Analysis of Classical Marble Sculptures in the Michael C. Carlos Museum, Emory University, Atlanta

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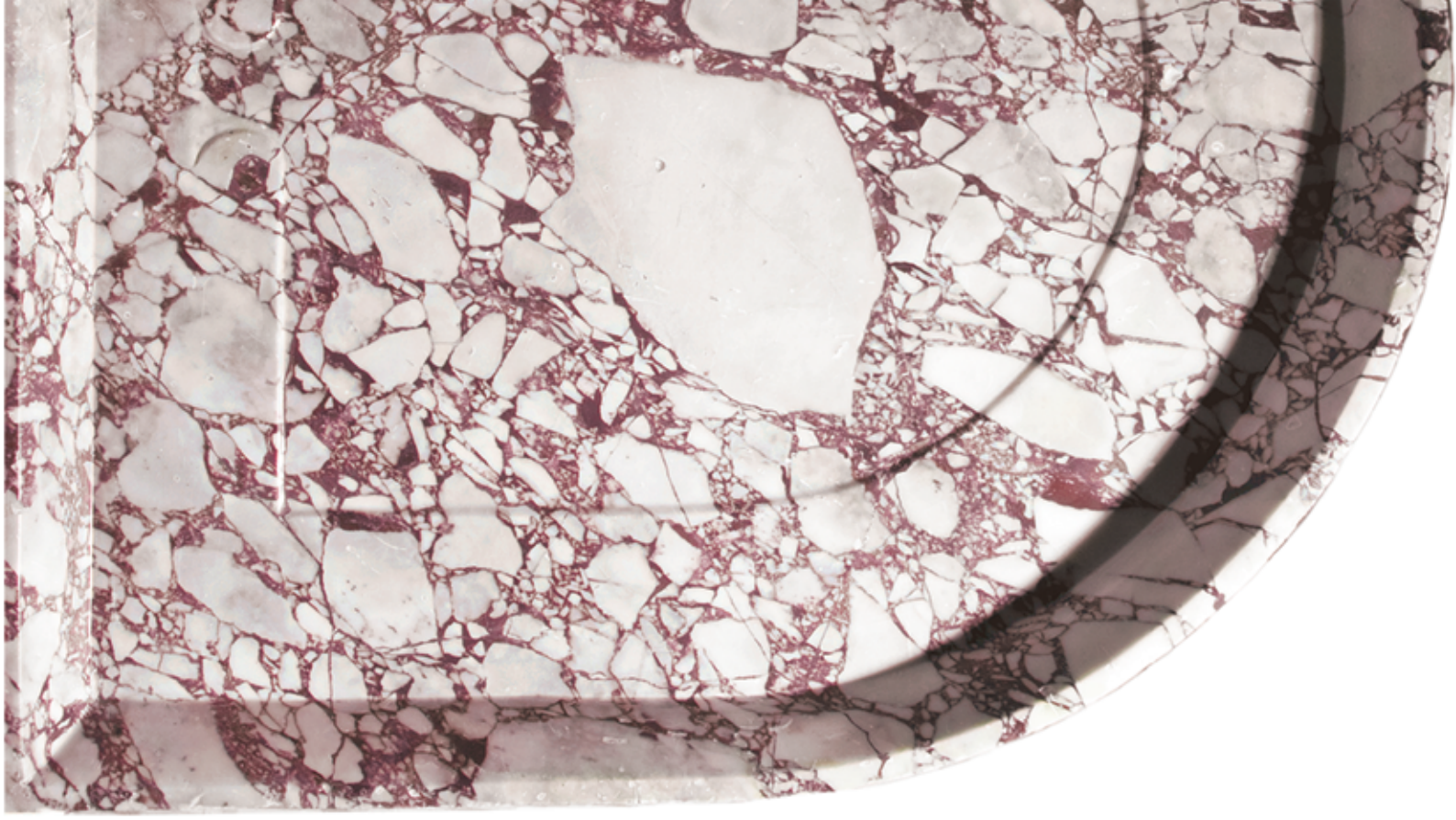

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CONTENT

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ANALYSIS OF CLASSICAL MARBLE SCULPTURES IN THE MICHAEL C. CARLOS MUSEUM, EMORY UNIVERSITY, ATLANTA

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Abstract

Fifty classical marble objects in the collections of the Michael C. Carlos Museum at Emory University have been analyzed, making use of several complementary techniques to determine the quarry sources for the marble. This collaborative project has been supported most generously over many years by the Andrew W. Mellon Foundation and the Thalia and Michael Carlos Foundation. Using a multi-method approach, including visual assessment, maximum grain size, testing for dolomite, stable isotope analysis, elemental analysis, and electron paramagnetic resonance, it was possible to assign most objects with a high degree of probability to a single source. Five objects, presented in chronological order, have been selected here for special attention either for art-historical reasons or for the use of marble from unexpected sources. These include an under life-size Hellenistic statue of a draped female (Aphrodite?) (Fig. 1), whose head is carved from marble assigned to the Paros 1 quarries, while the body is Pentelic. An archaistic relief of a woman carrying a jug (Fig. 2) is carved from Denizli marble, perhaps the first such identification for archaistic sculpture. A Roman statue representing Leda and the Swan (Fig. 3) is carved from Aphrodisias marble. A fine Roman statuette representing Apollo of the Anzio type (Fig. 4) is carved from Parian marble. An unusual Roman third-century relief of a ploughman (Fig. 5) uses marble from Göktepe.

Keywords
stable isotopes, electron paramagnetic resonance, x-ray fluorescence

Fig. 1. Statue of a draped woman (Aphrodite?) (photo: B. White)

Methodology

Following visual assessment of marble color, patterning, translucency, and maximum grain size (MGS), powder samples were drilled from each sculpture. In cases of sculptures assembled from different elements, or repaired, samples were obtained from separate component parts. Carbon and oxygen stable isotope analysis was conducted on all fifty, using a Thermo Delta+XL stable isotope mass spectrometer with a Kiel III carbonate device, in the Paleolab at the University of South Florida. Standard procedures were followed, and results are reported relative to VPDB.

Fig. 2. Relief of a draped woman (photo: B. White)

Fig. 4. Statue of Apollo of Anzio type (photo: B. White)

Fig. 3. Statue of Leda and the Swan (photo: B. White)

Fig. 5. Relief of a ploughman (photo: B. White)

The isotope data were compared to the isotopic diagrams for Mediterranean marble quarries by Carlo Gorgoni *et al.*[1], Scott Pike[2], and to the diagrams and data tables of Donato Attanasio[3] and Norman Herz. Isotopic matches were then narrowed down using MGS and visual characteristics.

To narrow down possible quarry attributions further, a selection of thirteen objects was analyzed by electron paramagnetic resonance (EPR), mainly to examine the strength of manganese 2+. This was conducted using a JEOL RE1X spectrometer in the Department of Chemistry at Williams College. X-ray fluorescence spectroscopy also was conducted on a select number of samples to measure magnesium, manganese and strontium, using a Bruker III-SD equipped with a vacuum. The magnesium results confirmed that none of the objects tested were of dolomitic marble, while the Mn and Sr values were compared with data tables of Attanasio. Five case studies of special interest, either for art-historical reasons or for the use of marble from unexpected sources, are examined in greater detail below, while the results for all 50 analyses are listed in Table 1.

Case Studies

1. ***Statue of a Draped Woman, perhaps Aphrodite***. Hellenistic, 4th – mid 2nd century BC.[4] (Fig. 1)
Head: Macroscopic assessment: very translucent, pure white; medium to fine grain.
$\delta^{13}C$ 5.4, $\delta^{18}O$ -3.0. Quarry assignment: **Paros 1**
Body: Macroscopic assessment: very translucent, very white with a few micaceous flaws; very fine grain.
$\delta^{13}C$ 2.5, $\delta^{18}O$ -4.7. Quarry assignment: **Pentelikon**

This beautiful statue depicts a youthful female standing beside a tree. Into the top of the tree, two small dowel holes have been drilled, indicating that either an attribute (such as a lyre) or a secondary figure (like Eros) was attached. She wears a sleeved garment (chiton), kept from billowing out above by means of a cord that passes below her breasts and over her shoulders. Over this a mantle (himation) is twisted around her right hip and drawn up in a rich swag of drapery over her left forearm. The himation is marked with horizontal lines, indicating press folds, and weights that would have allowed the garment to hang appropriately are also depicted. Traces of red pigment are visible on her proper left thigh. On her face, further traces of pigment are visible on her lips (red), eyes (black), and her ears are pierced for (gold wire?) earrings. The body was made in one piece. To this, four elements were added: her head, by insertion; and, using dowels, her forearms and the attribute or figure atop the tree.[5] These latter parts are not preserved. The head is clearly the original: it sits precisely into the shoulder cavity, matching both circumference and depth without any sign of modern adaptation. A neo-classical repair is set into her left foot. The sculpture shares much in the arrangement of the drapery and the cord that holds it with representations of Artemis and Themis, and in some ways recalls images on gems of Muses leaning against pillars while playing the lyre. It is, however, perhaps most closely related to a series of late classical and Hellenistic sculptures of Aphrodite, sometimes leaning against a herm.[6] The sensuous carving of the diaphanous chiton would tend to support this identification.

This sculpture is an early example of the practice of using different marbles for head and body – and probably also for the missing arms and the attribute. When white marble was used for all parts of a statue, it is probable that the more beautiful, unflawed, and prestigious stone was used for the flesh parts. Late classical temple inventories, like those of the Parthenon, usually refer to small marble objects such as pyxides using the generic term "lithos" or "lithinos". Just occasionally, however, the

1 GORGONI *et al.* 2002.

2 PIKE 2009.

3 ATTANASIO 2003, data diskette; ATTANASIO *et al.* 2013; ATTANASIO *et al.* 2014.

4 Carlos Museum 2002.31.1 A/B. Carlos Collection of Ancient Art. Height: 102 cm. *Art Newspaper* 135 (April, 2003) 20; GAUNT 2005, 17 fig. 18.

5 The dowel holes on top of the tree measure 0.7 cm in diameter, 3 cm deep and are separated by 2.4 cm. The dowel holes in the arms measure 0.9 cm in diameter; the right is 2.2 cm deep, and widened at the surface; the left is 3.5 cm deep.

6 For Artemis, compare a Roman version in Thebes of a late classical creation (Archaeological Museum BE 63: LIMC II 661 Artemis 528, pl. 488 [L. Kahil, N. Icard]). For Themis, compare two statues in Athens, National Museum 231 and Agora S 2370 (LIMC VIII 1201 Themis 8 & 9, pl. 829 [P. Karanastarsi]). For Muses, compare a glass paste gem in Florence (Museo Archeologico 14741: LIMC VII 997 Mousa, Mousai 210, pl. 718 [L. Faedo]); a cameo in Munich (Münzsammlung A 2918: LIMC VII 1019 Mousa, Mousai, Musae 45, pl. 731 [J. Lancha]); the drapery, although more chastely worn, somewhat recalls the so-called Melpomene Farnese (LIMC VII 993 Mousa, Mousai 172, 172a, pl. 716 [L. Faedo]). For the Aphrodites, compare perhaps a Hellenistic statuette in Vienna (Universität 723: LIMC II 44 Aphrodite 324, pl. [A. Delivorrias, G. Berger-Doer, A. Kossatz-Deissmann]) and a statue in Rhodes (Archaeological Museum 340: LIMC II 45 Aphrodite 340, pl. 33).

fact that the object was made of Parian marble is specified. Since no other marble source besides Paros is ever mentioned, it can only be the exceptionally high esteem in which this marvelous stone was held that led to it being so recorded in what are otherwise merely bureaucratic accounts.[7] Judging from the use of different marbles in this example, Parian also outranked Pentelic for statues.

2. ***Relief of a Draped Woman***. Greek, Neo-Attic, 1st century BC.[8] (Fig. 2)
Macroscopic assessment: not translucent, gray veins; very coarse grain.
$\delta^{13}C$ -0.1, $\delta^{18}O$ -8.6; low Mn, low Sr; EPR intensity 34.1.
Preferred quarry assignment: **Denizli 2**; other possibilities: **Pentelikon**, **Naxos**

This relief depicts a richly draped woman, who wears a sleeved garment (chiton) under a longer dress pinned on the shoulder and belted at the waist (peplos). The wine jug (oinochoe) she holds in her right hand was probably complemented by a shallow bowl (phiale) held in her upraised left, suggesting that she may have been in the act of pouring a libation perhaps at an altar which may have been represented on the part that has broken away. The panel appears to have been re-used, for the upper left corner of the relief (now missing) has a worked surface on top that preserves part of dowel hole whose scale is much larger than what would have been required for a small repair.

The crisp, mannered style of carving, particularly the flourish of drapery that flutters behind her, the complexity of the (misunderstood) clothing, and the braided tresses of her hair, are characteristic of so-called Neo-Attic sculpture, an academic school of sculptors working in Athens from the 2nd century BC until the 2nd century AD.[9] The artists drew on a repertoire of works from the archaic and classical periods (6th-4th centuries BC) to make decorative evocations for Roman connoisseurs.

The Neo-Attic style is especially associated with Attica, Athens, and Paros. The low oxygen ratio of this marble is, in fact, compatible with an origin on Mt. Pentelikon or the island of Naxos. The coarse grain is compatible with Naxos, and visually the markings are compatible with Pentelikon. The very low carbon ratio, however, points to an unexpected Asiatic source in Denizli. This marble is also coarse-grained, and, while it usually tends to be grayish, at times it can be white (Denizli Şeker).[10] The use of this marble is surprising since Denizli marble is not used for sculpture even in Aphrodisias, which lies only 30 km to its east.[11] The low carbon ratio of this relief might be considered an outlier of more commonly used quarries, but none of the intensive studies of Pentelikon[12] or Naxos[13] have found carbon values remotely this negative. This relief was resampled and the same isotope results were produced.

It seems likely thus that this sculpture in a rare marble was produced in the neighborhood of the marble's source, that is, Denizli itself. There is no indication that the Neo-attic style was practiced in the interior of Anatolia, and the relief must therefore be the work of a traveling sculptor from Athens or the Cycladic islands, where this style was at home. It is not unprecedented for sculptors from the Aegean to have traveled this far into the interior of Anatolia for a commission. A sculptor from Attica, in fact, traveled to Aphrodisias, where he signed a sarcophagus in the local marble.[14]

3. ***Statue of Leda and the Swan***. Roman, 1st century BC/AD.[15] (Fig. 3)
Macroscopic assessment: very translucent, slightly grayish, very coarse-grained marble
$\delta^{13}C$ 1.9, $\delta^{18}O$ -3.8; low Mn, low Sr; EPR Intensity 38.8.
Preferred quarry assignment: **Aphrodisias**

The torso and much of the legs are preserved of a young woman, who turns and crouches slightly. Rich locks of hair are preserved on the neck, and an armlet is modeled on her upper left arm. Her drapery slips from her legs, as the swan, whose tail feathers are preserved, consumes her attention. Jörg Detterling has identified two replicas of the type, in Dresden and in the market.[16]

Grain size, isotopic ratios, and EPR intensity compare well with Aphrodisias.[17] Grain size and Sr match

7 A pyxis in Parian marble is mentioned in the inventories of the Asklepieion in Athens: IG ii-iii² 1553, line 35. See further MILNE 1939, 249; GAUNT 2013, 384.

8 Carlos Museum 1986.9.15. Carlos Collection of Ancient Art. Height: 66 cm; width 44.8 cm. STAFFORD 1967, 143 no. 34, plate at p. 24.

9 On Neo-Attic sculpture see FUCHS 1959; HARRISON 1965; SAUSER 1987; ZAGDOUN 1989; FULLERTON 1990.

10 MONNA, PENSABENE 1977, 81-84.

11 ATTANASIO *et al.* 2014, 110.

12 PIKE 2009.

13 ATTANASIO 2003, data diskette.

14 ÖGÜS 2016.

15 Carlos Museum 1999.11.8. Carlos Collection of Ancient Art. Height 85 cm. From the collection of a French diplomatic family posted in North Africa.

16 DETTERLING 2015, 189 n. 28. For the replica in Dresden, see KNOLL, VORSTER, WOELK 2011, 339-342 no. 56 (entry by S. Oehmke). The replica in the market: Christie's, London, 13 October 2008, lot 24.

17 ATTANASIO *et al.* 2013, 4364-4365, table 2, fig. 8.

Paros 2 but the isotopic ratios do not, according to the data of Attanasio.[18]

The drapery of the statue is executed in a simplified, emphatic, and somewhat angular style, which may, like the marble, reflect an origin in the eastern Mediterranean. Similar drapery appears in a group of statues excavated in the theatre of Salamis, Cyprus.[19] The absence of conspicuous drill channels probably indicates a relatively early date for all of them. The Salamis sculptures might well stem from the theatre's first phase, which dates from the Augustan period.[20] A late Hellenistic Leda in Mantua also shows the fleshy treatment of the midriff.[21] The replica of the Carlos Leda in Dresden mentioned above is made of fine-grained marble and comes from Rome. The piece, which is dated 130-150 AD, has conspicuous drill work and lacks a fleshy midriff.

4. *Statue of a Nude Male Youth, Apollo of Anzio Type*.
Roman, 2nd century AD.[22] (Fig. 4)
Macroscopic assessment: translucent, uniformly white, very fine grain.
$\delta^{13}C$ 2.2, $\delta^{18}O$ -1.8, low Mn, low Sr.
Preferred quarry assignment: **Paros 2**

The torso, and parts of the legs and support are preserved of a statue of a youthful nude male, who stands with his weight on his left leg. The sculpture is a small version of a well-known and widely reproduced type named after the Apollo found at Anzio.[23] Over the tree stump that functions as a support for the statue has been placed the god's mantle, with a large bulla to fasten it at the shoulder on top. A snake, Python, rears its head half way up the strut on the outside.

This high quality statuette is made of an unspotted, translucent piece of marble. The isotopes also match Carrara, but Carrara marble is usually rather opaque and flecked with gray. The statuette's isotopic ratios also fall on the borderline of the field for Paros 2, Chorodaki, which tends to be more translucent. The statuette's Mn is low, which also favors Paros 2; the Mn (=EPR intensity) is much lower in Paros 2 than in Carrara, which is middling.[24] The statuette also has low Sr, and again Paros 2 has lower Sr than Carrara does. The statuette appears to have very fine grain, but Paros 2 can also have MGS as low as 0.47 mm.[25]

A Parian attribution goes against the general pattern of marble use in the second century, when Parian marbles generally seem to have disappeared from the western Mediterranean.[26] Four sculptures of Paros 2 marble, including statues of athletes, have, however, been identified at Hadrian's Villa.[27] The soft treatment of this Apollo seems to be Antonine, and extends the use of Parian marble into the mid- to late-second century.

5. *Relief of a Ploughman*. Roman, 2nd quarter of the 3rd century AD.[28] (Fig. 5)
Macroscopic assessment: translucent, uniformly white, fine grain
$\delta^{13}C$ 2.3, $\delta^{18}O$ -3.1; low Mn, high Sr.
Quarry assignment: **Göktepe**

A ploughman of heroic size in relation to the pair of oxen he drives, guides the plough with his left hand and wields a stick in his right. Open fields in rolling countryside are indicated by an uneven groundline. He wears a short-sleeved tunic with a broad belt around the waist. The sensitive carving of the head of the figure very much recalls the portraiture of the emperor Severus Alexander (ruled 222-235 AD), and allows us to date the sculpture in the second quarter of the third century. The relief is framed by a flat raised band that is articulated with a groove towards the inner edge. While the back of the panel is roughly worked, the edges are finished, and the remains of a dowel are preserved in the centre of the top. The lower right corner has broken away.

The theme of a ploughman is relatively rare; it appears in a relief in the Graeco-Roman Museum, Alexandria and in several funerary reliefs in the Istanbul Museum, all of which have been described as "mediocre Roman work".[29] This relief is fine work, with much

18 ATTANASIO *et al.* 2013, 4364-4365, table 2, fig. 8.

19 KARAGEORGHIS, VERMEULE 1964, cat. nos. 52-54.

20 FREDERICKSEN 2002, 113, 119.

21 Mantua, Palazzo Ducale 13: LIMC VI, 232 Leda 7, pl. 108 (L.Kahil; Icard-Gianolio).

22 Carlos Museum 1985.16. Carlos Collection of Ancient Art. Preserved height: 78 cm.

23 Rome, Museo Nazionale Romano 121302: LIMC II 380-381 Apollon-Apollo 56, pl. 303 (E. Simon).

24 ATTANASIO *et al.* 2013, 4364-4365, table 2, fig. 8.

25 ATTANASIO *et al.* 2013, 4364-4365, table 2, fig. 8.

26 ATTANASIO *et al.* 2013, 4367.

27 LAPUENTE *et al.* 2012, 366, fig. 1, nos. 28-29.

28 Carlos Museum 2005.21.1. Carlos Collection of Ancient Art. Gift in honor of President and Mrs James W. Wagner. LACOVARA, GAUNT 2006, 16 fig. 27; GAUNT 2011, 61 no. 39. Height 58.4 cm; width 40.6 cm.

29 MENDEL 1914, 310: cat. 1027, 1058, 1074, 1075. All these ploughmen wear looser tunics without broad belts.

Acc. No.	Object	Date	δ13C	δ18O	MGS	EPR intensity	pXRF Analysis	Most Likely	USF #
1984.3	Acrolithic Female Head, fragment	Greek, 3rd century BC	2.0	-4.7	very coarse		low Mn, low Sr	Pa-4	8958
1984.16	Votive Relief with Hero at a Feast	Greek, 400-350 BC	2.3	-7.3	fine			Pe	8969
1984.17	Head from a Statue of Weary Herakles	Roman, 1st century AD	2.7	-2.4	very fine		low Mn, high Sr	G	8960
1985.16	Apollo, Anzio type	Roman, 2nd century AD	2.2	-1.8	very fine		low Mn, low Sr	Pa-2	8956
1991.3	Head from a Statue of the Diadoumenos	Roman, mid-2nd century AD	1.8	-3.7	very coarse	32.3		Pa-2, A	8954
1992.22	Head from a Statue of Venus, Medici type	Roman, 1st century BC - 1st century AD	2.1	-3.8	very coarse	43.2		Pa-2, A	8955
1993.2	Statue of Roman Citizen wearing Toga	Roman, 2nd century AD	2.0	-2.1	very fine			C	8977
1994.2	Veiled Female Head, "Demeter, Europa"	Roman, 140-160 AD	2.7	-7.9	very fine		low Mn, low Sr	Pe	8959
1995.7	Building Inscription	Roman, North Africa, c. 300 AD	2.4	-6.9	very fine			Pe	8978
1986.9.13	Head from a statuette of a Bearded Man	Greek, 4th century BC	3.6	-3.4	fine-medium			Pa-1	8961
1989.9.15	Relief with a Draped Woman	Greek, 1st century BC	-0.1	-8.6	very coarse	34.1	low Mn, low Sr	De-2	8973
1989.2.5	Cinerary Urn	Roman, 70-90 AD	2.0	-1.8	very fine		high Mn, low Sr	C	8972
1989.3.1	Sarcophagus Fragment with Boar Hunt	Roman, 2nd - 3rd century AD	3.4	-2.0	coarse			Pr-1	8974
1997.4.14	Cinerary Urn of Gaius Pompeius Ireneus	Roman, 1st century AD	2.4	-2.6	very fine			C	8971
1998.13.1	Portrait of a Hellenistic Queen	Greek, 3rd-2nd century BC	3.2	-8.7	very fine			Pe	9847
1999.2.95	Head of a Young Boy from Sarcophagus	Roman, 2nd-3rd century AD	2.7	-2.6	fine		low Mn, high Sr	G	8962
1999.11.3	Votive Relief with Hero at a Feast	Greek, 4th century BC	0.4	-3.1	coarse	111.4		E-2, Pa-2	8964
1999.11.5	Statue of Mercury	Roman, 1st - 2nd century AD	1.4	-4.0	very coarse	36.9		A, Pa-2	8953
1999.11.7	Sarcophagus with the Four Seasons	Roman, Mid-2nd century AD	2.1	-2.4	very fine	68.5	low Mn, low Sr	C or D	8957
1999.11.8	Statue of Leda and the Swan	Roman, 1st - 2nd century AD	1.9	-3.8	very coarse	38.8	low Mn, low Sr	Pa-2, A	8970
2002.27.1	Cycladic Storage Jar (Kandila)	Cycladic, ca. 3000-2800 BC	2.1	-7.3	4-5 to 8-9 mm			N	10314
2002.31.1A/B	Statue of Draped Female - head	Greek, 4th - mid 2nd century BC	5.4	-3.0	medium - fine			Pa-1	8979
2002.31.1A/B	Statue of Draped Female - body	Greek, 4th - mid 2nd century BC	2.5	-4.7	.75 mm			Pe	8980
2003.4.1	Grave Stele of Glaukotas	Greek, 470-460 BC	1.9	-1.2	very coarse			Pa-2	8965
2003.5.1	Grave Relief of a Seated Man	Greek, Attic, 3rd quarter of 4th century BC	2.6	-4.3	very fine			Pe	8952
2003.18.1	Funerary Lekythos Fragment	Greek, 4th century BC	2.6	-6.2	fine			Pe	8967
2003.23.6	Votive Relief with Leto escaping Python	Greek, 4th - 3rd century BC	-0.8	-4.4	coarse			E-2	8968
2003.55.1	Portrait of Tiberius	Roman, c. 14 AD	4.6	-3.9	.55 mm			Pa-1	8981
2004.9.1	Relief with Scrolling Acanthus	Roman, early 1st century AD	2.1	-2.0	very fine		high Mn, low Sr	C	8963
2004.13.1	Portrait of a Bearded Man	Roman, late 2nd century AD	-0.6	-5.4	very fine			D	8976
2005.6.1	Portrait Bust of a Woman	Roman, late 1st - early 2nd century AD	4.2	-1.5	medium-coarse			Pa-1	8982
2005.21.1	Relief depicting a Ploughman	Roman, ca. 2nd quarter of the 3rd century	2.3	-3.1	fine		low Mn, high Sr	G	8966
2005.83.1	Head from a Statue of Sappho	Roman, 1st century AD	5.2	-2.5	coarse			Pa-1	10315
2006.38.1	Altar	Roman, 1st century AD	2.2	-1.8	fine			C	15113
2006.38.1	Altar, base fragment	18th century addition	1.9	-1.8	fine			C	15114
2006.38.1	Altar, rim fragment	18th century addition	2.0	-2.2	fine			C	15115
2006.38.2	Lintel Inscription	Roman, 1st century AD with 12th c	1.9	-2.3	fine			C	15116
2006.38.3	Altar, Top removed from	Roman, 1st century AD	2.4	-8.1	medium - fine	368.3		Pe	15117
2006.38.4	Altar, Base removed from	Roman, 1st century AD	2.0	-2.7	medium	81.4		?	15118
2006.40.1	Neo-Attic Krater fragment with Maenad	Greek, 1st century BC, 1st century AD	2.7	-5.5	fine		low Mn, low Sr	Pe	15112
2006.41.1	Statue of Venus, Medici type, head	Roman, 1st century AD	2.0	-3.6	very coarse	34.6		Pa-2, A	10319
2006.41.1	Statue of Venus, Medici type, base	Roman, 1st century AD	2.0	-3.6	very coarse	27.9		Pa-2, A	10320
2006.41.1	Statue of Venus, Medici type, dolphin fin	later repair, 18th c.?	4.2	-2.7	coarse			Pa-1	10317
2006.41.1	Statue of Venus, Medici type, right heel	later repair, 18th c.?	4.0	-3.0	coarse			Pa-1	10318
2006.41.1	Statue of Venus, Medici type, shin	later repair, 18th c.?	2.1	-3.6	1.5-1.8	33.2		Pa-2, A	10321
2007.1.1	Acrolithic Head of Demeter (?)	Greek, 2nd century BC	5.5	-2.5	coarse			Pa-1	10316
2008.41.1	Small Female Portrait Head	Roman, 2nd half of 1st century BC	4.7	-3.0	fine			Pa-1	15111a
2008.41.1	Small Female Portrait Head - base	Later addition, 18th-19th century AD	2.0	-1.8	fine		low Mn, low Sr	C	15111b
2012.11.1	Hellenistic Portrait Statue	Greek, 1st century BC/AD	2.0	-1.0	very coarse	44.5	low Mn, low Sr	Pa-2	19897
L2003.14.48a/b	Cinerary Urn and Lid	Roman, 1st century AD	2.5	-1.7	very fine		low Mn, low Sr	C	8975

Table 1. Analyses of marble of Classical Sculpture, Michael C. Carlos Museum

undercutting, excellent detail, and a sensitive portrait. Furthermore it distinguishes itself from other ploughing reliefs by the huge size of the man, his heavy belt, and the portrait head. The disproportionate size and a detailed portrait recall the famous relief of a circus official from Ostia in the Vatican, dated to the early 2nd century.[30] Like it, this relief could have been commissioned by a freedman to commemorate with cartoon-like exaggeration his rise from humble beginnings to wealth and prominence. The marble identification indicates that the sculptor came from Anatolia but that he was open to influences from Western Roman art of a century earlier. The empty background, rather than third-century Roman *horror vacui*, is another Eastern feature.

Conclusions

Scientifically supported marble identification offers a means to shed light on a multitude of issues for future study of ancient sculpture in the Michael C. Carlos Museum. In five cases, however, attempts have already been made to see what this light can reveal. In general, identification of the marble probably is an important clue to the geographic origin of the sculptor,[31] but these five cases bring up other issues as well. In the case of the Hellenistic goddess (Case Study 1), it has been possible to define the marbles used for the different parts of a high-quality statue. In this case, the head was made of Paros 1 marble and the body Pentelic. Further research may determine whether these choices were made

30 KLEINER 1992, 216, fig. 201-202.

31 ATTANASIO *et al.* 2013, 4367.

because of the presence of different sculptors of Greek origin working on the same project or because of the inherent qualities of the marble. Was Parian chosen for the head because of its greater prestige, its greater cost, its easier workability, its less obtrusive flaws, or its more flesh-like translucency? The situation is further complicated by the possible original application of paint, which might tend to counteract the translucency of the marble.

The relief of a draped woman (Case Study 2) is intrinsically interesting as a good quality Archaistic work in a marble rarely used for sculpture. It provides a new case of a traveling sculptor from the Aegean executing a commission in a local marble in the interior of Asia Minor.

Recognition of the marble of the Leda and the Swan (Case Study 3) helps to place the sculpture in the Eastern reaches of the Mediterranean and reclaim it from the rootless category of generic Roman ideal sculpture.

The statuette of Apollo of the Anzio type (Case Study 4) shows how macroscopic evidence can legitimately play a role in assessing contradictory evidence from laboratory analysis. The case also helps to define and circumscribe the surprisingly reduced role that Parian marble played in the second century AD.

The relief of the ploughman (Case Study 5) is a fine and unusual work, and identification of the marble as Göktepe helps to strike a balance between Eastern and Western Roman elements in the work.

In any case, much work remains to exploit the insights offered by these new marble analyses. It is hoped that this publication of the analyses of all the classical marble sculpture at the Carlos Museum will prompt investigation from scholars working the field, and any enquiries will be warmly welcomed.

Overall, this research illustrates the utility of a multi-method approach to marble sourcing, combining both macroscopic examination and instrumental analyses while demonstrating that it can be done with minimal effects on important museum objects. The identification of the source of the marble used for the significant assemblage of objects on display in this museum provides important information for both museum visitors and those studying the acquisition of marble and its use in antiquity.

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