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On the importation of monumental marble to Sardis

Robert H. Tykot and Michael H. Ramage

Abstract Recent work on some architectural marble at Sardis, dating to the 6th century BC, suggests that the marble is not from local quarries. We estimate that the marble of the tomb chamber of Alyattes, fourth king of Lydia, weighs at least 100 tons; the prospect of transporting such an amount over a long distance is not to be taken lightly. Stable isotope and petrographic analyses of marble from the tumulus of Alyattes are consistent with the marble having been imported from Ephesos, although comparative data are not available for some minor marble sources which are closer to Sardis. Other marble sources at Ephesos were used for the Artemision, also dating to the 6th century BC, and historical evidence demonstrates that Sardis and Ephesos did have close ties. Nevertheless, the movement of such a large quantity of marble, probably by boat along coastal and riverine routes, would have been a considerable effort.

The identification of the source of marble for the tumulus of Alyattes is important for our understanding of marble exploitation patterns during the Archaic Period in particular – and in the ancient Mediterranean in general – since it appears that the use of local sources can no longer be assumed, even for large-scale architectural purposes. This study also promotes the use of a multi-method approach to marble sourcing, while illustrating the limitations of provenance studies in which not all possible sources are well characterized.

INTRODUCTION

The source analysis of some architectural marble at Sardis in western Turkey, dating to the 6th century BC, surprisingly suggests that the marble is not from local quarries (Fig. 1). We estimate that the marble of the tomb chamber of Alyattes weighs at least 100 tons; the prospect of transporting such an amount over a long distance is not to be taken lightly. We analyzed marble samples from the tomb using stable isotope, petrographic, and historical evidence. The stable isotope data for the tomb chamber do not match the Sardis isotope field, nor a previously undocumented quarry in the same region. Ephesos appears to be the best match based on isotopic, petrographic, and historical evidence, although data are not yet available for some other minor marble sources which are closer to Sardis (Ramage, 1995; Ramage and Tykot, 1995).

TUMULUS OF ALYATTES

The tumulus of Alyattes, the fourth king of Lydia (ca. 610–560 BC), is located about 7 km north of Sardis in the region called Bin Tepe. It measures 300 m in diameter and 80 m in height and is the largest burial mound in Turkey (Fig. 2). The tomb chamber in the mound was first discovered by von Olfers (1858), the Prussian consul at Smyrna, and was identified as Alyattes' tomb based on Herodotus' descriptions (I.93). The tomb was re-measured in the 1960s by the Archaeological Exploration of Sardis (Fig. 3). The quarrying and transport of the estimated 100 tons of marble used in the tomb chamber represents considerable effort, regardless of the source. Our discovery that the tomb chamber marble

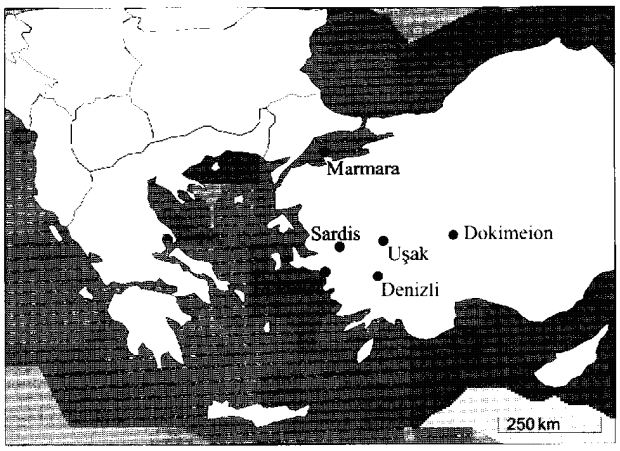

Figure 1 Sardis and some other Anatolian marble sources.

Figure 2 The Alyattes mound.

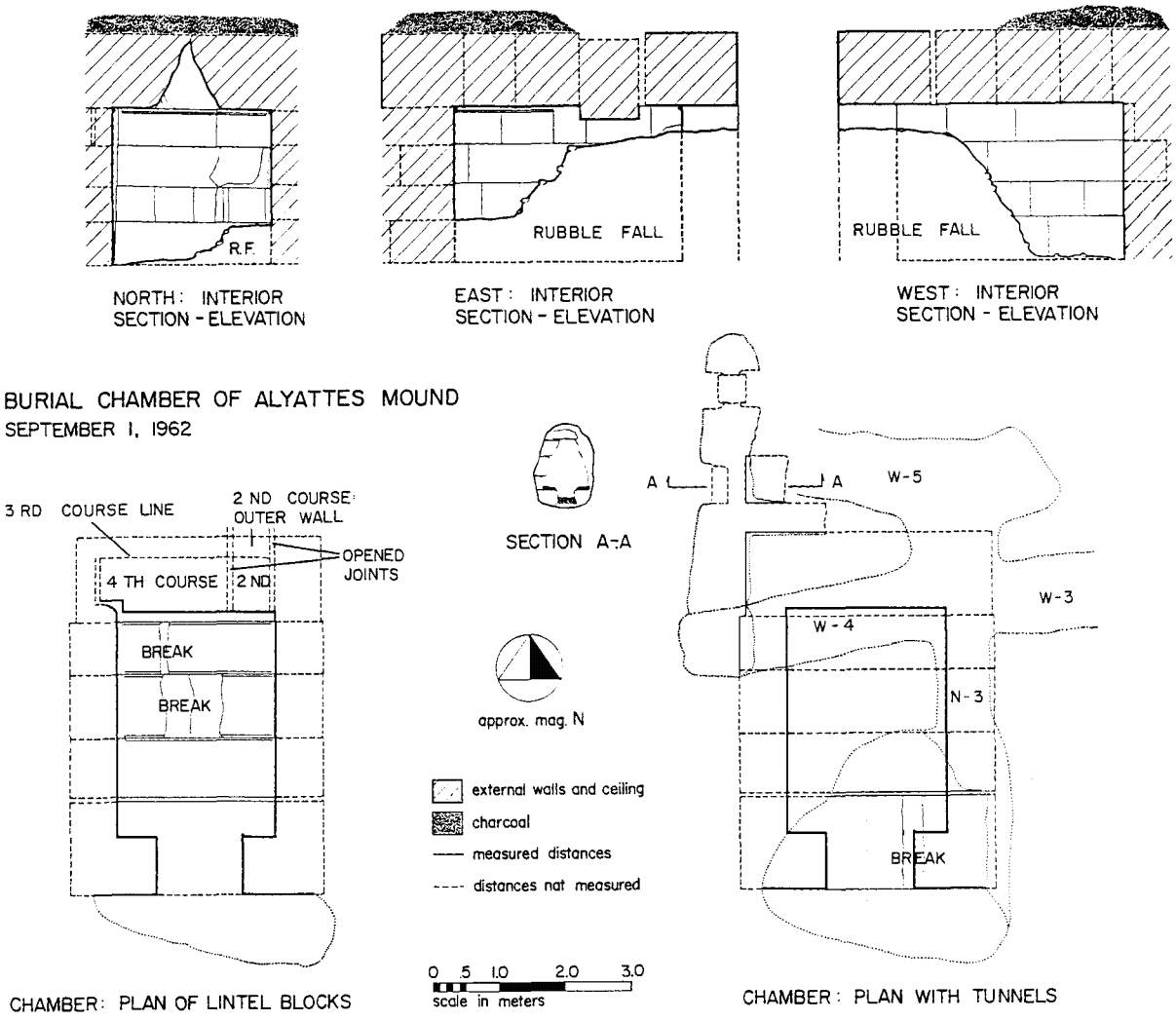

Figure 3 Plan of the Alyattes mound burial chamber.

does not isotopically match either the well-known local Sardis marble quarries or lesser-known quarries which we tested in the Sardis area is surprising and demands further investigation.

STABLE ISOTOPE ANALYSIS

The stable isotope ratios of carbon ($\delta^{13}C$) and oxygen ($\delta^{18}O$) were determined for several samples from the Alyattes tomb chamber and some other examples of 6th-century BC Lydian architectural marble. Geological samples from the previously untested quarries at Gölmarmara, near ancient Mermere some 20 km northwest of Sardis, were also analyzed, as were marble samples from the Magara Deresi gorge southwest of Sardis which supplements the existing data for Sardis compiled by Herz (1987). Our data for Sardis overlap with Herz' data and help to better define the Sardis isotopic field; the Gölmarmara quarry samples just touch the Sardis data field (Fig. 4). It should be noted that the ellipses in our figures are not statistical probabilities based on means and standard deviations, but rather enclose all of the quarry data points in order that any overlaps between sources are explicitly clear.

Significantly, the stable isotope ratios of the marble from the Alyattes tomb chamber do not match the Sardis isotopic field at all and are only close to one of the Gölmarmara quarry samples. Instead, they are similar to those for several other Lydian architectural marble samples, including one

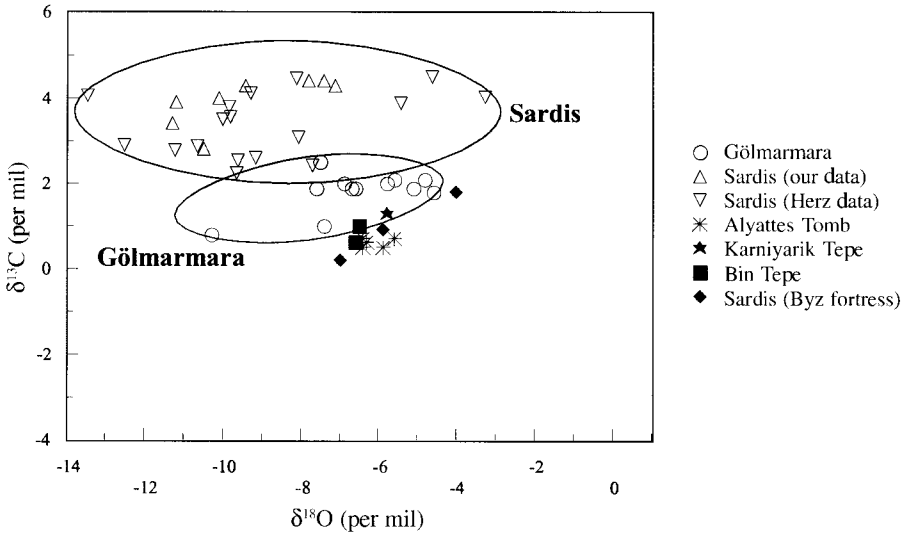

Figure 4 Carbon and oxygen isotope ratios of Sardis area marble quarries and architectural samples. Data from this study and from Herz (1987).

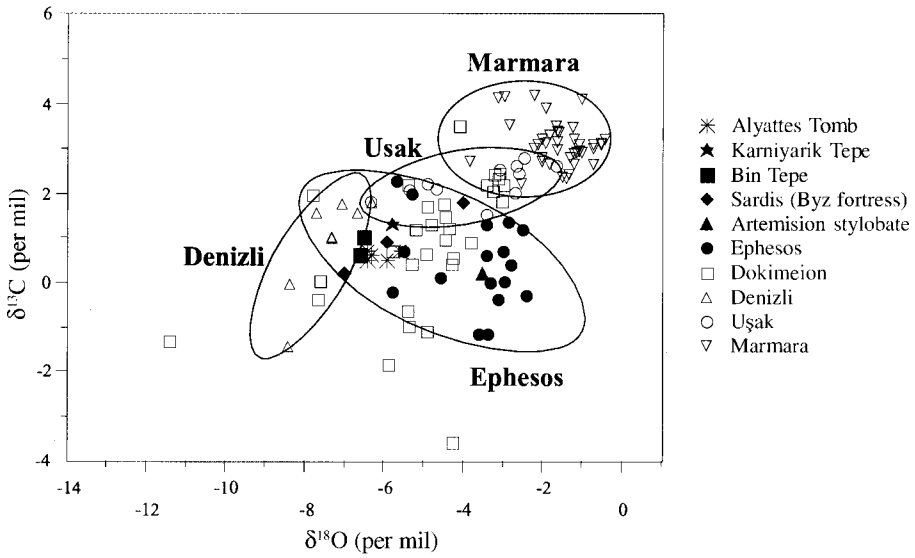

Figure 5 Carbon and oxygen isotope ratios of architectural samples (this study) and Anatolian quarries outside of the Sardis area (data Herz, 1987).

from another Lydian burial mound at Karniyarik Tepe, two from a Lydian stylobate from the Byzantine fortress sector of Sardis, and two from a funerary couch in a tomb at Bin Tepe. A third sample from Sardis, a gutter from the Byzantine fortress, falls just to the right of the Gölmarmara field (Table 1).

While the Sardis quarries exhibit a considerable range of oxygen isotope ratios, their variation in carbon isotope ratios is more limited, and it is unlikely that additional sampling of the Sardis quarries will produce specimens with carbon isotope ratios similar to those of our architectural marble samples. The ten quarry samples tested from Gölmarmara exhibit far less isotopic variation, except for one sample which is a statistical outlier. Since our quarry samples were selected from diverse locations in the quarry area, additional sampling is unlikely to extend the isotopic field boundaries enough to overlap with the marble from Alyattes' tomb chamber.

Other Anatolian marble quarries with generally similar isotope ratios include Marmara, Dokimeion, Ephesos, and possibly Denizli and Uşak (Fig. 5). The Marmara quarries are isotopically well defined and do not overlap with our samples. Uşak and Denizli are characterized by a limited number of samples, and while they do not overlap with the Alyattes tomb marble and our other architectural samples, they cannot absolutely be excluded on isotopic grounds. In any case, we consider both Uşak and Denizli unlikely sources. Two potential sources at Ephesos have been identified isotopically (Herz, 1987), including the Belevi quarry, which is a reasonable match for the Lydian samples. At least two geological samples from Herz' database have isotopic ratios very similar to our architectural marbles. Not surprisingly, Belevi also supplied the marble used in the stylobate of the Artemision at Ephesos, whereas a sample from the roof of the Artemision may be attributed to the second Ephesos source (not shown in the figure). Dokimeion, some 200 km from Sardis, also is an isotopic match for our Lydian architectural specimens.

PETROGRAPHIC AND HISTORICAL EVIDENCE

The results of petrographic analysis of the Alyattes tomb chamber marble (maximum grain size 2.6 mm) are also consistent with Ephesos (Ramage, 1995), whereas Dokimeion is more fine-grained (Moens *et al.*, 1990). Sardis and Ephesos are known to have had close ties in the 6th century BC; the Artemision at Ephesos was paid for by Croesus, the last Lydian king of Sardis and son of Alyattes. Significantly, graffiti resembling Lydian have been reported from some of the quarries at Ephesos (Hanfmann, 1975), despite the fact that the Ephesians spoke Greek. Dokimeion, on the other hand, cannot be shown to have any ties to Sardis during the 7th and 6th centuries BC. Denizli apparently was not an important source of marble until the Roman period. Among the ancient marble quarries that have been identified, then, Ephesos is the most likely source for 6th-century Lydian architectural marble.

LONG-DISTANCE MARBLE TRANSPORT

The identification of the source of marble for the tumulus of Alyattes is important for our understanding of marble exploitation patterns during the Archaic Period in western Anatolia in particular – and the ancient Mediterranean in general – since it appears that the use of local sources can no longer be assumed, even for architectural purposes. The direct route from Ephesos to Sardis is over the formidable Bozda range, which would have been quite a barrier to marble transport. It seems more likely that the ancient Lydians would have preferred a water route for transporting such large quantities of marble. The tumulus of Alyattes is only 5 km from the Gediz (ancient Hermos) river, so a combination of sea boats and river barges could possibly have been used to move marble from Ephesos to Sardis.

Table 1 Stable carbon and oxygen isotope results for marble samples in this study. For samples marked with an asterisk, the results reported are the average of two replicate analyses.

Site	Lab no.	Sample no.	$\delta^{13}C$	$\delta^{18}O$
Gölmarmara quarry	1332	GMQ-1	1.9	–7.6
Gölmarmara quarry	1333	GMQ-2	1.9	–5.1
Gölmarmara quarry	1334	GMQ-3	2.5	–7.5
Gölmarmara quarry	1335	GMQ-4	2.1	–5.6
Gölmarmara quarry	1336	GMQ-5	1.8	–4.6
Gölmarmara quarry	1543	* GMQ 95.1	0.8	–10.3
Gölmarmara quarry	1544	* GMQ 95.2	2.0	–5.8
Gölmarmara quarry	1545	* GMQ 95.3	1.9	–6.6
Gölmarmara quarry	1546	* GMQ 95.4	1.9	–6.7
Gölmarmara quarry	1547	* GMQ 95.5	2.0	–6.9
Gölmarmara quarry	1548	* GMQ 95.6	2.1	–4.8
Gölmarmara quarry	1549	* GMQ 95.7	1.0	–7.4
Magara Deresi gorge	1337	Q-1	3.4	–11.3
Magara Deresi gorge	1338	Q-2	2.8	–10.5
Magara Deresi gorge	1339	Q-3	4.0	–10.1
Magara Deresi gorge	1340	Q-4	4.4	–7.8
Magara Deresi gorge	1341	Q-5	4.3	–7.1
Magara Deresi gorge	1342	Q-6	4.4	–7.4
Magara Deresi gorge	1343	Q-7	4.3	–9.4
Magara Deresi gorge	1344	Q-8	3.9	–11.2
Alyattes tomb chamber	1348	ATC-1	0.7	–5.6
Alyattes tomb chamber	1349	ATC-2	0.6	–6.3
Alyattes tomb chamber	1550	* ATC 95.1	0.5	–5.9
Alyattes tomb chamber	1551	ATC 95.2	0.5	–6.4
Alyattes tomb chamber	1552	* ATC 95.3	0.7	–6.4
Karniyarik Tepe	1347	KT-M1	1.3	–5.8
Sardis	1553	* BF9195.1 stylobate	0.2	–7.0
Sardis	1554	* BF9195.2 stylobate	0.9	–5.9
Sardis	1559	BF9195.3 gutter	1.8	–4.0
Bin Tepe	1345	* kline leg	0.6	–6.6
Bin Tepe	1346	kline top	1.0	–6.5
Belevi quarry	1555	* Belevi 1	1.5	–3.4
Belevi quarry	1556	* Belevi 2	0.4	–3.8
Ephesos	1557	* Artemision roof	3.7	–3.0
Ephesos	1558	* Artemision stylobate	0.2	–3.5

CONCLUSION

It is evident that the Alyattes tomb was not made of local marble, and therefore considerable effort was expended on its transport. That Lydian kings could command such effort and expense is not entirely surprising. We cannot at this point definitively state, however, that marble from Ephesos was used in Lydian tomb architecture. Additional analyses, e.g. by paramagnetic resonance spectroscopy, would support or negate this possibility. Furthermore, several of the well-known marble sources in western Turkey are not very well characterized, while other lesser-known quarries have not been properly investigated at all. The possibility that one or more of these may visually, petrographically, and isotopically match the Alyattes tomb samples cannot be ruled out until they have been tested. While the existing analytical and historical data make the importation of marble from Ephesos to Sardis a reasonable hypothesis, the limitations of provenance studies in which not all possible sources are well characterized cannot be overstated.

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