* and a few other widely used stones from Greece have been reported at Djemila. A small yellow plaque at *Hippo* was tested isotopically and proved to be *giallo antico* (USF 10992) (Tab. 2, Fig. 4). Some Algerian centers were apparently richer in imported stones than Djemila. A variety of *crustae* from Greece and Asia Minor is preserved on the interior walls and in the courtyard paving of the Cherchel museum and in the floor of the Timгад museum. These fragments were probably collected from excavations and cemented into permanent displays when the museums were created. A few fragments in Timгад seem to be *rosso brecciatato*, a red marble with black and white spots from Iassos, Caria, Turkey, and two more such plaques were found at nearby *Lambaisis*. Their isotopic ratios, however, seem to contradict a provenance from Iassos and fall in the field for Ain Smara (USF 10891, 10893) (Tab. 2, Fig. 4). No red stone like this is known at the latter quarry. Pink and white marble plaques in the temple of Neptune ("temple des caux") at Khemissa come close isotopically to Iassos and Vezirhan, without resembling either unambiguously (USF 10844) (Tab. 2, Fig. 4).

Algeria is especially rich in quarries of calcite-alabaster or onyx marble, termed travertine in its less translucent form. Red and white *alabastro a pecorella* is famous for its use in Italy, and small quantities were exported to Tunisia, Egypt, and Spain. Fragmentary plaques of *alabastro a pecorella* also appear in the theatre of Nora in Sardinia. Inspection of the Enamarbre quarries has revealed that this beautiful travertine comes from Bou Hanifia near Mascara rather than Ain Tekbale near Oran, as has been traditionally maintained. Colonne types of *alabastro a pecorella* were used in the triumphal arch at Timгад. Facings of *alabastro a pecorella* may have been fairly widely used in Algeria. Fragmentary plaques of this stone are preserved at Djemila and in the floor of the Timгад museum. Well-preserved panels appear in a fountain basin in *Hippo* (USF 9348) (Tab. 2, Fig. 4), and a fragmentary rose-colored plaque at Khemissa also could be from Bou Hanifia isotopically (USF 10893, Fig. 4).

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16. Verde antico, cipollino verde, portasanta, breccia di Skiros; breccia cordilina, africano, bigio antico; giallo antico, breccia giulia. A rosso antico cornice is in the West Baths at Cherchel.
17. Verde antico, cipollino verde, portasanta, breccia di Skiros; breccia cordilina, pascinazzetto, rosso brecciatato, africano, giallo antico.
24. Antonelli et al., On the White and Coloured Marbles, cit., pp. 577, 579, fig. 2b.
25. Herrmann, van den Hoek, Tykot, Alabastro a pecorella, cit.
A travertine with vivid contrasts of pink, brown, gray, and white is produced at Mahouna, and pink slabs from this quarry were used for facings in Eastern Algeria. A fragmentary pink slab in a temple at Announa and a yellowish pink alabaster slab at Hippo Regius have isotopic values compatible with Mahouna (USF 9351, 10993) (Tab. 2, Fig. 4). Architectural elements, such as altars, pedestals, and small columns, were also made of Mahouna travertine, but they tend to be much less colorful. Some are essentially white, while others have by pink, gray or greenish bands, as in a Tuscan column from Announa (USF 9388) (Tab. 3, Fig. 5). Several banded or layered marble objects resemble Mahouna travertine but, judging by their isotopic values, come from an unknown quarry or quarries (USF 10840, 10852) (Tab. 3, Fig. 5).

Among the formerly celebrated quarries of Algeria are those of Ain Smara, near Constantine. The main variety of stone produced there is a honey-white layered travertine called onyx doree. No signs of ancient work appear in the quarry, but a small column shaft in the Constantine museum and an altar at Skikda seem clearly to come from this source, judging by their isotopic ratios and macroscopic appearance (USF 10917, 10954) (Tab. 3, Fig. 5). A very different alabaster from Ain Smara seems to have been used in antiquity. A small region at Ain Smara produces an unusual red, white, and black alabaster, a kind of grayish alabastro fioreto, which is locally called breche d'Afrique. A fragmentary plaque at Khemissa resembles this stone and has isotopes that coincide with an outlier of Ain Smara (USF 10845) (Tab. 3, Fig. 5).

Several slabs and an altar in the forum at Madaura in eastern Algeria are a type of alabaster with yellow, white, and gray bands that is visually similar to the Egyptian alabaster (Alabastro cotognino) (USF 9460-1) (Tab. 3, Fig. 5). The Madaura artifacts have isotopic values that correspond to the new isotopic results for Ain Tekbali, and they probably came from that source. Macroscopic observation indicates that the white-brown-orange travertine quarried at

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27. On contradictory results obtained by analyzing the C/O and C/Si isotopic ratios of alabasters from Ain Smara and Mahouna, see Antonelli et al., On the White and Coloured Marbles, cit., pp. 585, 587, fig. 10.

Ain Tekbalet, whose isotopic data are not included in the Figures, was used in Western Algeria, Cherchel, and perhaps Djemila.

**Conclusions**

Our isotopic testing and visual survey are in some cases contradictory but in other cases the two methods agree and provide clear identifications of the quarries of origin. Some of the uncertainties may be resolved by the application of other scientific methods and by more extensive sampling of colored marble quarries in both Algeria and the East. Our preliminary results, in any case, make it clear that some cities of ancient Algeria had access to a wide range of elite marbles from Aegean sources, and numerous local quarries provided material for the grandiose building projects of second- and third-century Algeria.

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Federico Frsson

Numidi in Liguria, Liguri in Numidia

A proposito di alcuni episodi bellici del II secolo a.C.

Cavalieri numidici presero parte, come truppe ausiliarie, alla campagna militare che il console romano Q. Minucio Terzo condusse contro i Liguri nel 193 a.C. Analogamente, corpi ausiliarie diari furono impiegate dai Romani in Numidia nel corso della guerra contro il re Giugurta verso la fine del II secolo a.C. Le testimonianze delle fonti antiche (soprattutto Livio, Frontino e Sallustio) riguardo ai Numidi in Liguria e ai Liguri in Numidia, analizzate in modo approfondito all'interno del loro contesto storico, sono significative di un lato per ricostruire l'equipaggiamento e le tattiche militari tradizionali dei Numidi, dall'altro per conoscere le attitudini dei guerrieri liguri.

**Parole chiave:** Numidia, Liguria, ausiliarie, cavalieri, Giugurta.

I cavalieri, componente principale degli eserciti numidici1, ebbero, com'e noto, un ruolo importante nel corso delle battaglie della seconda guerra punica, quando combatterono non solo negli eserciti...