Studies on the Presence and Role of Göktepe Marbles in Late Antique Ideal Sculpture

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Introduction

This article presents results of marble provenance studies carried out on a number of late antique ideal statues and statuettes and demonstrates that they were made using almost exclusively Asiatic marbles, mostly coming from the newly discovered quarries of Göktepe. This data usefully complements and details, with the support of scientific analyses, hypotheses and interpretations already put forward in the archaeological and art-historical literature on late antique sculpture, a field that in the last few decades has grown enormously.

Important archaeological discoveries, such as the 1977 finding at Carthage of a statuette of Ganymede and the eagle (Fig. 7) later published by Gazda[1] or the 1982 article by Erim and Roueché that established the late antique chronology of the inscriptions of the Esquiline sculptures[2], and developments in scholarship have unquestionably demonstrated that production of sculptures in the round, though markedly declining in terms of quantities, did not cease in the middle or late 3rd century A.D. as traditionally thought, but continued to be actively pursued at least during the entire 4th and 5th centuries[3].

Thanks to the studies carried out by Elaine Gazda, Niels Hannestad, Bente Kiilerich, Marianne Bergmann, Lea Stirling, Julie van Voorhis, and many others[4] there is now general agreement on a large number of late antique sculptures, often, but not always small-sized that have been found all over the Roman empire though, most frequently in its eastern part. The style has been unanimously recognized as Asiatic and the most important production centres have been located in Asia Minor where cities such as Aphrodisias, Docimium or Ephesos were situated near big marble sites and had developed a long-standing sculptural tradition. Another most important production centre was certainly Constantinople that in the 4th century and later, during the so-called Theodosian renaissance, strongly attracted craftsmen and sculptors from all over Asia Minor to work on its buildings and decoration[5]. Gathering in the big city of artists belonging to different traditions favoured development of an Asiatic eclectic style that, according to most scholars, satisfactorily explains peculiar traits of late antique sculptures that would hardly be reconciled with any specific production centre. Bergmann identifies the workshop structure as an artistic circle (*Kunstkreis*) related to Aphrodisias but based in Constantinople and accordingly calls »Aphrodisias – Constantinople« its sculptural style[6] thus emphasizing the dominant role played by stylistic and technical features typical of Aphrodisias within a broader amalgam of different artistic traditions.

Probably the most controversial aspect of the picture briefly sketched above is the persisting difficulty to date reliably some late antique sculptures when independent archaeological or epigraphic evidence is missing. As a matter of fact, crucial pieces continue to be variously dated either as high imperial or late antique works. Following most scholars the main problem seems to be the strong retrospective or »classicizing« tendency of late antique sculptors who continued

1 Gazda 1981.
2 Erim – Roueché 1982.
3 Witschel 2015.
4 Besides the references already mentioned a brief and incomplete list of studies may include: Hannestad 1994, 2007; Kiilerich 1993; Bergmann 1999; Stirling 2005; 2007; Smith 1990; van Voorhis 2018. See also papers in Bauer – Witschel 2007; Kristensen – Poulsen 2012; Kristensen – Stirling 2016.
5 Kiilerich 1993.
6 Bergmann 2000, 170.

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to keep strong ties with earlier traditions and, similarly to artists belonging to the high imperial age, emulated the styles of classical Greek and Hellenistic periods[7].

The best-known example of this dating problems are certainly the sculptures of the so-called Esquiline group. Establishing unquestionably their chronology has proven to be hard even in the presence of sculptors' signatures reliably dated to the late antique period. At present most scholars agree on the late dating[8]. Others, however, are sceptical and use stylistic arguments to state that the Esquiline sculptures might be genuine 2nd century works signed in the early 4th century when they were reused and perhaps refurbished[9].

The so-called Young Togatus of Aphrodisias[10] (Fig. 10 b) is another highly controversial piece. In this case no independent information is available and dating is exclusively based on stylistic, typological and technical arguments. The widely differing opinions expressed by different scholars, however, demonstrate the intrinsic difficulties of such an approach. According to Smith the statue »should be dated no later than c. A. D. 120–140 and could conceivably be a little earlier«[11], whereas Hannestad and Bergmann consider it a clear example of late production »placing the piece in the context of male portraits in Asia Minor of A. D. 400–450 or even later«[12].

Other pieces, however, provide absolute and uncontested dates based on inscriptions explicitly mentioning the year of dedication. A famous example are three statuettes representing Mithras, Aion-Chronos and Hekate found in a Mithraeum in Sidon and now in the Louvre that, according to base inscriptions, were dedicated in A. D. 389[13]. The Sidon statuettes are crucial because stylistic analogies allow to extend the late antique chronology that for them is securely fixed by the inscriptions to many other related sculptures.

Setting aside important details that are outside the scope of this work as well as some persisting uncertainties it seems possible to state that late antique ideal sculptures are a relatively homogeneous group of artefacts closely related in terms of style, carving techniques, ethnic origin of the sculptors, and location of the workshops. If this is the case, marble studies become especially interesting because they may allow to verify whether or not marble use was similarly homogeneous, as expected, and which specific marble was predominantly used. In other words, the whole issue is an exemplary case study to verify once again and under clear and well-defined conditions, the already suggested tight connection existing between artists and the material they used, a link that makes possible to obtain relevant archaeological information by exploiting scientific data dealing with material culture.

Similar work has been attempted very rarely in the past, providing results that, in any case, must be taken very cautiously for the simple reason that until recently, existence of the Göktepe site was unknown or ignored and its high quality marbles were generally mistaken as Carrara. Therefore, beside presenting and discussing new data, this work tries to reconsider and in case to re-interpret previously published results, with the aim of exploiting a base of data as large as possible that may provide results of general value on the marbles used for late antique ideal statuary.

7 Bergmann 1999, 14–15. 61–66; Kiilerich 1993, 189–192; Stirling 2005, 3; Witschel 2015, 332.

8 Hannestad 1994; 2007; Kiilerich – Thorp 1994; Bergmann 1999, 14–17; Stirling 2007, 315 n. 64; Vorster 2012/2013, 395–405.

9 Moltesen 2000; Smith 2007, 214–215; van Voorhis 2012.

10 The Young Togatus (inv. 6167; 83–64) is an over life-size statue found in 1983 near the Agora Gate of Aphrodisias. It is the only Docimium marble statue identified in the Carian city within a selection of 86 white marble sculptures (Attanasio et al. 2014, 130, table 1, no. 3). The togatus is thought to be a portrait statue by Smith, whereas Hannestad and Bergmann follow the suggestion of Goette (1990, 50) of an ideal divinized personification (Genius).

11 Smith 2006, 108–112 n. 3.

12 Hannestad 1994, 160; Bergmann 1999, 41. 64.

13 Stirling 2005, 92–98.

Material and Methods

The total number of late antique sculptures dealt with in this paper is 87 including 80 white, two black and five bichrome items. Only 14, however, were analyzed purposely for this study, whereas 50 were tested and published previously[14] within the frame of research projects focused on different targets. Data for the remaining 23 sculptures were excerpted from existing literature with the aim of confirming or re-assessing their provenance with the help of updated marble data including the newly discovered Göktepe marbles. It should be added that the late antique chronology of some sculptures is controversial or uncertain. Details are given in Tables 1 and 2 where all samples are listed, together with analytical and provenance results. As already stated all this material was grouped together with the aim of obtaining, as far as possible, results of general value.

Samples for the newly measured sculptures were, as usual, tiny chips measuring a few mm³ or less in the case of small or fragmentary artefacts. They were drawn from hidden parts or existing fractures so as to avoid or to reduce any possible damage to a minimum. The chips were carefully cleaned of weathered material, patinas and crusts and then polished for measuring the grain size. Subsequently they were ground to fine powders to carry out EPR, isotopic and chemical analyses, following methods and procedures already described in detail[15]. In several instances, however, chemical analysis of trace metals was not performed because the amount of available material was too small or the high discriminant power of the strontium variable had not yet been recognized.

In this way a maximum of seven analytical variables was measured for each sample and the provenance was obtained by comparing, with the aid of linear discriminant function analysis[16], these values with a selection of possible provenance quarries. The quarry selection takes into account all known fine-grained marbles plus a few other sites that are relevant for geographical or analytical reasons. In total nine quarry sites, corresponding to 13 marble groups were included:

- Italy: Carrara
- France: St. Béat (2 groups)
- Greece: Mt. Hymettos; Mt. Pentelicon; Paros (three groups)
- Turkey: Aphrodisias; Docimium, İscehisar; Docimium, Altıntaş; Göktepe (two groups)

Using these quarry sites and the above analytical variables linear discriminant analysis provides a classification rule which can be used to calculate the most probable quarry of provenance of each unknown sample as a function of distance and probability parameters defined as follows:

- Distance. This is the distance of the datapoint under consideration from the centre of the ellipse that represents the probability field of a quarry. The central point of an ellipse expresses the average and hence the most characteristic values of a quarry. The closer the point is to the centre of an ellipse, the more likely it is to be made of that marble.
- Relative (posterior) probability. This is the probability that the sample belongs to some group within the assumption that it originates in any case from one of the groups in the selection. The threshold is 60%. Low values indicate that the sample is in doubt between two or more groups.
- Absolute (typical) probability. This is a distance-dependent parameter measuring the absolute probability that the sample belongs to the chosen group or, in other words, is a typical representative of the group properties. The threshold is 10%, corresponding to samples on the edge of the 90% probability ellipse. Low values indicate anomalous samples (outliers) or samples that may not belong to any group in the selection.

The unknown samples are assigned to the most probable quarries and the results are considered to be reliable if the probability values are above their threshold limits. Graphical presentation using the experimental data as such (e.g. isotopic plots) or after statistical analysis (discriminant plots) are used to illustrate the results.

14 Attanasio et al. 2014; Attanasio et al. 2015a; Attanasio et al. 2016.

15 See for instance Attanasio et al. 2006; Prochaska 2013.

16 Attanasio et al. 2006, 213–260 (chapter 3).

Considerations on the Archaeometry of Göktepe Marbles

Studies carried out mostly by our group during the last 15 years strongly suggest that Göktepe marbles can be almost always easily and safely identified owing to the peculiar and unique combination of properties that they exhibit[17].

Recently, however, new data have been published that seem to contradict previous results casting doubts on the provenancing procedures adopted so far and the results that they produced[18]. It can be shown, however, that such critical opinions mostly arise from wrong analyses and misleading considerations, and the reader is referred to specific publications for rebuttal[19]. Obviously, such technical debates are not much interesting nor easily understandable for the archaeological, art-historical community and simply contribute to increase mistrust and lack of interest for marble studies. Therefore, leaving aside technical issues, it seems useful to summarize, once again, the main reasons that make possible clear and safe identification of Göktepe marbles[20].

Typical white samples exhibit a peculiar combination of properties that can be summarized as follows:

- fine to very fine crystal grain size (distinctly finer than Carrara),
- carbon and oxygen isotopes mostly tightly grouped at values slightly but characteristically higher than Carrara,
- high concentrations of strontium, unparalleled by any other known white marble,
- low to very low concentrations of manganese that among fine-grained varieties are paralleled only by Hymettos marbles,
- low EPR intensities and characteristic EPR linewidth values, both associated with the low concentration of manganese mentioned above.

The general characteristics just mentioned, however, are not without exceptions, and there are Göktepe samples, either quarry or artefacts, that exhibit deviations, even large, from the above values, though ›atypicalities‹ are generally limited to one variable only. The consequence is that Göktepe provenance, that in the case of variables within the range is easily and unquestionably obtained, cannot be excluded for the atypical samples just mentioned. The examples briefly discussed below demonstrate that more careful data analysis is needed in these cases to obtain conclusive results.

Generally speaking, however, the set of variables listed above is redundant in the sense that Göktepe provenance can often be proven or strongly suggested using a reduced sub-set. From this point of view strontium concentration is certainly the most powerful indicator of provenance and is able by itself to identify Göktepe marbles (Fig. 1). Similarly fine-grained marbles exhibiting low levels of manganese as measured by chemical analysis or EPR intensity originate almost certainly from Göktepe. Fig. 2 a, however, seems to suggest that in this respect EPR spectroscopy is a more selective tool, in that it better differentiates Carrara from Göktepe and stresses the high intensity of the few atypical samples that were found in district 4 (Göktepe 4h)[21]. Based on manganese values (Fig. 2 b) the only possible alternative to Göktepe are Hymettos marbles that, however, exhibit low strontium concentrations and additionally were virtually never used in Roman sculpture.

Even isotopes and grain size, despite their similarity with Carrara values that in the past led to extensive misclassification of the still unknown Göktepe marbles, exhibit high diagnostic power, if taken together. The point is that most Göktepe samples (ca. 82%) exhibit highly homogeneous isotopes tightly grouped in a narrow area centred at c. $\delta^{18}O \approx -2.9‰$ and $\delta^{13}C \approx 2.6‰$, whereas Carrara marbles, also quite homogeneous, exhibit values mostly around $\delta^{18}O \approx -2.0‰$ and $\delta^{13}C \approx 2.0‰$ or below (Fig. 3). The consequence is that fine-grained Carrara and Göktepe marbles can be almost always discriminated simply on isotopic grounds, although additional analyses are certainly useful to obtain conclusive evidence.

Obviously, depending on the specific problem investigated and the analytical methods actually avail-

17 See Attanasio et al. 2015b for the study of quarry marbles; Attanasio et al. 2019 and references therein for archaeological artefacts.

18 Brilli et al. 2018; Wielgosz-Rondolino et al. 2020.

19 Attanasio et al. 2020, published together with reply by Brilli and co-workers (Brilli et al. 2020). Another paper countering the arguments presented in Wielgosz-Rondolino et al. 2020 is in preparation and will be published in due course

20 The discussion is focused on white Göktepe marbles that account for most of the sculptures presented in this study. In the case of black and bichrome marbles the approach is slightly different and is discussed in detail in Attanasio et al. 2015b; 2017.

21 This higher selectivity is probably due to the fact the EPR spectroscopy detects only manganese that substitutes calcium into the calcite lattice and is insensitive to any interstitial manganese impurity.

able different provenancing strategies can be used and the variables discussed so far can be combined in various ways and used as such or after statistical elaboration with the aim of providing satisfactory results. Fig. 4 a–d illustrates in graphic form some possible approaches.

To the above collection of provenancing methods and procedures Wielgosz-Rondolino and co-workers add the isotopic analysis of strontium, claiming that the new variable is crucial especially for discriminating Göktepe from Carrara that otherwise may be problematic[22]. This conclusion, however, seems to be highly overstated. The above results clearly demonstrate that strontium isotopes, interesting and important as they may be, are certainly not necessary for the purpose of Göktepe identification and discrimination from Carrara[23].

To conclude this section it must be added that identification of atypical Göktepe samples is also a relevant issue because these marbles were occasionally used for the manufacture of prized and famous artefacts. Pertinent examples are a high manganese black marble vase in the store-rooms of the Aphrodisias Museum[24], a portrait head of Caracalla in the Capitoline Museums (inv. 464) exhibiting unusual, highly negative isotopic values[25], and finally the low strontium Göktepe marble sculptures of the Esquiline group[26]. In all cases the problem could be satisfactorily solved using statistical processing of multiple analytical data. The point is that deviations due to a single variable can be successfully counterbalanced by other variables that are at the same time typical of Göktepe and incompatible with other possible provenances. In this way the Göktepe marbles used for the black vase and the head of Caracalla could be reliably identified. The problem of the marble used for the Esquiline sculptures, however, proved to be more difficult and required additional field work to map in detail strontium distribution within and outside the ancient quarries. Details of the study are given in the original paper. Clearly additional variables, such as strontium isotopes, may further confirm the provenance of these atypical Göktepe marbles.

No.	Artefact	Present/Original location	Inv.	MGS (mm)	$\delta^{18}O$ (‰)	$\delta^{13}C$ (‰)	EPR Intensity Linewidth (%)	Sr; Mn; Fe (ppm)	Marble Rel. Prob. Abs. Prob. (%)
1	Alcibiades tondo	Aphrodisias	81-36 82-225	1.1	-2.17	1.69	17.0; 66.2	–	Aphrodisias 74; 21
2	Alexander tondo	Aphrodisias	81-101	1.4	-1.85	1.96	11.1; 48.1	–	Aphrodisias 53; 35
3	Old philosopher tondo	Aphrodisias	81-112	1.6	-2.31	1.60	28.1; 62.3	–	Aphrodisias 82; 76
4	Pindar tondo	Aphrodisias	81-115	1.1	-3.19	1.61	55.4; 64.2	–	Aphrodisias 69; 85
5	Pythagoras tondo	Aphrodisias	68-468 81-135 82-254	0.70	-1.92	1.86	21.2; 58.3	–	Aphrodisias 82; 79
6	Socrates tondo	Aphrodisias	81-103	1.2	-2.11	2.19	21.7; 56.2	–	Aphrodisias 52; 65
7	Herakles Farnese type statuette	Aphrodisias	10.232	0.40	-2.61	2.50	2.7; 64.2	–	Göktepe 3 99; 73
8	›Young Togatus‹ statue	Aphrodisias	6167	0.90	-4.36	0.24	54.3; 43.3	–	Docimium 77; 48

22 Wielgosz-Rondolino et al. 2020, 12.

23 It may be interesting to add that strontium isotopic analysis is a rather expensive technique (prices are in the range of a few hundred dollars per sample) not commonly available in all geosciences labs. Also for these reasons the method has never become widespread and the trend is not expected to change in the future.

24 Attanasio et al. 2014, 135 table 1, no. 91.

25 Attanasio et al. 2019, 209, 234 catalogue table, no. 69.

26 Attanasio et al. 2015a.