Artistry in Bronze

The Greeks and Their Legacy

XIXth International Congress on Ancient Bronzes

Edited by

Jens M. Daehner

Kenneth Lapatin

Ambra Spinelli

Artistry in Bronze

Artistry in Bronze

The Greeks and Their Legacy

XIXth International Congress on Ancient Bronzes

Edited by
Jens M. Daehner
Kenneth Lapatin
Ambra Spinelli

The J. Paul Getty Museum and the Getty Conservation Institute
Los Angeles

The free online edition of this book is available at http://www.getty.edu/publications/artistryinbronze and includes zoomable figures and tables. Also available are free PDF, EPUB, and MOBI downloads of the book.

First edition, 2017
Last updated, February 8, 2018
https://www.github.com/gettypubs/artistryinbronze

Published by the J. Paul Getty Museum and the Getty Conservation Institute, Los Angeles
Getty Publications
1200 Getty Center Drive, Suite 500
Los Angeles, California 90049-1682
www.getty.edu/publications

Ruth Evans Lane, *Project Editor*
Robin Ray, *Manuscript Editor*
Nick Geller, *Assistant Digital Editor*
Elizabeth Chapin Kahn, *Production*
Eric Gardner, *Designer and Developer*
Greg Albers, *Project Manager*

Distributed in the United States and Canada by the University of Chicago Press
Distributed outside the United States and Canada by Yale University Press, London

Library of Congress Cataloging-in-Publication Data
Names: Colloque international sur les bronzes antiques (19th : 2015 : Los Angeles, Calif.) | Daehner, Jens, editor. | Lapatin, Kenneth D. S., editor. | Spinelli, Ambra, 1982- editor. | J. Paul Getty Museum and Getty Conservation Institute, issuing body.
Title: Artistry in bronze : the Greeks and their legacy : XIX International congress on ancient bronzes / edited by Jens M. Daehner, Kenneth Lapatin, and Ambra Spinelli.
Description: Los Angeles : The J. Paul Getty Museum and Getty Conservation Institute, [2017] | Includes bibliographical references.
Identifiers: LCCN 2017023890 (print) | LCCN 2017030606 (ebook) | ISBN 9781606065426 (e-book) | ISBN 9781606065402 (online) | ISBN 9781606065419 (pbk.)
Subjects: LCSH: Bronzes, Ancient—Congresses. | Bronzes, Hellenistic—Congresses.
Classification: LCC NK7907 (ebook) | LCC NK7907 .C64 2015 (print) | DDC 745.1093—dc23
LC record available at https://lccn.loc.gov/2017023890

Front cover: Herm of Dionysos (detail), 200–100 BC. Attributed to the workshop of Boëthos of Kalchedon. Bronze, copper, and stone. Malibu, J. Paul Getty Museum, Villa Collection, inv. 79.AB.138

Back cover: Bust of a young male, ca. AD 50–80. Bronze. Malibu, J. Paul Getty Museum, Villa Collection, inv. 89.AB.67.2

Contents

International Bronze Congresses and Associated Publications and Exhibitions

1. **1970 NIJMEGEN**

   Ist International Congress on Ancient Bronzes, April 20–23, 1970. Rijksmuseum G. M. Kam, Nijmegen, Netherlands.

   Acta: 1970. "Tagung über römische Bronzegefäße im Rijksmuseum G. M. Kam in Nijmegen vom 20. bis einschließlich 23. April 1970." (Nijmegen).

2. **1972 MAINZ**

   IInd International Congress on Ancient Bronzes, May 23–26, 1972. Mainz, Germany.

   Acta: H. Menzel, ed. 1973. "Bericht über die Tagung 'Römische Toreutik' vom 23.–26. Mai 1972 in Mainz." *JRGZM* 20: 258–82.

3. **1974 BRUSSELS-MARIEMONT**

   IIIrd International Congress on Ancient Bronzes, May 27–29, 1974. Musées Royaux d'Art et d'Histoire, Brussels, Belgium.

   Acta: 1974 [1977]. "Actes des IIIe journées internationales consacrées à l'étude des bronzes romains Bruxelles-Mariemont. 27–29 mai 1974." *Bulletin des Musées Royaux d'Art et d'Histoire* 46: 5–217. Also printed separately.

4. **1976 LYON**

   IVth International Congress on Ancient Bronzes, May 17–21, 1976. Lyon, France.

   Acta: S. Boucher, ed. 1977. "Actes du IVe colloque international sur les bronzes antiques 17–21 mai 1976." *Annales de l'Université Jean Moulin* (Lyon): 5–236.

5. **1978 LAUSANNE**

   Vth International Congress on Ancient Bronzes, May 8–13, 1978. Lausanne, Switzerland.

   Acta: C. Bérard, P. Ducrey, and A. Altherr-Charon, eds. 1979. *Bronzes hellénistiques et romains: Tradition et renouveau: Actes du Ve colloque international sur les bronzes antiques, Lausanne, 8–13 mai 1978*. Cahiers d'archéologie romande de la Bibliothèque historique vaudoise 17 (Lausanne).

6. **1980 BERLIN**

   VIth International Congress on Ancient Bronzes, May 13–17, 1980. Staatliche Museen Preußischer Kulturbesitz, Antikenmuseum, Berlin, Germany.

   Acta: G.-M. Faider-Feytmans, ed. 1984. *Toreutik und figürliche Bronzen römischer Zeit: Akten der 6. Tagung über antike Bronzen 13.–17. Mai 1980 in Berlin*. Berlin: Staatliche Museen Preußischer Kulturbesitz, Antikenmuseum.

7. **1982 SZÉKESFEHÉRVÁR**

   VIIth International Congress on Ancient Bronzes, May 5–10, 1982. István Király Muzeum, Székesfehérvár, Hungary.

   Acta: J. Fitz, ed. 1984. "Bronzes romains figurés et appliqués et leurs problèmes techniques: Actes du VIIe colloque international sur les bronzes antiques, Székesfehérvár, 1982." *Alba Regia* 21: 5–136.

8. **1984 STARA ZAGORA**

   VIIIth International Congress on Ancient Bronzes, May 27–31, 1984. District Historical Museum, Stara Zagora, Bulgaria.

   Acta: unpublished.

   Catalogue: D. Nikolov et al., eds. 1984. *Ancient Bronzes*. Exh. cat., District Historical Museum, Stara Zagora.

9. **1986 VIENNA**

   IXth International Congress on Ancient Bronzes, April 21–25, 1986. Kunsthistorisches Museum, Vienna, Austria.

   Acta: K. Gschwantler and A. Bernhard-Walcher, eds. 1988. *Griechische und römische Statuetten und Großbronzen: Akten der 9. internationalen Tagung über antike Bronzen, Wien, 21–25 April 1986*. Vienna: Kunsthistorisches Museum.

   Catalogue: K. Gschwantler, ed. 1986. *Guß + Form: Bronzen aus der Antikensammlung*. Exh. cat., Kunsthistorisches Museum, Vienna.

10. **1988 FREIBURG**

   Xth International Congress on Ancient Bronzes, July 18–22, 1988. Freiburg, Germany.

   Acta: J. Ronke, ed. 1994. *Akten der 10. Internationalen Tagung über antike Bronzen, Freiburg, 18.–22. Juli 1988*. Forschungen und Berichte zur Vor- und Frühgeschichte in Baden-Württemberg 45.

   Catalogue: H. U. Nuber, ed. 1988. *Antike Bronzen aus Baden-Württemberg*. Exh. cat., Limesmuseum Aalen, Aalen (Germany).

11. **1990 MADRID**

   XIth International Congress on Ancient Bronzes, May–June 1990. Madrid, Spain.

   Acta: J. Arce and F. Burkhalter, eds. 1993. *Bronces y religion romana: Actas del XI congreso internacional de bronces antiguos, Madrid*. Madrid: Consejo Superior de Investigaciones Científicas.

   Catalogue: P. de Velázquez, ed. 1990. *Los bronces romanos en España*. Exh. cat., Palacio de Velazquez, Madrid.

12. **1992 NIJMEGEN**

   XIIth International Congress on Ancient Bronzes, June 1–4, 1992. Provincaal Museum G. M. Kam, Nijmegen, Netherlands.

   Acta: S. T. A. M. Mols et al., eds. 1995. *Acta of the 12th International Congress on Ancient Bronzes, Nijmegen*. Nederlandse Archeologische Rapporten 18. Nijmegen: Provincaal Museum G. M. Kam.

13. 1996 CAMBRIDGE, MA

XIIIth International Congress on Ancient Bronzes, May 31–June 2, 1996. Harvard University Art Museums, Cambridge, MA, U.S.A.

Acta: C. C. Mattusch et al., eds. 2000. *From the Parts to the Whole: Acta of the 13th International Congress on Ancient Bronzes*, 2 vols. *JRA Suppl.* 39.

Catalogue: C. C. Mattusch, H. Lie, et al., eds. 1996. *The Fire of Hephaistos: Large Classical Bronzes from North American Collections*. Exh. cat., Harvard University Art Museums, Cambridge, MA.

14. 1999 COLOGNE

XIVth International Congress on Ancient Bronzes, September 21–24, 1999. Römisch-Germanisches Museum, Cologne, Germany.

Acta: R. Thomas, ed. 2000. *Antike Bronzen: Werkstattkreise, Figuren und Geräte, 14. Internationaler Kongress, Römisch-Germanisches Museum, Köln*. Kölner Jahrbuch 33.

15. 2001 GRADO-AQUILEIA

XVth International Congress on Ancient Bronzes, May 22–26, 2001. Università di Udine, Gorizia, Italy.

Acta: A. Giumlia-Mair, ed. 2002. *I Bronzi Antichi: Produzione e Tecnologia: Atti del XV Congresso Internazionale sui Bronzi Antichi, organizzato dall'Università di Udine, sede di Gorizia, Grado-Aquileia*. Monographies instrumentum 21. Montagnac: Mergoil.

16. 2003 BUCHAREST

XVIth International Congress on Antique Bronzes, May 26–31, 2003. Romanian National History Museum, Bucharest, Romania.

Acta: C. Muşeteanu, ed. 2004. *The Antique Bronzes: Typology, Chronology, Authenticity: Acta of the XVIth International Congress on Antique Bronzes*. Bucharest: Cetatea de Scaun.

17. 2011 IZMIR

XVIIth International Congress on Ancient Bronzes, May 20–26, 2011. Sebanci Cultural Palace, Dokuz Eylül University, Izmir, Turkey.

Acta: A. Giumlia-Mair and C. C. Mattusch, eds. 2016. *Proceedings of the XVIIth International Congress on Ancient Bronzes, Izmir.* Monographies instrumentum 52. Autun: Mergoil.

18. 2013 ZURICH

XVIIIth International Congress on Ancient Bronzes, September 4–7, 2013. University of Zürich, Swiss National Museum Zurich, and the Paul Scherrer Institute, Zurich, Switzerland.

Acta: P. Della Casa and E. Deschler-Erb, eds. 2015. *New Research on Ancient Bronzes: Acta of the XVIIIth International Congress on Ancient Bronzes, Zurich 2013*. Zurich Studies in Archaeology 10.

Catalogue: M. Bürge, E. Deschler-Erb, and A. Kaufmann-Heinimann, eds. 2013. *Göttlich menschlich: Römische Bronzen aus der Schweiz*. Exh. cat., Archäologisches Institut der Universität Zürich.

19. 2015 LOS ANGELES

XIXth International Congress on Ancient Bronzes, October 13–17, 2015. The J. Paul Getty Museum, Los Angeles, CA, U.S.A.

Catalogue: J. M. Daehner and K. Lapatin, eds. 2015. *Power and Pathos: Bronze Sculpture of the Hellenistic World*. Exh. cat., The J. Paul Getty Museum, Los Angeles.

20. **2018 TÜBINGEN**

XXth International Congress on Ancient Bronzes, April 17–21, 2018. University of Tübingen, Germany.

Directors' Foreword

The Getty has long been committed to the appreciation, study, and conservation of ancient bronzes. Much like Cicero and others who valued these works for their history, beauty, and craftsmanship, J. Paul Getty himself greatly admired bronze sculpture. Among the early purchases that pleased him most were statuettes of gods and heroes. When he passed away in 1976, he was negotiating for the purchase of the rare life-size image of a victorious athlete that has come to be known as the Getty Bronze. Subsequently acquired by the museum that bears J. Paul Getty's name, that statue was the inspiration for the award-winning international loan exhibition *Power and Pathos: Bronze Sculpture of the Hellenistic World*, a project that brought together an exceptional group of ancient bronzes from around the world. The exhibition opened at Palazzo Strozzi in Florence in spring 2015, was seen by more than 165,000 people at the Getty Center in the summer and autumn of that year, and closed at the National Gallery of Art in Washington, DC, in spring 2016.

The exhibition's run in Los Angeles provided the backdrop for the XIXth International Congress on Ancient Bronzes, which the J. Paul Getty Museum and the Getty Conservation Institute were pleased to cohost in October 2015. Over the course of five days, archaeologists, art historians, curators, conservators, and scientists presented the papers published here addressing the diverse aspects involved in the production, reception, and conservation of bronzes of various kinds—not just sculpture—from many cultures and periods.

We are grateful to all of those who came to Los Angeles to present their research and engage in a fruitful exchange of ideas, as well as the many colleagues across the Getty Trust who assisted the organizers of the Congress—the editors of these proceedings—in making it such a success. We are also thankful to the staff of Getty Publications, who have launched this first electronic edition of the Congress papers, advancing the Getty's leadership role in the digital humanities.

Pliny the Elder wrote that bronze sculpture "has flourished to an extent passing all limit and offers a subject that would occupy many volumes if one wanted to give a rather extensive account of it" (*Naturalis historia* 34.37). It is our hope that these essays, representing the fruits of research shared at the XIXth International Bronze Congress, provide a lasting contribution to the study and conservation of ancient bronzes and a volume that would assist even Pliny in recounting the history of this treasured medium.

Timothy Potts
Director, J. Paul Getty Museum

Timothy P. Whalen
Director, Getty Conservation Institute

Introduction

Jens M. Daehner, J. Paul Getty Museum, Los Angeles
Kenneth Lapatin, J. Paul Getty Museum, Los Angeles
Ambra Spinelli, University of Southern California, Los Angeles

Building on a distinguished tradition, the XIXth International Congress on Ancient Bronzes convened in Los Angeles between October 13 and 17, 2015. Organized by the J. Paul Getty Museum in conjunction with the Getty Conservation Institute, this meeting of more than 150 attendees was held at the Getty Center in Brentwood and the Getty Villa in Malibu. Over 5 days, 116 presenters from 24 countries participated in 11 sessions, delivering 49 papers, 3 keynote addresses, and 1 public lecture, as well as 19 posters discussing diverse aspects of ancient bronze production and its modern reception. Contributors included archaeologists, art historians, historians, curators, conservators, scientists, philologists, and experts in cultural heritage.

The Congress was timed to coincide with the Getty's presentation of *Power and Pathos: Bronze Sculpture of the Hellenistic World*, an international loan exhibition that had previously opened at the Palazzo Strozzi in Florence in March 2015 and subsequently traveled to the National Gallery of Art in Washington, DC, closing in March 2016. The exhibition was unprecedented, bringing together rare ancient bronzes from 34 museums in 13 countries on 4 continents. Focusing on bronze as a medium of artistic innovation in the period between the death of Alexander the Great in 323 BC and the establishment of the Roman Empire in 31 BC, it explored how sculptors moved beyond Classical norms, supplementing traditional subjects and idealized forms with naturalistic renderings of physical and emotional states, dynamic compositions, dazzling displays of the nude body, and graphic expressions of age and character. Divided into six sections—images of rulers; images of gods; representation of the human body; portraiture and expression; replication; and retrospective styles—the exhibition featured exciting new finds recovered from recent excavations on both land and sea alongside famous works known for centuries, allowing for the first time significant opportunities for comparative viewing of these extraordinary works.

Many of the sculptures in the exhibition were the subject of papers presented at the Congress (and now published here), and Congress participants also took advantage of multiple visits, both formal and informal, to the Getty and other Southern California collections, as well as to the exhibition itself. A special excursion was arranged to the Norton Simon Museum in Pasadena and the Huntington Library, Art Collections, and Botanical Gardens in nearby San Marino.

The Congress, of course, was in no way limited to the themes of the exhibition, with its emphasis on Hellenistic sculpture. As at previous meetings, aspects of technology and production, analytical work regarding casting cores, alloys, joins, and patinas—all of which have significantly advanced our understanding of materials, processes, and techniques involved in this medium—were addressed. Also treated were larger historiographical issues, such as how technical scholarship has impacted our understanding of bronzes within the wider history of ancient art. How do these technical data relate to our ideas of style and development? How has bronze as a material affected ancient and modern perceptions of form, value, and the status of works of art?

These proceedings are organized along the structure and themes of the Congress itself. For mostly pragmatic reasons and to fit the requirements of the publishing format, the sequence of sections and papers during the meeting has been somewhat modified.[1] Where individual papers are referenced, they are identified by number.

Large-Scale Bronzes

With the exhibition on Hellenistic bronze sculpture installed at the J. Paul Getty Museum, large-scale bronzes received particular emphasis among the papers delivered, perhaps more than in previous congresses. In this first section, several papers specifically addressed works present in the exhibition, such as the bronze athlete from Ephesos (1), the head of a man with *kausia* from Kalymnos (4), and the Apollo head from Salerno (6). Congress participants subsequently continued and deepened the discussions directly in front of the objects, often with great enthusiasm. This was particularly productive, as many of these conversations involved the very experts in whose care these works are entrusted, including archaeologists, curators, and conservators. (In fact, a significant factor for colleagues and their institutions in deciding to lend several of these extraordinary objects to the exhibition was the coincidence of the Congress with the exhibition, providing unique opportunities for an exchange of ideas within an international community of specialists.) The papers in this section ranged from the legendary Colossus of Rhodes (2), the largest of all large-scale bronzes but known only from ancient descriptions, to the latest underwater discoveries in the Aegean Sea (3)—many as yet unpublished—and the reception of Greek bronze sculpture in the twentieth century. Here, as in other sections, some papers were the result of close collaboration between art historians and conservators (1, 7), exemplifying a model of bronze scholarship pioneered in the 1990s by Carol Mattusch and Henry Lie.

The Artist

Artistry being the theme of the Congress, several scholars devoted their papers to the question of artists and their workshops. A proverbial 99 percent (if not more) of large bronzes made in antiquity are irrevocably lost, so attempts to reconstruct some of that vast majority from textual, epigraphical, or other indirect evidence are inevitable and crucial for our understanding of the genre and of ancient sculpture production as a whole. Novel approaches to this old problem include an investigation of dowel holes on statue bases as indicators of technical innovations by sculptors and craftsmen (9); a prosopographical study of statue base inscriptions aiming to trace the movement of artists and markets (12); and an analysis of how natural patinas and their color impacted ancient writers' judgment of bronze sculptures (11). The most experimental proposal, perhaps, came from a team of researchers and engineers in Japan who used 3D-shape comparison software to examine sculpted faces and reassess attributions to one particular artist, the ever-present, ever-elusive Polykleitos (10).

Statuettes

As in previous congresses, the sheer quantity and wide distribution of small-scale figures invited a large number of papers, and in Los Angeles these were presented in two dedicated sessions. The inquiries, approaches, and methodologies were as wide-ranging as the material itself, including aesthetic, iconographic, contextual, and technological studies. Among them is a new interpretation of the identity of the so-called Artisan in the Metropolitan Museum, which was on view in *Power and Pathos* (15); a comparative investigation of enamel technology in Roman and Celtic miniature bronzes of enigmatic roosters (19); and a paper highlighting the phenomenon of medium-sized (i.e., large) statuettes (18), which may be a subset worthy of its own category.

The Hellenistic East

As its subtitle announced, *Power and Pathos* presented bronzes from the "Hellenistic World," which, in the wake of Alexander's conquests, stretched far beyond the shores of the Mediterranean. Although modern geopolitical considerations precluded more than a glimpse of the large bronzes preserved from the expanded East, some of this rich material was duly covered in the exhibition catalogue. The number of Congress papers addressing bronzes in the Hellenistic East warranted a separate session. These explore bronze—and its influence on other media—from sites ranging from central Anatolia (21), Syria (23), and Iran (22) to Uzbekistan in Central Asia in the area of ancient Bactria. (An irony illustrating the truly global reach of the International Bronze Congress: of all venues in its history, Los Angeles has been the most western.)

Vessels

Middle Eastern perspectives were also present among the papers dealing with bronze vessels, be it an examination of figurative vases from Lebanon (28) or a historical study of the role Hellenistic vessels played in the origins and development of Islamic metalware (29). The Derveni Krater, the subject of a series of papers in previous congresses, has been reconfirmed as a touchstone and climax of bronze artistry of any period (26).

Artifacts

Since its early days, the Bronze Congress has provided a forum not only for major artworks such as sculpture or elaborate vessels but also for more mundane artifacts and implements, from armor and weaponry, to lamps and mirrors, to medical instruments and even nails. One paper reminds us that as early as the Minoan period, the smallest of cosmetic devices, such as tweezers and scrapers, could in fact be status symbols (30). Similarly, bronze cases for writing and medical implements found in Hellenistic Macedonian tombs formed part of elite burials (32). Among the new material presented in this section—either unpublished or hitherto misinterpreted—were engraved bronze inlays, modest products by themselves but now understood as decorations for elaborate musical instruments (34).

Conservation and Analysis

One of the defining roles of Bronze Congresses has been as a platform for direct exchange between art historians, archaeologists, conservators, and scientists from a wide range of disciplines and specialized fields. Research presented in almost every session included projects conducted collaboratively with metal conservators and/or materials scientists. Bundled here are the manifold contributions whose main focus is on the metallurgy, chemistry, technology, or conservation of ancient bronzes. Papers and posters in this section dovetailed closely with the *Power and Pathos* exhibition, discussing metal analytics and manufacturing processes of the Medici Riccardi Horse (39), Alexander on Horseback (44), the Getty Herm (41), and the Apoxyomenos statue from Croatia (43), all of which were on display in the exhibition. As critical awareness of the fallibilities in sampling and testing methods has grown over the past decades, a number of important bronzes have recently been reanalyzed, for instance the Piombino Apollo (42), whose alloy was first tested in 1967, and the Nelidow Alexander statuette (47), whose authenticity had for some time been questioned.

✦ ✦ ✦

Among the newer developments in ancient bronze studies is a heightened awareness of the limitations of the investigative tools available to us, as well as their promises and opportunities. With this comes the need to accept the inconvenience that older analytical results may not be as reliable as our desire to trust “hard science” would have us believe. Thus, we have the responsibility and burden of seeking the resources, institutional support, and professional alliances to conduct new series of analyses where such investigations are warranted. In this regard, the International Bronze Congresses—being more than just a forum for scholarly exchange—can be an effective catalyst for advanced research agendas.

In the way it has evolved, the field of ancient bronze studies as a whole may be recognized as a role model for other disciplines: it embraces the utmost diversity in perspectives and methodologies—practiced, shared, and adopted by experts at home in the humanities, metallurgy, and engineering as well as nuclear physics and even traditional crafts. This is in part a function of bronze being a man-made material, but it is mostly due to a culture of curiosity, openness, and innovation among bronze’s enthusiastic scholars and practitioners. Future congresses will celebrate and advance this legacy, beginning with the XXth International Congress on Ancient Bronzes planned for early 2018.

✦ ✦ ✦

The Los Angeles Congress owed its success to the hard work and ingenuity of many colleagues and collaborators and the generosity of crucial supporters. Funding was provided by the Getty’s Villa Programming Committee, the Villa Council, and the Getty Conservation Institute. As organizers, we are most indebted to Lisa Guzzetta, whose coordination skills and programming experience were indispensable in the preparation of the Congress and whose equanimity guaranteed that it ran smoothly. We also relied on the support of several colleagues, including James Cuno, Heather Leisy, Andrea Bestow, Lorin Green, and Danielle Espino at the Trust; Timothy Potts, Jerry Podany, Jeffrey Maish, Jeffrey Spier, Claire Lyons, Nicole Budrovich, Paige-Marie Ketner, Emma Sachs, Eric Beckman, and Sheridan Marsh at the Museum, and Tim Whalen, Jeanne Marie Teutonico, and Gary Mattison at the Conservation Institute. In the middle of the Congress, we imposed our large group on two neighboring institutions, namely the Norton Simon Museum of Art in Pasadena and the Huntington Library, Art Collections, and Botanical Gardens in San Marino. We are extremely grateful to Carol Togneri, Gloria Williams, Emily Beeny, Elizabeth Clingerman, Catherine Hess, and Melinda McCurdy for welcoming us.

The life of a congress are its papers and the discussions and debates they inspire. It was an honor to host so many distinguished colleagues on this occasion, most of whom traveled far to come to Los Angeles. Their professional enthusiasm and thoughtful, lively presentations enriched this meeting for every participant. We express our thanks to all authors and presenters. In addition, we would like to acknowledge Beryl Barr-Sharrar, Carol Mattusch, and Salvatore Siano, who agreed to present keynote addresses, and Giorgos Koutsouflakis, who delivered a sold-out public lecture on the latest underwater discoveries in the Aegean.

Their contributions, too, are published in these proceedings.

The production of this digital volume—the first in the history of the Bronze Congress!—was in the expert hands of the staff at Getty Publications, in particular Kara Kirk, Karen Levine, Greg Albers, Eric Gardner, Nick Geller, Elizabeth Kahn, and Leslie Rollins. Project editor Ruth Evans Lane forcefully tackled the multiple challenges of this undertaking, a veritable beast with many tentacles, which were untangled and tamed by Robin Ray, our competent and sympathetic manuscript editor. Rights assistant Nina Damavandi rose above and beyond the call of duty in reviewing files and advising on permissions for this volume's hundreds of illustrations. Each of these staunch collaborators deserves an honorific bronze statue.

Los Angeles
September 2017

1. The original program can be found in the book of abstracts distributed at the time of the meeting and remains available online: http://www.getty.edu/museum/symposia/pdfs_bronze/bronzecongress_getty_schedule.pdf.

✦ ✦ ✦

Note to the Reader

Bibliographic abbreviations follow those employed by the *American Journal of Archaeology*. See https://www.ajaoline.org/submissions/abbreviations. Spelling and style of Greek and other foreign terms follow the guidelines set forth in the *Chicago Manual of Style*.

I. Large-Scale Bronzes

1.

The Bronze Athlete from Ephesos

Georg A. Plattner, Kunsthistorisches Museum, Vienna
Kurt Gschwantler, Kunsthistorisches Museum, Vienna
Bettina Vak, Kunsthistorisches Museum, Vienna

In the second year of the Austrian excavation in Ephesos (1896), fragments of the Athlete of Ephesos were found in the ruins of the Harbor Baths. Vast parts of the marble architecture of the *palaestra* had been destroyed by earthquake and fire, but 234 statue fragments of various sizes, buried beneath the burnt roofing, were preserved. Most unusually, the base on which the statue was mounted was also preserved.

Due to an agreement between the Ottoman sultan and the Austrian emperor, the statue and base were taken to Vienna as a gift to the imperial collections. In Vienna, sculptor Wilhelm Sturm was commissioned to restore the statue. Recognizing the similarity of the statuary type, Sturm based the arrangement and composition of the athlete on the Apoxyomenos in the Uffizi in Florence. The Athlete of Ephesos was put on display immediately, in the first show of finds from Ephesos in Vienna in 1901. Since 1978, it has been part of the Ephesos Museum in the former Austrian Imperial Palace in Vienna.

Since the first publication of the statue in 1906, dating and art historical classification of the athlete have been disputed. While it is widely accepted that the cast itself is Roman, some authors cite Greek models from the Late Classical/Early Hellenistic period from the third and second centuries BC, while others argue for a Roman work of eclecticism.

Sturm realized the reconstruction of the statue in 1897–98. He built an internal armature scaffold of tinned iron, brass bars, and screws to mount the preserved fragments. These original parts underwent several mechanical and chemical treatments, as was common at that time. Sturm used a magnesium-chloride mortar as a filler and stabilizer. Even in the first exhibition, this hygroscopic material caused problems of efflorescence due to temperature and humidity fluctuations.

In the ensuing eight decades, sculptors undertook two major interventions. In 1951, the position of the right arm was corrected, and in 1977 a synthetic resin was added as a new filling material.

To dispel lingering doubts concerning the stability and strength of the interior scaffold or the possibility of active corrosion on the original bronze fragments, the Kunsthistorisches Museum together with the Getty Museum undertook scientific investigations to characterize and evaluate the mortar chemically and structurally. A solid construction of aluminum square tubes with custom-fit interior design was developed for transport.

✦ ✦ ✦

1. Archaeological Background and History of the Bronze's Classification

Among the few preserved bronze statues from antiquity, the Athlete from Ephesos is an outstanding case in several respects (fig. 1.1): (1) discovered in the late nineteenth century (1896), it comes from a clear context within its ancient surroundings; (2) to this day, it ranks among the most complex conservation projects ever undertaken, requiring the reassembly of more than 200 fragments; (3) with the discovery of a “twin” statue in the sea near the coast of Croatia exactly 100 years later, it has recently become part of an intriguing case study and an issue for archaeology and art history.

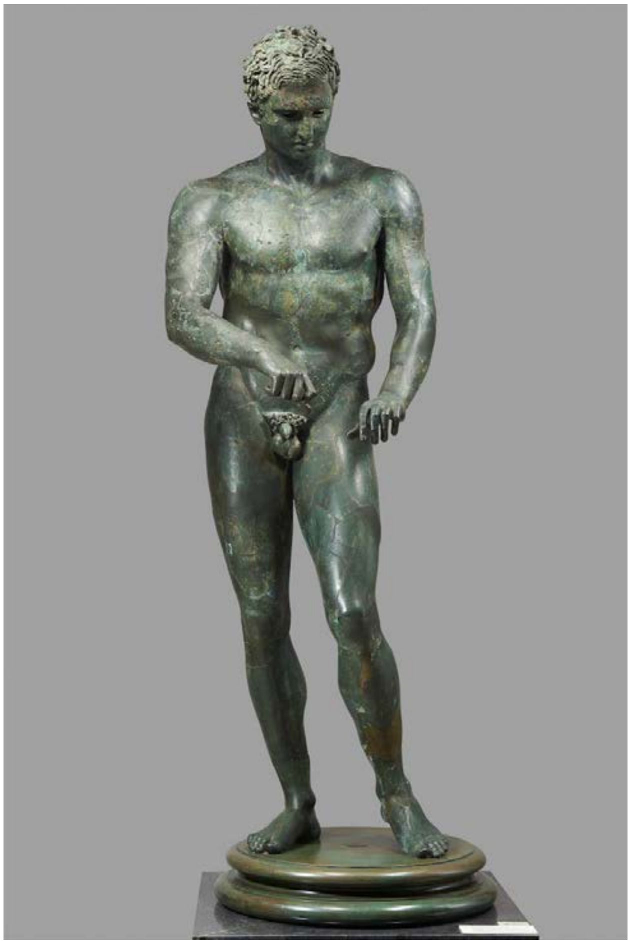


Figure 1.1. Athlete of Ephesos, Kunsthistorisches Museum Vienna, inv. VI 3168
Image: KHM-Museumsverband

Otto Benndorf (1838–1907), professor of Classical archaeology at the University of Vienna, began the Austrian excavations in Ephesos in 1895 with support from the Austrian emperor Franz Joseph. The focus in the early years was on major public buildings such as the Grand Theater and the so-called Harbor Baths, a spacious bath-gymnasium complex from the late first century AD.[1] In 1896, the Austrian mission unearthed the *palaestra* of these baths, discovering a splendid marble hall with several sculptures and elements of architectural decoration.[2] The southwest corner of the *palaestra* directly in front of this marble hall, although difficult to excavate due to the debris from the collapsed hall, turned out to be an important spot. It was the only section of the *palaestra* that remained untouched after the earthquake that was estimated to have taken place in the third century AD. In contrast, the main area of the *palaestra* was probably first looted and then, presumably in the fifth century AD, incorporated into the Late Antique town, as the surprisingly well-preserved wealthy houses unearthed recently demonstrate.[3]

The English archaeologist John Turtle Wood did not excavate in this corner in the nineteenth century because the remnants of the roof and the building structures obstructed the ongoing work.[4] Benndorf and his crew finally exposed the area in the late nineteenth century and found a solid stone pedestal with bases and lower parts of pilasters, being part of a (mainly lost) aedicula (fig. 1.2).

Figure 1.2. Ephesos, Harbor Baths: excavations (1896–97) in the southwest corner of the *palaestra* marked the base of the athlete in situ
Image: OeAW/OeAI

In front of this aedicula, 234 fragments of a life-size bronze sculpture were brought to light; it was dubbed the Athlete, or the "Schaber," of Ephesos.[5] Evidently the statue had been thrown off its base and fallen forward, as the feet were found nearest to the pedestal and the head was farthest away.[6] The wooden roof materials and the brick tiles of the hall covered the bronze fragments; marble blocks collapsed in such a way that they formed a kind of hollow, preserving the unbroken head attached to the upper part of the back (fig. 1.3).[7]

Figure 1.3. The Athlete of Ephesos, head and shoulders before restoration
Image: OeAW/OeAI

Due to an *irade* (edict) of Sultan Abdul Hamid II, the Austrian ambassador, Freiherr von Calice, was allowed to choose some of the excavated finds, which were sent to Vienna as a gift from the sultan to Emperor Joseph.[8] The Austrian Lloyd shipping company transported the sculptures, architectural elements, and small finds to Vienna in seven transports between 1896 and 1906; the fragments of the bronze athlete came to Vienna in the 1897 transport.[9] (From 1907 onward, a new law concerning the legal framework of preservation of antiquities promoted by Osman Hamdi Bey, founder of the Istanbul Archaeological Museum, halted the export of archaeological heritage.) Today, most of the finds from Ephesos brought to Vienna are on display in the Ephesos Museum, which was opened in 1978 in the former Habsburg Imperial Palace in Vienna.[10] We will discuss the reconstruction of the heavily damaged statue in greater detail below.

After its restoration, the statue was immediately put on display, in the first exhibition of finds from Ephesos in the "Theseus Temple" in Vienna (fig. 1.4).[11] This "temple," a reduced copy of the "Theseion" (Hephaisteion) in Athens, was built by Pietro di Nobile in Vienna in 1819–23 to house the famous sculpture *Theseus Fighting the Minotaur* by Antonio Canova. After this sculpture was moved to the main staircase of the Kunsthistorisches Museum in the 1880s, the Theseus Temple was ready to house the Ephesos exhibition, which was enthusiastically received.

Figure 1.4. Exhibition of finds from Ephesos in the "Theseus Temple" in Vienna, 1901
Image: KHM-Museumsverband

The exhibition of the Athlete represented a triumph of restoration, carried out by sculptor Wilhelm Sturm. The technique of the restoration and Sturm's groundbreaking approach to solving the complex three-dimensional puzzle posed by 234 bronze fragments gained international attention. For example, Sturm was invited to Greece in 1901 to consult on the restoration of the Antikythera sculptures,[12] though in the end he declined to take on the project.

Before the Ephesian sculpture could be reconstructed, one of the major tasks was to understand the composition of the statue and to determine the position of each fragment. Benndorf provided crucial knowledge, recognizing in the well-preserved head and its position the well-known statuary type of the marble athlete in the Uffizi of Florence.[13] This statue stands on display today in the Galleria, with modern arms added, holding a jug. A plaster cast of this sculpture was commissioned and it served Sturm as a model for reconstructing the Ephesian Athlete.[14] Due to the size and deformation of the fragments as well as losses, it was not possible to resolve every aspect of position of the arms and legs or the upper body. But remarkably only about ten fragments could not be allocated to a precise position.

Both the Ephesian and the Florentine statues were understood early on to represent athletes; this was clear because the short hair, slicked to the forehead, was apparently wet from sweat. Understanding the statuary type (or an assumed Greek original) as a masterpiece of the (Late) Classical period, scholars connected it to the *Apoxyomenoi* (scrapers) mentioned in ancient literature as works of Polykleitos and his successors (see below). The concentrated gaze down toward the hands seemed to favor this interpretation. Hence the Ephesian Athlete was reconstructed as cleaning his left arm—more precisely, the back of his left hand—with a *stlengis*, or scraper.[15]

At around the same time, in 1896, a smaller-than-life-size sculpture was found in Frascati, Italy, and soon made its way to the Museum of Fine Arts in Boston.[16] The statue follows the same type as the athletes from Ephesos and Florence. The importance of this find was the preserved hands of the sculpture. It became clear that the Athlete is not scraping the back of his hand but rather cleaning the *stlengis* using the thumb of his left hand.[17] Benndorf mentioned this statue in his publication of the Ephesian Athlete in 1906.[18] Obviously, however, it was too late to influence the restoration of the bronze statue from Ephesos: the right arm had already been mounted at an improper angle to the body. Half a century later, a major correction was made to the position of the right arm (see below). This correction also brought the fragments of the right shoulder and the upper right arm into considerably better coordination. Furthermore, the position of the arms now corresponds much better with the turn of the head.[19]

Figure 1.5. Campana relief showing statues in a *palaestra*. Kunsthistorisches Museum Vienna, inv. V 1895
Image: KHM-Museumsverband

Figure 1.6. Base found in the *palaestra* in Ephesos. Kunsthistorisches Museum Vienna, inv. III 1087
Image: KHM-Museumsverband

As to the find situation of the Ephesian Athlete, this statue was part of the sculptural program of the *palaestra* of the Harbor Baths.[20] Statues of athletes appear to have been a common sight in such contexts; for example, a scraping athlete statue is seen framed by columns and gables of *palaestra*—architecture on a series of Campana reliefs, including one preserved in the Kunsthistorisches Museum in Vienna (fig. 1.5).[21] The stone socle and fragments of the pilasters of the aedicula that framed the statue remained in situ, but the narrow marble base was taken to Vienna. This base has moldings on three sides and bears an inscription on the front, of which parts of six lines are still readable (fig. 1.6).[22] It mentions a Tiberius Claudius Frugianus as *gymnasiarchos* and a Tiberius Claudius (Aristion?) as *grammateus*; these individuals are well known as donor and builder, respectively, in the late first century/ beginning of second century AD. We owe the knowledge of these names and the readability of the few fragments to four other bases of the same type, also found in the *palaestra*, naming the same officials and their dedications of further sculptures, which have not survived.[23]

Surprising—and initially misleading—is the surface of the base. There are no holes or even traces thereof for fixing a sculpture on top of it. It is flat but not entirely even. Noting this fact, R. Heberdey in 1919 expressed doubt that this base carried a bronze sculpture: it lacks the characteristic holes to fix the legs by means of lead poured through the feet.[24] Frank Willer has recently shown, however, that over the course of time different techniques were used to fix bronze sculptures onto a base.[25] In the Roman Imperial age, a statue was more often fixed to a metal panel or base than to the stone base itself; so in the end, the sculpture was "freestanding" due to an enlarged platform.[26]

In this case from Ephesos, we have the rare good fortune of having both the bronze sculpture and its corresponding base. The date of the base might even hint at the age of the statue itself, taking into consideration the relatively short lifetime of this particular corner of the Harbor Baths. Sometime in the fourth century AD, the southern rooms adjacent to the *palaestra* were modified and reused in the new *atrium thermarum Constantiniarum.* It seems that by that time, the southwest corner of the *palaestra* had been abandoned. Hence, the earthquakes that destroyed this part of the building might have been those of the later third century AD, recorded strikingly by the destruction of the famous Slope Houses of Ephesos.[27] Considering this, we see a timespan of less than two hundred years for the "lifetime" of the base. Taking into consideration that the technique used to make the Athlete points to the first/second century AD, it is most likely that statue and base were purposely made for display in the *palaestra* of the Harbor Baths (fig. 1.7)—until they were both buried by debris and thus no longer available for reuse or reworking.[28]

Figure 1.7. Reconstruction of original position of the Athlete. After Benndorf 1906, 185, fig. 131

After first assuming or rather hoping they had unearthed a "Greek original," archaeologists soon agreed that the Ephesian Athlete must be a Roman sculpture. But even today a vivid discussion continues as to whether the statue is a copy of a Greek original or a Roman creation. The statuary type of the Ephesian Athlete is preserved in several surviving statues/torsos[29] and heads.[30] Two small-scale bronze statuettes also follow this type:[31] one from the Louvre differs in that the head is raised and the Athlete does not look down to his hands. Depictions of the type are also preserved on Campana reliefs,[32] as well as on gems,[33] and even on a statuary base from the Acropolis of Athens.[34]

Despite early speculation that the Ephesian Athlete was one of the two original Greek scrapers by Daidalos from Sikyon mentioned by Pliny,[35] it was soon clear that the statue had to be dated in the Roman era. Already by 1906, Benndorf had pronounced it an "excellent copy from early Roman times."[36] However, scholars differ widely in dating the original of the type, with estimates ranging from the fourth century BC to the end of the first century AD:

Greek original	
Schneider 1901 Greek (Attic)	mid-fourth century BC
Hauser 1902	Daidalos of Sikyon
Sieveking 1926	mid-fourth century BC
Stewart 1978	around 300 BC
Roman copy	
Benndorf 1906	early Roman copy
Johnson 1927	Hellenistic (Daippos?)
Lippold 1950	350 BC
Linfert 1966 Daidalos	370–360 BC
Arnold 1969 Daidalos	370–365 BC
Fuchs [1969] 1993	340/330 BC (Daidalos?)
Lattimore 1972	early Hellenistic, Phanis
Pochmarski 1988	Lysippos 320 BC or classicizing/copy of a Roman (!) sculpture
Moser von Filseck 1990	classicizing, early Augustan
Pochmarski 1999	Flavian (copy of Roman sculpture)
Willer 1996	Roman copy
Saladino 2006	before 350 BC (Daidalos? Polycletos II?)
Mattusch 2015	*officina* of Lysippos/Roman copy?
Daehner 2015	later fourth-century BC, early imperial copy

Karin Moser von Filseck claims the Ephesian Athlete to be the link between Polykleitos and Lysippos,[37] while Dorothea Arnold ascribes it to the second generation after Polykleitos (370–365 BC), naming—again—Daidalos from Sikyon as a possible artist.[38] Werner Fuchs explains the type as part of the Argive-Sikyonian tradition influenced by Lysippos (340/330 BC). A. F. Stewart and Steven Lattimore think of a possible date of origin in the third century BC following Lysippos.[39] Erwin Pochmarski, finally, proposes an imperial original in Rome (eclectisistic?) from which a direct copy was taken.[40]

The discovery of the "twin" of the Ephesian Athlete, the Apoxyomenos from Lošinj, Croatia,[41] brought renewed attention to the Ephesian Athlete.[42] For the first time, it is possible to compare two bronze statues of the same type found in completely different circumstances and regions of the Mediterranean. It also proves, finally, the correct reconstruction of the Ephesian Athlete. The technical aspects of both statues seem to be quite similar, which leads to the assumption that both statues are Roman Imperial, probably from the same decades. The mounting of the head, for example, is consistent in both sculptures with the characteristic V-shaped lower edge of the neck.

The overall impression differs, though: the Ephesian Athlete seems to be slightly more muscular. Of course, fixing 234 fragments causes as many joints, perhaps "inflating" the chest to a certain degree. However, this is not enough to explain these differences.

The opportunity of seeing the two statues next to each other in the exhibition *Power and Pathos* at the Getty Museum, Los Angeles, led the focus of investigation back to the ancient techniques of bronze casting and joining of separate sections, but it also invited new art historical discussion. In the catalogue to the exhibition, this type of athlete is suggested as coming from the *officina* of Lysippos[43] or—more loosely—to be understood as arising in the environment of Polykleitos, Daidalos, or Lysippos.[44]

Tracing a possible Greek original must be reconsidered in light of the different proportions and details of the two statues. Is it by chance that so many bronze specimens of this very type are preserved? In addition to the statues from Ephesos and Lošinj, the head now in the Kimbell Art Museum[45] and even the basanite torso from Castel Gandolfo might be taken into consideration, as the material probably is meant to resemble bronze. The issue of the main view axis—determining the "front side" of the statue—can also be revisited with new evidence. The Campana reliefs show the athlete from the side, making his movement clearly understandable. In contrast, the preserved rectangular base plate from the Croatian athlete suggests a frontal view of the statue.

— G. A. Plattner, K. Gschwantler

2. Restoration History and Stability Evaluation

The reconstruction of the Roman bronze statue was realized in Vienna in 1897–98 by the sculptor Wilhelm Sturm. He constructed an internal armature of tinned iron, brass bars, and screws to mount the 234 preserved fragments. The original fragments underwent several mechanical and chemical treatments, as was common at that time. Sturm used magnesium chloride containing mortar as a filler medium and stabilizer. During the first exhibition, this hygroscopic material caused problems of efflorescence due to temperature and humidity fluctuations; the Athlete was then moved to a better-protected indoor location.

In the following eight decades, sculptors undertook two larger interventions. In 1951, the position of the right arm was corrected, and in 1977 synthetic resin was added as a new filling material. It is important to study this restoration history and conserve the treatments as effectively as possible. To dispel all doubts concerning the stability and strength of the interior armature or the possibility of active corrosion on the original bronze fragments, the Kunsthistorisches Museum Vienna, together with the J. Paul Getty Museum,[46] undertook scientific investigations to characterize and evaluate the mortar chemically and structurally (mortar samples, X-radiography, endoscopic studies). Black-and-white images from 1898—taken before the mortar was poured inside the reconstructed statue—were helpful in gaining information about the condition of the original fragments and evaluating changes in comparison with the current X-ray images. For the transport of the Athlete, a "cage" of aluminum tubes, square in section, with a custom-fit interior design was developed.

This paper will present the remarkable reassembling of the bronze statue known as the Athlete of Ephesus at the end of the nineteenth century as well as the interventions in the twentieth century. The study of the different restoration treatments has revealed an interesting and complex history. Because of the diversity of materials involved, scientific investigations were necessary to evaluate the stability of the statue as it is preserved today. The first series of analyses was started fifteen years ago; recent research has focused on corrosion, the composition and quality of the filling mortar, and possible changes. In 2013, a collaborative project established between the Collection of Greek and Roman Antiquities of the Kunsthistorisches Museum Vienna and the J. Paul Getty Museum was launched to support this work as well as for the design and development of a novel transport cage.

Archival photographs exist (see fig. 1.3) that show us the condition of the head right after the discovery of the Athlete in 1896.[47] We see hard incrustations of sand and soil especially in the hair and on the forehead. No heavy corrosion or weakness of the metal is visible. However, the entire statue was broken into fragments. The heavy marble block that fell on the legs and lower part of the back caused deformation and loss of several pieces.

The reassembly of the 234 bronze fragments was a great challenge for Sturm; his father was then head of the restoration studio of the antiquities department.[48] Sturm followed the then standard practice for the treatment of outdoor bronze objects. He did not solder the fragments together, as he would have done with sound material. Instead, he reassembled them mechanically. Using more than 1,800 small brass screws, he connected 300 brass straps to the reverse side of the 234 fragments.[49] In this way, he managed to slot together the edges of the bronze as tightly as possible, with the reference statue from Florence in mind (see above).[50] He completed the statue by mounting brass clasps to connect the two fragment assemblies to a tin-plated iron armature, giving them a rigid structure. The cleaned fragments weighed 85 kilograms (187 lb.) (fig. 1.8). In order to fill the losses and to stabilize this very fragile framework, he filled the interior up to the cranium with a mortar mixture “of his own invention.”[51] This was based upon magnesium chloride, also known as Sorel cement. According to Sturm’s son and assistant, there were several advantages to using this material:[52] it was (1) lightweight; (2) believed to be free of hygroscopic properties; (3) absolutely stable; and (4) easy to model and to pigment to resemble bronze. Sturm remodeled the three missing fingers of the left hand, recasting them in bronze; only the thumb and ring finger are original (fig. 1.9).

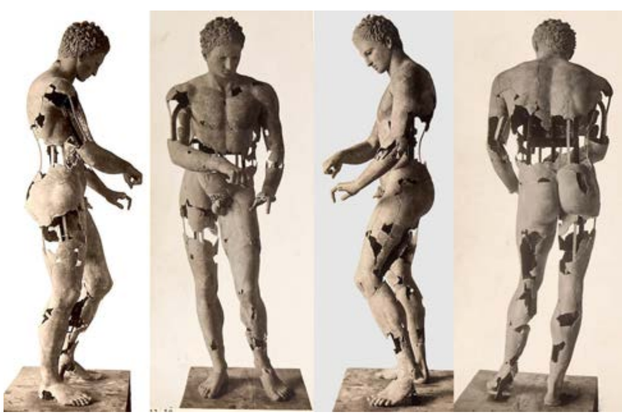


Figure 1.8. Black-and-white images from 1897 without the filling mortar
Images: KHM-Museumsverband

Figure 1.9. Top: Left hand with the original thumb and ring finger. Bottom: Index, middle, and little fingers are recast bronze additions.
Images: KHM-Museumsverband

As we know today, this mortar (containing magnesium salts) is extremely sensitive to moisture.[53] In the nineteenth century, it was only used indoors, as a very durable and long-lasting material for floors. Crucial in Sturm’s decision to use this particular mortar were probably its limited weight, its superb adhesion and binding power, and its rapid setting time of 30–45 minutes. Also, it is easy to grind and highly polishable. Presumably, he was aware of the basic principles set forth at the first international congress of art history held in Vienna 1873.[54] A full section was dedicated to restoration issues, proclaiming: “We demand conservation, not restoration!”

Given Sturm’s interventions, is there is any chance we can find residues of the original surface? His cleaning was achieved by reduction: Sturm used diluted hydrochloric acid, neutralized in 1% potash solution and stabilized in repeatedly changing baths of distilled water. To remove harder crusts, he annealed the pieces “softly” in an iron pan filled with charcoal.[55] In this context, “softly” probably means tempering the bronze fragments. The aim was to relax the inner structure of the metal and deliberately soften the metal, making it easier to reshape the deformed fragments. Since there is evidence in the records that the surface color changed after this treatment,[56] we must assume that there is little if any original surface left. We know for sure that Sturm mechanically removed the residues on the head and the hair with hammer and punches. The bronze surface was painted over with vinegar and later, to stop the oxidation, brushed with beeswax (wiping with neat's-foot oil or olive oil was also very common[57]) (fig. 1.10).

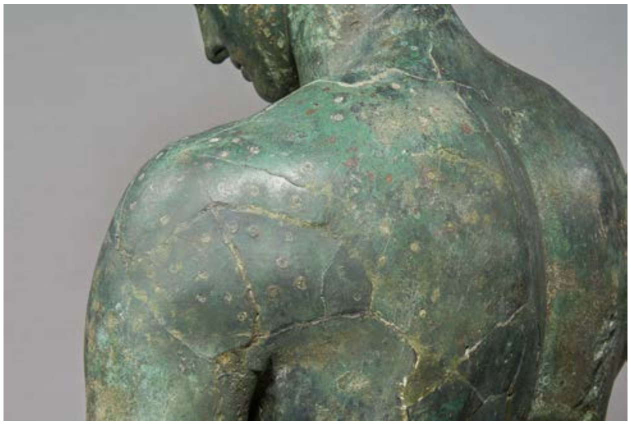


Figure 1.10. Brass screws, visible on the left shoulder
Image: KHM-Museumsverband

Shortly after the first exhibition of the freshly restored Athlete in the Theseus Temple in 1901, the person in charge complained about efflorescence appearing on the bronze surface.[58] Due to the fluctuating temperature and humidity from the outside, combined with the presence of a damp wine cellar below, the bronze had started to corrode. Ten years after the first exhibition, after repeated complaints and an expert opinion from Wilhelm Sturm Jr.,[59] the statue was removed, probably cleaned, and newly waxed or oiled.

Two further restorations or interventions are documented. First, in 1951, Karl Nieschlag,[60] an academic sculptor and stage designer who held an Austrian state award for music, was commissioned to follow Fritz Eichler's proposal to change the position of the right arm (see above).[61] He removed the mortar of the upper arm, shortened the main iron rod by sawing off 1 centimeter (0.4 in.), and cut three brass straps.[62] Using a short piece of iron, he welded the armature together again. Nieschlag completed the restoration with a new, pigmented mortar addition; we can see additional winding wire for fixing this mortar (fig. 1.11). He also filled cracks that had developed during transport or earlier, and he finished the surface treatment with a new wax coating. Nevertheless, he could not avoid producing new cracks. Second, in 1976, Alois Heidl,[63] an academic sculptor and student of Fritz Wotruba,[64] executed the most recent restoration of the Athlete. He removed parts of the mortar on the right calf including bronze fragments and gave the surface a new shape. Heidl worked large parts of the surface, leaving Nieschlag's supplement almost untouched. He covered the bigger areas of the old mortar filling, like the upper back, the stomach, and the thighs, by modeling a pigmented synthetic resin.

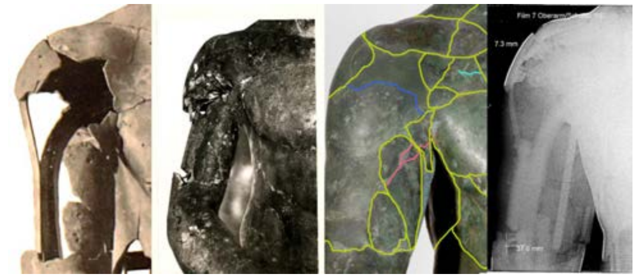


Figure 1.11. Break lines of right arm and shoulder before (yellow lines) and after (pink line) intervention; recent mortar boundary (blue line) and an original crack (turquoise line). Images dating from left to right: 1898, 1951, 2013 and X-ray image 2013
Image: KHM-Museumsverband

When considering the transport of the Athlete from Vienna to California for the exhibition *Power and Pathos*,[65] concerns arose about stability and strength of the internal framework and the mortar fill. Had the hygroscopic nature of the Sorel cement caused active corrosion on the inside of the ancient bronze as well as on the iron rod? Was the cement itself porous and inhomogeneous, and was volume expansion a dangerous issue? In collaboration with the Getty Museum's Department of Antiquities Conservation, samples of the Sorel cement were analyzed,[66] confirming that the Vienna statue, despite its well-known instabilities, does not show evidence of current or past corrosion problems in the accessible areas.[67] The mortar mixture is loaded with inert sand, and this highly porous mixture gives enough space for potential volume expansion. Inspection with a video borescope through one of the Athlete's eyes showed no active corrosion on the inner surface of the neck.

Since 1900 several investigations have been executed:

Bronze:

- 1900:[68] Fusing analysis: 89% Cu, 6% Sn, 4.8% Pb
- 2002:[69] μ-RFA: Polished surface: 84–88% Cu, 7–9% Sn, 4.5–7.7% Pb; corroded surface: 45–60% Cu, 7–14% Sn, 25–39% Pb

Mortar:

- 2001:[70] Cement Testing Laboratory
- 2002, 2012, 2014: SEM
- 2012: X-ray spectrometry
- 2012: FTIR spectrometry
- 2012: Polarized light microscopy
- 2013: Raman spectroscopy

Structure:

- 2001, 2012, 2013: Endoscopy
- 2002, 2013: Radiography

Surface:

- 2013: IR spectroscopy
- 2013:[71] Gas chromatography for organic coatings

To complement the X-radiography studies of the BAM[72] performed in Berlin 2001 (fig. 1.12), the Austrian Technical Inspection Authority (TÜV) provided their portable X-ray apparatus. Radiography images, produced by selenium-isotope continuous radiation, yielded additional information about the porosity and the structural distribution of the Sorel cement. For this investigation, the radiation had to reach as far as 40 meters (44 yd.), a difficult task to organize in the Neue Burg, the spacious building where the Athlete is on display in the Ephesos Museum.

Figure 1.12. X-ray BAM 2001
Image: KHM-Museumsverband

Under X-radiation, the chest of the Athlete showed very high density with almost no detectable penetration, even after doubling the radiation’s intensity and prolonging the exposure time fourfold. A possible reason could be the high concentration of barite[73] in the fill, but a conclusive explanation is still lacking.

New information enabled us to detect the traces of interventions (fig. 1.13), the distribution of the mortar inside the sculpture, and the thickness and position of the individual bronze fragments. Equally important for the final interpretation were the black-and-white images taken in 1898, showing the reconstructed Athlete without the mortar fill. Using these images for comparison with the X-ray images taken in 2013, we were able to gain essential new information regarding construction changes, fragment position, and visible facture lines (figs. 1.14–15).

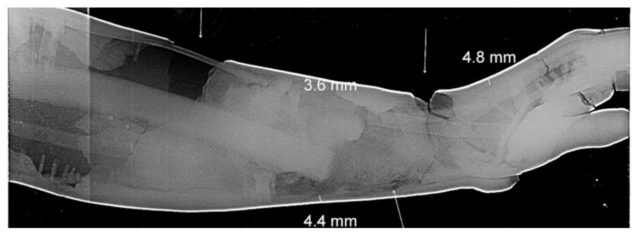


Figure 1.13. Image of the left hand taken with a transportable X-ray radiation instrument. Source: Selene 75, isotope continuous radiation; intensity 40–45 Curie; keep distance for 20 m (22 yards)
Image: KHM-Museumsverband

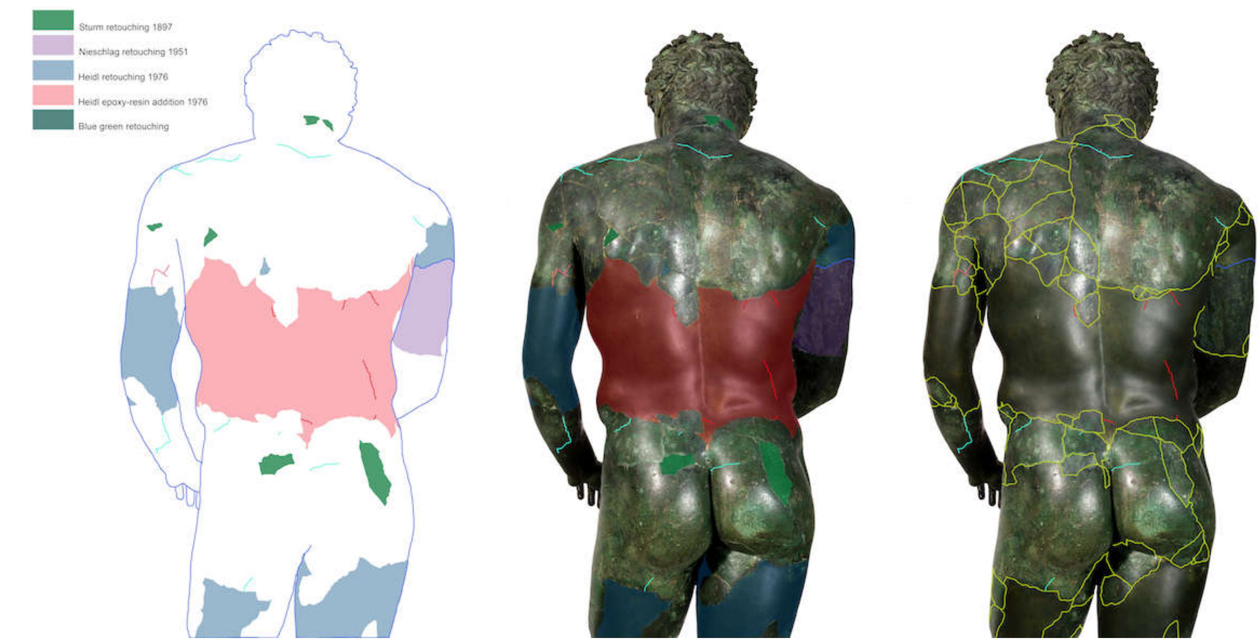


Figure 1.14. Athlete, back: mapping of the original fragment outlines, old and new cracks, and later interventions
Image: KHM-Museumsverband

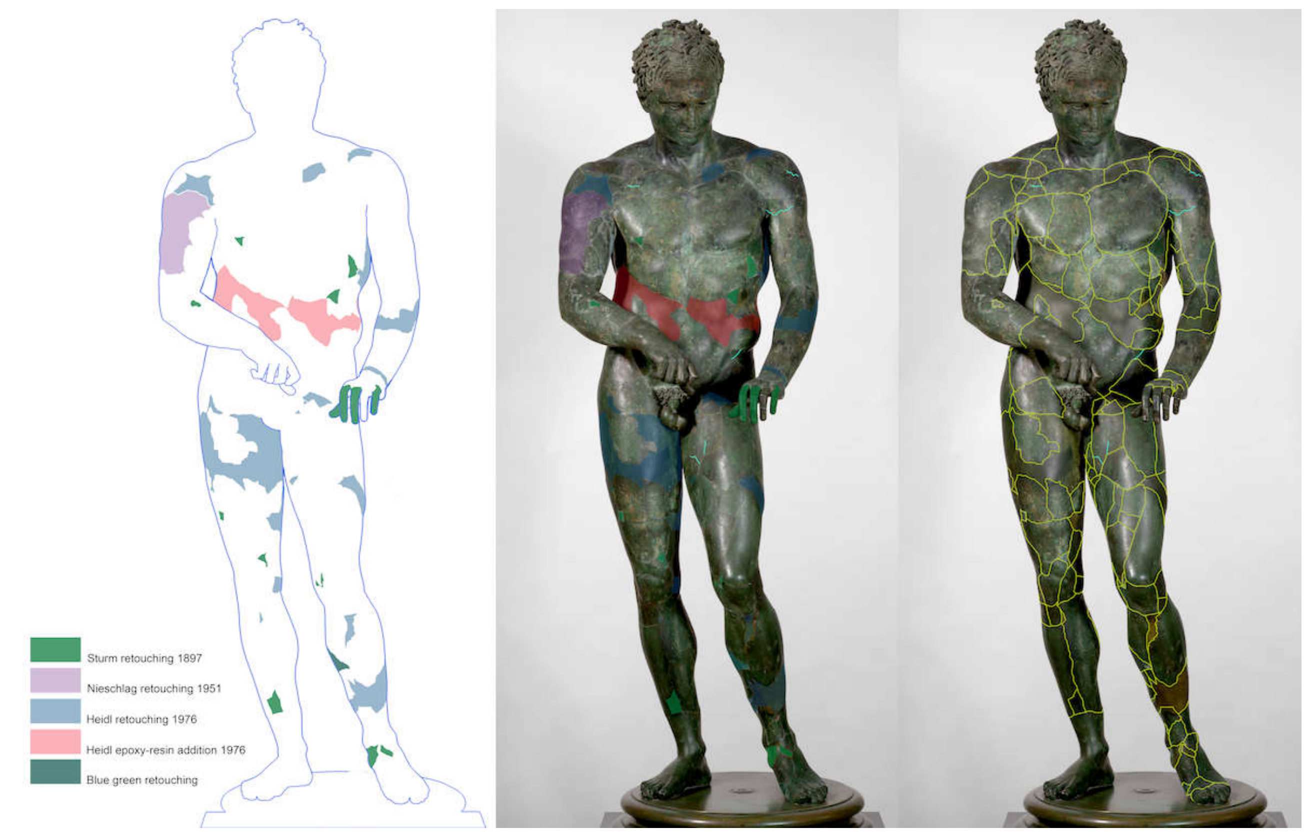


Figure 1.15. Athlete, front: mapping of the original fragment outlines, old and new cracks, and later interventions
Image: KHM-Museumsverband

In 2015, a three-dimensional model of the Athlete was generated to build the custom cage for transport.[74] Our colleagues at the Getty Museum developed the aluminum structure (fig. 1.16), which allowed the entire weight of the cage and the statue to be supported by the fillet of the base. An accurately fitted, two-piece counterpart made of epoxy resin was mechanically connected with the aluminum construction and the pallet. To keep the statue stable inside the cage, aluminum crossbeams were screwed onto the scaffolding. Customized designs were cut out of an inert foam and applied to the beams in order to supply soft but rigid and sufficient support to the Athlete.[75] For vibration control, a precalculated amount of special shock-absorbing material was placed between the inner and the outer crate, absorbing fully 93% of shock, as confirmed by vibration measurements.

Figure 1.16. Custom-built transport cage
Image: KHM-Museumsverband

—B. Vak

✦ ✦ ✦

Acknowledgments

Bettina Vak wishes to give special thanks to Erik Risser for assistance and support in all respects as well as helping to install and de-install the fragile Athlete six times; and for designing and assembling the transport cage together with B. J. Farrar; to Rita Gomez for the control of vibration in the crate; to John Twilley for the extensive mortar analysis; to her colleagues Angelika Kathrein, Michael Loacker, Martina Griesser, and Václav Pitthard from the Kunsthistorisches Museum, Vienna; and to the TÜV Austria for performing the X-radiography.

Notes

1. Benndorf 1906, 181–84; Wohlers-Scharf 1995, 79–83.
2. Benndorf 1898, 64–69.
3. Pülz 2010, 552–54.
4. Wood 1877, 34–35.
5. Benndorf 1898, 66–67; Benndorf 1906.
6. Heberdey 1919, 250: “Der rechte Fuß lag etwa zwei bis drei Schritte Nordost vom Ädikulasockel entfernt, an ihn schlossen sich in gleicher Richtung und ungestörter Folge die übrigen Bruchstücke bis zu dem durch glückliche Verkeilung einiger großer Gebälkstücke und eine bei dem Fall entstandene Mulde im Fußboden vor stärkerem Schaden bewahrten Kopfe.”
7. Benndorf 1898, 65–66; Benndorf 1906, 184.
8. Wohlers-Scharf 1995, 87–88, 98–99; Oberleitner et al. 1978, 36; in return the sultan received gifts of Lipizzan horses and other precious items.
9. The annual report of the Collection of Greek and Roman Antiquities, former k.k. Münz- und Antikenkabinett, from 1897 contains a short report: “Die bedeutendste Schenkung an die Antikensammlung sind die von S.M. dem Sultan gewidmeten Ausgrabungen von Ephesus, welche die österreichische Expedition dort ergraben und nach Wien gebracht hat, darunter Teile einer überlebensgroßen bronzenen Athletenstatue, ein bronzenes Thymiaterion, Bruchstücke einer Bronzegruppe des Hercules mit den Kentauren, Säulenschäfte aus kostbarem Marmor, einige Skulpturen und eine große Menge von Fragmenten. Dieser Schenkung solle hier aus dem Grund gedacht werden, weil sie zu Beginn des Jahres 1897 nach Wien gelangt und die allerhöchste Annahme in diesem Jahr erfolgt ist. Die Zusammensetzung der Bruchstücke ist aber unterbrochen worden teils durch Abwarten, ob die im Herbst 1897 fortgesetzten Ausgrabungen noch fehlende Fragmente bringen möchten, teils durch das verzögerte Eintreffen eines Gipsabgusses der Florentiner Athletenstatue, die als Modell für die Zusammensetzung der Bruchstücke unseres bronzenen Athleten dienen soll. Die Marmorskulpturen scheinen der römischen Kaiserzeit anzugehören, während die Epoche der Entstehung der Bronzestatue noch einen Gegenstand der Erörterung in den Fachkreisen bildet” (ZL AS 9, Jan. 28, 1898).
10. Oberleitner et al. 1978, 7–10.
11. Schneider 1901, 1–3.
12. Svoronos and Barth 1908, 15.
13. Mansuelli 1958, 59–60, cat. 36.
14. The cast is still kept in the collection of the Institute of Classical Archaeology, Vienna University; Pavese 1999 compares the different dimensions and proportions of the Viennese and Florentine statues, the result— extensive analogy—comes as no surprise knowing that Sturm used this copy.
15. For the first years of exhibition in the Theseus Temple, a Roman *strigilis*, in the collection of the Kunsthistorisches Museum, was placed in the Athlete’s right hand to clarify his movement for visitors; see fig. 1.4.
16. Hartwig 1901; Benndorf 1906, 195–97; Comstock and Vermeule 1976, 100–101, cat. 155.
17. The Viennese reconstruction was already questioned by Hauser 1902.
18. Benndorf 1906, 195–97.
19. Eichler 1953.
20. Benndorf 1906, 185, fig. 131.
21. Kunsthistorisches Museum, Vienna, Antikensammlung, inv. V 1895, see Hartwig 1903; for the type, see Perry 1997, 42–45, with further examples.
22. Kunsthistorisches Museum, Antikensammlung, inv. III 1087; Engelmann et al. 1980, 89, no. 1128.
23. Engelmann et al. 1980, 89–90, no. 1129a–c; Benndorf 1898, 65–66.
24. Heberdey 1919.

25. Willer 1996.
26. Willer 1996, 362–70.
27. Ladstätter 2002, 23–26.
28. George Niemann, architect and draftsman of the Austrian mission, reconstructed the aedicula from the few remaining parts.
29. Statues of the type Florence/Ephesos/Mali Lošinj (see also Daehner 2015, esp. 281):
    1. Ephesos (Vienna, Kunsthistorisches Museum/Ephesos Museum, inv. VI 3168, bronze)
    2. Florence (Florence, Galleria degli Uffizi, inv. 1914/100, marble; existing already under Cosimo I, in the Gallery since 1740; Mansuelli 1958, 59–60, cat. 36)
    3. Lošinj (Museum of Apoxyomenos, Mali Lošinj, bronze; Michelucci 2006)
    4. Frascati (Boston, Museum of Fine Arts, inv. 00.304, marble; small scale; Comstock and Vermeule 1976, 100–101, no. 155)
    5. Rome, from Tivoli (Musei Vaticani, no. 105, Braccio Nuovo, marble torso; Neudecker 1988, 236, no. 68.3, pl. 15.3)
    6. Rome (Musei Vaticani, Mus. Chiaramonti Braccio Nuovo 99, marble torso with head type Torino/Braccio Nuovo; Arnold 1969, 270, no. K7; Neudecker 1988, 236, no. 68.4, pl. 15.2)
    7. Castel Gandolfo (Villa Barberini/Castel Gandolfo, no. 36405, basanite; Liverani 1989, 59, no. 22)
    8. Louvre (Musée du Louvre, statue Borghese, marble; Benndorf 1906, 200–201, fig. 153; Arnold 1969, 270, no. K8)
30. Heads of the type Florence/Ephesos/Mali Lošinj:
    1. Fort Worth, Kimbell Art Museum, AP 2000.03, bronze (since 2000, before Senator Bernardo Nani [1712–1761], Venice. Lucien Guiraud [Hotel Drouot, Paris] sale June 14–15, 1956, no. 106 [as 16th century]; Hans Calmann [1899–1982], London and Somerset; auction, Sotheby's, New York, June 14, 2000, no. 60; Gschwantler 1995, 293)
    2. St. Petersburg, State Hermitage Museum, from Rome, marble (Benndorf 1906, 199, fig. 150-51; Arnold 1969, 269–207, no. K2)
    3. Rome, Museo Torlonia, inv. 86, marble (Götze 1938, 226; Arnold 1969, 270, no. K4; Gasparri 1980, 166, no. 86)
    4. Rome, Musei Vaticani, marble (Amelung [1903] 1956, 114, no. 99)
    5. New York, Metropolitan Museum of Art, marble (head of statue; Richter 1954, 110)
    6. Brussels, Musée Royaux d'Art e d'Histoire, marble (Cumont 1913, 10, fig. 5 = Hartwig 1901, 158, fig. 185). The head in Dresden, no. Hm 132, is no longer thought to follow the same type as Dörig 1965, 40, proposed; see now Vorster 2011.
31. Small-scale bronze statuettes:
    1. Trier (Furtwängler 1898, 9–11, fig. 5; Benndorf 1906, 201, fig. 154)
    2. Louvre (MND 1895, Charbonneaux 1941, 42, fig. 1; Arnold 1969, 166–67, pl. 21b)
32. Hartwig 1903; Perry 1997, 42–45.
33. Furtwängler 1893, 470–71, fig. 78; Benndorf 1906, 198–99, figs. 148–49.
34. Walter 1923, 195–98, nos. 401–401a.
35. Hauser 1902.
36. Benndorf 1906, 204.
37. Moser von Filseck 1988, 111–20.
38. Arnold 1969, 155–56, 269, no. 1; Linfert 1990 names the Ephesian Athlete in the group of Polykleitos's school.
39. Lattimore 1972; Stewart 1978.
40. Pochmarski 1988; Pochmarski 1999; as proof, he mentions unevenness of the surface of the Ephesian Athlete going back to *tasselli*, repair patches of the statue copied in Rome; due to the state of the fragments when found and the massive physical treatment they underwent while undergoing restoration, this observation is unconvincing.
41. Sanader 1999; Michelucci 2006; see the contribution of Karniš Vidovič and Mille (ch. 43) in this volume.
42. As the athletes are not strictly speaking scraping themselves but rather are cleaning their scrapers, they are not *Apoxyomenoi* but *strigilis*-cleaners; see Weber 1999.
43. Mattusch 2015.
44. Daehner 2015.
45. Potts 2015.
46. In 1989/90 a joint project (*The Conservation of the Apoxyomenos from Ephesos*) between the J. Paul Getty Museum (M. True, J. Podany) and the Collection of Greek and Roman Antiquities in Vienna was already planned, including the entire disassembly of the statue; this project was not realized because of the risks of transportation and disassembly (see Archive of the Collection of Greek and Roman Antiquities, Kunsthistorisches Museum Vienna, ZL AS 27 ex 1989; 9 ex 1990).
47. Benndorf 1898, 66–67.
48. Bauer 1885; Koller 2009.
49. Archive of the Collection of Greek and Roman Antiquities, ZL AS 16 ex Jan. 28, 1898 (*Jahresbericht* 1898).
50. Mansuelli 1958, 9–10, no. 36, inv. 100.
51. Benndorf 1906, 187–88.
52. Wilhelm Sturm Jr.'s explanation for choosing this technique is mentioned in a letter, written by Robert von Schneider, director of the collection of Greek and Roman Antiquities, to the Austrian emperor, Nov. 30, 1901; see archive ZL AS 26/1–4.
53. Weber et al. 2012, 98–103.
54. *Mitteilungen des Österreichischen Museums für Kunst und Industrie 8* (Vienna, 1873), 481–83.
55. Benndorf 1906, 186.
56. Benndorf 1906, 187.
57. Anonymous 1895.
58. Collection archive, AS.ZL 28 from June 15, 1906.
59. Collection archive AS.ZL 21 from July 6, 1910.
60. Frank 2007.
61. Eichler 1953.
62. Collection archive AS ZL 9/1951.
63. Nierhaus 1993, 180–269.
64. Breicha 1977.
65. Daehner 2015.
66. Twilley 2013.
67. At the back of the Athlete, a small fragment screwed separately could be removed; here access to the mortar fill was possible.
68. Natterer 1900.

69. Unpublished research report: Manfred Schreiner, Katharina Dietrich. Akademie der bildenden Künste, Vienna, 2002.
70. Gschwantler 1995, 290; Unpublished research report on Perlmoser Zementwerke (W. Melchart), 1992.
71. Unpublished research report on the GC-MS analysis (Vaclav Pitthard), 2013.
72. Bundesanstalt für Materialforschung und –prüfung, Berlin; the X-ray was made in the context of the exhibition *Die griechische Klassik* in 2002 in Berlin and Bonn by the BAM (J. Goebbels in collaboration with F. Willer, Bonn, and V. Freiberger, Vienna) as part of a project to study the condition of the statue and to clear up some technical questions; Gschwantler 2002.
73. Barium sulfate as a filler medium is generally applied: verbal comm., Farkas Pinter, Scientist, Federal Monument office (BDA) Vienna; see also Twilley 2013.
74. The scan was provided by Christian Kurtze, Austrian Archeological Institute.
75. A video clip of staff assembling the cage around the statue is available at: http://www.khm.at/erfahren/forschung/forschungsprojekte/antikensammlung/der-schaber-von-ephesos/.

Bibliography

Amelung [1903] 1956
Amelung, W. [1903] 1956. *Die Sculpturen des vaticanischen Museums*, vol. 1. Berlin: Kommission bei Georg Reimer.

Anonymous 1895
Anonymous. 1895. “Patinierung der Wiener Bronzedenkmale.” *Monatsblatt des Altertumsvereins*, 172.

Arnold 1969
Arnold, D. 1969. *Die Polykletnachfolge: Untersuchungen zur Kunst von Argos und Sikyon zwischen Polyklet und Lysipp*. JdI Ergh. 25. Berlin: de Gruyter.

Bauer 1885
Bauer, A. 1885. *Über die Reinigung der Monumente*. Vienna: printed lecture.

Benndorf 1898
Benndorf, O. 1898. “Vorläufiger Bericht über die Ausgrabung in Ephesus I.” *ÖJh* 1, Beibl. 53–72.

Benndorf 1906
Benndorf, O. 1906. “Erzstatue eines griechischen Athleten.” *Forschungen in Ephesos*, ed. O. Benndorf et al., 181–204. *FiE I*. Vienna: Hölder.

Breicha 1977
Breicha, O., ed. 1977. *Wotruba: Figur als Widerstand: Bilder und Schriften zu Leben und Werk*. Salzburg: Verlag Galerie Welz.

Charbonneaux 1941
Charbonneaux, J. 1941. “Statuette d’athlete au Musee du Louvre.” *MonPiot* 38: 40–54.

Comstock and Vermeule 1976
Comstock, M. B., and C. C. Vermeule. 1976. *Sculpture in Stone: The Greek, Roman, and Etruscan Collections of the Museum of Fine Arts, Boston*. Boston: Museum of Fine Arts.

Cumont 1913
Cumont, F. 1913. *Musée royaux du cinquantenaire: Catalogue des sculptures & inscriptions antiques (monuments lapidaires) des Musées Royaux du Cinquantenaire*. Brussels: Vromant.

Daehner 2015
Daehner, J. 2015. “Statue of an Athlete.” In Daehner and Lapatin 2015, 271–81.

Daehner and Lapatin 2015
Daehner, J. M., and K. Lapatin, eds. 2015. *Power and Pathos: Bronze Sculpture of the Hellenistic World*. Los Angeles: J. Paul Getty Museum.

Dörig 1965
Dörig, J. 1965. “Ein Jugendwerk Lysipps.“ *AntPl* 4: 37–42.

Eichler 1953
Eichler, F. 1953. “Die Bronzestatue aus Ephesos in verbesserter Wiederherstellung.” *JbKuHistSamml* 50: 15–22.

Engelmann et al. 1980
Engelmann, H., D. Knibbe, and R. Merckelbach. 1980. *Inschriften von Ephesos IV*. Inschriften griechischer Städte aus Kleinasien 14. Bonn: Habelt.

Frank 2007
Frank, A., ed. 2007. *Karl Nieschlag: Ein Künstler aus Floridsdorf*. Straßhof: vier-viertel-verlag.

Friesinger and Krinzinger 1999
Friesinger, H., and F. Krinzinger, eds. *100 Jahre Österreichische Forschungen in Ephesos*. Vienna: Verlag der ÖAW.

Fuchs [1969] 1993
Fuchs, W. [1969] 1993. *Skulptur der Griechen.* 4th ed. Munich: Hirmer.

Furtwängler 1893
Furtwängler, A. 1893. *Meisterwerke der griechischen Plastik*. Leipzig and Berlin: Giesecke & Devrient.

Furtwängler 1898
Furtwängler, A. 1898. “Römische Bronzen aus Deutschland.” *BJb* 103: 1–11.

Gasparri 1980
Gasparri, C. 1980. *Materiali per servire allo studio del Museo Torlonia di scultura antica*. Memoria Lincei, ser. 8, 24: 33–238.

Götze 1938
Götze, H. 1938. “Die attischen Dreifigurenreliefs.” *RM* 53: 189–280.

Gschwantler 1995
Gschwantler, K. 1995. “Der Athlet von Ephesos: Ein Projekt zur Restaurierung und Konservierung der Bronzestatue.” *JbKHSWien* 91: 287–94.

Gschwantler 2002
Gschwantler, K. 2002. “Der Schaber von Ephesos: Bronzeguss: Zerstörung und Rekonstruktion,” 506–8. In *Die griechische Klassik: Idee oder Wirklichkeit*. Exh cat. Berlin, Martin-Gropius-Bau; Bonn Kunst- und Ausstellungshalle der Bundesrepublik Deutschland. Mainz am Rhein: von Zabern.

Hartwig 1901
Hartwig, P. 1901. “Statuette eines Athleten im Museum in Boston.” *ÖJh* 4: 151–59.

Hartwig 1903
Hartwig, P. “Ein Terracottafries des Octavius mit Athletenstatuen.” *ÖJh* 6: 16–31.

Hauser 1902
Hauser, F. 1902. “Eine Vermutung über die Bronzestatue aus Ephesos.” *ÖJh* 5: 214–16.

Heberdey 1919
Heberdey, R. 1919. “Zur ephesischen Athletenbronze.” *ÖJh* 19/20: 247–52.

Johnson 1927
Johnson, F. P. 1927. *Lysippos*. Durham: Duke University Press.

Koller 2009
Koller, M. 2009. “Zur Geschichte und Gegenwart der Metallrestaurierung in Österreich.” In *Metallkonservierung, Metallrestaurierung: Geschichte, Methode, Praxis: Sammelband anlässlich der Fachtagung “Metallrestaurierung-Metallkonservierung” der Universität für Angewandte Kunst Wien, 2007*, ed. M. Griesser-Stermscheg and G. Krist, 25–56. Vienna: Böhlau.

Ladstätter 2002
Ladstätter, S. 2002. “Die Chronologie des Hanghauses 2.” In *Das Hanghaus 2 von Ephesos: Studien zu Baugeschichte und Chronologie*, ed. F. Krinzinger, 9–40. Vienna: Verlag der ÖAW.

Lattimore 1972
Lattimore, S. 1972. “The Bronze Apoxyomenos from Ephesos.“ *AJA* 76: 13–16.

Linfert 1966
Linfert, A. 1966. *Von Polyklet zu Lysipp: Polyklets Schule und ihr Verhältnis zu Skopas von Paros*. Giessen: Chemaoprint.

Linfert 1990
Linfert, A. 1990. “Die Schule des Polyklet.” In *Polyklet: Der Bildhauer der griechischen Klassi, Frankfurt am Main 17.10.1990–20.1.1991*, ed. H. Beck, P. C. Bol, and M. Bückling, 278–81. Mainz am Rhein: von Zabern.

Lippold 1950
Lippold, G. 1950. *Die griechische Plastik*. Handbuch der Archäologie 5. Munich: Beck.

Liverani 1989
Liverani, P. 1989. *L’Antiquarium di Villa Barberini a Castel Gandolfo*. Vatican City: Libreria archeologico.

Mansuelli 1958
Mansuelli, G. A. 1958. *Galleria degli Uffizi: Le sculture*, vol. 1. Rome: Ist. Poligrafico dello Stato, Libr. dello Stato.

Mattusch 2015
Mattusch, C. C. 2015. “Repeated Images: Beauty with Economy.” In Daehner and Lapatin 2015, 123–24.

Michelucci 2006
Michelucci, M. 2006. *Apoxyomenos: The Athlete of Croatia*. Florence and Milan: Giunti.

Moser von Filseck 1988
Moser von Filseck, K. 1988. *Der Apoxyomenos des Lysipp und das Phänomen von Zeit und Raum in der Plastik des 5. und 4. Jhs. v. Chr.* Bonn: Habelt.

Moser von Filseck 1990
Moser von Filseck, K. 1990. “Noch einmal zum Strigilisreiniger Ephesos – Wien. Klassik oder Klasszisimus?” *ÖJh* 60: 1–5.

Natterer 1900
Natterer, K. 1900. “Über Bronzen aus Ephesus.” *Sitzungsberichte der kaiserlichen Akademie der Wissenschaften*, 256–62.

Neudecker 1988
Neudecker, R. 1988. *Die Skulpturen-Ausstattung römischer Villen in Italien*. Mainz am Rhein: von Zabern.

Nierhaus 1993
Nierhaus, I. 1993. *Kunst-am-Bau im Wiener kommunalen Wohnbau der fünfziger Jahre*. Vienna: Böhlau.

Oberleitner et al. 1978
Oberleitner, W., K. Gschwantler, A. Bernhard-Walcher, and A. Bammer. 1978. *Funde aus Ephesos und Samothrake. Kunsthistorisches Museum, Katalog der Antikensammlung*, vol. 2. Vienna: Kunsthistorisches Museum.

Pavese 1999
Pavese, C. O. “L’Atleta di Ephesos.” In Friesinger and Krinzinger 1999, 579–84.

Perry 1997
Perry, R. 1997. *Die Campanareliefs: Katalog der Sammlung Antiker Kleinkunst des Archäologischen Instituts der Universität Heidelberg*, vol. 4. Mainz am Rhein: von Zabern.

Pochmarski 1988
Pochmarski, E. 1988. “Zur kunstgeschichtlichen Stellung des Schabers von Ephesos.” In *Griechische und römische Statuetten und Grossbronzen: Akten der 9. Internationalen Tagung über Antike Bronzen, Wien 21.–25. April 1986*, 74–81. Vienna: Kunsthistorisches Museum.

Pochmarski 1999
Pochmarski, E. 1999. “Neues zum Schaber von Ephesos.” In Friesinger and Krinzinger 1999, 585–92.

Potts 2015
Potts, T. 2015. “Head of an Athlete.” In Daehner and Lapatin 2015, 276–77, cat. 42.

Pülz 2010
Pülz, A. 2010. “Zum Stadtbild von Ephesos in byzantinischer Zeit.” In *Byzanz, das Römerreich im Mittelalter: Pracht und Alltag eines Weltreiches*, ed. F. Daim and J. Drauschke, 541–71. Monographien des RGZM 84/2/2. Mainz am Rhein: RGZM.

Richter 1954
Richter, G. M. A. 1954. *Catalogue of Greek Sculptures in the Metropolitan Museum of Art, New York*. Cambridge, MA: Harvard University Press.

Saladino 2006
Saladino, V. 2006. “The Athlete with a Strigil.” In *Apoxyomenos: The Athlete of Croatia*, ed. M. Michelucci, 35–51. Florence and Milan: Giunti.

Sanader 1999
Sanader, M. 1999. “Der Meergeborene: Die Entdeckung einer Bronzestatue in Kroatien.” *AW* 30/4: 357–59.

Schneider 1901
Schneider, R. von. 1901. *Ausstellung von Fundstücken aus Ephesos im Griechischen Tempel im Volksgarten*. Vienna: Holzhausen.

Sieveking 1926
Sieveking, J. 1926. “Athlet mit Schabeisen,” in Denkmäler griechischer und römischer Sculptur, ed. H. Brunn and F. Bruckmann, nos. 682–85 (right). Munich: Buckmann.

Stewart 1978
Stewart, A. F. 1978. “Lysippan Studies 3. Not by Daidalos?” *AJA* 82: 473–82.

Svoronos and Barth 1908
Svoronos, J. N., and W. Barth. 1908. *Das Athener Nationalmuseum*. Athens: Beck & Barth.

Twilley 2013
Twilley, J. 2013. *Analyses of Surface Samples and Fill Materials from the Bronze Apoxomenos, Kunsthistorisches Museum, Wien*. Unpublished research report.

Vorster 2011
Vorster, C. 2011. “Kopf des Herakles, Typus Landsdowne-Genzano.” In *Skulpturensammlung Staatliche Kunstsammlungen Dresden: Katalog der antiken Bildwerke II. Idealskulptur der römischen Kaiserzeit*, vol. 2, ed. K. Knoll, C. Vorster, and M. Woelk, 652–55. Munich: Hirmer.

Walter 1923
Walter, O. 1923. *Beschreibung der Reliefs im Kleinen Akropolismuseum in Athen*. Vienna: Hölzel.

Weber et al. 2012
Weber, J., K. Bayer, and F. Pintér. 2012. “Nineteenth Century ‘Novel’ Building Materials: Examples of Various Historic Mortars under the Microscope.” In *Historic Mortars: Characterization, Assessment and Repair*, ed. J. Válek, J. J. Hughes, and C. J. W. P. Groot, 89–103. RILEM Bookseries 7. Dordrecht: Springer.

Weber 1996
Weber, M. 1996. “Zum griechischen Athletenbild: Zum Typus und zur Gattung des Originals der Apoxyomenosstatue im Vatikan.” *RM* 103: 31–49.

Weber 1999
Weber, M. 1999. “Zur Gattung des Strigilisreinigers.” In Friesinger and Krinzinger 1999, 593–96.

Willer 1996
Willer, F. 1996. “Beobachtungen zur Sockelung von bronzenen Statuen und Statuetten.” *BJb* 196: 337–70.

Willer 2000
Willer, F. 2000. “Neue Beobachtungen zur Herstellung und Versockelungstechnik von Bronzestatuen.” *JbKöln* 33: 565–73.

Wohlers-Scharf 1995
Wohlers-Scharf, T. 1995. *Die Forschungsgeschichte von Ephesos*: *Entdeckungen, Grabungen und Persönlichkeiten*. Frankfurt am Main and Vienna: Lang.

Wood 1877
Wood, J. T. 1877. *Discoveries at Ephesus*. London: Longmans, Green.

2.

Was the Colossus of Rhodes Cast in Courses or in Large Sections?

Ursula Vedder, Kommission für Alte Geschichte und Epigraphik des Deutschen Archäologischen Instituts, Munich

The paradoxographer Philo of Byzantium (*De septem mundi miraculis* 4) claimed that the Colossus of Rhodes was cast in situ in horizontal courses buried gradually by an earthen embankment. The study of large-scale ancient bronzes and foundries, however, has provided evidence only for casting in large sections. Here it is argued that the technology used for the Colossus was no exception.

How do we reconstruct the fabrication process of an exceptionally large and lost statue? First, the general parameters for the working steps must be known. Therefore, the indirect lost-wax process in antiquity is compared with better-known methods used to create two extant colossal statues, the Great Buddha in Nara (cast in courses) and the *Bavaria* in Munich (cast in large sections). Then the various steps of the working process attested in ancient times are examined. The analysis reveals basic differences between the three casting methods.

Philo's text contains a certain level of technical knowledge but lacks important details and indeed states an important falsehood. A possible explanation for this discrepancy is that he used a written reconstruction of a working process. This means that we can give the archaeological evidence greater weight than this text.

✦ ✦ ✦

In the argument over where the monumental statue known as the Colossus of Rhodes was located, its casting has hitherto seldom been considered. The statue—made of cast bronze with a height of 70 cubits (30–35 m, or 98–114 ft.)—must have left at least some remnants of its production. Furthermore, these remnants must be discoverable in the city of Rhodes. However, a requirement for recognizing these remnants is knowledge of the casting technique that was used. For this reason, it is worth undertaking a reconstruction of the manufacturing process of this lost statue.[1]

Philo of Byzantium (*De septem mundi miraculis* 4) wrote the longest text describing bronze casting to survive from antiquity, and also left a description of a casting technique said to have been used for the Colossus.[2] His text has been given a lot of authority in our scholarly tradition. In this paper, a more analytic approach is taken: it is a technical-archaeological commentary on the text by Philo, verifying whether the details he mentioned are compatible with the ancient situation.

Philo claims that the Colossus was cast in a different way than normal statues. He explains: "For the individual metal sections could not be moved."[3] But given that the monumental architraves of the Hellenistic temples in Asia Minor are heavier than any large bronze piece, this is clearly not true.[4] Further, he writes: "after the first part had been cast, the second was modeled upon it, and for the following part again the same method of working was adopted.... After the casting of the new course upon that part of the work already completed.... the artist heaped up a huge mound of earth round each section as soon as it was completed, thus burying the finished work under the accumulated earth, and carrying out the casting of the next part on the level." Thus, according to Philo, the Colossus of Rhodes was cast in situ in horizontal courses buried gradually by an earthen embankment.

Fortunately, a lot of bronze-workshops in the city of Rhodes have been uncovered and provide good information about the casting process used on the island at the time of the Colossus.[5] They prove that, contrary to Philo's report, colossal statues were cast in large sections.

The largest known casting pit was excavated at the southern slope of the Acropolis in the city of Athens, on the Mylonas property. It was part of a workshop that operated at the beginning of the third century BC, the time when the Colossus was manufactured. It measures at its center 7 meters long and 3.25 meters wide and it is 3.6 meters deep (22 x 11 x 12 ft.). G. Zimmer reconstructed in it a colossal upper part of a male body.[6] Thus he proved the existence of tall statues cast in large sections up to 15 meters (49 ft.) high. This is an archaeological proof, as no statue of these dimensions has survived.

Could the Colossus of Rhodes—a statue twice the size of the one Zimmer reconstructed—also have been cast in large pieces? How realistic is the method described by Philo? As no ancient examples remain, two extant colossal bronzes will help to answer these questions. They provide the general parameters of the working process and the keywords to be searched for in the ancient literary sources.

The first and older of the two was brought into the discussion by D. Haynes in 1992.[7] The Great Buddha Vairocana in the Todaiji monastery in Nara (Japan) is 14.96 meters (49 ft.) high and was manufactured in AD 743–57.[8] The statue was cast in a method similar to that described by Philo and proves that this method is technically possible. The second statue, the *Bavaria* at the Ruhmeshalle, was completed between 1837 and 1850 in Munich.[9] Its large cast pieces were assembled into a figure 18.52 meters (60 ft.) tall. These sculptures, though enormous, are roughly half the size of the Colossus. As a sitting figure, the Buddha at least has similar proportions to the standing Colossus. Contemporary documents relating to the manufacturing process exist for both the Buddha and the *Bavaria*.

Five working steps are necessary for both life-size statues and for extremely large-scale statues such as the Buddha and the *Bavaria*.

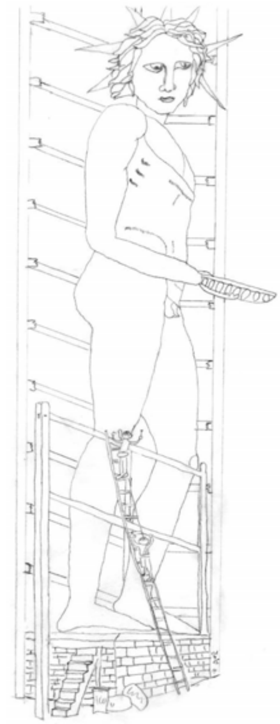


Figure 2.1. Colossus of Rhodes, master model. Drawing based on picture by L. von Schwanthaler (base and workers), statue of Aias (body), and Rhodian coin (head)
Image: © Ursula Vedder

The *first working step* is the construction and modeling of the master model. Colossal statues need a model with the same dimensions as the bronze statue to be cast. And the Colossus of Rhodes was no exception, as illustrated in the author's schematic drawing (fig. 2.1). The master model provides certainty that the statics of the statue are well done and that after assembly the large sections will fit together.[10]

The *Bavaria* and the Buddha both had a master model consisting of a wooden scaffold covered with materials to provide a surface for modeling in clay. A wood sheathing for this purpose is recorded in Munich. In Nara, the walling of the model still consists of wood, linen, and clay. In both cases, completion of the master model took several years of the decade or more it took to complete the statue. A Japanese text records 426 days just to make the clay surface of the Buddha's master model.[11] It remained inside the statue, forming its core. Of relevance here is the fact that it was built around a central mast of the same height as the statue.

The existence of master models in antiquity is proven by the monumental chryselephantine statues of the fifth century BC. Consider, for example, the Athena Parthenos, 26 cubits (ca. 13 m) high, which was in effect a master model covered with precious materials. Traces of her base are preserved in the Parthenon. In its naos, a hole still is visible where the central mast of her scaffold was affixed. Thus its construction was similar to that of the Buddha in Nara.[12]

Pheidias, the master of the Parthenos, also made the Athena Promachos, which stood on the Acropolis near the Parthenon. The statue was made of cast bronze, and its height is believed to have been between 9 and 15 meters (29–49 ft.).[13] It is notable that the ground plan of the statue's base again has a hole in the center (fig. 2.2).

Following the arguments of Palagia, the statue was cast in the same period as the Parthenos was manufactured. The Promachos was dedicated to the main deity of the polis of Athens and stood in her sanctuary. Thus the Promachos is a real predecessor of the Colossus of Rhodes. Pheidias built a scaffold in the location of the bronze statue in order to make the master model for the Promachos. Afterward the statue was cast in pieces on the south side of the Acropolis. The finished parts were brought up to the Acropolis and assembled on the base in place of the master model. Thus for colossal statues with a height up to 15 meters, we have not only archaeological remains of casting pits but also references concerning the master model.

Figure 2.2. Ground plan of the platform for the pedestal of the Athena Promachos in Athens (drawing by T. Tanoulas, Palagia 2013, fig. 11)
Image: © Tasos Tanoulas, Olga Palagia

Philo does not mention the master model of the Colossus. But the master model of the Colossus commissioned by Nero for his *Domus Aurea* in Rome is probably the subject of a half sentence in Pliny (*Naturalis historia* 34.45–46). The statue was indeed constructed and cast imitating the Rhodian prototype.[14]

Finally, it can be proved that the Rhodians not only had the technological skills to cast colossal statues but also were able to build a sophisticated timber structure. Such a timber structure was known to be present in Rhodes when the Colossus was planned: the war machine *Helepolis* was built by order of Demetrios Poliorketes during the unsuccessful siege of Rhodes in 304/303 BC and was left behind when he quit the island. Ancient sources record its height as between 86 and 100 cubits (44–50 m, or 144–164 ft.). According to Pliny (*Naturalis historia* 34.41), it was sold to make the Colossus, the dedication to Helios after the victory. Perhaps the Rhodians used even its timbers to construct the master model.

The *second working step* was to make the casting molds. For all casting methods, it is common for workers to prepare the mold and the core so as to fashion a cavity for the thickness of the bronze wall, which would then be filled with the molten metal. In antiquity, beeswax was used for this purpose, giving the name to the “lost wax method.” Details of this process need not be repeated here.[15]

In Japan they used neither wax nor clay to create the cavity for the Buddha. Over three thousand bronze pins with heads about 3 centimeters thick and 12 centimeters square were fabricated and hammered into the surface of the master model. The thickness of the pinheads determined how much of the clay surface needed to be reduced in order to provide the cavity for the bronze. The pins remained in place, becoming part of the statue’s walling, and are visible today (fig. 2.3). The reduced surface of the master model was burned out by fire, thus transforming the master model into the core of a casting form. Around this core, the walling of the statue was cast in six layers, as seen in the schematic drawing in figure 2.4.

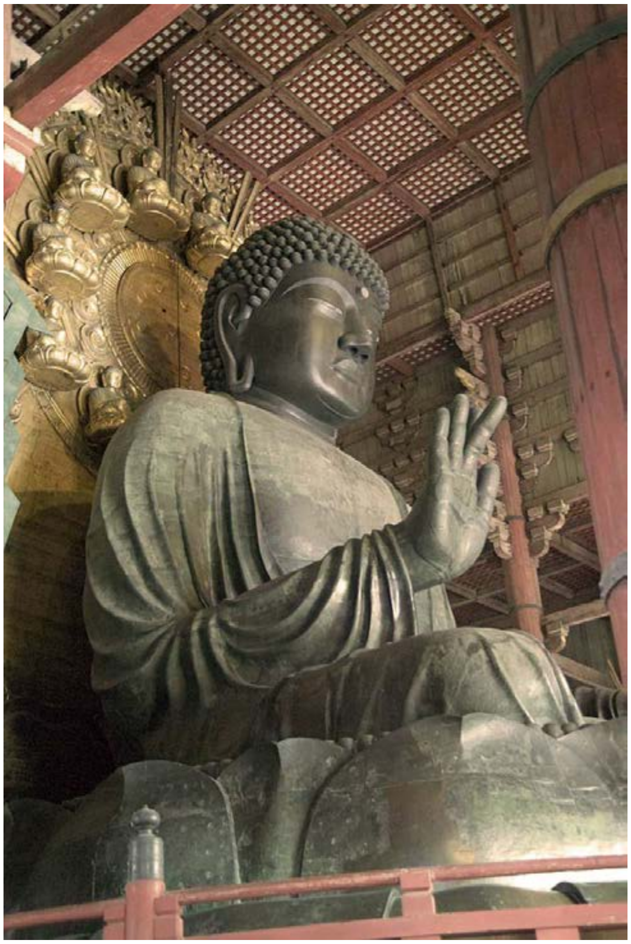


Figure 2.3. Statue of Buddha Vairocana in the Todaiji Temple, Nara, Japan
Image: © Jakub Hałun (Own work) (GFDL), via Wikimedia Commons

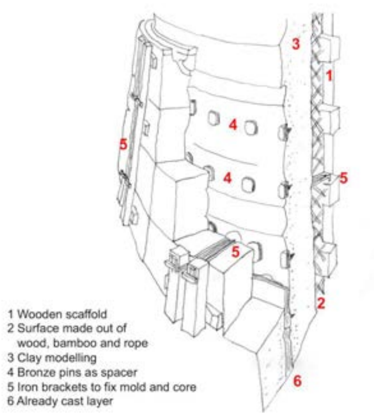


Figure 2.4. Buddha of Nara, reconstruction of the casting mold. (The drawing is a copy of Maeda et al. 1997, fig. 55, omitting Japanese characters and adding numbers and English text.)
Image: © Todaiji, Nara, Japan © Ursula Vedder

The Buddha of Nara proves that the casting method described by Philo is technically feasible. But in important details, such as the master model and the use of wax, the description is incomplete and unreliable. Philo also neglects to mention the making of a core. Instead he describes an armature in the inside of the statue, growing higher with every cast course. Hence the inside was thought to be open.

It cannot have worked like that. Without a master model, it would have been impossible to form the course of a statue on the finished section covered with earth. And a sculptor's copy cage to scale up the object, as Maryon proposed, is not feasible.[16] Furthermore, this technique, though used by Roman portrait sculptors, was unknown in the early third century BC.

Turning to our other analog in Munich, the *Bavaria* was cast in large sections, so the master model was cut into numerous pieces (fig. 2.5). The largest of these are marked in figure 2.6. The fabrication of mold and core was done according to the "sand-casting process," in which the fabricators used a special sand—a mixture of fire-resistant soils fixed by plaster—instead of clay. Instead of wax, clay sheets were used. And whereas in antiquity the system of funnels, gates, and vents was distributed regularly over the body, in Munich the funnel system was manufactured only above the mold. The channels for the vents were fixed at the lower edge of the mold at the bottom of the casting pit. Mold and core were built up from the bottom of the casting pit in such a way that no chaplets were needed. As illustrated in figure 2.7, the sections of the core can still be seen in the statue's interior.

Figure 2.5. Statue of Bavaria, part of the Hall of Fame, Munich, Germany
Image: © Ursula Vedder

Figure 2.6. Statue of Bavaria. The edges of the large cast pieces are marked
Image: © Ursula Vedder

Figure 2.7. Statue of Bavaria. Detail of the interior: edges of the core's sections visible in the area under the armpit of the left arm
Image: © Ursula Vedder

The *third working step* is the melting of the bronze alloy and casting. These processes are not mentioned by Philo. It seems that he did not understand that Greek melting ovens were small.[17] The earthen hill for casting would have to have been more than 70 cubits high, and had to have provided a large surface with space for a great many casting ovens and workers.

In eighth-century Japan, the ovens were larger and took up less space. Both the oven and the mud-brick hill are proved by archaeological finds. In nineteenth-century Munich, they were able to build an oven large enough to melt the metal for one large section at a time.

Working step four is the treatment of the bronze surface after casting. Casting a large bronze in large sections means that the treatment of the bronze surface can be done at the same time as the preparation for the casting of other pieces. In this case, *working step five*, the mounting of the finished pieces, is the last step.

The Japanese workers, by contrast, had to wait until the casting of the head was complete. Only then could they begin with the removal of the mud-brick hill, the molds, and the surface treatment of the bronze. The mud brick was later spread in the terrain, an important detail for our context: there are no reported finds in Rhodes that can be connected with an artificial hill 35 meters (114 ft.) high.

And another detail is not comparable: in Nara, surviving documents indicate that eight thousand workers and two hundred overseers worked on the Buddha project. It is unlikely that there were that many workers in the Greek context at the beginning of the third century BC.

Conclusion

Summing up, the technique described by Philo is not compatible with the situation proved by archaeology in ancient Greece. An explanation for this discrepancy might be that his text is not a factual account but rather a reconstruction of the casting of the Colossus. The text, or an earlier source from which it was compiled, was written because the original information from the third century BC—the time of Chares of Lindos, the sculptor of the Colossus—was lost. Thus we need no longer credit the idea that the Colossus of Rhodes was cast using a different technique from that attested on Rhodes. The statue must have been cast in large sections.

This understanding leads to the following points useful in the search for the location of the statue and its workshop on Rhodes. We are looking for a workshop in which an extremely large figure was cast in large sections. I believe it was situated near the statue's base, with space for a workshop to be built and used over a long working period (Pliny *Naturalis historia* 34.41 suggests twelve years).[18] The statue base had dimensions comparable to those of the surviving base of the Colossus of Nero (17.60 x 14.75 m, or 58 x 48 ft.). It was used first for the construction and modeling of the master model and then for the finished statue. The casting pits were nearby. They were not necessarily oval and were wider but not deeper than the pits already known.[19]

In 2015 I published a proposal for the possible location of the Colossus's base and workshop in the sanctuary of Helios above the stadium and the odeion on the acropolis of Rhodes (fig. 2.8).[20] The ruin northeast of the temple may be the remains of the base and the workshop. In the discussion of this interpretation of the ruin, the casting technique of the Colossus plays an important role.

Figure 2.8. Rhodes, Sanctuary of Helios (said to be of Apollon Pythios) and the possible location of the Helios Colossus (drawing added)

Map data: © 2017 Google and Basarsoft

✦ ✦ ✦

Notes

1. This paper summarizes Vedder 2015, 40–56, figs. 23–55, 60–65.
2. Vedder 2015, 82–84.
3. Translation by Haynes 1992, 121–22.
4. Zimmer 1990, 17 n. 646.
5. Zimmer and Bairamē 2008.
6. Zimmer and Bairamē 2008, 38–51, figs. 1–10.
7. Haynes 1992, 121–22.
8. Maeda et al. 1997; Rosenfield 2011, 107–15; Vedder 2015, 95–96, 111, figs. 40–48. My gratitude to A. Mori and K. Totsu for important help.
9. Pangkofer 1854, 21–28; Vedder 2015, 96–98, 111–12, figs. 49–53, 60–65.
10. Agreeing with Lapatin 2001, 72–73.
11. Rosenfield 2011, 108.
12. Stevens 1955, 240–76, figs. 2–5; Lapatin 2001, 63–79; Vedder 2015, 86–87, figs. 33–35.
13. Zimmer 1990, 62–71; Palagia 2013; Vedder 2015, 85–86, figs. 30–32. My gratitude to O. Palagia for the permission to publish the detail of the ground plan in fig. 2.2.
14. Vedder 2015, 92–95.
15. Mattusch 2014, 87–88.
16. Maryon 1956, 81–82.
17. Zimmer 1990, 143–52.
18. Compare Giumlia-Mair 2012, 17.
19. See the rectangular foundry in Zimmer and Bairamē 2008, 73–77.
20. The sanctuary is wrongly attributed to Apollon Pythios, Vedder 2015, 57–68.

Bibliography

Giumlia-Mair 2012
Giumlia-Mair, A. 2012. "The Technology of Bronze Statuary." In *Myth, Allegory, Emblem: The Many Lives of the Chimaera of Arezzo*, ed. G. C. Cianferoni, M. Iozzo, and E. Setari, 9–27. Rome: Aracne.

Haynes 1992
Haynes, D. 1992. *The Technique of Greek Bronze Statuary*. Mainz: Philipp von Zabern.

Lapatin 2001
Lapatin, K. D. S. 2001. *Chryselephantine Statuary in the Ancient Mediterranean World*. Oxford: Oxford University Press.

Maeda et al. 1997
Maeda, Y., T. Matsuyama, S. Hirakawa, D. Nishi, and K. Totsu. 1997. *Todaiji Daibutsu no kenkyu: Rekishi to chuzog ijutsu*. Tokyo: Iwanami Shoten.

Maryon 1956
Maryon, H. 1956. "The Colossus of Rhodes." *JHS* 76: 68–86.

Mattusch 2014
Mattusch, C. C. 2014. *Enduring Bronze: Ancient Art, Modern Views*. Los Angeles: J. Paul Getty Museum.

Palagia 2013
Palagia, O. 2013. "Not from the Spoils of Marathon: Pheidias' Bronze Athena on the Acropolis." In *Marathon the Day After: Symposium Proceedings, Delphi, July 2–4, 2010*, ed. K. Buraselis and E. Koulakiotis, 117–37. Athens: European Cultural Center of Delphi.

Pangkofer 1854
Pangkofer, J. A. 1854. *Bavaria, Riesenstandbild aus Erz*. Munich: Georg Franz. http://www.mdz-nbn-resolving.de/urn/resolver.pl?urn=urn:nbn:de:bvb:12-bsb10384297-4.

Rosenfield 2011
Rosenfield, M. 2011. *Portraits of Chōgen: The Transformation of Buddhist Art in Early Medieval Japan*. Leiden and Boston: Brill.

Stevens 1955
Stevens, G. P. 1955. "Remarks upon the Chryselephantine Statue of Athena." *Hesperia* 24: 240–76.

Vedder 2015
Vedder, U. 2015. *Der Koloss von Rhodos: Archäologie, Herstellung und Rezeptionsgeschichte eines antiken Weltwunders*. Mainz: Nünnerich-Asmus.

Zimmer 1990
Zimmer, G. 1990. *Griechische Bronzegusswerkstätten: Zur Technologieentwicklung eines antiken Kunsthandwerkes*. Mainz: Philipp von Zabern.

Zimmer and Bairamē 2008
Zimmer, G., and Bairamē, K. 2008. *Ροδιακά εργαστήρια χαλκοπλαστικής*. Athens: Ministry of Culture, Archaeological Resources and Receipts Fund.

3.

Bronzes from the Aegean Sea: A Reassessment of Old and New Finds

George Koutsouflakis, Hellenic Ephorate of Underwater Antiquities, Athens

Bronze artworks have seldom survived the whims of fortune on land. The Mediterranean Sea remains the richest reservoir of ancient bronzes lost in transit, and over the last 130 years the Aegean Sea has yielded some of the most spectacular and well-known masterpieces. The bronze pieces retrieved by salvage operations sponsored by the Greek state at Antikythera (1901) and Cape Artemision (1928) inaugurated a discussion about the exact nature of such cargoes that continues well into the twenty-first century. Yet bronzes from known underwater contexts are far outnumbered by isolated finds unexpectedly brought to light by fishing activities. Extracted violently from their postdepositional environment, they offer little information about the circumstances of their transit, while the wreck sites from which they originate continue to resist discovery.

The aim of this paper is to examine the existing evidence of bronzes found in the Aegean Sea, highlighting less-known material retrieved from the sea over the last twenty years or long forgotten in museum storerooms.

✦ ✦ ✦

"Thank God for Vesuvius; thank God for shipwrecks." Bondo Wyszpolski's comment[1] on the exhibition *Power and Pathos: Bronze Sculpture of the Hellenistic World* at the Getty Museum accurately sums up an art historical reality: bronze artwork of antiquity rarely survived the vicissitudes of history, except by mere chance. The contribution of Pompeii together with a handful of other sites is well known and recognized; the Villa dei Papiri at Herculaneum, for example, with its exquisite bronze portraiture "catapulted the study of bronzes from antiquarian pastime to art historical discipline,"[2] presenting an excellent archaeological context in which the Hellenistic art of portraiture could be well appreciated and understood. By contrast, the yield from the depths of the sea covers a considerably longer time span and is mostly the result of unintentional acts, resulting in a testimony that is far more ambiguous. The pursuit of context remains a major issue for most bronzes recovered underwater.[3]

The Mediterranean Basin forms the largest reservoir of bronze statuary, and a kind of reservoir that will not run out anytime soon. Scholars tend to link the bronzes recovered from the sea to shipwrecks, dated to the Late Republican and Early Imperial periods. This notion, often perceived as true a priori, is contingent upon a perceptual framework that dominated scholarly thought for more than a century. Yet, after a hundred years of underwater research, examples of solid shipwrecks carrying bronzes are very few, with a large number of "ghost-wrecks" remaining evasive and tenaciously resisting discovery. This very fact reveals one of the weaknesses of early discoveries: while much ink has been spilled over analyzing styles, musculature, drapery, and rendering, the exact locations where those masterpieces were found are poorly documented and have fallen into oblivion. Those infinitesimal details that could lead directly to the findspots were left unpublished because they were regarded as either unimportant or self-evident. Furthermore, recent finds suggest a much more nuanced story in the dating of bronzes loaded on board.

Shipwrecks do indeed present evidence for the advance of archaeological studies that no other terrestrial or underwater site can possibly provide. They offer an opportunity to trace the nexuses between trade, trade routes, commercial strategies, shipping, and ship-management. But doubtless their most salient quality is the range of intact artifacts they provide in connection with their existence per se in space and time. As self-contained and self-organized units, they offer a unique possibility to study bronzes in a transitional context, completely independent of the historical topography of terrestrial sites. This "disconnected reasoning" is well appreciated by scholars, who are often inclined to dovetail wrecks with certain historical events recorded in written sources.

Although underwater archaeology as an open-water activity was initiated in the Aegean in the nineteenth century, certain discoveries were made even earlier, when the sea was still considered insurmountable. Bronze statues were traditionally raised from the sea by fishermen dragging their nets. This phenomenon, as old as some of the raised statues themselves, was illustrated for the first time on a relief from Ostia, found in the vicinity of the temple of Hercules and dated around 70 BC (fig. 3.1).[4] Commissioned and dedicated to the temple by the haruspex Caius Fulvius Salvis, the relief depicts six fishermen pulling up a supernatural statue of Hercules Promachos in their net. It is not well understood if the episode depicted is an accident or a deliberate act.

Figure 3.1. Ostia relief. Ostia Archaeological Museum, inv. 157
Image: Schwanke, Neg. D-DAI-Rom 81.4534

The earliest reported example of a bronze statue raised by nets in the Aegean is the "Berlin Youth" or "Apollo," a headless corpus of a youth dated in the late first century BC, said to have been retrieved by Italian fishermen from the sea off Salamis in the Saronic Gulf in 1878.[5] Very little is known about the circumstances of the discovery. The youth passed into the Sabouroff collection and in 1884 was acquired by the Antikensammlung in Berlin.

A few years later, in 1899, a bronze statue of another god was discovered in the shallows of the modern village of Agios Vasileios, in southern Boeotia, affixed to an inscribed base that identified the figure as Poseidon.[6] The statue, dated in the very late Archaic period and restored in the 1970s, was placed on permanent display in the Athens Archaeological Museum.

The history of the Antikythera wreck discovered shortly thereafter, in 1900, is well known.[7] The Greek state, though on the verge of bankruptcy and just recovering from war, nevertheless undertook and completed one of the most remarkable archaeological operations ever. Thanks to a group of sponge divers from the island of Sími, most of the wreck's cargo was raised, bringing to light some of the most dazzling masterpieces of ancient sculpture. This historic research opened a long archaeological dialogue, renewed several times during the twentieth century and prolonged well into the twenty-first. Apart from leading the way and triggering the underwater excavation of the Mahdia wreck several years later, the Antikythera wreck demonstrated for the first time the potential of underwater archaeological research. The site remains under investigation 115 years after it was first discovered: no other project undertaken by the Hellenic Ephorate of Underwater Antiquities has been more time-consuming in organization, more complex in application, more demanding in resources, and more celebrated by the press than the "Return to Antikythera" project, the first attempt to reevaluate this historic shipwreck and excavate it according to modern procedures.

The resonance of the 1901 research did not last long, however. Technological limitations, ignorance, and a series of unfortunate international circumstances seriously affected any further steps toward establishing a discipline. For the following half century, shipwrecks were considered suitable only for salvage operations: any other retrieval from the sea remained accidental until the 1950s.

Nevertheless, the recovery of some of the most famous masterpieces of art worldwide is dated to this early twentieth-century period. In June 1925 a complete bronze statue of a youth known as the "Marathon Boy" was raised during a fishing operation in the southern Euboean Gulf. Konstantinos Rhomaios, to whom the piece was handed in the port of Rafina, was not keen to delve deep into the details of the discovery: he contented himself with the information provided. "The statue was found," he writes, "in the Marathon Bay, between the coast and some tiny island."[8] The information was never cross-checked, although he reports that there was evidence available from other eyewitnesses. The nickname *agalma* (statue) was adopted among the local fishermen to define the findspot. Ironically enough, the nickname survived in records and lists of toponyms, but there is no living memory of where it is.

Those three statues—the Berlin Youth, the Poseidon, and the Marathon Boy—were all single objects retrieved from the sea and lacking a definite context. The obvious and most self-evident reasoning—that they once belonged to the cargo of ships that never reached port—was generally accepted without further investigation. This is not, however, the only reasoning. Even Rhomaios in his 1925 report remained circumspect in recognizing a wreck under every statue raised from the sea.[9] In fact, a large number of excerpts culled from ancient writers declare that ancient bronzes could have been submerged underwater in antiquity for a variety of reasons. They could result from an act of "dumping," or jettison (the legal term for goods or equipment thrown overboard from a ship when in danger); from geophysical phenomena (earthquakes, inundations, etc.); or from an official symbolic condemnation of the memory of a certain person (*damnatio memoriae*).[10] "Dumping," or jettison, no doubt, was a common practice, since it was expedient to heave things overboard when a ship was in danger. References to jettison of all kinds abound in ancient sources,[11] and we can assume that the things dumped into the sea were the heaviest on board.

After Antikythera, the first bronzes directly linked to a shipwreck came from the sea off Artemision, the narrow strait separating Euboea from the Pagasetic Gulf, and once the site of a famous sea battle between the Persians and the Greeks.[12] The first piece to be drawn up in fishing nets in 1926 was the left forearm of Zeus of Artemision, one of the most celebrated works of ancient Greek art.[13] The find was reported to the Department of Antiquities, and initially no further action was taken. Two years later, in September 1928, a boat was reported to be performing illicit salvage operations in the same area. Concerted action led to the investigation of the suspected boat and confiscation of a newly broken right arm of a statue. A heavy cable was attached at that very moment to something that the divers and crew were about to pull up. Over the next few days, the authorities towed the remaining body of Zeus ashore onto the beach of Pefki.

The incident triggered outrage among the press and the public, who reprimanded the department for its idleness. Pressure mounted to undertake a more intensive investigation of the site. A new mission was pioneered by the *ephor* (magistrate), Nikos Vertos, an enthusiastic land archaeologist who, unfortunately, could not dive and therefore could not be directly involved in underwater work. Diving in those days was still difficult and dangerous, and archaeologists could not possibly meet the demands of such operations. To quote a passage from George Bass, they "stayed instead on deck and gratefully accepted the artifacts handed up to them by hired divers."[14] The exclusion of scholars from the finds' archaeological context had a serious impact on our understanding of early shipwrecks. Yet Vertos's official report, precise in its facts and accurate in its diction, remains today the main source of information regarding the Artemision shipwreck. The expedition lasted less than three weeks and was undertaken at the wrong time of the year, and thus confronted extreme weather conditions. The divers unearthed and pulled up the forepart of the body of a horse and the statue of a small boy. A short expedition resumed work in the spring of 1929, before the project ended due to the lack of adequate diving equipment. Efforts to locate the rear part of the horse failed, and Vertos insinuated that the piece had been washed away into a deep channel. This missing part appeared several years later, in 1936, caught by fishing nets in a spot several kilometers west of the wreck site, near the town of Oreoi. Even at such an early stage of underwater investigation, there was clear evidence of a fact that would prove an ongoing issue even seven decades later: bronzes discovered underwater, no matter how heavy, tend to get dismembered and separated from their postdepositional context as a result of secondary human action.

There is no official record indicating that anyone saw the wreck site again, and all later attempts to relocate the site—by Jacques Yves Cousteau (1976, 1982), Willard Bascom (1993), and Shelley Wachsmann (2006)—failed to yield any results. Details or schedules about the exact findspot again are lacking in the archives. Probably the site was silted over without leaving visible remains.

The statue of the horse and jockey was reassembled, and after extensive restoration went on display at the National Museum of Athens.[15] The original artist and the circumstances under which the work was created are unknown. Seán Hemingway has suggested that it may have been plundered from Corinth in 146 BC by the Roman general Mumius during the Achaean War and given to Attalus as a share of the booty, but lost while in transit to Pergamon.[16] Christos Piteros connected the wreck with the plundering of Chalkis by Mithridates's general Archelaos after the defeat of their coalition by Sulla in 86 BC and his escape back to Pergamon.[17]

Figure 3.2. Artemis statuette from the sea off Mykonos. Athens NAM, inv. X16790
Image: Courtesy of the National Archaeological Museum, Athens

After the delivery of the last part of the Artemision assemblage, almost half a century passed without any significant new finds in Greece. The only exception was the confiscation by the port police of a bronze statuette depicting Artemis, raised during illegal operations in 1959 from the sea off Mykonos (fig. 3.2).[18] According to the statue's drapery and style, it should be dated in the Early Hellenistic period.

Several bronzes have however been reported found off the coast of Asia Minor, modern Turkey. The "Lady from the Sea" was found in 1953 by fishermen dragging their nets along the coast of Arap Adasi, not far from the Knidos peninsula, at a depth of around 100 meters (330 ft.).[19] They brought the bronze to the village of Bitez, near Bodrum, and abandoned it on the beach. There, neglected and covered with marine incrustations, it remained for several weeks until it attracted the attention of George E. Bean, a British professor at Istanbul University; he had the bronze removed to Izmir, where it was cleaned and housed. The work is usually dated in the first half of the third century BC. Extensive underwater surveys conducted in the area failed to link the bronze to any specific context.[20]

Ten years later, in 1963, the half-broken bronze statue of a young African was pulled from the sea by sponge-draggers at a depth of 100 meters (330 ft.), not far from the modern city of Bodrum.[21] Preserved from the hips up and retaining both arms, it might represent a groom and might have been part of a Hellenistic honorary monument. A bronze figurine of Isis-Fortuna was netted in the same area that same year, leaving open a hypothesis that both works may have originated from the same wreck.

The latest reported statue from the coast of Turkey is the life-size bronze of a runner discovered at the Bay of Nemrut, near the ancient city of Cyme (Kyme).[22] The work represents an athlete, probably the victor of a footrace. Somewhat awkwardly composed and schematically muscled, he is remarkable for the individual features of the face. It is evidently a portrait, but it might also echo a famous high Classical statue, Myron's *Ladas*, which inspired numerous epigrams praising its sense of swiftness; this work has unfortunately not survived, even in replica. The face's individuality and hairstyle suggest a Late Hellenistic or even an Early Imperial Roman date.

The next find was again in Greek territorial waters, in Spring 1979: the bronze equestrian statue of a male was delivered by fishermen to the authorities, from the sea near the island of Ai Stratis (Agios Efstratios), in the northern Aegean.[23] It was immediately identified as Augustus on the basis of the emperor's portraits on coins. Statues like this were probably promoted by Roman state policy and distributed to the provinces to serve the aims of imperial propaganda. There is evidence of another bronze cuirassed equestrian statue from the same area, suggesting that the presumptive wreck may have carried a number of such sculptures. A small part of a bronze statue was delivered to the Ephorate of Underwater Antiquities in 1981; it was never published and has lain forgotten ever since in the storerooms (fig. 3.3).[24] It exhibits the right thigh and the *pteryges* ("feathers") of the lower part of a cuirass of another life-size equestrian statue, possibly a companion or general of Augustus, although there is no clear evidence that the two bronzes originate from the same site.

Figure 3.3. Fragment of an equestrian torso from the sea off Ai Stratis (Athens, EUA, inv. BE 1981/43)

The most monumental bronze statue to be raised from the sea, known as the "Lady of Kalymnos," was pulled up by a fishing boat in the sea east of the Greek island of Kalymnos in 1994 from a depth of about 120 meters (390 ft.).[25] It is a Hellenistic variation of the statue type known as the Large Herculaneum Woman. Variants of this type were used during the Hellenistic period to portray women from the middle and upper classes, queens, and even goddesses;[26] it exemplifies the ideal of the demure, respected lady of that era. On the basis of the idealized facial features and the similarity with works such as the Ackland Head,[27] the Lady of Kalymnos could, in all likelihood, be dated within the third century BC. The manner of representing the veil covering the head and hair very much recalls the portraits of Ptolemaic queens on coins. An identification of the Kalymnos Lady as Arsinoë III has recently been suggested by Olga Palagia, based on the similarity of the facial features to those of a bronze head in Mantua.[28]

The delivery of the Lady of Kalymnos to the Hellenic Archaeological Service and the stupendous reward granted for it had a huge impact on the community of local fishermen and resulted in an unexpected chain reaction: for the next twenty years, parts of statues were delivered to the department, some of them newly found and raised from the sea, others that had been stored for years in Kalymnian cellars. Dragging nets for the recovery of bronzes was for a while considered much more profitable than fishing. We can only imagine the damage inflicted to ancient shipwrecks in the deep. Whatever entered the Archaeological Service after 1994 was very fragmentary and of highly questionable origin.

A fragment of a bronze dolphin was salvaged in 1997 in the waters off the north Dodecanese island of Leipsoi.[29] It has a broad, curved forehead and a wide, raised snout that correspond to the widespread iconographic convention for Hellenistic dolphins. Iconographic parallels with dolphins in comparable representations allow this sculpture to be dated in the Hellenistic period.

A bronze head slightly larger than life-size was found in the sea northwest of Kalymnos in 1997.[30] The head is a portrait of a mature bearded man wearing a *kausia*, the felt hat worn at the Macedonian court and used by the Diadochoi as a distinctive sign of their origin. The head is gently tilted with separated lips and eyes looking slightly upward—two features known from the iconography of Alexander the Great. But it also has some personalized characteristics such as a short, curly beard, mustache, short hair, and deep horizontal and vertical wrinkles in the middle of the forehead. These characteristics suggest that it is a portrait of a well-known man, a face that was to be immediately recognizable.

Two identical bronze legs, right and left, were also found in the sea south of Kalymnos during 1997 and 1999, albeit in different locations, some nautical miles apart.[31] Their knees are bent, and the lower legs slope gently downward, like the legs of a rider who, like all ancient equestrians, did not use stirrups. The shoe is an almost perfect match with the *krepis*, a sandal that, according to Pliny the Elder, was worn when traveling on foot or horseback. Feet wearing identical shoes are likewise found in Hellenistic bronzes, especially statues of riders, with all known examples dating to the third and second centuries BC. A fragmentary piece of a third leg was lifted from the sea northwest of Kalymnos,[32] suggesting the existence of at least two mounted bronze figures, but the evidence for combining the findspots was highly controversial.[33]

Figure 3.4. Bronze rider from the sea off Kalymnos (Athens, EUA, inv. BE 2006/1)

In 2006 a fragmentary body of an armored rider was raised from waters south of Kalymnos (fig. 3.4).[34] The rider wears a type of leather cuirass that corresponds to a *spolas* over a short-sleeved garment, and over it a *chlamys*, which is fastened at the right shoulder and runs across the chest to fall freely down the back. The bottom part of the armor is decorated with a band of incised pairs of spiral motifs, while the lower edge exhibits a double line of *pteryges*. The cuirass is tied at the waist with a cloth belt that crosses at the back and then fastens in an intricate knot at the center front, imitating the "Persian girdle" worn by Alexander the Great.

Figure 3.5. Bronze rider from the sea off Kalymnos (Athens, EUA, inv. BE 2009/28)

The most complete piece of this group appeared in 2009: the full bust of an armored horseman, preserved from the neck down to the flaps of the cuirass (fig. 3.5).[35] The head, both legs, and the horse are missing. The figure exhibits the same kind of cuirass as the rider found in 2006. The visible right shoulder strap is decorated with a relief of a winged thunderbolt. The left shoulder strap is hidden by the *chlamys*, which, fastened on the right shoulder, folds over the chest and falls back, covering the entire back. Clearly, the horseman held the horse's reins with the left hand. The right hand is raised forward in a gesture of greeting. A strap hangs from the neck, down the left side of the cuirass, and is decorated with a plate incised with an archaistic female figure. The cuirass is tied at the waist with the exact same Persian-girdle manner as the find of 2006. Unlike its former companion, the whole work is fully decorated with minor details: a griffin under the armpit, a line of flying birds on the belt, and double spiral motifs at the lower edge of the thorax. The pair of legs raised in the 1990s have been securely associated with the figure. The attribution of the head with a *kausia* to the one or the other rider torso, however, remains less certain.

The two horsemen are of similar size, wear the same type of clothes and armor, were found in the same waters, and reasonably should be attributed to the same shipwreck.[36] However, the exact archaeological context is still lacking. The dating of the riders can be based only on stylistic and typological criteria: the style of the clothing, the double row of flaps, and the knotted belt are all known already from a fourth-century BC rock relief depicting the general Alketas on the funerary monument at Termessos in Lycia.[37] The elaborate belt (*cingulum*) on each of the two armored riders appears in depictions of the Diadochoi and is adopted later by the Romans, who used it to indicate that the wearer held an official post. Stylistic analysis of some details of the clothing, and the striking resemblance of the bent legs and leather shoes to an example found in a well in the Athenian Agora,[38] suggests a date from the third to the mid-second century BC.

Up to now it has not been possible to identify the head with a *kausia* with any certainty. It has, however, been suggested that it represents a famous Macedonian king. On grounds of iconographical resemblance with a much worn marble head from the island of Kos, Palagia suggests that it is Philip V, the penultimate ruler of the Antigonid dynasty.[39]

Concerning the conditions of transport and loss of the statues retrieved from the sea near Kalymnos, we can only make assumptions. A *terminus ante quem* for the date of the bronzes is provided by an intact stamped amphora, part of the same catch with the horseman recovered in 2006, partially covered with calcareous deposits containing a high percentage of copper oxides. This fact clearly demonstrates that the armored figure and the amphora were in the same underwater environment for a long time.[40] It is a typical example of a Knidos-type amphora, which, on the basis of shape and the two stamps, can be dated approximately between 78 and the end of the first century BC.

Among the late finds originating from the Aegean there is also a life-size bronze statue of a nude male, raised in 2004 from a depth of almost 450 meters (1,475 ft.) in the area west of Kythnos in the Cyclades.[41] The entire head, the right arm from the shoulder, the right leg from the knee down, and part of the back are missing. The nudity, the equipoise, and the musculature of the body suggest a robust athlete, perhaps a discus thrower. The dating of the bronze is still very uncertain and depends on its potential relationship with a shipwreck found in the same area, loaded with a mixed cargo that contained, among other items, Chian amphorae of the late fourth or early third century BC.[42]

Figure 3.6. Bronze head from Kythera (Athens, EUA, inv. BE 2015/14)
Image: Hellenic Ministry of Culture and Sports, Greece

The latest accession in this long series of bronzes found underwater is a head of a young male figure that was delivered to the department by a spear-fisherman in late summer 2015 (fig. 3.6).[43] It was collected in shallow waters in front of the village of Agia Pelagia in the island of Kythera, south of Peloponnese; according to the existing evidence, it is not connected to any shipwreck remains. The rendering of the hair in shallow relief might indicate a Late Hellenistic, if not Early Roman, variation of an earlier prototype.

Any catalogue of bronzes retrieved from Greek or Turkish territorial waters inevitably remains incomplete: we lack information about the numerous bronzes that worked their way through illegal transactions directly into private collections or appeared out of nowhere on the international market. Ownership of art is de facto sanctioned by time. After aging a few years in private collections and then taking advantage of less strict legislation, they may well end up in collections of well-respected institutions. The repatriation in 2002 of a young male nude, now in the National Archaeological Museum of Athens,[44] is one of the very few that made its way back. The sculpture allegedly was found somewhere in the Ionian Sea, perhaps off Preveza, but as in most such cases, there is no definite information. No doubt, there are many more.

While complete or dismembered statues may at any time rise from the deep to the full glare of publicity, investigators of shipwrecks on the coastal zone tend to conceal any trace of more valuable or uncommon cargo. As of summer 2015, the number of ancient wrecks surveyed in Greek territorial waters exceeded two hundred. Yet the number of wreck sites containing bronzes has remained stable for almost a century: Antikythera and Artemision, two of the very first wrecks ever investigated, were the only known examples until 2010. In that year a series of unexpected finds came to light during the opening of some trial trenches on a Late Hellenistic shipwreck in the southern Euboean Gulf, off the island of Styra, at an accessible depth between 40 and 45 meters (131–47 ft.).[45] Several fragmentary pieces of bronze statues of natural size were unearthed by removing the upper sediments: a part of a nude calf, parts of folded drapery, and the selvage of a garment displaying a zone of inlaid reddish cooper (fig. 3.7).[46] From the same wreck, two intact bronze legs of a table or couch decorated with busts of sirens and acanthus leaves were also recovered (fig. 3.8).[47] Luxury furniture is seldom found in ancient shipwrecks, with the only other known examples reported in the wrecks from Antikythera and Mahdia, both known for their cargo of bronzes.[48]

Figure 3.7. Fragment of folded drapery from the Styra shipwreck (Athens, EUA, inv. BE 2010/4-50)

Figure 3.8. Wooden core and bronze fittings of furniture legs from the Styra shipwreck (Athens, EUA, inv. BE 2010/4-6, 4-7)

Bronzes, however, constituted only a small part of the total cargo of the Styra shipwreck. The main cargo was a consignment of north Peloponnesian (Sikyonian) amphorae and tableware (fig. 3.9). The nature of this complementary cargo of bronzes cannot be fully understood until the completion of the excavation. They could represent booty from the devastation of a town; the luxury belongings of an official who was travelling to or from his post; or even art objects ordered by a Roman patron. And considering the historic circumstances, fragmentary bronzes may well also have been collected as scrap and transported by sea on their way to the foundries that operated incessantly during that period to meet the demands of war.

Figure 3.9. Site view of the Styra wreck

The Styra shipwreck clearly demonstrates that shipwrecks loaded with bronzes do not necessarily differ from any other carrier of the period. Scholars have made much of the heavy construction of the hulls from the Antikythera and the Mahdia shipwrecks.[49] No doubt, the Antikythera ship was a huge vessel with characteristics that only exceptionally large ships of the Roman era presented.[50] However, the rest of the consignment shipped together with statuary and luxury items does not differ significantly from any other cargo circulating in those years between the Aegean Sea and the Adriatic Sea. The Antikythera wreck provided Rhodian, Koan, Ephesian, and Lamboglia II amphorae. Knidian amphorae were probably carried together with the bronzes recovered from the wreck off Kalymnos, as yet undiscovered. Amphorae are also reported from the Kythnos wreck, and mixed consignments can be traced even back to the early fourth century BC, with the Porticello shipwreck being the most characteristic example.[51] Instead of indicating aberrant times, these mixed consignments seem to insinuate nothing out of the ordinary.

These facts clearly demonstrate that common boats, loaded with all kinds of commodities, were used to load the bronzes and make crossings. The correspondence of Cicero, in a letter written from Rome in March of 67 BC, seems to verify that. Cicero orders his agent, Titus Pomponius Atticus, to find him Megarian statues, Pentelic herms, and any other statue suitable for a lecture hall and colonnade. Closing his letter, he underscores that “if a ship of Lentulus is not available put them aboard any [ship] you think fit.”[52] It seems that any ship seaworthy and safe enough could have been used to transport works of art. If we push this argument to its extreme, any shipwreck, any amphora carrier dated between the years 150 BC and AD 50 could have carried bronzes.

Shipwrecks transporting bronzes remain elusive no matter the time, means, and funds invested in tracing them. Several good reasons for this should be mentioned. Doubtless, the great depth to which these wrecks sank increases the operational cost of any underwater survey, and as such, it is not often expected to be prolonged to the final exhaustion of any possibility offered by a certain area. The dynamic underwater environment in several areas is now hiding and now unveiling traceable remains over and over again. Secondary, postdepositional removal of bronzes may also draw underwater investigation several miles away from the original spot of a wreck. False or deliberately misleading information also has its share in the failure of many missions of the past. While amateur divers have too often been flung into the breach between illusion and reality, professional fishermen remain very reluctant to provide accurate information, for fear of a possible generalized ban on the use of dragged nets in their traditional fishing fields. State policy must also claim a fair share of blame. While Hellenic law encourages and rewards the handing over of antiquities and information, bureaucratic procedures are often stalled by officious public servants with no interest in achieving a sensible balance between underwater archaeologists and local communities of fishermen: rewards can be delayed for years and this creates an additional ambience of mistrust.

Defining an archaeological context remains today the most crucial issue for the majority of bronzes retrieved underwater. Bronzes without context can still serve the history of art, but our understanding of the conditions of transit are relegated to the sphere of assumption. A subsequent need to relocate and investigate anew historic wrecks of the past is slowly being fulfilled. The painstaking documentation of the remains of the Antikythera shipwreck, now under excavation, will partly address that. The relocation of the remnants of the Artemision wreck is evoking a reconsideration of the date and circumstances of the ship's transit. Experience has shown that only fully excavated shipwrecks and detailed study of all of the material on board can provide the kind of information that will allow scholars to link those wrecks to specific historical episodes.

✦ ✦ ✦

Notes

1. http://www.easyreadernews.com/108987/power-and-pathos-bronze-sculpture-of-the-hellenistic-world.
2. Daehner and Lapatin 2015, 26.
3. Hemingway 2015, 66–67.
4. Ostia, Archaeological Museum, inv. 157; Becatti 1939; Mattusch 1997, 12, fig. 9.
5. Berlin, Altes Museum, inv. Sk 1; Heilmeyer 1996.
6. Athens, National Archaeological Museum, inv. X11761; Filios 1899. The work is often erroneously referred as "Poseidon of Livadostra" or "Poseidon of Kreusis" even though it was found several miles away from the ancient city. See Kaltsas 2002, 86, no. 146.
7. For the most recent discussion on the Antikythera shipwreck and its finds, see Kaltsas, Vlachigianni, and Bouyia 2012, with previous bibliography.
8. Athens, National Archaeological Museum, inv. X15118; Rhomaios 1924–25, 146; Kaltsas 2002, 242–43, no. 509.
9. Rhomaios 1924–25, 147.
10. The sea has been always considered as "a place of no return," a place where one could easily get rid of something one would rather not deal with again (Lindenlauf 2003). Ancient sources briefly refer to the disposal of bronze portraits and statues of Demetrius of Phaleron when the Antigonid dynasty took control of Athens in the late fourth century BC: His statues were either destroyed or thrown into the sea as part of a political condemnation. See Azoulay 2009.
11. Aeschylus *Agamemnon* 1008–13; Herodotus 8.118; Josephus *Bellum Judaicum* 1.280; Lycophron *Alexandria* 618; Plutarch *Moralia* 134C; Athenaeus 2.5; 7.39, Juvenal 12.30–56; Cicero *De officiis* 3.23.89.
12. For the circumstances of the discovery, see Vertos 1929; Hemingway 2004, 35–43; Tzalas 2007, 351–52.
13. Athens, National Archaeological Museum, inv. X15161; Karouzos 1930–31; Kaltsas 2002, 99–93, no. 159.
14. Bass 2011, 6.
15. Athens, National Archaeological Museum, inv. X15177. For a full discussion of the sculpture, see Hemingway 2004.
16. Hemingway 2004, 146–48.
17. Piteros 2001, 114–20.
18. Athens, National Archaeological Museum, inv. X16790; Bouyia 2011, 76, n. 113.
19. Izmir, Archaeological Museum, inv. 3544; Ridgway 1967; on the circumstances of the discovery, see Throckmorton 1965b, 78; and Frost 1963, 200.
20. Bass and Joliene 1968; Green 2004.
21. Bodrum, Archaeological Museum, inv. 756; Ridgway 1990, 339, plate 177.
22. Izmir Archaeological Museum, inv. 9363; Ridgway 2000, 313, plate 76; Daehner and Lapatin 2015, 26–27, fig. 1.7.
23. Athens, National Archaeological Museum, inv. X23322; Touloupa 1986; Kaltsas 2002, 318, no. 664.
24. Athens, Hellenic Ephorate of Underwater Antiquities, inv. BE 1981/43.
25. Kazianis 1994, 856, plate 265; Koutsouflakis and Simosi 2015, 72–73, fig. 5.1.
26. For a comprehensive survey of the type, see Daehner 2007.
27. Immerwahr 1969. The Ackland Head might as well originate from Asia Minor and it exhibits some traces that indicate an underwater context.
28. Palagia 2013, 155–56. For the Mantua head, Museo Civico di Palazzo Te, inv. 96190279, see Daehner and Lapatin 2015, 200–201, no. 8 (E. Ghisellini).
29. Kalymnos Archaeological Museum, inv. 3904. Kazianis 1997, 1201, plate 444ε; Koutsouflakis 2007, 48, fig. 8, Bairamē 2014, 238–39; Koutsouflakis and Simosi 2015, 75, plate 5.2.
30. Kalymnos Archaeological Museum, inv. no. 3901; Kazianis 1997, 1201, plate 444β; Tzalas 2007, 362; Koutsouflakis 2007, 46–47; Lichtenberger 2012, 173–74; Bairamē 2014, 238; Koutsouflakis and Simosi 2015, 78; Daehner and Lapatin 2015, 194–95, no. 5 (E. Bairamē); Palagia 2013 and in this volume.
31. Kalymnos Archaeological Museum, inv. 3902; Kazianis 1997, 1201, plate 444δ; Dellaporta and Dimitriadou 1999, 1031–32. figs. 20–22; Koutsouflakis 2007, 48–49; Koutsouflakis and Simosi 2015, 76–78, figs. 5.5–6.
32. Athens, Hellenic Ephorate of Underwater Antiquities, inv. BE 1997/1956; Koutsouflakis 2007, 47–48, fig. 7; Koutsouflakis and Simosi 2015, 78, fig. 5.7.
33. On the puzzling circumstances and findspots of most of the bronzes attributed to the "Kalymnian cluster" and delivered from 1994, see Koutsouflakis 2007.
34. Athens, Hellenic Ephorate of Underwater Antiquities, inv. BE 2006/1; Dellaporta 2006; Koutsouflakis 2007; Koutsouflakis and Simosi 2015, 75–76, fig. 5.4.
35. Athens, Hellenic Ephorate of Underwater Antiquities, inv. BE 2009/28. Koutsouflakis and Simosi 2015, 75, fig. 5.3
36. Both figures present close typological similarities to a torso of another bronze equestrian formerly in the collection of Bill Blass, now in the Metropolitan Museum of Art (inv. 2003.407.7). It is long believed to have been retrieved from an undefined place in the Mediterranean. The rendering of the New York bronze, however, seems to indicate a more advanced chronology (or a less skillful craftsmanship), while the hypothesis of an underwater origin is seriously challenged by the results of chemical analysis (Hemingway, Abramitis, and Stamm, forthcoming).
37. Pekridou 1986.
38. Shear 1973, 165–68, plate 36.
39. Palagia 2013 and in this volume.
40. Koutsouflakis 2007, 45, figs. 3–4.
41. Athens, Hellenic Ephorate of Underwater Antiquities, inv. 2004/45; Dellaporta 2001–2004, 591–92; idem. 2014, 237; Daehner and Lapatin 2015, 214–15, no. 14 (K. P. Dellaporta).
42. Dellaporta, Kourkoumelis, and Micha 2005, 1247; Sakellariou et al. 2007.

43. Athens, Hellenic Ephorate of Underwater Antiquities, inv. BE 2015/14.
44. Athens, National Archaeological Museum, inv. X26087; Tzalas 2007, 362–63; Proskynitopoulou 2004.
45. Koutsouflakis et al. 2012, 51–52; Koutsouflakis, forthcoming.
46. Athens, Hellenic Ephorate of Underwater Antiquities, inv. BE 2010/4–50.
47. Athens, Hellenic Ephorate of Underwater Antiquities, inv. BE 2010/4–6, 4–7.
48. Faust 1994; Palaiokrassa 2012.
49. Throckmorton 1965a; Höckmann 1994.
50. Steffy 1994, 71–72.
51. Eiseman and Ridgway 1987.
52. Cicero *Epistulae ad Atticum* 4(I.8), 2, Loeb, trans. D. R. Shackleton Bailey.

Bibliography

Azoulay 2009
Azoulay, V. 2009. "La gloire et l'outrage: Heurs et malheurs des statues honorifiques de Démétrios de Phalère." *Annales. Histoire, Sciences Sociales* 64.2: 303–40; http://www.cairn.info/revue-annales-2009-2-page-303.htm.

Bairamē 2014
Bairamē, K. 2014. "Male Head with Hat" and "Fragment of a Dolphin Sculpture." In *Nautilus: Navigating Greece*, 238–39. Exh. cat. Athens, Centre for Fine Arts (Bozar). Athens: Hypourgeio Polismou kai Athletismou.

Bass 2011
Bass, G. F. 2011. "The Development of Maritime Archaeology." In *The Oxford Handbook of Maritime Archaeology*, ed. A. Catsabis, B. Ford, and D. I. Hamilton, 3–22. Oxford: Oxford University Press.

Bass and Joliene 1968
Bass, G. F., and L. T. Joliene 1968. "Problems in Deep Wreck Identification." *Expedition* 11.1: 9–12.

Becatti 1939
Becatti, G. 1939. "Il culto di Ercole ad Ostia ed un nuovo rilievo votive." *Bull.Com.Arch.* 67: 37–60.

Bouyia 2011
Bouyia, P. 2011. "Σπένδουσα Άρτεμις." In *Μύθος και Νόμισμα, Παραστάσεις, Συμβολισμός και Ερμηνείες από την Ελληνική Μυθολογία*, exh. cat., 76, n. 153. Athens: National Archaeological Museum.

Daehner 2007
Daehner, J., ed. 2007. *The Herculaneum Women: History, Context, Identities*. Los Angeles: J. Paul Getty Museum.

Daehner and Lapatin 2015
Daehner, J. M., and K. Lapatin, eds. 2015. *Power and Pathos: Bronze Sculpture of the Hellenistic World*. Los Angeles: J. Paul Getty Museum.

Dellaporta and Dimitriadou 1999
Dellaporta, K., and T. Dimitriadou, 1999. "Παραδόσεις." *ΑΔ* 54, Χρονικά Β΄2: 1030–32.

Dellaporta 2001–2004
Dellaporta, K. P. 2001–2004. *ΑΔ* 56–59, Χρονικά Β΄6: 591–92.

Dellaporta 2006
Dellaporta, K. P. 2006. *ΑΔ* 61, Χρονικά Β΄2: 1409.

Dellaporta 2014
Dellaporta, A. P. 2014. "Statue of an Adolescent." *Nautilus: Navigating Greece*, 237. Exh. cat. Athens, Centre for Fine Arts (Bozar). Athens: Hypourgeio Polismou kai Athletismou.

Dellaporta, Kourkoumelis, and Micha 2005
Dellaporta, A., D. Kourkoumelis, and P. Micha. 2005. *ΑΔ* 60, Χρονικά Β΄2: 1246–48.

Eiseman and Ridgway 1987
Eiseman, C. J., and B. S. Ridgway, eds. 1987. *The Porticello Shipwreck*. College Station: Texas A&M University Press.

Faust 1994
Faust, S. 1994. "Die Klinen." In Hellenkemper Salies et al. 1994, 573–606.

Filios 1899
Filios, D. 1899. "Χάλκινον ἄγαλμα Ποσειδῶνος ἐκ Βοιωτίας." *Ἀρχ. Ἐφ.*, 58–74.

Frost 1963
Frost, H. 1963. *Under the Mediterranean: Marine Antiquities*. London: Routledge and Kegan Paul.

Green 2004
Green, J. 2004. "Report on the Demeter Side Scan Sonar Search and the Aslan Burnu Site Survey, Turkey, 2004." *Report*: *Department of Maritime Archaeology, Western Australian Maritime Museum* 188: 1–12.

Heilmeyer 1996
Heilmeyer, W.-D. 1996. *Der Jüngling von Salamis*. Mainz: Philipp von Zabern.

Hellenkemper Salies et al. 1994
Hellenkemper Salies, G., H.-H. von Prittwitz und Gaffron, and G. Bauchhenss, ed. *Das Wrack: Der antike Schiffsfund von Mahdia*. Cologne: Rheinland Verlag.

Hemingway 2004
Hemingway, S. 2004. *The Horse and Jockey from Artemision: A Bronze Equestrian Monument of the Hellenistic Period*. Berkeley: University of California Press.

Hemingway 2015
Hemingway, S. 2015. "Contexts of Discovery." In Daehner and Lapatin 2015, 66–67.

Hemingway, Abramitis, and Stamm, forthcoming
Hemingway, S., D. H. Abramitis, and K. Stamm. Forthcoming. "Hellenistic and Roman Commemorative Military Sculpture: A Bronze Torso in the MET." In *Art of the Hellenistic Kingdoms: From Pergamon to Rome*, Symposium held in New York, 2016.

Höckmann 1994
Höckmann O. 1994. "Das Schiff." In Hellenkemper Salies et al. 1994, 53–81.

Immerwahr 1969
Immerwahr, S. A. 1969. “A New Greek Bronze Head in the Ackland Museum.” *Hesperia* 38: 150–6.

Kaltsas 2002
Kaltsas, N. 2002. *Sculpture in the National Archaeological Museum, Athens*. Los Angeles: J. Paul Getty Museum.

Kaltsas, Vlachogianni, and Bouyia 2012
Kaltsas, N., E. Vlachogianni, and P. Bouyia, eds. 2012. *The Antikythera Shipwreck. The Ship, the Treasures, the Mechanism*. Athens: National Archaeological Museum.

Karouzos 1930–31
Karouzos, C. 1930–31. “Ὁ Ποσειδῶν τοῦ Ἀρτεμησίου.” *ΑΔ* 13: 41–104.

Kazianis 1994
Kazianis, D. 1994. *ΑΔ* 49, Χρονικά Β΄2: 856, pl. 265.

Kazianis 1997
Kazianis, D. 1997. *ΑΔ* 52, Χρονικά Β΄3: 1201.

Koutsouflakis 2007
Koutsouflakis, G. 2007. “Χάλκινος κορμός ιππέα από την θαλάσσια περιοχή της Καλύμνου.” *Ενάλια* 10: 42–57.

Koutsouflakis, forthcoming
Koutsouflakis, G. Forthcoming. “Ναυάγιο Ύστερης Ελληνιστικής Περιόδου στο Ακρωτήριο Ρέθι της Νήσου Στύρα.” *ΑΔ* 2010.

Koutsouflakis et al. 2012
Koutsouflakis, G., X. Argyri, Chr. Papadopoulou, and J. Sapountzis. 2012. “Υποβρύχια Αναγνωριστική Έρευνα στο Νότιο Ευβοϊκό (2006–2008).” *Enalia* 11: 40–69.

Koutsouflakis and Simosi 2015
Koutsouflakis, G., and A. Simosi. 2015. “Hellenistic Bronze Sculptures from the Aegean Sea: Recent Discoveries (1994–2009).” In Daehner and Lapatin 2015, 72–81.

Lichtenberger 2012
Lichtenberger, A. 2012. “Gibt es seine vorhellenistische Tradition für das Diadem?” In *Das Diadem der hellenistischen Herrscher: Übernahme, Transformation oder Neuschöpfung eines Herrschaftszeichens?*, ed. A. Lichtenberger et al., 163–79. Bonn: Habelt.

Lindenlauf 2003
Lindenlauf, A. 2003. “The Sea as a Place of No Return in Ancient Greece.” *World Archaeology* 35: 416–33.

Mattusch 1997
Mattusch, C. C. 1997. *The Victorious Youth*. Los Angeles: J. Paul Getty Museum.

Palagia 2013
Palagia, O. 2013. “Aspects of the Diffusion of Ptolemaic Portraiture Overseas.” In *The Ptolemies, the Sea and the Nile: Studies in Waterborne Trade*, ed. K. Buraselis, N. Stefanou, and D. J. Thompson, 143–59. Cambridge: Cambridge University Press.

Palagia 2017
Palagia, O. 2017. “A Royal Macedonian Portrait Head from the Sea off Kalymnos.” Chapter 4 of the present volume.

Palaiokrassa 2012
Palaiokrassa, N. 2012. “Small Metal Objects and Utensils.” In *The Antikythera Shipwreck: The Ship, the Treasures, the Mechanism*, ed. N. Kaltsas, E. Vlachogianni, and P. Bouyia, 116–21. Athens: National Archaeological Museum.

Pekridou 1986
Pekridou, A. 1986. “Das Alketas-Grab in Termessos,” *Ist Mitt.*, Beiheft 32.

Piteros 2001
Piteros, C. 2001. “Ο Δίας του Αρτεμισίου και ο Ποσειδώνας του Ισθμού της Κορίνθου.” In *Άγαλμα. Μελέτες για την αρχαία πλαστική προς τιμήν του Γιώργου Δεσπίνη*, 99–121. Thessaloniki.

Proskynitopoulou 2004
Proskynitopoulou, R. 2004. “Άγαλμα νεαρής ανδρικής μορφής.” In *Αγών*, ed. N. Kaltsas, 101–3. Exh. cat. Athens: National Archaeological Museum.

Rhomaios 1924–25
Rhomaios, K. 1924–25. “Ὁ ἔφηβος τοῦ Μαραθῶνος.” *ΑΔ* 9: 145–87.

Ridgway 1967
Ridgway, B. S. 1967. “The Lady from the Sea: A Greek Bronze in Turkey.” *AJA* 71: 329–34.

Ridgway 1990
Ridgway, B. S. 1990. *Hellenistic Sculpture*. Vol. 1: *The Styles of ca. 331–200 B.C.* Madison: University of Wisconsin Press.

Ridgway 2000
Ridgway, B. S. 2000. *The Hellenistic Sculpture*. Vol. 2: *The Styles of ca. 200–100 B.C.* Madison: University of Wisconsin Press.

Sakellariou et al. 2007
Sakellariou, D., P. Georgiou, A. Mallios, V. Kapsimalis, D. Kourkoumelis, P. Micha, T. Theodoulou, and K. Dellaporta 2007. “Searching for Ancient Shipwrecks in the Aegean Sea: The Discovery of Chios and Kythnos Hellenistic Wrecks by Marine Geological-Geophysical Methods.” *IJNA* 36.2: 365–81.

Shear 1973
Shear, T. L., Jr. 1973. “The Athenian Agora: Excavations of 1971.” *Hesperia* 42: 121–79.

Steffy 1994
Steffy, J. R. 1994. *Wooden Ship Building and the Interpretation of Shipwrecks*. College Station: Texas A&M University.

Throckmorton 1965a
Throckmorton, P. 1965. “The Antikythera Ship.” In *The Antikythera Shipwreck Reconsidered*, ed. G. D. Weinberg, V. R. Grace, G. R. Edwards, H. S. Robinson, P. Throckmorton, and E. K. Ralph, *TAPS* 55.3, 40–46.

Throckmorton 1965b
Throckmorton, P. 1965, *The Lost Ships: An Adventure in Undersea Archaeology*. London: Jonathon Cape.

Touloupa 1986
Touloupa, E. 1986. “Das Bronze Reiters Tandbild des Augustus aus dem nordägäischen Meer.” *AM* 101: 185–205.

Tzalas 2007
Tzalas, C. E. 2007. “Χάλκινα αγάλματα από τα βάθη της θάλασσας.” In *Μεγάλες Στιγμές της Ελληνικής Αρχαιολογίας*, ed. P. Valavanis, 342–63. Athens: Kapon.

Vertos 1929
Vertos, N. 1929. “Περί τῆς ἐξερευνήσεως τοῦ βυθοῦ τῆς θαλάσσης Ἀρτεμισίου.” *ΑΔ* 10: 87–95.

4.

A Royal Macedonian Portrait Head from the Sea off Kalymnos

Olga Palagia, University of Athens

The over-life-size head of a bearded man wearing a *kausia*, the Macedonian elite hat, and a padded headband was found in the sea near Kalymnos in 1997.

Representations of Macedonians wearing *kausias* in Macedonian wall-paintings, for example, the hunting frieze of Vergina Tomb II and the banquet frieze of the Tomb of Agios Athanasios, do not include headbands. Only Macedonian kings could wear the *kausia* with a cloth diadem, its ends falling down the back, according to a custom introduced by Alexander the Great. This headgear is documented by the ancient sources, by the coins of Seleukos II and of Antimachos I of Bactria, and by a wall-painting from Boscoreale portraying a Macedonian king.

The Kalymnos head does not, strictly speaking, wear a royal diadem since its tail ends do not fall down his back, and it has consequently been argued that it is not a royal portrait. However, the similarity of the bronze head to a marble head of the second century BC from Kos wearing a royal diadem indicates that he is a king. As both the Kalymnos and Kos heads resemble the coin portraits of Philip V of Macedon, it is suggested that they are portraits of this king.

✦ ✦ ✦

Figure 4.1. Bronze head of a man wearing a *kausia*, here identified with Philip V of Macedon. Kalymnos Museum, inv. 3901
Image: Olga Palagia

Figure 4.2. Bronze head of a man wearing a *kausia*. Right profile. Kalymnos Museum, inv. 3901.
Image: Daehner and Lapatin 2015, 195

Figure 4.3. Bronze head of a man wearing a *kausia*. Left profile. Kalymnos Museum, inv. 3901
Image: Olga Palagia

The fine bronze portrait head of a man wearing a *kausia* (figs. 4.1–3), which was on display in the exhibitions *Power and Pathos* in Florence, Los Angeles, and Washington, DC, and *Pergamon and the Hellenistic Kingdoms of the Ancient*

World at the Metropolitan Museum of Art in New York, is one of four over-life-size bronze statues of the Hellenistic period that were recovered from the sea near Kalymnos.[1] Another colossal bronze is a female portrait statue of very fine quality, dating from the late third century BC.[2] A third monumental bronze from the same area is the cuirassed torso of a horseman,[3] while a fourth is an even larger headless horseman,[4] which may or may not belong together with the *kausia* head. It is sometimes assumed that this bronze head belonged to an equestrian statue, but this is by no means established.

All four statues could conceivably come from the same shipwreck, but we do not have a verified excavation context. The works were recovered by fishermen, who specified different findspots for each before turning them over to the Greek government. No shipwrecks have been located so far and the bronzes are not yet fully published, even though two of them were found in the previous century: the female statue was found in 1994, the head with a *kausia* in 1997, the cuirassed torso in 2006, and the headless horseman in 2009.[5] There is little doubt that all four statues are portraits. Their high quality and monumental size suggest that they are portraits of rulers or high officials of the Hellenistic period. In 2013 I published an article tentatively identifying the female portrait statue from the sea off Kalymnos with the Ptolemaic queen Arsinoë III, who reigned in the late third century BC, by comparison with the bronze head of Arsinoë in Mantua, which was also included in the exhibition *Power and Pathos*.[6] I associated the statue with the island of Kos, where several portraits of the queen are attested and where a ruler cult of the Ptolemies was located. Kos is very close to Pserimos, where the bronze female allegedly came to light.

The bronze head wearing a *kausia* (see figs. 4.1–3) is slightly over life-size. It was created by an outstanding sculptor and is one of the finest bronzes to have come down to us from antiquity. He has a long, oval face, large ears, short hair, sideburns and a short beard. He wears a distinctive hat of mushroom shape, slightly pointed, ending in a sweatband around the scalp. It seems to imitate a leather cap, judging by its sharp edges, with a woolen sweatband. A similar hat is represented on the weapons frieze of the propylon of the sanctuary of Athena at Pergamon (fig. 4.4), which dates from the reign of Eumenes II, probably from the 180s BC,[7] The same hat is worn by Seleukos II on his bronze coins minted at Susa in 228 BC.[8] Two Bactrian kings are also portrayed wearing this type of hat: Antimachos I on his coin portraits from around the first quarter of the second century BC (fig. 4.5);[9] and Demetrios II on a clay seal from Seleukeia on the Tigris from the last quarter of the same century.[10] Their hats may be interpreted as a version of the *kausia*, the Macedonian hat for elite men.[11]

Figure 4.4. Block of the weapons frieze from the propylon of the sanctuary of Athena at Pergamon. Berlin, Pergamonmuseum
Image: Hans R. Goette

Figure 4.5. Silver tetradrachm of Antimachos I of Bactria. New York, American Numismatic Society 1954.11.1
Image: Courtesy of the American Numismatic Society

The *kausia* is mentioned by the historians of Alexander the Great as having been worn by Alexander and his companions. After his conquest of Persia, Alexander introduced a new royal headgear by combining his *kausia* with a Persian diadem, which was originally a cloth ribbon worn at the royal court of the Achaemenids.[12] It was tied around one's head, with its ends falling on the neck. Alexander tied the diadem around his *kausia*, which became a *kausia diadematophoros* and henceforth a royal prerogative.[13] Demetrios Poliorketes, king of Macedon from 306 to 283 BC, wore a *kausia* with a double diadem.[14] This Macedonian royal headgear persisted until the time of (or was revived by) Cleopatra VII of Egypt. In 34 BC she presented her infant Ptolemy, son of Antony, at a public ceremony known as the Donations of Alexandria, wearing a *kausia* with diadem.[15]

After his return from the expedition to India, Alexander presented his friends with purple *kausias* as royal gifts.[16] This gesture was later imitated by Eumenes, who distributed purple *kausias* to Alexander's veterans.[17] Plutarch tells us that Alexander's friend Krateros wore a *kausia*,[18] and the hat is still attested at the court of Demetrios's great-grandson, Philip V, who reigned from 221 to 179 BC.[19]

An earlier version of the *kausia*, closer to Alexander the Great's own time, is attested in the wall-paintings of Macedonian tombs from the late fourth and early third centuries BC. The hunting frieze on the facade of the so-called Tomb of Philip at Vergina shows two Macedonians in *kausias* hunting with Alexander the Great.[20] More *kausias* are worn by royal pages and Macedonian bodyguards represented on the facade of the tomb of Agios Athanasios.[21] One of Alexander's companions on the Alexander mosaic, a second-century BC copy of an early Hellenistic painting of the battle of Issos, wears a similar *kausia*.[22] We have no contemporary representations of Alexander wearing a *kausia* with diadem, but he has been tentatively identified in a Roman copy of a Macedonian painting: a wall-painting from the Villa of Synistor at Boscoreale, dating from the mid-first century BC, shows a Macedonian sitting next to a Macedonian shield.[23] The figure wears a *kausia* with a diadem tied around the head under the hat, its ends falling over the right ear. The identification with Alexander is based on the fact that the figure wears a Persian chiton.[24] We know that Alexander adopted a mixed Persian and Macedonian dress after the death of Dareios III in 330 BC;[25] he is therefore the only Macedonian king who ever wore both a Persian garment and a *kausia* with diadem, like the figure on the fresco from Boscoreale.

Alexander's royal diadem was adopted by the Successors as a sign of royalty from 306 BC on. Plutarch, in his *Life of Demetrios* (18), provides a vivid description of the assumption of the diadem by Antigonos the One-Eyed and remarks that Ptolemy I and Lysimachos followed his example soon thereafter.[26] Ptolemy I was the first to depict himself wearing a diadem on his coins.[27] The diadem continued to serve as royal insignia until the end of the Hellenistic period.

It is of course quite obvious that the bronze head (see figs. 4.1–3) does not wear a royal diadem. Could he be a Macedonian king? Or is he one of the king's friends, who were entitled to wear a *kausia* without a diadem?

Equestrian bronze statues of high officials of the Macedonian kingdom voted by the Greek cities are attested as early as the late fourth century. For example, the Athenians honored Asandros with a statue in the Agora in 314/13 BC, while the Eretrians set up a statue of Timotheos in 309 BC.[28]

The head with *kausia* from near Kalymnos preserves no royal insignia. Could he still be a royal? The answer lies on Kos. A fragmentary portrait head in Parian marble (figs. 4.6–7), showing almost certainly the same man and being of the same scale as the bronze head, comes from an unknown findspot on Kos.[29] The marble head has the same oval-shaped face, large ears, drooping eyelids, sideburns, and short beard as the bronze head (see figs. 4.1–3). It differs in having luxuriant locks over the ears, but these may indicate a slight change of hairstyle or may be due to the fact that the hair is not constrained by a hat. The marble head differs in another crucial detail: it wears a royal diadem, visible on the right profile;[30] it therefore portrays a Hellenistic king.

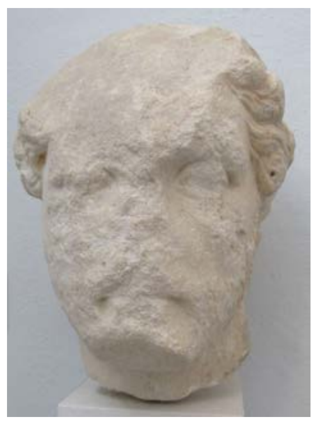


Figure 4.6

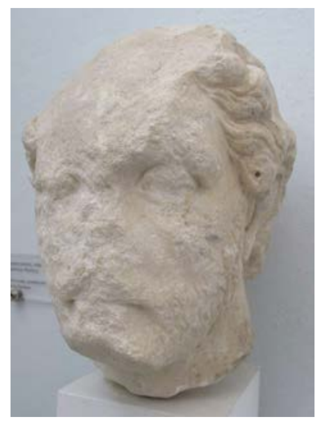


Figure 4.7

Marble portrait head of Philip V (?) from Kos. Kos Museum, inv. 82. Image: Olga Palagia

The Kos head was originally published by Gerhard Neumann, who suggested that it may represent the last Macedonian king, Perseus.[31] However, the shape of the face, the cheekbones, and the curly beard of Perseus's coin portraits are quite different from the features of the man on Kos.[32] In her catalogue of the sculptures from Kos, Renate Kabus-Preisshofen pointed out the differences between the marble head and Perseus. She tentatively dated the Kos head to the last quarter of the third century, before the reign of Perseus, and suggested that it might be Philip V of Macedon, Perseus's father.[33] Another possibility is of course Antigonos Doson, king of Macedon from 229 to 221, uncle and predecessor of Philip V. Doson received ruler cult on Kos in a shrine called Antigoneion, which is documented by a third-century inscription.[34] We do not know the location of this shrine or the nature of Doson's benefaction to the Koans. It appears that this cult functioned until the second century BC. As Antigonos Doson did not portray himself on his coins, we do not know what he looked like. We do not even know whether he had a beard. The Successors of Alexander the Great were all clean-shaven following the example of the conqueror, and this fashion persisted in most Hellenistic dynasties. The situation in Macedon after Demetrios Poliorketes, who was clean-shaven,[35] is uncertain, because we have no coin portraits of his successors until his great-grandson, Philip V, ascended the throne in 221. And Philip V sported a beard.

Figure 4.8. Silver tetradrachm of Philip V of Macedon. New York, American Numismatic Society 1967.152.211
Image: Courtesy of the American Numismatic Society

The coin portraits of Philip V (fig. 4.8)[36] betray a lot of similarities to the bronze head (see fig. 4.3), especially the hairstyle and oval face. They also exhibit the same drooping eyelids as the marble portrait on Kos. Could the bronze and marble heads be portraits of Philip V? As we do not know what Antigonos Doson looked like, Philip V remains a distinct possibility. The presence of his marble portrait on Kos would not be so easy to explain, given that relations between Philip V and Kos were not friendly.[37] But we know that his son Perseus had a royal estate on Kos, which he may well have inherited from his father.[38] In addition, the shrine of Antigonos Doson may have served as a repository of other royal Macedonian portraits. The Koans were more often than not staunch supporters of the Ptolemies,[39] but they may have had to placate the aggressiveness of Philip V. The original location of our bronze head with *kausia* is of course unknown, but Kos is not impossible.

In sum, the bronze head appears to represent a king of Macedonia of the late third century BC, very likely Philip V, and deserves pride of place among extant portraits of Hellenistic rulers. In addition, this is the only original over-life-size bronze portrait of a Macedonian king known to date, thus enriching our appreciation of the sculpture of Macedonia.

✦ ✦ ✦

Acknowledgments

I would like to thank Hans Goette for the photo in fig. 4.4; Andrew Meadows for the photo in fig. 4.5; and Ute Wartenberg Kagan for the photo in fig. 4.8. Thanks also to George Koutsouflakis and Despina Ignatiadou for advice and suggestions.

Notes

1. Kalymnos Museum, inv. 3901; Tzalas 2007, 362, fig. 37; Koutsouflakis 2007, 46–47, figs. 6a–b; Koutsouflakis and Simosi 2015, 78; Daehner and Lapatin 2015, 194–95, no. 5 (Bairami); Picón and Hemingway 2016, 212–13, no. 138.
2. Kalymnos Museum, inv. 3903; Tzalas 2007, 362, fig. 38; Palagia 2013, 154–56, figs. 9.7–8; Koutsouflakis and Simosi 2015, 74–75, fig. 5.1.
3. Athens, Ephorate of Underwater Antiquities, inv. BE 2006/1; Koutsouflakis 2007, 42–45, figs. 1–2; Koutsouflakis and Simosi 2015, 75–76, fig. 5.4.
4. Athens, Ephorate of Underwater Antiquities, inv. BE 2009/28; Koutsouflakis and Simosi 2015, 75–76, fig. 5.3.
5. Koutsouflakis and Simosi 2015. See this paper also for further bronzes recovered from the sea near Kalymnos.
6. Mantua, Museo Civico di Palazzo Te, inv. 96190279; Palagia 2013, 156, fig. 9.9; Daehner and Lapatin 2015, 200–201, no. 8 (E. Ghisellini).
7. Bohn 1885, 96, plate 45; Dintsis 1986, 309, cat. no. 293, plate 83.1; Schwarzmaier et al. 2012, 315.
8. Houghton and Lorber 2002, 233, 279, 281, nos. 797–98, plate 84.
9. Dintsis 1986, 310, cat. no. 295, plate 80.3; Cribb 2007, 340, fig. 23; Palagia 2012, 379, fig. 14.
10. Torino, Museo Civico d'Arte Antica, inv. S7-4058; Messina 2007, 50, cat. no. 26.
11. On the *kausia*, see Dintsis 1986, 183–95; Saatsoglou-Paliadeli (1993) argues that the *kausia* was made of leather.
12. Xenophon *Cyropaedia* 8.3.13. See also Wiesehöfer 2012.
13. Ephippos ap. Athenaios 12.537e; Arrian *Anabasis* 7.22.2. See also Lane Fox 2007, 278; Dahmen 2012; Palagia 2014, 212–13.
14. Plutarch *Demetrius* 41.4. For rulers wearing a *kausia* with a diadem, see fig. 4.5 and nn. 8–10 above.
15. Plutarch *Antonius* 54.5; Green 1990, 675.

16. Plutarch *Moralia* 11e.
17. Plutarch *Eumenes* 8.7.
18. Plutarch *Eumenes* 6.1.
19. Worn by the royal pages: Plutarch *Moralia* 760b.
20. Saatsoglou-Paliadeli 1993, 135, fig. 3; Saatsoglou-Paliadeli 2004, plates 15, 19, and 20γ.
21. Tsimbidou-Avloniti 2005, plates 35–39.
22. Naples, National Museum, inv. 10020; Dintsis 1986, 305–306, cat. no. 284, plate 83.2; Saatsoglou-Paliadeli 1993, 136, fig. 4.
23. Naples, National Museum, inv. 906; Dintsis 1986, 307, cat. no. 287, plate 80.4; Palagia 2014, 211–14, figs. 1 and 2.
24. Palagia 2014, 211–14. For the identification of this figure as Alexander, see also Torelli 2003, 245–46.
25. Arrian 4.7.4; 4.9.9; Plutarch *Alexander* 45.1; Diodorus Siculus 17.77.5; Curtius Rufus 3.3.17–19; 6.6.4. Lane Fox 2007, 278; Palagia 2014, 212.
26. See Haake 2012, 299–302.
27. On his gold coins minted in the early third century BC: Lorber 2012, 213, fig. 12.4.
28. Asandros: *IG*^{2} 450, ll. 10–15; Wycherley 1957, 208, no. 278; Siedentopf 1968, 83, no. 1; Ma 2013, 129. Timotheos: Siedentopf 1968, 83, no. 2; Ma 2013, 129.
29. Kos Museum, inv. 82; Kabus-Preisshofen 1989, 102–105, 280–81, no. 79, plate 28.1–2.
30. Kabus-Preisshofen 1989, plate 28.1.
31. Neumann 1967.
32. See Mørkholm 1991, plate 39, no. 589.
33. See n. 29 above.
34. Sherwin-White 1978, 115–18; Kotsidu 2000, 240, cat. 158 (ca. 220 BC).
35. For coin portraits, see, for example, Mørkholm 1991, plate 10, nos. 172–73.
36. Mørkholm 1991, plate 39, no. 588.
37. Sherwin-White 1978, 120–24.
38. Sherwin-White 1978, 134.
39. See Sherwin-White 1978, 90–112 and 134–37; Kotsidu 2000, 241–44, cat. 160–62.

Bibliography

Bohn 1885
Bohn, R. 1885. *Das Heiligtum der Athena Polias Nikephoros*. Altertümer von Pergamon 2. Berlin: Spemann.

Cribb 2007
Cribb, J. 2007. “Money as a Maker of Cultural Continuity and Change in Central Asia.” In *After Alexander: Central Asia before Islam*, ed. J. Cribb and G. Herrmann, 333–75. Oxford: Oxford University Press.

Daehner and Lapatin 2015
Daehner, J. M., and K. Lapatin, eds. 2015. *Power and Pathos: Bronze Sculpture of the Hellenistic World*. Los Angeles: J. Paul Getty Museum.

Dahmen 2012
Dahmen, K. 2012. “Alexander und das Diadem: Die archäologische und numismatische Perspektive.” In Lichtenberger et al. 2012, 281–92.

Dintsis 1986
Dintsis, P. 1986. *Hellenistische Helme*. Rome: Bretschneider.

Green 1990
Green, P. 1990. *Alexander to Actium*. Berkeley and Los Angeles: University of California Press.

Haake 2012
Haake, M. 2012. “Diadem und basileus: Überlegungen zu einer Insignie und einem Titel in hellenistischer Zeit.” In Lichtenberger et al. 2012, 293–313.

Houghton and Lorber 2002
Houghton, A., and C. Lorber. 2002. *Seleucid Coins*. New York: American Numismatic Society; Lancaster, PA, and London: Classical Numismatic Group.

Kabus-Preisshofen 1989
Kabus-Preisshofen, R. 1989. *Die hellenistische Plastik der Insel Kos*, AM Beih. 14. Berlin: Mann.

Kotsidu 2000
Kotsidu, H. 2000. ΤΙΜΗ ΚΑΙ ΔΟΞΑ*: Ehrungen für hellenistiche Herrscher im griechischen Mutterland und in Kleinasien unter besonderer Berücksichtigung der archäologischen Denkmäler*. Berlin: Akademie.

Koutsouflakis 2007
Koutsouflakis, G. 2007. “Χάλκινος κορμός ιππέα από τη θαλάσσια περιοχή της Καλύμνου. *Enalia* 10: 42–56.

Koutsouflakis and Simosi 2015
Koutsouflakis, G., and A. Simosi 2015. “Hellenistic Bronze Sculptures from the Aegean Sea. Recent Discoveries (1994–2009).” In Daehner and Lapatin 2015, 72–81.

Lane Fox 2007
Lane Fox, R. 2007. “Alexander the Great: ‘Last of the Achaemenids?’” In *Persian Responses: Political and Cultural Interaction With(in) the Achaemenid Empire*, ed. C. Tuplin, 267–311. Swansea: Classical Press of Wales.

Lichtenberger et al. 2012
Lichtenberger, A., K. Martin, H.-Helge Nieswandt, and D. Salzmann, eds. 2012. *Das Diadem der hellenistischen Herrscher.* Bonn: Habelt.

Lorber 2012
Lorber, C. C. 2012. “The Coinage of the Ptolemies.” In *The Oxford Handbook of Greek and Roman Coinage*, ed. W. E. Metcalf, 211–34. Oxford: Oxford University Press.

Ma 2013
Ma, J. 2013. *Statues and Cities: Honorific Portraits and Civic Identity in the Hellenistic World*. Oxford: Oxford University Press.

Messina 2007
Messina, V., ed. 2007. *Sulla via di Alessandro: da Seleucia al Gandhara*. Exh. cat. Turin, Palazzo Madama. Museo Civico d’Arte Antica. Silvana: Cinisello Balsamo.

Mørkholm 1991
Mørkholm, O. 1991. *Early Hellenistic Coinage*. Cambridge: Cambridge University Press.

Neumann 1967
Neumann, G. 1967. "Ein Bildnis des Königs Perseus." *JdI* 82: 157–66.

Palagia 2012
Palagia, O. 2012. "The Impact of Alexander the Great in the Art of Central Asia." In *The Alexander Romance in Persia and the East*, ed. R. Stoneman, K. Erickson, and I. Netton, 369–82. Groningen: Groningen University Press.

Palagia 2013
Palagia, O. 2013. "Aspects of the Diffusion of Ptolemaic Portraiture Overseas." In *The Ptolemies, the Sea and the Nile: Studies in Waterborne Trade*, ed. K. Buraselis, M. Stefanou, and D. J. Thompson, 143–59. Cambridge: Cambridge University Press.

Palagia 2014
Palagia, O. 2014. "The Frescoes from the Villa of P. Fannius Synistor in Boscoreale as Reflections of Macedonian Funerary Paintings of the Early Hellenistic Period." In *The Age of the Successors and the Creation of the Hellenistic Kingdoms (323–276 B.C.)*, ed. H. Hauben and A. Meeus, 209–31. Leuven: Peeters.

Picón and Hemingway 2016
Picón, C. A., and S. Hemingway, eds. 2016. *Pergamon and the Hellenistic Kingdoms of the Ancient World*. Exh. cat. New York, Metropolitan Museum of Art. New Haven and London: Yale University Press.

Saatsoglou-Paliadeli 1993
Saatsoglou-Paliadeli, C. 1993. "Aspects of Ancient Macedonian Costume." *JHS* 113: 122–47.

Saatsoglou-Paliadeli 2004
Saatsoglou-Paliadeli, C. 2004. *Βεργίνα: Ο Τάφος του Φιλίππου: Η τοιχογραφία με το κυνήγι.* Athens: Archaeological Society of Athens.

Schwarzmaier et al. 2012
Schwarzmaier, A., A. Scholl, and M. Maischberger, eds. 2012. *Die Antikensammlung: Altes Museum, Neues Museum, Pergamonmuseum / Staatliche Museen zu Berlin*. Darmstadt: Philipp von Zabern.

Sherwin-White 1978
Sherwin-White, S. M. 1978. *Ancient Cos: An Historical Study from the Dorian Settlement to the Imperial Period*. Göttingen: Vandenhoeck and Ruprecht.

Siedentopf 1968
Siedentopf, H. B. 1968. *Das hellenistische Reiterdenkmal*. Wiesbaden: Stiftland.

Torelli 2003
Torelli, M. 2003. "The Frescoes of the Great Hall of the Villa at Boscoreale: Iconography and Politics." In *Myth, History and Culture in Republican Rome: Studies in Honour of T. P. Wiseman*, ed. D. Braund and C. Gill, 217–56. Exeter: University of Exeter Press.

Tsimbidou-Avloniti 2005
Tsimbidou-Avloniti, M. 2005. *Μακεδονικοί τάφοι στον Φοίνικα και στον Άγιο Αθανάσιο Θεσσαλονίκης*. Athens.

Tzalas 2007
Tzalas, H. E. 2007. "Bronze Statues from the Depths of the Sea." In *Great Moments in Greek Archaeology*, ed. P. Valavanis, 342–63. Los Angeles: J. Paul Getty Museum.

Wiesehöfer 2012
Wiesehöfer, J. 2012. "Das Diadem bei den Achaimeniden: Die schriftliche Überlieferung." In Lichtenberger et al. 2012, 55–62.

Wycherley 1957
Wycherley, R. E. 1957. *Literary and Epigraphical Testimonia*. Athenian Agora 3. Princeton: American School of Classical Studies at Athens.

5.

The Bronze Head of Arsinoë III in Mantua and the Typology of Ptolemaic Divinization on the Archelaos Relief

Patricia A. Butz, Savannah College of Art and Design, Georgia

The paper proposes the bronze head of Queen Arsinoë III from the collection of the Museo Civico di Palazzo Te in Mantua, Italy, as a portrait type relating directly to the representation of the queen on the bottom register of the British Museum's Archelaos Relief. There, the figure is identified by inscription as Oikoumene. The structural elements that so distinguish the bronze head in its profile views are very similar to those of this marble relief, in which the queen, together with Ptolemy IV, is presented as a deified and deifying force in the act of crowning Homer. Arsinoë's label "Oikoumene" helps define the meaning common to the relief and the head and suggests a new dimension of immortality, including the choice of bronze. In contrast is Arsinoë's representation on the contemporary trilingual Raphia Stele, where she is divinized in the Egyptian manner. The role of Hellenistic Alexandria, arguably the place of origin for both the bronze head and the marble relief, is seen as essential for the gestation and diffusion of such a sophisticated typology.

✦ ✦ ✦

Ὑπὲρ Πτολεμαίου ἐμοῦ τοῦ Ἐπιφανεστάτου

The bronze head of Arsinoë III is one of the most important pieces in the Giuseppe Acerbi Collection of the Museo Civico di Palazzo Te in Mantua, a collection assembled when Acerbi was the Austrian consul general in Alexandria between 1826 and 1834 and later given to his hometown of Mantua (fig. 5.1). Even compared with the exceptional quality of the overall collection, which is particularly strong in Late Period, Ptolemaic, and Roman material, this representation of Arsinoë III is singular. It is the only major bronze Acerbi acquired, and it is a rare embodiment in that material of Hellenistic royal portraiture in the Greek tradition. The head (fig. 5.2) connects strongly with other significant portraits displayed in the same room at the Palazzo Te. One is possibly a portrait of Psammetichus I, who took the throne of Egypt in the seventh century BC with the help of Greek mercenaries and who, by formally authorizing the Greek settlement at Naukratis (southeast of Alexandria), opened the intercultural contact that would culminate in the Ptolemaic period.[1] One of the portraits of a Ptolemaic king is also nearby, rendered in the Egyptian style and identified as perhaps Ptolemy II Philadelphus,[2] who would have been the queen's grandfather.

Figure 5.1. Northwest corner of the Courtyard of Honor, Palazzo Te, Mantua (1524–1534), looking up at the gallery windows of the Acerbi Collection. Architect Giulio Romano
Image: By author

Figure 5.2. Frontal view of the bronze head of Arsinoë III, 30 x 20 x 30 cm (11 ¾ x 7 ⅝ x 11 ¾ in.). Mantua Museo Civico di Palazzo Te, Acerbi Collection, inv. no. 96190279
Image: © Museo Civico di Palazzo Te, Mantua

While the head of Arsinoë III was published in the catalogue for the 2015–16 exhibition *Power and Pathos: Bronze Sculpture of the Hellenistic World*, it was exhibited only at the Palazzo Strozzi in Florence and did not travel to either of the American venues. The catalogue entry, entitled "Portrait of Arsinoë III" and written by Elena Ghisellini, is illustrated with the same frontal image shown here as figure 5.2.[3] It is important to note the title of the entry and the firmness of Ghisellini's identification of this queen's portrait, especially since other publications have sometimes opted for more generic names. For example, it is called simply "Testa femminile" in the Palazzo Te's own publication *La Raccolta Egizia di Giuseppe Acerbi*;[4] in Paul Stanwick's *Portrait of the Ptolemies* it is called "Bronze head attributed to Arsinoë III."[5] Ghisellini has also written the most recent and complete monograph on the subject, *La regina Arsinoe: Un ritratto bronzeo tolemaico da Mantova a Roma* (2008) in conjunction with the exhibition *La Forza del Bello: L'arte greca conquista l'Italia* held between Mantua and the Musei Capitolini in Rome. As she summarizes in the *Power and Pathos* entry, citing Kyrieleis (1975) on the coinage, "The identification is confirmed by comparisons with the image of the queen on a series of gold octodrachms … minted during the early years of the reign of her son Ptolemy V (204–180)."[6] My position, which fully accords with Ghisellini's—that the bronze head from Mantua belongs to Arsinoë III—is substantiated, as will be shown, by the Archelaos Relief at the British Museum in London.

What struck me initially upon seeing the bronze head, first from photographs and then in person, was the remarkably subtle combination of realism and idealism in the rendering of the features, an impression that is heightened when one compares the two profile views (figs. 5.3a–b). They are appreciably different, a point to which I will return. Many scholars have considered two marble heads of a Ptolemaic king and queen in Boston as standards for studying the portrait sculpture of the fourth Ptolemaic royal couple, Ptolemy IV and Arsinoë III.[7] But the Boston case is not definitive, as is the case with the numismatic evidence such as the series of gold octodrachms already cited. A unique realism has been noted in these coin portraits of Arsinoë III by R. R. R. Smith:

> The queen's coin portrait is unusual. It is close to Arsinoe II and Berenike II in its crisply articulated court style and greatly enlarged eyes, but here the queen has a sharp mortal individuality. Her prominent nose breaks the classical profile and she looks a little older than the ideal of young womanhood; and the whole seems to be of a woman who could age. The queen has no divine, only royal attributes: stephane, diadem and sceptre; and an air of reality is given by the prominent earrings and necklace. Her predecessors created new female royal ideals; she uses the same formal means but introduces a strong portrait element to express her more stern, rather Victorian-looking, royal style.[8]

Figure 5.3a-b. Profile views of the bronze head of Arsinoë III
Image: © Museo Civico di Palazzo Te, Mantua

It was her son Ptolemy V Epiphanes, of course, who introduced the series, not the queen herself. In speaking about the Mantua head, which he identifies as "most likely" the queen, Smith surprisingly describes it as "stiff and lifeless and the hair merely engraved on top of the head rather than modeled" and "not the best Hellenistic bronze-work."[9] A view of the top of the head shows the incised patterning to which he refers (fig. 5.4). Ghisellini, while recognizing the restrained realism, asserts that the whole adds up a little differently:

> Classical principles dominate the structure of the head. The almost frontal view, the even contours, the harmonious proportions and the essentially symmetrical rendering of the features, and the simple elegant hairstyle are all classically inspired. However, this legacy does not diminish the portrait's realism, but rather enhances it with a stately note. Indeed we can immediately perceive the divine nature of the queen who enjoyed immense popularity among all her subjects….[10]

Figure 5.4. Top view of the bronze head of Arsinoë III
Image: © Museo Civico di Palazzo Te, Mantua

Ghisellini, as already noted, utilized the frontal view for her principle assessment in this entry, but in the above quotation refers to it as the "almost frontal view." By that she surely means the fine difference between the left and right sides of the face if divided on axis. As can be seen by close examination of figure 5.2, the head is shifted very slightly to its left. There is the slightest uplift visible in this left side of the face, from the mouth to the nose, the eye and eyebrow, through to the hairline. This matches the infinitesimal turn of the head also to the left. It must be remembered that if the statue had survived intact, parallax would have made this analysis impossible from the ground. It is a great luxury indeed to understand the finesse with which the axis is handled, which exact measurement would corroborate.[11] Comparing the profiles, however, is even more revealing of the dichotomy. The right profile (see fig. 5.3a) embodies the realistic characteristics noted by both scholars: a certain heaviness in the treatment of the features and the ability to age, as Smith puts it very well. The rounded face gains little definition from the underlying bone structure, especially in the transition to the neck. The nose, a key element to Arsinoë's portraiture recognized by both Smith and Ghisellini, maintains the slightly convex swelling along the bridge seen on the coins, as well as the sharp angularity at the tip. The line of the mouth is downward, but not in the extreme.

The left profile (see fig. 5.3b), on the other hand, has a different vitality. There is an uplift, which one also observes from the front, and a focused energy that even the loss of the inlaid eye cannot impair. The mouth actually curves upward at the corner and the overall effect is one of tempered lightness. The hairstyle, considered her own as confirmed on the coinage, balances the face very well from any angle, but on this side the thrust of the twisted braids forming the bun at the back is stronger and extends forcibly, a perfect counterweight to the face. We appreciate how the braiding, far more plastic in its rendering of the strands of hair, forms a natural diadem for the queen making a stephane unnecessary (see fig. 5.4). Yet the deep groove between the side braids and the carefully combed crown is capable of receiving one, as noted by Smith. It is the more enlivened left profile, then, that has the sense of rejuvenation and hence divinity about it.

There is one Hellenistic relief that I claim relates directly to the Mantua head because it sheds further light on these mixed elements of realism and divinity in Arsinoë's portraiture: the Archelaos Relief, signed by Archelaos of Priene (fig. 5.5). Found at Bovillae, some 19 kilometers (12 mi.) outside of Rome, and now in the British Museum, the relief presents the immortalization of Homer in a series of four registers.[12] The event itself is depicted on the bottom register; then it is celebrated by Apollo and the Muses and Mnemosyne on the second and third registers, and finally by Zeus at the apex. These deities indicate the divine inspiration enjoyed by Homer from the inception of his works and facilitate his triumphant "homecoming." J. J. Pollitt states that the facial similarity between Homer and Zeus not only brings the two together but also is responsible for the modern title "Apotheosis of Homer" sometimes given to the relief.[13] There is in addition a standing figure on the far right of the second register, positioned in contrapposto upon a statue base and holding a scroll with a lightly incised tripod behind him. While this could very likely be a victorious poet honored by the stele or the dedicant proper,[14] it could conceivably be Homer himself as a younger genius, especially if the relief were implying an actual apotheosis, that is, the raising of the individual to the higher status.[15] But of greatest interest to us here is the pair of figures farthest to the left on the bottom register, stepping toward the seated Homer, framing the scene on that side, and acting as sole agents in his crowning (fig. 5.6a). Recognizable from coin portraits, the couple are unquestionably Ptolemy IV and Arsinoë III—Richard Neer calls the portraits "thinly disguised"[16]—although other rulers have been proposed in the past.[17] No matter what date is given to the relief or its actual place of manufacture, in the end it comes back to this couple and hence the traditions of the Alexandrine literati.[18] Ptolemy IV, known throughout his reign for his religious piety, erected a Homereion as part of his temple-building campaign in Alexandria honoring many of the Egyptian gods.[19] An important anonymous papyrus preserves an epigram in which Ptolemy IV is called "blessed" for this act.[20] Aelian (*Varia historia* 13.22) also attests to the foundation of the Homereion. While the location of the shrine is not known, it is worth citing the passage:

Figure 5.5. The Archelaos Relief ("Apotheosis of Homer"), approx. 121 x 76 cm (47 ¾ x 30 in.). London, British Museum, inv. 1819,0812.1

Image: Courtesy of John Pollini

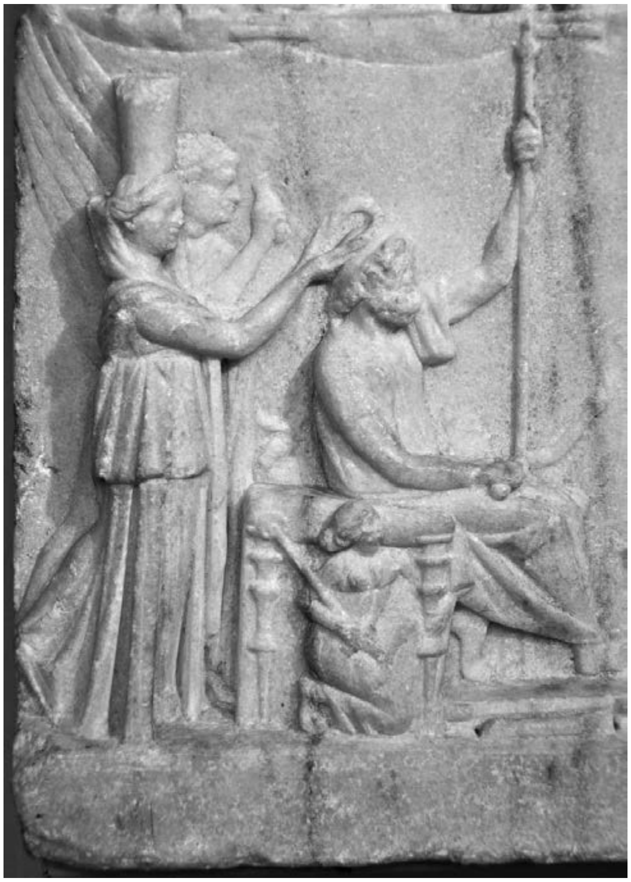


Figure 5.6a. Portraits of Ptolemy IV, Arsinoë III, and Homer from the Archelaos Relief viewed from side angle
Image: Courtesy of John Pollini

> Πτολεμαῖος ὁ Φιλοπάτωρ κατασκευάσας Ὁμήρῳ νέων, αὐτὸν μὲν καλὸν καλῶς ἐκάθισε, κύκλῳ δὲ τὰς πόλεις περιέστησε τοῦ ἀγάλματος, ὅσαι ἀντιποιοῦνται τοῦ Ὁμήρου. Γαλάτων δέ ὁ ζωγράφος ἔγαψε τὸν μὲν Ὅμηρον αὐτὸν ἐμοῦντα, τοὺς δὲ ἄλλους ποιητὰς τὰ ἐμημεσμένα ἀρυτομένους.[21]

This description brings to mind the circle of poets, part of the dromos installation at the Sarapieion of Saqqara, the statuary of which may well be dated to the reign of Ptolemy IV.[22] Homer was among the subjects of that elite circle of statues, if not the focal point. This has led me to a tentative theory that what is depicted on the Archelaos Relief may also be related to the larger installation, firmly connecting Alexandria to Memphis.[23] The Archelaos Relief depicts at least two distinct environments. The first is the theatrical ambience of the bottom register with its backdrop of columns joined by a draped curtain attached just below the abacus of each column. The result is a shallow, contained space dominated by Homer and the royal couple to the left. In front of Homer, just off-center, is a circular altar, with a magnificent, Apis-like horned bull looming over it. Two small figures, kneeling and flanking Homer's throne, are personifications of the bard's epic creations, as the inscriptions below tell the viewer. Facing Homer on the other side of the altar are the genres of literature and intellect that acknowledge his inspiration and will ultimately carry it forward. The *rhythmos* of the scene is interesting. There is a processional quality to the repetitious, fixed contrapposto position of many of the figures on the right, with everyone gesturing toward Homer. The votive effect has been noted by several scholars.[24] The second environment of the relief is the mountain-like ascent of the upper registers combining some architectonic elements, such as the cave-like archway or grotto sheltering Apollo and the curving, graded stairway connecting the third register to the top. Neer has associated these details with a shrine to the Muses overlooking the Great Library at Alexandria,[25] but it is very possible that we could be looking at some part or parts of the Homereion itself. The figure on the statue base is positioned directly below the staircase between the third and fourth registers. Mnemosyne, the mother of the Muses, stands in contrapposto on an outcropping of rock to the left of the stairway, looking upward toward a reclining Zeus. Her imposing figure breaks down the division between the third and fourth registers. Their offspring, the Muses, are the major occupants of the registers below. Zahra Newby traces what would have been the orchestration of the eye contact between these figures, many now missing their actual heads.[26] Space and the transmission of knowledge are definitely handled differently in the upper three registers.

Figure 5.6b. Detail from the bottom register of the Archelaos Relief of the royal couple, Ptolemy IV and Arsinoë III, crowning Homer
Image: P. Butz

While undoubtedly advancing side by side toward Homer in three-dimensional space, the conventions of the two-dimensional relief put Ptolemy IV's head just ahead of his wife's on the left end of the bottom register. The hands of Arsinoë III holding the stephane over Homer's head, however, extend beyond the hands of her husband, each holding a scroll. But the subtleties go beyond this. The three heads—those of Ptolemy, Homer, and Arsinoë—are cut at significantly different levels. They range from the very precise, coin-like quality of Ptolemy IV's profile in low relief, to the higher treatment of the seated Homer's almost three-quarter turn, to the fully achieved three-quarter high relief of Arsinoë III (fig. 5.6b). It is even possible to sense the existence of the far side of her face, recalling the profile views of Arsinoë III in Mantua and that peculiar blending of the realistic and divinized aspects of the queen in a single artwork. It may be asking too much, given the wear on her image (breakage of the nose to start with), to talk about the far side of Arsinoë's portrait on the Archelaos Relief; but my assessment of her right profile is that it is idealized. There is, once again, that rejuvenated quality in the face; she looks young, especially alongside her husband. Her mouth is visibly upturned. This is not the "Victorian" realism of the octodrachm coin portrait. One can speak even more definitively of her hairstyle: it is exactly that of the Mantua head but with an important difference. The twisted bun at the back is draped, the long material visibly extending over her right shoulder, signifying the religious import of her action. But unlike the full *capite velato* regularly seen in the coinage of her predecessors Arsinoë II and Berenike II, the coin portrait of this queen, as we have learned, is more worldly. If she were to have worn the full *capite velato* on the Archelaos Relief, what a shift it would have made in the whole iconographical message. Instead, Arsinoë III takes absolute command of the deification of Homer via her choice of headgear, namely the *polos* crown reserved for goddesses, among them Aphrodite or Tyche, dominating the partial *capite velato*. Ptolemy may have been given wings (rendered in the lightest relief), but she is the deified and deifying force propelling the action of the relief.

The set of inscriptions situated along the narrow frame below the relief zone clinches the meaning of the bottom register where the couple is so strategically located (fig. 5.7). These inscriptions are labels or tags. Their force is didactic but in the fullest sense of the word because they teach on multiple levels. They congregate in two groupings, one to the left and the other to the right, positioned beneath the subject matter to which they relate. They have enabled Andrew Stewart to call this one of the most important visual allegories in all of Hellenistic art.[27] Significantly, a *vacat* (empty space) is left directly under the cylindrical altar, heightening its heraldic position, but there is a graphic mark in the middle of its squared base. The labels are selective in their disclosure as they identify only Homer and his works, the *Iliad* and the *Odyssey*, by true name; the rest of them are personifications from the major genres of literature, together with four of the Virtues (on the far right paying homage). Most importantly, Ptolemy IV and Arsinoë III could, like Homer, have been labeled by name, but they are not. The very first inscription on the left is OIKOUMENE, and it belongs to Arsinoë III. It is closely followed by KHRONOS, the identifier for Ptolemy IV; together they designate the embodied power that deifies Homer. "Oikoumene" is extremely rich in its possible interpretations here. Literally, the word translates as the "inhabited region"[28] but at various periods of usage it could mean the Greek world as opposed to the barbarian, the generally inhabited versus the uninhabited, and finally the whole world or (in the plural) earthly worlds. The message must be that Homer would be comprehensible to such worlds, further implying the pervasiveness of the Greek language, epitomized by the very use of Greek inscription on the relief. The remarkable thing about associating Oikoumene with Arsinoë III is the fact she is herself crowned with the *polos*. Before its definition as the headdress of a goddess, *polos* means a pivot, an axis on which things turn, including that of the celestial sphere.[29] The turning of such a sphere implies dissemination through space, and the fact that Arsinoë crowns Homer with a circular stephane held by her outstretched hands is surely in keeping with the imagery being invoked by her label.

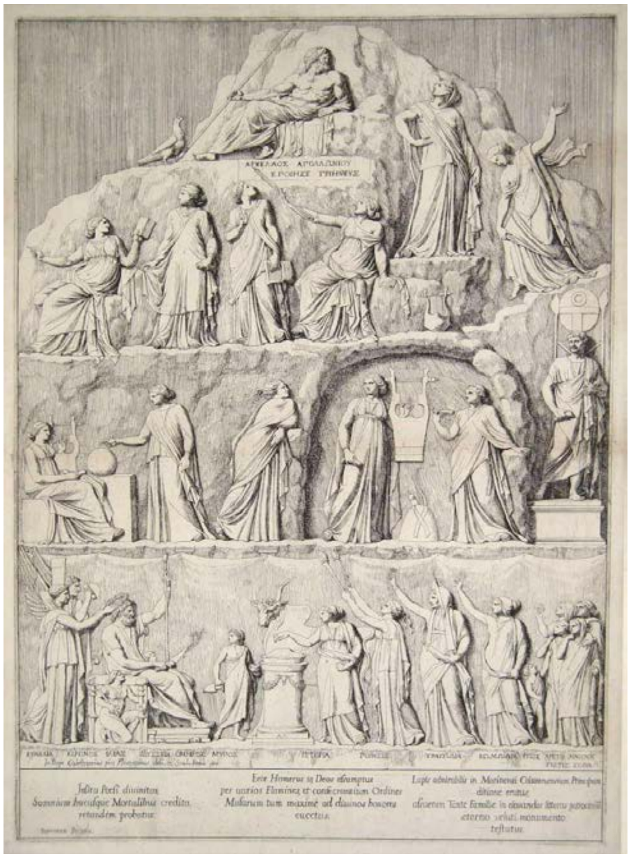


Figure 5.7. An etching of the Archelaos Relief by Giovanni Battista Galestruzzi (1658) at the British Museum records the disposition of inscriptions with, however, several inaccuracies along the framework of the bottom register. The inscriptions are difficult to see in most photographs of the stone. For the epigraphy, see Newton et al. 1874, no. 1098. 449 x 325 mm (17 ¾ x 12 ⅞ in.), British Museum. inv. 1874,0808.782
Image: © Trustees of the British Museum, CC BY-NC-SA 4.0

Khronos (time) is necessarily more two-dimensional in depiction compared to Oikoumene, but the profile of Ptolemy IV loses nothing and compares beautifully with the coins.[30] Time in the sense of this relief is not Egyptian time, whether *neheh* or *djet*, so eloquently explicated by Jan Assmann.[31] The linearity of time is the product of the Greeks, Assmann asserts, and was ultimately embraced by the West. It is well that Ptolemy IV embodies it. Furthermore, as previously stated, he is carrying two scrolls, one in each hand. The right proper hand is raised, the left is lowered, actually mimicking the respective gestures of the *Odyssey* and the *Iliad* figures alongside Homer. Ptolemy's scrolls are surely alluding to the epics themselves, preserved on papyrus as they would be found in the Great Library, and consequently a concrete metatext. The single scroll held by Homer with his right hand—his left holds a staff—reinforces the power of the written word despite the genesis of the epics through the oral tradition. There is thus a practicality that comes with Assmann's linearity: documentation provided by the relief itself, which is expected to last through time, just as the Homeric epics themselves did. Homer's footstool appears to bear a relief of two mice facing off; it has been judged by some to be symbolic of the *Batrachomyomachia* attributed to the poet in antiquity, but Stewart describes the combative mice as "reminders of what would happen to his books in a lesser institution."[32] Most importantly, I would argue, the mice are embellishments deliberately placed under the feet of Homer. While there could be multiple meanings, there is a sure sense that he is subjugating any threat to his greatest works, parody or otherwise, entirely in the tradition of any Pharaonic footstool richly ornamented with the foes of Egypt in tow (it is important that the enemies of Egypt are always bound together in this iconography).[33]

The build of this relief as it climbs from footstool through to the uppermost register implies something enormous in vision, but it is still a very active, not crystallized, immortality; things work in all directions, horizontally and vertically, including not only the association of Homer with Zeus but also the location of the artist's signature. It is essential to consider why the artist's signature, the only other inscription besides those connected to the bottom register, is boldly placed in a wide, strip-like *tabella ansata* just below Zeus (fig. 5.8). Furthermore, Euterpe, identifiable by her double flute, is seated underneath the signature and points to the name of the artist with her instrument. Archelaos signs on the central vertical axis of the relief; only Zeus is higher. Newby does not examine the palaeography of the signature, the disposition of the name, or the gesture of the Muse beyond the generalized observation that "The one to the left looks upwards and points towards Zeus and Archelaos' signature with a double flute," and this is surely a major omission.[34] The signature is very well cut with extended serifs, its letterforms enlarged and regular in size as compared to the variable letter height of the bottom register. Brunilde Ridgway makes the interesting comment that the tabula-like treatment of this signature links it more likely to an Italian manufacture. I would add that the ordering of the patronymic and demotic separated by the verb could be significant in that respect as well. This palaeography requires more study than it has thus far received.[35] The signature of Archelaos of Priene, like the royal couple and the standing figure on the second-register statue base, is on the conduit between Homer and Zeus. It all starts in the bottom left-hand corner with Arsinoë III labeled "Oikoumene."

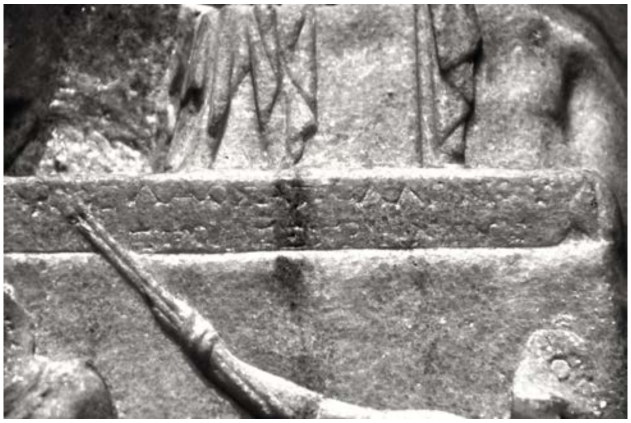


Figure 5.8. Detail of the signature of Archelaos of Priene from the third register of the Archelaos Relief
Image: Courtesy of John Pollini

In contrast to the Archelaos Relief but also prompting analysis of the real and divine nature of Arsinoë III, mention must be made of one of the most critical representations of this queen from the standpoint of Egyptian history, namely her image on the Raphia Decree. One of three surviving fragmentary copies of the decree, which was enacted in 217 BC to commemorate the victory of Ptolemy IV over the Seleucids that year, is displayed in the Ptolemaic galleries of the Egyptian Museum, Cairo.[36] This Egyptian-style stele carries the official decree in dark granite; it is trilingual like the Rosetta Stone, with an incised composition in the lunette portion where, because of the break lines, only images of the king and queen are preserved. In a simple line relief, Ptolemy IV, in Egyptian military dress and wearing the double crown, rides on horseback against the enemy, presumed to be Antiochus III if the other portion of the relief had survived.[37] Goddess-like, Arsinoë III stands immediately behind him, substantiating the ancient description of the battle and her physical presence there.[38] In the Raphia representation, as opposed to the Archelaos Relief, the couple's roles have reversed. Here Ptolemy IV is the active member, charging his horse toward the Seleucids, with Arsinoë standing firm. On the more fully preserved lunette of the copy known as the Pithom Stele II,[39] Ptolemy IV is likewise shown on horseback, now in Macedonian military dress; he dominates over the kneeling enemy with the Egyptian gods in attendance while Arsinoë retains the full Egyptian style.[40] Günther Hölbl remarks on the innovation the Raphia Decree brings to official Egyptian art by showing the pharaoh on horseback.[41] But there can be no doubt that this image of the king, authorized by the priests in the decree itself,[42] resonates with the Greek tradition and the power of Alexander on his famed horse Bucephalos. Arsinoë, however, is Egyptianized in stance and costume. Her double-plumed solar crown is a type worn by queens as well as goddesses, one of the most renowned examples being the depiction of Ankhesnamun attending the seated Tutankhamun on the back of the golden throne from his tomb. The horns of Hathor enclosing the double plumes of Ankhesnamun's crown are not apparent on either of the copies of the Raphia Decree, but Arsinoë's divine identity is assured. The text of the Raphia Decree not only honors the divinized Theoi Philopatores but also commissions statues of the queen in standing position beside her husband for all major temples.[43] Thus, via the lunette's most economical of images, the whole of the famous battle—which Arsinoë is also credited with saving—is reduced down to the principal figures. They are depicted acting as pure divinities on the battlefield and in modified heraldic composition, securing simultaneously their fame and the continuity of their dynasty within Pharaonic Egypt.

The head of Arsinoë III in Mantua, however, is the key to understanding her subtle, two-sided portraiture and exploring the phenomenon of the Greek interaction with Egypt under the Ptolemies. The specific dynamic between this representation and that of the queen on the Archelaos Relief calls for a reinterpretation of her portrait type. The survival of these works is fortuitous: the bronze for its material in the heroic sense and the marble relief for the divine personification of the queen as Oikoumene. Both masterfully mix realism and divinity. The head in Mantua may be argued to show the queen at her most beautiful: the perfect balance between realistic and idealized parts, whether analyzed from the front, sides, or any other viewpoint. The relief, on the other hand, shows her leading the action not only on the bottom register but in the narrative as a whole: the overwhelming feminine presence, the sheer number of Muses and female personifications needs to be taken into account. It is she who bestows the crown and hence births the deification of the epic embodiment of Greek cultural memory. The role of Hellenistic Alexandria, her home base, is acknowledged very soundly as the place of genesis, if not origin, for the ideology embodied in both the bronze head and the marble relief. It is the necessary catalyst for motivating two such sophisticated responses within the type.[44]

✦ ✦ ✦

Acknowledgments

I foremost acknowledge Chiara Pisani, conservator of the Museo Civico di Palazzo Te in Mantua, for her generous permission to study the head of Arsinoë III in September 2015 and for our ensuing dialogue. My sincere appreciation also goes to Daniela Saccenti, librarian at the Palazzo Te, for discussing the Acerbi

Collection in detail and inspiring me to come back and work more on this material. Special thanks are owed to the organizers of the XIXth International Congress on Ancient Bronzes at the J. Paul Getty Museum, who coordinated the rich program and schedule of events with the *Power and Pathos* exhibition; and especially Jens Daehner, Kenneth Lapatin, and Ambra Spinelli for their work in ensuring the excellence of the proceedings.

Notes

1. Donatelli 1995, 43, cat. no. 10. See also Butz 2010, 98–103, for the site of Naukratis as a place of important epigraphic exchange between the Egyptian and Greek traditions.
2. Donatelli 1995, 46, cat. no. 13.
3. Ghisellini 2015, 201, cat. no. 8.
4. Donatelli 1995, 162, cat. no. 390.
5. Stanwick 2002, 80–81, figs. 252–53.
6. Ghisellini 2015, cat. no. 8, 200; Kyrieleis 1975, 102–104, pl. 88.
7. Smith 1988, nos. 48 and 49, pls. 35, 1–3 and 4–6. Smith says the pair "can certainly be identified as Ptolemy IV Philopater and his queen Arsinoe III by their single, highly consistent coin-portrait types" (91). See also Stanwick 2002, nos. 248–49 for the Boston Ptolemy IV and nos. 250–51 for the Boston Arsinoë III. Stanwick states that the arguments favoring the identifications "are not fully convincing" because of the recutting of the Philopater head and the hairstyle of the Arsinoë head (55).
8. Smith 1988, 91–92, and pl. 75.8, which shows the coin dated to ca. 200 BC.
9. Smith 1988, 92.
10. Ghisellini 2015, 200.
11. The proportional analysis of the head in Mantua would be one of my goals for a future study.
12. Zeus's register, while pedimental in shape and imitating the peak of a mountain, is still its own entity. It is accessed by the transitional space on the right, connecting to the next register below. Newby (2007, 158) counts only three main registers. She also discusses the "false closure" on the far right side of the second register where the statue on its base is located, and the "mezzanine platform" just below Zeus occupied by Mnemosyne (162). The British Museum description for fig. 5.7 refers to "four tiers."
13. Pollitt 1986, 304, n. 24.
14. Stewart 1990, 1: 217; Pollitt 1986, 16; Newby (2007, 172–74) also includes Herodes of Priene and mentions Homer and Hesiod as considerations by some scholars.
15. The column krater attributed to the Group of Boston 00.348 in the Metropolitan Museum of Art (inv. 50.11.4) shows just such a scene: the deified (or soon-to-be deified) Herakles looking on at the painting of his statue, also witnessed by Nike and by his father, Zeus, who is in the same iconic lounging position as that found on the Archelaos Relief.
16. Neer 2012, 380.
17. Stewart (1990, 1: 217) accepts the identification of the Ptolemaic couple: "… recognizable as Ptolemy and Arsinoe from both the context and the king's rather bloated features." Ridgway (2000, 207) gives the "range of proposed attributions": Ptolemies, Seleucids, and Attalids. She concludes, "This very range of suggestions should suffice to prove our inability to make a positive identification of two diminutive heads that, in my opinion, correspond to common types rather than to specific individuals." See also Richter 1965, 1: 54 and fig. 120; and 3: fig. 1831, who advocates Ptolemy IV and Arsinoë III and shows in fig. 3: 1831 a close-up of the heads on the relief, almost coin-like in precision.
18. Pollitt (1986, 16) indicates the role that letterforms have played in the dating: "The date of the Archelaos relief has been sought for by most scholars in the form of the letters in its inscriptions. For many years it was generally held that the lettering confirmed a date of ca. 125 B.C. Recent studies suggest, however, that a somewhat earlier date is not only possible but perhaps even probable." Stewart (1990, 1: 217) brings in the sculptural types as well: "Dates range from Ptolemy's own lifetime to the later second century, depending on where one dates the Muses it reproduces and the letter forms of the inscriptions." Ridgway (2001, 265–66) favors a first century BC date and offers sound evidence for the Late Republican interest in Homer in the area in which the Archelaos Relief was found. She reiterates this in Ridgway 2000, 207–8 and Ridgway 2002, 96, n. 8.

    See also the author's forthcoming article, "The Ptolemaic Dedication of Archepolis in the Bibliotheca Alexandrina: materiality and text," in *Proceedings of the XI International Congress of Egyptologists, Florence Egyptian Museum, Florence, 23-30 August 2015,* ed. G. Rosati and M. C. Guidotti, 69-74, to be published by Archaeopress Publishing Ltd., Oxford, in 2017. The inscription of Archepolis, son of Kosmos, deme Leonnateus (one of the oldest and most venerable demes in Alexandria) reflects the same Alexandrine sophistication discussed here but on a non-royal and more modest level.
19. McKenzie 2007, 64; Fraser [1972] 2001, 1: 611. Fraser discusses the association of the poems in P.Cair. 65445 dealing with the Homereion and the Fountain of Arsinoë with Ptolemy IV Philopator and Arsinoë III. While McKenzie references the Homereion, she does not bring in the Archelaos Relief or its architectural implications.
20. Fraser ([1972] 2001, 2: 862) gives the text for the epigram (P.Cair. 65445) including the vocative address, εὐαἰων Πτολεμαῖε. In a disappointing assessment, Fraser seemingly disassociates the Archelaos Relief not only from Ptolemy IV and Arsinoë but from Alexandria itself. The reasons given are not clear. Mention is made of a "later date."
21. See http://data.perseus.org/citations/urn:cts:greekLit:tlg0545.tlg002.perseus-grc1:13.22.
22. Thompson 2012, 108–9; Bagnall and Rathbone 2004, 100–101, especially fig. 3.4.6.
23. I intend this to be the subject of a longer publication, together with a full palaeographic treatment (see n. 35 below).
24. Stewart 1990, 1: 216; Newby 2007, 158.
25. Neer 2012, 380. Stewart (1990, 1: 217), describing the upper registers of the relief, writes, "And soaring above this firm foundation [the first register] are the dizzy heights of the Mouseion, where the poet may keep company with the Muses and Apollo, progeny of Zeus himself." McKenzie (2007, 51) gives details of the Museum and Library complex based on Herodotus, but states that the location and exact plans are not known (74, 76).
26. Newby 2007, 162.

27. Stewart 1990, 1: 217. Newby (2007, 158, 165) takes exception with the word "didactic" and to some degree with the allegorical identification, arguing that allegory lies not in the personifications of Homer's worshippers per se but in the literal differentiation between the bottom section of the object (where the inscriptions are) and the votive relief above. Ridgway (2000, 207) considers the didactic nature of the relief its raison d'être, as opposed to connections with a votive offering, arguing for its pragmatic, educational use in Italy. My response is that the bona fide allegory begins with Oikoumene and Khronos on the far left because they really are Arsinoë and Ptolemy. Homer is ultimately going to be dwelling in more than one "inhabited world" and "time zone," and that is worth teaching.
28. *LSJ*[9], s.v. "οἰκουμένη, ἡ."
29. *LSJ*[9], s.v. "πόλος, ὁ."
30. See the detail of the relief already cited in Richter (see n. 17 above), which matches Ptolemy IV's profile.
31. Assmann 2003, 18–19.
32. Stewart 1990, 1: 218.
33. While Ridgway (2002, 3: 117–118) does not discuss the footstool, she sees Egyptianizing influence in the presence of the two small literary "offspring" of Homer, like the children or wives placed alongside the principal male figure in Egyptian reliefs "as is typical of Egyptian family groups since the Old Kingdom." She further suggests that the Italian taste for Egyptianization "may serve to confirm the first-century date and Italian destination."
34. The omission is noticeable because Newby's article on the Archelaos Relief is the second entry in Part II: Images and Their Labels, in *Art and Inscriptions in the Ancient World*, the publication she also co-edited.
35. The palaeography is valuable in this inscription, both aesthetically and for chronological considerations as already noted. Newby (2007, 172) mentions the "epigraphical grounds," leading some to a date of ca. 125 BC, but does not explain what those epigraphical grounds are. Concerning the inscriptions of the Hellenistic period in general, Ridgway, referencing Pinkwart (1965), states a commonly held belief that "Epigraphy is of little help, since no clear development can be discerned over wide geographical areas. Relative chronology can be attempted only within each site, if a fairly substantial corpus of inscriptions is preserved for internal comparison."
36. Egyptian Museum, Cairo, Cat. Gén. 31088. Hölbl 2001, 131–32, and fig. 6.1.
37. Hölbl 2001, 163, caption to fig. 6.1.
38. Hölbl 2001, 131, citing Polybius 5.83.3, 5.84.1, 5.87.6; and 5.85.8 for the Egyptian model of a pharaoh doing battle against an Asian enemy for the last time.
39. Budge [1929] 1989, 296. Budge identifies the material of the Pithom Stele as sandstone and gives the number 47806 in the Egyptian Museum, Cairo. See Ashton 2001, 15, fig. 4.
40. Hölbl 2001, 163–64; Ashton 2001, 16.
41. Hölbl 2001, 164. Compare, however, Ashton (2001, 16), who describes the Pithom Stele lunette as follows: "At the top of the text is a traditional scene showing Ptolemy IV on horseback, accompanied by his wife Arsinoe, standing before the Egyptian gods."
42. Demotic section of the Pithom Stele, ll. 35–36, cited by Hölbl (2001, 174, n. 27) as the Raphia Decree.
43. Demotic section of the Pithom Stele, ll. 32–33, cited by Hölbl (2001, 174, n. 27) as the Raphia Decree.
44. See Butz, forthcoming. The inscription of Archepolis, son of Kosmos, deme Leonnateus (one of the oldest and most venerable demes in Alexandria) reflects the same Alexandrine sophistication discussed here but on a nonroyal and more modest level.

Bibliography

Ashton 2001
Ashton, S.-A. 2001. *Ptolemaic Royal Sculpture from Egypt: The Interaction between Greek and Egyptian Traditions*. BAR–IS 923. Oxford: Archaeopress.

Assmann 2003
Assmann, J. 2003. *The Mind of Egypt: History and Meaning in the Time of the Pharaohs*. Trans. Andrew Jenkins. Cambridge, MA, and London: Harvard University Press.

Bagnall and Rathbone 2004
Bagnall, R. S., and D. W. Rathbone, eds. 2004. *Egypt from Alexander to the Early Christians*. Los Angeles: J. Paul Getty Museum.

Budge [1929] 1989
Budge, E. A. [1929] 1989. *The Rosetta Stone*. London: The Religious Tract Society; repr. ed., New York: Dover Publications.

Butz 2010
Butz, P. A. 2010. *The Art of the Hekatompedon Inscription and the Birth of the Stoikhedon Style*. Monumenta Greca et Latina 16. Leiden and Boston: E. J. Brill.

Butz, forthcoming
Butz, P. A. Forthcoming. "The Ptolemaic Dedication of Archepolis in the Bibliotheca Alexandrina: Materiality and Text." In *The Proceedings of the International Congress of Egyptologists XI held in Florence, Italy, 2015*. Archaeopress Publishing Ltd.

Donatelli 1995
Donatelli, L. 1995. *La Raccolta Egizia di Guiseppe Acerbi*. 2nd ed. Mantova: Publi Paolini.

Fraser [1972] 2001
Fraser, P. M. [1972] 2001. *Ptolemaic Alexandria.* 3 vols. Repr. ed. Oxford: Clarendon Press.

Ghisellini 2015
Ghisellini, E. 2015. "Portrait of Arsinoë III." In *Power and Pathos: Bronze Sculpture of the Hellenistic World*, ed. J. M. Daehner and K. Lapatin, 200–201. Los Angeles: J. Paul Getty Museum.

Hölbl 2001
Hölbl, G. 2001. *A History of the Ptolemaic Empire.* Trans. T. Saavedra. London and New York: Routledge.

Kyrieleis 1975
Kyrieleis, H. 1975. *Bildnisse der Ptolemäer*. Berlin: Mann.

McKenzie 2007
McKenzie, J. 2007. *The Architecture of Alexandria and Egypt: 300 BC–AD 700*. New Haven and London: Yale University Press.

Neer 2012
Neer, R. T. 2012. *Greek Art and Archaeology: A New History c. 2500–c. 150 BCE*. New York: Thames and Hudson.

Newby 2007
Newby, Z. 2007. "Reading the Allegory of the Archelaos Relief." In *Art and Inscriptions in the Ancient World*, ed. Z. Newby and R. Leader-Newby, 156–78. Cambridge: Cambridge University Press.

Newton et al. 1874
Newton, C. T., E. L. Hicks, G. Hirschfeld, and F. H. Marshall. 1874. *The Collection of Ancient Greek Inscriptions in the British Museum*. 4 vols. London: British Museum.

Pinkwart 1965
Pinkwart, D. 1965. *Das Relief des Archelaos von Priene und die "Musen des Philiskos*." Kallmütz: Lassleben.

Pollitt 1986
Pollitt, J. J. 1986. *Art in the Hellenistic Age*. Cambridge: Cambridge University Press.

Richter 1965
Richter, G. M. 1965. *Portraits of the Greeks*. 3 vols. London: Phaidon.

Ridgway 2000
Ridgway, B. S. 2000. *Hellenistic Sculpture*. Vol. 2, *The Styles of ca. 200-100 B.C.* Madison: University of Wisconsin Press.

Ridgway 2001
Ridgway, B. S. 2001. *Hellenistic Sculpture*. Vol. 1: *The Styles of ca. 331–200 B.C.* Madison: University of Wisconsin Press.

Ridgway 2002
Ridgway, B. S. 2002. *Hellenistic Sculpture*. Vol. 3: *The Styles of ca. 100-31 B.C.* Madison: University of Wisconsin Press.

Smith 1988
Smith, R. R. R. 1988. *Hellenistic Royal Portraits*. Oxford: Clarendon Press.

Stanwick 2002
Stanwick, P. E. 2002. *Portraits of the Ptolemies: Greek Kings as Egyptian Pharaohs*. Austin: University of Texas Press.

Stewart 1990
Stewart, A. 1990. *Greek Sculpture: An Exploration*. 2 vols. New Haven and London: Yale University Press.

Thompson 2012
Thompson, D. J. 2012. *Memphis under the Ptolemies*. 2nd ed. Princeton and Oxford: Princeton University Press.

6.

The Apollo from Salerno: Hellenistic Influence in Southern Italy

Silvia Pacifico, Museo Archeologico Provinciale di Salerno, Italy

The bronze head of Apollo found in the waters of the Gulf of Salerno in 1930 still offers an opportunity to discuss the date, casting, production, place of manufacture, and function of the work of art in antiquity.

Laboratory analyses show that the bronze has percentages of copper (81%), lead (11%), and tin (5.5%) that can be associated with alloys found in the Roman Imperial period. The presence of copper seems to have been more elevated in the oldest bronzes (84–92%). Further evidence confirms that during the Roman phase, for large-scale bronze statuary, the lead content reached 20 percent and the tin, 10 percent. In terms of manufacturing, the head was made with the indirect lost-wax technique: the top of the head was joined above the fillet, as were individual curls.

The head once belonged to an over-life-size sculpture, probably wearing a cloak and intended to be seen mainly from the front for a religious purpose or as a symbolic expression of elite power. The size and softness of forms define a composition of elements expertly aggregated as often in bronze and terracotta. The rhythmic complexity, resulting from the movement and inclination of the head, seems to be subjected to a single principle: a rendering style of curves and contours inherited from the Hellenistic Baroque. The features that might suggest an Italian production (that was able to combine tradition and innovation) still have to be evaluated and analyzed more in depth. Influences from both the cosmopolitan Hellenistic world and the Vesuvian region as well as from, even more extensively, Magna Graecia, may also be present.

✦ ✦ ✦

The bronze head of Apollo found in the waters of the Gulf of Salerno in 1930 still offers an opportunity to discuss the date, casting and production, place of manufacture, and function of the work of art in antiquity.

Laboratory analysis shows that the bronze has percentages of copper (81%), lead (11%), and tin (5.5%) that can be associated with alloys found in the Roman Imperial period.[1] The presence of copper was higher in the oldest bronzes (84–92%). Further evidence confirms that during the Roman phase, for large-scale bronze statuary, the lead content could reach up to 20 percent with tin up to 10 percent.[2]

In the artistic history of the Italian peninsula, the period ranging from Hannibal's invasion to the battle of Actium is undoubtedly the hardest to analyze. After the Hannibalic wars, the Italian territory acquired greater political autonomy and the Roman Republic started to become a single cultural unit. The classic artistic themes of the Hellenistic courts were rendered through new interpretations. Hellenic culture in Italy got its foothold in Taranto, from whence it spread throughout the peninsula. Its counterpart is in Sicily, where mostly Alexandrian themes were diffused.

The literary sources confirm that, mainly starting from the second century BC, a great many works of art were transferred to Rome as war booty from the Mediterranean East. Many notable Italian and noble Roman families sought to make this culture their own, recalling the luxurious environment of the northern Grecian courts, of Egypt, and of the Hellenistic East. The Roman *nobilitas* adhered to these canons starting from the first century BC. The discoveries of Hellenistic bronze armor in the region of

Latium and the bronzes and ivories from Palestrina testify that, at least for the dominant classes in Rome, there existed a formal culture in which skilled workers were able to create sophisticated works of art.

In terms of manufacture, the bronze head under discussion was made by the indirect lost-wax technique; the top of the head was joined above the fillet; and some individual curls were also cast separately and joined. The head once belonged to a larger-than-life-size sculpture, probably wearing a cloak and intended to be seen mainly from the front for a religious purpose or as a symbolic expression of elite power. The size and softness of the forms define a composition of elements expertly aggregated, as often happens with bronze and terracotta. The rhythmic complexity, resulting from the movement and inclination of the head, seems to be subjected to a single principle: a rendering style of curves and contours inherited from the Hellenistic Baroque (fig. 6.1).

Figure 6.1. Bronze head of Apollo
Image: Courtesy of Museo Archeologico Provinciale di Salerno

The features that might suggest Italian production—combining tradition and innovation—have yet to be evaluated and analyzed in depth. Influences from both the cosmopolitan Hellenistic world and the Vesuvian region as well as from, even more broadly, Magna Graecia, may also be present.

This Hellenistic matrix in the Apolline iconography is discoverable also in the Roman coins of Campania, which were widely diffused throughout the territory. Starting from the third century BC, the stater from Sessa Aurunca, an inland Campanian town, reveals a new image of Apollo. On this coin, his mane of hair reaches the shoulders; his head is crowned with a laurel wreath; and the rings of the neck are very pronounced, as in the Apollo from Salerno.

Campania represented an environment that connected the tendencies and symbolism of the Hellenistic art with the rest of southern and Apennine Italy. More precisely, the maritime towns of Campania (Cuma, Puteoli, Neapolis, Paestum), in contrast with the inland towns, maintained a Hellenistic manufacturing tradition with a characteristic manner of portraying the deities and famous characters of Hellenism. These characteristic motifs are developed to a high degree of stylistic maturity and come to life in the figurative art of the Late Republic and the Early Imperial age, the phase to which the Apollo head likely belongs.

In the wider frame of the particular political and commercial interests along the Campanian coast, Rome had in 197 BC approved the *Lex Atinia de coloniis deducendis* for the foundation of five maritime colonies in Campania economic; the colony of Salernum was founded shortly thereafter, in 194 BC. Thanks to the creation of the Via Popilia in 132 BC, it soon became an important commercial confluence, reaching a high level of prosperity and wealth in the Augustan age.

Neapolis (modern Naples), a few kilometers away from Salernum, was an active center of figurative art from the earliest Imperial times. There were a great many bronze artisans who produced work for export as well as for the surrounding areas. According to some literary sources, there was a sculptor named Pasiteles, born in Neapolis, who worked in the first century AD. A note in Pliny's *Natural History*, taken from Varro (*Naturalis historia* 35.39–40), reports that Pasiteles was born on the "Grecian Italian coast"—that is, in Magna Graecia. The term was earlier used generically to indicate most of southern Italy, but during Varro's age it referred to the coastal towns from Cuma to Taranto. The literary tradition suggests that Pasiteles's activity was mostly carried on between Rome and Neapolis, and that he was able to sculpt in every medium. We cannot exclude the possibility that our Apollo is the product of one of the flourishing Neapolitan workshops in which artists like Pasiteles worked, or even is a work of his followers.

The cult of Apollo has very ancient manifestations, especially along the Ionic and Campanian coasts, which were rejuvenated during the time of Sulla[3] and even more strongly during the Pax Augustea. Apollo, a bright deity, was a fitting emblem for the political program of renewal and purification pursued by Octavian-Apollo. The building of the temple of Palatine Apollo in Rome and the renewal of the surrounding area were among the key points in the thoughtful and global project of cultural propaganda planned by Octavian during the years of his rise to power and its reinforcement after the victory at Actium. Apollo represented the official protector of Octavian/Augustus or, according to a well-planned line of propaganda, his divine parent.

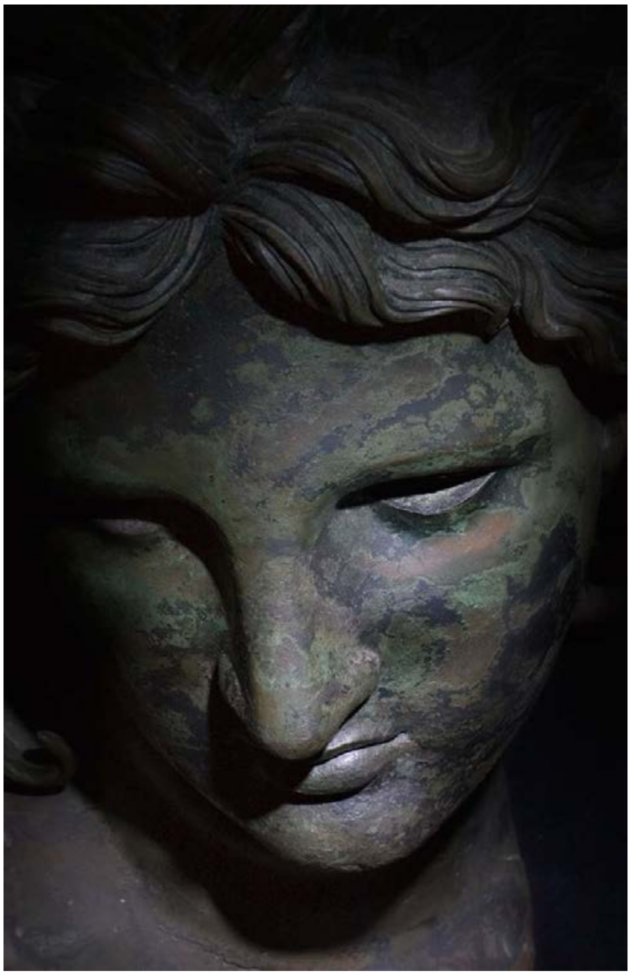


Figure 6.2. Detail of bronze head of Apollo
Image: Courtesy of Museo Archeologico Provinciale di Salerno

We can also assume that the Apolline allegory, shown through the detailed style and the formal magnificence of our Apollo, is a symbolic expression of the power of a restricted elite (fig. 6.2). Outside the confines of Rome, the forms of communication of the central power and its modalities of reception by the local elites found their expression in a complex game of interactions. The ties between Rome and Campania were strengthened and most fully expressed during the Augustan age through the creation of *regio I*.

To the Romans, Campania is the ideal place to heal the disagreement between *luxuria* and *mos maiorum* through the experience of *otium*. The collecting of and taste for art, the luxurious furniture and decorations, the practice of the thermal baths, and the theater experienced in the villas of Campania became paradigmatic of the golden age as promoted by Augustan propaganda.

Mostly probably, the bronze Apollo is proof of how the most influential Campanian families, whose lives were spent on the coast, adhered to and identified themselves with this cultural program and with the mythology of the mastery of the *princeps*.

We still have to evaluate and analyze the aspects of the head that indicate the characteristic features of this Italian production. The artisans' ability to meld tradition and innovation reflects both the cosmopolitan heritage of the Hellenic universe and a parallel elaboration of Vesuvian and, on a larger scale, Magna Grecian influences, played out at that particular moment of transition from the tumultuous Republican period to the florid Augustan peace of whom Apollo is the tutelary deity.

✦ ✦ ✦

Notes

1. Giorgetti et al. 1991.
2. See Giumlia-Mair 2015, 167–72.
3. Sulla, a devotee of Apollo, retired to Campania in his last years.

Bibliography

Andreae 2001
Andreae, B. 2001. *Skulptur des Hellenismus*. Munich: Hirmer.

L'Apollo 1961
"L'Apollo di Salerno." 1961. In *Apollo: Bollettino dei Musei Provinciali del Salernitano* 1: 3–20.

Giorgetti et al. 1991
Giorgetti, F., M. Miccio, P. Pellecchi, and R. Pecchioli. 1991. "Indagini sulle caratteristiche tecnologiche e sullo stato di conservazione." *Apollo: Bollettino dei Musei Provinciali del Salernitano* 7: 15–18.

Giumlia-Mair 2015
Giumlia-Mair, A. 2015. "Techno-Chronology? Alloy Composition and the Use of Technical Features for the Dating of Ancient Bronzes." In *Power and Pathos: Bronze Sculpture of the Hellenistic World*, ed. J. M. Daehner and K. Lapatin, 167–81. Los Angeles: J. Paul Getty Museum.

Guarino 1991
Guarino, D. P. 1991. "L'Apollo di Salerno: Dalla conservazione alla lettura del reperto." *Apollo: Bollettino dei Musei Provinciali del Salernitano* 7: 4–22.

Horn 1937
Horn, R. 1937. "Archäologische Funde in Italien, Tripolitanien, der Kyrenaika und Albanien vom Oktober 1936 bis Oktober 1937." *AA* 3/4: 348–466.

Maiuri 1942
Maiuri, A. 1942. Untitled note. *RendAccIt* 3: 10–12.

Mustilli 1937/38
Mustilli, D. 1937/38. "L'Apollo di Salerno." *BdA*, ser. 3, 31: 136–46.

Pacifico 2015
Pacifico, S. 2015. "Head of Apollo." In *Power and Pathos: Bronze Sculpture of the Hellenistic World*, ed. J. M. Daehner and K. Lapatin, 236–37. Los Angeles: J. Paul Getty Museum.

Palmentieri 2011
Palmentieri, A. 2011. "Testa di Apollo citaredo." In *Dopo lo Tsunami: Salerno Antica*, ed. A. Campanelli, 103–5. Exh. cat. Salerno, Complesso monumentale si Santa Lucia. Naples: Art'm.

Technau 1931
Technau, W. 1931. "Bericht über Archäologische Funde in Italien, Tripolitanien, der Kyrenaika und Albanien von Oktober 1930 bis Oktober 1931." *AA* 3/4: 620–710.

7.

Tiberius from Herculaneum: Methods of Assembling a Monumental Bronze Portrait

Erik Risser, J. Paul Getty Museum, Los Angeles
David Saunders, J. Paul Getty Museum, Los Angeles

Between 2012 and 2013, the J. Paul Getty Museum collaborated with the Museo Archeologico Nazionale di Napoli to return the bronze portrait of Tiberius from Herculaneum to display. The project provided an opportunity for a full investigation into the statue's eighteenth-century restorations and its ancient manufacture.

The restoration techniques proved typical of the Royal Foundry at Portici, as documented for other Herculaneum bronzes by Edilberto Formigli and Götz Lahusen. Rather less expected was the discovery that the monumental statue—erected in AD 37—had been assembled from a large number of individually cast pieces. This has valuable implications for our knowledge of Roman bronze-working, and in particular the techniques that were employed to simplify the production of a large, complex statue. The many drapery folds of the toga offered a way of subdividing the larger-than-life-size portrait into numerous smaller parts that could be cast separately. The multiplicity of cast pieces not only made their molding easier but also allowed for smaller, safer pours of molten bronze, required less lead in the alloy, and demanded fewer chaplets. Once cast, the individual pieces were then joined with simple and economical tack welds, which were able to sustain the great weight of the statue.

✦ ✦ ✦

Introduction

Building on a collaboration to conserve the bronze Apollo from Pompeii,[1] the J. Paul Getty Museum partnered with the Museo Archeologico Nazionale di Napoli between 2012 and 2013 to return the larger-than-life-size portrait of Emperor Tiberius (42 BC–AD 37) from Herculaneum for display (fig. 7.1).[2] The statue, which measured 2.4 meters (8 ft.) in height, had been off view for some twenty years, owing to weaknesses in the legs and base. The opportunity to resolve these issues, and the generous support of our colleagues in Naples, allowed us to undertake a full study of the statue's historical restorations and ancient manufacture.

Figure 7.1. Portrait of Tiberius (2013, following conservation treatment)

Image: Su concessione del Ministero dei Beni e delle Attività Culturali e del Turismo, Museo Archeologico Nazionale di Napoli

Discovery and Ancient Context

The portrait was discovered on August 30, 1741; three days later, an inscription believed to belong to it was found nearby.[3] This would date the statue to AD 36 or 37, suggesting that the council dedicated it to Tiberius in the last year of his life or even posthumously. The portrait would then have stood for forty-two years until the eruption of Vesuvius in AD 79.

Early publications indicate that the statue had been found in the Theater at Herculaneum.[4] However, in recent decades, study of archival sources indicates that excavations were *not* under way there when the Tiberius was discovered. Rather, activity was focused on the area of the Porticus (the so-called Basilica), and excavation reports from this time refer to the discovery of two bronze female figures and one male, the latter most likely Tiberius. Tina Najbjerg has fully explored the arguments in favor of the statue's location in the Porticus[5] and, proposing that this building was set up in the Claudian period, discusses its adornment with a series of imperial portraits that were added to and moved around during the three decades prior to the eruption of Vesuvius.[6] The statue of Tiberius would thus have been part of a Julio-Claudian family group that was displayed in the niches along the east and west sides of the building. Nevertheless, a chronological puzzle remains, for, as noted, the inscription dates the portrait to AD 36 or 37, a decade earlier than the building of the Porticus. Najbjerg proposes that the statue could have served initially as a cult image in the nearby Collegio degli'Augustali; when Tiberius died, it would have been moved and set up in the Porticus.[7]

Eighteenth-Century Restoration

The earliest illustration of the portrait, dating to 1771,[8] shows it fully intact (fig. 7.2). However, discoveries from the Vesuvian sites often underwent extensive intervention before they were put on display, and such work was rarely mentioned in contemporary publications. In the case of the Tiberius, we have archival evidence for its restoration. Camillo Paderni reported on June 14, 1760—almost nineteen years after the portrait had been discovered—that its reassembly had been completed, and all that remained was to provide a patina.[9] A substantial body of research has accumulated regarding the practices of the Royal Foundry at Portici, most substantially by Götz Lahusen and Edilberto Formigli.[10] Their observations regarding the restoration of the Tiberius are, however, relatively brief, since their access to the statue was limited. Nonetheless, our findings match with what has been observed for the other large Herculaneum bronzes (fig. 7.3). Thus, the Tiberius was aggressively cleaned with rasps, files, and possibly acids. The left hand, which had been separated on discovery, was reattached, and other missing sections were repaired by being cast in situ and pinned for added security. The right arm is also a restoration but does not appear to belong to the ancient statue. The portrait was then given a patina, which was achieved by the application of oxidizing solutions with heat. Finally, small fills were executed using a dark putty containing corrosion products that had been removed from the statue's surface during cleaning.

Figure 7.2. Illustration of the Tiberius in *De' Bronzi di Ercolano* (*Antichità* 1771)

Image: Los Angeles, Getty Research Institute (84-B21058)

Figure 7.3. Portrait of Tiberius, with areas of eighteenth-century restoration highlighted

Image: Su concessione del Ministero dei Beni e delle Attività Culturali e del Turismo, Museo Archeologico Nazionale di Napoli

Ancient Manufacture

The aggressive and invasive methods used by the Royal Foundry to clean and restore the Tiberius posed substantial challenges to our attempts to understand its ancient manufacture. Nonetheless, through a combination of close visual observation, technical analysis, and some sampling, we have been able to glean evidence for the ways in which the portrait was conceived and assembled. At the outset, we expected to find that the statue was composed of a number of parts. This was standard practice and has been well documented for many other large ancient bronzes. Unanticipated, however, was the quantity of individual pieces. In total, we identified sixty-two separate bronze parts (figs. 7.4a–b). In order to fully appreciate the reasons for this, we will present a step-by-step reconstruction of the statue's manufacture, highlighting its division into sections and subsections, and the substantial forethought that went into the early stages of production in order to facilitate the later phases.

Figure 7.4a. Portrait of Tiberius, front, with ancient parts indicated. Photoshop annotations by E. Risser

Image: Su concessione del Ministero dei Beni e delle Attività Culturali e del Turismo, Museo Archeologico Nazionale di Napoli

Figure 7.4b. Portrait of Tiberius, rear, with ancient parts indicated. Photoshop annotations by E. Risser

Image: Su concessione del Ministero dei Beni e delle Attività Culturali e del Turismo, Museo Archeologico Nazionale di Napoli

Creation and Assembly of the Wax Model

In order to produce the statue, the sculptors would have fashioned a wax working-model. This was likely achieved with pre-existing molds for a number of the anatomical sections, such as the hands, arms, and the portrait head, which is entirely open in the back where it is covered by the drapery. Residual burial encrustations and the eighteenth-century restorations make it difficult to ascertain how these various wax sections would have been formed. There are no seams to indicate that wax slabs had been applied to the interior of the molds, and given the bronze's regular thickness and the even modeling between its inner and outer surfaces, we surmise instead that the molds would have been brushed with molten wax. In the case of the head, liquefied wax may have been slurried within the mold, for there is a thickening of the metal at the nose and chin, where pools are likely to have formed.

As for the drapery, the consistent thickness of the metal suggests that molds were used in the production of the wax working-model. However, the complex patterns of the folds could not have been pulled directly from molds. Indeed, their deep undercuts would be impossible to obtain without substantially distorting or even destroying the solidified wax. We propose, therefore, that areas of drapery started out being relatively schematic in the wax-working stage, and that they were then refined to create the arrangement of individual folds. Some of this work might have been done in situ, but in other cases wax sections could have been excised, worked up to create high-relief folds, and then reincorporated back into the working model. Some sections could have been subdivided further into pieces, in order to produce the assemblage of naturalistic drapery fold-by-fold. To get a sense of the degree of elaboration that this process allowed, compare the flat and schematic rendering of fabric on the back (see fig. 7.4b)—evidently not substantially manipulated during the wax-working phase—with the complex pattern of folds and creases on the front. In discussing the drapery worn by the bronze portrait of Antonia Minor from Herculaneum, Lahusen and Formigli suggested that actual textile was used in its creation.[11] This is also a possibility for the Tiberius, but cannot be proven. What does seem likely, however, is that some sections of the statue's drapery were created entirely from scratch—in other words, using the *direct* lost-wax technique. Seen from below, the undercuts between the folds that hang from the left hand are not as thin or uniform in thickness as other sections of the drapery. Furthermore, the spaces between each fold, which should be empty, are partially filled. This contrasts with other areas of drapery on the statue, and the most plausible means of achieving this would have been by shaping this section directly by hand. Therefore, although the production of the Tiberius must have involved numerous molds—what would conventionally be called an *indirect* lost-wax casting—it is better to understand its creation as a composite of indirect and direct techniques, as need required.

Preparation for Casting

A further and probably intentional consequence of this approach was to allow for the simplification of the casting process and, thereafter, the reassembly of the different bronze elements. To divide the statue into sixty-two pieces entailed more than one hundred strategic incisions in the wax working-model, mostly along the deep recesses within the drapery folds. Such an operation was not undertaken haphazardly, but rather with substantial planning, and the advantages were multiple.

Having created separate pieces during the elaboration of the wax-working model, the bronze-workers could take advantage of these subdivisions when it came to cutting the model into individual parts for casting. Furthermore, by dividing the figure so extensively, the founders could work with pieces that were manageable in size and thus easy to handle. Working with smaller sections also meant that a smaller firing pit could be employed, permitting an economical use of both materials and fuel. Most importantly, the multiple subdivisions of the wax working-model not only produced smaller shapes, but simpler ones, which reduced the risk of casting flaws. This can be demonstrated with the drapery on the front of the statue. In cross section, the folds of the toga are highly complex, three-dimensional forms (fig. 7.5a). These undulations and curves would have been troublesome to cast. By subdividing such sections into numerous individual components (fig. 7.5b), the founders could work instead with a series of curved sheets or "half-open" shapes. These would have been easier to prepare for casting, for there was no need to create an interior core of refractive material or an external vestiture. Rather, the open forms could simply be enclosed in refractive material (fig. 7.5c). Though the subdivision of the figure into many pieces and their separate casting might have been more labor-intensive in the short term, it was strategic in the long term, for it increased the likelihood that the cast sections would have been well made.

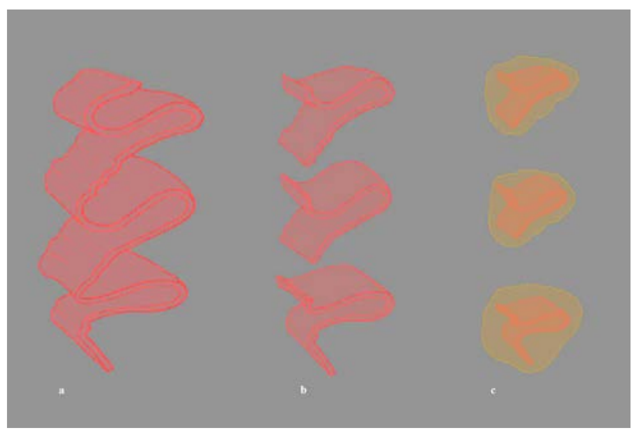


Figure 7.5. Schematic diagrams of (a) drapery in cross-section; (b) subdivision; (c) enclosure of subdivisions by vestiture. Illustration by E. Risser

A surprising feature of the statue's production can also be explained in this context. During the study of the Tiberius, we identified just six chaplets. At first, this small number seemed remarkable, especially given the statue's scale, but it can be understood as an additional benefit of dividing the sculpture into numerous "simple" forms. Typically, chaplets are needed in order to prevent slippage between the interior core and the external vestiture during casting. In the case of the Tiberius, because the simple forms were *encased* in refractive material, the likelihood of any movement was greatly reduced. Thus chaplets were rendered largely superfluous.

The founders not only prepared the wax model for casting with great care; it also appears that they sought to perfect the quality of the bronze that they used. The alloy is very low in lead at 89.97 percent copper, 9.36 percent tin, and just 0.39 percent lead. This seems to have been deliberate. Adding lead to the alloy makes it easier to work, providing increased fluidity that is particularly helpful when casting large pieces of bronze. The fact that lead was *not* added to the alloy used for the Tiberius could be related to the division of the statue into numerous pieces. As noted above, these parts would have been of manageable size and shape, with no need for the addition of lead to guarantee a successful pour.[12]

Assembly of the Bronze Figure

Most of the sixty-two constituent pieces are for the front of the figure; the rear, which presumably was never intended to be visible and is much more schematically rendered, is made up of just a dozen parts (see figs 7.4a–b). Once all of the metal pieces were cast, and sprues and vents removed, the final assembly of the statue could begin. All evidence here points to both efficiency and pragmatism: there are numerous open seams, and just a small number of joins.

In its finished state, the Tiberius weighs around 454 kilograms (1000 lb.), so how and where the joins were made would have been critical for the portrait's structural stability. Rather than laboriously welding the statue piece by piece, the founders joined most of the parts together at just ten "zones" of connection. These are visible (fig. 7.6) in the X-radiographs as areas of greater density, the bronze being thicker on account of the fusion welds. Notably, the alloy used for these joins was of a much higher lead content (15.17%) than that used for the parts of the statue. This must have been intentional, as adding lead to the alloy would have allowed for a lower melting point and improved the flow of the molten metal.

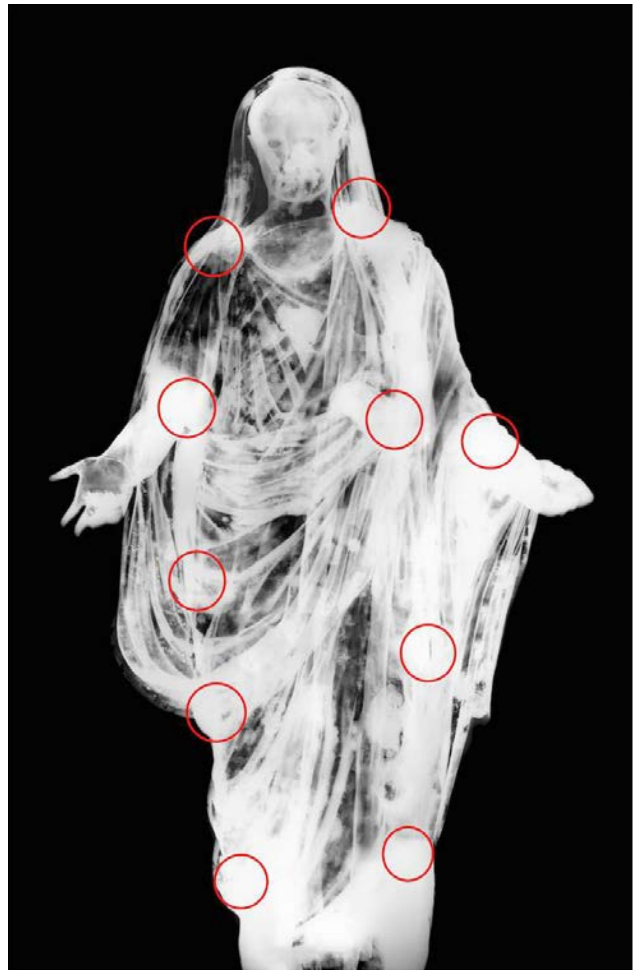


Figure 7.6. X-radiograph of Tiberius, with points at which sections are connected indicated. Photoshop annotations by E. Risser
Image: Su concessione del Ministero dei Beni e delle Attività Culturali e del Turismo, Museo Archeologico Nazionale di Napoli

In studying the X-ray images and the locations of these points of connection, we conclude that the sixty-two pieces of the statue were largely assembled in sections (marked here in yellow) (fig. 7.7), as many of the joins occur at points where the drapery folds meet. Thus, individual pieces would have been placed side by side and then fusion-welded only where they converge. There was no need to close each and every seam, and many were instead left open (fig. 7.8). Because of the careful preparation of the wax working-model, these open seams are all but invisible today, lying deep within the folds of the drapery. This economical method of joining was employed not only for the complex folds of drapery, but also for the body parts. Thus the head is attached at just four points: two where the neck contacts the tunic, and another two where the mantle meets the crown.

Figure 7.7. Portrait of Tiberius, with ancient parts (red) and sections in which they were assembled (yellow). Photoshop annotations by E. Risser

Image: Su concessione del Ministero dei Beni e delle Attività Culturali e del Turismo, Museo Archeologico Nazionale di Napoli

Figure 7.8. Detail of Tiberius, showing four separate sections of drapery and points of attachment (blue circles). The yellow lines indicate open seams. Photoshop annotations by E. Risser

Image: Su concessione del Ministero dei Beni e delle Attività Culturali e del Turismo, Museo Archeologico Nazionale di Napoli

Surface Treatment

Once the statue was fully assembled, any defects on the surface could be rectified. A number of post-casting repairs, such as cold patches, are visible, but they are relatively few, indicating that the casting was successful. As a final step, the surface of the statue may also have been treated, although the eighteenth-century cleaning severely compromises our understanding of the bronze's ancient appearance. In studying one of the deepest recesses of drapery, however, we did encounter a smooth black surface. Under high magnification, this showed very fine parallel lines that are shallower and more numerous than those created by the tools used to clean the statue in the eighteenth century. These lines could indicate that a pumice or another fine abrasive application was used to finish the bronze in antiquity. The black color provides evidence for copper sulfides, potentially chalcocite (Cu_2S). It may be the result of natural corrosion phenomena typical in the volcanic soil of the Bay of Naples, or it may indicate the application of sulfuric vapors or liquids to color the surface. If so, the portrait would have been a lustrous dark gray or black.[13]

Conclusion

The techniques used to produce the portrait of Tiberius, from its conception in wax to its translation and reassembly in bronze, highlight the Roman bronze-workers' ingenuity and pragmatism in achieving a naturalistic sculptural composition, while at the same time increasing the probability of a successful casting. Most significant in this regard is the discovery that the statue was composed of such a large number of parts. Comparison with other large bronzes—most obviously those from Herculaneum—suggest that the Tiberius is exceptional. By comparison, Lahusen and Formigli distinguished 22 parts for the Livia, 19 for the Antonia Minor, and 15 for one of the Agrippina Minor statues.[14] Other large-scale, heavily draped bronzes are scarce, but around 26 separate parts have been documented for the Victoria of Brescia,[15] and at least 29 for the Marcus Aurelius in Cleveland.[16] In sum, therefore, the sixty-two parts used to create the Tiberius are roughly double what might be expected. The counts for the other statues just mentioned could prove to be underestimates. How else might we explain the quantity of pieces?

Even though many of the other large Herculaneum bronzes are imperial portraits, Najbjerg has proposed that the Tiberius was initially conceived of in isolation.[17] This could account for its complexity: the status of the commission may have warranted a more advanced level of production. More superficially, the richness of the drapery could be the reason for the quantity of pieces; simply put, the portrait of Tiberius is a more elaborate composition than the other large bronzes cited above. Or perhaps equating sixty-two parts with "complexity" is to miss the point. For though it involved substantial forethought and labor, separating the wax working-model into so many pieces increased the likelihood that the finished product would have been a success. Firstly, casting the pieces would have been easier, as they would have been smaller and simpler to handle, and the risk of flaws reduced. Secondly, because the subdivisions of the wax working-model had been carefully planned, the bronze-workers could assemble the cast pieces in sections, using just a few focused points for fusion welding. Finally, because many of the divisions between the parts run along recesses of the drapery folds, their open seams could be hidden. So while sixty-two parts may at first betoken a complex production process, this is better understood as a means of guaranteeing a successful outcome: multiplicity translates into simplicity. In this light, our Tiberius of many parts offers a valuable lesson in Roman risk-reduction.

✦ ✦ ✦

Acknowledgments

For the opportunity to study the portrait of Tiberius, we are indebted to Luigia Melillo, Teresa Elena Cinquantaquattro, and Valeria Sanpaolo, together with their colleagues at the Soprintendenza per i beni archeologici di Napoli e Pompeii. At the Getty, David Bomford, Timothy Potts, Jerry Podany, and Claire Lyons enthusiastically supported the project, to which the museum's Villa Council contributed with great generosity. For assistance with technical analyses, we thank Arlen Heginbotham, Lynn Lee, and Vanessa Muros. We owe particular thanks to Jens Daehner, Kenneth Lapatin, Jeffrey Maish, and Ambra Spinelli for their insights into ancient bronze-working and guidance as we prepared this paper for the conference and its subsequent publication. Finally, we are indebted to Tina Najbjerg for sharing a manuscript draft of her book, *Locus Augustalibus et civibus: Reconstructing the Great Porticus in Herculaneum*, and for discussing the Tiberius's findspot with us.

Notes

1. See most recently Risser and Saunders 2015.
2. Museo Archeologico Nazionale di Napoli, inv. 5615; Lahusen and Formigli 2007, 40–42 with bibliography, to which add Boschung 2002, 120, no. 42.8 and Najbjerg 1997, 235–36 (S13). For more on the project, see the blog posts: http://blogs.getty.edu/iris/a-roman-emperor-sojourns-at-the-getty-villa/; http://blogs.getty.edu/iris/rediscovering-tiberius/; http://blogs.getty.edu/iris/has-history-got-roman-emperor-tiberius-all-wrong/.
3. *CIL* X 1414. Bardet's excavation report (quoted in Panutti 1983, 210) testifies to the association, but the authors of *Antichità* 1771 rejected any connection between the portrait and the inscription (312, n. 6). Given the inscription's substantial width, Boschung (2002, 123, n. 691), has also sought to disassociate the two.
4. *Antichità* 1771, 311–13. In rejecting the sculpture's connection with the inscription, the authors declared the portrait to be that of Claudius Drusus Nero. When it was first unearthed, it was initially identified as that of a woman (Pannuti 1983, 210).
5. Najbjerg 1997, 158–63. Allroggen-Bedel (1974, 107 n. 87), and Guadagno (1981, 138), were the first to publish doubts that the Tiberius was found in the Theater. Lahusen and Formigli (2007, 142–51) discuss these concerns, but ultimately remain in favor of the Theater as the findspot. Parslow (1995, 39), Pagano (1996, 242), and Boschung (2002, 120) accept the Porticus as the findspot.
6. See also Najbjerg 2002.
7. Najbjerg 1997, 201–3.
8. *Antichità* 1771, pl. 80.
9. "… Intorno alli ristauri delli antichi metalli in tutto oggi deve essere compita la statua dell'omo velato, non rimarra altro nella settimana ventura di dargli la patena, cioè al novo, et accordarla intiera.^{te}, qual fatica sara di un omo, e li altri daranno principio a quella della Donna, la quale e in moltiss^{mi} pezzi…" (quoted in Scatozza Höricht 1982, 524–25).
10. Lahusen and Formigli 2001; see also Mattusch and Lie 2005, 335–37; Represa Fernandez 1988, 21–25; Scatozza Höricht 1982; Caianiello 1998; and Prisco 2008.
11. Lahusen and Formigli 2007, 43.
12. Lahusen and Formigli (2007, 167) provide comparable compositions for a number of other figures, such as the Augustus (MANN inv. 5595) and the Antonia Minor (MANN inv. 5599). These, too, are composed of numerous pieces—albeit not as many as the Tiberius—and we may justifiably see in their low lead content a sign of the bronze-workers' expertise and familiarity with their medium.
13. It is plausible that the low lead content of the alloy could have facilitated the process of mercury gilding. However, due in large part to the statue's treatment after discovery, there is no chemical or physical evidence for this.
14. MANN inv. 5589, 5599, 5609; Lahusen and Formigli 2007, 28, 43–44, and 53.
15. Brescia, Santa Giulia–Museo dell Città, inv. MR 369; Salcuni and Formigli 2011, 14.
16. Cleveland Museum of Art, inv. 1986.5; Christman 1987, 106.
17. Above, n. 7.

Bibliography

Allroggen-Bedel 1974
Allroggen-Bedel, A. 1974. "Das sogenannte Forum von Herculaneum und die Borbonischen Grabungen von 1739." *CronErcol* 4: 97–109.

***Antichità* 1771**
Accademia ercolanese di archeologia, 1771. *De' Bronzi di Ercolano e contorni: incisi con qualche spiegazione*. Delle antichità di Ercolano 6. Naples: Nella Regia stamperia.

Boschung 2002
Boschung, D. 2002. *Gens Augusta: Untersuchungen zu Aufstellung, Wirkung und Bedeutung der Statuengruppen des julisch-claudischen Kaiserhauses*. Mainz am Rhein: Philipp von Zabern.

Caianiello 1998
Caianiello, T. 1998. "Restauratori di sculture antiche a Portici: dai 'primi errori sì decantati da più gente' all'acquisizione di un metodo di intervento (1739–1781)." *Dialoghi di storia dell'arte* (June): 54–69.

Christman 1987
Christman, B. 1987. "Technical Study: The Emperor as Philosopher." *BClevMus* 74: 100–113.

Fuchs 1987
Fuchs, M. 1987. *Untersuchungen zur Ausstattung römischer Theater in Italien und den Westprovinzen des Imperium Romanum*. Mainz am Rhein: Philipp von Zabern.

Guadagno 1978
Guadagno, G. 1978. "Supplemento epigrafico Ercolanese." *CronErcol* 8: 132–55.

Guadagno 1981
Guadagno, G. 1981. "Supplemento epicrafico Ercolanese II." *CronErcol* 11: 129–64.

Lahusen and Formigli 2001
Lahusen, G., and E. Formigli. 2001. *Römische Bildnisse aus Bronze*. Munich: Hirmer.

Lahusen and Formigli 2007
Lahusen, G., and E. Formigli. 2007. *Grossbronzen aus Herculaneum und Pompeji: Statuen und Büsten von Herrschern und Bürgern*. Worms: Wernersche Verlagsgesellschaft.

Mattusch and Lie 2005
Mattusch, C. C., with Lie, H. 2005. *The Villa dei Papiri at Herculaneum: Life and Afterlife of a Sculpture Collection*. Los Angeles: J. Paul Getty Museum.

Najbjerg 1997
Najbjerg, T. 1997. "Public Painted and Sculptural Programs of the Early Roman Empire: A Case-Study of the So-Called Basilica in Herculaneum." PhD diss., University of Michigan, Ann Arbor.

Najbjerg 2002
Najbjerg, T. 2002. "A Reconstruction and Reconsideration of the So-Called Basilica in Herculaneum." *JRS Supplementary Series* 47: 122–65.

Pagano 1996
Pagano, M. 1996. "La nuova pianta della cittá e di alcuni edifici pubblici di Ercolano." *CronErcol* 26: 229–62.

Pagano and Balasco 2000
Pagano, M., and A. Balasco. 2000. *The Ancient Theatre of Herculaneum.* Naples: Electa.

Panutti 1983
Panutti, U. 1983. "Il giornale degli Scavi di Ercolano (1738–1756)." *MemLinc* Ser. 8, 26.3: 163–410.

Parslow 1995
Parslow, C. 1995. *Rediscovering Antiquity: Karl Weber and the Excavation of Herculaneum, Pompeii, and Stabiae*. Cambridge: Cambridge University Press.

Prisco 2008
Prisco, G. 2008. "Restauri per via di mettere, restauri per via di togliere: Alla ricerca di un metodo nelle officine di Portici." In *Herculanense Museum–Laboratorio sull'antico nella Reggia di Portici*, ed. R. Cantilena and A. Porzio, 189–207. Naples: Electa.

Represa Fernandez 1988
Represa Fernandez, F. 1988. *El Real Museo de Portici (Napoles): 1750–1825*. Valladolid: Universidad de Valladolid.

Risser and Saunders 2015
Risser, E., and D. A. Saunders. 2015. "The Bronze Apollo and Diana from Pompeii: An Example of Serial Production." *AntK* 58: 78–95.

Ruesch 1911
Ruesch, A. 1911. *Guida illustrata del Museo Nazionale di Napoli.* Naples: Richter & Co.

Ruggiero 1885
Ruggiero, M. 1885. *Storia degli scavi di Ercolano ricomposta du' documenti superstiti da Michele Ruggiero*. Naples: Tipografia dell'Accademia reale delle scienze.

Salcuni and Formigli 2011
Salcuni, A., and E. Formigli. 2011. *Grandi bronzi romani dall'Italia settentrionale: Brescia, Cividate Camuno e Verona*. Bonn: Habelt.

Scatozza Höricht 1982
Scatozza Höricht, L. A. 1982. "Restauri alle collezioni del Museo Ercolanese di Portici alla luce di documenti inediti." *Atti dell'Accademia Pontaniana*, n.s. 31: 495–540.

8.

When a Statue Is Not a Statue

Carol C. Mattusch, George Mason University, Fairfax, Virginia

A number of large-scale bronzes that have been identified by scholars as being Archaic, Classical, or Hellenistic statues of kouroi, *mellephebes*, a very young Apollo, or Dionysos may need to be reclassified. Many of them are now assigned to the Hellenistic or Graeco-Roman period, the explanation being that wealthy Romans continued to enjoy earlier styles of statuary. Other evidence suggests a different interpretation. At least three of these figures originally recognized simply as statues were found together with fragments that were identified after reconstruction as elaborate supports for trays. At least one wall-painting depicts such a tray-bearer on a base in a triclinium, and literary testimonia also refer to such figures. Two of the figures previously identified as statues were in fact discovered in triclinia. So in what sense are they statues? One by one, these bronzes are being added to an ever-expanding genre of what might better be described as luxury furniture—tray-bearers and lamp-holders. It appears to be a genre that was very popular in wealthy homes of the Graeco-Roman world. Interestingly enough, no marble examples of this type have as yet been identified, and so far none of the bronzes can be securely dated before the Hellenistic period.

Why have we been so slow to recognize this class of ancient bronzes? Is it because we might have to describe them not as statuary bronzes belonging to the major arts, but rather as interior decor, as a minor art, or—perhaps somewhat easier on our own aesthetic perceptions—as luxury art? Will familiar works like the Apollo from Piombino and Apollo the Citharist from Pompeii no longer shape our modern aesthetic? Is it possible that even statues such as the Marathon Boy will be moved from future discussions of Classical sculpture into the category of luxury arts? A new and expanded view of the luxury arts may well change our comprehension of ancient art.

✦ ✦ ✦

The Piombino Apollo has recently undergone new studies of its production, measurements, alloy, and associated inscriptions (fig. 8.1, left). That statue and the similar Apollo from Pompeii (fig. 8.1, right) were installed side by side for the first time in the exhibition *Power and Pathos*, which made it possible to compare and contrast the two figures and to raise new questions about their similarities and differences. The Piombino Apollo was discovered underwater and sold at Livorno in 1832; in 1834 it was acquired by the Louvre.[1] On the statue's left foot, in capital letters, the phrase "… ος Αθαναια δεκαταν" (… os dedicated this as a tithe to Athena) was cut in the metal after casting[2] and inlaid with silver. The image's peculiar style led to debate over its date that continued until 1967, when Brunilde Sismondo Ridgway argued persuasively that the Piombino Apollo was made in the Late Hellenistic period.[3] Inside the statue were four fragments of a lead tablet, three of which were exhibited in *Power and Pathos*. The lead strips are inscribed with another phrase, in handwriting similar to that on the foot, partially preserving the names of its sculptors: "… ηνοδο … φων Ροδ[ι]ος εποο …" ([M]enodotos and … phon of Rhodes made it).

Figure 8.1. *Left*. Piombino Apollo. Paris, Musée du Louvre, Département des Antiquités grecques, étrusques et romaines, inv. Br. 2. *Right*. Statue of Apollo/kouros, from the triclinium of the House of Gaius Julius Polybius in Pompeii (IX 13.1–3). Pompeii, Soprintendenza Speciale per i Beni archeologici di Pompei, Ercolano e Stabia, inv. 22924
Image: K. Lapatin

Menodotos of Tyre founded a workshop in Rhodes, for which three generations of his family are recorded, ranging in date from 150 BC to perhaps 50 BC, and two of his descendants also bore the name Menodotos.[4] These dates have suggested to some that the bronze image from Piombino might have been dedicated to Athena Lindia in Rhodes during the last quarter of the second century BC, and that it was shipped to Italy at some later date.[5] Sophie Descamps-Lequime has asked, however, whether a statue of a god could be dedicated to another god,[6] and this leads to the question of whether this kouros necessarily represents Apollo. That is, in what sense might an archaizing kouros be recognized as a statue of that god and yet actually have been dedicated to Athena. One might even ask whether the statue's buyer believed that this was an Archaic statue, as did many modern scholars. Furthermore, the bronze from Piombino may not have been produced in Rhodes. Menodotos himself came from Tyre, and inscriptions record works by his family members in Halikarnassos, in Athens, and in Delphi. A versatile family, they produced at least three different types of works: an athletic group, portrait statues, and the archaizing Piombino bronze.[7] This image is of very high quality, with delicate detailing of the hair, gracefully curving inlaid copper brows and lips, inlaid copper nipples, and almost no evidence of bubbles, patches, or other repairs, beyond the possible repair of one toe.[8]

In 1978, excavation at Pompeii in the House of Gaius Julius Polybius (IX 13.1–3) uncovered in the triclinium identified as EE a bronze image bearing remarkable similarities to the Piombino (see fig. 8.1, right).[9] This bronze, however, is also said to have been standing on a small, round molded base. Seeing the two bronzes exhibited side by side has led to a number of new general observations, although detailed comparisons are hampered by the fact that no systematic study of the Pompeii bronze has yet been undertaken. Nonetheless, new measurements have been made of both statues at the same points and with the same instruments.[10] The most important difference between the two is that the Pompeii bronze is significantly taller (by about 12.5 cm, or just over 5 in.) than the Piombino. This discrepancy in height may be explained by the fact that joining limbs to bodies or heads to necks can easily affect measurements as well as overall configuration. Furthermore, in twenty-eight of thirty-six measurements taken of the two, the Pompeii bronze is between 1 millimeter and 5.6 centimeters (up to 2 ½ in.) larger than the Piombino; it is 1 to 9 millimeters (up to ⅜ in.) smaller at five points; and the two bronzes are equal in only three measurements.[11]

The two statues are, however, of precisely the same Hellenistic type: they are archaizing kouroi with the left foot slightly forward; and both have highly decorative features. In addition, the profiles of the two bronzes strongly suggest that they are based on the same basic model or on two versions of that basic model, which would account for the differences: the Pompeii statue's neck is thicker and more cylindrical, and the torso is bulkier, whereas those features on the Piombino are more delicately modeled; the right buttock of the Pompeii bronze is farther back than the left one, and the Piombino's buttocks are aligned, but his feet are farther apart than those of the Pompeii bronze.

There are many differences in surface details, such as in the rendering of the hair and facial features. The bronze from Pompeii has wavy locks, each finely combed, radiating from the crown of his head; there are rows of snail-shell curls and spiral locks on his forehead; his long hair is knotted at the back of the neck in a broad bun; he wears a diadem and a tiara ornamented with upright lotuses and palmettes; and the two neatly arranged fillets emerging from behind his ears are neatly splayed across either side of his chest. The Piombino bronze has wavy, finely combed hair radiating from the crown of his head, a row of roughly delineated curlicue locks on his forehead, parts of a diadem visible behind the ears with wavy locks folded symmetrically over it, and the longer hair beneath that is tied in a four-part knot at the nape of the neck.

Many and perhaps all of the individualizing features were added on the wax working-models, resulting in different editions of the same basic model for an archaizing youth. If so, why are the measurements so different? And why is the Piombino bronze a nearly flawless casting, whereas there are many small rectangular patches on the Pompeii bronze recording the repair of casting flaws?

At this point, all we can say for certain is that the similarities between the two bronzes cannot be coincidental. There was surely a basic model for this particular kouros, and copies of that model, as of any popular type, would have been owned by more than one workshop. If so, such bronzes might have been commissioned in different times and at different places, the Piombino between approximately 150 BC and 50 BC, perhaps on Rhodes or perhaps not, and the other in Pompeii at some date before AD 79. At the same time, because each bronze was carefully individualized in the wax, each of them is undoubtedly one of a kind, representing a different edition of the basic model. They are both more decorative than pious.

The Piombino is likely to have been conceived and recognized as an archaistic statue, given its significant departures from Archaic standards, particularly in the hairstyle. But it poses a number of questions. Was it dedicated to Athena, or was the inscription cut on top of the foot a form of artifice, like the style of the statue? Why were the names of the artisans hidden on a lead tablet inside the statue? And does the slightly flattened left forearm reveal that the wax model was made to support a tray?

The Pompeii bronze is usually described as probably having once held a phiale and a bow, the floral tray-supports that he was holding at the time of discovery being identified tentatively as a sign of later adaptation for use in the triclinium in which the image was found.[12] There is a hole in the statue's right palm, beside which is marked "III"; another mark cut on the back of the attachment for one of the floral supports appears to read "VIII" or "III."[13] Did these numbers guide the assembly, ensuring that workmen chose attachments that would fit the statues? There are no signs of solder having been used to fix the attachments in place. To those scholars who would prefer to think that this image started its existence as a statue, it is possible that when the image was not in use as a server, the tray or lamp could have been replaced by other fittings, such as a phiale and a bow. Thus the tray-holder would become a statue, the tray could be cleaned, a pitcher polished, a lamp refilled with oil. Perhaps this Graeco-Roman archaistic statue-type had been created to serve a dual function, as a statue and as a tray-holder, the attributes changed as the situation demanded. The highly decorative details of both bronzes suggest that they were made as fine furnishings that took the form of Archaic statues, a style that never fell from favor.

Evidence of such furnishings can be found in literary sources. Entering the palace of the Phaiakian king Alkinoos, Odysseus crosses a bronze threshold; there are silver columns and lintel, golden doors with a golden handle, and gold and silver guard-dogs. Where the Phaiakians gathered for the evening's entertainment, "there were golden youths (χρύςειοι κοῦροι), holding in their hands blazing torches, and standing on the strong-compounded bases, to shed a gleam through the house by night, and to shine on the banqueters" (Homer *Odyssey* 7.100–102).[14] Lucretius, who preferred natural pleasures, disdainfully recalled these Homeric lines, scoffing at the "golden images around the house of youths (*aurea simulacra*) holding flaming torches in their right hands to light banquets that last into the night" (*De rerum natura* 2.24–26).[15]

There are, in fact, numerous statues that are known today as silent butlers, a designation that might have inspired Lucretius to further criticism. They are all bronzes, all ephebes, and they range broadly through archaizing and classicizing styles, many of them standing on small round bases. Like real children, they are all diminutive in size. Their extended or raised hands, now devoid of their detachable accessories, have given rise to lively and continuing debate about their identity. I will examine these in turn, including one depicted in a wall-painting.

The Citharist

In October of 1853, the clearing of a street in Pompeii was interrupted by a mudslide that exposed a large house (I 4.1–3), which was actually two houses joined together, with entrances on both the Via Stabiana and the Via dell'Abbondanza. In early November of the same year, the diggers found a bronze statue of a youth[16] in what was later identified as the southeast corner of the south peristyle courtyard, adjacent to a large triclinium (fig. 8.2). Excavations in the house were halted for five years; when they began again in 1858, the House of the Citharist was given its name, deriving from the identification of the statue as an Apollo who had once held a cithara.[17]

Figure 8.2. Statue of an ephebe, from the House of the Citharist in Pompeii (I 4.5). Naples, Museo Nazionale Archeologico, inv. 5630
Image: © Archivio dell'Arte – Pedicini Fotografi

The male figure, an ephebe early Classical in style, stands on a molded bronze base that is just large enough for his feet. He has long hair divided into finely striated (as if combed) wavy locks radiating from the crown of his head, parted in the middle of the forehead, and rolled around a diadem. There are delicate comma-like curls on the back of the neck, and two long, thick, curly locks escape from behind each ear and fall to the shoulder blades.[18] The boy's eyes are inset in bone or ivory and stone; the nipples are inlaid with copper. He looks down in the general direction of his raised left hand, into the palm of which is fitted a rectangular plaque with two curious features: half of an elongated oval on one side; and something that resembles a keyhole beside it, perhaps a notch. In the lowered right hand, he holds a thick, curved object that is slightly longer than the width of his hand: it is rounded, curving, and tapered toward the back, with hollows on either side of the thicker end. That object has always been identified as a plectrum, the rectangle in the other palm as the vertical arm of a cithara, and the youth himself as a prepubescent Apollo.

The lyre and the cithara both have arms that rise from the sides of the instrument's body, the strings attached to a crossbar at the top. The cithara is larger than the lyre; a tortoiseshell may form the back of a lyre. Both instruments are associated with Apollo, and both were plucked with the fingers or with a plectrum,[19] a small, flat piece of shell, horn, or metal that does not resemble the thick object that this statue is holding in his right hand. The rectangular object in the left hand has not yet been identified.

The Ephebe

Seventy-five years after the Citharist was found, in 1925, less than two blocks away on the Via dell'Abbondanza, Amedeo Maiuri excavated a very large home (I 7.11) consisting of several conjoined houses with three entrances. Another small bronze youth was excavated there; it became known as the Ephebe from the Via dell'Abbondanza,[20] and the house was soon named the House of the Ephebe (fig. 8.3). The statue was found at the entrance to a hallway connecting an atrium and a tablinum, where it and other objects were thought to have been in storage during a renovation project.

Like the previous image, this bronze is slightly under 150 centimeters (59 in.) in height. He too stands on a small, round molded-bronze base, this one mounted on a round marble footed base. In his left hand he held a floral support for a tray. This ephebe has essentially the same hairstyle as the one found nearby, even the little comma-like curls on the back of his neck, lacking only the long spiral sidelocks. The similarities between the two boys—in size, in identity, in early classicizing design, in their small, round bases—could well mean that they were both products of the same Pompeiian workshop. Was the "citharist" also a tray- or lamp-bearer? Had his tray been temporarily removed, allowing him to function as a statue? It would be no surprise to find similar rich furnishings in two fine houses located only two blocks apart on the same street. Scholars might wish to consider what else these two bronzes have in common. Were they made in the same way? Do their arms and legs and heads have comparable measurements? Is the copper alloy similar?

Figure 8.3. Statue of an ephebe with tray-support, from the House of the Ephebe in Pompeii (I 7.11). Naples, Museo Archeologico Nazionale, inv. 143753

The Youth from the House of Marcus Fabius Rufus

In 1960, a fleshy bronze youth, Late Classical in style, poised gracefully on an elaborate base, was excavated at Pompeii, in the House of Marcus Fabius Rufus, the location unspecified (fig. 8.4).[21] The height of the statue on its base is 137 or 139 centimeters (ca. 54 in.), of the figure alone 122 centimeters (48 in.). He has long, thickly curled luxuriant, hair, a fleshy face, and a soft, effeminate body. The object he once held aloft in his right hand is now missing, but it may have been a wine-cup, because his left hand held tray supports in the form of grapevines, suggesting that the bearer is a young Bacchus. He is usually identified, but without explanation, as a statue that was repurposed as a lampstand (*lampadēphoros* or *lychnophoros*). On the contrary, it seems more likely that this too was intended as a piece of furniture, designed in the form of a statue.

The Idolino

The Idolino, now in Florence, was found in 1530 at Pesaro (fig. 8.5).[22] The bronze youth was initially identified as a statue by Myron or, more widely, by Polykleitos, and an elaborate, highly decorated base was made for him by Sebastiano Serlio during the 1530s, to which his small, round ancient base was affixed. Little attention was paid to the tray-support made of grapevines that was found with the statue. Mario Iozzo has aptly described the Idolino not as a Roman version of a Classical statue but rather as a "vaguely Polykleitan" piece of furniture.[23]

Figure 8.4. Statue of young Bacchus, from the House of M. Fabius Rufus in Pompeii (VII 16.22). Pompeii, Soprintendenza Speciale per i Beni archeologici di Pompei, Ercolano e Stabia, inv. 13112

Image: By author

Figure 8.5. Statue of an ephebe (Idolino) from Pesaro. Florence, Museo Archeologico Nazionale, inv. 1637

Image: Courtesy of Sailko, CC-BY SA 3.0

An Ephebe in a Pompeiian Wall-Painting

A classicizing statue of a naked ephebe is barely visible standing in the lower right-hand corner of a Pompeiian wall-painting, his feet on a small, round base, his lower arms outstretched to hold a large rectangular tray (fig. 8.6).[24] To his left and beside a three-legged round table stands a representation of an actual servant, also a boy, but dressed in a tunic. Larger, mature diners recline behind them, one of them reaching forward for an item on the table. The scene recalls banquet scenes on Greek red-figure vases, in which men reclining on couches are served wine by naked boys with wine-pitchers. These were not meant to be statues, but in Roman dining-rooms silent butlers could stand alongside the actual servants.

Figure 8.6. Wall painting of a banquet scene with a silent butler at the lower right, from room 15 of the House of the Triclinium in Pompeii (V 2.4). Naples, Museo Archeologico Nazionale, inv. no. 120030. After W. Amelung, "Bronzener Ephebe aus Pompeji," *JdI* 42 (1927): 143, fig. 7

The bronze youths may have held lights in a raised hand, or trays on outstretched arms with hors d'oeuvres or cups of wine. The trays are lost, but we can imagine the finest of them, thanks to Pliny the Elder, who writes that citrus-wood tables were as popular with ladies as were pearls with gentlemen. He describes the variety of veining in the citrus-wood, noting that its color gleamed like the wine that was set upon it, and that it was not even damaged by spills (*Naturalis historia* 13.91–99). Cicero paid 500,000 sesterces for a citrus table, and Gallus Asinius, consul in 8 BC, paid a million sesterces for one. When not in use, a tray and its supports could be removed, the tray-bearer or cupbearer becoming a statue of an ephebe or a youthful Bacchus, to whose hands alternative accessories might be attached. Indeed, there is no evidence that trays and their supports were permanently pinned or soldered to the hands and forearms of these youths.

These three-dimensional images, appointments for the luxury household, recall the Greek traditions represented on red-figure vases that were admired and emulated by the Romans: serving-boys with tables, trays, and pitchers, attending to gentlemen at dinner. Perhaps because the luxury arts have always been difficult for scholars to accept as major arts, there is reluctance to accept the fact that a beloved image like the Idolino is not a famous statue or a derivative of one, but a piece of furniture. Homer and Lucretius called them golden boys—and some of them held lamps, others held trays. They functioned as fine furniture, and they were available in a variety of archaic and Classical styles.

Marathon Boy

An elegantly posed bronze ephebe was netted by fishermen in 1925 near the beach in the Bay of Marathon, with no other finds and no trace of a shipwreck (fig. 8.7).[25] The figure was nearly intact, missing only the front of the right foot, which had been separately cast, and a piece of the left heel. Ever since, scholars have argued over what the youth once held on the flattened palm of his left hand, at which he is looking so intently. The Marathon Boy's right hand is raised, the wrist bent, the thumb and forefinger touching each other, again as if he is holding something. But what was it? Was he pouring liquid into a bowl? Picking fruit and putting it in a bowl? Holding a child, or perhaps a tortoiseshell lyre? Was he holding a box from which he was taking a ribbon? A top? Or was he snapping the fingers of his right hand? Who is he? Is he a young Hermes? Or does the fillet with the leaflike tab at the middle identify him as an athlete?

Figure 8.7. Statue of an ephebe from the Bay of Marathon. Athens, National Archaeological Museum, inv. 15.118

Some have imagined that the arms had broken off and were restored in Roman times, when he was turned into a lamp-bearer.[26] But there is no evidence to support this conjecture. The statue was nearly intact when found, with his arms, legs, and head in place. The only point upon which scholars generally agree is that the style is Praxitelean, late fourth century, or perhaps Early Hellenistic. Was he actually made at that time, or was he a later production, made in the ever-popular Classical style?

Figure 8.8. Statue of an ephebe from the Bay of Marathon, detail of left hand. Athens, National Archaeological Museum, inv. 15.118

Was the Marathon Boy on a ship bound for Italy? Nothing else was found nearby. Why would a ship have jettisoned this bronze in the bay, close to the beach? Could the ephebe have been associated in some way with the sumptuous villa of Herodes Atticus at Marathon, dating to the second century AD? The sculptures in his personal collections were of the highest quality. And so is this figure, though even today we know very little about it. As to its manufacture, we know only what we can see on the surface: the joins of the arms, made with oval flow-welds, appear to be the original joins; they are of a type that is typically found on both Greek and Roman bronzes; and they are in their usual location, below the shoulders, unpatched. One detail that has not been explored is the intentional hole in the left palm, within which there is a cast-in sturdy round pin, well-suited to holding a large object (fig. 8.8). Furthermore, both the hand and the lower arm were flattened in the wax before casting. Did he hold a tray of wine-cups for guests of Herodes Atticus, an oinochoe in his raised right hand? Ridgway had already suggested in 1997 that he might be a server.[27] Now this seems likely.

We might ask ourselves what deserves consideration as a statue. If the Marathon Boy were a tray-bearer, could he not also be a statue? As we look at these once-gleaming bronze ephebes with outstretched arms, we might remember that the well-made "golden boys" are first brought to our attention by Homer in the Palace of Alkinoos, and that the genre enjoyed great popularity in sumptuous Roman homes.

✦ ✦ ✦

Notes

1. Louvre inv. Br. 2. H. 115 cm (3 ft. 9 in.).
2. I thank Benoît Mille for this observation.
3. Ridgway 1967, 43–75.
4. See Goodlett 1991, 669–81.
5. Descamps-Lequime 2015, 288–91; also Badoud 2015, 281.
6. Descamps-Lequime 2015, 288.
7. Goodlett 1991, 677–78.
8. Benoît Mille reports that the alloy of the fourth toe on the left foot suggests that is an ancient replacement: see here paper #42 by Mille and Descamps, particularly figs. 42.4a-b and 42.5.
9. Pompeii 22924; H. 128 cm (50 ½ in.). Vittozzi 1993; Lapatin 2015, 292–93; Pappalardo 2016, 329–30.
10. I am grateful to Kenneth Lapatin and Jens Daehner for taking many new measurements of both the Piombino bronze and the Pompeii bronze in October 2015.
11. Two of the equal measurements are in the heights of the ears, which are likely to have been added separately in wax. However, the ears of the two bronzes do not seem to be the same. For other bronzes on which the joining of similar parts led to rather different results, see the pairs of mirror-image fountain figures from the Villa dei Papiri at Herculaneum: Mattusch 2005, 296–315.
12. See recently Pappalardo 2016, 329.
13. I am grateful to Ruth Bielfeldt and other participants at the Bronze Congress for making this observation in October 2015.
14. I am grateful to Richard S. Mason for this reference.
15. Leonard and Smith 1968, 314, n. to lines 2.24–26.
16. Naples, MANN inv. 5630. H. with base 150 cm (59 in.).
17. Dwyer 1982, 79–80; Mattusch 2014.
18. See Ridgway 1970, 136–37.
19. Hipkins, Hipkins, and Schlesinger 1911, 177–79.
20. Naples, MANN inv. 143753. H. 149 cm (59 in.); with base 162 cm (64 in.). Iozzo 2015, 298; Iozzo 1998, 36–38; Melillo 2013.
21. Pompeii 13112. H. 137 cm (54 in.) with base. From the House of Marcus Fabius Rufus (Pompeii VII 16 [ins. Occ.].19). See Varone 1993, 336–39; Mattusch 2008, 43–44; Iozzo 2015, 298; Iozzo 1998, 39–41; and Sodo 2011, 154.
22. Florence, Museo Archeologico Nazionale, inv. 1637. Height 152 cm (60 in.).
23. Iozzo 2015, 298; Iozzo 1998.
24. Naples, MANN inv. 120030. This is one of three paintings of banquet scenes from the walls of a room in the House of the Triclinium at Pompeii (V 2.4). See Dunbabin 2003, 58.
25. Athens, National Archaeological Museum, inv. 15118. H. 130 cm (51 in.). Pasquier 2007, 112–15.
26. Lullies 1960, 93; Pasquier 2007, 112–15; Calligas 1989; Mattusch 1996, 15–16.
27. Ridgway 1997, 343–44.

Bibliography

Badoud 2015
Badoud, N. 2015. *Le temps de Rhodes: Une chronologie des inscriptions de la cité fondée sur l'étude de ses institutions*. Munich: Beck.

Calligas 1989
Calligas, P. 1989. "Statue of a Young Athlete." In *Mind and Body: Athletic Contests in Ancient Greece*, ed. O. Tzachou-Alexandri, trans. T. Cullen, 179–81. Athens: Ministry of Culture.

Daehner and Lapatin 2015
Daehner, J. M., and K. Lapatin, eds. 2015. *Power and Pathos: Bronze Sculpture of the Hellenistic World*. Los Angeles: J. Paul Getty Museum; Florence: Giunti.

Descamps-Lequime 2015
Descamps-Lequime, S. 2015. "Statue of Apollo (Piombino Apollo)." In Daehner and Lapatin 2015, 288–91.

Dunbabin 2003
Dunbabin, K. M. D. 2003. *The Roman Banquet: Images of Conviviality*. Cambridge and New York: Cambridge University Press.

Dwyer 1982
Dwyer, E. J. 1982. *Pompeiian Domestic Sculpture*. Rome: L'Erma di Bretschneider.

Goodlett 1991
Goodlett, V. C. 1991. "Rhodian Sculpture Workshops." *AJA* 95: 669–81.

Hipkins, Hipkins, and Schlesinger 1911
Hipkins, K. S., A. J. Hipkins, and K. Schlesinger. 1911. s.v. "Lyre." *Encyclopedia Britannica*. 11th ed., 17: 177–79. Cambridge and New York.

Iozzo 1998
Iozzo, M. 1998. *"… qual era tutto rotto": L'enigma dell'Idolino di Pesaro: Indagini per un restauro*. Exh. cat. Florence: Museo Archeologico Nazionale.

Iozzo 2015
Iozzo, M. 2015. "Ephebe (Idolino from Pesaro)." In Daehner and Lapatin 2015, 298–99, no. 51.

Lapatin 2015
Lapatin, K. 2015. "Statue of Apollo (Kouros)." In Daehner and Lapatin 2015, 292–93, no. 48.

Leonard and Smith 1968
Leonard, W. E., and S. B. Smith, eds. 1968. *T. Lucreti Cari, De Rerum Natura*. Madison, Milwaukee, London: University of Wisconsin Press.

Lullies 1960
Lullies, R. 1960. *Greek Sculpture*. New York: Harry N. Abrams.

Mattusch 1996
Mattusch, C. 1996. *The Victorious Youth*. Los Angeles: J. Paul Getty Museum.

Mattusch 2005
Mattusch, C. 2005. *The Villa dei Papiri at Herculaneum: Life and Afterlife of a Sculpture Collection*. Los Angeles: J. Paul Getty Museum.

Mattusch 2008
Mattusch, C. 2008. *Pompeii and the Roman Villa: Art and Culture around the Bay of Naples*. Exh. cat. Washington, DC: National Gallery of Art.

Mattusch 2014
Mattusch, C. 2014. "Portrait, Brunnenfigur, Götterbild. Skulpturen als Ausstattungselemente in der Casa del Citarista." In *Pompeji: Götter, Mythen, Menschen*, ed. V. Sampaolo and A. Hoffmann, 86–93. Hamburg: Hirmer.

Melillo 2013
Melillo, L. 2013. "The Ephebe from the Via dell'Abbondanza: History of a Restoration." In *The Restoration of Ancient Bronzes: Naples and Beyond*, ed. E. Risser and D. Saunders, 57–63. http://www.getty.edu/museum/symposia/restoring_bronzes/index.html.

Pappalardo 2016
Pappalardo, U. 2016. "I bronzi." In *Caio Giulio Polibio: Storie di un cittadino pompeiano*, ed. V. C. Morelli, E. De Carolis, and C. R. Salerno, 329–50. Naples: Assessorato Agricoltura and Istituto per la Diffusione delle Scienze Naturali.

Pasquier 2007
Pasquier, A. 2007. "Statue d'un jeune athlète dit *Éphèbe de Marathon*." In *Praxitèle*, 112–15, no. 17. Exh. cat. Paris: Musée du Louvre.

Ridgway 1967
Ridgway, B. S. 1967. "The Bronze Apollo from Piombino in the Louvre." *Antike Plastik* 7: 43–75.

Ridgway 1970
Ridgway, B. S. 1970. *The Severe Style in Greek Sculpture*. Princeton: Princeton University Press.

Ridgway 1997
Ridgway, B. S. 1997. *Fourth-Century Styles in Greek Sculpture*. Madison: University of Wisconsin Press.

Sodo 2011
Sodo, A. M. 2011. "Éphèbe." In *Pompéi: Un art de vivre*, ed. P. Nitti, S. De Caro, V. Sampaolo, V. Varone, and A. Varone, 154. Exh. cat. Paris, Musée Maillol.

Varone 1993
Varone, A. 1993. "Statua di efebo." In *Riscoprire Pompeii*, ed. B. Conticello, 336–39. Rome: L'Erma di Bretschneider.

Vittozzi 1993
Vittozzi, S. E. 1993. "Apollo lampadoforo." In *Riscoprire Pompeii*, ed. B. Conticello, 262–64, no. 193. Exh. cat. Rome: L'Erma di Bretschneider.

Abstracts

Second-Century Large Bronze Workshop at Gerasa (Jerash, Jordan): Jordanian-European Cultural Heritage Conservation Program at Jerash 2012

Lutfi Khalil, University of Jordan, Amman
Jacques Seigne, University of Tours, France
Thomas Weber, University of Jordan, Amman

In 1993, 2012, and 2014, well-preserved partial remains of a large bronze-workshop were uncovered at the Sanctuary of Zeus in Jerash. Thanks to the close cooperation between Jordanian, German, and French specialists, more than three thousand mold fragments have been restored and the other relevant installations of the workshop, dated to the second half of the second century AD, preserved. All the pieces will be accessible, as a unique cultural heritage monument of Jordan, through an exhibit in the Jordan National Museum.

The bronze-workshop was located on the lower terrace of the Zeus sanctuary. At the moment, its remains include four large mold pits, with traces of large copper-alloy cast objects at the bottom (two circular, two rectangular in plan). Some three thousand pieces of the smashed mold mantle (consisting of baked earth), along with numerous fragments of the furnaces and other installations, had been dumped into these pits when the casting process was finished. The negative impression on the interiors of the mold fragments led to the conclusion that large-sized draped statuary, as well as other objects (cultic instruments?), was fabricated in this workshop by the lost-wax procedure.

Apoxyomenos: Discovery, Underwater Excavation, and Survey

Jasen Mesić, Parliament of Croatia, Committee for Science, Education, and Culture, Zagreb

The main goal of this paper is to present the discovery and underwater survey of the ancient Apoxyomenos and to explore the mystery of how the statue ended up at the bottom of the sea.

A Belgian diver, R. Wouters, discovered the bronze statue of the Apoxyomenos by chance while diving in the waters off the island of Mali Lošinj in the Republic of Croatia. The statue was found at a depth of 46 meters on a curved seabed, stuck between two rocks. After very exacting preparations, which incorporated the advice of many experts, the process of excavation began. The statue was brought to the surface with the cooperation of underwater archaeologists and members of the special police. Afterward, the Apoxyomenos was delivered to conservators. A month of research was then conducted at the underwater site where the statue was found.

The research was international in character, with English, Belgian, and Croatian divers. They were driven by the same goal: to find other discoveries and possibly the underwater shipwreck. Unfortunately, despite detailed investigation with underwater metal detectors and waterpipes, the shipwreck has not been found. Does this mean that we will never find out how the Apoxyomenos ended up on the seabed? To answer this question, we will have to look more deeply into historical, geographic, climatic, and nautical contexts.

The Bronze Statue of Germanicus from Ameria (Amelia)

John Pollini, University of Southern California, Los Angeles

Although it was discovered many years ago near Amelia (Italy), a handsome, over-life-size bronze cuirassed statue with an inserted portrait head of Germanicus has garnered relatively little attention. In pose and typology, this work resembles the statue of Augustus from Prima Porta, but the imagery of the muscled cuirass—depicting the death of the Trojan Troilos at the hands of Achilles—is quite different.

Because of its seemingly odd subject matter for a Roman sculpture, the principal interpretation of this statue, in a 2008 monograph by G. Rocco, is that it originally represented King Mithridates VI, who saw himself as a new Achilles in his war against Rome. The depiction of the defeat of Troilos would have served as a reference to Mithridates's victory over Rome, which traced its origins back to Troy. In the end, Mithridates was himself defeated by Sulla, who, according to Rocco, then brought the statue back to Rome, where its head was first replaced with a portrait of Sulla and eventually with one of Germanicus.

I argue, however, that the portrait of Germanicus either was integral to the original composition or was substituted for the head of his son Caligula after Caligula's assassination and damnation. My interpretation is based on the decorative motifs of the armor, which go back to Hellenistic models but are also found in Roman art, as well as technical considerations and a very different interpretation of the meaning of the defeat of Troilos.

(The full article based on this abstract has appeared in *AJA* 121.3 [2017].)

The Doryphoros in Bronze: Venerated–Suppressed–Forgotten

Rolf Schneider, Ludwig-Maximilians-Universität, Munich

The two reconstructions of Polykleitos's lost *Spear-Bearer* in bronze can tell us many stories. They were both made in Munich from three Roman copies between 1910 and 1921. This paper addresses the bronzes' place in history: in ancient art, in Stettin and Munich, and in Germany after the First and Second World Wars.

The Influence of Ancient Bronzes in Cuban Large-Scale Sculptures

Jorge Rolando Toledo, Subasta HABANA Auction House, Havana

This project studies the influence of ancient bronzes on Cuban large-scale sculptures that are still on display in Havana today. It focuses on the process of creation and construction of three specific works, located inside the capitol of the Republic of Cuba in the twentieth century.

These pieces are *The Republic*, *The Progress of Human Activity*, and *The Virtue of the People*. They were commissioned from the Italian sculptor Angelo Zanelli (1879–1942), who created them and was in charge of placing them inside the capitol. This poster explains the impact they had on the Cuban architectural style of the period.

II. The Artist

9.

More Than Holes! An Unconventional Perspective of the "Greek Revolution" in Bronze Statuary

Gianfranco Adornato, Scuola Normale Superiore, Pisa

This paper explores the technical and art historical importance of dowel holes, a largely overlooked source of material evidence for the study of fifth-century Greek bronze statuary. Generally, the "artistic revolution" in Greek sculpture is associated with the Persian Wars, with two sculptors, Kritios and Nesiotes, and with their sculptural group, the Tyrannicides, precisely dated to 477/476 BC. From an art historical point of view, I discuss whether their statues can indeed be considered "revolutionary." For this purpose, I investigate inscribed and signed bases connected to Kritios and Nesiotes in order to identify and highlight technical improvements in Greek sculpture. Thanks to a fresh and close inspection of dowel holes and remains of footprints, I argue that it is not until Polykleitos's activity and not before the Kyniskos base in Olympia that we can detect a new technical solution in positioning bronze sculptures and, consequently, in rendering poses. The different posture resulting from the shift of balance from both feet to only one has profound artistic, technical, and anatomical implications. Polykleitos's fundamental characteristic breaks with the previous rules and traditional stance and represents a revolutionary innovation. I conclude that the balance on one leg (*uno crure*), a peculiarity of Polykleitos's works attested by the remaining dowel holes and in Pliny (*Naturalis historia* 34.55–56), represents a turning point in perfecting the representation of the human figure and a different solution to the problem of ponderation.

✦ ✦ ✦

1. Defining the Severe-Style Period

The artistic revolution in Greek sculpture is generally associated with one fundamental historical event, the Persian Wars; with two of the most important sculptors of the late sixth–early fifth century BC, Kritios and Nesiotes; and with a sculptural group: the Tyrannicides. The chronological span between the end of the Persian Wars—marked by the destruction of the monuments on the Athenian Acropolis (480/479 BC)—and the beginning of the construction of the Parthenon (448/447 BC) is commonly labeled as the "Severe style period" in archaeological literature.[1] In this paper I discuss the notion of the artistic revolution in Greek art from an unconventional and entirely neglected perspective: the dowel holes on statue bases. I investigate the archaeological evidence in order to single out and highlight technical improvements in Greek sculpture, which in turn had aesthetic implications.[2]

As far as I know, Gustav Kramer was the first scholar to introduce the term "Severe style." In his 1837 contribution on Greek vases, he identified three main phases: the Old style (*Alter Styl*) up to Olympiad 80 (460 BC); the Severe style (*Strenger Styl*) to Olympiad 90 (460–420 BC); and the third period, the Beautiful style (*Schöner Styl*) until Olympiad 100 (420–380 BC).[3] It is evident that his classification and chronology do not coincide with the stylistic labels currently adopted in archaeological literature and handbooks.

Since the publication of Vagn Poulsen's *Der strenge Stil* in 1937, the term has been used unequivocally to indicate a specific period and style: to Poulsen and those who followed, Kritios, Nesiotes, and the Tyrannicides represented the turning point and the very beginning of a new period and style.[4]

Ridgway concurred and catalogued the most prominent traits of the Severe style: “the official date of the Tyrannicide group by Kritios and Nesiotes, 477 BC, can therefore be considered the legal birthday of the Severe style.”[5] More recently, Stewart defined this cultural and artistic phase and concluded, “the totality of the evidence from the stratigraphy, architecture, pottery, and sculpture of the Acropolis deposits supports the theory that the Severe Style began (just) after the Persian sack.”[6] Stewart considers the Tyrannicides “not only the earliest dated monuments in the *new style* but also themselves *revolutionary*.”[7]

Which new and revolutionary stylistic and technical criteria do we find looking at the artistic production of Kritios and Nesiotes in comparison with previous sculptures? And what kind of appreciation of their works of art can we find in ancient literary sources? Furthermore, does the word “severe” correctly translate Greek and Latin adjectives?

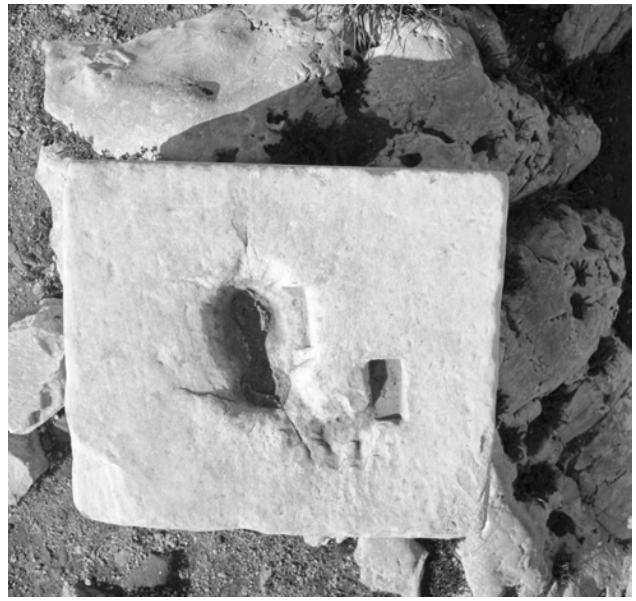


Figure 9.1. Base of Epicharinos. Athens, Acropolis Museum, inv. 13248

Image: E. Feiler, DAI, D-DAI-ATH-1976/1623.

2. Signed Bases, Dowel Holes, and Iconography

The names of the artists Kritios and Nesiotes are known from six inscriptions found on statue bases on the Acropolis, three of which are diagnostic for the purposes of this analysis.[8] The dowel holes on these bases allow us to reconstruct the poses and schemes of the figures mounted on them and to evaluate their technical novelty. On the top of the pedestal dedicated by Epicharinos (fig. 9.1),[9] two dowel holes are recognizable, even though it is not easy to reconstruct the pose of the figure: it stood either with the left foot advanced, to be seen in profile, or with the right foot advanced, facing the viewer. In any case, the figure was standing with both feet on the ground.

On top of the base dedicated by Hegelochos, father and son of Ekphantos (fig. 9.2), two dowel holes placed widely apart make it appear as if the base supported a large-scale bronze figure: it is possible to reconstruct Hegelochos’s dedication as an approximately life-size, striding male warrior in an attacking pose (a pose identical to that of an Athena Promachos).[10]

Figure 9.2. Base of Hegelochos. Athens, Acropolis Museum, inv. 13206

Image:

The circular base dedicated by "[...]as and Ophsios" (fig. 9.3) presents two long dowel holes on the surface. The shape of the base is not common and it may be that one of the unfinished column drums of the older Parthenon was reused as a pedestal. The position of the dowel holes shows that the bronze statue, a lost bronze Athena,[11] stood with its feet close together; the statue was standing and not in motion.

Figure 9.3. Base of [...]as and Ophsios. Athens, Acropolis Museum, inv. 13270
Image: Socratis Mavrommatis © Acropolis Museum

Unfortunately, we cannot evaluate style and technique of those lost sculptures by Kritios and Nesiotes. However, thanks to the presence of the dowel holes on the bases, it is possible to pinpoint some aspects related to the typology and the iconography of the statues. On two monuments, the figure is represented standing with both feet anchored to the ground, according to poses already attested in the sixth century BC. More interesting is the case of Hegelochos's dedication: the figure was represented with legs spread, like those of the coeval Tyrannicides.

Going back to the initial issues, were the pose and the iconography new and revolutionary in comparison with the sculpture of the (Late) Archaic period? The answer is negative, since Kritios and Nesiotes adopted and exploited typologies that were already in use in different media and at various scales in Late Archaic artistic production. Examples include the imposing Athena Promachos from the Gigantomachy pediment, the Ugento Zeus, and, in small format, a bronze hoplite statuette from Dodona.[12] The tradition of this pose is documented on the Athenian Acropolis after 480 BC, as we can see on the small bronze depicting Athena, dedicated by Meleso.[13] In sum, the poses and typologies used in the sculptures of Kritios and Nesiotes appear not to be innovative in comparison with previous statues.

The Tyrannicides[14]—representing the attack by Harmodios and Aristogeiton—are constructed employing a well-established iconography: legs spread, rear foot lifted, torso erect, arm raised, and head held frontally.[15] The vehement action of the two protagonists is not reflected in their abdominal muscles—which while precisely detailed are not very natural in terms of rendering movement—or in the position of the heads, which are held straight and facing fixedly forward on muscular necks.[16] We have the same impression observing coeval sculptures like the Miletus torso, the statues of athletes from Delos, or the archer from the Acropolis.[17]

In literary sources, statues made by Kritios and Nesiotes were not highly appreciated. In a rhetorical context, Lucian gives aesthetic evaluations of the "hardness" of the sculptures, mentioning the sculptor Hegias (also called Hegesias) in association with the more renowned figures of Kritios and Nesiotes. In chapter 9 of his *Rhetorum praeceptor*, the author mentions as exemplary (*paradeigmata*) exponents of ancient technique (*palaia ergasia*) Hegias and artists around Kritios and Nesiotes,[18] characterizing their works as rigid (*apesphigmena*), robust and muscular (*neurode*), hard (*sklera*), and precisely divided into parts with lines (*akribos apotetamena tais grammais*).[19]

Although in modern historiography the two sculptors are considered to be the pioneers of the artistic revolution of the Severe style, in ancient literary sources they are classified among the "hard" (*sklera*, Lucian). Furthermore, in a well-known passage of the *Institutio oratoria* by Quintilian (12.10), Hegias's style is described as "harder and close to Etruscan statues" (*duriora et Tuscanicis proxima*).

It is interesting to note how the Greek and Latin adjectives associated with the artists of this period (*skleros*, *durus*, *rigidus*) have been rendered in modern translations as *severo*,[20] severe,[21] *sévère*,[22] and *streng*[23] in an attempt to put a positive twist on an aesthetic concept that was by no means positive for the ancients. This connotation does not seem to be supported by textual analysis of these adjectives used in other contexts, where they definitely indicated rigidity, fixedness, and immobility.[24] According to scholars such as Strocka and Stewart, this wording can be traced back to a formulation suggested by J. J. Winckelmann.[25] Reading Winckelmann, however, I realized that he used the adjective *streng* not to characterize ancient artists but solely in connection with a modern artist; he contrasted the "correct and strict" style (*die richtig und streng angegebenen Figuren*) of Raphael with the gentler style (*die rundlich und sanft gehaltenen Formen*) of Correggio.

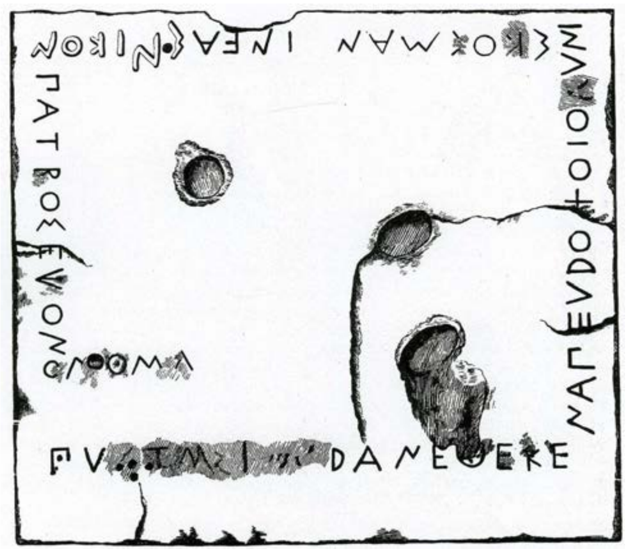


Figure 9.4. Drawing of the base of Kyniskos. Olympia, Museum of the History of the Olympic Games, inv. 526 Dittenberger-Purgold 1896, no. 149

From a technical and art historical point of view, it is not until the activity of Polykleitos and his "Canon" that we have a clear testimony of interest in the movement of the body and its laws: the inflection of the anatomy, the position of the head, and the movement of the body are all precisely anatomically reflected in the individual parts. That sculptor's distinction, as we read in Pliny, was to have created statues standing on one leg (*proprium eius est uno crure ut insisterent signa excogitasse*), breaking with the traditional stance of sculptures characterized by a certain sense of rigidity and immobility of the figure.[26] We need only compare works attributed to Polykleitos with other coeval sculptures to visualize and understand his achievements. In his works[27] we detect the surpassing of the previous anatomical schema: on the base of Kyniskos of Mantinea (fig. 9.4),[28] we find a very peculiar positioning of the lower limbs, with the left foot barely resting on the ground and the right held to the rear with the heel raised. This ponderation (the tension of the figure moving from resting to moving) is found in both the Doryphoros and in the Diadumenos statues. Perhaps due to this new artistic concept and its technical solution, Quintilian reported that Polykleitos's statues were perceived as lacking stability (*deesse pondus putant*) compared to those of Pheidias.[29] In previous translations, *pondus* has been rendered as "grandeur, solemnity, majesty"[30] and connected to his style and iconography of the statues. Polykleitos was thought, Quintilian continues, to have been less successful in representing the dignity of the gods (*deorum auctoritas*), and was further alleged to have shrunk from representing persons of mature years, having ventured on nothing more difficult than a smooth and beardless face. I would like to propose an alternative translation of *pondus*, namely "stability, equilibrium," to be connected with the new pose and stance "on one leg" (*uno crure*), as attested in Pliny's passage (*Naturalis historia* 34.56).

In order to support this hypothesis, we can look at sculptural evidence. For instance, we can compare the anatomical structure of the Kassel Apollo (believed to be a replica of the Parnopios Apollo) or the Lemnian Athena,[31] as passed down through Roman copies, with the Kyniskos statue, as far as we can reconstruct it based on holes for mounting: we find a major difference in balance and stability. The impression gathered from an examination of these statues attributed to Pheidias is one of stable poses and solid bodies, while Polykleitos's works of art are not well balanced. For this reason, Polykleitos's statues were not appropriate for the representation of gods.

This comparison allows us to fully comprehend the importance of Polykleitos's achievement, the final outcome of a long, slow, continuous technical process begun at the end of the sixth century BC, through small but significant formal stages.

This analysis brings me to conclude that significant changes in Greek sculpture are to be detected around that time: it is a transitional period, which seems to include the second quarter of the fifth century BC. I favor a paradigm of continuity instead of a clear-cut division of artistic periods, artists, and styles: the poses, typologies, and iconography of statues of the second quarter of the fifth century BC are inherited from the past. Furthermore, Late Archaic artists of the ancient Mediterranean worked both before and after the year 480 BC (some of them were spared by the Persians!): the case of Kritios and Nesiotes is self-evident in this regard. This experimental phase lasted several decades until the middle of the fifth century: it is with Polykleitos that we detect a significant change, a disruptive innovation in pose and scheme in comparison with the previous artistic production.

This notwithstanding, the notion of a "Severe style period" need not be expunged from handbooks, but we must be aware that we use it as a modern, conventional art historical label, somewhat misleading yet nonetheless useful. Reading ancient sources is very instructive on the perception of aesthetic evaluation and judgments of ancient art and artists and the modern reception of it in the construction of an art historical system. In epigram 62 by Poseidippos of Pella, for instance, there is no distinction between the Late Archaic and Classical periods, between Late Archaic and Classical artists. To him, what happened before Lysippos's activity is considered as an indistinct entity.[32] According to Latin literary sources,[33] the art of bronze sculpture proceeds through formal steps and advancement, adopting the scale of hardness and beauty: from the most rigid statues by Late Archaic artists to the less rigid statues by Kalamis, to the beautiful ones by Myron and those more beautiful still by Polykleitos. In this frame of progress and continuity, it must be clear that to the ancients the Severe style as a chronological and stylistic category never existed.

✦ ✦ ✦

Acknowledgments

This paper is part of a wider project on a technical lexicon and art criticism in ancient sources: thanks to a National Research Fund (PRIN 2012), as Principal Investigator I am currently working on a new edition of and commentary on Pliny the Elder's Books of Art. I am grateful to Jens Daehner for his invaluable comments on the manuscript.

Notes

1. See Stewart 1990; Rolley 1994; this chronological span is also labeled as "transition period" (Richter 1951) or "Bold Style" (Harrison 1985), among others.
2. A thorough investigation on the development of technique is in Mattusch 2006; see also Adornato 2008.
3. Kramer 1837, 101.
4. Poulsen 1937.
5. Ridgway 1970, 12. Already Poulsen 1937, 116.
6. Stewart 2008a, 406–7.
7. Stewart 2008b, 608 (my italics).
8. Raubitschek 1949, no. 161: the fragment found between 1877 and 1886 west of the Erechtheion contains too few letters to be included in this analysis. No. 161a is not included because the fragment was found in the Agora and contains just a few letters.
9. *IG* I^{3}, 847 = DAA 120; Keesling 2003, 170–72.
10. *IG* I^{3}, 850 = DAA 121; Raubitschek 1949, 128; Keesling 2003, 186–90.
11. *IG* I^{3}, 848 = DAA 160; Keesling 2000.
12. Athens, Acropolis Museum, inv. 631: Stewart 1990, 129; Taranto, National Archeological Museum, inv. 121327: Adornato 2010, 318–20; Berlin, Staatliche Museen, inv. Misc. 7470: Stewart 1990, 147.
13. Athens, Acropolis Museum, inv. X 6447: Stewart 2008a, 385, 388, 410.
14. Naples, National Archaeological Museum, inv. 6009 and 6010; *FGrHist* 239 A 54; Marm. Par. A, ll. 70–71 (*IG* 12.5.444, 70–71); Brunnsåker 1971; Taylor 1991.
15. De Cesare 2012.
16. This is in disagreement with Stewart (1997, 73), who writes that "its revolutionary 'severe' or early classic style with its emphatic, powerfully organic, yet still rigorously ordered articulation of the male body did what the archaic style's calligraphic patterning could not do." I argue, on the contrary, that the rendering of the joints and muscles is still bound to the formal conventions and traditions of the Late Archaic period.
17. Paris, Louvre, inv. Ma 2792: Bol 2005; Delos, Archaeological Museum, inv. A 4275, A 4276, A 4277: Hermary 1984, 8–13, nos. 5–7; Athens, Acropolis Museum, inv. 599: Stewart 2008a, 385, 408.
18. On Kritios and Nesiotes: Muller-Dufeu 2002, nos. 576–84; see also Keesling 2000.
19. Zweimüller 2008, 240–43.
20. Vlad Borrelli 1966.
21. For example, Ridgway 1970. On the reception of Archaic style, Hallett 2012.
22. Rolley 1994, 320: "C'est sous l'influence des auteurs latins, qui caractérisent les œuvres des sculpteurs de cette période par les qualificatifs *durus*, *rigidus*, *austerus*, que Winckelmann, dans son *Histoire de l'art antique* de 1764, qualifie de sévère (*streng*) la sculpture antérieure à Pheidias.... C'est l'étude fondamentale de V. Poulsen qui a imposé l'expression 'style sévère'." For Muller-Dufeu (2002, 171): "le style sévère, en référence à la noblesse d'attitude que les artistes donnent alors à leurs œuvres."
23. Poulsen 1937; Bol 2004a; Germini (2008, 19) attributes the concept of *hardness* solely to Archaic artistic production, in clear contradiction with the literary sources analyzed. See Lapatin 2012.
24. For example, Quintilian *Institutio oratoria* 11.3.76: staring eyes (*rigidi oculi*); 11.3.82: head held high, neither rigid nor bowed (*cervicem rectam oportet esse, non rigidam aut supinam*).
25. Winckelmann 1764, ch. 4, section 3, part I.C (Engl. trans., see Winckelmann 2006, 231–32); Donohue 1995; Strocka 2002, 120; Germini 2008, 17.
26. Pliny *Naturalis historia* 34.55–56. Fruitful discussion in Leftwich 1995.
27. In general, see La Rocca 1979. On the Doryphoros: von Steuben 1990; on the Diadumenos: Bol 1990; Settis 1992; in general, Franciosi 2003 (with bibliography), to be read with the discerning assessments of Di Cesare 2003.
28. The attribution of the Kyniskos statue to Polykleitos is based on Pausanias 6.4.11, since the base in Olympia is not signed. On the inscription: Dittenberger and Purgold 1896, 255–58, no. 149. Borbein (1996, 78) rejects the hypothesis that the Westmacott Boy is linked to the Kyniskos base, for chronological reasons; Stewart (2008c, 167, fig. 84), on the contrary, is open to the possibility of the connection.
29. Kaiser 1990; Neumeister (1990, 441) links the meaning of *pondus* to the concepts of *auctoritas* and *maiestas*; see Hölscher 2002.
30. Pollitt 1974, 422–23; on aesthetic thought in ancient Greece: Porter 2010; Adornato 2015.
31. Kassel, Staatliche Kunstsammlungen, Antikensammlung inv. Sk 1; Bol 2004a, 29–32, and 2004b; Gercke and Zimmermann-Elseify 2007, 44–50; Dresden, Staatliche Kunstsammlungen, Skulpturensammlung, inv. Hm 49; Knoll, Vorster, and Woelk 2011, 121–31, no. 2 (J. Raeder).
32. Adornato 2015.

33. Cicero *Brutus* 70; Quintilian *Institutio oratoria* 12.7–9; Adornato, forthcoming.

Bibliography

Adornato 2008
Adornato, G. 2008. "Delphic Enigmas? The Γέλας ἀνάσσων, Polyzalos and the Charioteer statue." *AJA* 112: 29–55.

Adornato 2010
Adornato, G. 2010. "Bildhauerschulen: un approccio." In *Scolpire il marmo: Importazioni, artisti itineranti, scuole artistiche nel Mediterraneo antico*, ed. G. Adornato, 313–41. Milan: LED Edizioni Universitarie di Lettere Economia Diritto.

Adornato 2015
Adornato, G. 2015. "Aletheia/Veritas: The New Canon." In Daehner and Lapatin 2015, 49–59.

Adornato, forthcoming
Adornato, G. Forthcoming. "The Invention of Classical Style in Sculpture." In *Handbook of Greek Sculpture*, ed. O. Palagia. Berlin: De Gruyter.

Beck, Bol, and Bückling 1990
Beck, H., P. C. Bol, and M. Bückling, eds. 1990. *Polyklet: Der Bildhauer der griechischen Klassik*. Frankfurt am Main: Philipp von Zabern.

Bol 1990
Bol, P. C. 1990. "Diadumenos." In Beck, Bol, and Bückling 1990, 206–12.

Bol 2004a
Bol, P. C. 2004. "Der strenge Stil der frühen Klassik. Rundplastik." In *Die Geschichte der antiken Bildhauerkunst: II. Klassische Plastik*, ed. P. C. Bol, 1–32. Mainz am Rhein: Philipp von Zabern.

Bol 2004b
Bol, P. C. 2004. "Die hohe Klassik: Die großen Meister." In *Die Geschichte der antiken Bildhauerkunst: II. Klassische Plastik*, ed. P. C. Bol, 123–43. Mainz am Rhein: Philipp von Zabern.

Bol 2005
Bol, R. 2005. "Der Torso von Milet und die Statue des Apollon Termintheus in Myus." *IstMitt* 55: 37–64.

Borbein 1996
Borbein, A. H. 1996. "Polykleitos." In *Personal Styles in Greek Sculpture*, ed. O. Palagia and J. J. Pollitt, 66–90. Cambridge: Cambridge University Press.

Brunnsåker 1971
Brunnsåker, S. 1971. *The Tyrant-slayers of Kritios and Nesiotes: A Critical Study of the Sources and Restorations*. 2nd ed. Stockholm: Svenska Institutet i Athen.

Daehner and Lapatin 2015
Daehner, J. M., and K. Lapatin, eds. 2015. *Power and Pathos: Bronze Sculpture of the Hellenistic World*. Los Angeles: J. Paul Getty Museum; Florence: Giunti.

De Cesare 2012
De Cesare, M. 2012. "Pittura vascolare e politica ad Atene e in Occidente: Vecchie teorie e nuove riflessioni." In *Arte-Potere: Forme artistiche, istituzioni, paradigmi interpretativi*, ed. M. Castigione and A. Poggio, 97–127. Milan: LED Edizioni.

Di Cesare 2003
Di Cesare, R. 2003. Review of *Il "Doriforo" di Policleto*, by V. Franciosi. *ASAtene* 81: 720–23.

Dittenberger and Purgold 1896
Dittenberger, W., and K. Purgold. 1896. *Die Inschriften von Olympia*. Berlin: Asher.

Donohue 1995
Donohue, A. A. 1995. "Winckelmann's History of Art and Polyclitus." In Moon 1995, 327–53.

Franciosi 2003
Franciosi, V. 2003. *Il "Doriforo" di Policleto*. Naples: Jovene Editore.

Gercke and Zimmermann-Elseify 2007
Gercke, P., and N. Zimmermann-Elseify. 2007. *Antike Steinskulpturen und Neuzeitliche Nachbildungen in Kassel: Bestandkatalog*. Mainz am Rhein: Philipp von Zabern.

Germini 2008
Germini, B. 2008. *Statuen des strengen Stils in Rom: Verwendung und Wertung eines griechischen Stils im römischen Kontext*. Rome: L'Erma di Bretschneider.

Hallett 2012
Hallett, C. H. 2012. "The Archaic Style in Sculpture in the Eyes of Ancient and Modern Viewers." In *Making Sense of Greek Art*, ed. V. Coltman, 70–100. Exeter: University of Exeter Press.

Harrison 1985
Harrison, E. B. 1985. "Early Classical Sculpture: The Bold Style." In *Greek Art: Archaic into Classical*, ed. C. Boulter, 40–65. Leiden: Brill.

Hermary 1984
Hermary, A. 1984. *La sculpture archaïque et classique*. Vol. 1: *Catalogue des sculptures classiques de Délos*. Paris: De Boccard.

Hölscher 2002
Hölscher, T. 2002. *Il linguaggio dell'arte romana: Un sistema semantico*. Turin: Einaudi.

Kaiser 1990
Kaiser, N. 1990. "Schriftquellen zu Polyklet." In Beck, Bol, and Bückling 1990, 48–78.

Keesling 2000
Keesling, C. M. 2000. "A Lost Bronze Athena Signed by Kritios and Nesiotes (*DAA* 160)." In *From the Parts to the Whole: Acta of the 13th International Bronze Congress*, ed. C. Mattusch, A. Brauer, and S. Knudsen, 69–74. *JRA* suppl. 39.

Keesling 2003
Keesling, C. M. 2003. *The Votive Statues of the Athenian Acropolis*. Cambridge: Cambridge University Press.

Knoll, Vorster, and Woelk 2011
Knoll, K., C. Vorster, and M. Woelk, eds. 2011. *Katalog der antike Bildwerke: Skulpturensammlung, Staatliche Kunstsammlungen Dresden*. Vol. 2: *Idealskulptur der römischen Kaiserzeit*. Munich: Hirmer.

Kramer 1837
Kramer, G. 1837. *Über den Styl und die Herkunft der bemahlten griechischen Thongefässe*. Berlin: Nicolai.

Lapatin 2012
Lapatin, K. 2012. "Ancient Writers on Art." In *A Companion to Greek Art*, ed. T. J. Smith and D. Plantzos, vol. 1, 273–89. Malden, MA, and Oxford: Wiley Blackwell.

La Rocca 1979
La Rocca, E. 1979. "Policleto e la sua Scuola." In *Storia e civiltà dei Greci: La Grecia nell'età di Pericle: Le arti figurative*, ed. R. Bianchi Bandinelli, 517–56. Milan: Bompiani.

Leftwich 1995
Leftwich, G. V. 1995. "Polykleitos and Hippokratic Medicine." In Moon 1995, 38–51.

Mattusch 2006
Mattusch, C. C. 2006. "Archaic and Classical Bronzes." In *Greek Sculpture: Function, Materials, and Techniques in the Archaic and Classical Periods*, ed. O. Palagia, 208–42. Cambridge: Cambridge University Press.

Moon 1995
Moon, W. G., ed. 1995. *Polykleitos, the Doryphoros, and Tradition*. Madison: Wisconsin Studies in Classics.

Muller-Dufeu 2002
Muller-Dufeu, M. 2002. *La sculpture grecque: Sources littéraires et épigraphiques*. Paris: École Nationale Supérieure des Beaux-Arts.

Neumeister 1990
Neumeister, C. 1990. "Polyklet in der römischen Literatur." In Beck, Bol, and Bückling 1990, 428–49.

Pollitt 1974
Pollitt, J. 1974. *The Ancient View of Greek Art: Criticism, History and Terminology*. New Haven and London: Yale University Press.

Porter 2010
Porter, J. I. 2010. *The Origins of Aesthetic Thought in Ancient Greece: Matter, Sensation, and Experience*. Cambridge: Cambridge University Press.

Poulsen 1937
Poulsen, V. H. 1937. *Der strenge Stil: Studien zur Geschichte der griechischen Plastik 480–450*. Copenhagen: Levin & Munksgaard.

Raubitschek 1949
Raubitschek, A. E. 1949. *Dedications from the Athenian Akropolis: A Catalogue of the Inscriptions of the Sixth and Fifth Centuries B.C.* Cambridge, MA: Archaeological Institute of America.

Richter 1951
Richter, G. M. A. 1951. *Three Critical Periods in Greek Sculpture*. Oxford: Clarendon Press.

Ridgway 1970
Ridgway, B. 1970. *The Severe Style in Greek Sculpture*. Princeton: Princeton University Press.

Rolley 1994
Rolley, C. 1994. *La sculpture grecque*. Vol. 1: *Des origines au milieu du Ve siècle*. Paris: Picard.

Settis 1992
Settis, S. 1992. "Fortuna del Diadumeno: I testi." *NumAntCl* 21: 51–76.

Steuben 1990
Steuben, H. von. 1990. "Der Doryphoros." In Beck, Bol, and Bückling 1990, 185–98.

Stewart 1990
Stewart, A. 1990. *Greek Sculpture: An Exploration*. New Haven and London: Yale University Press.

Stewart 1997
Stewart, A. 1997. *Art, Desire, and the Body in Ancient Greece*. Cambridge: Cambridge University Press.

Stewart 2008a
Stewart, A. 2008. "The Persian and Carthaginian Invasions of 480 B.C.E. and the Beginning of the Classical Style: Part 1, The Stratigraphy, Chronology, and Significance of the Acropolis Deposits." *AJA* 112: 377–412.

Stewart 2008b
Stewart, A. 2008. "The Persian and Carthaginian Invasions of 480 B.C.E. and the Beginning of the Classical Style: Part 2, The Finds from Other Sites in Athens, Attica, Elsewhere in Greece, and on Sicily; Part 3, The Severe Style: Motivations and Meaning." *AJA* 112: 581–615.

Stewart 2008c
Stewart, A. 2008. *Classical Greece and the Birth of Western Art*. Cambridge: Cambridge University Press.

Strocka 2002
Strocka, V. M. 2002. "Der Apollon des Kanachos in Didyma und der Beginn des strengen Stils." *JdI* 117: 81–125.

Taylor 1991
Taylor, M. W. 1991. *The Tyrant Slayers: The Heroic Image in Fifth Century B.C. Athenian Art and Politics*. Salem: Ayer.

Vlad Borrelli 1966
Vlad Borrelli, L. 1966. s.v. "Severo, Stile." *Enciclopedia dell'arte antica* 7: 228–29. Rome: Istituto della Enciclopedia italiana.

Winckelmann 1764
Winckelmann, J. J. 1764. *Geschichte der Kunst des Alterthums*. Dresden: Walther.

Winckelmann 2006
Winckelmann, J. J. 2006. *History of the Art of Antiquity*. Introduction by Alex Potts, trans. Harry Francis Mallgrave. Los Angeles: Getty Research Institute.

Zweimüller 2008
Zweimüller, S. 2008. *Lukian "Rhetorum praeceptor": Einleitung, Text und Kommentar*. Hypomnemata 176. Göttingen: Vandenhoeck and Ruprecht.

10.

Polykleitos and His Followers at Work: How the Doryphoros Was Used

Kyoko Sengoku-Haga, Tohoku University, Honshu, Japan
Sae Buseki, Tohoku University, Honshu, Japan
Min Lu, Tencent Technology Co. Ltd., Shenzhen
Shintaro Ono, The University of Tokyo
Takeshi Oishi, The University of Tokyo
Takeshi Masuda, National Institute of Advanced Industrial Science and Technology, Japan
Katsushi Ikeuchi, Microsoft Research Asia, Beijing

Our 3D shape comparison methods enable us to distinguish millimeter-sized differences between statues. They have shown that, at least in terms of facial and feet areas, "exact" marble Roman copies are actually quite precise. We have also demonstrated that the face shapes of the copies of the Doryphoros, the Diadumenos, and the Sosikles Amazon are almost identical. Adding to these previous results, it is newly demonstrated that the facial features of the Sciarra Amazon are close to those of the Pericles by Kresilas. The face shape of the statue of Diomedes, often attributed to Kresilas, does not match that of the Sciarra Amazon but is rather close to that of the Doryphoros. Through this method, it has been proven that the Sosikles Amazon was made by Polykleitos, the Sciarra Amazon by Kresilas, and the Diomedes statue by a disciple of Polykleitos.

✦ ✦ ✦

Introduction

For more than a century, arguments have been made both for and against the identification of the Doryphoros with the "Canon" of Polykleitos without a definitive conclusion being reached. Although the most important information is Pliny's famous phrase, it also is the cause of controversy. He writes: "Polyclitus … et doryphorum viriliter puerum fecit. quem canona artifices vocant, liniamenta artis ex eo petentes veluti a lege quadam …" ["Polykleitos made … and a Doryphoros, a virile-looking boy. He also made a statue which artists call the 'Canon' and from which they derive the basic forms of their art, as if from some kind of law."] (*Naturalis historia* 34.55).[1]

Since the connection between the two sentences is rather abrupt, Jahn suggested it be read as "doryphorum viriliter puerum fecit [et] quem canona artifices vocant," namely, "the sculptor made the Doryphoros and this very statue was called the 'Canon' by artists." It is strange that the subject of such an important and influential work is not mentioned, given that, judging from the number of Roman copies, the Doryphoros was Polykleitos's most famous work. This reading has therefore been supported by some[2] but rejected by others.[3] Furthermore, even to the broadly accepted identification of the "doryphorum viriliter puerum" with the Doryphoros type (fig. 10.1), an objection has been raised recently.[4]

In this confused situation, we need to reflect again on the series of Roman copies, possibly attributable to the great sculptor: first, the famous (so-called, if necessary) Doryphoros, known to us through more than sixty copies; second, the Diadumenos mentioned by Pliny in the passage cited above as the most costly work of the sculptor, copies of which we have only two (and some more head copies); third, three (or four) Amazon types, each of which was created by Polykleitos, Pheidias, or Kresilas. We also have some types of statues that might originate from disciples or followers of the great master. Of course these pieces of evidence have been available for a long time, but with the help of new technology we have the possibility of obtaining from them some substantial new data.

Figure 10.1. Doryphoros from the Palaestra of Pompeii. Naples, National Archaeological Museum, inv. 6011

Image: Kyoko Sengoku-Haga

Methodology[5]

We first scanned each work (or its modern plaster casts in Munich) with a 3D laser scanner with an accuracy of ±50 μm and created a very precise 3D model. From two of the models to be compared, a pair of corresponding parts are cut out, normalized in scale if necessary, and aligned together. To clarify the distances of the gap between the two parts, two means of visualization are devised (see fig. 10.5). One is color-mapping, in which the distances of the two forms are plotted and visualized with a color-code. The threshold of the color-mapping is to be defined: in most cases, 4 millimeters (⅛ in.) so that we can recognize 1 millimeter differences. A perfect match (0 mm distance) is colored green; +1 mm yellow; +2 mm orange; –1 mm light blue, and so on. The distances over 4 millimeters are colored black. If the image is colored all green, it means that the shapes of two compared objects are identical. The second visualization method is valley-line drawing, which is useful for distinguishing gaps of important points and lines, such as eyes, eyelids, nose features, and mouths.

1. Reliability of Roman Copies

It is well known that many Roman sculptures are copies of famous Greek masterpieces, but at the same time it has been pointed out that even the mechanically carved "exact" copies are not exact in any real sense. The traditional method of *Kopienkritik* has revealed that Roman copies are variable in their forms, especially in their limbs, in some cases to a great extent. Still, it is too early to discard the reliability of those copies. In the case of bronze copies, you may easily imagine that they reproduce exactly their original forms, because they are replicated in the molding and casting processes. Marble copies too maintain their original forms, more or less, because in the first century BC sculptors began to carve marble copies mechanically, using instruments and/or compasses by means of which theoretically they managed to reproduce "exact" marble copies.[6]

But how "exact" are the marble copies?[7] In the case of two almost complete copies of the Doryphoros—one excavated in the Palaestra of Pompeii (Museo Archeologico Nazionale di Napoli, inv. 6011, see fig. 10.1) and the other conserved in Minneapolis (Institute of Fine Arts)—they don't match at all when they are compared as a whole. But compared separately in body parts, they match better. Maybe it is because the copy-makers, when they took plaster casts of the original bronze statues, took molds part by part. It was also noticed that the detailed parts, such as heads, hands, and feet (or toes) match better. Obviously they were copied more accurately than the arms and legs.

Additionally, four copied heads of the Doryphoros—the bronze herm by Apollonios (Museo Archeologico Nazionale di Napoli, inv. 4885, fig. 10.2) and the marble herm (Museo Archeologico Nazionale di Napoli, inv. 6412), both found in Herculaneum, and the two statues above mentioned—were compared. It was noted that, while their forms are copied quite accurately, they differ among each other in scale. The head of the statue from Pompeii is bigger than the other two marble copies by 3%; this difference may be because the back of its head is not finished and therefore the scales were not calculated correctly. The bronze head, by contrast, is about 2% smaller than the other two; this difference is probably attributable to the casting process: the size of a bronze copy always becomes smaller, since clay shrinks when it dries and bronze shrinks when it cools.

Figure 10.2. Bronze herm of the Doryphoros signed by Apollonios. Naples, National Archaeological Museum, inv. 4885
Image: Kyoko Sengoku-Haga

With the 3D shape comparison method, it has been proven that regarding detailed parts of statues, such as heads, feet, and hands, the "exact" copies are in fact incredibly precise and their deviations are in most cases within a few millimeters.

2. The Doryphoros Reused in Polykleitos's Own Works

Having checked the reliability of "exact" copy heads, we should go back to the fifth century BC to discuss the originals of Polykleitos: the Doryphoros, the Diadumenos, and one of the three (or four) Amazon types.[8]

The first two male statues are variously dated,[9] but scholars agree at least on one point: the Doryphoros was created at least a decade earlier than the Diadumenos, because the latter has softer facial features, more natural wavy hair, and a more melancholic overall expression. However, the 3D comparison reveals that the face of the Diadumenos from Delos now in Athens (National Archaeological Museum, inv. 1826) and that of the bronze Doryphoros herm from Herculaneum now in Naples have surprisingly close shapes, while the former is 1% smaller than the latter (fig. 10.3). It is true that the areas between the brows and the eyelids, the nose sides, and the lip contours indicate gaps of more or less 1 millimeter. Actually, the Delian Diadumenos has the swelled upper eyelids, the slightly closed eyes, the slim nose line, and its lip contour is less marked; these differences cause the different expressions of the two heads. Some of them may be due to the Late Hellenistic sculptor who copied the Diadumenos statue around 100 BC on Delos, but that should not be the only factor causing the difference. As Pliny said, the two original statues were actually different in style and the Diadumenos was "softer" than the Doryphoros. There are small gaps to be sure, but the overall coincidence of the shapes of the facial features is more noteworthy: the position and shape of eyes, noses, and the upper lips are almost the same. If Polykleitos had modeled the two heads independently, this closeness would not have occurred. We may safely suppose that he reused the model of the Doryphoros to create the Diadumenos, using the indirect lost-wax casting method. Thus, he kept a clay model of the Doryphoros in his workshop. Later, to create a new work, he took molds of this model, at least of the face, and then added some small changes and remodeled the hair to create a new clay model, the Diadumenos, which he fired to make durable.

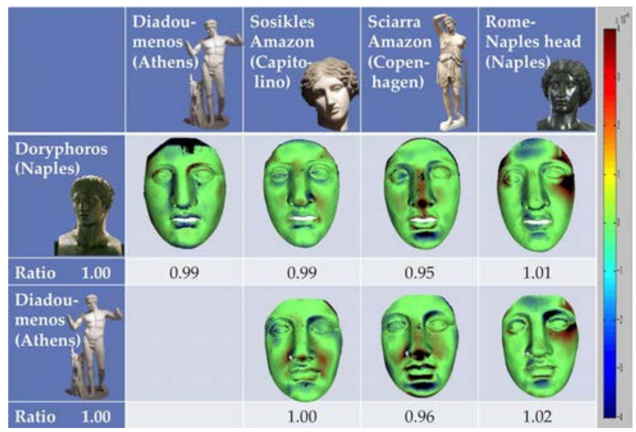


Figure 10.3. 3D shape comparison between the Doryphoros and the Diadumenos and with the three Amazon types (the threshold is 4 mm)
Image: By authors (Kyoko Sengoku-Haga, Sae Buseki, Min Lu, Shintaro Ono, Takeshi Oishi, Takeshi Masuda, Katsushi Ikeuchi)

Polykleitos also created an Amazon statue in competition (or, more probably, in collaboration) with other contemporary sculptors to dedicate it in the sanctuary of Artemis at Ephesos (Pliny *Naturalis historia* 34.53). Three or four Classical Amazon types are known, but scholars have not arrived at an agreement on the type to be attributed to Polykleitos.[10]

We tried 3D shape comparison for three Amazon heads (the Sosikles-type head in the Capitoline Museum in Rome, inv. 1091; the Sciarra type in the Ny Carlsberg Glyptothek in Copenhagen, inv. 1658; and the bronze head of Rome–Naples type, often attributed to the Mattei type, in the National Archaeological Museum in Naples, inv. 4889) with the works of Polykleitos: the bronze herm of the

Doryphoros from Herculaneum in Naples and the Diadumenos from Delos in Athens.[11] The results were quite clear (see fig. 10.3). While the comparisons with the Sciarra type and the Rome–Naples type show some black areas, the comparison with the Sosikles type has almost no black area. They are as close as the pair of the Doryphoros and the Diadumenos and, between the two statues, the Sosikles type is closer to the Doryphoros than the Diadumenos. We can conclude that the gap between the heads of the Doryphoros and the Sosikles Amazon are within the range of works from one model. This is quite strong evidence to affirm that the Sosikles type was created by Polykleitos, reusing the model of his Doryphoros.

3. Kresilas

Since most scholars agree with the attribution of the Mattei type (either with or without the Rome–Naples head type) to Pheidias,[12] the remaining one, the Sciarra type, is to be attributed to Kresilas. He was a native of Kydonia in Crete but was active mainly in Athens.[13] Probably around 430 BC, he collaborated with Polykleitos on the group of Amazons at Ephesos and inevitably should have been influenced by the greater sculptor; his Amazon shows the same head inclination and a hairstyle similar to (but less naturalistic than) that of Polykleitos. However, these similarities are superficial and do not originate from the reuse of Polykleitos's model, as has been shown by the 3D shape comparisons (see fig. 10.3). This is understandable because Kresilas was an independent sculptor and did not belong to Polykleitos's workshop.

Although he was less renowned than Polykleitos, Kresilas made a highly regarded portrait of Pericles (Pliny *Naturalis historia* 34.74). Pausanias (1.28.2) saw Pericles's portrait near the Propylaia of the Acropolis in Athens without mentioning the sculptor's name. Excavations on the Athenian Acropolis have unearthed a statue base on which the name of Kresilas was inscribed as a sculptor, but without the name of Pericles.[14] However, a portrait type of Pericles is attested in several Roman marble copies, two of which are inscribed with Pericles's name.[15] All these pieces of evidence—Pliny, Pausanias, the Acropolis base, and marble copies—seem to refer to a single work: Kresilas's portrait of Pericles erected on the Acropolis. Still, we are not absolutely certain about its identification.

At first glance, the Sciarra Amazon and the Pericles portrait don't look alike at all. While the Sciarra Amazon has an idealized female head, the Pericles is male with a beard, a mustache, and sagging cheeks. Besides, the nose of the Pericles herm in the British Museum is restored. Keeping all these obvious differences in mind, we dared to compare the Sciarra head in Copenhagen and Pericles head in the British Museum (fig. 10.4).[16] In the image of the color-mapping visualization (fig. 10.5, left below), wide areas of the above-mentioned parts (the nose, the cheeks, and the mustache area) are colored in blue, red, or black; that is, their 3D shapes differ by more than 4 millimeters. However, using the valley-line visualization, we ascertained that the eye forms match perfectly and that the positions of nose and mouth are the same (fig. 10.5, right below), indicating that the Sciarra Amazon has the same facial features as the Pericles portrait. Although the results were not firm enough to prove the sculptor's reuse of his own model, they support at least the attribution of both works to the same sculptor, Kresilas.

Figure 10.4. Portrait herm of Pericles. London, British Museum, inv. 1805,0703.91
Image: © Trustees of the British Museum, CC BY-NC-SA 4.0

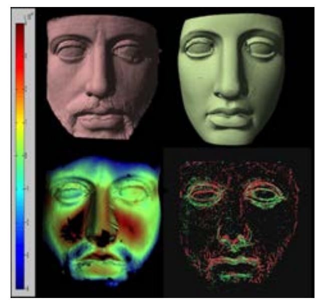


Figure 10.5. 3D shape comparison of the face of Pericles (left above) with that of Sciarra Amazon (right above) and its visualization in color (left below; the threshold is 4mm) and in valley lines (right below). Their size ratio is 1:1.03.
Image: By authors (Kyoko Sengoku-Haga, Sae Buseki, Min Lu, Shintaro Ono, Takeshi Oishi, Takeshi Masuda, Katsushi Ikeuchi)

4. The Doryphoros Reused in "Diomedes"

In addition to the statuary types whose originals have been attributed to Polykleitos himself, there are several Classical statue types that more or less recall his style. Scholars have debated whether they are works by one of his disciples or simply influenced by his works, judging from the fidelity to the great master's principles of body structure.[17]

The so-called Diomedes, known from one replica from Cuma (Naples, National Archaeological Museum, inv. 144978, figs. 10.6–7) and another in Munich (Glyptothek, inv. 304), is one of such statues.[18] Its pose and the modeling of the torso are very close to those of the Doryphoros, except for the left foot positioned slightly farther to the left. The biggest change is the direction of the head, which turns strongly to the opposite side to gaze at something. Some scholars attribute it to the circle of Polykleitos, but others prefer to attribute it to Kresilas based on its similarity with Pericles's head and the leg position identical with the Sciarra Amazon.[19]

Figure 10.6. Diomedes from Cuma. Naples, National Archaeological Museum, inv. 144978
Image: Kyoko Sengoku-Haga

Figure 10.7. Head of Diomedes from Cuma
Image: Kyoko Sengoku-Haga

To determine its relationship to Polykleitos or to Kresilas, we compared the face of Diomedes in Naples to the bronze Doryphoros herm in Naples and the Sciarra Amazon in Copenhagen, using 3D imaging. The results show a clear discrepancy with the Sciarra Amazon and a similarity to the Doryphoros (fig. 10.8). In both cases, the nose parts are black because that of Diomedes is broken. While the eyes and the mouth of the Sciarra Amazon are out of position, the eyes of the Doryphoros are in exactly the same place. It is true that Diomedes's mouth is smaller, in a slightly higher position, and its cheeks are slimmer than those of the Doryphoros; this can be explained as a modification of the mouth shape and an addition of the short beard on Diomedes's cheeks. The rest of the image is colored green, indicating that the gap between the surfaces is almost zero. As a whole the shape of Diomedes's face is quite similar to that of the Doryphoros, which suggests that the sculptor of Diomedes did not merely imitate the pose and the style of the Doryphoros, but he used the Doryphoros as his model. He was not Kresilas but rather a sculptor to whom the model of the Doryphoros was available.

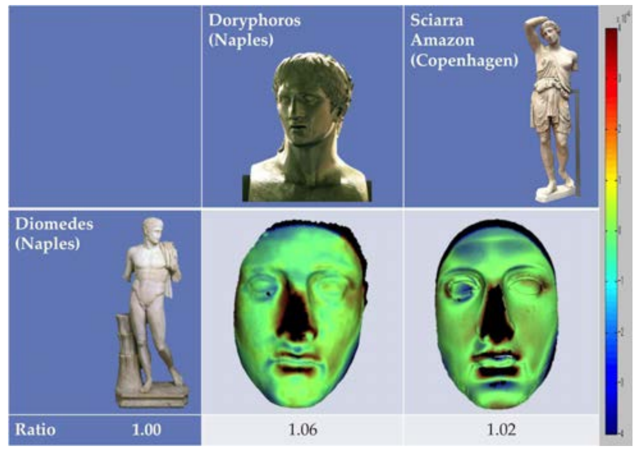


Figure 10.8. 3D shape comparison of Diomedes with the Doryphoros and the Sciarra Amazon (the threshold is 4 mm)
Image: By authors (Kyoko Sengoku-Haga, Sae Buseki, Min Lu, Shintaro Ono, Takeshi Oishi, Takeshi Masuda, Katsushi Ikeuchi)

Who could use the Doryphoros model? In the later period, copy-makers took plaster casts from bronze statues displayed in public spaces,[20] but in the Classical period such an operation is not likely. Most probably, the "Diomedes sculptor" was one of Polykleitos's disciples who worked in his master's workshop. It is true that the Diomedes sculptor, in addition to making some modifications to his master's model, tried another solution for the balance and proportion of the male body. As is often the case of an excellent disciple, he deviated from his master.

Conclusion

We have asserted that the model of the Doryphoros was reused not only by Polykleitos himself but also by another sculptor, most probably one of his disciples. Interestingly, so far as we have discerned, the later works are always smaller in scale than the Doryphoros. Taking into account that the face of the bronze Doryphoros is around 2% smaller than those of the other two marble copies, we can calculate that the Amazon Sosikles and the Diadumenos are around 3% smaller than the marble Doryphoros, and the Diomedes statue, around 7% smaller than it.

This scaling-down may be explained as shrinkage of the clay model. Theoretically, if Polykleitos kept a clay model of the Doryphoros in his workshop, to create another work he would have taken a mold from the Doryphoros model and, modifying some details, created a new clay model. Before casting in bronze, the sculptor should have dried and baked the new model to increase its durability, thus inevitably the model's size was reduced. In the case of his disciple, if he kept a new Doryphoros model in his own workshop, this reproduction should have always been smaller than the original Doryphoros model.

Adopting the indirect lost-wax casting technique, probably from the beginning, Polykleitos intended the model of the Doryphoros to be reused. Remembering that the Doryphoros is almost 2 meters (158 in.) tall, larger than normal statues of athletes and heroes, a question comes to mind: did Polykleitos create the Doryphoros larger expecting to scale it down when reusing it for other works? Being a skilled sculptor, Polykleitos would have anticipated this shrinkage. If that is the case, we might call the Doryphoros the "Canon," created for the purpose of being "cited" in other works by Polykleitos and other artists. Then Pliny's phrase, cited earlier, should be read in the way proposed by Jahn: "Polykleitos made a Doryphoros, which artists call the Canon and from which they derive the basic forms of their art."

Since we have proved the reuse of the Doryphoros's face model and the shrinkage in size of the faces in only a few samples, our conclusion is still preliminary. Nevertheless, we are at least certain of the great potential of the method of the 3D shape comparison in the study of ancient sculpture.

✦ ✦ ✦

Acknowledgments

For generous permission and kind assistance during the scanning, I am particularly grateful to Dr. Ingeborg Kader, museum management and chief keeper of the Museum für Abgüsse Klassischer Bildwerke München; Dr. Teresa Elena Cinquantaquattro, then superintendent of the Soprintendenza Speciale per i Beni Archeologici di Napoli e Pompei; and Dr. Valeria Sampaolo, then director of the Museo Archeologico Nazionale di Napoli. I am also deeply grateful to my colleague Todd Enslen for revising my manuscript. This work is supported by JSPS KAKENHI Grant Numbers 23320040, 16K02262, and Microsoft Research CORE 12 Project.

Notes

1. Translation by Pollitt 1990, 75.
2. Jahn 1851, 315–16; Furtwängler 1893, 422; Hafner 1997, 10–18 with n. 10.
3. Pollitt 1990 (see n. 1 above); Stewart 1990, 264, T62; *DNO* 1234.
4. Franciosi 2003.
5. For technical details, see Zhang et al. 2013, 58–59. (The preliminary results regarding Polykleitos's Amazon, on p. 60 of that paper, are to be corrected. See Sengoku-Haga et al. 2015.)
6. Pfanner 1989.
7. In detail, see Sengoku-Haga et al. 2015, 205–7. The 3D data of the Minneapolis Doryphoros were obtained through the scan of a plaster cast conserved in the Museum of Classical Statues in Munich.
8. In detail, see Sengoku-Haga et al. 2015, 207–14.
9. Stewart 1990 (Doryphoros ca. 440 BC, Diadumenos ca. 430 BC); Borbein 1996 (Doryphoros 450–440 BC, Diadumenos ca. 420 BC).
10. Bol 1998 (with a catalogue of replicas).
11. For details, see Sengoku-Haga et al. 2015, 210–13. The 3D data of the Sciarra type Amazon in Copenhagen were scanned from a plaster cast in the Museum of Classical Statues in Munich.
12. Except for Weber (1976; 2008), who attributed the Mattei type to Kresilas. As for the Rome–Naples type, attribution to Pheidias is supported by von Steuben (Helbig^4 no. 2261). In contrast, Bol (1998, 187, no. I.26) put this head type into the variant of the Sciarra type, and Mattusch (2005, 278) calls it a "Polykleitan" head. Weber (1976), Raeder (1983, 77–78, no. I.64), and Boardman (1985, 217), preferred the Petworth head as belonging to the Mattei type.
13. As for Kresilas, see Vierneisel-Schlörb 1979, 79–93; Rolley 1999, 149–52; Vollkommer 2001, s.v. Kresilas (M. Weber); *DNO* II, 337–50.
14. *IG* I^2 528; Raubitschek 1949, no. 131.
15. See Richter and Smith 1984, 173–75.
16. We scanned plaster casts in Munich.
17. For example, Linfert 1990; Rolley 1999, 42–51.
18. Admitting the strong influence of the Doryphoros, many scholars denied the relationship of the Diomedes sculptor to Polykleitos' workshop, based on its departure from the Canon in its structure. Stewart 1990, 168; Stewart 1995, 251–53; Linfert 1990, 289. See also n. 19 below.
19. Attribution to Kresilas: Furtwängler 1893, 311–25; Vierneisel-Schlörb 1979, 79–93; Weber 2008, 11.
20. Lucian *Iuppiter tragoedos* 32–33.

Bibliography

Boardman 1985
Boardman, J. 1985. *Greek Sculpture: The Classical Period: A Handbook*. London: Thames and Hudson.

Bol 1998
Bol, R. 1998. *Amazones Volneratae: Untersuchungen zu den Ephesischen Amazonenstatuen*. Mainz: Philipp von Zabern.

Borbein 1996
Borbein, A. H. 1996. "Polykleitos." In *Personal Styles in Greek Sculpture*, ed. O. Palagia and J. J. Pollitt, 66–90. Cambridge: Cambridge University Press.

DNO
Der Neue Overbeck (DNO): Die antiken Schriftquellen zu den bildenden Künsten der Griechen, ed. S. Kansteiner et al. 5 vols. Berlin: De Gruyter.

Franciosi 2003
Franciosi, V. 2003. *Il "Doriforo" di Policleto*. Napoli: Jovene Editore.

Furtwängler 1893
Furtwängler, A. 1893. *Meisterwerke der griechischen Plastik*. Leipzig and Berlin: Giesecke & Devrient.

Hafner 1997
Hafner, G. 1997. *Polyklet, Doryphoros. Revision eines Kunsturteils.* Frankfurt: Fischer Taschenbuch.

Jahn 1851
Jahn, O. 1851. "Zu Plinius." *RhM* 9: 315–20.

Linfert 1990
Linfert, A. 1990. "Die Schule des Polyklet." In *Polyklet: Der Bildhauer der griechischen Klassik*, ed. H. Beck, P. C. Bol, and M. Bückling, 240–97. Frankfurt: Philipp von Zabern.

Mattusch 2005
Mattusch, C. C. 2005. *The Villa dei Papiri at Herculaneum: Life and Afterlife of a Sculpture Collection*. Los Angeles: J. Paul Getty Museum.

Pfanner 1989
Pfanner, M. 1989. "Über das Herstellen von Portäts." *JdI* 104: 157–257.

Pollitt 1990
Pollitt, J. J. 1990. *The Art of Ancient Greece: Sources and Documents*. Cambridge: Cambridge University Press.

Raeder 1983
Raeder, J. 1983. *Die statuarische Ausstattung der Villa Hadriana bei Tivoli.* Frankfurt am Main and Bern: Peter Lang.

Raubitschek 1949
Raubitschek, A. E. 1949. *Dedications from the Athenian Akropolis: A Catalogue of the Inscriptions of the Sixth and Fifth Centuries B.C.* Cambridge, MA: Archaeological Institute of America.

Richter and Smith 1984
Richter, G. M. A., and R. R. R. Smith. 1984. *The Portrait of the Greeks*. Ithaca: Cornell University Press.

Rolley 1999
Rolley, C. 1999. *La sculpture grecque*. Vol. 2: *La période classique*. Paris: Picard.

Sengoku-Haga et al. 2015
Sengoku-Haga, K., Y. Zhang, M. Lu, S. Ono, T. Oishi, T. Masuda, and K. Ikeuchi. 2015. "Polykleitos' Works 'from One Model': New Evidence Obtained from 3D Digital Shape Comparisons." In *New Approaches to the Temple of Zeus at Olympia*, ed. A. Patay-Horváth, 201–22. Newcastle upon Tyne: Cambridge Scholars Publishing.

Stewart 1990
Stewart, A. 1990. *Greek Sculpture: An Exploration*. 2 vols. New Haven and London: Yale University Press.

Stewart 1995
Stewart, A. 1995. "Notes on the Reception of the Polykleitan Style: Diomedes to Alexander." In *Polykleitos, the Doryphoros, and Tradition*, ed. Warren G. Moon, 246–61. Madison: University of Wisconsin Press.

Vierneisel-Schlörb 1979
Vierneisel-Schlörb, B. 1979. *Klassische Skulpturen des 5. und 4. Jahrhunderts v. Chr.* Glyptothek München, Katalog der Skulpturen 2. Munich: C. H. Beck.

Vollkommer 2001
Vollkommer, R., ed. 2001. *Künstlerlexikon der Antike*, 2 vols. Munich and Leipzig: K. G. Saur.

Weber 1976
Weber, M. 1976. "Die Amazonen von Ephesos." *JdI* 91: 28–96.

Weber 2008
Weber, M. 2008. "Neues zu den Amazonen von Ephesos." *Thetis* 15: 45–56.

Zhang et al. 2013
Zhang, Y., M. Lu, B. Zheng, T. Masuda, S. Ono, T. Oishi, K. Sengoku-Haga, and K. Ikeuchi. 2013. "Classical Sculpture Analysis via Shape Comparison." In *2013 International Conference on Culture and Computing*, 57–61. http://ieeexplore.ieee.org/document/6680331/.

11.

Looking at the Bronze of Lost Sculptures: The Reception of the Delphic Monument of the Admirals in the Imperial Age

Eva Falaschi, Scuola Normale Superiore, Pisa

The paper focuses on Plutarch's interpretation of the Monument of the Admirals in Delphi and attempts to explain if and how the material (in particular the blue patina of bronze), the state of preservation of the statues, and their style influenced Plutarch's perception and led him to attribute peculiar meanings and values to the group. It investigates also how these issues intertwined with the philosophical, religious, and historical reflections that are part of his discussion of the monument.

✦ ✦ ✦

At the beginning of his writing *On the Pythian Responses* (*De Pythiae oraculis*), Plutarch dedicates several chapters (395b–396c) to the blue patina that characterized bronze Delphian votive offerings. Several studies have tried to give a scientific explanation for this patina and to identify it in artworks brought to light during excavations.[1] This contribution focuses on a different aspect, strictly linked to the reception and perception of art in the Imperial age. Its aim is not to explain what the blue patina is but rather the values and meanings that Plutarch attributed to it, and also how it influenced his interpretation of the Monument of the Admirals.

On the Pythian Responses describes a group of intellectuals walking along the Sacred Way in Delphi. The walk begins at the entrance of the sanctuary and ends in front of the Temple of Apollo. Along the way, various discussions on Delphic philosophy and religion take place, each of them linked to a votive offering that the group looks at.

The first stop along the way is the Monument of the Admirals, as Plutarch points out (*De Pythiae oraculis* 395b, ἀπ' ἐκείνων γὰρ ἤρκται τῆς θέας).[2] It was dedicated by the Spartans after the victory at Aigospotamoi in 405 BC. According to Pausanias (10.9.7–11), it included thirty-eight statues, but at least one more should be added on the basis of preserved inscriptions. Lysander was represented among a number of gods, being crowned by Poseidon; there were also statues of the Spartan navarch Arakos and of the Greek trierarchs who were Spartan allies.[3]

Plutarch (395b) tells us that, in front of this offering, one of the visitors, Diogenianos of Pergamon, is struck by the patina (τοῦ χαλκοῦ τὸ ἀνθηρὸν) that covered the monument, because it is neither like dirt (πίνῳ) nor like verdigris (ἰῷ), but shines with a dark blue dye (βαφῇ δὲ κυάνου στίλβοντος). This observation provokes a discussion of the origin of that patina, which is considered an alteration, a deterioration of the bronze. According to Theon, it is subject (πεπονθὼς) to the action of air (395d).

At first it does not seem that Plutarch intends to refer to the patina of the Monument of the Admirals in particular. In fact, he describes (395a–b) with a bit of irony the guides who bore the visiting intellectuals with tedious explanations of all the sanctuary's inscriptions; he reports that Diogenianos was not interested in the appearance and artistic merit of the statues (ἡ μὲν ἰδέα καὶ τὸ τεχνικὸν), because he had already seen beautiful artworks elsewhere. He does, however, admire the blue patina of the statues (ἐθαύμαζε δὲ τοῦ χαλκοῦ τὸ ἀνθηρὸν), in particular that of the group of the Admirals. This means that, according to Plutarch, the blue patina was not a feature just of the Monuments of the Admirals but also characterized at least some of the bronze statues nearby.[4] Therefore, it is first of all necessary to understand why he chose this specific monument for developing his reflections.

The visual impact of the Monument of the Admirals certainly played an important role in Plutarch's choice. Comprising at least thirty-nine bronze statues, it was a very impressive monument, and the peculiarity of Delphic bronze would have been extremely evident there. Even before entering the gate of the sanctuary, one could see the monument looming over the walls of the sacred precinct.

Moreover, the monument stood at the entrance of the sanctuary and this corresponds well with Plutarch's need to deal with the issue of the patina at the beginning of the walk. *On the Pythian Responses*, in fact, is first of all a theological and philosophical text and this aspect obviously influences how Plutarch looks at artworks.[5] The walk along the Sacred Way is an ascent to the Temple of Apollo and to the heart of the discussion, which is the responses of the Pythian oracles and how they changed through time. All the issues discussed along the way are a preparation for that main discussion. In this perspective, the debate on the patina is suited to be the first one, because it is linked to substance and physics. In other words, it is a perfect bridge between art and its materiality on one side and philosophy and its physical theories on the other.[6] Therefore, also Plutarch's explanation of the patina is deeply linked with the sanctuary and Delphic religion.[7]

Nonetheless, the Monument of the Admirals was not the only significant bronze monument at the entrance of the sanctuary. While the group of Admirals was certainly impressive for the number of its statues, there was nearby at least one other equally impressive bronze offering, the bull dedicated by the Korkyreans (Corcyraeans), which was over life-size. Because it stood on a high base, the bull also appeared in the visitor's field of vision before entering the gate, above the wall.[8] Similarly, we can assume that the Admirals' group was renowned in part because it celebrated an important victory, the one at Aigospotamoi, but just near it there was also a base by Pheidias celebrating Marathon.[9]

In conclusion, location, visual impact, and fame are not in and of themselves sufficient reasons to justify Plutarch's choice. The mention of the group is rather connected to its interpretation: in the case of the Admirals, the blue patina made the statues look, to Diogenianos's eyes, very like sea creatures in their surface color and deeper than the ocean (οἷον ἀτεχνῶς θαλαττίους τῇ χρόᾳ καὶ βυθίους).[10] It seems that Plutarch is playing with history here. In fact, the reference to the color of the sea seems, primarily, an allusion to the naval battle the monument celebrated. Except for the gods, the figures were mainly those of the men who commanded the victorious ships at Aigospotamoi, so that a sea-blue patina made them look like real "men of the sea." But θαλάττιος also means something that is "*in* or *of* or *on* or *from* the sea."[11] Thus another interpretation suggests itself. Perhaps Plutarch, in writing this passage, also had in mind bronze statues that were actually found in the sea. This phenomenon was not unfamiliar to the ancients, as we know from a famous relief from Ostia representing statues in a fishermen's net.[12]

Plutarch refers twice to the Spartan Monument as the monument "of the Admirals" (*De Pythiae oraculis* 395b, πρὸς τοὺς ναυάρχους; *Lysander* 18.1, τῶν ναυάρχων[13]), and this is the name commonly used today, although from a historical point of view it is erroneous. In fact, only Arakos was navarch at Aigospotamoi. He was elected because Lysander, who was navarch the year before, could not assume that role again. Instead, Lysander was vice-navarch, while all the other men represented in the Delphian monument were trierarchs. Historical mistake or not, from Plutarch's perspective all the commanders are put on the same level, so that the impression of *concordia* and unity among Greek cities is stressed. Since this is a very important theme in Plutarch's reading of the past and present history of Greece and also in his interpretation of the votive offerings in Delphi,[14] we can conclude that the philosopher attributed to the Monument of the Admirals a peculiar political, historical, and social meaning and considered it an apt symbol of *concordia*.

Lysander was undoubtedly the main character of the monument; nonetheless, when Plutarch wants to mention a portrait of him (*Lysander* 1.1), he refers to a marble statue in the Treasury of Brasidas and the Akanthians.[15] The indication of the material (λίθινον) serves, together with information on the statue's exact position inside the treasury (τὸν ἐντὸς ἑστῶτα τοῦ οἴκου παρὰ ταῖς θύραις λίθινον ἀνδριάντα), first of all to identify the statue. In describing it, Plutarch is interested in just a few features: the long beard and hair, according to the ancient Spartan tradition. He interprets this tradition as a rule established by Lykourgos: according to the Spartan ruler, long hair made beautiful men more fascinating and ugly men more fearsome. We can conclude that, in Plutarch's opinion, Lysander belonged to one of these two categories, though it is not clear which one, and his marble portrait mirrored this feature very well, probably better than his portrait in the Monument of the Admirals. Plutarch's preference could also be due to a different way of representing the Spartan commander and/or an inferior state of preservation of the bronze statue. In fact, we should also take into consideration that, unlike the Admirals' group, Lysander's marble statue was set inside a building, so that it was not subjected to atmospheric agents.

As a priest in Delphi, Plutarch knew very well the histories and myths connected to the sanctuary, and, above all, he had access to its archives. For this reason, his interpretation of the marble statue of Lysander is particularly interesting. According to him, the statue was usually identified with Brasidas because of the name of the treasury itself. But it seems he had further information confirming that, indeed, it represented Lysander.

The doubtful identification of the statue seems to suggest, first of all, that at least in Plutarch's time the statue in the treasury did not have an inscription.[16] Although the philosopher does not state where he learned that the statue was Lysander, it is possible to propose a hypothesis about his source. In the *Life of Lysander* (18.2), he reports that according to Anaxandrides of Delphi (Ἀναξανδρίδης δ' ὁ Δελφὸς ἱστορεῖ), Lysander had left a gold and ivory trireme in the Treasury of Brasidas and the Akanthians. Consequently, we can conclude that Anaxandrides was certainly one of his sources on the connections between Lysander and the Treasury of Brasidas and the Akanthians. Therefore, it is possible that the identification of the marble statue as Lysander—and not Brasidas, as usual—also came from Anaxandrides.

Plutarch refers to a Delphic marble statue of Lysander again in *On the Pythian Responses* (397f), when he reports the extraordinary event that happened after the battle of Leuktra in 371 BC: the face of Lysander's statue was covered in grass (ὁ δ' αὐτοῦ <τοῦ> Λυσάνδρου λίθινος ἀνδριὰς ἐξήνθησεν ἀγρίαν λόχμην καὶ πόαν τοσαύτην τὸ πλῆθος, ὥστε κατακρύψαι τὸ πρόσωπον).

The event was very famous and is recorded also by Cicero, who gives a slightly different version: according to Cicero, the grass did not cover Lysander's face but made a corona around his head (Cicero *De divinatione* 1.34.75: in Lysandri, qui Lacedaemoniorum clarissumus fuerat, statua, quae Delphis stabat, in capite corona subito exstitit ex asperis herbis et agrestibus).

Plutarch's reference to marble and the use of the article *ὁ* encourages us to identify the statue with the one in the Treasury of Brasidas and the Akanthians,[17] as if it was *the* marble statue of Lysander par excellence. Nonetheless, it seems a bit odd that such a famous event was connected to a statue whose identification was not clear and which was usually identified as Brasidas. It is, then, possible that another marble statue of Lysander was in the sanctuary. In either case, Plutarch intends the reference to marble as a way to distinguish this statue from another, probably from the most famous: that in the Monument of the Admirals, which was mentioned at the beginning of *On the Pythian Responses*.

Conclusion

In conclusion, Plutarch's description of Lysander's monuments in Delphi reveals a use of the material—bronze or marble—first of all to distinguish between two different statues. In the case of the group of the Admirals, the deterioration of the bronze and the formation of the blue patina became a means of interpreting the monument in light of the event it celebrated and of its connection with the sea. Moreover, the discussion of the origin of the patina, which is due to the Delphic air, introduces the philosophical nature of the writing and represents the first step in the theological reflection that Plutarch intends to develop. Therefore, the bronze and its patina also assumes a philosophical and religious value: it is peculiar to the sanctuary of Delphi and strictly linked to Apollo. In Plutarch's view, the bronze becomes more than bronze and a bronze statue more than just the sum of its technique and aesthetic appearance. The material assumes both a historical and a philosophical value and becomes the key of Plutarch's interpretation of the Monument of the Admirals.

✦ ✦ ✦

Notes

1. Jouanna 1975; Pouilloux 1986; Craddock and Giumlia-Mair 1993a, 1993b; Giumlia-Mair and Craddock 1993, 15–17; Giumlia-Mair and Lehr 1998; Giumlia-Mair et al. 2000; Giumlia-Mair 2001a, 2001b; Giumlia-Mair 2008, 269–73; Franke and Mircea 2005.
2. The text is cited from Schröder 1990.
3. On the Monument of the Admirals, see Bommelaer 2015, 132–34 (with further bibliography). During a conference at the Scuola Normale Superiore, Pisa, in June 2016, Anne Jacquemin presented a new reconstruction of the monument by D. La Roche, which is going to be published.
4. Jouanna 1975, 69–70.
5. Flacelière 1964, 208.
6. Falaschi 2015, 49–51.
7. Pouilloux 1986; Zagdoun 1995, 589–90; Ildefonse 2006, 60–63, 259.
8. On the Corcyraean Bull, see Bommelaer 2015, 126–27 (with further bibliography).

9. On the Marathon Base, see Bommelaer 2015, 135 (with further bibliography).
10. For the explanation of this expression, see Schröder 1990, 117; Ildefonse 2006, 259 n. 22.
11. LSJ Online, s.v. "θαλάσσιος."
12. Ostia, Museo Nazionale inv. 157 (from Ostia, first century BC).
13. The text is from Angeli Bertinelli et al. 1997.
14. See, for example, Plutarch *Flamininus* 11.6; *Timoleon* 29.5–6; *Philopoemon* 8.3. On this issue, see Falaschi 2015, 53–55.
15. On the Treasury of Brasidas and the Akanthians, see Bommelaer 2015, 188–90 (with further bibliography).
16. Angeli Bertinelli et al. 1997, 124.
17. Angeli Bertinelli et al. 1997, 124–25.

Bibliography

Angeli Bertinelli et al. 1997
Angeli Bertinelli, M. G., M. Manfredini, L. Piccirilli, and G. Pisani. 1997. *Le vite di Lisandro e Silla*. Milan: Mondadori.

Bommelaer 2015
Bommelaer, J. F. 2015. *Guide de Delphes: Le site*. 2nd rev. ed. Sites et Monuments 7. Athens and Paris: École française d'Athènes; De Boccard.

Craddock and Giumlia-Mair 1993a
Craddock, P. T., and A. R. Giumlia-Mair. 1993a. "Beauty Is Skin Deep: Evidence for the Original Appearance of Classical Statuary." In *Metal Plating and Patination: Cultural, Technical and Historical Developments*, ed. S. La Niece and P. Craddock, 30–38. Oxford: Butterworth-Heinemann.

Craddock and Giumlia-Mair 1993b
Craddock, P. T., and A. R. Giumlia-Mair. 1993b. "Hsmn-Km, Corinthian Bronze, Shakudo: Black-patinated Bronze in the Ancient World." In *Metal Plating and Patination: Cultural, Technical and Historical Developments*, ed. S. La Niece and P. Craddock, 101–27. Oxford: Butterworth-Heinemann.

Falaschi 2015
Falaschi, E. 2015. "BIOI POIKILOI: Le biografie dei pittori negli scritti di Plutarco." PhD diss., Scuola Normale Superiore, Pisa.

Flacelière 1964
Flacelière, R. 1964. *Sagesse de Plutarque*. Paris: Presses Universitaires de France.

Franke and Mircea 2005
Franke, W. A., and M. Mircea. 2005. "Plutarch's Report on the Blue Patina of Bronze Statues at Delphi: A Scientific Explanation." *Journal of American Institute of Conservation* 44: 103–16.

Giumlia-Mair 2001a
Giumlia-Mair, A. R. 2001a. "Alchemy and Surface Treatments in Antiquity." In *Surface Modification Technologies XIV: Proceedings of the 14th International Conference on Surface Modification Technologies (Paris, September 11–13, 2000)*, ed. T. S. Sudarshan and M. Jeandin, 404–11. Scarborough, Ontario: Emptek Publishing.

Giumlia-Mair 2001b
Giumlia-Mair, A. R. 2001b. "Colouring Treatments on Ancient Copper-alloys." *La Revue de Métallurgie* 98: 767–76.

Giumlia-Mair 2008
Giumlia-Mair, A. R. 2008. "Antiche tecniche di colorazione dei metalli." In *Colore e arte: storia e tecnologia del colore nei secoli: Atti del convegno AIAr Associazione Italiana di Archeometria, Metodologie Scientifiche per i Beni Culturali, Firenze, 28 febbraio–2 marzo 2007*, ed. M. Bacci, 259–75. Bologna: Patron Editore.

Giumlia-Mair and Craddock 1993
Giumlia-Mair, A. R., and P. T. Craddock. 1993. *Corinthium aes: Das schwarze Gold der Alchimisten*. Zaberns Bildbände zur Archäologie 11. Mainz am Rhein: Verlag Philipp von Zabern.

Giumlia-Mair and Lehr 1998
Giumlia-Mair, A. R., and M. Lehr. 1998. "Patinating Black Bronzes: Texts and Tests." In *The 4th International Conference on the Beginning of the Use of Metal and Alloys (BUMA-IV): Kunibiki Messe, Matsue, Shimane, Japan. May 25–28, 1998*, 103–8. Aoba: BUMA-IV Organizing Committee, Japan Institute of Metals.

Giumlia-Mair et al. 2000
Giumlia-Mair, A. R., S. Meriani, and E. Lucchini. 2000. "Antiche patine artificiali e rivestimenti su leghe a base di rame." In *Atti del I° Congresso Nazionale di Archeometria AIAr (Verona 2–4 Dicembre 1999)*, 171–84. Bologna: Patron Editore.

Ildefonse 2006
Ildefonse, F. 2006. *Plutarque: Dialogues pythiques*. Paris: Flammarion.

Jouanna 1975
Jouanna, M. 1975. "Plutarque et la patine des statues a Delphes (Sur les oracles de la Pythie 395b–396c)." *RPhil* 39: 67–71.

Pouilloux 1986
Pouilloux, J. 1986. "L'air de Delphes et la patine du bronze." In *D'Archiloque à Plutarque: Littérature et réalité: Choix d'articles de Jean Pouilloux*, 267–79. Collection de la Maison de l'Orient Méditerranéen 16. Série épigraphique 1. Lyon: Maison de l'Orient et de la Méditerranée Jean Pouilloux. Originally published in *RÉA* 67 (1965): 54–66.

Schröder 1990
Schröder, S. 1990. *Plutarchs Schrift* De Pythiae Oraculis. Beiträge zur Altertumskunde 8. Stuttgart: Teubner.

Zagdoun 1995
Zagdoun, M. 1995. "Plutarque à Delphes." *RÉG* 108: 586–92.

12.

Mobility and Migration: Issues Concerning Itinerant Sculptors

Martin Horne, Indiana University, Bloomington, Indiana

The economic considerations involved in ancient sculptural production share recognizable characteristics with the concerns of sculptors from subsequent periods. Recent study of the modern "creative class" has led scholars of anthropology to examine additional factors affecting employment opportunity, such as cultural, logistical, and legal influences that motivate mobility. These same principles may help us to focus our perception of the ancient sculptors' trade beyond the fragmentary body of epigraphic, archaeological, and literary evidence. This paper briefly considers the financial pressures upon sites of sculptural production before embarking on an analysis of legal factors that would affect individual sculptors seeking improved employment opportunities throughout the Classical world. The wealth of epigraphic information from statue bases on Rhodes and logistical documents at Athens provide a body of evidence ideally suited to study how this broader conception of external pressures relates to sculptors and workshops of antiquity.

✦ ✦ ✦

Our understanding of the ancient sculptor's profession, like so much of ancient sculpture itself, is fragmentary. The particulars of ephemeral facets such as training and organization come primarily from literary sources, supplemented by meager evidence found at sites of bronze and marble sculpture production. As a result, the clearest picture forms around the major figures of antiquity such as Praxiteles and Pheidias, who, according to ancient accounts, were sought out to complete major works across the Aegean.[1] While we cannot fault encyclopedists, principally Pliny the Elder and Pausanias, for focusing their comments on notable pieces and creators, their perspectives are their own; it is rather our understanding of their accounts that deserves critical reexamination. A passing analysis of these literary accounts skews our understanding of the broader system of employment for all sculptors toward a series of major commissions.[2] It is perhaps more accurate to consider commissions, or *patroned* work, as exceptional highlights rather than reflecting the trade more generally.[3] This perspective raises important questions such as: What would have occupied the intervening years of a patron-less sculptor's career? Were there periods during which he was actively seeking employment at sites of sculptural production? I will argue that in order to understand *un-patroned* employment and its relation to mobility, it is prudent to turn to approaches typically considered ancillary to the study of art. These include the modern study of migration dynamics as well as logistical and contractual documents within the epigraphic record.[4] Sculptors of the ancient world were, after all, engaged in a commercial enterprise and reliant upon monetizing their material output.[5] In the case of sculpting for large-scale architectural projects, we are fortunate to have documentation pertaining to the experiences of such individuals. This essay draws on these important bodies of evidence, identifying where pay rate, job type, and civic status affected the employment of sculptors and their apparent movement to locations of opportunity. These sources of information can be correlated with epigraphic evidence from Athens and Rhodes, which demonstrate the economic pressures on two diverse types of work settings: architectural projects and static workshops. By identifying common legal and economic catalysts, it becomes possible to broaden our understanding of the working lives of bronze and marble sculptors in antiquity.[6]

As previously mentioned, our sources on the ephemeral aspects of production are limited; even Lucian's colorful account of stone sculpting is largely devoid of useful details.[7] We will see in Athens that, in the case of large-scale architectural projects, the practice of documenting expenditures provides valuable information regarding employment of figural sculptors. The temporary nature of such projects adds an additional consideration when contemplating the effect upon workmen with niche skills. The Athenian Building Commission's records of the Erechtheion's construction from 409 to 405 BC, found on fragmentary marble slabs, include individual workmen's roles, pay, period of employment, and civic status (fig. 12.1).[8] Richard Randall Jr. has drawn several important conclusions about the organization of these laborers, sculptors included. First, workmen of mixed status (slave, *metic*, and citizen) labored side by side on tasks of similar complexity while earning an equal sum during this third phase of construction.[9] In the case of skilled slave labor, earnings would have been given directly to the slave's owner.[10] Considering the equality of pay, one must ask what factors affected the initial selection of workmen. Were there factors outside of the familiar facets of opportunity: resources (individuals possessing the necessary skills) and positional factors (availability of workers)? The second interesting piece of information gleaned from the marble fragments is that individual craftsmen engaged in more than one trade. The *metic* Agathanor, for example, worked as a sculptor on two projects (likely carving the Erechtheion's small frieze figures) and as a wax modeler for the ceiling coffers, as documented by job title and its associated pay (table 12.1). Randall goes on to point out that Agathanor was not the only individual engaged in multiple trades. These craftsmen sought to capitalize on the availability of work provided by complex multifaceted projects. With this information, one begins to see the value of investigating the context of logistical data as a corrective to preconceived notions of absolute trade specialization and assumptions privileging "artists" over craftspeople.

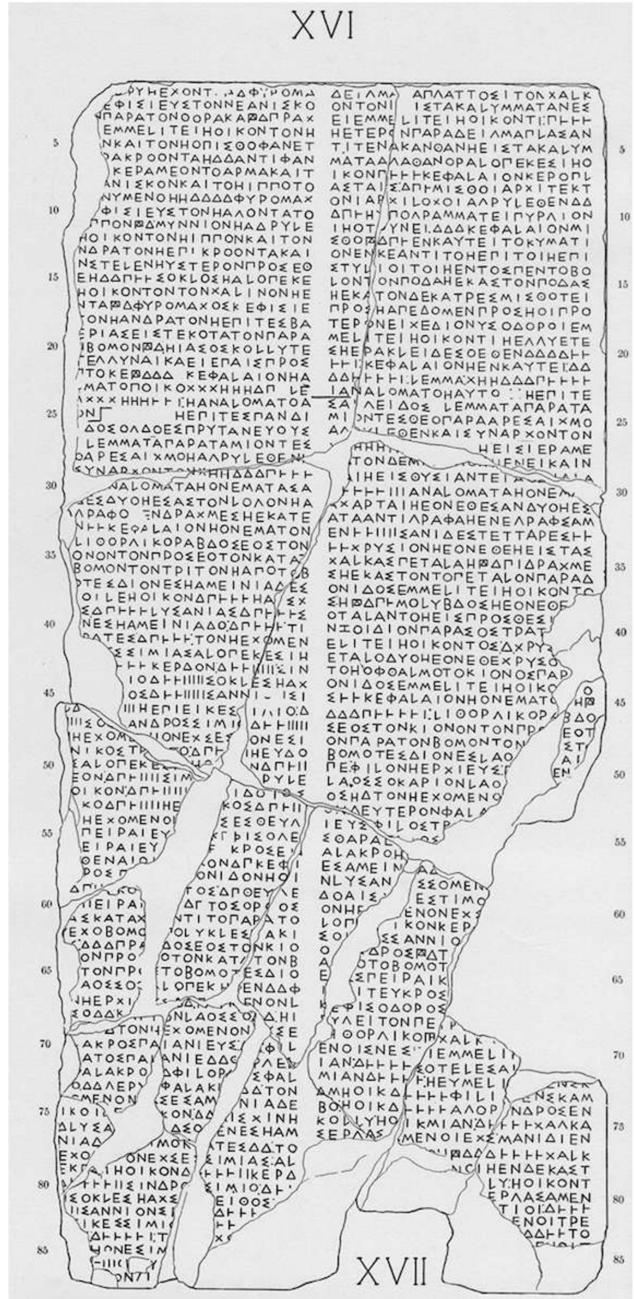


Figure 12.1. Fragment of the Erechtheion construction record of the Athenian Building Commission, ca. 409–405 BC. After Paton, Caskey, and Stevens 1927

Name	Carpenter	Joiner	Laborer	Mason	Modeler in Wax	Sculptor	Woodcarver
Aganthor - *metic*					1	2	
Gerys - slave (Philokles)	2		1				
Kephisodoros - *metic*			1	4			
Kerdon - slave			1	4			
Kroisos - slave	3	1					
Manis - *metic*	2	2	2				1
Mikion - *metic*	3		1				
Sindron - slave			1	4			
Neseus - *metic*					1		1
Teukros - *metic*			1	3			
Theodotos - citizen	1						1
Numbers denote the frequency of working a specific trade.							

Table 12.1. Erechtheion craftsmen working in more than one trade. Athenian Building Commission, ca. 409–405 BC. After Randall 1953

Delving further into the numerical data of the Erechtheion construction project, the details of civic status, compensation, and tenure provide clues to the larger picture of the *un-patroned* sculptor's profession. It should be reiterated that these architectural engagements are by definition temporary; however, the specifics of sculptors' terms of employment illustrate the necessity of constantly pursuing new opportunities. In this phase of construction, attributed to the aforementioned inscriptions, the sculptors were carving small-scale figures for the frieze on the north porch.[11] In Randall's assessment, these nine sculptors were paid the rather modest sum of sixty drachmae per figure, an amount comparable to what masons were paid for carving a similarly sized block of stone.[12] In looking at the sculptors on a neighboring project, the Parthenon pediment, Alison Burford noted that sculptors were paid a sum comparable to the woodworkers and masons, the equivalent of 1.5 to 2 drachmae per day.[13] Simplifying the numbers in this way leads to the conclusion that workmen were similarly compensated regardless of their technical proficiency. The second point of concern is that the changing terms of payment—that is, wages payable on completion of individual frieze figures versus a contract or daily wage—suggest a day-to-day arrangement that was economically efficient for the project foremen but insecure for the sculptors. Here is where the modern study of migration dynamics can be most effectively applied, helping us understand how similar practices affected opportunity and motivated individuals' mobility.

The movement of people for political, social, economic, and other reasons is clearly visible in the historical records of antiquity. Changing circumstances often motivated individuals to relocate to more stable and profitable environs.[14] For those with financial motives, the primary governing factor remains improved opportunity. Scholars of the past decades have sought to elucidate and quantify the extramonetary motives that act upon those seeking permanent working situations, as well as those favoring a transient experience. In his 1984 article "The Logic of Opportunity and Mobility," John Skvoretz seeks to refine the working model around which social scientists had constructed the study of upward movement within contemporary structured labor environments.[15] Previous studies had been limited to considerations of position availability and numbers of applicants. Skvoretz suggests that additional facets play a significant role in calculating an individual's potential for movement, principally (1) timing (as a function of periods of high demand versus low demand), (2) skills possessed by the individual, and (3) the availability of positions in a given environment.[16] More recently, scholars have expanded considerations to include dimensions such as gender and race.[17] The original tripartite conception of the governing factors must thus be reconsidered as a matrix of dimensions, each of which exerts a degree of influence upon the modern or ancient laborer's ability to pursue new opportunities. It is difficult to apply Skvoretz's statistical models to an ancient context; however, incorporating dimensions of identity including citizenship, ethnicity, and civic status into a sculptor's *opportunity exposure* allows for a more complex understanding of forces acting upon *un-patroned* practitioners of the sculptural trade.

The machinations of the Athenian bureaucracy would have placed added financial hardship on the *metic* craftsmen residing in the city: foreign merchants and craftspeople were required to pay a special market tax in order to sell their wares on the Agora.[18] While this would not have immediately affected the Erechtheion workmen, their counterparts working in terracotta and with small-scale bronzes would have felt this pressure. Those *metics* who chose to reside in the city for any length of time were also required to pay a yearly poll tax, regardless of their employment status. In his study of mobility in ancient Greece, Robert Garland points to the writings of Xenophon to show that such taxes brought in a considerable sum to the Athenian treasury. These financial pressures contribute to our understanding of the complex matrix of legal and financial forces acting on non-citizen craftsmen. Despite these specific pressures, it appears that workmen were attracted to Athens as a site of employment, even if only on a temporary basis.

The prevalence of *metics* in artisanal trades is mirrored in the now familiar records of Erechtheion's construction.[19] Of the total workforce employed during this phase of construction, *metics* predominate: 42 *metics* versus 24 citizens and 20 slaves (table 12.2). A useful point of comparison is the construction of another monumental building project, the sanctuary at Eleusis dating between 329/328 and 319/318 BC.[20] According to documentary inscriptions, *metic* workmen once again outnumber citizens, but here only by a small margin.[21] The trend in civic status of workers on these two projects is reflected in the smaller sample of sculptors employed to carve the Erechtheion's frieze: of 9 total, 5 were *metic*, 3 were citizens, and 1 was of unknown status. The logistical concerns of the commission's records provide us with information on these individuals beyond just their names. Randall suggests that the bulk of the *metic* workforce did not remain in Athens waiting for more work.[22] While his assessment is based on the relatively small detail of stylistic comparanda from a single other architectural project, the weight of the aforementioned terms of employment and tax-related concerns provide strong supporting evidence for the sculptors' itinerant lifestyle.[23] It appears that Pliny's celebrity sculptors differed from their compatriots not in their ability to travel but in the reasons for their mobility: commissions by wealthy patrons, rather than external financial pressures.

In order to more fully understand the role of financial pressures in sculptors' mobility, the scope of their settings must be widened to include a second source of non-commission employment: static workshop sites such as Rhodes. Here the potential for sustained employment offered new opportunities to *metic* sculptors in stone and bronze.

In stationary sculptural workshops, the financial concerns were generally similar to those in architectural projects, that is, the costs of materials and labor—of technicians, carvers, and/or painters. In the case of bronze sculpting, these concerns were evident in several measures for cutting material costs, such as hollow casting for large-scale pieces.[24] This and other innovations demonstrate a clear financial concern in the function of the bronze-workshop at sites such as those on Rhodes, documented by Chris Kantzia and Gerhard Zimmer.[25] While literary accounts attest to a high volume of production comparable to major civic centers, Rhodes is unique in that statue bases belonging to locally commissioned pieces provide a detailed epigraphic record of production by specific named sculptors. The density of signatory inscriptions has allowed scholars such as Virginia Goodlett to reconstruct several Rhodian family workshops and to calculate the number of local and *metic* sculptors, which appears to be considerable.

	Citizens	Metics	Slaves	Unknown	Total
Architects	2				2
Under-Secretary	1				1
Guard				1	1
Mason	9	12	16	7	44
Sculptors	3	5		1	9
Wax Modelers		2			2
Woodcarvers	1	5		1	7
Carpenters	5	7	4	3	19
Sawyers		1		1	2
Joiner		1			1
Lathe Worker				1	1
Painters		2		1	3
Gilder		1			1
Laborers	1	5		3	9
Unknown Trade	2	3		2	7
Total	24	42	20	21	107

Table 12.2. Breakdown of trades of Erechtheion workmen by civic status. Athenian Building Commission, ca. 409–405 BC. After Randall 1953

According to Goodlett's calculations, the height of Rhodes's sculptural production correlates to a numerical superiority of statue bases bearing foreign sculptors' signatures (fig. 12.2). The profusion of foreign craftsmen suggests an analogous environment of positional opportunity akin to the aforementioned architectural projects. Bronze sculptors were aware of these opportunities in Rhodes and sought to capitalize on the demand.[26] The largest proportion of individuals came from Athens and, later, Asia Minor. In the years 250–200 BC, approximately 60 statues were produced and the same number in the following fifty years (fig. 12.3).[27] The same periods reveal a sample of 11 citizen versus 19 foreign signatures, and 12 citizen versus 16 foreign signatures, respectively.[28] Goodlett points out that during the specific period of 250–167/166 BC, the *metic* sculptors must have been itinerant, since their signatures appear on only one piece.[29] Once again, we are confronted with the question: what affected these individuals' short tenure? In this case the circumstances of production did not generate the type of detailed logistical documentation seen at the Erechtheion's construction; however, the assumption that sculptors on Rhodes were employed under similar circumstances (e.g., per-unit compensation) is suggested by inscriptions detailing individual commissions from the fourth to second century.[30] Another contributing factor to the transience of foreign sculptors on Rhodes could have been the island's economic downturn in the mid-second century BC, which surely affected local demand. The latter circumstance explains the general decrease in production by way of decreased patronage, but does not directly address the short-term stay of itinerant sculptors during the earlier decades of prosperity. Goodlett provides a possible explanation in her analysis of the puzzling numerical inversion of foreign versus Rhodian signatures from 100 to 50 BC.[31] She suggests that the structure of Rhodian citizenship followed Athenian precedent in regard to the exclusivity of land ownership, making it difficult for *metics* to establish permanent workshop facilities. If these administrative systems were as closely related as Goodlett suggests, it is possible that there was an added tax burden on foreigners in Rhodes like the one described by Xenophon for Athens. As a hub of maritime commerce, Rhodes was well positioned to capitalize on this potential tax base of *metic* merchants and craftsmen.[32] With unpredictable opportunities for employment and external financial pressures, sculptors would have felt compelled to keep moving, seeking a more favorable positional opportunity. At this point the notion that mobility was key to sculptors of various media at temporary as well as static production sites becomes more attractive; yet there are far more questions to answer about the trade and other sites.

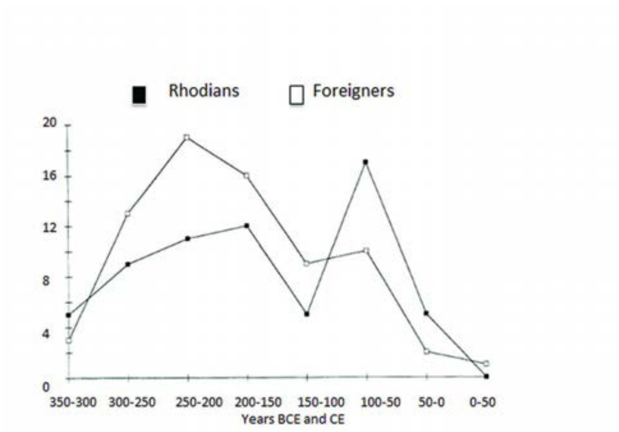


Figure 12.2. Sculptor's ethnics (citizenship) on statue bases of Hellenistic Rhodes. After Goodlett 1991

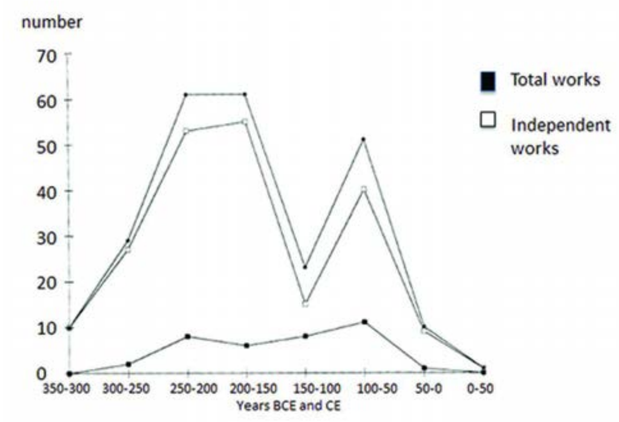


Figure 12.3. Sculpture production in Hellenistic Rhodes (350 BC–AD 50). After Goodlett 1991

The full reality of the ancient sculptors' trade is difficult to discern from the meager evidence left to us. Scholars have wrestled with literary testimony, visual documentation, and physical evidence associated with the constructive process. In many cases, it has proven invaluable to our understanding of physical materials, yet the greater challenge remains in explaining the ephemeral facets of the trade. By adopting new approaches such as migration dynamics and analyzing ancillary data at sites of production, we can begin to reconstitute the working lives of sculptors and their mobility through their environment. These *un-patroned* individuals certainly constitute a larger proportion of the workforce than those we know from literary accounts. After all, it was the *un-patroned* sculptors and technicians whose assistance was required in the creation of Pliny's masterworks.

✦ ✦ ✦

Acknowledgments

I would like to thank the organizers of the XIXth International Bronze Congress for the opportunity to present my initial thoughts on the subject. The helpful comments provided by various individuals greatly aided subsequent thought on the subject, notably the earliest discussions with Carol Mattusch.

Notes

1. Pliny *Naturalis historia* 36.20, 34.69; Pausanias 8.9.1, 1.23.7, 10.37.1.
2. The passing accounts of familial workshops such as those of Polykleitos and Polykles detail specific works and their varied locations.
3. The use of the term *patroned* refers to the active pursuit of a sculptor by a patron. Conversely, the *un-patroned* individual is the active party seeking work from a patron.
4. Bennett (2010) and Boren and Young (2013) approach the subject of creatives' mobility as a function of attracting said individuals.
5. Here the distinction between sustained sponsorship by a patron and specific commissions must be elucidated.
6. Classical Athens and Hellenistic Rhodes are notably distinct; however, their shared model of governance and legal distinctions allows for important comparisons to be drawn.
7. Lucian *Somnium* 130: 222–23.
8. *IG* 1.324.
9. Randall 1953, 203. Burford (1974, 34) comes to the same conclusion in her later study of the Parthenon construction. Mossé 1969 expresses the same sentiment, though he conflates several contributing factors. Randall addresses the high proportion of non-citizen workmen, suggesting that naval engagements drew from the reserves of citizen workmen, contributing to the reliance upon *metic* laborers. Garland (2014, 163) suggests that *metic* men were also pressed into service by the Athenian state in times of war.
10. Mossé 1969, 29.
11. Randall 1953, 199. The famous caryatid porch had already been completed by this point.
12. Randall 1953, 207.
13. Burford 1974, 34.
14. MacDonald (1981) provides a contrast between utilitarian (and more accessible) pottery and the luxury of sculpture, which must be considered.
15. Skvoretz 1984 analyzes several competing theories but this discussion is limited to his critique of Sørensen (1976), Cohen (1972), and White (1970).
16. Skvoretz 1984, 73.
17. Skvoretz (1984, 74) points out that mathematical models such as Sørensen's (1976) assume potential movement only within these individual groups.
18. Garland 2014, 156.
19. Randall 1953, 203.
20. Sargent 1924, 40.
21. *IG* 2.834b–c; 4.2.834b.
22. Randall 1953, 203.
23. Randall's assertion is based on commentary by Dinsmoor (1950), who noted a correlation in building construction

between the Erechtheion and the Nereid Monument at Xanthos.

24. Stewart 2015, 43. Stewart and Ma (2013) provide a general idea of material costs, though exact conclusions are difficult to draw due to the small sample of available data.
25. Kantzia 1989; Zimmer 1990. Materials left behind in the pits suggest that they were used on multiple occasions.
26. Goodlett (1991, 676) points out that the Mnasitimos family hired outside sculptors Menippos of Kos and Eukles of Mylasa.
27. Pliny *Naturalis historia* 34.36 asserts that 3,000 bronze statues remained on Rhodes in the first century AD, some two hundred years after the city's fall from power.
28. There is a brief spike in Rhodian sculptors from 100 to 50 BC, which Goodlett attributes to *metic* sculptors gaining citizenship, a rare event. Rostovtzeff ([1941] 1953, 689) argues against any precedent of full citizenship.
29. Goodlett 1991, 675. The small size of Goodlett's sample raises important questions; however, I would suggest that her general hypotheses remain sound.
30. *IG* 12.9.196, 198. Ma (2013, 244) lists numerous instances in which specific costs appear on the associated statue base.
31. Goodlett 1991, 679.
32. See Gabrielsen 1997.

Bibliography

Bennett 2010
Bennett, D. 2010. "Creative Migration: A Western Australian Case Study of Creative Artists." *Australian Geographer* 41: 117–28.

Boren and Young 2013
Boren, T., and C. Young. 2013. "Migration Dynamics of the 'Creative Class': Evidence from a Study of Artists in Stockholm, Sweden." *Annals of the Association of American Geographers* 103: 195–210.

Burford 1974
Burford, A. 1974. *Craftsmen in Greek and Roman Society*. Ithaca: Cornell University Press.

Cohen 1972
Cohen, M. 1972. "An Empirical Foundation for an Explanation of Organizational Mobility." *Human Organization* 31: 291–302.

Dinsmoor 1950
Dinsmoor, W. 1950. *Architecture of Ancient Greece: An Account of Its Development*. London: B. T. Batsford Ltd.

Gabrielsen 1997
Gabrielsen, V. 1997. *Naval Aristocracy of Hellenistic Rhodes*. Aarhus: Aarhus University Press.

Garland 2014
Garland, R. 2014. *Wandering Greeks: The Ancient Greek Diaspora from the Age of Homer to the Death of Alexander the Great*. Princeton: Princeton University Press.

Goodlett 1991
Goodlett, V. 1991. "Rhodian Sculptural Workshops." *AJA* 95: 669–81.

Kantzia 1989
Kantzia, C. 1989. "Rhodische Kolosse: Eine hellenistische Bronzegusswerkstatt." *AA*: 497–523.

Ma 2013
Ma, J. 2013. *Statues and Cities: Honorific Portraits and Civic Identity in the Hellenistic World*. Oxford: Oxford University Press.

MacDonald 1981
MacDonald, B. 1981. "Emigration of Potters from Athens in the Late Fifth Century B.C." *AJA* 85: 159–68.

Mossé 1969
Mossé, C. 1969. *The Ancient World at Work*. Trans. J. Lloyd. New York: Norton.

Paton, Caskey, and Stevens 1927
Paton, J., L. Caskey, and G. Stevens. 1927. *The Erechtheum*. Cambridge, MA: Harvard University Press.

Randall 1953
Randall, R., Jr. 1953. "The Erechtheum Workmen." *AJA* 57: 199–210.

Rostovtzeff [1941] 1953
Rostovtzeff, M. 1953. *Social and Economic History of the Hellenistic World*. Reprint of 1941 original. Oxford: Clarendon Press.

Sargent 1924
Sargent, R. 1924. *The Size of the Slave Population at Athens during the Fifth and Fourth Centuries before Christ*. Urbana: University of Illinois.

Skvoretz 1984
Skvoretz, J. 1984. "Logic of Opportunity and Mobility." *Social Forces* 63: 72–97.

Sørensen 1976
Sørensen, A. 1976. *The Structure of Inequality and the Process of Attainment*. Madison: University of Wisconsin Press.

Stewart 2015
Stewart, A. 2015. "Why Bronze?" In *Power and Pathos: Bronze Sculpture of the Hellenistic World*, ed. J. M. Daehner and K. Lapatin, 34–47. Los Angeles: J. Paul Getty Museum.

White 1970
White, H. 1970. *Chains of Opportunity*. Cambridge, MA: Harvard University Press.

Zimmer 1990
Zimmer, G. 1990. *Griechische Bronzegusswerkstätten: Zur Technologieentwicklung eines antiken Kunsthandwerkes*. Mainz am Rhein: Philipp von Zabern.

Abstract

Praxiteles's Bronze Sculpture at Delphi

Aileen Ajootian, University of Mississippi, Oxford

A statue base (Delphi Museum, inv. no. 3951) discovered in 1896, southeast of the Apollo Temple at Delphi, preserves cuttings for a now lost bronze statue and evidence for the fourth-century Athenian sculptor Praxiteles's commissions in the eastern Mediterranean. The inscription states that the *demos* Abydos, a Milesian colony in Mysia, dedicated a portrait of Chairidemos, son of Antiphanos of Pitania, to Apollo, and that Praxiteles Athenaios made it. Attributed to a shadowy third-century member of the Praxiteles family because of tripuncts (vertical rows of dots) separating some words in the inscription, the monument has been ignored. It does not even appear in Jacquemin's recent publication of inscriptions at Delphi.

A reevaluation of the inscribed text, an examination of the old arguments for the attribution to Praxiteles's hypothetical grandson, and a new look at the stone itself suggest that it should be assigned instead to the famous fourth-century sculptor himself. Furthermore, this base, with another now in the Thebes Museum, provides secure evidence for Praxiteles's production of bronze statues. Overall, the five fourth-century bases from mainland Greece bearing his name all attest to Praxiteles's work as a portrait artist. Delphi 3951, the only surviving Praxitelean votive commissioned by a city instead of a private individual, documents the sculptor's work in bronze at the panhellenic site. Ancient literary sources emphasized Praxiteles's mythological statues, especially his famous marble Aphrodite, but analysis of the archaeological record—fourth-century statue bases bearing his "signature"—reveals a different facet of his artistic profile. The inscribed base for a bronze statue at Delphi sheds new light on Praxiteles.

III. Statuettes

13.

Assertions by the Portable: What Can Bronze Statuettes Tell Us about Major Classical Sculpture?

Beryl Barr-Sharrar, Institute of Fine Arts, New York University

Many surviving Hellenistic and Roman bronze statuettes are variants of lost large-scale works, among them well-known Classical masterpieces. The degree of a statuette's adherence to a statue type, however, is difficult to assess if not unknowable, even when full-size Roman marble copies exist. Thus it is fair to ask just how informative these portable bronzes are regarding the sources of their inspiration. Answering this requires analysis of individual examples and assessment of dates. A group of bronze Hermes statuettes can be seen to be dependent on male figure types generally accepted to have been created by Polykleitos, corresponding in stance and sometimes body structure, if not in gesture. There are several small bronze versions of Polykleitos's Diadumenos that deviate subtly from closely related marble copies of the original. A small bronze Diskobolos is one of two poised in the same complicated posture as the finest Roman marble copy of Myron's fifth-century bronze original (their veracity is suggested by the description of the original by Lucian *Philopseudes* 18) but does not share its Classical style. Among other statuettes provoking problems of truth to prototype, date, and origin are bronze Aphrodites that reflect several distinctive models, not all of which survive in Roman copies.

✦ ✦ ✦

Discussing Polykleitos's Doryphoros in his landmark *Masterpieces of Greek Sculpture* (1895), Adolf Furtwängler included a few bronze statuettes pertinent to his subject. The largest and most important known to him was a statuette from Fins d'Annecy now in the Musée du Petit Palais in Paris (fig. 13.1).[1] Suggestive of Roman marble copies of the Doryphoros with the movement of the arms reversed, Furtwängler said it had previously been identified by Adolf Michaelis and other late nineteenth-century scholars as a copy of the Hermes by Polykleitos mentioned by Pliny as "once in Lysimachea" (*Naturalis historia* 34.55–56) that was contemporary to it and much reduced in scale. Furtwängler had seen the statuette in 1881 in Rouen in the collection of M. Dutuit, with whose name it is still associated, and he described it as showing traces of complete gilding. Similar to the Doryphoros is the stance, with one leg relaxed and placed somewhat back with a raised heel, the head turned toward the weight-bearing leg, and the characteristic equilibrium inexorably linked to Polykleitos and his school.

Furtwängler studied the statuette's proportions and details carefully and, while appreciating the high quality of the modeling, found variations, including shorter arms, as well as anomalies in the modeling of the hair, that betrayed a later style. He rejected the assertions of his contemporaries as absolutely untenable, re-dating the bronze statuette to the Roman period, specifically to the time of Augustus, and emphatically removed it as a connecting link to a Hermes by Polykleitos. Even the figure's identification as a Hermes was uncertain, Furtwängler said, as the remains of the attribute the figure held in his left hand were indeterminate. Modern technical examination indicates an ancient repair.[2]

Despite Furtwängler's forceful rejection of the notion, there were periodic suggestions throughout the first three-quarters of the twentieth century that the Annecy bronze substantiated a claim for a Polykleitan bronze Hermes. But by 1984, the statuette was labeled simply "Athlete (?)" by Judith Petit, conservator of the Dutuit Collection at the Musée du Petit Palais, who dated it between the end of the first century BC and the first century AD.[3] In the catalogue of the Polykleitos exhibition at Liebieghaus in Frankfurt in 1990, Detlev Kreikenbom maintains Furtwängler's Early Imperial date, calls the bronze a *Polykletisierende* statuette of Hermes, and suggests its left hand held a caduceus or cornucopia.[4]

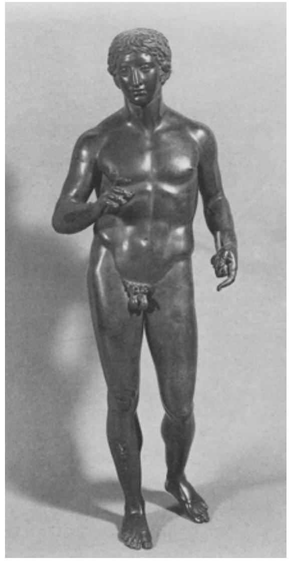


Figure 13.1. Ephebe from Fins d'Annecy (Hte. Savoir), early Augustan. H: 63 cm (25 in.). Paris, Musée du Petit Palais, inv. DUT

Image: From Beck, Bol, and Bückling 1990, plate 186, p. 654

Meanwhile, recognition of a Polykleitan Hermes has been, and remains, elusive. While agreeing with the *communis opinio* about the ephebe from Fins d'Annecy, in 1990 Bol identified a frequently reproduced Polykleitan marble head type that he believed copies the Hermes, and suggested leaving open the possibility that Polykleitos produced a Hermes following the structural pattern of the Doryphoros. To bolster his suggestion, he pointed to a Roman marble Hermes in the Boboli Gardens in Florence—from which he subtracted the mantle and the baby Dionysos that are not part of the Polykleitan Hermes type.[5] There are, in fact, a few Late Hellenistic and Roman bronze statuettes with attributes of Hermes that mimic the posture of the Doryphoros, as we will see, but all are modifications of the type. Most bronze statuettes reiterating the Polykleitan "Canon" that represent the god Hermes follow a different Polykleitan type, the type considered to be Polykleitos's Diskophoros.

Roman marble copies of the Diskophoros, the original of which is presumed to have held a discus, have the Polykleitan shift in the figure's weight, but the proportions are more slender and both feet are flat on the ground in a stance associated with earlier Classical figures. The head is turned to the figure's right, like the Doryphoros's, but lowered, gazing down. While no ancient source specifically attributes a Diskophoros to Polykleitos, it is the first one discussed in Paul Zanker's catalogue of Polykleitan types used for Roman classicistic statues.[6]

A Roman bronze statuette in the Louvre copies the pattern of what is considered Polykleitos's Diskophoros, without the more slender proportions of that type and, of course, much reduced in scale (fig. 13.2). It was first identified by Rolley as a Hermes because of traces on the head that Rolley believed to have been for the insertion of two small wings.[7] No other identifying features survive. In the figure's clenched left hand is an opening for an attachment, perhaps a caduceus, and he appears to have held something in his right hand as well, possibly a money sack, another common attribute of this god. His eyes are inlaid with silver, and his lips as well as his nipples are overlaid with copper. Calling it either a copy of a work by Polykleitos or a faithful imitation of his style, Rolley dated the statuette to the first half of the first century AD.[8] It appears prominently in a chart of bronze statuettes revealing the influence of Polykleitan types published by the Roman bronze expert Annalis Leibundgut in 1990 (fig. 13.3).[9] Located on the upper left of her fig. 238 (as no. 2), it is described together with a statuette in Basel (no. 1) as a remodeling (*Umbildung*) of the Diskophoros type in small scale.[10] The dates of all these statuettes encompass several centuries.

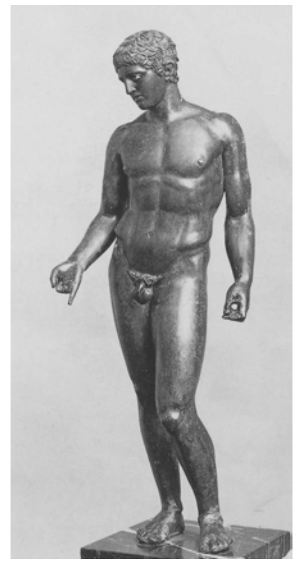


Figure 13.2. Hermes (?), first half of the first century AD. H: 21 cm (8 ¼ in.). Paris, Musée du Louvre, inv. B 183

Image: From Beck, Bol, and Bückling 1990, plate 39, fig. 536

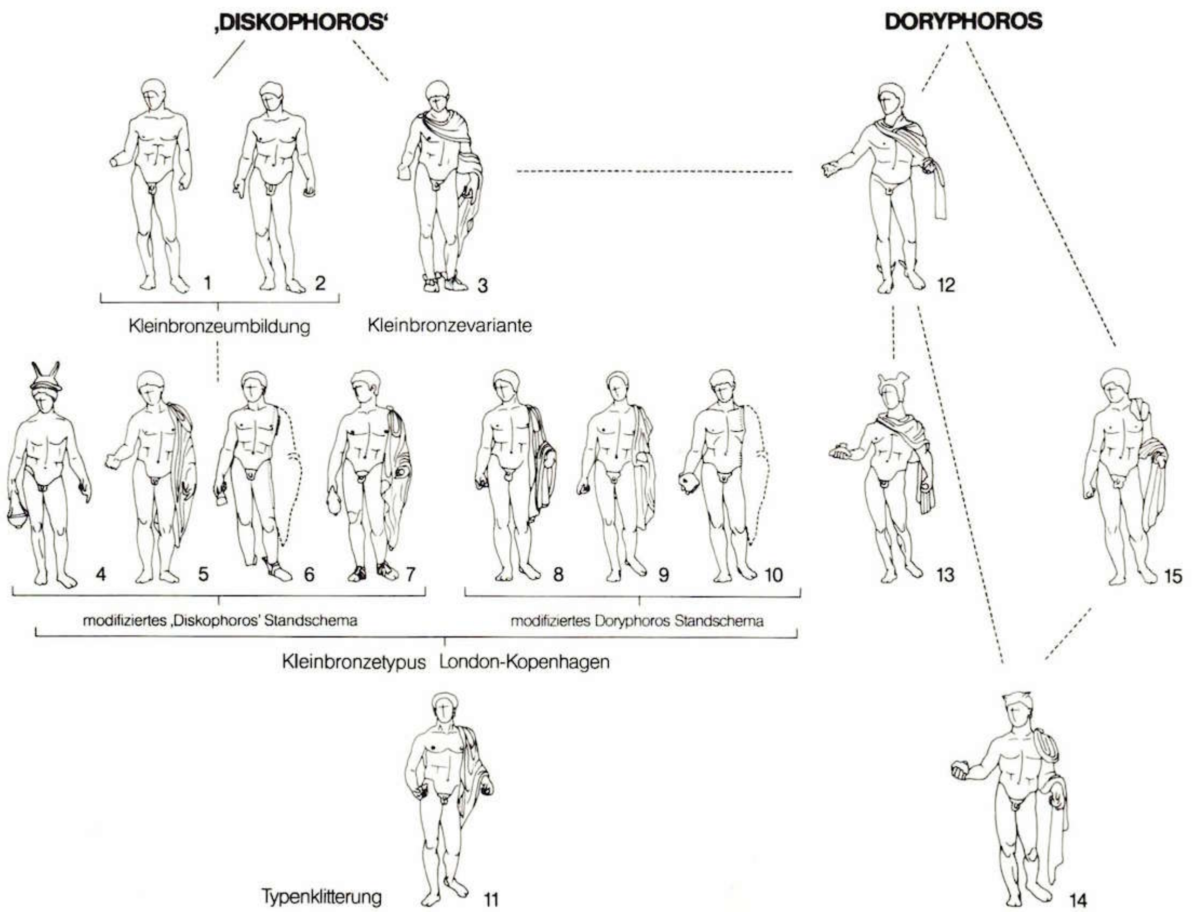


Figure 13.3. Bronze Hermes statuettes influenced by Polykleitan types
Image: From Beck, Bol, and Bückling 1990, plate 398, fig. 238

The Hermes—no. 12, on the upper right of this chart in a position of prominence as a reiteration of the Doryphoros stance—is the Hermes statuette from the Mahdia shipwreck (fig. 13.4). The muscles of its trunk follow Polykleitan models, but the outstretched right arm of the statuette upsets the equilibrium—the *symmetria*—in the same way that the *ad locutio* gesture of the Augustus of Prima Porta does in that larger Roman appropriation of the Doryphoros motif. The attribute in his left hand, probably a caduceus, was separately cast and soldered on.

Figure 13.4. Hermes, ca. 100 BC. H: 32 cm (12 ½ in.). Tunis, Bardo Museum, inv. 208
Image: H. Koppermann, Neg. D-DAI-Rom 61.451

In his publication of the Mahdia finds, Werner Fuchs interpreted the statuette's outstretched right arm with open hand as a speaking motif, but Ursula Höckmann has more plausibly suggested it represents the god's invitation to follow him.[11] The gesture can be seen in the Hermes on the facade of a Macedonian tomb at Lefkadia dating to the late fourth century BC[12] and identifies the bronze Hermes as a statuette intended for either a sanctuary or, more likely, a Roman villa. There it may have been placed alone in a niche for domestic veneration, for which there is evidence from Delos,[13] or, as in later Roman households, in a *lararium*.

Found on its original base in the Mahdia shipwreck, which is dated by its ceramic finds to 90–60 BC,[14] the Hermes is a Late Hellenistic bronze product of an artist familiar with both Polykleitan and fourth-century sculptural concepts of the standing figure that must have been traditional by that time and part of the artist's vocabulary. Disseminated through images on coins, probably drawings on papyri, and possibly hardened wax or plaster models, these formal concepts could be adapted according to the intended use of the statuette, the sophistication of the sculptor, and, importantly, the knowledge and taste of the client.

It seems apparent that Hermes was the most popular deity for household use in the Late Hellenistic and Early Roman world, the god's popularity increasing substantially in the Roman Imperial period, judging from the number of extant bronze statuettes of Hermes/Mercury dated to that time. There is great variety among those statuettes that have survived, the identification of the deity being made clear through the addition of his attributes. Truth to a prototypical origin, even had one been accessible to the artist, may, in this case at least, have been far less important to the buyer than the god's identity.

The same repertory was available to artists throughout the Roman Empire. Tonio Hölscher has written about the usefulness of certain Greek styles and figure types for specific subjects in Roman sculptural practice.[15] He was referring to large-scale statues, but one of the many late first- or early second-century AD bronze statuettes of the god Mercury found in Roman Gaul can serve to demonstrate the Roman use of modified Polykleitan schemes for a male deity (see fig. 13.3, no. 7; fig. 13.5). It is a free adaptation, suggesting the broad eclecticism of artists of bronze statuettes in the Imperial period. Leibundgut's chart (see fig. 13.3) makes clear that variations in the statuette of a god such as Hermes/Mercury were the norm even among those whose ultimate reference for stance and general pose is the same Polykleitan type. None of these can be said to assure us of the appearance of an original Polykleitos Hermes.

Figure 13.5. Mercury, found near Lyon (France) in 1792, late first or early second century AD. H without base: 15.3 cm (6 in.). London, British Museum inv. Br 825

It was not the manufacture of bronze statuettes but the production of full-size marble copies that was the principal means of satisfying the interest of Roman clients in famous Classical prototypes, and there is evidence of some remarkable consistency among those copies.[16] There were clearly some attempts, however, to recall well-known large-scale statues in miniature versions. A few small Roman bronzes of the Polykleitan Diadumenos have survived (for example, fig. 13.6), and there is a well-known Late Hellenistic terracotta rendition.[17] But while these small-scale figures are faithful iterations of the Diadumenos pose, with the turning of the head and its inclination, and sometimes accurately repeat the proportions of the Polykleitan body, the intimacy of their scale allows an element of the artist's personality to be introduced. Seeing the effects of the hands of the modeling artists may add to our appreciation of the relaxed and youthful forms of these small sculptures. There can be little question, however, that in various ways and to varying degrees, seeing the statuettes in isolation would inevitably modify an understanding of the original statue.

Figure 13.6. Diadumenos, mid-first century AD. H: 14.3 cm (5 ⅝ in.). Paris, Bibliothèque Nationale, Cabinet des Médailles, inv. 927

While the forms and proportions of the body of the very small bronze Diadumenos in the Cabinet des Médailles in Paris (see fig. 13.6) appear close to the marble copies, the figure's left leg is noticeably pushed farther back and his upper left arm is more sharply raised. The added touch of luxury represented by the silver inlay in the ribbon the young man is tying around his head suggests that, however imperfect as a true copy, the bronze was intended to be valued by a knowledgeable Roman collector of the mid-first century AD as a recognizable reference to the well-known masterpiece.

Two extant small Roman bronzes mimic the pose of Myron's Diskobolos, which we know from the Lancelotti marble copy,[18] discovered with its original head in 1781 on the Esquiline Hill; it is considered the copy closest to Myron's original bronze statue.[19] The body of the well-known bronze Diskobolos statuette in Munich is poised in the same complicated and momentary position (fig. 13.7). Though the artist of the statuette may have had access to the bronze original or, perhaps more likely, a marble copy faithful to it, the statuette's truth to its prototype is clearly limited. The limbs of the bronze are elongated, the torsion is exaggerated by the more frontal position of the upper torso, and the individualized head and face of the statuette bear no resemblance at all to the Classical style of the marble copies. With its silver eyes and overlaid copper nipples, the statuette was produced, like the small bronze version of the Diadumenos in Paris (see fig. 13.6), as a collector's item for the Roman market. Michael Maass dated the Munich statuette to the third century AD as a free, small-scale adaptation of the concept behind Myron's Diskobolos.[20] The concept was a brilliant fifth-century Greek *tour-de-force* and of considerable interest for that reason.

The second Roman bronze Diskobolos presenting this complex pose was found in 1964 in a cache of statuettes in the Athens suburb of Ambelokipi.[21] At 25 centimeters (8 in.) high, it is somewhat smaller than the Munich Diskobolos (see fig. 13.7) and sadly too corroded to distinguish details. But we recognize its Classical prototype immediately and can see that it is less exaggerated in its torsion and more classicizing in its proportions than the bronze in Munich. Now in the National Museum in Athens, it has been dated to the first century AD.

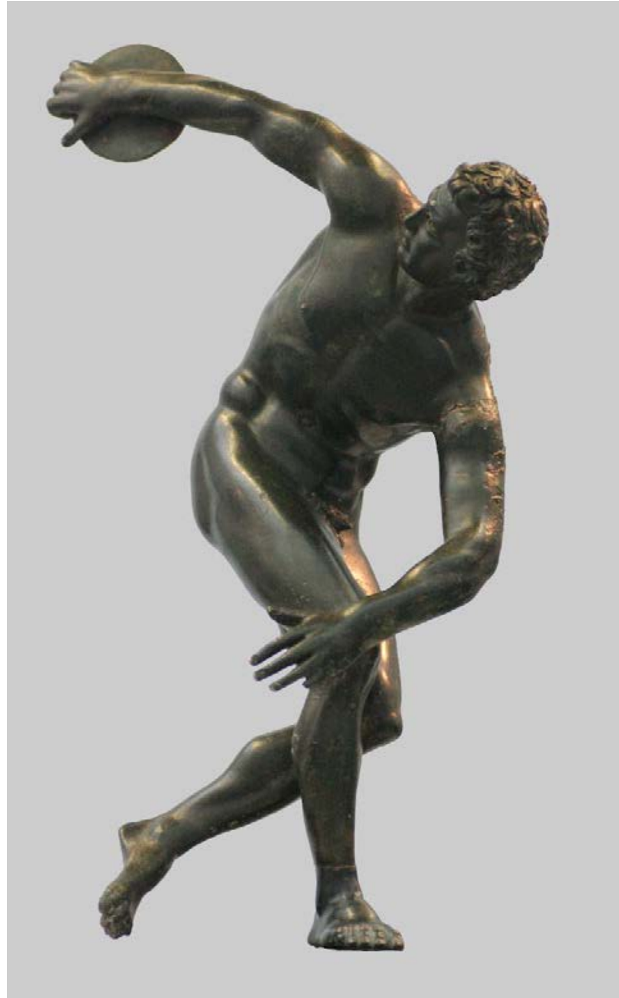


Figure 13.7. Diskobolos, third century AD. H: 31 cm (12 ¼ in.). Munich, Glyptothek, inv. 3012
Image: Matthias Kabel, CC BY-SA 3.0

Determining whether a bronze statuette is of Hellenistic or Roman manufacture is a frequent problem and often left unresolved. The origin and date of one of the most arresting extant bronze statuettes assumed to represent a major Classical Greek statue has remained controversial. An inlaid silver inscription on a base added to a bronze statuette of Herakles (35.9 cm or 14 in. high) in Chieti identifies the figure as a votive dedication from M. Atticus Peticius Marsus, known from other sources to have lived in the first century AD, to the Sanctuary of Hercules Curinus in Sulmona, where it was found in 1959. The left foot is missing and lower leg is damaged, but the figure is well modeled with great attention paid to the details of the hero's hair and the lion's mane.[22] Paolo Moreno has dated the statuette to the third century BC,[23] not long after the production of the Lysippos original that he believes the statuette reiterates in much smaller scale. Those who promulgate this date suggest that the antiquity of the statuette added to its value as a dedication from a pious Roman citizen. Diethelm Krull, on the other hand, who catalogued 127 examples of the resting hero type, believes the statuette to be a Roman Imperial work, dating it to around AD 100.[24] Recent publications vary in their assessments.[25]

In both cultures, the very nature of the artistic practice of those who produced bronze statuettes—modeling their casting models in clay or wax by hand—not only allowed the artists the freedom to embellish or deviate from a given prototype, it also made changes inevitable, even when the intention was an accurate miniature copy. The Chieti bronze Herakles is highly detailed, with several large areas full of surface activity and visual interest. While textured surfaces are not characteristics generally associated with the sculpture of Lysippos, it must be remembered that the original was cast in bronze, a medium that easily lends itself to surface variety.

Figure 13.8. Aphrodite, 150–100 BC. H: 51.8 cm (20 ½ in.). New York, Metropolitan Museum of Art (Rogers Fund, 1912), inv. 12.173

When a small-scale bronze version reiterates a marble prototype, the potential for deviation from the original expands considerably. A single, rather obvious example, a large statuette of Aphrodite in New York, explicates very clearly the relationship of a bronze statuette to a reputed prototypical Classical masterpiece carved in marble (fig. 13.8). Usually dated 150–100 BC, it is one of the most interesting of the many extant bronze versions of the famous over-life-size fourth-century Aphrodite in Knidos by Praxiteles. Praxiteles's resolution of his brilliant and innovative concept of a naked Aphrodite was in marble, and full-size Roman versions are likewise in marble. The statuette, perhaps from Asia Minor, has its share of restorations: the right arm has been reattached, the join hidden by restoration. The left arm was probably also reattached, and part of the upper arm has been restored. There are minor restorations on the upper back, as well, and a depression on the bottom of the figure's right foot was probably made to attach it to a base; the heel is pierced for the insertion of a modern wooden dowel. Originally there may have been drapery in the statuette's left hand, a feature making it closer to Praxiteles's original conception as we understand it. The slight bending of the bronze figure is exaggerated in comparison to most of the marble copies, considerably heightening the animation of the pose.

Artists who built bronze casting models from pliable wax on what may well have been flexible armatures could design freer and more open gestures of the arms and hands, which was not so easily achieved in marble without struts or supports. A bronze statuette like the Aphrodite follows the general *schema* of its prototype and is unquestionably indicative of the original statue's great fame and a moving testament to Praxiteles's genius. But whatever its artist's intention might have been, we must consider the statuette an inventive response by an artist who was inspired and motivated by some familiarity with the original marble type, not a copy.

✦ ✦ ✦

Dedicated to the memory of Prof. Dr. Annalis Leibundgut, June 27, 1932–September 13, 2014.

Notes

1. Furtwängler [1895] 1964, 231–32.
2. Petit 1980, 23.
3. Petit 1980, 18–23, 88–93, with earlier bibliography.
4. Kreikenbom 1990, 535–36, cat. 39.
5. Bol 1990; Kreikenbom 1990, 531–35, cat. 34–38.
6. Zanker 1974, 4–7, nos. 1–5.
7. Rolley 1983, 153, no. 143.
8. Rolley 1983, 153, no. 143.
9. Leibundgut 1990, 398–89, fig. 238.

10. Beck et al. 1990, 654, no. 186 (A. Leibundgut). Attributed to a workshop in southern Gaul and dated early Claudian.
11. Fuchs 1963, 20, no. 11, fig. 20; Höckmann 1994. Dated to about 100 BC.
12. Petsas 1966, plate Z′ and 6.
13. Kreeb 1988.
14. The most recent transport amphora (fitting the category Dressel 1B/Will 4 b) could be dated to no later than the second or third decade of the first century BC. Rotroff 1994, 139–42.
15. Hölscher 2004, 98–100.
16. A marble Polykleitan Diadumenos, considered Flavian (69–96 AD), was purchased in 1925 by the Metropolitan Museum in New York. The head, arms, and both legs below the knee were restored to form a complete statue on the basis of plaster casts taken from the torso and upper legs of an originally gilded copy of the Diadumenos from the island of Delos dated by external evidence to the early first century BC. Their perfect integration suggests a remarkable uniformity in truth to the original bronze model in scale and disposition of forms over a period of almost two centuries. The carving of the marble musculature, facial features, and hair among copies of the same prototype, however, can reveal as much creative latitude as the rendering of the small bronze versions.
17. Zanker 1974, plate 11, 1–6. The terracotta (1, 4), from Smyrna, dated to the first half of the first century BC, must be considered a creation of the coroplast based on Polykleitos's Diadumenos, or on an adaptation of it. For another bronze variant, see Beck, Bol, and Bückling 1990, 272, fig. 145.
18. In the Museo Nazionale, Rome. See Jenkins 2012, 16, fig. 7.
19. Its restoration confirmed the ancient report by Lucian (AD 120–200), who saw the original in a house in Athens and described the head facing back toward the hand with the discus (*Philopseudes* 18).
20. Maass 1979, 36.
21. Krystalli-Votsi 2014, 64–67, plate 14.
22. Museo Archeologico Nazionale d'Abruzzo, Chieti, inv. 4340. H with base: 39 cm (15 ½ in.). Recent publications of the statuette, with bibliographies, are Daehner and Lapatin 2015, 218–19, no. 16 (K. Lapatin), and Picón and Hemingway 2016, 112–13, no. 14 (R. Tuteri).
23. Moreno 1995, no. 4.14.1, 104–6.
24. Krull 1985, 158, no. 63.
25. Lapatin, in Daehner and Lapatin 2015 (see n. 22 above), leaves open the possibility of either date; R. Tuteri in Picón and Hemingway 2016 (see n. 22 above) dates the statuette to the third century BC, the base to the early first century AD.

Bibliography

Beck, Bol, and Bückling 1990
Beck, H., P. C. Bol, and M. Bückling, eds. 1990. *Polyklet: Der Bildhauer der griechischen Klassik*. Exh. cat. Frankfurt, Liebieghaus Museum alter Plastik. Mainz am Rhein: Zabern.

Bol 1990
Bol, P. C. 1990. "Hermes." In Beck, Bol, and Bückling 1990, 118–20.

Daehner and Lapatin 2015
Daehner, J. M., and K. Lapatin, eds. 2015. *Power and Pathos: Bronze Sculpture of the Hellenistic World*. Los Angeles: J. Paul Getty Museum.

Fuchs 1963
Fuchs, W. 1963. *Der Schiffsfund von Mahdia*. Tübingen: W. Wasmuth.

Furtwängler [1895] 1964
Furtwängler, A. 1964. *Masterpieces of Greek Sculpture*. New and enlarged ed. by A. N. Oikonomides. Chicago: Argonaut. (Orig. ed., New York: Charles Scribner's Sons, 1895.)

Höckmann 1994
Höckmann, U. 1994. "Die Hermesstatuette." In *Das Wrack: Der antike Schiffsfund von Mahdia*, ed. G. Hellenkemper Salies, 469–81. Cologne: Rheinland-Verlag.

Hölscher 2004
Hölscher, T. 2004. *The Language of Images in Roman Art*, trans. A. Snodgrass and A. Künzl-Snodgrass. Cambridge: Cambridge University Press.

Jenkins 2012
Jenkins, I. 2012. *The Discobolus*. British Museum Objects in Focus. London: British Museum Press.

Kreeb 1988
Kreeb, M. 1988. *Untersuchungen zur figürlichen Ausstattung delischer Privathauser*. Chicago: Ares.

Kreikenbom 1990
Kreikenbom, D. 1990. Catalogue entries in Beck, Bol, and Bückling 1990, 519–64.

Krull 1985
Krull, D. 1985. *Der Herakles vom Typ Farnese*. Frankfurt am Main: P. Lang.

Krystalli-Votsi 2014
Krystalli-Votsi, P. 2014. *Τα Χαλκά των Αμπελοκήπων* (The Ambelokipi Bronzes). Athens: Hypourgeio Politismou kai Athlētismou, Tameio Archailogikōn Porōn kai Apallotriōseōn.

Leibundgut 1990
Leibundgut, A. 1990. "Polykleitische Elemente bei späthellenistischen und römischen Kleinbronzen." In Beck, Bol, and Bückling 1990, 397–427.

Maass 1979
Maass, M. 1979. *Griechische und römische Bronzewerke der Antikensammlungen*. Munich: Beck.

Moreno 1995
Moreno, P. 1995. *Lisippo: L'Arte e la fortuna*. Exh. cat. Rome, Palazzo delle Esposizioni. Milan: Fabbri.

Petit 1980
Petit, J. 1980. *Bronzes antiques de la collection Dutuit: Grecs, hellénistiques, romains et de l'Antiquité tardive*. Musée du Petit Palais. Paris: Presses artistiques.

Petsas 1966
Petsas, P. M. 1966. *O táphos ton Lefkadion*. Athens: TAP.

Picón and Hemingway 2016
Picón, C., and S. Hemingway, eds. 2016. *Pergamon and the Hellenistic Kingdoms of the Ancient World*. Exh. cat. New York: Metropolitan Museum of Art.

Rolley 1983
Rolley, C. 1983. *Les bronzes grecs*. Fribourg and Paris: Office du livres.

Rotroff 1994
Rotroff, S. I. 1994. “The Pottery.” In *Das Wrack: Der antike Schiffsfund von Mahdia*, ed. G. Hellenkemper Salies, 133–52. Cologne: Rheinland-Verlag.

Zanker 1974
Zanker, P. 1974. *Klassizistische Statuen: Studien zur Veränderung des Kunstgeschmacks in der römischen Kaiserzeit*. Mainz am Rhein: Zabern.

14.

The Use of Inlays in Early Greek Bronzes

Seán Hemingway, Metropolitan Museum of Art, New York
Dorothy H. Abramitis, Metropolitan Museum of Art, New York

Ancient Greek bronzesmiths had a variety of techniques at their disposal to enhance the appearance of their creations. Due to their often fragmentary state of preservation, the modern observer tends to think of early Greek bronzes as monochromatic, but it is clear that the practice of inlaying other materials into bronze started early in ancient Greece.

Inlays appear in a broad variety of bronze object types from weapons and armor to vessels and jewelry to relief-decorated objects and figural sculpture. Many of the finest early Greek bronzes were embellished with inlays that enlivened the sculptural forms and may have added symbolic or even magical qualities. Eyes were often given particular prominence with inlays.

Of special interest is a new technical analysis of a Late Geometric statuette of a man and a centaur (Metropolitan Museum of Art, inv. 17.190.2072) in which the eyes of the man were inlaid with silver to contrast with the eyes of the centaur, which appear to have an iron-rich inlay. Although the evidence is frequently incomplete, it is clear that a wide variety of colorful inlays such as gold, silver, iron, bone, ivory, and amber were utilized, and other materials, such as stone and shell, were certainly used as well.

This paper looks at the evidence for the Geometric (900–700 BC) and Archaic (700–480 BC) periods with particular reference to artworks in the collection of the Metropolitan Museum of Art in New York.

✦ ✦ ✦

Ancient Greek bronzesmiths used a variety of techniques to enhance the appearance of their creations. Due to their often fragmentary state of preservation, the modern observer tends to think of early Greek bronzes as monochromatic, but it is clear that the practice of inlaying other materials into bronze started early in ancient Greece. This paper looks at the evidence for the Geometric (ca. 900–700 BC) and Archaic (ca. 700–480 BC) periods from many different regions, with particular reference to artworks in the collection of the Metropolitan Museum of Art, where a variety of nondestructive scientific analyses were conducted in the museum's conservation and scientific laboratories. While not the focus of this paper, the history of inlays on copper alloy artifacts began much earlier in ancient Greece, during the Bronze Age. Certainly among the most spectacular and accomplished examples of the Late Bronze Age are the daggers inlaid with figural scenes of gold, silver, and copper found in the Shaft Graves at Mycenae and in other coeval tombs, which have been catalogued and discussed in detail.[1] Exquisite new examples continue to be discovered in archaeological excavations. Although these inlays are often described as using niello (a mixture of sulfur and various metals) in the archaeological and art historical literature on the subject,[2] scientific analysis has shown that a different technique was used to produce the rich black or blue-black patination.[3] Such fine complex figural inlays in bronze artifacts made in Greece generally do not appear again until the Archaic period, and niello is not securely attested until the Roman Imperial period.

Turning now to the Geometric period, of special interest is the statuette of a man and centaur (fig. 14.1), said to be from Olympia, which came into the Met's collection in 1917 as the gift of J. P. Morgan.[4] This rare figural composition of a man and a centaur locked in mortal combat likely represents a Greek myth such as the battle between the centaur Nessos and the hero Herakles. It is among the finest Greek Geometric bronze sculptures preserved today.

It has long been known that the male figure has hollowed-out eyes in which considerable traces of the gray-black inlay are still preserved, especially in the right eye. The remains of the inlay in the man's eye were identified as silver through X-ray fluorescence (XRF) analysis.

Figure 14.1. Bronze statuette of man and centaur. Greek, mid-eighth century BC. X-radiograph illustrates hollows for inlays of centaur's eyes. Metropolitan Museum of Art, New York, inv. 17.190.2072. Gift of J. Pierpont Morgan, 1917

Image: © The Metropolitan Museum of Art, New York, www.metmuseum.org, CC0

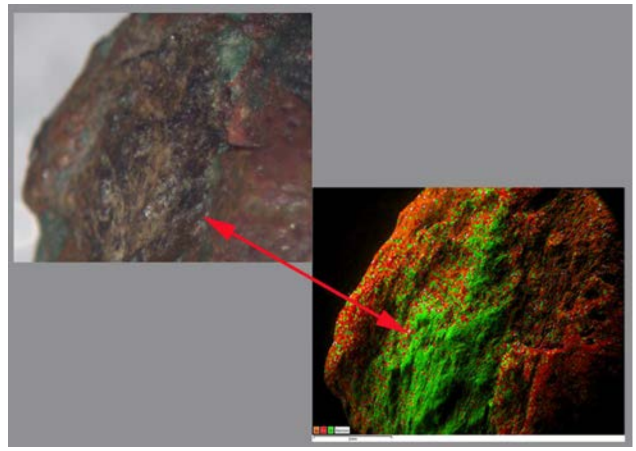


Figure 14.2. Detail of centaur's head, proper left profile. EDS image maps elemental distribution with iron shown in green. Metropolitan Museum of Art, New York, inv. 17.190.2072. Gift of J. Pierpont Morgan, 1917

Image: © The Metropolitan Museum of Art, New York, www.metmuseum.org, CC0

In 2013, while preparing the statuette for loan to an exhibition in Rome at the Palazzo Massimo (Paris et al. 2014), the statuette was X-rayed (see fig. 14.1, inset) and an important discovery was made. The centaur also clearly has cavities for inlays in the eyes, inlays that are still in situ. Examination of the eyes under magnification revealed a difference in color and texture in these areas, as can be seen in a detail image of the left eye (fig. 14.2, left). Analysis using XRF detected a significantly higher amount of iron than found elsewhere on the object, suggesting an iron-rich inlay in both eyes.

To confirm the XRF results of the material of the centaur's eyes, energy dispersive spectroscopy (EDS) was undertaken in the scanning electron microscope. Due to the geometry of the instrument and the figures, only the area of the proper left eye of the centaur could be examined. EDS confirmed the XRF results of iron; figure 14.2 maps elemental distribution, with iron shown in green. It is notable that imaging turned up neither aluminum nor silicon, which one would have expected to see if the iron derived from ochre, or even simply from soil embedded in the cavity. Given the way the iron fills the cavity of both eyes completely, it seems more probable to us that it was used as an inlay itself and was not merely the remains of an iron pin used to hold another material, such as bone or ivory. Iron is not a common inlay with bronze but does occur elsewhere, such as on Thracian cuirasses of the sixth century BC.[5] The use of silver for the man's eyes, versus the iron for the centaur's eyes, would have created a dramatic contrast between the two figures.

Figure 14.3. Bronze statuette of a horse. Greek, seventh century BC. X-radiograph of the head (inset) illustrates hollows for inlays of horse's eyes. Metropolitan Museum of Art, New York, inv. 1972.118.48. Bequest of Walter C. Baker, 1971

Image: © The Metropolitan Museum of Art, New York, www.metmuseum.org/. EDS mapping by Department of Scientific Research

One of the most popular subjects of Greek Geometric bronze statuettes is the horse.[6] Thousands of small horse statuettes have been found at Greek sanctuaries, most notably at Olympia, where they were likely votive offerings by the aristocratic horse-owning class. Typically, the statuettes do not feature inlays, being instead embellished with incised details, but some of the largest and finest examples appear to have had inlays as well. One likely candidate is the large bronze statuette from Olympia, dated to ca. 730 BC and now in the Berlin Antikensammlung (inv. 31317). Its large hollow eyes probably originally held inlays that are now lost. Another example is a Geometric statuette of a horse (fig. 14.3) in the Metropolitan's collection. The original surface of the Met's horse is in poor condition, but ancient holes in each hoof support the hypothesis that it was not a stand-alone work but was once attached to the rim or handle of a large tripod cauldron, a typical and expensive votive offering at Greek sanctuaries in the Geometric and Archaic periods.[7] An X-radiograph of this object, shot from above (see fig. 14.3, inset), shows how each eye was carefully hollowed out to receive an inlay; these cavities have the same basic shape as the eyes of the man-centaur statuette discussed above (see figs. 14.1–2). XRF analysis of the horse's eyes did not yield any positive results for identifying the material of the inlay. The poor state of preservation hampers further identification of the inlay, whether it was of metal, stone, or an organic material.

Fine bronze sculpture of the Orientalizing period (ca. 700–600 BC) typically is embellished with inlays as well, especially in the eyes. Good examples from the seventh century BC are the small statues from Dreros on Crete, whose hollow eyes were surely originally filled with inlays.[8] The use of inlays in bronze artifacts had a long history in the ancient Near East,[9] perhaps inspiring Greek developments at this time.

A Late Archaic bronze head from Kerkyra now in the Antikensammlung in Berlin (inv. Misc. 6324) preserves part of its original inlay, which naturalistically renders the whites of the eyes. In the succeeding Classical and Hellenistic periods, such inset eyes were highly articulated, as is evident in a pair in the Met's collection (inv. 1991.11.3a–b) that perhaps date to the fifth century BC.[10] Statuettes also could have inlays like their large-scale counterparts, as for example the eyes of the Mantiklos Apollo statuette in the Museum of Fine Arts, Boston,[11] or the nipples of the early fifth-century BC statuette of Apollo from Kosmas in Arkadia now in the collection of the Athens National Archaeological Museum (inv. 16365).

Griffin protomes attached to large cauldrons set on tripod stands are another type of bronze object that frequently received inlays, especially for the eyes. The famous Cypro-Archaic cauldron and rod tripod stand from a royal tomb at Salamis, Cyprus, is a particularly well-preserved example.[12] A variety of materials were used for inlaying the eyes of Archaic Greek bronze protomes. Amber was used for griffin eyes, as on an example from Olympia, dated 680–650 BC, in the Athens National Museum.[13] Bone and ivory were also employed, sometimes with articulation for the pupil, as in a pair of griffin protomes dated to 625–575 BC in the collection of Chicago's Art Institute.[14]

One of the largest and most splendid griffin protomes to survive from antiquity is in the collection of the Metropolitan Museum of Art (fig. 14.4).[15] It is said to have come from Olympia and has been associated with two other similar examples, one in the Athens National Museum and the other in the Olympia Archaeological Museum.[16] Its scales are carefully punched and its large eyes would have been inlaid, probably much like the examples from Chicago. The Greek historian Herodotus tells us that such tripod cauldrons could be truly monumental; he mentions one made for King Croesus of Lydia that could hold 2,700 gallons (Herodotus 1.70).

Figure 14.4. Bronze head of a griffin. Greek, third quarter of seventh century BC. Metropolitan Museum of Art, New York, inv. 1972.118.54. Bequest of Walter C. Baker, 1971

Image: De Abramitis. © The Metropolitan Museum of Art, New York, www.metmuseum.org

Since it is clear that the Met's griffin had inlaid eyes, the relevant areas were examined under magnification and using XRF, in case any physical evidence remained. Unfortunately, as expected, none was found. However, a difference in the alloy of the beading that surrounds the edge of the neck (see fig. 14.4) was identified. The main metal alloy, including that surrounding the eyes, is made of copper, tin, and lead with significant traces of numerous other elements. By contrast, the beaded rim and rivets that attach it to the neck are made of an alloy that is mostly copper with trace amounts of tin and lead. The dramatic differences between the bronze alloy of the main sculpture and the copper beading would have produced a noticeable chromatic variation.

Figure 14.5. Bronze support in the form of a sphinx. Greek, ca. 600 BC. Metropolitan Museum of Art, New York, inv. 2000.660. Gift from the family of Howard J. Barnet, in his memory, 2000

Image: © The Metropolitan Museum of Art, New York, www.metmuseum.org, CC0

A massive Archaic Greek bronze support in the form of a sphinx (fig. 14.5) was gifted to the Metropolitan Museum in 2000.[17] Small hollows in the center of its eyes most likely served to secure inlaid pupils of another material. Visual examination of the eyes revealed small bits of iron. However, analysis turned up silica and a copper alloy similar to other areas analyzed, such as the chest. Thus it appears that the cavities in the center of the eyes contain the remains of soil that mask any clearer signals. Because there is a massive lead fill on the back of the bronze, X-radiography was not a useful tool. Interestingly, the pronounced bulbous center of the diadem crowning the sphinx's head (fig. 14.6) was found to differ from the general copper alloy used in the sculpture, having a higher level of silver, bismuth, and arsenic. Conceivably, this area may have had a silver overlay that enriched the surface but is no longer preserved. The ears of the sphinx are pierced and quite likely would have originally had earrings made of another material, which would have enhanced the polychrome effect.

Figure 14.6. Detail of bulbous center of diadem on the forehead of the sphinx in fig. 14.5

Image: De Abramitis. © The Metropolitan Museum of Art, New York, www.metmuseum.org

The practice of inlaying eyes on vessel and stand protomes extended to animal subjects as well as to humans and mythical creatures. Bull's heads embellish fragments of a bronze and iron rod tripod from Kourion, Cyprus, dating to the seventh century BC, that once belonged to Luigi Palma di Cesnola and are now divided between the collections of the Metropolitan and Berlin.[18] As reconstructed, six bull's head protomes originally decorated the upper ring and three smaller bull protomes decorated the lower ring. All of these have eyes that are carefully hollowed out to receive inlay, which is no longer preserved. The bull's head protome in the Met's collection (inv. 74.51.5620) is a particularly good representative example where the hollowed eyes are well preserved. A Greek bronze cauldron from a tomb at Leontini in southern Italy and now in the collection of the Antikensammlung in Berlin (inv. Misc 8600) illustrates the same basic kind of inlay, about a century later, for the eyes of ram's head protomes. Again the inlays are missing.

The finest Archaic Greek armor and weapons were also frequently embellished with inlays. With examples to choose from in almost all known types of arms, here we focus on just a few particularly interesting examples. The kneecaps of a pair of greaves found in a tomb at Ruvo in southern Italy, now in the British Museum, are carefully decorated with gorgons, whose eyes, teeth, and tongue are inlaid with ivory. Several examples of this type are known. One example in the Shelby White and Leon Levy Collection, which only represents the head of the gorgon on the kneecap, has amber inlays for the pupils set into whites made of bone or ivory.[19] A bronze pectoral from a horse's armor, found in another tomb in Ruvo, exhibits ivory inlays for the gorgon's eyes, mouth, and fangs, which are particularly well preserved.[20]

A Late Archaic spear butt (fig. 14.7) in the Metropolitan Museum's collection exhibits evidence of a decorative inlay at the end of the shaft.[21] Narrow bands are inset on either side of an ivy motif (fig. 14.8). The spear butt bears an inscription identifying it as a dedication at a sanctuary. Analysis of the inscription shows no indication of inlay. However, XRF analysis of the bands and the ivy inlay show compositional differences in their corrosion products, although not the elements that one would expect from a different metal inlay such as silver, gold, or lead. Evidence of a higher content of copper and zinc and a lower content of tin when compared to the main corroded alloy of the spear butt may indicate a different copper alloy used as an inlay, or possibly an organic filling. A Corinthian helmet excavated at Olympia (dated to ca. 650–545 BC) in the collection of the Olympia Archaeological Museum also exhibits carefully executed bands of inlay along its outer edge; most of the silver inlay is preserved in situ.[22]

Figure 14.7. Bronze spear-butt. Greek, ca. 500 BC. Metropolitan Museum of Art, New York, inv. 38.11.7. Fletcher Fund, 1938

Image: © The Metropolitan Museum of Art, New York, www.metmuseum.org, CC0

Figure 14.8. Detail of decorative inlay with bands and ivy pattern at end of shaft of spear-butt in fig. 14.7

Image: De Abramitis. © The Metropolitan Museum of Art, New York, www.metmuseum.org

One of the best preserved and most important Archaic bronzes in the Metropolitan Museum of Art's collection is the chariot from the tomb of an Etruscan noble discovered in 1902 in Monteleone.[23] The chariot was reexamined in great detail in preparation for installation in its newly restored form in 2007. A major study of the object by Adriana Emiliozzi was published in 2011 in the *MMA Journal*, incorporating a great deal of technical and scientific analysis undertaken in collaboration with the Met's team of conservators and research scientists.[24] In her article, Emiliozzi makes a strong case for identifying the chariot as the work of an East Greek artisan; she also elucidated how this spectacular chariot features a large number of inlays especially of ivory, from both elephant and hippopotamus. The eyes of many of the figures on the chariot are hollowed out to receive inlay, including the figures on the main panel,[25] the eagle's head that caps the chariot pole, and the boar's head that was part of the attachment between the pole and the chariot carriage. The boar's tusks are made of hippopotamus ivory and are quite well preserved.[26]

The main relief panel of the chariot was singled out for particular embellishment with inlay. The eyes of the main figures, Thetis presenting the armor to Achilles, are hollowed out to receive inlay. Likewise, the shield of Achilles, which occupies the center of the scene, was elaborately inlaid, particularly the eyes and mouth of the gorgon and the eyes of the panther; some of the original inlays, such as the gorgon's tongue and one of the panther's eyes, are preserved. The effect of the gorgon's head would have been much like the horse pectoral from Ruvo discussed above. The same design, but done with incision, appears on one of the chariot's side panels, where Achilles's shield is also represented as he battles the

Ethiopian King Memnon.[27] Fragments of ivory inlays were also found that belonged to the main panel and were used to fill the spaces around the figures and in the shield's lateral cutouts. Further, less elaborate ivory inlays appointed the side panels and other parts of the carriage. The overall effect of this sumptuous polychrome display, combined with the superlative metalwork, must have made this parade chariot a prized showpiece.

In conclusion, it is apparent that inlays were used on Greek bronzes from very early on and many of the types of inlay that exist in later periods are already evident by the Archaic period. Special prominence was given to inlaying eyes. In this paper alone, we have seen the inlaying of eyes belonging to humans, deities, mythical creatures, animals, and birds. Often the inlays are no longer preserved, but scientific analysis can sometimes help determine the nature of inlays that appear missing to the naked eye. Figural sculpture and decorative elements of vessels, armor, weapons, and a variety of bronze reliefs were sometimes richly inlaid with various materials of contrasting colors to enhance their appearance. It is evident that inlaying was a favored technique, in addition to careful modeling and incised details, for embellishing the finest Archaic bronzes. Further chromatic variations were sometimes made by the overlaying of contrasting metals such as silver or copper. This paper presents a small sample focusing on examples from the collection of the Metropolitan Museum of Art, but future investigations combining careful archaeological research with scientific examination of other existing collections promise to further our knowledge of this interesting aspect of ancient bronze-work.

✦ ✦ ✦

Acknowledgments

This kind of collaborative research among curators, conservators, and research scientists involves the support of many individuals. We wish to thank in particular Thomas P. Campbell, director; Carrie Rebora Barratt, deputy director; Carlos A. Picón, curator in charge of the Department of Greek and Roman Art; Lisa Pilosi, head of the Department of Objects Conservation; Marco Leona, head of the Department of Scientific Research; and Federico Caro, Elena Basso, and Mark Wypyski, research scientists, for their assistance with the scientific analyses, as well as Michael Baran and Lillian Bartlett Stoner, all of the Metropolitan Museum of Art, New York.

Notes

1. Xenaki-Sakellariou and Chatziliou 1989, 25–33.
2. See, for example, Betancourt 2007, 145–46; Hemingway 2014, 34; Andreadaki-Vlazaki and Balaska 2014, 66, no. 37.
3. Giumlia-Mair 2013.
4. Padgett 2004, 133–36, no. 13; Picón et al. 2007, 50 and 415, no. 33; Paris, Sotari, and Giustozzi 2014, 187–91, no. 1.
5. See Born 2010, 145 and 150, fig. 14.
6. Zimmerman 1989; Andrews 1994.
7. See Valavanis 2004, 39, 176–78, fig. 236.
8. See Mattusch 1988, 42–44, figs. 3.11–12.
9. Lie and Bewer 2014, 59–60.
10. Hemingway 2004, 12, fig. 8.
11. Thomas 1992, 58, fig. 42.
12. In the collection of the Cyprus Museum in Nicosia, inv. T.79/202. Aruz, Graff, and Rakic 2014, 188–92, illustrated on 190, no. 76a–b (V. Karageorghis).
13. Aruz et al. 2014, 312, no. 185.
14. Chicago Institute of Art inv. 1994.38.1–2.
15. Mertens 1985, 20–21.
16. Mattusch 1990.
17. Mertens 2002.
18. Karageorghis et al. 2000, 172–73, no. 278.
19. Bothmer 1990, 110–11, no. 91.
20. Paris et al. 2014, 164–65, no. 4.
21. Richter 1939, 146–47, fig. 3; Picón et al. 2007, 91, 424, no. 99.
22. Valavanis 2004, 52–53, fig. 54.
23. De Puma 2013, 46–51, fig. 4.1a.
24. Emiliozzi 2001.
25. De Puma 2013, 48, fig. 4.1b.
26. De Puma 2013, 51, fig. 4.1e.
27. De Puma 2013, 49, fig. 4.1c.

Bibliography

Andreadaki-Vlazaki and Balaska 2014
Andreadaki-Vlazaki, M., and A. Balaska, eds. 2014. *The Greeks: From Agamemnon to Alexander the Great*. Athens: Hellenic Ministry of Culture and Sports.

Andrews 1994
Andrews, T. K. 1994. "Bronzecasting at Geometric period Olympia and Early Greek Metal Sources." PhD diss., Brandeis University.

Aruz, Graff, and Rakic 2014
Aruz, J., S. Graff, and Y. Rakic, eds. 2014. *Assyria to Iberia at the Dawn of the Classical Age*. Exh. cat. New York, Metropolitan Museum of Art. New York: Metropolitan Museum of Art; New Haven: Yale University Press.

Betancourt 2007
Betancourt, P. P. 2007. *Introduction to Aegean Art*. Philadelphia: INSTAP Academic Press.

Born 2010
Born, H. 2010. "Des Kaisers neue Kleider: Restaurierung und Herstellungstechnik des Stična Brustpanzers aus Grabhügel." In *Stična:Grabhügel aus der älteren Eisenzeit II/2*, ed. S. Gabrovec and B. Terzan, 137–59. Ljubljana: Narodni Muzej.

Bothmer 2000
Bothmer, D. von, ed. 2000. *Glories of the Past: Ancient Art from the Shelby White and Leon Levy Collection*. New York: Metropolitan Museum of Art.

De Puma 2013
De Puma, R. 2013. *Etruscan Art in the Metropolitan Museum of Art*. New York: Metropolitan Museum of Art.

Emiliozzi 2011
Emiliozzi, A. 2011. "The Etruscan Chariot from Monteleone di Spoleto." *Metropolitan Museum Journal* 46: 9–132.

Giumlia-Mair 2013
Giumlia-Mair, A. R. G. 2013. "Development of Artificial Black Patina on Mycenaean Metal Finds." *Surface Engineering* 29.2: 98–106.

Hemingway 2004
Hemingway, S. 2004. *The Horse and Jockey from Artemision: A Bronze Equestrian Monument of the Hellenistic Period*. Los Angeles and Berkeley: University of California Press.

Hemingway 2014
Hemingway, S. 2014. "The Age of Bronze in Greece, Cyprus and the Near East." In *Ancient Bronzes through a Modern Lens*, ed. S. Ebbinghaus, 21–37. Cambridge, MA: Harvard Art Museums.

Karageorghis, Mertens, and Rose 2000
Karageorghis, V., J. R. Mertens, and M. E. Rose. 2000. *Ancient Art from Cyprus: The Cesnola Collection in The Metropolitan Museum of Art*. New York: Metropolitan Museum of Art.

Lie and Bewer 2014
Lie, H., and F. Bewer. 2014. "*Ex Aere Factum*: Technical Notes on Ancient Bronzes." In *Ancient Bronzes through a Modern Lens: Introductory Essays on the Study of Ancient Mediterranean and Near Eastern Bronzes*, ed. S. Ebbinghaus, 39–63. Cambridge, MA: Harvard Art Museums.

Mattusch 1988
Mattusch, C. C. 1988. *Greek Bronze Statuary: From the Beginnings through the Fifth Century B.C.* Ithaca and London: Cornell University Press.

Mattusch 1990
Mattusch, C. C. 1990. "A Trio of Griffins from Olympia." *Hesperia* 59: 549–60, pls. 91a–d.

Mertens 1985
Mertens, J. R. 1985. "Greek Bronzes in the Metropolitan Museum of Art." *Metropolitan Museum of Art Bulletin* 43.2: 4–65.

Mertens 2002
Mertens, J. R. 2002. "An Early Greek Bronze Sphinx Support." *Metropolitan Museum Journal* 37: 23–33.

Padgett, M. 2004
Padgett, M. 2004. *The Centaur's Smile: The Human Animal in Early Greek Art*. Exh. cat. Princeton, Princeton University Art Museum. New Haven and London: Yale University Press.

Paris, Sotari, and Giustozzi 2014
Paris, R., E. Sotari, and N. Giustozzi, eds. 2014. *Mostri: Creature fantastiche della paura e del mito*. Exh. cat. Rome, Museo nazionale romano. Milan: Mondadori Electa.

Picón et al. 2007
Picón, C. A., J. R. Mertens, E. J. Milleker, C. S. Lightfoot, and S. Hemingway with R. De Puma. 2007. *Art of the Classical World in the Metropolitan Museum of Art: Greece, Cyprus, Etruria, Rome*. New York: Metropolitan Museum of Art.

Richter 1939
Richter, G. M. A. 1939. "Newly Acquired Greek Bronzes." *Metropolitan Museum of Art Bulletin* 34: 145–48.

Thomas 1992
Thomas, R. 1992. *Griechische Bronzestatuetten*. Darmstadt: Wissenschaftliche Buchgesellschaft.

Valavanis 2004
Valavanis, P. 2004. *Games and Sanctuaries in Ancient Greece: Olympia, Delphi, Isthmia, Nemea, Athens*. Los Angeles: J. Paul Getty Museum.

Xenaki-Sakellariou and Chatziliou 1989
Xenaki-Sakellariou, A., and C. Chatziliou. 1989. *"Peinture in Metal" a l'epoque Mycenienne*. Athens: Ekdotike Athenon.

Zimmerman 1989
Zimmerman, J.-L. 1989. *Les Chevaux dans l'art géometrique grec*. Mainz: Philipp von Zabern.

15.

The Poet as Artisan: A Hellenistic Bronze Statuette in the Metropolitan Museum of Art

Elizabeth McGowan, Williams College, Williamstown, Massachusetts

A Hellenistic bronze statuette of a bearded, balding man in the collection of the Metropolitan Museum of Art (1972.11.1) has attracted attention for its serious expression and startling silver eyes. The compact, muscular figure wears an *exomis* and carries a wax tablet, attributes that have led to his identification as a master sculptor of myth or history, such as Daidalos or Pheidias. Craftsmen of words, such as Odysseus, might also wear the *exomis*. But what of other wordsmiths? I suggest that the figure represents the sixth-century BC poet Hipponax, the contentious composer of iambic poetry and "limping" meters, who wrote acerbic attacks on the fictive sculptors Boupalos and Athenis and is credited with the invention of parody. Hipponax's poems accuse Boupalos and Athenis of representing him in a laughable way, an open invitation to historical sculptors to characterize him likewise. Later authors describe him, presumably on the basis of his self-descriptions and outrageously negative poetry, as misshapen in ways compatible with this statue. Hipponax's revival in Alexandria by Kallimachos in the third century BC may have inspired the imaginative portrait seen in the statuette: a figure who, though imperfect in form, is strong, with a thoughtful countenance; whose extraordinary intellectual and creative powers shine through silver eyes; and who bears a wax tablet to record those extraordinary thoughts. With an artisan's body and a poet's means of expression, the Hellenistic bronze statuette becomes a personification of the *paragone* between poetry and the visual arts at the heart of Hipponax's poetry.

✦ ✦ ✦


Figure 15.1


Figure 15.2


Figure 15.3

Bronze statuette of an artisan. New York, Metropolitan Museum of Art inv. 1972.11.1. Rogers Fund, 1972.

Many of the papers in this volume deal with the technical aspects of bronze manufacture and analysis of fabric and technique. But what of the artisans themselves? A large, relatively well-preserved Hellenistic bronze statuette in the Metropolitan Museum of Art, said to have been found off the coast of North Africa, appears to be an image of an artisan (fig. 15.1).[1] He has been identified as such by his dress, his stocky build, and his hunched posture.[2] Although missing its right arm and leg, the figure is well preserved. He appears to be short in stature, compact, and muscular. The well-defined, gnarled muscles of his left arm and leg, down to his bare feet, imply the physique of someone used to physical labor. His neck is short and his posture somewhat stooped and uneven, with rounded upper spine and right shoulder raised, as if years of working at a bench has resulted in scoliosis (fig. 15.2).[3] His egg-shaped head seems large for his body and perhaps appears further elongated by the fact that, although he has curly hair at the sides and back of his head, he is balding on top (fig. 15.3). The figure's brow is furrowed and his mouth has full, downturned lips set in a scruffy beard. He is far from canonically beautiful, yet the artist gave him silver eyes. The bright silver adds intensity to his gaze and imbues him with inner life and a certain nobility. This nobility seems at odds with the social status implied by his physical aspect and clothing. He wears an *exomis*, a short, belted garment that is fastened on one shoulder to allow the opposite arm maximum mobility, and in Greek art worn most often by artisans, laborers, slaves, and soldiers.[4] Here the *exomis* is fastened on the right shoulder with a square knot, which would allow his left arm to move freely. At his full waistline, the *exomis* is secured with a belt with fringed ends, tied, again, in a square knot. Tucked behind the knot is a wax tablet, an attribute that sets this figure apart from the status of everyday workman. His left arm wraps across his body and might have supported the missing right arm, which has been imagined as bent at the elbow with its hand near the chin, a familiar gesture in antiquity of a figure deep in thought.[5] Alternatively, his right hand might have held a staff or gripped a crutch tucked under his right arm.[6]

The unusual detail of silver eyes and the wax tablet seem tantalizing clues to the statue's identity. Some have suggested that he might represent an historical figure while others propose that he belongs to the realm of myth. Stéphanie Boucher-Colozier, who first published the statuette, thought it might represent an imaginary portrait of Monimos, a cynic philosopher.[7] Nikolaus Himmelmann recognized this bronze as an important example of Alexandrian realism, and noted correspondences between terracotta figures from Egypt and the figure's clothing and gesture, especially among those he identified as cult attendants and waiting slaves.[8] One Hellenistic terracotta figure thought to represent a slave, once in Leipzig and now lost, even had a wax tablet tucked behind the belt of his short chiton.[9] Himmelmann alternatively suggested that the figure might represent the first sculptor in Greek myth, Daidalos.[10] Other possible contenders are Epeios, the artist who made the Trojan horse, and even Hephaistos, as Seán Hemingway suggests, characterized by Homer as limping and not ideal in his features.[11] He may even represent a mortal craftsman of great repute, such as Pheidias.[12] All these interpretations point in the right direction. Here we have a figure who poses a conundrum: he seems like a person of some importance but does not represent an ideal. At the same time, he lacks the humorous exaggerations that one might expect in a true caricature. The figure seems outside the genre of realism that might reflect everyday characters.

Figure 15.4. Foundry Painter, red-figure cup, tondo with Hephaistos and Thetis. Berlin, Antikensammlung F2294, *ARV*[2] 400,1, BAPD 204340

Image: J. Laurentius. Courtesy bpk, Berlin / Antikensammlung / J. Laurentius / Art Resource, NY

We can narrow down his identity if we turn to the few attributes he possesses, starting with his clothing. He wears an *exomis* and is bare-headed as well as barefoot. Foremost among the mythological characters who wear the *exomis* is Hephaistos. As the Olympian god who is the patron of metalworkers, stonemasons, potters, and other craftsmen, he is often shown in either a short chiton or an *exomis*, and often with the tools of his trade: hammer, tongs, and torch for lighting the forge. In the tondo of the Foundry Painter's name vase, Hephaistos wears a *chitoniskos*, with the sleeve unbuttoned to the top of his right shoulder to allow for freedom of movement (fig. 15.4). The fifth-century BC cult statue of Hephaistos in Athens, as reconstructed by Evelyn Harrison and others, is shown wearing an *exomis*.[13] The image seems to be reflected on two terracotta Roman lamp discs, one in the Agora (fig. 15.5) and the other in the Athens National Museum (fig. 15.6).[14] On both, Hephaistos wears an *exomis* and *pilos* (a workman's felt hat) and holds a torch in his left hand. This type of image of the craftsman god appears on later Roman monuments, such as the figure of Vulcan carved in relief on a lower section of the Jupiter Column in Mainz (fig. 15.7).[15] Here the god holds a hammer in his right hand and a torch in his left. Relying on the numerous echoes of the fifth-century statue in later art, Harrison concludes that the cult image wore the *exomis* tied on his left shoulder, so that his right arm could move freely and that his weight was on his right leg with his head turned slightly in that direction. The Hellenistic bronze statuette is in a mirrored position: the weight leg, the exposed arm, and the turn of the head all favor the left. And the Hephaisteion's cult statue wore a workman's hat, a felt *pilos*, while the bronze artisan is bare-headed.[16] None of the preserved images of Hephaistos shows him with a wax tablet.

Figure 15.5. Roman lamp disc with bust of Hephaistos. Athens, Agora L 5413

Image: Courtesy of American School of Classical Studies at Athens: Agora Excavations

Figure 15.6. Roman lamp disc with image of Hephaistos. Athens, National Archaeological Museum, Ministry of Culture and Sport – Archaeological Fund Resources and Expropriations, inv. 18011 (Empedokles Collection)
Image: © Hellenic Ministry of Culture and Sports (N.3028/2002)

Figure 15.7. Roman relief with Vulcan, Jupiter Column. Mainz, Landesmuseum inv. S 137
Image: © Ursula Rudischer GDKE-Landesmuseum Mainz

Daidalos also wears a one-shouldered chiton or an *exomis* in art. The few examples preserved are Roman. In a first-century Pompeian wall-painting, the sculptor wears a *chitoniskos*, with a sleeve on the left but the right arm free, as he presents the mechanical cow costume to Pasiphaë.[17] A mosaic from the third-century Roman villa at Zeugma in southeast Turkey shows Daidalos in an *exomis* fastened on his left shoulder.[18] Both images of the sculptor seem to reflect earlier Athenian images of Hephaistos. Daidalos is hatless, however, and in the case of the mosaic, he carries a saw in his right hand and a length of wood in his left, as Ikaros, also dressed in an *exomis*, works at a small table nearby. In two out of three scenes of the same story on a Late Roman sarcophagus in the Louvre, Daidalos wears an *exomis* with the right arm free. In one scene, he wears the *exomis* as he stands in contrapposto as he presents the cow to Pasiphaë. His drapery's folds closely resemble those of many Roman representations of Hephaistos/Vulcan, such as that on the Jupiter Column from Mainz, where Vulcan's pose recalls that of the highly influential Athenian cult statue of Hephaistos.[19] The image of Daidalos that seems closest to the bronze artisan in dress appears on a relief in the Villa Albani, where the sculptor, seated in right profile at a table and bent over his work, crafts wings for himself and Ikaros.[20] He wears an *exomis* that leaves his right shoulder and arm free. None of the examples shows Daidalos with a tablet.

Craftsmen of words might also wear the *exomis*. Odysseus, the great wordsmith of the Trojan epics, is shown in an *exomis* as early as the first quarter of the fifth century BC. On an Attic red-figure skyphos by the Penelope Painter, Odysseus, disguised as a beggar, takes aim with a bow and arrow at the suitors who have invaded his home (fig. 15.8). In Hellenistic and Roman art, Odysseus is often shown with the *exomis* and *pilos*.[21] For example, a Roman statuette of Odysseus presenting a cup of wine (apparently to Polyphemos) also shows him wearing an *exomis* and *pilos*, as well as a short cloak (fig. 15.9).[22]

Figure 15.8. Penelope Painter, red-figure skyphos, obverse. Berlin, Antikensammlung F2588, *ARV*^{2} 1300.1, BAPD 216788

Image: J. Laurentius. Courtesy bpk, Berlin / Antikensammlung / J. Laurentius / Art Resource, NY

The Metropolitan's bronze statuette has affinities to images of Odysseus, in his dress and also in his hairstyle, such as on the Penelope Painter's cup. On the Lykaon Painter's vase in Boston, Odysseus is shown in the gesture of contemplation, resting his head on his hand, as he converses with the shade of Elpinor in the underworld.[23] But the writing tablet is out of place for Odysseus. We think of Odysseus as more of an *ex tempore* composer in Homer. Before the Phaiakians, Odysseus crafts his tales on a moment's notice, without notes.[24] Also, although Homer describes Odysseus as compact and strong and shorter than, for example, Agamemnon, he is not necessarily bad-looking, most of the time.[25] The Met statuette's large head with scruffy beard and fraught expression, and the slightly misshapen body, do not suit the entirety of Odysseus's established iconography.

Figure 15.9. Odysseus with wine-cup, Roman copy of Hellenistic original. Vatican Museums, Museo Chiaramonti inv. 1901

Image: © Marie-Lan Nguyen / Wikimedia Commons

The statuette may represent another wordsmith, one who admired Odysseus and referred obliquely to him in his poetry: Hipponax, the sixth-century BC poet of contentious iambic verse and choliambic ("limping") meters.[26] Hipponax reputedly wrote acerbic attacks on Boupalos and Athenis, sculptors identified by Pliny as sons of Archermos of Chios. In Book 36 of the *Natural History*, Pliny claims that Boupalos and Athenis were Hipponax's contemporaries and goes on to explain a rivalry between the poet and the sculptors: "The face of Hipponax was notoriously ugly; on account of this they impudently exhibited a humorous likeness of him to a circle of laughing spectators. In anger at this Hipponax unsheathed such bitter verses that some believe he drove them to the noose. This is untrue, since later they made several statues in neighboring islands" (*Naturalis historia* 36.4.11).[27]

The few surviving fragments of Hipponax's poetry do not mention this particular statue, but his iambics are full of vituperative remarks about and condemnations of Boupalos. For example, according to Hipponax, Boupalos has "unnatural" relations with his mother.[28] The sculptor is cast as well as the poet's sexual rival.[29] He is also his rival in art. In one fragment, Hipponax turns the tables and calls Boupalos a stone statue, a criticism that might suggest that Hipponax's poetry is more powerful than Boupalos's sculptural production.[30]

The Hellenistic and Roman biographical tradition about Hipponax is no doubt based on his self-descriptions, his fictitious accounts of his own exploits at the lowest levels of society, and his scurrilous comments about others in his poetry. As Enzo Degani and others have shown, the poet's reputation for physical ugliness may reflect not only his slanderous comments about rivals but also self-parody.[31] Metrodorus of Scepsis in the *Art of Training* notes that Hipponax "was not only small of body but also thin and yet was so muscular that in addition to other feats he threw even an empty oil flask a very great distance."[32] It is probable that in a lost verse of self-parody, Hipponax lets fly a lekythos instead of a discus, a scenario that recalls Odysseus's great discus toss in *Odyssey* 8, a comparison Ralph Rosen has explored.[33] In one poem Hipponax himself implies that he's not a very large person: shivering and with chattering teeth, he prays to Hermes to provide him with "a cloak, a *little* tunic, *little* wooden-soled sandals, and *little* felt socks," as well as sixty gold staters (emphasis added).[34] In another poem he complains that Hermes never came through with either the warm clothes or the gold coins.[35] Ultimately, Hipponax creates an unflattering *self*-portrait in *poetry*: he is small and wiry, poor, has thieving on the mind, hangs out with lowlifes and prostitutes, and hurls scatological invective and curses at his rivals. Then, in a poem that has not survived, he seems to have attributed a sculptured caricature to Boupalos, his archrival.[36] By creating a fictitious self-portrait, a caricature, in poetry, Hipponax the poet is perhaps saying that he is a craftsman and takes on the role of a sculptor.

Sculptural caricature is not attested archaeologically in the sixth century BC, when Hipponax lived. The Hellenistic period presents another story. The figure characterized in the Metropolitan's Hellenistic bronze is definitely short and wiry, his belly slightly distended by bad food or flatulence, and his demeanor is hunched and brooding. And, like Hipponax's poetic persona, he lacks a cloak and shoes. The laborer's simple *exomis* suits the lower-class image of his self-described roles, from thief to craftsman. His non-ideal body corresponds as well to the typical physique of the artisan who works indoors, a social outsider bent over his workman's bench, described by Xenophon: "the illiberal arts (*banausikai*), as they are called, are spoken against, and are, naturally enough, held in utter disdain in our states. For they spoil the bodies of the workmen and the foremen, forcing them to sit still and live indoors, and in some cases spend the day at the fire."[37] Here Xenophon links artisanal work to low social class, just as Hipponax does, as well as to the ruin of the body. The statuette's hunched, asymmetrical posture might even suggest that his gait was halting; in that case the bronze would literally incorporate the choliambic "limping" meters that Hipponax employed in his vituperative verses. If we restore a stick in his right hand, the concept of the limp would be emphasized further. The sculpture would personify not only the poet in his own words, but also the meter of his poetry.

The admiration for past poets was cultivated enthusiastically in the Hellenistic period, especially in Alexandria in the third century BC. During this period, scholars were actively recording and cataloguing works of Archaic and Classical Greek literature at the great Library of Alexandria. Many cults of poets were established or renewed at this time, and a number of posthumous and retrospective or imaginary portraits of poets were commissioned.[38] Included in their number were statues of lyric poets, such as the "Old Singer," now in Copenhagen, who is seated on a throne and richly draped.[39] He appears to be entranced by the song he plays on the lyre he once held in his hands. At least three seated poets, all draped with himations, are included in a fragmentary Hellenistic sculpture group of philosophers and poets found at the Sarapieion at Memphis.[40] Of the three, one holds a lyre and another a scroll. The third, unfortunately headless, statue may represent Homer. Better known is the retrospective portrait of Homer, of which over twenty copies survive, including a bust in Naples (fig. 15.10).[41] He is shown as well dressed as the kings he sang about or for whom he is imagined to have performed.

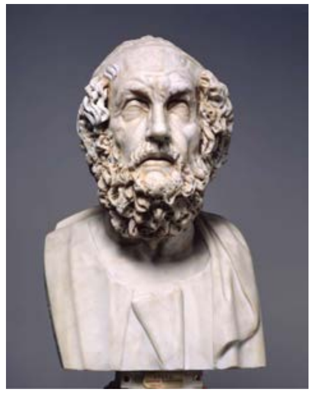


Figure 15.10. Homer, marble bust, Roman copy after Hellenistic original. Naples, Museo Archaeologico Nazionale inv. 6023

Image: Scala / Ministero per i Beni e le Attività Culturali / Art Resource, NY

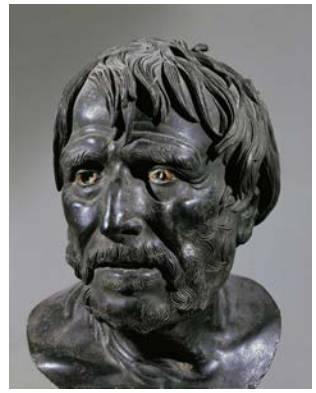


Figure 15.11. Bronze bust of Hesiod ("Pseudo-Seneca"), Roman copy after Hellenistic original. From Herculaneum, Villa dei Papiri. Naples, Museo Archaeologico Nazionale inv. 5616

Image: Erich Lessing / Art Resource, NY

There are exceptions to the rule that poets must be shown heroized and sumptuously draped: a number of scholars have suggested that the bronze portrait from the Villa dei Papiri, known as the Pseudo-Seneca, may be a copy of a retrospective/imaginary portrait of the epic poet Hesiod (fig. 15.11).[42] The scraggly beard and weather-beaten skin evoke the caricatures of aged fishermen and peasants, preserved in great numbers in Hellenistic terracottas, but the passionate energy and compelling expression seem to ennoble this figure.[43] Paul Zanker refers to "biographical physiognomy" here that might reflect "the life of toil, worry, and disappointment" that Hesiod describes in his verses.[44] Such biographical portraiture is an obvious offshoot of the *Bios*-tradition, in which a poet's oeuvre fed and colored the later accounts of his or her life and personality. This tradition was developed fully in the Hellenistic period and extended long into the Roman.[45]

Like the supposed Hesiod, the Metropolitan's Hellenistic bronze statuette may be a retrospective and imaginary poet portrait in this vein. Here we have a figure whose physiognomy and dress are based on his self-described physical flaws, his imitation and parody of Odysseus, and his penchant for living life so close to the bone that he can afford neither shoes nor cloak: Hipponax. Even his wax tablet implies that as a poet he sticks with the tool for drafts and notes, a papyrus scroll being far out of his reach.[46]

One more characteristic of the statuette might further support the identification as Hipponax. In some aspects of pose and dress, the figure mirrors that of the Athenian cult statue of Hephaistos, discussed above. Hephaistos's statue emphasizes the *right* side of the figure: his weight is on his *right* leg, his head turns to the *right*, and his *exomis* is fastened on the left shoulder so that his *right* arm could move freely. He is right-handed. All point to the "good" side of the Pythagorian Table of Opposites.[47] The statuette, in contrast, has his weight on his *left* leg and his head turned to the *left*. His *exomis* is tied on his right shoulder and leaves the *left* arm free. His right hand either would have supported his head or held a stick. In one poetic fragment, Hipponax declares "I'm *amphidexios* [literally, I have two right hands], and I don't miss with my punches."[48] The free left arm of the statuette might imply this ambidexterity. The emphasis on the left throughout the figure would suggest the darker side of the Pythagorian Table, and perhaps the negativity of Hipponax's verses, as well as the poet's presumed ugliness, both internal and external: the opposite of *kalokagatheia*.[49]

The sculptor also might have incorporated a visual pun in the inclusion of the diptych tucked into the figure's belt: the word for "tablet" or "diptych" in Greek is *ptykti* or *pychti*, a feminine noun with the accent on the second syllable. It is close to the word for "boxer," *pychtis*, a masculine noun with the accent on the first syllable. We are reminded that not only can the poet throw punches with both hands, he can write invective. His opponents don't stand a chance as the effect of Hipponax's words will last long after the sting of his punches has worn off.

The poetry of Hipponax enjoyed a considerable revival in the third century BC at Alexandria, where it was celebrated for the lasting power of its biting words.[50] Pseudo-epigrams written for the tomb of Hipponax and preserved in the *Palatine Anthology* caution the traveler to beware his grave because any disturbance might have unwanted repercussions. For example, an epigram attributed to Philip of Thessaloniki warns: "Stranger, flee from the grave with its hailstorm of verses, the frightful grave of Hipponax, whose very ashes utter invective to vent his hatred of B[o]upalus, lest somehow you arouse the sleeping wasp who has not even now in Hades put to sleep his anger, he who shot forth his words straight to the mark in limping meters."[51]

Like a wasp, Hipponax's ability to sting lasts long after his death. This idea puts a spin on the concept of the relative immortality of poetry when compared to that of built monuments at the heart of the *paragone*—the competition between the poetry and the visual arts—that Pindar and Simonides, among others, promoted and that Hipponax embodied in his ongoing feud with the sculptor Boupalos.[52]

Hipponax was revived most effectively by Kallimachos, the first librarian at Alexandria, himself a poet. Emulating Hipponax, Kallimachos wrote a book of thirteen iambic poems. In the very first line of *Iambos* 1, Kallimachos imagines Hipponax returning from Hades itself, to gather together a group of Alexandrian literati in order to advise them against envying one another. "Listen to Hipponax," he says, "for it is I in fact who have come from the place where they sell an ox for a penny, bearing iambics that do not sing of the fight with Bupalus…."[53] A few lines later in the same poem, as the scholars arrive in droves, Hipponax describes himself as "the bald man" not willing to set aside a "threadbare cloak" (i.e., not spoiling for a fight), but to tell, instead, the story of the Seven Sages.[54]

In *Iambos* 1, Kallimachos underscores Hipponax's unattractive looks, his poverty, his feud with Boupalos, and the subject of one of his poems, as Hipponax is one of the earliest Greek poets to mention the tale of the Seven Sages.[55] He also employs the iambic and choliambic meter that Hipponax claimed to have invented, all in the self-referential way that Hipponax employed them.[56] But the meter that was acknowledged by ancient grammarians to be best suited to angry and curse-filled verses appears to be used by Kallimachos instead to elevate and rehabilitate Hipponax.

Kallimachos's ennobling of the poet does not come out of the blue, however. M. L. West has noted that despite its invective subject matter, the poems of Hipponax are cleverly and beautifully constructed.[57] The poet, he argues, far from being a lowlife of the sort he describes in his verses, is as artful as the noblest of lyricists. Like West, Kallimachos saw in Hipponax the high quality of his poetry and not just the work of a "vulgar simpleton."[58] Kallimachos's rehabilitation and literal resurrection of Hipponax in *Iambos* 1, in which the poet chastises other writers for quarreling among themselves and admonishes them to "rise above," raises Hipponax and puts him on a level with other early poets, such as Archilochos, who wrote lyric as well as invective. The artist of the bronze statuette appears to think along the lines of Kallimachos. He shows us, as do most sculptors of retrospective and imaginary portraits, a portrait inspired by his subject Hipponax's poetry: the poet is short and wiry, balding, cloakless, and crabby, and with a limp like his choliambic verses. But with the intense gaze and silver eyes he also shows the noble qualities of the poet who wrote, in West's words, "simple but potent" lines that have "the clear-cut quality of the best Greek poetry," the "artless art" of the finest lyricists.[59] In a word, Kallimachos "got" Hipponax. The statuette's sculptor "got" Hipponax too. Both understood the poet at the heart of the poetry.

Hipponax's revival in Alexandria by Kallimachos in the third century BC, and his appreciation by Hellenistic poets, scholars, and erudite patrons in the hothouse atmosphere provided by the Great Library itself, may have inspired the imaginative portrait seen in the statuette: a figure who, although imperfect in form, is strong, with a thoughtful countenance; whose extraordinary intellectual and creative powers shine through silver eyes, and with a wax tablet to record those extraordinary thoughts. In combining an artisan's body with a poet's means of expression, an actual Hellenistic sculptor refigured in the bronze statuette of Hipponax a personification of the struggle between the poet and his archnemesis, the sculptor Boupalos, revealing the *paragone* between poetry and the visual arts at the heart of Hipponax's poetry. The statue is reputed to have come from the sea off North Africa, which might suggest Alexandria as its place of manufacture. Wherever this statuette stood originally, many must have sought inspiration from it, for the bald forehead has been worn and rubbed smooth by touch, no doubt by those who sought luck and inspiration, or even protection, from the poet's aura.[60]

✦ ✦ ✦

Acknowledgments

I am grateful to Kenneth Lapatin and Jens Daehner for the invitation to contribute a paper to the XIXth International Congress on Ancient Bronzes. Thanks are due as well to Gianfranco Adornato, Ruth Bielfeldt, Kenneth Lapatin, and John Pollini for valuable questions and discussion of the paper. I am most indebted to Guy Hedreen, whose chapter on Hipponax in *The Image of the Artist in Archaic and Classical Greece: Art, Poetry, and Subjectivity* (2016) introduced me to the biographical tradition surrounding the poet, and for selflessly standing as sounding board for many of the ideas presented here. For photographs, thanks are due to Maria Chidiroglou at the National Archaeological Museum in Athens; Liz Kurtulik Mercuri at Art Resource; Craig Mauzy at the Athenian Agora; Dr. Ramona Messerig, Dr. Ellen Riemer, and Ursula Rudischer at the Landesmuseum Mainz; and Marie-Lan Nguyen of Wikimedia Commons. The photographs of the "Bronze Artisan" himself are from the Metropolitan Museum Collections website and are used here thanks to OASC at www.metmuseum.org.

Notes

1. New York, Metropolitan Museum of Art, Rogers Fund, inv. 1972.11.1. Hemingway 2015, 262–63, no. 36 with bibliography; and Hemingway 2016, cat. 71. On the findspot: Himmelmann 1981, 205.
2. Himmelmann 1983, 78.
3. Some of the figure's disproportionate physical properties possibly reflect a congenital syndrome known as spondyloepiphyseal dysplasia. For the syndrome, see Dasen 1993, 8–15.
4. Lee 2015, 112 with nn. 178–81. A variety of figures wear the *exomis*: a Hellenistic or Roman bronze figurine of a fisherman from Volubilis (Musée archéologique de Rabat inv. 99.1.12.1345): Morel-Deledalle 2014, 154–55; the Hellenistic Jockey from Artemision (Athens, National Archaeological Museum, inv. X15177): Hemingway 2004, 44, fig. 25, 55; a bronze shepherd statuette from Ampelokepoi (Athens, National Archaeological Museum, inv. X16789): Daehner and Lapatin 2015, 106, fig. 7.8; the dancing male dwarf from the Mahdia shipwreck (Tunis, Musée National du Bardo, inv. F215): Picón and Hemingway 2016, 289, inv. 233 with figure; Pfisterer-Haas 1994, 484–86 with figs. 6, 7, 13–15, and color plate 17. Two first-century BC small terracotta figures of bald, thin, stooped, *exomis*-wearing comic actors in the guise of slaves from Myrina, in the Athens National Archaeological Museum (inv. 5050 and 5051), await publication.
5. Himmelmann 1981, 205 and 1983, 76.
6. Hemingway 2015, 262.
7. Boucher-Colozier 1965, 38.
8. Himmelmann 1983, 76–85; Török 1995, 116–18, nos. 156–57, plates XIII, LXXXII–LXXXIII.
9. Himmelmann 1983, 79 and plate 59a.
10. Himmelmann 1983, 78.
11. Hemingway 2015, 262. For Hephaistos's limp, see *Iliad* 18.371 where he's described as "club-footed" (*kyllopodiōn*) and *Iliad* 18.397 where the god describes himself as "lame" or "crippled" (*chōlon*). On Hephaistos's lameness: Hedreen 2016, 137–38.
12. Frel 1981, 17; Hemingway 2015, 262.
13. Harrison 1977, 140, illustration 2; 146–48.
14. Agora L 5413: Harrison 1977, 147, fig. 4; and Athens National Archaeological Museum, inv 18011-2, Empedokles Collection: Harrison 1977, 147, fig 3.
15. Brommer 1973, 6, cat. 18 and plate 18. Reflections of the Hephaisteion statue appear in Greece as early as the fourth century BC, for example on a grave relief, Worcester Art Museum, inv. 1936.21, *CAT* 1.153. Roman images of Vulcan in this pose may begin as early as the first century BC as seen on the base with Vulcan, Venus, and Amor from Falerii (Cività Castellona). See Kuttner 1995, 39 and fig. 28.
16. On the *pilos* as the craftsman's hat, see Pipili 2000, 153–62.
17. Pompeii VI 15.1, Casa dei Vettii, *triclinium* P, North Wall: *LIMC* 7.2, plate 130, Pasiphaë 11. See also De Carolis 2001, 56 and illustration on 57; and Panetta 2004, 365.
18. The *triclinium* mosaic in the so-called House of Poseidon shows Pasiphaë commissioning the artificial cow from Daidalos, who shrinks from the task: Abadie-Reynal 2002, 751–52 and fig. 6. *LIMC* Supplementum 2 2009, pl. 71, Daidalos et Ikaros, add. 5.
19. Marble sarcophagus: Paris, Louvre, inv. MA 1033. *LIMC* 7.2, plate 131, Pasiphaë 23. See also Maurer 2015, 208–11 with fig. 6.4. Himmelman 1981, 205, notes a similarity of dress and

gesture between the bronze artisan and the image of Daidalos at the far left on the sarcophagus.

20. Second-century AD marble relief (*rosso antico*) from Rome. Villa Albani inv. 164. *LIMC* 3.1, 317, Daidalos et Ikaros 23a; *LIMC* 3.2, pl. 239, Daidalos et Ikaros 23a. Neudecker 1992, 125–27. A second relief in the Villa Albani, inv. 1009, is largely restored, based on inv. 164. See *LIMC* 3.1, 317, Daidalos et Ikaros 23b.
21. For example, an Etruscan bronze mirror case of the third century BC shows Odysseus talking to Penelope: London, British Museum, inv. 1865, 0712.8; Gaultier and LaCroix 2013, 51, 305 (cat. 378).
22. *LIMC* 6.1, 956, Odysseus 87. *LIMC* 6.2, pl. 627, Odysseus 87.
23. Boston, Museum of Fine Arts, inv. 34.79: Lykaon Painter, red-figure pelike, *ARV*^{2} 1045.2, 1679; *Paralipomena* 444; *BAPD* 213553; *LIMC* VI.2, pl. 632, Odysseus 149.
24. *Odyssey* 9–12 for Odysseus's story.
25. On Odysseus's good but somewhat different looks see, for example, *Iliad* 3.192–96; *Odyssey* 8.134–36. Athena also occasionally adds to Odysseus's charisma and accentuates his good points: *Odyssey* 6.229–35; 8.18–20; 23.156–63. His normally handsome presentation is disrupted when Athena intentionally disguises him with attributes of an old beggar: *Odyssey* 13.429–38.
26. An original Hellenistic portrait head of a bearded man with a fillet discovered in the Kerameikos (Athens, National Archaeological Museum, inv. 2800) has been called "Hipponax" because of his grim expression. No further evidence supports the identification. See Zanker 1995, 154, 369, n. 7; and 155, fig. 82; Dillon 2006, 86, 124 and fig. 126.
27. Pliny *Naturalis historia* 36.4.11 = Hipponax test. 1W; Gerber 1999, 342–43.
28. Frag. 12W, *metrokoites*, literally "mother-fucker" (Gerber 1999, 362–63), and possibly frag. 70W, 7–8 (Gerber 1999, 404–405). For Hipponax's rivalry with Boupalos, see Hedreen 2016, 106–10.
29. For example, frag. 15W, Gerber 1999, 354–55.
30. On the rivalry between Hipponax and Boupalos as an early iteration of the *paragone* between poetry and the visual arts: Hedreen 2016, 103, 115–16.
31. West 1974, 28–30, 32–33; Degani 2002, 150–51.
32. Athenaeus 12.552c–d = test. 5W; Gerber 1999, 346–47.
33. Gerber 1999, 347, n. 3. Rosen 1990, 11–15, discusses the scene between Euryalus and Odysseus in *Odyssey* 8.158–90. See also Hedreen 2016, 103–7, for Hipponax's relationship to Odysseus.
34. Frag. 32W, Gerber 1999, 376–77.
35. Frag. 34W, Gerber 1999, 380–81.
36. Hedreen 2016, 110–16.
37. Xenophon *Oikonomikos* 4.2–3, text/trans. Marchant and Todd 1923.
38. On cults of poets, see Zanker 1995, 158–73; Clay 2004, especially 127–51; Dillon 2006, 105–6. Some poet's cults had been founded as early as the fifth century BC, hence Artistotle's citation of Akidamas's observation that "Everyone honors the wise. The Parians honored Archilochos, even though he was a slanderer [*blásphemos*] and the Chians have honored Homer although he was not one of their citizens…." *Rhetorica* 2.23.1398 b 11–12. Trans. Lefkowitz 2012, 32.
39. "Old Singer": Ny Carlsberg Glyptotek, inv. 1563; Zanker 1995, 146–49 and 148–49, figs. 79a–b, and Clay 2004, 61 with pl. 30.
40. Bergmann 2007, 247–56, figs. 161–64, 166–67.
41. Richter and Smith 1984, 147, 150; Zanker 1995, 168–71, with fig. 90.
42. Richter and Smith 1984, 191–92. Identification as Hesiod: Pollitt 1986, 119–20; Smith 1991, 37; Zanker 1995, 151–54, and 369, n. 4, where the author states, "Most archaeologists are currently inclined to the identification as Hesiod."
43. For Hellenistic images and figurines of fishermen and peasants, see, for example, Himmelmann 1983, 26, plates 31a–b, 33a–b. More recently, Masséglia 2015, 219–41. Examples from Myrina ("personnages comiques"): Mollard-Besques 1963, 346 and pls. 174b, 175b, 175f.
44. Zanker 1995, 151.
45. Lefkowitz 2012; Bing 1993, 619–31.
46. Meyer 2009 argues that Muses are often shown with diptychs in Greek and Roman art, and poets with scrolls. In a Pompeian wall-painting (House of the Golden Bracelet, VI Ins. Occ. 17.42), a muse hands a poet a wax tablet, a gesture that indicates that the wax tablet was used for inspired ideas before the final draft: Meyer 2009, 581, fig. 12.
47. Aristotle *Metaphisica* 1.5.986a. Vidal-Naquet 1986, 61–82, presents a classic study of the Pythagorean oppositions. See especially 64–65.
48. Frag. 121W, Gerber 1999, 423.
49. Hipponax's poetry is the opposite of the praise poetry that one associates with athletic victory or positive civic duty. Accordingly, his portrait lacks the harmonious proportions one associates with the ideal commemorative sculpture. For example, the disproportionate size of the artisan's head when compared to his body would underscore the lack of commensurability of parts one associates with idealized athletic figures, such as the Polykleitan types where the parts of the body are proportioned harmoniously with one another. Lissarrague 2000, 136, discusses Aesop as the opposite of an ideal figure, in that he is characterized by some ancient sources as a barbarian and a slave as well as ugly and deformed. The bronze artisan has some similar attributes to this description, but does not reflect all of the extremities that are said to characterize Aesop.
50. Kerkhecker 1999, 7, notes that "early in the third century, Hipponax is fashionable. After a period of almost complete obscurity, there is a sudden burst of Hipponactean verse, a choliambic craze. Callimachus is reacting, not only to the past but to the present."
51. *Anthologia Palatina* 7.405, test. 8W, Gerber 1999, 348–49, trans. Gerber.
52. Hedreen 2016, 115–16.
53. Kallimachos, *Iambi* 1, ll. 1–4, trans. Gerber 1999, 347, test. 6W.
54. Kallimachos, *Iambi* 1, ll. 29 and 30, respectively: Trypanis 1978, 106–7. Trypanis idem., n. *c*, notes that one scholiast suggests that the temple site where Hipponax tells the literati to gather is the Sarapieion at Alexandria. The idea of gathering great thinkers and writers at a Sarapieion may have inspired, or been inspired by, the actual sculpture group of poets and philosophers at the Sarapieion at Memphis. For the sculpture group see Bergmann 2007.
55. Strabo 14.1.2 = test. 123W, Gerber 1999, 454–55.

56. Hedreen 2016, 101–3; Acosta-Hughes 2002, 36–38.
57. West 1974, 28–29.
58. West 1974, 28.
59. West 1974, 28–29.
60. The square knot on the statuette's right shoulder and the other that ties his belt might be seen as apotropaic in function. A pseudo-epigram by Theokritos for the tomb of Hipponax also suggests that although scoundrels should give Hipponax's tomb wide berth, those who are honest have nothing to fear—and can even nap on the tomb. Thus, Hipponax might protect the good-hearted. Theocritus, *Epigrammata* 19 Gow = *HE* 3430–33 (*Anthologia Palatina* 13.3), test. 7W; Gerber 1999, 346–47.

Bibliography

Abadie-Reynal 2002
Abadie-Reynal, C. 2002. "Les maisons aux décors mosaïqués de Zeugma." *CRAI* 146.2: 743–71.

Acosta-Hughes 2002
Acosta-Hughes, B. 2002. *Polyeideia: The Iambi of Callimachus and the Archaic Iambic Tradition*. Berkeley: University of California Press.

Bergmann 2007
Bergmann, M. 2007. "The Philosophers and Poets in the Sarapieion at Memphis." In *Early Hellenistic Portraiture: Image, Style, Context*, ed. P. Schulz and R. von den Hoff, 246–63. Cambridge and New York: Cambridge University Press.

Bing 1993
Bing, P. 1993. "The *Bios*-Tradition and Poets' Lives in Hellenistic Poetry." In *Nomodeiktes: Greek Studies in Honor of Martin Oswald*, ed. R. M. Rosen and J. Farrell, 619–31. Ann Arbor: University of Michigan Press.

Boucher-Colozier 1965
Boucher-Colozier, Stéphanie. 1965. "Un bronze d'époque Alexandrine: Réalisme et Caricature." *Monuments et mémoires* (Fondation Eugène Piot) 54: 25–38.

Brommer 1973
Brommer, F. 1973. *Der Gott Vulkan auf provinzialrömischen Reliefs*. Cologne and Vienna: Böhlau.

Brown 1997
Brown, C. G. 1997. s.v. "Iambos." In *A Companion to the Greek Lyric Poets*, ed. D. E. Gerber. Leiden, New York, and Cologne: Brill.

Clay 2004
Clay, D. 2004. *Archilochos Heros: The Cult of Poets in the Greek Polis*. Washington, DC: Center for Hellenic Studies.

Daehner and Lapatin 2015
Daehner, J. M., and K. Lapatin, eds. 2015. *Power and Pathos: Bronze Sculpture of the Hellenistic World*. Los Angeles: J. Paul Getty Museum.

Dasen 1993
Dasen, V. 1993. *Dwarfs in Ancient Egypt and Greece*. Oxford: Clarendon Press.

De Carolis 2001
De Carolis, E. 2001. *Gods and Heroes in Pompeii*. Los Angeles: J. Paul Getty Museum.

Degani 1991
Degani, E. 1991. *Hipponax: Testimonia et Fragmenta*. Stuttgart and Leipzig: B. G. Teubner.

Degani 2002
Degani, E. 2002. *Studi su Ipponatte: Nuova edizione anastaticamente riprodotta*. Hildesheim: Georg Oms.

Dillon, S. 2006
Dillon, S. 2006. *Ancient Greek Portrait Sculpture: Contexts, Subjects, and Styles*. Cambridge and New York: Cambridge University Press.

Frel 1981
Frel, J. 1981. *Greek Portraits in the J. Paul Getty Museum*. Los Angeles: J. Paul Getty Museum.

Gaultier and LaCroix 2013
Gaultier, F., and M. LaCroix 2013. *Les Etrusques et la Méditerranée: La cité de Cerveteri*. Paris: Louvre Museum.

Gerber 1999
Gerber, D. E. 1999. *Greek Iambic Poetry*. Cambridge (MA).: Harvard University Press.

Harrison 1977
Harrison, E. B. 1977. "Alkamenes' Sculptures for the Hephaisteion: Part 1, The Cult Statues." *AJA* 81: 137–78.

Hedreen 2016
Hedreen, G. M. 2016. *The Image of the Artist in Archaic and Classical Greece: Art, Poetry, and Subjectivity*. Cambridge and New York: Cambridge University Press.

Hemingway 2004
Hemingway, S. 2004. *The Horse and Jockey from Artemision: A Bronze Equestrian Monument of the Hellenistic Period*. Berkeley and Los Angeles: University of California Press.

Hemingway 2015
Hemingway, S. 2015. "Statuette of an Artisan." In Daehner and Lapatin 2015, 262–63.

Hemingway 2016
Hemingway, S. 2016. "Statuette of an Artisan." In Picón and Hemingway 2016, 161–62.

Himmelmann 1981
Himmelmann, N. 1981. "Realistic Art in Alexandria." *Proceedings of the British Academy* 67: 194–207.

Himmelmann 1983
Himmelmann, N. 1983. *Alexandria und der Realismus in der griechischen Kunst*. Tübingen: E. Wasmuth.

Kerkhecker 1999
Kerkhecker, A. 1999. *Callimachus' Book of Iambi*. Oxford: Clarendon Press.

Kuttner 1995
Kuttner, A. L. 1995. *Dynasty and Empire in the Age of Augustus: The Case of the Boscoreale Cups*. Berkeley: University of California Press.

Lee 2015
Lee, M. M. 2015. *Body, Dress, and Identity in Ancient Greece*. Cambridge and New York: Cambridge University Press.

Lefkowitz 2012
Lefkowitz, M. R. 2012. *The Lives of the Greek Poets*. 2nd ed. London: Bristol Classical Press.

Lissarrague 2000
Lissarrague, F. 2000. "Aesop, Between Man and Beast: Ancient Portraits and Illustrations." In *Not the Classical Ideal: Athens and the Construction of the Other in Greek Art*, ed. Beth Cohen, 132–49. Leiden and Boston, Cologne: Brill.

Marchant and Todd 1923
Marchant, E. C., and O. J. Todd, trans. 1923. *Xenophon*. Vol. 4: *Memorabilia, Oeconomicus, Symposium, Apology*. Cambridge, MA: Harvard University Press.

Masséglia 2015
Masséglia, J. 2015. *Body Language in Hellenistic Art and Society*. Oxford and New York: Oxford University Press.

Mattusch 1980
Mattusch, C. C. 1980. "The Berlin Foundry Cup: The Casting of Greek Bronze Statuary in the Early Fifth Century B.C." *AJA* 84: 435–44.

Maurer 2015
Maurer, M. F. 2015. "The Trouble with Pasiphaë: Engendering Myth in the Gonzaga Court." In *Receptions of Antiquity, Constructions of Gender in European Art, 1300–1600*, ed. M. Rose and A. C. Poe, 199–229. Leiden and Boston: Brill.

Meyer 2009
Meyer, E. A. 2009. "Writing Paraphernalia, Tablets, and Muses in Campanian Wall Painting." *AJA* 113: 569–97.

Mollard-Besques 1963
Mollard-Besques, S. 1963. *Musée du Louvre: Département des antiquités grecques et romaines: Catalogue raisonné des figurines et reliefs en terre-cuite grecs, étrusques, et romans*. Vol. 2: *Myrina*. Paris: Editions des Musées nationaux.

Morel-Deledalle 2014
Morel-Deledalle, M., ed. 2014. *Splendeurs de Volubilis: Bronzes antiques du Maroc et de Méditerranée*. Exh. cat. Marseilles, Le musée des civilisations de l'Europe et de la Méditerranée (MuCEM). Arles: Actes Sud.

Neudecker 1992
Neudecker, R. 1992. "Relief mit Daidalos und Ikaros." In *Forschungen zur Villa Albani: Katalog der antiken Bildwerke*. Vol. 3, 125–27, no. 296, plate 84. P. C. Bol, ed. Berlin: Gebr. Mann.

Panetta 2004
Panetta, M. R., ed. 2004. *Pompeii: The History, Life and Art of the Buried City*. Vercelli: White Star.

Pfisterer-Haas 1994
Pfisterer-Haas, S. 1994. "Die bronzenen Zwergentänzer." In *Das Wrack: Der antike Schiffsfund von Mahdia*, ed. G. Hellenkemper Salies, H-H. von Prittwitz und Gaffron, and G. Bauchhenß, vol. 1, 483–504. Cologne: Rheinland-Verlag GmbH.

Picón and Hemingway 2016
Picón, C. A., and S. Hemingway. 2016. *Pergamon and the Hellenistic Kingdoms of the Ancient World*. New York: Metropolitan Museum of Art.

Pipili 2000
Pipili, M. 2000. "Wearing the Other Hat: Workmen in Town and Country." In *Not the Classical Ideal: Athens and the Construction of the Other in Greek Art*, ed. B. Cohen, 153–79. Leiden, Boston, and Cologne: Brill.

Pollitt 1986
Pollitt, J. J. 1986. *Art in the Hellenistic Age*. Cambridge and New York: Cambridge University Press.

Richter and Smith 1984
Richter, G. M. A., and R. R. R. Smith. 1984. *The Portraits of the Greeks*, rev. ed. Oxford: Phaidon.

Rosen 1990
Rosen, R. M. 1990. "Hipponax and the Homeric Odysseus." *Eikasmos* 1: 11–25.

Smith 1991
Smith, R. R. R. *Hellenistic Sculpture*. London: Thames & Hudson.

Török 1995
Török, L. 1995. *Hellenistic and Roman Terracottas from Egypt*. Rome: L'Erma di Bretschneider.

Trypanis 1978
Trypanis, C. A., ed. 1978. *Callimachus: Aetia, Iambi, Hecale and Other Fragments*. Cambridge, MA: Harvard University Press.

West 1974
West, M. L. 1974. *Studies in Greek Elegy and Iambus*. Berlin and New York: Walter de Gruyter.

Vidal-Naquet 1986
Vidal-Naquet, P. 1986. *The Black Hunter: Forms of Thought and Forms of Society in the Greek World.* Trans. A. Szegedy-Maszak. Baltimore and London: John Hopkins University Press.

Zanker 1995
Zanker, P. 1995. *The Mask of Socrates: The Image of the Intellectual in Antiquity*. Trans. Alan Shapiro. Berkeley, Los Angeles, and Oxford: University of California Press.

16.

The Paramythia Bronzes: Expressions of Cultural Identity in Roman Epirus

Heather Sharpe, West Chester University, West Chester, Pennsylvania

In the British Museum is a collection of statuettes known as the Paramythia bronzes, named after the place of their discovery near Paramythia, Epirus, Greece, ca. 1792. The statuettes depict various deities including a Roman *lar* figure, and therefore they presumably once belonged to a *lararium* (a Roman household shrine). It is likely that the bronze statuettes originated in a Roman villa situated in or near the ancient Roman colony of Photike, which is located a short distance from Paramythia. The bronze hoard provides valuable evidence for the presence of Roman settlers in Epirus and, more importantly, informs us about Roman domestic cult activities in the province of Achaea. Additionally, the bronzes may be interpreted as symbols that served to project and reinforce the cultural and ethnic identity of the Roman householder.

✦ ✦ ✦

Introduction

This paper will focus on a hoard of bronze statuettes found near Paramythia (Epirus) at the end of the eighteenth century (fig. 16.1–14).[1] It is appropriate to review these bronzes in light of recent scholarship on Roman Greece and current discussions regarding aspects of Roman identity.[2] A reappraisal of the Paramythia material can contribute to recent deliberations concerning how material culture, in particular personal items, might reflect and reinforce the patron's social and cultural identity. With this focus in mind, I will discuss some of the recent scholarly and archaeological investigations of Roman Epirus, specifically the Roman colony of Photike, which is where the Paramythia bronzes were said to have originated. Although the specific findspot of the bronzes has been lost, the statuettes most likely came from a Roman house or villa, judging from the predominantly Roman character of the finds from Photike. This paper will conclude with a brief discussion of the subject matter of the bronzes (i.e., the deities represented), and with consideration of how the villa owner might have utilized these bronzes as a means to project and reinforce his or her Roman identity.


Figure 16.1

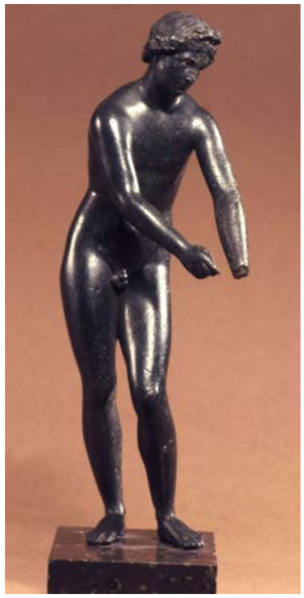


Figure 16.2


Figure 16.3


Figure 16.4


Figure 16.5


Figure 16.6


Figure 16.7


Figure 16.8


Figure 16.9


Figure 16.10


Figure 16.11


Figure 16.12


Figure 16.13


Figure 16.14

Figure 16.1. Bronze statuette of Neptune (?), inv. 1824,0453.4; Figure 16.2. Bronze statuette of Apollo, inv. 1824,0405.2; Figure 16.3. Bronze statuette of Serapis. London, British Museum inv. 1824,0478.1; Figure 16.4. Bronze statuette of Castor. London, British Museum inv. 1824,0429.1; Figure 16.5. Bronze statuette of Isis-Aphrodite. London, British Museum, inv. 1824,0428.1; Figure 16.6. Bronze statuette of Venus. London, British Museum, inv. 1824,0490.4; Figure 16.7. Bronze statuette of a Ram with Odysseus. London, British Museum, inv. 1824,0473.1; Figure 16.8. Bronze relief with face of Apollo as sun god. London, British Museum, inv. 1824,0405.3; Figure 16.9. Bronze statuette of Jupiter. London, British Museum, inv. 1824,0453.5; Figure 16.10. Bronze arm from a statuette. London, British Museum, inv. 1824,0453.6; Figure 16.11. Bronze fragment of a bull's hoof and fetlock. London, British Museum, inv. 1824,0415.11; Figure 16.12. Bronze statuette of a *Lar*. London, British Museum, inv. 1824,0437.2; Figure 16.13. Bronze mirror-case relief depicting Aphrodite and Anchises. London, British Museum, inv. 1904,702.1; Figure 16.14. Bronze statuette of Mercury. London, British Museum, inv. 1904,1010.1.

Discovery of the Bronze Statuettes

At the end of the eighteenth century, local inhabitants living around the modern Greek town of Paramythia discovered approximately twenty bronze statuettes in a "dry sandbank"; they were subsequently taken to Ioannina purportedly to be sold as scrap metal.[3] Fortunately, a

Greek merchant noticed them and, recalling that he had seen similar works of art in Moscow, sent some of the statuettes to St. Petersburg to be sold.[4] The bronzes were purchased by various collectors, but by 1904 the majority had been donated to the British Museum (see Appendix).

Richard Payne Knight (1750–1824), who had acquired twelve of the statuettes, dated the bronzes to the second century BC, believing that they had been buried for safekeeping prior to the Roman invasion of Epirus in 167 BC.[5] However, the presence of a Roman household deity—a *lar* (see fig. 16.4)—clearly indicates that the hoard must be Roman in date. Later scholars, including Karl Anton Neugebauer and Luigi Beschi, proposed that they should be dated to the Hadrianic or Antonine period, respectively.[6] N. G. L. Hammond and Judith Swaddling provided further information on the origin of the bronzes, demonstrating that they originated from ancient Photike (a Roman site) and were once part of a *lararium*.[7]

The Findspot: Contextualizing the Bronzes

Today, this group of bronzes is commonly referred to as the Paramythia Hoard due to the misconception that they were discovered at Paramythia. In 1809, William Martin Leake, a British military man and antiquarian, visited Paramythia and clarified that the bronzes in fact had been discovered just outside of that town.[8] He described a valley located to the north of Paramythia, "watered by one of the tributaries of the Vuvó" (Kokytos River), where a village named Lábovo once stood (figs. 16.15–16). There he observed some architectural fragments as well as broken pottery in neighboring fields. Hammond, who extensively explored Epirus from 1929 to 1939, clarifies the findspot of the bronzes further by connecting Lábovo with the modern site of Liboni (also spelled Limboni).[9] Liboni has not been excavated, but a number of inscriptions have been found in the vicinity that identify the site as the ancient city of Photike.[10]

Figure 16.15. Map with approximate location of the Roman colony of Photike
Image: © 2016 CNES / Astrium

Photike was a Roman colony founded in the first century BC by either Julius Caesar or Augustus.[11] It is situated at an important crossroads with access to the Kalamas River to the north, the Acheron River to the south, and a mountain pass leading east to Dodona and Ioannina (see fig. 16.15).[12] In addition to having an advantageous geographic location, the area has long been considered to be especially fertile. The climate and landscape are well suited to pastoralism, and in antiquity Epirus was famed for the quality of its livestock (figs. 16.17–18).[13] The varied terrain could support a broad array of foodstuffs and goods; in addition to livestock, the region is suitable for the cultivation of apple, pear, olive, and almond trees; wheat, barley, and pulses; and is abundant in a variety of timber species: holm oak, poplar, willow, and pine.[14] It is therefore not surprising that after the sack and devastation of the area by Romans under Aemilius Paullus in 167 BC (including the enslavement of 150,000 inhabitants),[15] the territory experienced an influx of Roman settlers who took advantage of the economically stricken region.[16] Roman immigration to northern Epirus took place as early as the third century BC,[17] and Roman colonies were established at Butrint, Nikopolis, and Photike in the second half of the first century BC.[18] Archaeological excavations and surveys, most recently the Thesprotia Expedition conducted by the Finnish Institute at Athens,[19] have uncovered evidence of Roman settlers in the Kokytos Valley to the south of Paramythia, including inscriptions,[20] farmsteads, and a villa.[21] The Roman villa, located at Agios Donatos of Zervochori, is situated approximately 9 kilometers (5 mi.) south of Paramythia and therefore is unlikely to have been the origin of the Paramythia bronzes.[22] In his discussion of Thesprotia during the Roman and Late Antique periods, William Bowden has suggested that, as at Roman Butrint, rich suburban villas were likely situated in and around Photike; he further proposes that the Paramythia bronzes once belonged to such a villa.[23]

Figure 16.16. View (looking west) of the northern end of the Kokytos River valley where the Roman colony of Photike may have been located

Figure 16.17. View looking south of the Kokytos River valley from the hills above the modern town of Paramythia

Figure 16.18. View of the northern end of the Kokytos River valley with Mount Chionistra to the northeast. This area is reputed to be the location of the Roman colony of Photike

We are further informed of Roman settlers in Epirus through literary sources, specifically Cicero, in his letters to his friend Titus Pomponius Atticus, and Varro, who wrote an agricultural treatise in which he often referenced large estate holders in Epirus.[24] We learn from Cicero and Cornelius Nepos that Atticus had acquired property in Epirus, notably a villa at Buthrotum (Butrint) and property on Corcyra.[25] Varro speaks more generally of Roman settlers in the region, referring to them as *Synepirotae* (fellow citizens of Epirus), and he playfully refers to two Romans—Atticus and Cossinius—as *semi-graeci pastores* (half-Greek shepherds).[26] The *Synepirotae*, however, were not simple farmers; they were *Epirotici pecuariae athletae* (cattle-raising champions of Epirus),[27] noted for their wealth, the size of their estates, and their focus on animal husbandry, considered to be a rich man's hobby.[28] We should imagine that the Paramythia bronzes, which must have cost a considerable sum of money, once decorated the villa of one of these wealthy Roman settlers.

The region of Epirus recovered economically under the Pax Romana with growth and expansion visible in and around Butrint and perhaps also at Nikopolis and Photike.[29] Survey results from the Thesprotia Expedition indicate that settlements in the Kokytos Valley continued to increase in number into the fifth century AD;[30] however, there are signs of growing unrest in the region beginning in the middle of the third century AD.[31] Sometime around AD 250, the Roman villa at Agios Donatos (Zervochori) and a farmstead located on the hill of Mastilitsa next to the delta of the Kalamas River were abandoned.[32] Furthermore, a number of inhabitants in Epirus took pains to safeguard some of their wealth by hoarding coins; four hoards have been found in the region ranging in date from AD 193 to 268 and were likely buried over fears of the Herulian invasion of Greece in AD 267.[33] It is likely for this reason that the Paramythia bronzes were buried.

The Bronze Statuettes: Function and Iconography

Bronze statuettes from Roman Greece are relatively rare, and thus far there is little evidence of Greek inhabitants adopting Roman domestic cult practices.[34] During the period of Roman rule, Greeks continued to venerate their traditional household gods, particularly Aphrodite, Dionysos, and Herakles, as well as new and foreign gods including Cybele, Asklepios, Isis, and Serapis. By contrast, the Paramythia bronzes are much more representative of Roman domestic cult practices.[35] The inclusion of a *lar* statuette (see fig. 16.12) strongly suggests that the owner was Roman, and many of the Paramythia bronzes depict deities that were commonly venerated in Roman houses and villas (notably Jupiter and Neptune, see figs. 16.9 and 16.1). The presence of the Apollo, Hercules, and Pan may be due to the popularity of local cults, such as those at Nikopolis.[36] More unusual is the Paramythia Isis-Aphrodite figure (see fig. 16.5), which belongs to a series of bronze statuettes more commonly found in the eastern Mediterranean.[37] In Roman Egypt, written and archaeological evidence indicates that Aphrodite statuettes formed part of a woman's dowry taken to the home of her new husband.[38] In Syria, Isis-Aphrodite was associated with Astarte, and in the Roman period, there was a tradition of burying a woman with a statuette of Aphrodite or Astarte beneath her head.[39] It is certainly possible that a member from the Photike household to which the Paramythia bronzes belonged was of Syrian or Egyptian heritage.[40]

Earlier scholars have often referred to the gods represented in the Paramythia hoard by their Greek names and have attempted to associate the bronzes with local Greek cults at nearby Dodona. With the realization that the Paramythia bronzes are Roman, it is necessary to adjust our interpretation of the statuettes and the deities they represent. Depictions of gods and goddesses may convey very different meanings or ideas to individuals of diverse historical and cultural backgrounds. Rather than examine these statuettes solely within the framework of a Greek cultural context, we should explore how they might be interpreted as symbols of Roman identity. It should not be surprising that Romans living abroad would desire to maintain cultural ties to their homeland by surrounding themselves with references to *Romanitas*, which might range from the design of their villas, the inclusion of Roman-style mosaics and wall-paintings, the utilization of Roman-made ceramics and glass, and the display and veneration of their household gods. From the time of the Republic, the retention of Roman customs and traditions was especially important for Romans living abroad, who were considered to be at risk from the corrupting influences of contemporary Greek society.[41] With increased contact with the Greek world, a number of Roman writers developed xenophobic views of contemporary Greeks, condemning them for a number of perceived character flaws: excessive talkativeness, immoderation, arrogance, rashness, deceit, and a lack of manliness (from living a soft, luxurious lifestyle).[42] Romans living or stationed abroad (especially in Greek lands) were deemed especially vulnerable, exposed as they were to the deleterious effects of the alleged luxurious lifestyle of indolent Greeks.[43] We are reminded again of Varro's comments regarding Romans living in Epirus, referring to them as "Greeks," which implies a certain ambiguity regarding their cultural and political bonds with Rome.[44]

Certainly, the Roman owner of the Paramythia bronzes prized these objects because they represented his or her household gods, which ensured the prosperity and success of the family household, but they also must have projected and reinforced the owner's Roman identity, to Greek and Roman visitors alike. They would have served as reminders of Roman ethnicity and emphasized the religious and cultural connections to the owner's homeland, which might have been called into question if the family had resided in Greece for multiple generations.

Conclusions

Although discovered over two hundred years ago, the Paramythia bronzes still have much to reveal not only about the character of Roman domestic cult practices in Roman Epirus but also as evidence for how Romans may have maintained a sense of Roman identity while living abroad. There are very few signs that Greeks living under Roman rule were interested in adopting Roman domestic cult practices, so the display of bronze statuettes in *lararia* must have been a remarkable sight in Roman Greece, one that immediately proclaimed the status and identity of the owner. While recent archaeological work has added to our knowledge of major Roman sites in Epirus (e.g., Butrint and Nikopolis) with some attention directed to determining the extent of the Roman cultural stamp placed on these cities, it is worth considering the personal experience of an expatriate Roman family and the measures it took to maintain and promote a Roman identity. During a period of unrest and insecurity—perhaps the Herulian invasion of Greece in AD 267—the owner of these bronze statuettes took great pains to safeguard them. They were not just objects of great monetary value but important symbols of status and identity. Today, they are worthy of reexamination as they add immensely to our understanding of the interrelationships between Romans and Greeks, both artistically and culturally, in Roman Epirus.

✦ ✦ ✦

Acknowledgments

I wish to thank the Trustees of the British Museum for allowing me to work on this material, and I am especially appreciative to the staff in the Department of Greece and Rome (in particular Judith Swaddling) for their kind assistance. I also wish to convey my gratitude to the Office of Sponsored Research at West Chester University for generously funding this research project.

Appendix: List of the Paramythia Bronzes

In the collection of the British Museum, with current acquisition and catalogue numbers from Walters's 1899 catalogue. With the exception of no. 5, the identifications are taken from Judith Swaddling's 1979 paper.

Donated by Richard Payne Knight

1. Neptune (?) (inv. 1824,0453.4; Walters no. 274) (originally identified as a Jupiter[45]) (fig. 16.1)
2. Apollo (inv. 1824,0405.2; Walters no. 272) (fig. 16.2)
3. Serapis (inv. 1824,0478.1; Walters no. 276) (fig. 16.3)
4. Castor (inv. 1824,0429.1; Walters no. 277) (fig. 16.4)
5. Isis-Aphrodite (inv. 1824,0428.1; Walters no. 279) (originally identified as a Dione) (fig. 16.5)
6. Venus (inv. 1824,0490.4; Walters no. 280) (fig. 16.6)
7. Ram with Odysseus (inv. 1824,0473.1; Walters no. 1446) (fig. 16.7)
8. Relief with face of Apollo as sun god (inv. 1824,0405.3; Walters no. 273) (fig. 16.8)
9. Jupiter (inv. 1824,0453.5; Walters no. 275) (fig. 16.9)[46]
10. Arm from a statuette (inv. 1824,0453.6; Walters no. 281.1) (fig. 16.10)
11. Bull's hoof and fetlock (inv. 1824,0415.11; Walters no. 281.2) (fig. 16.11)
12. *Lar* (inv. 1824,0437.2; Walters no. 278) (originally identified as a Ganymede) (fig. 16.12)

Donated by John Hawkins

1. Mirror-case relief depicting Aphrodite and Anchises (inv. 1904,702.1) (fig. 16.13)[47]
2. Mercury (1904,1010.1) (fig. 16.14)

Belonging to the Czernicheff Family

(Acquired in St. Petersburg; current locations unknown.[48])

1. Jupiter
2. Faun
3. Cupid
4. Hekataion
5. Draped female figure with diadem (Juno?)

Owner/Location Unknown

1. Hercules

Notes

1. Society of Dilettanti 1835, lxiv–lxvii; Walters 1899, xiv, 36–38; Swaddling 1979.
2. On Roman cultural identity and ethnicity, see in particular Laurence and Berry 1998; McInerney 2014; Woolf 1998; Swift 2006.
3. Dallaway 1816, 357; Society of Dilettanti 1835, lxv; Edwards 1870, 407; Walters 1899, xiv.
4. Society of Dilettanti 1835, lxv; Edwards 1870, 407.
5. Society of Dilettanti 1835, lxvii.
6. Neugebauer 1921, 113; Beschi 1966–67, 49, n. 9; see Hill 1979, 249.
7. Hammond 1967, 73–74 and 579–80; Swaddling 1979, 105.
8. Leake 1835, 62–63.
9. Hammond 1967, 580.
10. Samsaris 1994, 17–19; Sironen 2009.
11. Dakaris 1972, 197; Rizakis 1996, 271–72; Samsaris 1994, 20–22, 113–40.
12. Forsén 2009b, 1.
13. Hammond 1967, 40–41; Nelsestuen 2015, 124–25.
14. Dakaris 1971, 12–15; Bowden 2003, 9–12.
15. Polybius 30.15; Strabo 7.7.3; Livy 45.34.5–6; Plutarch *Aemilius Paulus* 29.
16. Alcock 1993, 75; Cabanes 1997, 122.
17. Cabanes 1997, 124; Karatzeni 2001, 163.
18. Hatzopoulos 1980, 100–101.
19. Forsén 2009b; Forsén and Tikkala 2011.
20. Hatzopoulos 1980; Sironen 2009; Samsaris 1994, 113–40. According to Hatzopoulos 1980, 101, of the 27 inscriptions found in the vicinity, 74.1 percent are in Latin, 25.0 percent are in Greek.
21. Karatzeni 2001; Forsén et al. 2011; Forsén and Reynolds 2011.
22. Forsén 2011, 17–19.
23. Bowden 2009, 169–71.
24. Cicero *Epistulae ad Atticum* 1.5.7; 14.20.2; Varro *De re rustica* 2.1.2; 2.5.1. See also Dakaris 1972, 196; Karatzeni 2001, 171; Nelsestuen 2015, 127–29;
25. Cicero *Epistulae ad Atticum* 14.20.2; Cornelius Nepos *Atticus* 14.3; Hansen 2011, 90.
26. Varro *De re rustica* 2.1.2.
27. Varro *De re rustica* 2.1.2; 2.5.1.
28. Alcock 1993, 88.
29. Bowden 2009, 169–70.
30. Forsén 2011, 21–27.
31. Karatzeni 2001, 164 and 171.
32. Forsén 2011, 17, 19.
33. Karatzeni 2001, 164; Calomino 2011, 314–16. Epirus may have escaped the devastation caused by the invaders elsewhere, but the inhabitants apparently took precautions to safeguard their wealth: Wozniak 1987, 264.
34. Sharpe 2014.
35. Orr 1978.
36. Tzouvara-Souli 1987.
37. Hekler 1911, 117. Additionally, the copper, lead, and tin content of the statuette (65% Cu, 30% Pb, and 3% Sn) is markedly different from the other statuettes: Swaddling 1979, 105.
38. Burkhalter 1990.
39. Piot 1878, 57; de Ridder 1905, 3.
40. Mixed marriages might have been frowned upon but they were not uncommon: Treggiari 1991, 45–49; Phang 2001, 190, 332.
41. Braund 1998, 12.
42. Petrochilos 1974, 35–53; Isaac 2004, 381–405.
43. Petrochilos 1974, 70–71; Livy 34.4.4; Diodorus Siculus 31.26.7; Dio Cassius 29.64.
44. Nelsestuen 2015, 124–30.
45. Society of Dilettanti 1835, lxv. Misattributed to the Townley Collection: Walters 1899, 36, no. 274.
46. Purchased in London from Thomas Amaxari, a Greek dragoman to the Turkish Ambassador; Society of Dilettanti 1835, lxv–lxvi.
47. The mirror dates to the fourth century BC and therefore is unlikely to be part of the original Paramythia hoard.
48. Society of Dilettanti 1835, xlv–xlvi. In personal records, Richard Payne Knight (Knight MS n.d.) indicates that these five bronzes, in addition to an arm fragment (no. 10?), once belonged to Count Golovkin; Swaddling 1979, 103, identifies nos. 15–20 as belonging to Count Golowkin [*sic*].

Bibliography

Alcock 1993
Alcock, S. E. 1993. *Graecia Capta: The Landscapes of Roman Greece*. Cambridge: Cambridge University Press.

Beschi 1966–67
Beschi, L. 1966–67. "Una statuetta bronzea di Giove dai pressi di Verona." *BMusBrux* 38–39: 45–62.

Bowden 2003
Bowden, W. 2003. *Epirus Vetus: The Archaeology of a Late Antique Province*. London: Duckworth.

Bowden 2009
Bowden, W. 2009. "Thesprotia in the Context of Roman and Late Antique Epirus." In Forsén 2009a.

Braund 1998
Braund, D. 1998. "Cohors: The Governor and His Entourage in the Self-image of the Roman Republic." In *Cultural Identity in the Roman Empire*, ed. R. Laurence and J. Berry, 10–24. London: Routledge.

Burkhalter 1990
Burkhalter, F. 1990. “Les statuettes en bronze d’Aphrodite en Égypte romaine d’après les document papyrologiques.” *Revue Archéologique* 1: 51–60.

Cabanes 1997
Cabanes, P. 1997. “Social, Economic, and Cultural Developments.” In *Epirus: 4000 Years of Greek History and Civilization*, ed. M. V. Sakellariou, 122–24. Athens: Demetrius and Egle Botzaris Foundation.

Calomino 2011
Calomino, D. 2011. *Nicopoli d’Epiro: Nuovi studi sulla zecca e sulla produzione monetale*. BAR International Series 2214. Oxford: Archaeopress.

Dakaris 1971
Dakaris, S. I. 1971. *Cassopaia and the Elean Colonies*. Athens: Athens Technological Organization, Athens Center of Ekistics.

Dakaris 1972
Dakaris, S. I. 1972. *Thesprotia*. Athens: Athens Technological Organization, Athens Center of Ekistics.

Dallaway 1816
Dallaway, J. 1816. *Of Statuary and Sculpture among the Antients: With Some Account of Specimens Preserved in England*. London: J. Murray.

Edwards 1870
Edwards, E. 1870. *Lives of the Founders of the British Museum: with Notices of Its Chief Augmentors and Other Benefactors, 1570–1870*. London: Trübner.

Forsén 2009a
Forsén, B., ed. 2009. *Thesprotia I: Towards a Regional History*. Helsinki: Foundation of the Finnish Institute at Athens.

Forsén 2009b
Forsén, B. 2009. “An Interdisciplinary Odyssey into the Past.” In Forsén 2009a, 1–24.

Forsén 2011
Forsén, B. 2011. “The Emerging Settlement Patterns of the Kokytos Valley.” In Forsén and Tikkala 2011, 1–37.

Forsén et al. 2011
Forsén, B., J. Forsén, K. Lazari, and W. Tikkala. 2011. “Catalogue of Sites in the Central Kokytos Valley.” In Forsén and Tikkala 2011, 73–122.

Forsén and Reynolds 2011
Forsén, B., and P. Reynolds. 2011. “An Early Closed Deposit at the Roman Villa of Agios Donatos.” In Forsén and Tikkala 2011, 247–67.

Forsén and Tikkala 2011
Forsén, B., and E. Tikkala, eds. 2011. *Thesprotia Expedition II: Environment and Settlement Patterns*. Helsinki: Foundation of the Finnish Institute at Athens.

Hammond 1967
Hammond, N. G. L. 1967. *Epirus: The Geography, the Ancient Remains, the History and the Topography of Epirus and Adjacent Areas*. Oxford: Clarendon.

Hansen 2011
Hansen, I. L. 2011. “Between Atticus and Aeneas: The Making of a Colonial Elite at Roman Butrint.” In *Roman Colonies in the First Century of Their Foundation*, ed. R. J. Sweetman, 85–100. Oxford: Oxbow Books.

Hatzopoulos 1980
Hatzopoulos, M. 1980. “Photice: Colonie romaine en Thesprotie et les destinées de la latinité epiroté.” *BalkSt* 21: 97–105.

Hekler 1911
Hekler, A. 1911. “Alexandrinische Aphroditestatuetten.” *ÖJh* 14: 112–20.

Hill 1979
Hill, D. K. 1979. “Jupiter Variations on the Theme of Olympian Zeus.” In *Studies in Classical Art and Archaeology: A Tribute to Peter Heinrich von Blanckenhagen*, ed. P. H. von Blanckenhagen, M. B. Moore, and G. Kopcke, 247–50. Locust Valley, NY: J. J. Augustin.

Isaac 2004
Isaac, B. 2004. *The Invention of Racism*. Princeton: Princeton University Press.

Karatzeni 2001
Karatzeni, V. 2001. “Epirus in the Roman Period.” In *Foundation and Destruction, Nikopolis and Northwestern Greece: The Archaeological Evidence for the City Destructions, the Foundations of Nikopolis and the Synoecism*, ed. I. Jacob, 163–79. Athens: Danish Institute at Athens.

Knight MS n.d.
Knight [Richard Payne] MS (Bronzes). n.d. A catalogue of his bronzes including some works in marble and in various other materials. Department of Greek and Roman Antiquities. British Museum.

Laurence and Berry 1998
Laurence, R., and J. Berry. 1998. *Cultural Identity in the Roman Empire*. London: Routledge.

Leake 1835
Leake, W. M. 1835. *Travels in Northern Greece*, vol. 4. London: J. Rodwell.

McInerney 2014
McInerney, J. 2014. *A Companion to Ethnicity in the Ancient Mediterranean*. Chichester, West Sussex: John Wiley & Sons.

Nelsestuen 2015
Nelsestuen, G. A. 2015. *Varro the Agronomist: Political Philosophy, Satire, and Agriculture in the Late Republic*. Columbus: Ohio State University Press.

Neugebauer 1921
Neugebauer, K. A. 1921. *Antike Bronzestatuetten*. Berlin: Schoetz & Parrhysius.

Orr 1978
Orr, D. G. 1978. “Roman Domestic Religion: The Evidence of the Household Shrines.” *ANRW* 16.2.2: 1557–91. Berlin: de Gruyter.

Petrochilos 1974
Petrochilos, N. 1974. *Roman Attitudes to the Greeks.* Athens: Char. Kovanis.

Phang 2001
Phang, S. E. 2001. *The Marriage of Roman Soldiers (13 B.C.–A.D. 235): Law and Family in the Imperial Army*. Leiden, Boston, and Cologne: Brill.

Piot 1878
Piot, E. 1878. "Vases peints athéniens." *GazArch* 4: 55–59.

Ridder 1905
Ridder, A. de. 1905. *Collection de Clercq: Catalogue méthodique et raisonné; antiquités assyriennes; cylindres orientaux, cachets, briques, bronzes, bas-reliefs, etc*. Vol. 3: *Les bronzes*. Paris: Leroux.

Rizakis 1996
Rizakis, A. D. 1996. "Les colonies romaines des côtes occidentals grecques: populations et terriroires." *Dialogues d'Histoire Ancienne* 22.1: 255–324.

Samsaris 1994
Samsaris, D. K. 1994. *Η ρωμαϊκη αποικία τησ Φωτικής στη Θεσπρωτία της Ηπείπου*. Ioannina: n.p.

Sharpe 2014
Sharpe, H. F. 2014. "Bronze Statuettes from the Athenian Agora: Evidence for Domestic Cults in Roman Greece." *Hesperia* 83.1: 143–87.

Sironen 2009
Sironen, E. 2009. "Some Notes on Inscriptions of Roman Date from Thesprotia." In Forsén 2009a, 185–96.

Society of Dilettanti 1835
Society of Dilettanti. 1835. *Specimens of Antient Sculpture, Ægyptian, Etruscan, Greek and Roman: Selected from Different Collections in Great Britain*, vol. 2. London: T. Bensley for T. Payne, and J. White and Co.

Swaddling 1979
Swaddling, J. 1979. "The British Museum Bronze Hoard from Paramythia, North Western Greece: Classical Trends Revived in the 2nd and 18th Centuries A.D." In *Bronzes hellénistiques et romains: Tradition et renouveau, Acte du Ve Colloque international sur les bronzes antiques, Lausanne, 8–13 May 1978* (Cahiers d'Archéologie romande 17), ed. C. Bérard, P. Ducrey, and A. Altherr-Charon, 103–6. Lausanne: Bibliothèque historique vaudoise.

Swift 2006
Swift, E. 2006. "Constructing Roman Identities in Late Antiquity? Material Culture on the Western Frontier." In *Social and Political Life in Late Antiquity*, ed. W. Bowden, A. Gutteridge, and C. Machado, 97–111. Leiden: Brill.

Treggiari 1991
Treggiari, S. 1991. *Roman Marriage:* Iusti Conuiges *from the Time of Cicero to the Time of Ulpian*. Oxford: Clarendon Press.

Tsouvara-Souli 1987
Tsouvara-Souli, C. 1987. "Λατρείς στη Νικόπολη." In *Nicopolis I: Proceedings of the First International Symposium on Nicopolis (23–29 September 1984)*, ed. E. Chrysos, 169–96. Preveza: Municipality of Preveza.

Walters 1899
Walters, H. B. 1899. *Catalogue of the Bronzes, Greek, Roman, and Etruscan, in the Department of Greek and Roman Antiquities, British Museum*. London: Printed by order of the Trustees.

Woolf 1998
Woolf, G. 1998. *Becoming Roman: The Origins of Provincial Civilization in Gaul*. Cambridge: Cambridge University Press.

Wozniak 1987
Wozniak, F. 1987. "Nikopolis and the Roman Defense of Epirus." In *Nicopolis I: Proceedings of the First International Symposium on Nicopolis (23–29 September 1984)*, ed. E. Chrysos, 263–67. Preveza: Municipality of Preveza.

17.

Roman Bronze Figurines of Deities in the National Archaeological Museum of the Marche (Ancona)

Nicoletta Frapiccini, Soprintendenza per i Beni Archeologici delle Marche, Ancona

Numerous bronze statuettes of deities discovered in the Marche region of Italy probably come from domestic *lararia*, belonging to the *domus* or villas in the territory of Umbria and Piceno. They are particularly emblematic for their quality and for their inspiration from Greek statues. Their iconographic scheme, while often displaying the characteristic autonomy of these statuettes, is nevertheless clearly dependent on the prototypes. Furthermore, they confirm that there was in this area a grassroots distribution of bronze statuettes in the domestic sphere. There were numerous bronze artifacts, often of high quality, including well-known statues of medium size, such as the famous Idolino *lychnouchos* and the Eros-Hypnos *lampadophoros* from Pesaro. This is indicative of a considerable circulation of these statuettes: they may have been imported, but it is also possible that local workshops created them. One of these workshops might be the foundry discovered in Sentinum (Sassoferrato, Ancona), which some scholars believe to be responsible also for the creation of large gilded-bronze statues.

✦ ✦ ✦

The collection of Roman bronze statuettes in the National Archaeological Museum of the Marche at Ancona includes numerous representations of deities. The majority of these statuettes are probably from domestic *lararia* in the territory, which in ancient times belonged to the *regiones* of Umbria and Piceno. This paper analyzes some of the most interesting statuettes, including the bronze figurines from Sentinum, where a foundry is known to have existed.

The first statuette represents Jupiter (fig. 17.1) and was found in Piandimeleto (Pesaro e Urbino) in 1933.[1] It is a bronze statuette of appreciable quality and the subject is rendered following a well-known iconographic scheme, in this case adhered to quite faithfully: the figure is nude, standing with the weight on the right leg, with the left bent and placed behind; the right hand grasps a thunderbolt, the left arm would originally have rested on a scepter. The posture and demeanor identify it as the Type I of Kaufmann-Heinimann, replicated in numerous examples;[2] to these we may add also bronze figurines with inverted posture, where the switch of the supporting leg may be a simple variant. The common prototype, replicated at times with considerable liberty, may be recognized in the statue of Zeus Brontaios by Leochares, which has been identified in the marble replicas of Zeus of the Ince Blundell and Cyrene types.[3] Our bronze figurine presents a marked suppleness of the bust, a well-rendered softness in the modeling, and a variation in the position of the head, which is directed upward and toward the scepter, rather than down toward the thunderbolt, as in most cases.[4] The hair, perhaps originally bound by a *taenia* in a different material, descends from the summit of the head in flat, wavy locks, which rise in a sort of *anastolè* or upswept hair over the forehead, increasing in volume around the face and above the neck; this is quite different from the more widespread thick-ringed locks. The closest analogies would be the head of Zeus from Vieil-Evreux[5] and the Jupiter of Gran San Bernardo,[6] while the mustache and beard appear to have soft lines, similar to those of a head of Zeus at the Liebieghaus in Frankfurt,[7] sharing also the slightly pathetic facial expression. These details and the analogous works suggest a date after the end of the first century AD, but not later than the first decades of the second century.

Figure 17.1. Jupiter from Piandimeleto (PU). H: 11.6 cm (4 ½ in.). Museo Archeologico Nazionale delle Marche, Ancona, inv. 186
Image: Nicoletta Frapiccini

This bronze statuette was found by chance in Piandimeleto, in the area of Castellaro/Cabuccaro, at a site that has never been excavated, and we may only hypothesize that it belonged to the *lararium* of a villa.[8] Agriculture, forestry, and sheepherding were common occupations in this area, as were quarrying and artisan activities, thus there were certainly some villas or rustic settlements.[9] It is also possible that the statuette suggests the existence of a sacred area, perhaps connected with the local mineral waters, which were held to have medicinal properties.[10] The quality of this statuette testifies to the circulation of well-made artifacts in this territory, which was perhaps not completely closed within its own microsystem of roads.[11] In fact, the site is located between Sestinum (a veritable crossroads) and Pitinum Pisaurense (Maceratafeltria), along a road that connected the valley of the Pisaurus (Foglia) River with that of the Tiber by way of the Viamaggio pass, a route that led to Arretium (modern Arezzo) and hence to Rome. The area was therefore open to the circulation of goods, influences, and models.

A second statuette, of unknown provenance, portrays a majestic Jupiter (fig. 17.2) in a markedly modest version of the "Florence type Zeus,"[12] which is considered, even in the most recent studies, to be derived from an iconographic model dating to a Greek original in the late Severe style, identified with the Zeus of Myron at the Heraion of Samos.[13] This latter artifact, placed on the Capitoline by Augustus, must have had considerable influence on later representations of the god, which would explain its widespread distribution among small bronze statuettes. This statuette is a far cry from that precious model and constitutes an impoverished and simplified version thereof, which is attested in many other examples.[14] The rendering of our example is quite rough and approximate, and the patina is highly inhomogeneous: these observations, along with the fact that the area of discovery is unknown, go so far as to throw doubt on its authenticity.[15]

Figure 17.2. Jupiter. H: 11 cm (4 ¼ in.). Museo Archeologico Nazionale delle Marche, Ancona, inv. 563
Image: Nicoletta Frapiccini

Also unknown is the provenance of a statuette of Mercury with petasos and a *chlamys* folded in a triangle (fig. 17.3). It represents the god according to a widespread model of Polykleitan tradition, inspired by the Doryphoros, but the result of mediation with Late Hellenistic or Roman experiences.[16] Undeniable Polykleitan reminiscences emerge through the stance, the rendering of the torso muscles, the position of the head and the hair, with the characteristic "pincer" locks. It may be attributable to Annalis Leibundgut's London–Copenhagen group, being closer to the Copenhagen variant, which is more dependent upon the Doryphoros.[17] There are clear analogies between our bronze statuette and those found in Italy and beyond the Alps, above all in southern Gaul,[18] especially with the exemplars from Trento, Trieste, Waldenburg, and Augst.[19] The soft modeling and the calibrated *a freddo* workmanship, which can be appreciated above all in the rendering of the *chlamys*, would suggest a date probably no later than the end of the first century AD.[20]

Figure 17.3. Mercury. H: 11 cm (4 ¼ in.), including base. Museo Archeologico Nazionale delle Marche, Ancona, inv. 525
Image: Nicoletta Frapiccini

Figure 17.4. Mercury from Castelfidardo (Ancona). H: 8 cm (3 ¼ in.). Museo Archeologico Nazionale delle Marche, Ancona, inv. 26980
Image: Nicoletta Frapiccini

A second bronze statuette of Mercury (fig. 17.4) was found by chance in Castelfidardo (Ancona),[21] not far from the *municipium* of Auximum (modern Osimo), along a road that led toward the coast to the Roman cities of Ancona and Potentia (modern Porto Recanati-Macerata).[22] A rustic villa was discovered at the same site some years later;[23] it was concluded that the bronze statuette must have belonged to its *lararium*. The presence of a lotus leaf suggests an identification with Mercury-Toth, a Hellenistic creation, probably Egyptian, which was very widespread especially from the time of Augustus and in the mid-Imperial age.[24] In terms of its general lines, the iconographic scheme of the statuette would appear inspired by a model influenced by Polykleitos. However, the statue reveals also the rhythms of fourth-century BC sculpture, both for its spatial layout and the rendering of the anatomy, which is quite disharmonic. The layout of the *chlamys* is typical of the Hermes Richelieu and the Praxitelean Hermes Andros-Farnese types,[25] as is the hair, which shows Late Classical influences, with a double row of ringed curls.[26] The rendering, which is commonplace and in some points quite poor, nevertheless reveals a taste for marked, rippled modeling, together with dynamic aspects in the position of the body,[27] which were particularly appreciated from the period of Claudius onward. These considerations, supported by the context of its provenance, suggest a date between the second half of the first century and the beginning of the second century AD.

Two more bronze statuettes were found by chance in Orciano di Pesaro and Montebello Metaurense in 1923.[28] The first represents Diana (fig. 17.5),[29] one of a large series of bronze statuettes of the goddess as *venatrix*, with bow and arrows, in a static position.[30] The Polykleitan stance, derived from the Amazon type, is conjoined with later features, such as the short chiton with a long *apoptygma*. The calm stance of the statue is reminiscent of analogous examples, and it is attributable to a model close to the Diana of the Ostia–Berlin–Copenhagen type.[31] This statuette also presents a peculiar position of the head, turned toward the right hand, and a hairstyle with diadem, quite similar to the Artemis of Versailles, rather than the more common knot of the Rospigliosi Artemis,[32] which is more frequently replicated in bronze statuettes. With its eclectic character, the sobriety of the surface treatment, and the hairstyle, the statuette may be still datable to within the first century AD.

Figure 17.5. Diana from Orciano di Pesaro (PU). H: 11.3 cm (4 ½ in.). Museo Archeologico Nazionale delle Marche, Ancona, inv. 538
Image: Nicoletta Frapiccini

Figure 17.6. Victory from Montebello Metaurense (PU). H: 11.5 cm (4 ½ in.). Museo Archeologico Nazionale delle Marche, Ancona, inv. 515
Image: Nicoletta Frapiccini

The second figurine from Montebello Metaurense, close to the river Metauro, represents Victory atop a globe (fig. 17.6). This example seems to depart from the typical iconographic scheme for bronze figurines of this deity, which usually were inspired, more or less liberally, by the statue of Victory dedicated in Taranto and placed by Augustus in the Curia Iulia in 29 BC.[33] Instead of the goddess dynamically posed in flight, she is here represented standing with her weight on her right leg, with the left extended forward and a himation wrapped around her legs. This detail reveals iconographic models of Late Hellenistic influence, also observable in the slender proportions of the figure. Only the measured twist of the bust toward the left, culminating in the head, gives the figure a slight sense of upward thrust, perhaps reminiscent of Hellenistic rhythms. This iconography has analogies in some coinage dating to the end of the third and beginning of the second century BC (where the globe, however, is absent), and on coins from AD 69.[34] The decidedly eclectic character and the rendering of the clean, well-defined fabric folds suggest a date in the mid- to late first century AD.

The provenance of the two examples from nearby sites along the Via Flaminia,[35] the road connecting the Adriatic coast with Rome, perhaps explains their peculiarity. It is quite possible that along this road there traveled not only trade goods but also bronze figurines, their molds or their models, and it is likely that there were local workshops. It is worth remembering that the exquisite bronze statuette of Victory in flight on a globe, today in Kassel, came from the nearby Forum Sempronii.[36]

It is plain that the iconographic scheme of all our statuettes, while often displaying the characteristic autonomy of these *Kleinbronzewiederholungen* (small bronze copies), nevertheless reveals a dependence on prototypes, even when these are liberally influenced by the predominant taste for eclectic creations.[37] The figurines also testify that artisans took up models, often quite swiftly, that became part of the figurative repertory of small statue production, and that the mid-Adriatic elite kept up with the prevailing contemporary tastes.

Finally, an exceptional discovery is the group of bronze figurines from Sentinum (Sassoferrato, Ancona).[38] Among these is a statuette of Minerva, found in the excavations in the northwest quarter of Sentinum in 1960, close to a room identified as a foundry (fig. 17.7). This excavation uncovered a large number of Imperial-age pottery fragments in the same context, supporting the dating of the statuette to the second century AD.[39] In the nearby room of the foundry, numerous finds in bronze had already been uncovered in 1954, among which were a large number of utensils (fig. 17.8). There were numerous small spatulas, 109 scrapers, 66 pieces of slag, 102 rods and portions of sprues, 4 dowels, 4 rods for dowels, 9 portions of wire, and 4 pairs of pliers. Inside the foundry, finds included many fragments of bronze objects, plaques, waste pieces of cut bronze foil, little fragments of a gilded-bronze horse's head, a finger of a statue, fragments of garments from statues, and unfinished objects.

Figure 17.7. The foundry at Sentinum (Sassoferrato [AN])
Image: By permission of the MiBACT, Segretariato Regionale per le Marche, Soprintendenza Archeologia delle Marche — Archivio Fotografico

Figure 17.8. Tools from the foundry of Sentinum. Sassoferrato, Museo Civico Archeologico
Image: Nicoletta Frapiccini

In 1997–98 Giuliano de Marinis conducted new excavations to clarify the nature and use of this building. The exploration, though only partial, highlighted a complex stratigraphic sequence, from the Late Antique to the Late Republican age.[40] The identification of probable traces of wooden stairs on the southern wall of a room argues for the existence of an underground level. The excavation was unfortunately interrupted, and a comprehensive layout of the building, which was located in an area dedicated to artisan activities, has yet to be completed.[41] Therefore, although these rooms are now almost certainly identifiable as belonging to a foundry, its size and layout have yet to be outlined. This information would be useful to determine whether its function was to create large statues during the Roman age, as Giuliano de Marinis supposed,[42] or just small votive and other bronze objects up to the Late Antique period. The fact that metallurgy was widely practiced in Sentinum and its territory is also confirmed by the much older finds of bronze figurines from archaic sanctuaries, which are associated with local workshops.[43] These, located in Sassoferrato and the nearby San Fortunato di Genga, testify to the existence of a strong tradition of small-scale bronze sculpture in the area, with roots dating back to an era long before Romanization.

✦ ✦ ✦

Notes

1. Soprintendenza Archeologia delle Marche, A.V.S., cassetta 6 bis, fascicolo 1. See Galli 1946–48, 3–8.
2. Kaufmann-Heinimann 1977, 17–18, no. 1, plate 1. See particularly the Jupiter from Paramythia, Epiro (*LIMC* 8: 432, no. 116, plate 278); the statuette from Köln (Menzel 1984, 191, plate 20); the statuette in Paris (*LIMC* 8: 430–31, no. 91, plate 275); the statuette in the Historisches Museum Basel (Kaufmann-Heinimann 1977, 18, no. 1, plate 1); and the Jupiter from Verona in Bruxelles (Bolla 1999, 199, plate 1).
3. See also Beschi 1962, 75–76; Boucher 1976, 70–77; Menzel 1984, 190–91; *LIMC* 8: 339, no. 195, plate 227.
4. For the positioning of the head toward the scepter, see the Jupiter from Muri (Bern), with inverted schema (Leibundgut 1980, 16–17, no. 6, plates 11–13); a statuette of Jove in Florence (Muscillo 2015, 66–67, no. 5); and the Jupiter from Montorio Veronese, with inverted position of the arms (Beschi 1962, 75; Bolla 1999, 197–99, plate 2). Regarding the liberty taken in the replication of such archetypes, see D'Andria 1978, 21–31; Leibundgut 1980, 9; Menzel 1984; Koortbojian 2015, 47–48.
5. Menzel 1984, 188, plates 9–12.
6. Leibundgut 1980, 14–16, plates 4–9.
7. Dörig 1964, 262–66; *LIMC* 8: 340, no. 196a, plate 228.
8. About the *lararia*, see Adamo Muscettola 1984; Kaufmann-Heinimann 1998; Cadario 2015, 54–56.
9. On some sporadic discoveries in the area, see Monacchi 1995, 109, nos. 69–74.
10. Lombardi and Mazzarini 1995, 67–80.
11. Mario Luni argues otherwise: Luni 1995, 93–100; Luni 2003, 199–200.
12. Kaufmann-Heinimann (1977, 17–18, no. 2, pls. 2–3) attributes this statuette to Type II. See the further analysis in Leibundgut 1980, 9–13, no. 1, pls. 1–2.
13. Berger 1969, 66–92. Iozzo (2015, 63–65, no. 1), accepting Berger's interpretation, presents a survey of the hypotheses on the prototype. Some scholars attribute the prototype to Pheidias or his school, while others hold it to be a classicistic creation of the Hadrianic period (Neugebauer 1935, 321; Beschi 1966–67, 60; Leibundgut 1980, 12–13).
14. Leibundgut (1980, 9–13, no. 1, pl. 1–2) distinguished two groups, attributing to the first the statuettes of higher quality and larger dimensions, while to the second, the replicas of smaller dimensions and commonplace workmanship, to which our example may be attributed.
15. See analogous observations for the series of Mercury with paenula: Bolla 1997, 38–39, no. 7, pl. 4.
16. On this problem, see Beschi 1993.
17. Leibundgut 1990, 405–12, no. 195. See also Kaufmann-Heinimann 1977, 29, Type III.
18. Boucher 1976, 81–84, pls. 32, 142–44, map no. X.
19. Walde Psenner 1983, 42, no. 12 (Trento); Cassola Guida 1978, 76, no. 60 (Trieste); Kaufmann-Heinimann 1977, nos. 27–28, pls. 17–19 (Waldenburg and Augst).
20. See also Leibundgut 1990, 411–12.
21. Frapiccini 2005a, 174, no. 90.
22. Gentili 1990, 20.
23. Mercando 1979, 132.
24. See Kaufmann-Heinimann 1994, 15–16, no. 12; *LIMC* 6: 508, no. 43–45, plates 276 and 535; Capriotti Vittozzi 1999, 206–9.
25. *LIMC* 5: 367–68.
26. See the head of the statuette of Mercury in Verona (Franzoni 1973, 58, no. 38).
27. Similar statuettes came from Milan (Bolla 1997, 41–42, no. 9, pl. iv), Trento (Walde Psenner 1983, 49–50, no. 21), Verona (Franzoni 1973, 56, no. 36), and Casteggio (Invernizzi 1996, 30–32, no. 1, pl. xviii, figs. 1a–c).
28. Soprintendenza Archeologia Marche, A.V.S. cassetta 6, fascicoli 1–2.
29. Pellati 1929, 502.
30. See the statuettes in Verona (Franzoni 1973, 86, no. 66) from Monteveglio (BO), in the National Archaeological Museum of Naples (*LIMC* 2: 813, nos. 73, 75, plate 601), and in the National Archaeological Museum of Florence (Cianferoni 2015, 117, no. 79).
31. Picciotti Giornetti 1979, 23–24, no. 24 (statue from Ostia); *LIMC* 2: 802, nos. 18a–b.
32. *LIMC* 2: 805, no. 27, pl. 592 (Artemis of Versailles); 646, no. 274, pl. 468 (Rospigliosi Artemis). See also a statue of Artemis from Rome, datable at the time of Emperor Claudius, which presents a similar hairstyle and the same diadem: Paribeni 1981, no. 8.
33. Hölscher 1967, 6–16.
34. *LIMC* 8: 242, 18, pl. 168; Hölscher 1967, 18, pl. 1, fig. 5.
35. Luni and Mei 2013.
36. Luni and Mei 2014.
37. See Koortboijan 2015, 43–52.
38. Frapiccini 1998; Frapiccini 2005b; Frapiccini 2005c.
39. Fabbrini 1961, 320; Frapiccini 1998, 36–41, figs. 2–3.
40. Excavations of the Soprintendenza Archeologia delle Marche (not yet published).
41. Medri 2008, 212, fig. 3.1.10.
42. De Marinis 2003.
43. Colonna 1970; Frapiccini 2008; Frapiccini 2015, 595–98.

Bibliography

Adamo Muscettola 1984
Adamo Muscettola, S. 1984. "Osservazioni sulla composizione dei *larari* con statuette in bronzo di Pompei ed Ercolano." In *Toreutik und figürliche Bronzen römischer Zeit: Akten der 6. Tagung über antike Bronzen, Berlin, 13–17 Mai 1980*, ed. U. Gehrig, 87–94. Berlin: Staatliche Museen Preussischer Kulturbesitz, Antikenmuseum.

Arbeid and Iozzo 2015
Arbeid, B., and M. Iozzo, eds. 2015. *Piccoli Grandi Bronzi: Capolavori greci, etruschi e romani delle collezioni mediceo-lorenesi nel Museo Archeologico Nazionale di Firenze*. Florence: Edizioni Polistampa.

Berger 1969
Berger, E. 1969. "Zum samischen Zeus des Myron in Rom." *RM* 76: 66–92.

Beschi 1962
Beschi, L. 1962. *I bronzetti romani di Montorio Veronese*. Memorie, Classe di Scienze Morali e Lettere 32. Venice: Istituto Veneto.

Beschi 1966–67
Beschi, L. 1966–67. “Una statuetta bronzea di Giove dai pressi di Verona.” *BMusBrux* 38–39: 45–62.

Beschi 1993
Beschi, L. 1993. “Bronzetti classicistici policletei: Alcune osservazioni.” In *Bronces y religión romana: Actas del XI Congreso Internacional de Bronces Antiguos*, ed. J. Arce and F. Burkhalter, 45–56. Madrid: Consejo Superior de Investigaciones Científicas.

Bolla 1997
Bolla, M. 1997. *Bronzi figurati romani nelle Civiche raccolte archeologiche di Milano*. Notizie dal chiostro del Monastero maggiore, Supplemento 17. Milan: Civiche Raccolte Archeologiche e Numismatiche.

Bolla 1999
Bolla, M. 1999. “Bronzetti figurati romani del territorio veronese.” *Rassegna di Studi del Civico Museo Archeologico e del Civico Gabinetto Numismatico di Milano* 43/44: 193–260.

Boucher 1976
Boucher, S. 1976. *Recherches sur les bronzes figurés de la Gaule pré-romaine et romaine*. Paris: École française de Rome.

Cadario 2015
Cadario, M. 2015. “Le statuette in bronzo in contest tra culti, *ornamenta* e pezzi da collezione.” In Arbeid and Iozzo 2015, 53–59.

Capriotti Vittozzi 1999
Capriotti Vittozzi, G. 1999. *Oggetti, idee, culti egizi nelle Marche: Dalle tombe picene al tempio di Treia*. Picus, Supplemento 6. Tivoli: Tipigraf.

Cassola Guida 1978
Cassola Guida, P. 1978. *Bronzetti a figura umana dalle collezioni dei Civici Musei di Storia ed Arte di Trieste*. Venice: Electa.

Cianferoni 2015
Cianferoni, C. 2015. “Diana.” In Arbeid and Iozzo 2015, 117.

Colonna 1970
Colonna, G. 1970. *Bronzi votivi umbro-sabellici a figura umana.* Vol. 1: *Il periodo arcaico*. Rome: Sansoni.

D’Andria 1978
D’Andria, F. 1978. *I bronzi romani di Veleia, Parma e del territorio parmense*. Contributi dell’Istituto di Archelogia 3. Milan: Università Cattolica del Sacro Cuore.

De Marinis 2003
De Marinis, G. 2003. “Produzioni bronzistiche romane nelle Marche.” In *L’Uomo la Pietra i Metalli: Tesori della terra dal Piceno al Mediterraneo*, ed. G. Capriotti Vittozzi, 156–57. San Benedetto del Tronto: Sfera.

De Marinis 2005
De Marinis, G., ed. 2005. *Arte romana nei Musei delle Marche*. Rome: Istituto Poligrafico e Zecca dello Stato.

Dörig 1964
Dörig, J. 1964. “Lysipps Zeuskoloss von Tarent.” *JdI* 79: 257–78.

Fabbrini 1961
Fabbrini, L. 1961. “Sentinum.” In *Atti del VII Congresso Internazionale di archeologia classica*, 315–23. Rome: L’Erma di Bretschneider.

Franzoni 1973
Franzoni, L. 1973. *Bronzetti romani del Museo archeologico di Verona*. Collezioni e Musei Archeologici del Veneto. Venice: Alfieri.

Frapiccini 1998
Frapiccini, N. 1998. “I bronzetti sentinati nel Museo Archeologico Nazionale delle Marche.” *Picus* 18: 31–61.

Frapiccini 2005a
Frapiccini, N. 2005. “Mercurio-Thot.” In De Marinis 2005, 174, no. 90.

Frapiccini 2005b
Frapiccini, N. 2005. “Iside-Fortuna.” In De Marinis 2005, 176, no. 92.

Frapiccini 2005c
Frapiccini, N. 2005. “Volto di Jupiter.” In De Marinis 2005, 200–201, no. 107.

Frapiccini 2008
Frapiccini, N. 2008. “Bronzetti votivi italici nel Museo Civico Archeologico di Sassoferrato.” In *Sentinum 295 a.C. Sassoferrato 2006: 2300 anni dopo la battaglia: Una città romana tra storia e archeologia*, *Convegno Internazionale, Sassoferrato 21–23 settembre 2006*, ed. M. Medri, 257–78. Rome: L’Erma di Bretschneider.

Frapiccini 2015
Frapiccini, N. 2015. “Bronzetti di produzione umbra nelle Marche.” In *Gli Umbri in età preromana: Atti del XXVII Convegno di Studi Etruschi ed Italici, Perugia – Gubbio – Urbino, 27–31 ottobre 2009*, 589–608. Pisa and Rome: Fabrizio Serra.

Galli 1946–48
Galli, E. 1946–48. “Il piccolo Giove di Pian di Meleto.” *BullCom* 72: 3–8.

Gentili 1990
Gentili, G. V. 1990. *Osimo nell’antichità: I cimeli nella civica raccolta d’arte e il Lapidario del Comune*. Bologna: Grafis.

Hölscher 1967
Hölscher, T. 1967. *Victoria Romana: Archäologische Untersuchungen zur Geschichte und Wesensart der römischen Siegesgöttin von den Anfängen bis zum Ende des 3. Jhs. n. Chr.* Mainz am Rhein: Philipp von Zabern.

Invernizzi 1996
Invernizzi, R. 1996. “Bronzetti figurati e instrumentum bronzeo da uno scavo a Casteggio.” *Notizie dal chiostro del Monastero maggiore: Rassegna di studi del Civico museo archeologico e del Civico gabinetto numismatico di Milano* 58: 29–45.

Iozzo, M. 2015
Iozzo, M. 2015. “Zeus.” In Arbeid and Iozzo 2015, 63–65.

Kaufmann-Heinimann 1977
Kaufmann-Heinimann, A. 1977. *Die römischen Bronzen der Schweiz*. Vol. 1: *Augst und das Gebiet der Colonia Augusta Raurica*. Mainz am Rhein: Philipp von Zabern.

Kaufmann-Heinimann 1994
Kaufmann-Heinimann, A. 1994. *Die römischen Bronzen der Schweiz*. Vol. 5: *Neufunde und Nachträge*. Mainz am Rhein: Philipp von Zabern.

Kaufmann-Heinimann 1998
Kaufmann-Heinimann, A. 1998. *Götter und Lararien aus Augusta Raurica: Herstellung, Fundzusammenhänge und sakrale Funktion figürlichen Bronzen in einer römischen Stadt*. Augst: Römermuseum.

Kaufmann-Heinimann 2004
Kaufmann-Heinimann, A. 2004. "Götter im Keller, im Schiff und auf dem Berg: Alte und neue Statuettenfunde aus dem Imperium Romanum." In *The Antique Bronzes: Typology, Chronology, Authenticity: The Acta of the 16th International Congress of Antique Bronzes, Organised by the Romanian National History Museum – Bucharest 2003*, ed. C. Muşeţeanu, 249–63. Bucharest: Cetatea de Scaun.

Koortbojian 2015
Koortbojian, M. 2015. "*Opera minora*: *Monumenta* in miniatura?" In Arbeid and Iozzo, 2015, 43–52.

Leibundgut 1980
Leibundgut, A. 1980. *Die römischen Bronzen der Schweiz*. Vol. 3: *Westschweiz, Bern und Wallis*. Mainz am Rhein: Philipp von Zabern.

Leibundgut 1990
Leibundgut, A. 1990. "Polykletische Elemente bei späthellenistischen und römischen Kleinbronzen: Zur Wirkungsgeschichte Polyklets in der Kleinplastik." In *Polyklet: Der Bildhauer der griechischen Klassik*, ed. P. C. Bol, 397–427. Mainz am Rhein: Philipp von Zabern.

Lombardi and Mazzarini 1995
Lombardi, F. V., and A. Mazzarini 1995. "Le acque minerali." In *Il Montefeltro*. Vol. 1: *Ambiente, storia, arte nelle alte valli del Foglia e del Conca*, ed. G. Allegretti and F. V. Lombardi, 67–90. Verucchio: Comunità Montana del Montefeltro.

Luni 1995
Luni, M. 1995. "Il territorio dei municipi di *Sestinum* e *Pitinum Pisaurense*." In *Il Montefeltro*. Vol. 1: *Ambiente, storia, arte nelle alte valli del Foglia e del Conca*, ed. G. Allegretti and F. V. Lombardi, 93–109. Verucchio: Comunità Montana del Montefeltro.

Luni 2003
Luni, M. 2003. *Archeologia nelle Marche: Dalla preistoria all'età tardoantica*. Florence: Nardini.

Luni and Mei 2013
Luni, M., and O. Mei, eds. 2013. *Forum Sempronii*. Vol. 2: *La città e la Flaminia: 1974–2013*. Urbino: Quattroventi.

Luni and Mei 2014
Luni, M., and O. Mei, eds. 2014. *La Vittoria "di Kassel" e l'"Augusteum" di Forum Sempronii: Un ritorno nel bimillenario di Augusto*. Rome: L'Erma di Bretschneider.

Medri 2008
Medri, M., ed. 2008. *Sentinum: Ricerche in corso*, vol. 1. Studia Archaeologica 162. Rome: L'Erma di Bretschneider.

Menzel 1984
Menzel, H. 1984. "Die Jupiterstatuetten von Bree, Evreux und Dalheim und verwandte Bronzen." In *Toreutik und figürliche Bronzen römischer Zeit: Akten der 6. Tagung über antike Bronzen, Berlin, 13-17 Mai 1980*, ed. U. Gehrig, 186–96. Berlin: Staatliche Museen Preussischer Kulturbesitz, Antikenmuseum.

Mercando 1979
Mercando, L. 1979. "Marche: Rinvenimenti di insediamenti rurali." *NSc* 33: 89–296.

Monacchi 1995
Monacchi, W. 1995. "La carta archeologica." In *Il Montefeltro*. Vol. 1: *Ambiente, storia, arte nelle alte valli del Foglia e del Conca*, ed. G. Allegretti and F. V. Lombardi, 101–25. Verucchio: Comunità Montana del Montefeltro.

Muscillo 2015
Muscillo, A. 2015. "Giove." In Arbeid and Iozzo 2015, 66–67.

Neugebauer 1935
Neugebauer, K. A. 1935. "Zwei Jupiterstatuetten in Berlin und Weimar." *AA* 1935: 321–34.

Paribeni 1981
Paribeni, E. 1981. "Statua di Artemide." In *Museo Nazionale Romano: Le sculture*, part I, vol. 2, ed. A. Giuliano, 283–85. Rome: De Luca.

Pellati 1929
Pellati, F. 1929. "Notiziario archeologico: Fano, scoperte di antichità." *Historia* 3: 502.

Picciotti Giornetti 1979
Picciotti Giornetti, V. 1979. "Statua ritratto di giovinetta: Tipo Artemide." In *Museo Nazionale Romano: Le sculture*, part 1, vol. 1, ed. A. Giuliano, 23–24. Rome: De Luca.

Walde Psenner 1983
Walde Psenner, E. 1983. *I bronzetti figurati antichi del Trentino*. Patrimonio storico e artistico del Trentino 7. Trento: Assessorato alle attività culturali della Provincia Autonoma di Trento.

18.

Function and Use of Roman Medium-Sized Statuettes in the Northwestern Provinces

Annemarie Kaufmann-Heinimann, Universität Basel

In contrast to life-size statues and small bronzes, medium-sized statuettes have rarely been the focus of scholarly interest. As to their function, it is often assumed that there must have been a clear distinction between purely decorative pieces and statuettes that were used as votive objects. The epigraphical and literary sources, however, contradict such a distinction and rather draw attention to their multipurpose usage. With this broader approach in mind, some medium-sized statuettes from both secular and religious contexts of Rome's northwestern provinces are discussed.

✦ ✦ ✦

When we think of figural bronzes from the northwestern provinces of the Roman world, a considerable number of small statuettes and some impressive fragments of life-size statues come to mind.[1] Medium-sized statuettes, between approximately 40 and 100 centimeters (16 to 39 in.) high, however, are less well documented, as they seem to have had less chance of surviving either intact, as did small bronzes, or as fragments, as did large statues. It may be worthwhile, therefore, to examine some of these specimens more closely in order to see whether it is possible to gain more information about their use and function: Were they used as decorative elements in villa gardens, as votive objects, or even as the cult images of temples?[2]

Before looking at some objects and their original contexts, it is important to know more about the presumed Roman approach to questions of function, covering life-size statues as well. According to literary and epigraphical evidence, the Latin language did not distinguish between the types of use mentioned above.[3] Every anthropomorphic image of a god could be called simulacrum or signum, but these terms were not restricted to one function: they could apply either to the cult statue—which was consecrated at the same time as the temple itself—or to other works of art displayed in the temple or elsewhere. Simulacra displayed in a sanctuary, however—with the exception of the cult statue itself—had the status of *ornamenta*. This means that they were not sacred but, being *res profana*, could be reused in other contexts if the need should arise. Votive objects, too, belonged to the category of *ornamenta*, independent of what they represented. This means that our ideas about neatly defined and mutually exclusive functions of statues and statuettes do not accord with the reality of the time. A vivid illustration of this fact is given, for instance, by Pliny the Younger in one of his letters (3.6): contrary to what we would expect, he did not keep his newly acquired medium-sized statuette of an old man made of Corinthian bronze as an embellishment of his own house but decided to offer it as a votive gift at the temple of Jupiter, having ordered a base for it mentioning his name and titles.[4] In an archaeological context, we would certainly have classified such an object as a private decorative sculpture and not as a votive object. It is advisable to keep in mind this broader Roman approach when trying to improve our knowledge of possible functions.

One group of statuettes is best characterized as decorations for private houses and gardens, if we take into account the evidence provided by the Vesuvian cities. There are, on the one hand, all sorts of fountain decorations,[5] and on the other hand a wide range of so-called silent servants and lamp-bearers, which can reach up to life-size.[6] The most famous representative of the second group found north of the Alps is certainly the so-called Boy from Xanten, discovered in 1858 on the bank of the Rhine near Xanten.[7] Another large statuette in the same category of bronzes serving a practical purpose was found in 1893, also on a riverbank, this time in northern France, at Pont-Sainte-Maxence near Senlis (Oise) (fig. 18.1); unfortunately, its present location is unknown.[8] A closely related parallel to it came to light in 1875 on the Viminal Hill in Rome,[9] and it is evident that these two tablet-bearing Hermaphrodites must have derived from the same prototype. The existing photos of the bronze from France do not allow a definite statement as to its style and place of manufacture; a Gallo-Roman origin, however, cannot be ruled out. The Boy from Xanten, on the other hand, was certainly manufactured in a Mediterranean workshop in Early Imperial times and most likely came to northern Germany in the possession of a high-ranking officer posted to the legionary camp of Xanten.

Figure 18.1. Hermaphrodite from Pont-Sainte-Maxence. Present location unknown. Height without base 60 cm (23 ⅝ in.). *RA* (1898), plate IX

An impressive find was made in the Roman villa of Champigneulles near Nancy (Meurthe-et-Moselle, France), inhabited from the second century AD onward. The metal hoard stored in one of the cellars contained not only all sorts of bronze, iron, and lead fragments, but also one nearly intact statuette of Bacchus, whose only damage was the missing left arm, originally cast separately.[10] According to the numismatic evidence and the traces of fire, the villa was destroyed around the middle of the fourth century AD, and it is most likely that at that time the invaders collected all sorts of metal items found in the house with the intention of recycling them later. The large statuette of Bacchus could originally have been used as a garden sculpture.

So far the evidence of the archaeological context or the specific type of a statuette has pointed to its possible use as a private decorative sculpture. There are, however, a great many medium-sized statuettes that are best understood as forming part of the furnishings of a sanctuary. Important information is given by an old find made within the sacred area of the *vicus* of Dalheim (Luxembourg), which was part of the *civitas* of the Treveri. The excavations undertaken in 1863 were incompletely documented, but they brought to light an octagonal sanctuary and, installed on the same axis, a small square building in which two large statuettes of Jupiter and Minerva were found (figs. 18.2–3).[11] They testify to the very high standard of Gallo-Roman bronze-work of the late second century AD, although the artist did not fully master the complicated drapery of Minerva's dress. John Scheid's suggestion that the statuettes may have been the cult images of a temple dedicated to the Capitoline triad is tempting; in that case the statuette of Minerva, which is considerably smaller than the Jupiter, might have been a later replacement for the one originally belonging to the group.[12] So far, however, no firm epigraphical evidence for the Capitoline triad has come to light at Dalheim.[13] The survival of the two statuettes, virtually unharmed, in the middle of the *vicus* is quite exceptional, when we think of the devastating raids of Germanic tribes in the later third century AD. More often, deposits of statues are preserved at a certain distance from the places to which they originally belonged, as the following finds will show.

Figure 18.2. Jupiter from Dalheim. Height 61 cm (24 in.). Paris, Musée du Louvre, inv. Br 36
Image: © Réunion des musées nationaux

Figure 18.3. Minerva from Dalheim. Height 40.2 cm (15 ¾ in.). Paris, Musée du Louvre, inv. Br 1071
Image: © Réunion des musées nationaux

Figure 18.4. Mercury and Rosmerta (?) from Turny. Height 40–50 cm (15 ¾–19 ¾ in.). Musée archéologique de Dijon, inv. 2008.1.1 and 2008.1.2
Image: © Musée archéologique de Dijon, cl. F. Perrodin

A few years ago, two statuettes of Mercury and his female counterpart—perhaps Rosmerta—were discovered in a forest near Turny (Yonne, France) (fig. 18.4).[14] They had been deposited in a pit far from the nearest known Roman remains. This could hint at a reorganization of the mass of votive gifts put on display in a sanctuary by removing some of the older ones. Yet we cannot entirely rule out the possibility that the two statuettes have been put aside by a bronze-worker; but if such were the case we ought to wonder why no other bronze fragments were added, as was the case of Champigneulles. Mercury and Rosmerta were probably made in the same Gallo-Roman workshop active in the late second or early third century AD, taking into account the modeling of the bodies and the rather coarse facial features. A technical detail that we often notice in statuettes of this size is the missing cap-like top of Mercury's skull. As the head was to be covered by the petasos, this part would be invisible later and therefore no metal was wasted on it.

A similar scenario may account for a find made around 1910 in the north of France. Dredging the river Lys near Thiennes (Nord) brought up three medium-size bronze statuettes of Jupiter, Mars, and Mercury (figs. 18.5–7).[15] We may only speculate about where they were originally stashed and what was the nature of that spot, as in Roman times they were certainly deposited on firm ground. Some scattered Roman potsherds were found in the vicinity, but no traces of a building are known so far. Without an autopsy it is difficult to say whether the bodies of all three statuettes are based on a single model, but it seems at least possible that they were made in the same workshop, if by different bronze-workers.[16] As to their original function, Stéphanie Boucher suggested that they might have been standing in an extra shrine dedicated to that *trias*, despite the fact that there is hardly any epigraphical evidence of the three together.[17] It is certainly safer to assume that they had been offered as votive gifts to a regional sanctuary, the location and divine patron of which are unknown.[18] At a certain point they were put away, in the same way as has been suggested for the bronzes from Turny.

Figure 18.5. Jupiter from Thiennes. Height 49 cm (19 ¼ in.). Lille, Palais des Beaux-Arts, inv. ANT2752

Image: © RMN-Grand Palais / Stéphane Maréchalle

Figure 18.6. Mars from Thiennes. Height 52 cm (20 ½ in.). Lille, Palais des Beaux-Arts, inv. ANT2751

Image: © RMN-Grand Palais / Stéphane Maréchalle

Figure 18.7. Mercury from Thiennes. Height 49 cm (19 ¼ in.). Lille, Palais des Beaux-Arts, inv. ANT2753

Image: © RMN-Grand Palais / Stéphane Maréchalle

The phenomenon of ritual depositions of all sorts is well documented by archaeological finds, although we do not yet know much about the rules governing such practices. Though there are few written sources dealing with this topic on a theoretical level, in the last few years it has received increased attention.[19] In any case it is to be assumed that there were no general regulations that applied to the whole range of depositions, from so-called ritual rubbish to intact statues, but rather that there were local traditions and interpretations, depending also on the type of objects to be deposited.[20] Filling up a pit with a large quantity of small ceramics certainly followed different customs than did depositing statues or statuettes. Coming back to our topic, we do not know exactly how the statuettes from Turny and Thiennes were arranged when they were hidden, but we have more information about the way this was done in another case.

Figure 18.8. Minerva from Dinéault. Original height approx. 70 cm (27 ½ in.). Rennes, Musée de Bretagne, inv. 972.0059.1

Image: A. Amet. © Collection Musée de Bretagne, Rennes — reproduction interdite

In 1913 (and in an additional attempt in 1928), a farmer at Kerguilly-en-Dinéault (Finistère, France), on the fringe of the Romanized parts of Gaul, discovered a large bronze statuette of Minerva (fig. 18.8), still standing upright in a pit carefully coated with clay.[21] In the attempt to recover it, most of the body, consisting of a thin hammered sheet, crumbled away, and only the cast parts of the statuette survived. This combination of hammered and cast parts seems to have been typical of Gallo-Roman works of Early Imperial times and is evidenced by numerous other bronzes, for instance the famous masks and heads from the woods near La Compiègne (Oise, France), which also represent the closest stylistic parallels.[22] In addition, there is a marked discrepancy in the proportions of the head and the limbs. There can be no doubt, however, that the statuette is directly derived from Roman, Classical-influenced representations of Minerva, as can be seen, for instance, in the crouching bird (a wild goose?) under the crest of the helmet, which seems to be a local adaptation of Minerva's owl. Lacking any further information, we do not know why the statuette was "buried" in such a strange manner. We may safely assume that it had been an important votive object in a local sanctuary, or possibly even the main cult statue.

So far we have been looking at large statuettes stored away in isolation, without their bases and with no other objects; in these cases it was the location and the method of deposition that hinted at their previous use in the area of a sanctuary. Yet there are some deposits that contain a large variety of votive objects in addition to statuettes, many of them featuring votive inscriptions.

Certainly the largest and most precious temple treasure including statuettes is the silver hoard found at Berthouville (Eure, France) in 1830.[23] It is linked to the deposit from Dalheim insofar as, according to the excavation reports of the late nineteenth century, its findspot, too, was located within the area of a large sanctuary. All the objects, which were deposited together at one stage, are of silver, indicating a deliberate prior separation of materials; accordingly, it can be assumed that a much larger quantity of bronze votive objects once existed. The votive inscriptions mention the names of nineteen dedicants who donated their small or larger offerings to the Gallo-Roman god Mercurius Canetonnensis.[24] As the bases of the two statuettes of Mercury are lost,[25] we do not have any information about their donors. Both figures were made by combining hammered and cast parts, the same technique used for the Minerva from Kerguilly. The two solid-cast hands of the larger statuette seem disproportionately small compared with the dominant head, which originally was covered with a separately cast petasos. The smaller Mercury, found in fragments, was reassembled and completed by a nineteenth-century artist. Both statuettes, made presumably at the end of the second or the beginning of the third century AD, may have been offered as votive objects to Mercury; there is no evidence linking the larger one with the cult statue itself, as has been tentatively suggested.[26]

The last statuette in this series, too, served as a votive object. It belongs to a bronze hoard (some of which is kept at the Getty Villa), whose origin could be ascertained, thanks to epigraphic evidence, as the territory of the Haedui (modern Burgundy, near Vézelay).[27] There are in fact three statuettes depicting the previously unknown Gallo-Roman god Cobannus, but the two smaller ones adopt the well-known type of a young naked Mars whereas the largest statuette (nearly 70 cm or 27 ½ in. high) and artistically quite outstanding, presents an exceptional iconography.[28] The god wears a Classical *chlamys*, normally worn by Mercury, over a long-sleeved tunic and long pants—a combination of garments also found in a few other statuettes of Gallo-Roman origin, such as those portraying Sucellus.[29] His head, covered with a helmet of the "Niederbieber type" used by the Roman army in the second century AD, presents a sharp contrast to his peaceful outfit. We may safely assume that such an original creation could not have been bought ready-made but points to the initiative of its donor, L. Maccius Aeternus, himself a Roman citizen and magistrate, who made sure that he fulfilled his vow to this local god with an adequate gift.

This brief overview has shown that the group of medium-sized statuettes might greatly profit from more systematic research into their iconographic, technical, and functional aspects.

✦ ✦ ✦

Notes

1. In memory of Kenneth Painter († 13th May 2016). For a number of years I have been able to rely on him as an extremely kind and knowledgeable colleague who was very generous with his time. His demise has left us all bereft.
2. What had to be left aside in this paper are all the technological aspects that, however, might add much to a better understanding of the composition, manufacturing, and provenience of medium-sized statuettes. One successful step toward this target has been made with the exemplary study of the bronze hoard from Vieil-Evreux (Eure, France), which comprises two medium-sized statuettes; Azéma et al. 2012; Guyard et al. 2012.
3. Stewart 2003, 184–222, esp. 184–95; Estienne 2010; Estienne 2013.
4. Stewart 2003, 230–31; Kunze 2015, 58–9.
5. Kapossy 1969 seems still to be the only comprehensive study on the subject.
6. Heilmeyer 1996, 40–45; Peltz and Schalles 2011, 88–92.
7. H: 144 cm (56 ¾ in.). Hiller 1994; Peltz and Schalles 2011.
8. Reinach 1898; Oehmke 2004, 106, no. 51; Peltz and Schalles 2011, 92–94, fig. 9.
9. H: 67 cm (26 ⅜ in.). Oehmke 2004, 102, no. 47; Peltz and Schalles 2011, 92–94, fig 10.
10. H: 60 cm (23 ⅝ in.). Billoret 1970, 281, fig. 3; Manfrini-Aragno 1987, 62–63, fig. 46; Kaufmann-Heinimann 1998, 243, GF22, fig. 195.
11. Jupiter: de Ridder 1913, no. 36, pl. 7; Menzel 1980; Lavagne 1989, 29–30, no. 6 (F. Beck). Minerva (h: 40.2 cm or 15 ⅞ in.): de Ridder 1913, no. 1071, plate 63; Lavagne 1989, 28–29, no.

5 (F. Beck); Dövener 2010, 50–53, fig. 5. For the discovery and early excavations: Metzler and Zimmer 1978, 354–59, figs. 1–5.

12. Scheid 2007, 482. A complete but smaller bronze group of Jupiter, Juno, and Minerva (h: 29–33 cm or 11 ½–13 in.) was part of a hoard connected to a rural sanctuary at Muri (Switzerland): Leibundgut 1980, nos. 6, 42–43, plates 11–13, 54–59; Kaufmann-Heinimann 1998, 283, GF80, fig. 245. For other representations of the Capitoline triad, see Costantini 1997.
13. The actual state of the epigraphical evidence at Dalheim is presented by Krier 2011.
14. Deyts and Vernou 2008–2009. For representations of Rosmerta, see Bauchhenß 1994.
15. De Mély 1913; Boucher 1972.
16. It has to be noted that the metal composition analyzed in 1972 is not homogeneous; see Boucher 1972, 147–48.
17. Boucher 1972, 144–46, and accordingly Gury 2006, 110–11. A votive inscription from Geneva, now lost (*CIL* XII 2589), is still the only testimony known so far to mention Mars, Jupiter, and Mercury; see Bertrandy et al. 2005, 215–16, no. 824 (F. Wiblé).
18. As mentioned above, Roman sanctuaries usually housed all sorts of images besides the main cult statue; see, for example, W. Van Andringa's instructive case study on the inventories of various temples in the center of Pompeii (Van Andringa 2012).
19. See Schäfer and Witteyer 2013; Scheid 2009; Scheid 2013.
20. See Haynes 2013 and the references given there.
21. Sanquer 1973; Galliou 2010, 184–85, fig. 142.
22. Woimant 1995, 287, fig. 185; Sanquer 1973, 75, figs. 9a–b.
23. Babelon 1916; Lapatin 2014.
24. Nuber 1974; Deniaux 2006.
25. H: 56.3 and 40.5 cm (22 ¼ and 16 in.). Babelon 1916, pls. 1–4; Lapatin 2014, figs. 6–7.
26. Baratte and Painter 1989, no. 27 (A. Kaufmann-Heinimann); Lapatin 2014, 17.
27. Pollini 2002; Rolley 2002, 281–87; Dondin-Payre and Kaufmann-Heinimann 2009. There are still some open questions concerning the original size and provenance of the hoard.
28. H: 67.5, 51.5, and 16 cm (36 ½, 20 ¼, and 6 ¼ in.). Pollini 2002, 7–12, nos. 4–6, figs. 27–54.
29. Kaufmann-Heinimann 2012, 5–18, figs. 3, 6–9, 12–13.

Bibliography

Azéma et al. 2012
Azéma, A., B. Mille, F. Pilon, J.-C. Birolleau, and L. Guyard. 2012. "Étude archéométallurgique du dépôt de grands bronzes du sanctuaire gallo-romain du Vieil-Evreux (Eure)." *ArchéoSciences* 36: 153–72.

Babelon 1916
Babelon, E. 1916. *Le trésor d'argenterie de Berthouville, près Bernay (Eure), conservé au Département des médailles et antiques de la Bibliothèque nationale*. Paris: Librairie centrale des Beaux-Arts; Émile Lévy.

Baratte and Painter 1989
Baratte, F., and K. Painter, eds. 1989. *Trésors d'orfèvrerie gallo-romains*. Paris: Éditions de la Réunion des musées nationaux.

Bauchhenß 1994
Bauchhenß, G. 1994. "Rosmerta." In *LIMC* 7: 644–48.

Bertrandy et al. 2005
Bertrandy, F., F. Kayser, A. Pelletier, B. Rémy, and F. Wiblé. 2005. *Inscriptions latines de Narbonnaise (ILN)*. Vol. 5.3: *Vienne*. Gallia, Suppl. 44. Paris: CNRS.

Billoret 1970
Billoret, R. 1970. "Circonscription de Lorraine." *Gallia* 70: 281–315.

Boucher 1972
Boucher, S. 1972. "Trois bronzes divins de Thiennes (Nord)." *Gallia* 30: 127–48.

Costantini 1997
Costantini, A. 1997. "La Triade Capitolina." In *LIMC* 8: 461–70.

Deniaux 2006
Deniaux, E. 2006. "Les dédicants du trésor du sanctuaire de Berthouville (cité des *Lexonii*)." In *Sanctuaires, pratiques cultuelles et territoires civiques dans l'Occident romain*, ed. M. Dondin-Payre and M.-Th. Raepsaet-Charlier, 271–95. Brussels: Livre Timperman.

Deyts and Vernou 2008–2009
Deyts, S., and C. Vernou. 2008–2009. "Mercure et Rosmerta, un nouveau couple de divinités gallo-romaines au Musée archéologique." *Bulletin des Musées de Dijon* 11: 23–33.

Dondin-Payre and Kaufmann-Heinimann 2009
Dondin-Payre, M., and A. Kaufmann-Heinimann. 2009. "Trésors et biens des temples: Réflexions à partir de cas de Gaules: Neuvy: Champoulet, Cobannus (Éduens)." *Archiv für Religionsgeschichte* 11: 89–120.

Dövener 2010
Dövener, F. 2010. "'Auge um Auge' … Ein seltenes Fundstück aus dem Tempelbezirk des römischen Vicus in Dalheim." *Empreintes* 3: 48–53.

Estienne 2010
Estienne, S. 2010. "*Simulacra deorum* versus *ornamenta aedium*: The Status of Divine Images in the Temples of Rome." In *Divine Images and Human Imaginations in Ancient Greece and Rome*, ed. J. Mylonopoulos, 259–71. Religions in the Graeco-Roman World 170. Leiden: Brill.

Estienne 2013
Estienne, S. 2013. "Penser le patrimoine des dieux, entre public et privé." In *Dialogues entre sphère publique et sphère privée dans l'espace de la cité romaine: Vecteurs, acteurs, significations*, ed. A. Dardenay and E. Rosso, 55–66. Ausonius Éditions, Scripta Antiqua 56. Bordeaux: De Boccard.

Galliou 2010
Galliou, P. 2010. *Carte archéologique de la Gaule*. 29: *Le Finistère*. Paris: Académie des Inscriptions et Belles-Lettres.

Gury 2006
Gury, F. 2006. "Mars en Gaule romaine: images d'un dieu investi par l'idéologie impériale." In *Mars en Occident: Actes du colloque*

international "Autour d'Allones (Sarthe), les sanctuaires de Mars en Occident," Le Mans, Université du Maine, 4–5–6 juin 2003, ed. F. Brouquier-Reddé, E. Betrand, M.-B. Chardenoux, K. Gruel, and M.-C. L'Huillier, 105–19. Rennes: Presses Universitaires.

Guyard et al. 2012
Guyard, L., C. Fontaine, and S. Bertaudière. 2012. "Relecture du dépôt de bronze de l'époque romaine du Vieil-Évreux (Eure)." *Gallia* 69.2: 151–94.

Haynes 2013
Haynes, I. 2013. "Advancing the Systematic Study of Ritual Deposition in the Greco-Roman World." In Schäfer and Witteyer 2013, 7–19.

Heilmeyer 1996
Heilmeyer, W.-D. 1996. *Der Jüngling von Salamis: Technische Untersuchungen zu römischen Großbronzen*. Mainz: Philipp von Zabern.

Hiller 1994
Hiller, H. 1994. "Zum Xantener Bronzeknaben." In *Akten der 10. Internationalen Tagung über antike Bronzen, Freiburg, 18.–22. Juli 1988*, 201–10. Forschungen und Berichte zur Vor- und Frühgeschichte in Baden-Württemberg 45.

Kapossy 1969
Kapossy, B. 1969. *Brunnenfiguren der hellenistischen und römischen Zeit*. Zurich: Juris Druck & Verlag.

Kaufmann-Heinimann 1998
Kaufmann-Heinimann, A. 1998. *Götter und Lararien aus Augusta Raurica: Herstellung, Fundzusammenhänge und sakrale Funktion figürlicher Bronzen in einer römischen Stadt*. Forschungen in Augst 26. Augst: Römermuseum.

Kaufmann-Heinimann 2012
Kaufmann-Heinimann, A. 2012. "Ikonographie und Stil: Zu Tracht und Ausstattung einheimischer Gottheiten in den Nordwestprovinzen." In *Bronzes grecs et romains: Hommage à Claude Rolley*, 2–28. Institut national d'historie de l'art (INHA), Actes de colloques & livres en ligne. http://inha.revues.org/7253.

Krier 2011
Krier, J. 2011. "*Deae Fortunae ob salutem imperi*: Nouvelles inscriptions de Dalheim (Luxembourg) et la vie religieuse d'un *vicus* du nord-est de la Gaule à la veille de la tourmente du III^{e} siècle." *Gallia* 68.2: 313–40.

Kunze 2015
Kunze, C. 2015. "Kontextwechsel: Zur Interpretation antiker Skulpturen in unterschiedlichen Aufstellungssituationen." In *Leibhafte Kunst: Statuen und kulturelle Identität*, ed. D. Boschung and C. Vorster, 55–91. Morphomata 24. Paderborn: Wilhelm Fink.

Lapatin 2014
Lapatin K., ed. 2014. *The Berthouville Silver Treasure and Roman Luxury*. Los Angeles: J. Paul Getty Museum.

Lavagne 1989
Lavagne, H., ed. 1989. *Les dieux de la Gaule romaine*. Exh. cat. Luxembourg, Galerie d'Art Municipale Villa Vauban. Luxembourg: Ville de Luxembourg.

Leibundgut 1980
Leibundgut, A. 1980. *Die römischen Bronzen der Schweiz*. Vol. 3: *Westschweiz, Bern und Wallis*. Mainz: Philipp von Zabern.

Manfrini-Aragno 1987
Manfrini-Aragno, I. 1987. *Bacchus dans les bronzes hellénistiques et romains: Les artisans et leur répertoire*. Cahiers d'archéologie romande 34. Lausanne: Bibliothèque historique vaudoise.

de Mély 1913
de Mély, E. 1913. "Les trois statuettes de bronze de Merville." *MonPiot* 20: 155–62.

Menzel 1980
Menzel, H. 1980. "Die Jupiterstatuetten von Bree, Evreux und Dalheim und verwandte Bronzen." In *Toreutik und figürliche Bronzen römischer Zeit: Akten der 6. Tagung über antike Bronzen, 13.–17. Mai 1980 in Berlin*, ed. U. Gehrig, 186–96. Berlin: Staatliche Museen Preussischer Kulturbesitz.

Metzler and Zimmer 1978
Metzler, J., and J. Zimmer. 1978. "Beiträge zur Archäologie von Dalheim." *Hémecht* 30: 351–82.

Nuber 1974
Nuber, H. U. 1974. "Zum Vergrabungszeitpunkt der Silberfunde von Hildesheim und Berthouville." *BMusBrux* 46: 23–30.

Oehmke 2004
Oehmke, S. 2004. *Das Weib im Manne*: *Hermaphroditos in der griechisch-römischen Antike.* Winckelmann-Institut der Humboldt-Universität zu Berlin 4. Berlin: Willmuth Arenhövel.

Peltz and Schalles 2011
Peltz, U., and H.-J. Schalles. 2011. *Der Xantener Knabe: Technologie, Ikonographie, Funktion und Datierung*. Xantener Berichte: Grabung – Forschung – Präsentation 22. Darmstadt and Mainz: Philipp von Zabern.

Pollini 2002
Pollini, J. 2002. *Gallo-Roman Bronzes and the Process of Romanization: The Cobannus Hoard*. Monumenta Graeca et Romana 9. Leiden, Boston, and Cologne: Brill.

Reinach 1898
Reinach, S. 1898. "Hermaphrodite: Statuette de bronze de la collection du M^{is} de Luppé." *RA:* 321–36.

de Ridder 1913
de Ridder, A. 1913. *Les bronzes antiques du Louvre*. Vol. 1: *Les figurines*. Paris: Ernest Leroux.

Rolley 2002
Rolley, C. 2002. "Les bronzes grecs et romains: recherches récentes." *RA*: 269–89.

Sanquer 1973
Sanquer, R. 1973. "La grande statuette de bronze de Kerguilly en Dinéault (Finistère)." *Gallia* 31: 61–80.

Schäfer and Witteyer 2013
Schäfer, A., and M. Witteyer, eds. 2013. *Rituelle Deponierungen in Heiligtümern der hellenistisch-römischen Welt: Internationale Tagung Mainz 28.–30. April 2008*. Mainzer Archäologische Schriften 10.

Mainz: Generaldirektion Kulturelles Erbe, Direktion Landesarchäologie.

Scheid 2007
Scheid, J. 2007. "Comprendre les cultes et lieux de culte des cités des Gaules." In *Les villes romaines du Nord de la Gaule: Vingt ans de recherches nouvelles: Actes du XXV^e colloque international de HALMA-IPEL UMR CNRS 8164*, ed. R. Hanoune, 477–83. Revue du Nord, hors série. Collection Art et Archéologie 10. Villeneuve-dAscq: Revue du Nord.

Scheid 2009
Scheid, J. 2009. "Les biens des temples à Rome et dans le monde romain." *Archiv für Religionsgeschichte* 11: 1–4.

Scheid 2013
Scheid, J. 2013. "Bemerkungen zu *bothros* und *fauis(s)a*." In Schäfer and Witteyer 2013, 21–24.

Stewart 2003
Stewart, P. 2003. *Statues in Roman Society: Representation and Response*. Oxford: Oxford University Press.

Van Andringa 2012
Van Andringa, W. 2012. "Statues in the Temples of Pompeii: Combinations of Gods, Local Definitions of Cults, and the Memory of the City." In *Historical and Religious Memory in the Ancient World*, ed. B. Dignas and R. R. R. Smith, 83–115. Oxford: Oxford University Press.

Woimant 1995
Woimant, G.-P. 1995. *Carte archéologique de la Gaule*. 60: *L'Oise*. Paris: Académie des Inscriptions et Belles-Lettres.

19.

Through Celts and Romans: Technology and Symbolism of Bronze Enameled Roosters

Federica Grossi, Università degli Studi di Milano

One of the most interesting groups of Roman bronze metalwork spans the second and third centuries AD. It comprises about ten enameled statuettes portraying roosters, possibly standing on bases. Their provenance is attested at sites of the Western Empire, possibly connected with Celtic art. The roosters are portrayed in attack position, with the beak open and the crest up. Their chests are decorated with triangles or lozenges of multicolored champlevé enamels and they have detachable backs. The recent find of a similar item, complete with its tail, has brought renewed attention to these objects, but they are still rarely published or are mentioned only in old scholarship. There are still open questions about them, such as how they were made and why, with such an elegant and precious technique. Furthermore, there are debatable aspects of both the metalworking and the shapes of these objects, which are probably connected with the Celts, as well as problems related to ateliers and workshops. Finally, it would be interesting to know more about their function, whether as lamps, containers, or simple decorative statuettes.

✦ ✦ ✦

Introduction

The symbology characterizing the Roman world, as much as its artistic production, often manifests a beautiful syncretism: there are many cases in which a theme, a figure, or a meaning is rearranged and presented in a different way, and it is often possible to see that their roots are planted far away. From this point of view the Celts were very important, because their myths, rites, and interpretations influenced Roman ones over a long span of time. If we add that the technique and technology used for the objects under discussion are originally Celtic, the bond between these two cultures will become clearer, as will the artistic debt that the Romans owe to the Celts. The purpose of this paper is to describe in detail a group of bronze enameled roosters—fascinating objects related to the larger group of enameled vessels—trying to understand their background, technology, age, and function.

Roosters and Mercury: Ancient Sources and Archaeological Finds

In the Greek and Roman worlds, the figure of the rooster was frequently associated with gods such as Asclepius, Minerva, and Mars, and represented different aspects of their personalities or spheres of influence, such as healing, readiness, and pugnacity.[1] Nevertheless, the god most often portrayed with a rooster is Mercury, a central character in trade and communication: he was not only the divine messenger but also represented the means and ways of communication. Mercury was the connection between different levels of existence, as they were understood at the time: divine, mortal, and afterlife. In other words, he was an entity at the limits in every sense. No one was more suited to this role: he was born at dawn, between night and day; he was a thief and a gambler, but also a merchant and a gifted musician; excess and moderation in a single god. Probably for these reasons, he was also the chaperone of souls, and the rooster is one of his totemic animals: it is fierce and smart, and, above all, it too knows the borderlines, because it announces the rising sun with its voice, obliterating darkness.

Greeks and Romans were not the only ones to think this way. Caesar (*Bellum Gallicum* 6.17.1) asserts with no doubt the supremacy of the god in Gaul. He says: "Amongst the gods, they worship Mercury above all and he is the one with the most numerous representations."[2] Lucan (*Pharsalia* 1.444–46), on the other hand, presents three strong, cruel Celtic gods—Taranis, Esus, and Teutates—the latter two of which, according to their attributes, could have been Mercury;[3] Taranis was recognized as Jupiter. The matter of their identification with Mars, Mercury, or simple local gods is still open and scholars are trying to determine the truth, but it's difficult because attributes blur one into the other, dialects vary, and there is no definitive archaeological evidence.[4] Nevertheless, in Gaul, Germany, and Britain, there are materials such as statues, bronzes, and inscriptions that demonstrate the peculiar devotion to this god of commerce and craftsmanship and that witness the bond between him and the rooster. Among them are a bronze statuette found in a deposit at Dax, in the south of France, portraying the god with a rooster and a goat at his feet;[5] a stone altar from Horn, the Netherlands, with a relief decoration of a rooster on top of a caduceus;[6] and a silver handle of a pan from Capheaton, England, with Mercury sitting under a pavilion and holding a bag, while a small rooster stands next to him.[7] Finally, it's very important to note findings of chicken bones. A clear example is a grave in a cemetery in Tartigny, Picardy: among the grave goods accompanying someone believed to be an official are about twenty vases, in one of which were found the bones of a chicken and a goose, with their wings and claws cut at the tips.[8] Other cases are the sanctuary of Mercury at Uley, Gloucestershire, where scholars have found a large quantity of bones from goats and roosters;[9] and the sanctuary of Mirebeau, Burgundy, with similar finds.[10] Data of this kind are sparse because chicken bones are small and fragile, so we may not have a good estimate of the frequency or quantities of such deposits. Importantly, though, these finds are in closed, protected contexts, so they were meant to survive. And they prove that those animals were necessary, as a sacrifice for a god and as a link to the afterworld.

Analyzing the Artifacts

Presently we know of nine bronze enameled statuettes of roosters, all of them coming from the western part of the Roman Empire: five from England (London; Cople in Bedfordshire; Cirencester in Gloucestershire; Slyne with Hest in Lancashire; and Drayton Bassett in Staffordshire); two from the Netherlands (Ezinge and Buchten), and one from Belgium (Tongeren). The final one is said to come from Cologne and is now in Bonn (fig. 19.1). The best known and best preserved one is from Cirencester (fig. 19.2): it is a beautiful, complete specimen, the only one with its tail intact, which was discovered in 2011 during the excavation of a Roman burial site that was probably in use from the middle of the second to the fourth century AD. It was the grave of a child, two or three years old and of unknown gender, buried in a nailed wooden coffin with the bronze rooster and a ceramic eating vessel.[11] These are simple grave goods, yet very significant ones, particularly if one remembers that the site of Uley, with the sanctuary of Mercury, is only a few miles west of Cirencester. Since many of these objects were found in the nineteenth century outside of archaeological excavations, there are only two others with known contexts, both of them from the Netherlands: the one from Ezinge was found in a burial site (see fig. 19.6),[12] and the one from Buchten is probably from a sanctuary (fig. 19.3). This specimen is particularly interesting not only because it still retains its pedestal but also because it bears an inscription that may prove useful in hypothesizing about dating and workshops.[13] It seems that there was another rooster from Cirencester that was found in 1870, but it has since been lost.[14]

Figure 19.1. Bronze rooster with enamel from Cologne. Rheinisches Landesmuseum, Bonn
Image: Jürgen Vogel. LVR – Landesmuseum Bonn

Figure 19.2. Bronze rooster with enamel from Cirencester. Corinium Museum, Cirencester
Image: © Cotswold District Council, courtesy of Corinium Museum, www.coriniummuseum.org

Figure 19.3. Bronze rooster with enamel from Buchten. Limburgs Museum, Venlo
Image: Courtesy of the Limburgs Museum (Venlo, The Netherlands)

Looking at these objects, we can define common elements that lead us to discover subgroups among them. First of all, the mechanisms differ. Most seem to have been made the same way: with a pedestal, a body in a single piece, a tail that slots into the back, and a removable spine. Second, the decoration differs. One type has colorful chest patterns like a slanting checkerboard; if we also consider the shape of neck and eyes and the similarities among beaks and combs, we have three samples probably coming from the same production (Cologne, Buchten, and Cirencester). In a second group, the chest pattern shows many little triangles with rounded angles, which probably points to a different place of production; three samples (Cople, Lancashire, Tongeren) belong to this group (figs. 19.4–5). The three last specimens cannot be ascribed to either group: the one from Ezinge (fig. 19.6) is far too corroded to recognize its pattern; the one from Staffordshire (fig. 19.7) has lost its head; and the one from London has a different structure entirely. It seems that its body was made by the union of an upper and lower part and its decoration was based on moon crescents on chest and back.

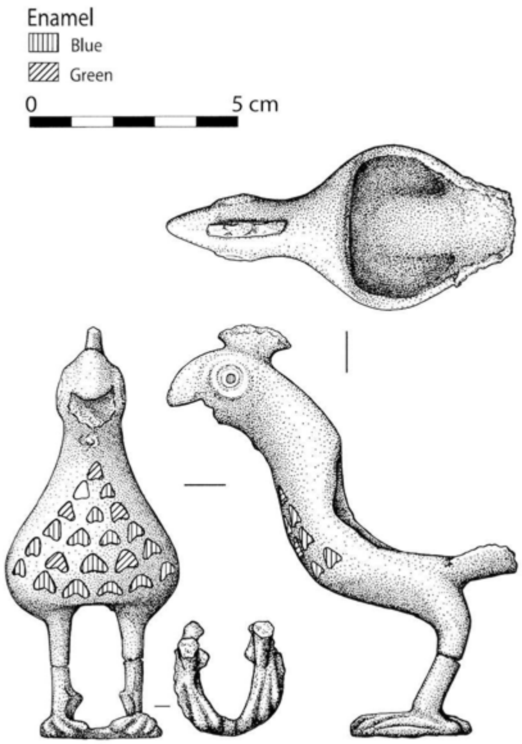


Figure 19.4. Bronze rooster from Cople, Bedfordshire
Image: Courtesy of the Portable Antiquities Scheme

Figure 19.5. Bronze rooster from Slyne with Hest, Lancashire
Image: Courtesy of the Portable Antiquities Scheme

Figure 19.6. Bronze rooster from Ezinge. Groninger Museum, Groningen. Rooster. 1–300 AD. Bronze. Collection Groninger Museum
Image: Marten de Leeuw

Figure 19.7. Bronze head of a rooster from Drayton Bassett, Staffordshire
Image: Courtesy of the Portable Antiquities Scheme

A Celtic Technique?

Working enamel is difficult and the technique known as champlevé requires great skill, not only for the bronze craftsman but also for the glass maker: preparing and firing enamel is a very difficult process, especially when making such jointed statuettes. The first step was the preparation of supports: the various parts were poured separately into molds that probably already had their hollows to contain the enamel. Then, a mix of colored ground glass and water was spread into the hollows with a spatula or a brush; the excess water was dried; and the bronze pieces were fired. Temperatures had to be watched carefully in order to avoid mistakes or damage, and the artisan had to know which pigments needed more layers of glass and which needed fewer to give perfect results. Finally, the artisan waited for the object to cool down before proceeding with cleaning and assembly. At least, this is how Romans used this technology; but how much of it was a Roman development? It is pertinent therefore to discuss some issues about the origins of enamel.[15]

Let us first look at what Philostratus, a Greek sophist who lived in Rome during the reign of Septimius Severus, had to say on the subject. In one of his essays he wrote: "These pigments, it is said, the Barbarians living by Oceanus compound of red-hot bronze and they combine and grow hard and preserve what is painted with them" (Philostratus *Imagines* 1.1.28). There are two main points to raise about this statement. First, Philostratus speaks about Barbarians who execute this technique as artisans or well-trained workers. Second, he probably went to Britain with the emperor during military campaigns defending the *limes*, between AD 208 and 211.[16] Furthermore, some recent studies have suggested the possibility that there was a significant workshop in Castleford, south of York, where excavations have turned up two large pits with molds for the making of enameled objects.[17] On the continent, however, the situation remains puzzling: suggestions for possible workshops have been proposed in France and Belgium, but there is no clear evidence of their existence.[18]

In light of this information, it should be simpler to see common elements that associate individual roosters and that distinguish particular workshops, but there is something further to be taken into account. If it is true that the concept and the technology are Celtic, it is also clear that Romans refined them and made them their own. In analyzing the pieces, we can see that—based on contexts, styles, or comparisons—they should be ascribed to the second century AD. The specimen from Buchten can help illuminate the situation (see fig. 19.3). It is a rooster like the others, but on its pedestal there is a Latin inscription reading: "Ulpius Verinus, veteran of the Sixth Legion, consecrates this to the goddess Arcanua, discharging a vow to her, who merits it."[19] The inscription states that Ulpius Verinus was a veteran, meaning he served as a soldier for a long time, at least 20 or 25 years. Furthermore, he was a veteran of the sixth *legio Victrix*, which was in Novaesium (Neuss) from AD 71 to 100, then in Castra Vetera (Xanten) from AD 103 to 122, and finally in Eburacum (York). This is also relevant, because York is quite near the site of Castleford—the ancient Roman Lagentium—where the enamel molds were found. Finally, it's important to remember that Philostratus personally witnessed enameling and that his journey in Britain with Septimius Severus took place at the very beginning of the third century AD. With these premises, it is possible to hypothesize that Ulpius Verinus bought the rooster near Hadrian's Wall, brought it back to Germany at the end of his service, and offered it to the local goddess Arcanua. If this theory is plausible, it would mean that there was a workshop producing this kind of precious object connected to the military service. Notably, five sites—three in England and one each in Spain and France[20]—have yielded small bowls that, in detail, are distinctive in their decoration, demonstrating a link between enameled vessels and Hadrian's Wall. These objects not only represent a stylized wall but also give us names that correspond to Roman forts along Hadrian's Wall. They are currently interpreted as souvenirs from the Wall, perhaps produced in an atelier near the Wall itself.[21]

Conclusion

To conclude, it is necessary to devote some words to the function of these artifacts. Surely, given the difficulty of their production and the preciousness of their materials, they must have been very expensive, true luxury goods. Scholars have proposed a number of hypotheses about their use. The first and least persuasive one asserts that the roosters could have been lamps, with the cavity in the back filled with oil.[22] This is not possible for several reasons: for example, it would have been too difficult to insert the wick along the body and to make it come out from the beak; also, the fire could have damaged the object causing the enamels to detach. Finally, it has been shown that the spine was soldered to the back and that it served to fix the tail, so the cavity was not functional. This discovery, made especially clear by the complete Cirencester specimen, leads us also to reject the idea that these roosters were boxes: they could not contain any kind of treasure, nor jewels like necklaces, earrings, or bracelets, nor spices, essences, or incense. This use having been ruled out, the only remaining possibility is that the enameled roosters were not functional at all but were instead beautiful decorative statuettes that were intended for private use as precious objects to display. This interpretation is not all that astonishing: given the link between Mercury and the afterworld, the statuette of a rooster could have had an apotropaic value: keeping an object of this kind could have meant that the owner trusted the god for the journey at the end of his (or her) life. Over time, this meaning was forgotten and modified. This allows us to introduce a new and stirring hypothesis. We know that the bird has been a symbol of passage or a channel into another dimension since the beginnings of the Christian religion, but the innovation is that it's no longer represented by a rooster, but rather by a dove. Images of doves become more frequent over the centuries of Late Antiquity, and by the Middle Ages—between the twelfth and the thirteenth centuries—they will form a new type of liturgical furniture known as "eucharistic doves."[23] These spread especially across France and, most importantly, show similarities with the roosters under discussion: they have a spiritual or religious meaning; they are metallic birds composed of joined pieces; and, especially, they are enameled in champlevé technique (the most famous site of production was in Limoges).[24] Hence it is possible that, after the role of roosters and their association with Mercury became increasingly obsolete, western Christians adopted and adapted an ancient model for their own liturgical needs. Surely, this wouldn't be the first case.

✦ ✦ ✦

Notes

1. Pintus 1986, 243–46.
2. Caesar *Bellum Gallicum* 6.17.1: Deum maxime Mercurium colunt. Huius sunt plurima simulacra. hunc omnium inventorem artium ferunt, hunc viarum atque itinerum ducem, hunc ad quaestus pecuniae mercaturasque habere vim maximam arbitrantur.
3. Lucan *Pharsalia* 1.444–46: Et quibus inmitis placatur sanguine diro / Teutates horrensque feris altaribus Esus / et Taranis Scythicae non mitior ara Dianae.
4. On the discussion on Esus and Teutates as Mercury and Mars, see Sjoestedt 1949, 21–23. See also Duval 1976, 27–31, 69–73; and Kruta 1997, 536–39.
5. Santrot et al. 1996, 260–82.
6. Hardenberg 1946, 5–42.
7. Brailsford 1964, 41, plate 10.49.
8. Massy 1986, 16–18.
9. Van Andringa and Lepetz 2002, 89.
10. Goguey 1979; Barral and Joly 2011; Joly and Barral 2008.
11. Hilts 2013, 28–34.
12. The exact word to describe the structure is *hutkom* or *komhut*, as Hoss et al. (2015, 166) say: it indicates a rectangular pit covered with a sloping roof. In contrast, Zadoks-Josephus Jitta, Peters, and Van Es (1967, 114) only mention a provenance from the artificial hillock of Ezinge.
13. Hoss et al. 2015, 159–71.
14. Hoss et al. 2015, 167.
15. For a complete history of enamel and its development, see Henry (1933, 65–146).
16. There are many problems regarding Philostratus and his historical accuracy, because there were four philosophers with the same name and place of birth. It is difficult to distinguish one from the other and it is even more complicated to establish a precise chronology for each one. However, only two of them are said to be the possible author of the text known as *Imagines*. They are Philostratus of Athens and Philostratus the Elder; both of them came to Rome to serve the emperor Septimius Severus, so it is possible that one of them followed the court to Britannia.
17. Bayley 1995.
18. Bequet 1900; Goudineau and Peyre 1993.
19. The goddess Arcanua (or Arkanua) is only mentioned twice in epigraphy (*AÉpigr* 1983, nos. 723–24): she was probably a local goddess, whose sanctuary was found and excavated in the Netherlands. See Derks 2015a, 150–54; Toorians 2015; Derks 2015b, 173–76.
20. Rudge Coppice, Ilam, Bath, in England; Zamora, Spain; and Amiens, France.
21. Breeze 2012; Hunter 2016, 136–39.
22. Faider-Feytmans 1979, 134–41.
23. McLachlan 2005.
24. Boehm and Taburet-Delahaye 1996.

Bibliography

Barral and Joly 2011
Barral, P., and M. Joly. 2011. "Le sanctuaire de Mirebeau-sur-Bèze." In *Aspects de la romanisation dans l'Est de la Gaule*, ed. M. Redde, P. Barral, F. Favory, M. Joly, J.-P. Guillaumet, J.-Y. Marc, P. Nouvel, L. Nuniger, and C. Petit, 543–56. Collection Bibracte 21. Glux-en-Glenne: Centre archéologique européen.

Bayley 1995
Bayley, J. 1995. "Spoon and Vessel Moulds from Castleford, Yorkshire." In *Acta of the 12th International Congress on Ancient Bronzes, Nijmegen 1992*, ed. S. T. A. M. Mols, A. M. Gerhartl-Witteveen, H. Kars, A. Koster, W. J. Th. Peters, and W. J. H. Willems, 105–11. Nederlandse Archeologische Rapporten 18. Nijmegen: Provincial Museum G. M. Kam.

Bequet 1900
Bequet, A. 1900. "La bijouterie chez les Belges sous l'Empire Romain (II^{e} siècle)." *Annales de la Societé Archéologique de Namur* 24: 237–76.

Boehm and Taburet-Delahaye 1996
Boehm, B. D., and E. Taburet-Delahaye, eds. 1996. *Enamels of Limoges, 1100–1350*. New York: The Metropolitan Museum of Art.

Brailsford 1964
Brailsford, J. W. 1964. *Guide to the Antiquities of Roman Britain*. 3rd ed. London: Trustees of the British Museum.

Breeze 2012
Breeze, D. J., ed. 2012. *The First Souvenirs: Enamelled Vessels from Hadrian's Wall*. Kendal: Titus Wilton & Son.

Derks 2015a
Derks, T. 2015. "Inscripties en graffiti." In Derks and de Fraiture 2015, 148–55.

Derks 2015b
Derks, T. 2015. Summary to *Een Romeins heiligdom en een vroegmiddeleeuws grafveld bij Buchten (L)*. In Derks and de Fraiture 2015, 173–81.

Derks and de Fraiture 2015
Derks, T., and B. de Fraiture, eds. *Een Romeins heiligdom en een vroegmiddeleeuws grafveld bij Buchten (L)*. Rapportage Archeologische Monumentenzorg 226. Amersfoort: Rijksdienst voor het Cultureel Erfgoed.

Duval 1976
Duval, P. M. 1976. *Les dieux de la Gaule*. Petite bibliothèque Payot 298. Paris: Payot.

Faider-Feytmans 1979
Faider-Feytmans, G. 1979. *Les Bronzes Romains de Belgique*. Mainz am Rhein: Philipp von Zabern.

Goguey 1979
Goguey, R. 1979. "Le Sanctuaire gallo-romain de Mirebeau." *Mémoires de la Commission des antiquités de la Côte-d'Or* 31: 169–206.

Goudineau and Peyre 1993
Goudineau, C., and C. Peyre. 1993. *Bibracte et les Eduens: A la découverte d'un people gaulois*. Paris: Editions Errance.

Hardenberg 1946
Hardenberg, H. 1946. "L'Autel de Mercure Arverne à Horn." *AntCl* 15.1: 5–42.

Henry 1933
Henry, F. 1933. "Émailleurs d'Occident." *Préhistoire* 2.1: 65–146.

Hilts 2013
Hilts, C. 2013. "Corinium's Dead: Excavating Cirencester's Tetbury Road Roman Cemetery." *Current Archaeology* 281: 28–34.

Hoss et al. 2015
Hoss, S., J. Kempken, and T. Lupak. 2015. "Bronzen beeldje van een haan met voetstuk." In Derks and de Fraiture 2015, 159–71.

Hunter 2016
Hunter, F. 2016. "The Impact of Rome, c. AD 50–250." In *Celts: Art and Identity*, ed. J. Farley and F. Hunter, 128–52. London: The Trustees of the British Museum and National Museums Scotland.

Joly and Barral 2008
Joly, M., and P. Barral. 2008. *Archéologie en Bourgogne: La longue histoire d'un sanctuaire lingon à Mirebeau-sur-Bèze (Côte-d'Or)*. Archéologie en Bourgogne 12. Dijon: DRAC Bourgogne.

Kruta 1997
Kruta, V. 1997. "La Religione." In *I Celti*, ed. S. Moscati, O. Hermann Frey, V. Kruta, B. Raftery, M. Szabó, E. Arslan, and D. Vitali, 533–42. Milan: Bompiani.

Massy 1986
Massy, J.-L. 1986. "La Nécropole gauloise de Tartigny (Oise): Étude des structures." *Revue archéologique de Picardie* 3.4: 13–22.

McLachlan 2001
McLachlan, E. P. 2001. "Liturgical Vessels and Implements." In *The Liturgy of the Medieval Church*, ed. Th. J. Heffernan and E. A. Matter, 369–429. Consortium for the Teaching of the Middle Ages. Kalamazoo: Western Michigan University.

Pintus 1986
Pintus, G. M. 1986. "Storia di un simbolo: il gallo." *Sandalion* 8–9: 243–67.

Santrot et al. 1996
Santrot, J., B. Derion, X. Dupuis, M. Fincker, and P. Guibert. 1996. "Bronzes et fers de Dax, Landes: La cachette d'un antiquaire-restaurateur au IV s. après J.-C." *Gallia* 53: 251–343.

Sjoestedt 1949
Sjoestedt, M.-L. 1949. *Gods and Heroes of the Celts*. London: Methuen & Co.

Toorians 2015
Toorians, L. 2015. "Naamkundige analyse van het theoniem Arcanua." In Derks and de Fraiture 2015, 156–57.

Van Andringa and Lepetz 2002
Van Andringa, W., and S. Lepetz. 2002. "Le ossa animali nei santuari: per un'archeologia del sacrificio." In *Sanctuaires et sources dans l'antiquité: Les sources documentaires et leurs limites dans la description des lieux de culte*, ed. O. de Cazanove and J. Scheid, 85–96. Actes de la table ronde organisée par le Collège de France, l'UMR 8585 Centre Gustave-Glotz, l'Ecole française de Rome et le Centre Jean Bérard. Collection du Centre Jean Bérard 22. Naples: Centre Jean Bérard.

Zadoks-Josephus Jitta, Peters, and Van Es 1967
Zadoks-Josephus Jitta, A. N., W. J. T. Peters, and W. A. Van Es. 1967. *Roman Bronze Statuettes from the Netherlands*. Vol. 1: *Statuettes Found North of the Limes*. Groningen: J. B. Wolters.

20.

Representations of Zeus/Jupiter in Bronze Statuettes from Albania

Sabina Veseli, Institute of Archaeology, Center of Albanian Studies, Tirana

Zeus and Jupiter were venerated gods in ancient Albania, as we can see from numerous attestations in inscriptions, coins, and marble sculpture. The presence of four bronze statuettes depicting Zeus/Jupiter is added evidence for his cult in this territory, which was situated on an important crossroads of the Mediterranean. The bronze statuettes representing Zeus with a thunderbolt follow the canons of the Greek world and find many similarities with other statuettes that were used as votive offerings in various temples. The two Roman examples depicting Jupiter follow models widely used in the Roman Empire, mostly reproductions of the sculpture of the fourth century BC.

These bronze statuettes attest not only to the cult of Zeus/Jupiter in the territory of ancient Albania but also to influences of style and bronze-working techniques, and to similarities in religion shared with the rest of the Mediterranean world.

✦ ✦ ✦

Zeus/Jupiter was one of the most venerated gods in ancient Albania, a country situated on one of the crossroads of the Mediterranean. The area was heavily influenced culturally by the Graeco-Roman world. The eclectic religious life of this Graeco-Roman civilization ensured that the indigenous Illyrian pantheon was very similar to the Greek, and that most of the Olympian gods were venerated, as were Roman deities in a later era. Zeus/Jupiter, one of the most important gods, is represented in the small-scale bronze sculpture found in Albania, and in particular by the four examples discussed here. These have been previously published only in a descriptive manner, mostly in exhibition catalogue formats.

Zeus with a Thunderbolt

This statuette of Zeus (figs. 20.1a–c), which originates from Apollonia, is shown in full heroic nudity. His left arm and foot are thrust dynamically forward in the direction of his foes, while his right leg is straight; the arm is raised and slightly bent, implying movement. His weight falls on his left forward leg, but the figure is balanced and poised. His left arm is held straight before his body. He may have held an eagle on his missing left hand, while his right arm is bent at a right angle to throw the thunderbolt, which is also missing.

Figure 20.1a. Zeus, Apollonia: front

Figure 20.1b. Zeus, Apollonia: rear

Figure 20.1c. Zeus, Apollonia: detail of face

This statuette, which is meant to be seen in profile, demonstrates a high-quality execution of anatomy, as can be seen through the intense expression on the face and the variegated transitions between the muscles. The statuette seems to be in motion.

In the Archaic and Early Classical periods, numerous bronze statuettes of the thunderbolt-wielding Zeus Keraunios appear at Olympia, Dodona, and elsewhere in Greece and other territories.[1] The early examples of Zeus from the Archaic period are static and not represented in motion, however, while later examples of the transitional period seem to be in a vigorous stride, like certain examples from Dodona.[2] The same can also be said for the statuette from Apollonia. These statuettes belong to two main types that have a wide distribution: the first represents Zeus throwing a thunderbolt and holding an eagle on his extended left hand, while the second group lacks the eagle.[3] This type of Zeus was used for military votive offerings at Olympia, and the god's attributes, such as the thunderbolt and spear, were interchangeable. The statuette from Apollonia finds its closest analogies with the Zeus from Dodona. The same stature of the body and the anatomy can be noted; the facial expression and the arrangement of the hair (both heads have a similar roll of hair) also present closed similarities. The Zeus of Dodona has no eagle in the left hand, while for the Zeus of Apollonia it is difficult to determine whether it once held one in the outstretched left hand. However, the presence of a hole at the end of the forearm might suggest that an eagle was standing there.

The findspot, the Greek colony of Apollonia of Illyria, suggests it was an import from around the beginning of the fifth century BC, representing one of the finest examples of this series.

Zeus with a Thunderbolt or Poseidon?

The statuette (fig. 20.2) is represented nude; his left arm and foot move forward, while his right leg is straight and his arm is raised and bent. The weight falls on the forward leg. The anatomy of the body is schematic and poorly designed, with the main concern being the portrayal of a strong figure of the god. The head rests on a very short neck. The features are of poor quality due to a neglected full cast but also the lack of cold work.

This statuette is represented in an attitude very similar to the Zeus of Apollonia (see fig. 20.1a), but with a notably less quality of execution. All the details that are exceptionally well executed in the statuette from Apollonia are quite neglected here. The coiffure is poorly designed, almost schematic, as is the anatomy of the body, with few close parallels.[4]

Figure 20.2. Zeus, Salaria. From Anamali 1984

Two hypotheses for the identification of this statuette have been suggested: the first recognizes it as a representation of Zeus on account of the similarities with the exemplar from Apollonia,[5] while the second identifies it as Poseidon, mainly because of its findspot. The statuette was found in Salaria (southern Albania), in the vicinity of an inscription mentioning Poseidon, and some researchers believe that this archaeological evidence might suggest the presence of a sanctuary of Poseidon in this area.[6]

However, the pose, the attitude, and the resemblance to other statuettes in this category impel us to recognize it as a representation of Zeus, modeled on the famous Zeus Keraunios, but of poorer quality. Hence we are probably dealing with a local product dated to the same time as or possibly a little bit more recent than the Classical examples and the bronze statuette of Zeus from Apollonia.

Jupiter

Jupiter is represented by two bronze statuettes of very good quality found in the region of Korça in southeast Albania. In the first statuette, Jupiter is portrayed naked (figs. 20.3a–b). In the right hand he would have held a thunderbolt, an eagle, or a patera; the left hand extends upward, most probably to hold a scepter. This statuette is largely intact, missing only his feet and forearms. In addition, it has a youthful body, as can be noticed by the slender legs and semimuscular body. He looks very regal, with a haughty expression under his beautifully sculpted beard and laurel crown.

Figure 20.3a. Jupiter, Korça: front

Figure 20.3b. Jupiter, Korça: rear

The other statuette of Jupiter is wearing only a *chlamys* draped over his neck and left shoulder (figs. 20.4a–b). The statuette has exceptional facial features and hair, and a very muscular body. The bearded Jupiter is seen looking away to his right, and his weight is on his right leg.

Figure 20.4a. Jupiter with *chlamys*, Korça: front

Figure 20.4b. Jupiter with *chlamys*, Korça: rear

In these two similar poses, the figure can be recognized as Jupiter the Thunderer of the Capitoline, the preserver and supporter of the Roman state, which imitated the famous sculpture of Zeus by the Athenian sculptor Leochares.

These statuettes are represented in a very Classical schema: nude, with or without the *chlamys*, and with a contrapposto of the body. The body's incline and the head turned three-quarters to the right are characteristic of the Polykleitan style, which is visible also in the position of the legs, which are adjusted to the stature of the body, providing coherence to the establishment of the figure in space. The type was a creation of Leochares, who was commissioned by the Arcadian League to create a sculpture of Zeus Soter in Megapolis. The model was recognized as the expression of a new type of deity[7] and was widely imitated in sculpture, presenting an important development in the image of Zeus and other paternal deities. In the late first century BC, Leochares's statue was taken to Rome and installed in the Temple of Jupiter Tonans on the Capitoline, according to Pliny (*Natural History* 39.79). A similar typology of Jupiter can also be seen in the grave markers and the coins of that period.[8]

This model was used widely for the production of bronze statuettes, the best example of which is probably the Zeus of Paramythia.[9] This series is characterized by a developed musculature, beard, and leonine hairstyle. It changes considerably from the Hellenistic examples, which were characterized by slenderer, less muscular physiques and a less pronounced coiffure. To this series belong examples of varying quality, which sometimes show reversed positions of the hands and the legs.[10]

The statuettes from Albania are noted for the realistic modeling of the body and the position of the arms, which would once have held the attributes of Jupiter the Thunderer: the thunderbolt and the scepter or patera, which was the chief vessel used for libations.[11] In most cases the thunderbolt was embellished with two small flames (depicted as two torches linked with decorated leaves); this was one of the most commonly represented attributes of the Jupiter during the Roman period.[12] In addition to these attributes, Jupiter often wears a wreath composed of oak leaves, which represents the god's sacred tree.[13]

The counterparts of the statuette of naked Jupiter (see figs. 20.3a–b) are numerous and widespread throughout the Roman Empire.[14] This statuette, although of a good quality, is not among the best of the series. The anatomy looks a bit neglected, and the coiffure, though following Roman style, is not thoroughly worked in its details. It finds its closest parallel in a bronze statuette found in Germany.[15]

The other statuette, wearing a *chlamys* "en sautoir" (see figs. 20.4a–b), finds numerous analogies in a series of bronze statuettes of the same type. It differs from the first statuette in the depiction of the body in a very muscular manner and with a more leonine style of the beard and hair. Similar statuettes are seen holding an eagle in the outstretched right hand, in the act of throwing a thunderbolt with raised left arm or holding a scepter.[16] This type is also derived from the Zeus of Leochares, but it is dated to the Roman period based on its coiffure and the contrapposto of the body.[17]

The Zeus Cult in Ancient Albania

The cult of Zeus in Albania is well attested from other types of archaeological evidence in addition to the bronze statuettes. It is worth mentioning here the presence of inscriptions in various media dedicated to Zeus, which highlight the importance of his cult in the territory of ancient Albania.[18] Especially the cult of Zeus of Dodona, which was depicted in a manner similar to the bronze statuette from Apollonia, was widespread from Dodona across Ambracia, Apollonia, Olympia, Amantia,[19] and especially northern Epirus.[20]

Ancient coinage also presents various representations of Zeus, but the most frequently represented, radiating especially from Amantia, is the cult of Zeus of Dodona.[21] Other typologies of Zeus are also well represented on coins found in the territory of modern Albania.[22] In contrast, representations of Zeus in sculpture in the round and on reliefs are rare, though they are not unknown.[23] The presence of these two bronze statuettes depicting Zeus is additional evidence for his cult in the territory of southern Illyria and northern Epirus.

The Jupiter Cult in Ancient Albania

These two bronze statuettes of Jupiter (see figs. 20.3–4) attest to the presence of the cult of Jupiter Capitolinus in southern Illyria. However, the cult of Jupiter is attested by just a few rare documents in Albania, indicating that his cult was not widespread in the country. Only two inscriptions are known: the first from Byllis, where Jupiter is addressed with the epithet *Sabazios*,[24] and the other from the environs of Dyrrhachium.[25] His cult can also be documented by the presence of Roman coins on which he is depicted with the leonine head.[26]

In the meantime his cult was more popular in other Illyrian territories, such as Dalmatia, where he was known as Maximus, Dolicheus, or Capitolinus, and in Dardania, where inscriptions regarding this god are seen throughout the territory, for example in Dërsnik[27] and Pejë,[28] and on two altars from the area of Suhareka.[29] The popularity of his cult in these territories is probably due to the presence of the Roman army.

In sum, the two bronze statuettes depicting Jupiter, characteristic products of the first centuries AD, are evidence for his cult in the territory of ancient Albania, adding to the scant evidence from other types of documents.

Conclusion

Zeus/Jupiter was one of the most venerated gods in ancient Illyria and northern Epirus as attested in many documents, such as inscriptions, coins, marble sculpture, and small bronze sculpture.

The bronze statuettes examined here follow the canons of the Greek world for the two Classical examples, which find most of their parallels at Olympia, Dodona, and elsewhere. The Roman examples follow the same canons as in the rest of the Roman Empire, mostly Greek reproductions of the sculpture of the fourth century BC. These reproductions were very widespread; based on the rarity of finds in Albania and the good quality of these pieces, we are inclined to believe that we are dealing with imported Roman objects.

These bronze statuettes bear close similarities with their counterparts in large-scale bronze sculpture of the Greek and Roman periods, testifying to influences of styles and bronze-working methods, and also similarities in religion across the Mediterranean world.

✦ ✦ ✦

Notes

1. Perdrizet 1911, 702, fig. 4219; Carapanos 1878, plate XII, no. 4; De Ridder 1894, 140, fig. 805; Langlotz 1927, plate 30, nos. 1–2, and plate 37; Karouzos 1930–31, 55–67; Elderkin 1940, 225–33; Mylonas 1944; Mitten and Doeringer 1968, 89, fig. 85; Ognenova-Marinova 1975, 58–61, no. 51, fig. 51; Mattusch 1988, 151–53, fig. 6.10.
2. Elderkin 1940, 225.
3. Mylonas 1944, 149–51, with extensive bibliography.
4. Petit 1980, 30–32, fig. 1. Similarities exist only in the schematic design of the body and the face, but the exemplar in question seems more ancient than our figurine.
5. Anamali 1984.
6. Quantin 1997, 448.

7. On the identification with the Zeus of Leochares, see Charbonneaux 1963, 10–17; Rolley 1967, 9, fig. 88; and Rolley 1994, 292–94, fig. 303.
8. Nash 1961, 53–36, figs. 661–62.
9. Boucher 1976, 67–70, plate IV, with list of exemplars and distribution map.
10. Menzel 1966, 2, plate 2, no. 3, with the thunderbolt; Zadoks-Josephus Jitta et al. 1967, 28, no. 13, of inferior quality, and 32, no. 14; Menzel 1986, 2, plate 2, no. 3: also of poor quality.
11. Ognenova-Marinova 1975, 70, fig. 61, and 72, fig. 64: Zeus with patera and scepter.
12. Daremberg and Saglio, s.v. "Fulmen," 1352–60. For similar exemplars, see Babelon and Blanchet 1895, 2, fig. 3; Reinach 1904–1908, vol. 1 (1906), 186, fig. 4, and 189, fig. 4; vol. 2 (1908), 11, fig. 2, and 13, fig. 8; vol. 3 (1904), 2; Bol 1985, 142–45, fig. 66.
13. Beschi 1958, 111, fig. 17: in some cases the crown is made of olive leaves.
14. Babelon and Blanchet 1895, 1–4, figs.1–8; Faider-Feytmans 1957, 41, plate 1, no. 2; Espérandieu and Rolland 1959, 23, plate 2, no. 7; Fleischer 1967, 27–28, plate 5, nos. 6–8; Veličković 1972, 114–15, fig. 3; Boucher 1973, 49, fig. 80; Ognenova-Marinova 1975, 69, no. 60, fig. 60; Bonnet et al. 1989, 63, fig. 15; Schnitzler 1995, 36, no. 10.
15. Kaufmann-Heinimann 1977, 17–18, plate 1, no. 1: Jupiter with lightning, with extensive bibliography.
16. Boucher 1976, 72, map VI, type 4; 118–22, plate 27; Poulsen 1977, 1ff., particularly 23 ff., type 7.
17. Veseli 2014, 92, with extensive bibliography.
18. Tzouvara-Souli 1993, 74–79. Zeus was venerated in Amantia, as demonstrated by an inscription of the Hellenistic period; Cabanes and Ceka 1997, 91–92, figs. 340–41: two inscribed bronze plaques from Apollonia; Drini 2004, 584, with bibliography: the cult of Zeus attested through the inscriptions in Apollonia, Olympia, Amantia, and elsewhere.
19. Tzouvara-Souli 1993, 78.
20. Tzouvara-Souli 2004, 533–38.
21. Ceka 2001–2002, 6; Gjongecaj 2011, 50: coins of Epirote *koinon*, Zeus/Thunderbolt.
22. Ceka 2001–2002, 6: Zeus/Nike in Dyrrhachium; Gjongecaj 2011, 42: coins from Dyrrhachium, Zeus/tripods; 46: coins from Scodra (modern Shkodër) and Lissos, Zeus/galley; 50: coins from the Epirote *koinon*, Zeus/thunderbolt.
23. Head of Zeus displayed in the museum of Butrint.
24. Anamali, Ceka, and Deniaux 2009, 151, fig. 194.
25. Mommsen 1873, 184, fig. 603.
26. Ceka 2001–2002, 5: coin from Scodra, Jupiter/ship; Gjongecaj 2009, plate IV: coin with Jupiter's leonine head.
27. Perzhita and Peja 2009, 244: inscription about Jupiter dated to the second–third centuries AD.
28. Shpuza 2015, 119.
29. Dobruna-Salihu 2003–2004, 305.

Bibliography

Anamali 1984
Anamali, S. 1984. "Një figurinë bronzi nga Nivica e Kurveleshit (Une figurine de bronze trouvée à Nivica de Kurvelesh)." *Iliria* 1984.1: 129–30.

Anamali, Ceka, and Deniaux 2009
Anamali, S., H. Ceka, and E. Deniaux, eds. 2009. *Corpus des inscriptions latines d'Albanie*. Rome: École française de Rome.

Babelon and Blanchet 1895
Babelon, E., and J. Blanchet. 1895. *Catalogue des bronzes antiques de la Bibliothèque nationale*. Paris: E. Leroux.

Beschi 1958
Beschi, L. 1958. "Una testa di Giove nella collezione di antichita dell'Universita di Padova." *Arte Antica e moderna* 2: 99–111.

Beschi 1962
Beschi, L. 1962 . *I bronzetti romani di Montorio veronese*. Memoria Presentata dal s. c. prof. L. Polacco, nell'adunanza ordinaria del 2 dicembre 1962. Venice: Istituto veneto.

Bol 1985
Bol, P. C. 1985. *Antike Bronzetechnik: Kunst und Handwerk antiker Erzbildner*. Munich: C. H. Beck.

Bonnet et al. 1989
Bonnet, J., P. Velay, and P. Forni. 1989. *Les Bronzes antiques de Paris*. D'après la thèse de P. Forni. Collections du Musée Carnavalet. Paris: Musée Carnavalet; Paris-Musées.

Boucher 1973
Boucher, S. 1973. *Bronzes romains figurés du Musée des beaux-arts de Lyon*. Lyon: Éditions de Boccard.

Boucher 1976
Boucher, S. 1976. *Recherches sur les bronzes figurés de Gaule pré-romaine et romaine*. Paris: École française de Rome.

Cabanes and Ceka 1997
Cabanes, P., and N. Ceka. 1997. *Corpus des inscriptions grecques d'Illyrie méridionale et d'Epire*. Vol. 1.1: *Inscriptions d'Epidamne-Dyrrachion et d'Appolonia*. Etude épigraphiques 2. Athens: École française d'Athenes.

Carapanos 1878
Carapanos, C. 1878. *Dodone et ses ruines*. Paris: Hachette.

Ceka 2001–2002
Ceka, H. 2001–2002. "Ndikimi zotërues i kultit ilir mbi monetat antike të vendit tonë (The influence of the Illyrian cult on ancient coins from Albania)." *Iliria* 30.1-2: 5–8.

Charbonneaux 1963
Charbonneaux, J. 1963. "Le Zeus de Léochares." *Mon. Piot* 53: 9–17.

Daremberg and Saglio 1877–1919
Daremberg, C., and M. E. Saglio. 1877–1919. *Dictionnaire des Antiquites grecques et romaines d'après les textes et les monuments*. 10 vols. Paris: Librairie Hachette et cie.

Dobruna-Salihu 2003–2004
Dobruna-Salihu, E. 2003–2004. "Disa monumente sepulkrale dhe të kultit nga koha romake të gjetura me zbulime të rastit në Kosovë." *Gjurmime Albanologjike* 33–34.

Drini 2004
Drini, F. 2004. "Divinités et cultes dans les contrées antiques de l'actuelle Albanie." In *L'Illyrie méridionale et l'Epire dans l'antiquité: Actes du IV Colloque international de Grenoble (10–12 octobre 2002)*, ed. P. Cabanes and J.-L. Lamboley, 583–87. Paris: De Boccard.

Elderkin 1940
Elderkin, G. W. 1940. “Bronze Statuettes of Zeus Keraunios.” *AJA* 44.2: 225–33.

Espérandieu and Rolland 1959
Espérandieu, E., and H. Rolland. 1959. *Bronzes antiques de la Seine-Maritime*. Paris: Centre nationale de la recherche scientifiche.

Faider-Feytmans 1957
Faider-Feytmans, G. 1957. *Recueil des bronzes de Bavai*. Paris: Centre nationale de la recherche scientifiche.

Fleischer 1967
Fleischer, R. 1967. *Die Römischen Bronzen aus Österreich*. Mainz am Rhein: Philipp von Zabern.

Gjongecaj 2009
Gjongecaj, S. 2009. “Thesari i Lleshanit, një ndihmesë për politikën monetare të Dyrrahut (Le trésor de Lleshan, une contribution pour la politique monétaire de Dyrrachion).” *Iliria* 32 (2005–2006): 105–37.

Gjongecaj 2011
Gjongecaj, S. 2011. “Të dhëna numizmatike nga Iliria e Jugut dhe Epiri i veriut në shekujt V–I p.e.s. (Donnees numismatiques de l’Illyrie du Sud et d’Epire du nord aux V–I siècles av. J.-C).” *Iliria* 34 (2009–2010): 29–60.

Karouzos 1930–31
Karouzos, C. 1930–31. “Ho Poseidon tou Artemisiou.” *ArchDelt* 13: 41–104.

Kaufmann-Heinimann 1977
Kaufmann-Heinimann, A. M. 1977. *Die Römischen Bronzen der Schweiz*. Vol. 1: *Augst und das Gebiet der Augusta Raurica*. Mainz am Rhein: Philipp von Zabern.

Langlotz 1927
Langlotz, E. 1927. *Frühgriechische Bildhauerschulen*. Nuremberg: E. Frommann & Sohn.

Leibundgut 1980
Leibundgut, A. 1980. *Die Römischen Bronzen der Schweiz*. Vol. 3: *Westschweiz, Bern und Wallis*. Mainz am Rhein: Philipp von Zabern.

Mattusch 1988
Mattusch, C. 1988. *Greek Bronze Statuary: From the Beginnings through the Fifth Century B.C*. Ithaca: Cornell University Press.

Menzel 1966
Menzel, H. 1966. *Die Römischen Bronzen aus Deutschland*. Vol. 2: *Trier*. Mainz: Römisch-Germanisches Zentralmuseum.

Menzel 1986
Menzel, H. 1986. *Die Römischen Bronzen aus Deutschland*. Vol 3: *Bonn*. Mainz am Rhein: Römisch-Germanisches Zentralmuseum.

Mitten and Doeringer 1968
Mitten, D. G., and S. Doeringer. 1968. *Master Bronzes from the Classical World*. Exh. cat. Cambridge (MA), Fogg Art Museum. Greenwich, CT: New York Graphic Society.

Mommsen 1873
Mommsen, T. 1873. *Inscriptiones Asiae, provinciarum Europae graecarum, Illyrici latinae*. Berlin: G. Reimer.

Mylonas 1944
Mylonas, G. E. 1944. “The Bronze Statue from Artemision.” *AJA* 48: 143–60.

Nash 1961
Nash, E. 1961. “Juppiter Tonans.” In *Bildlexicon zur Topographie des antiken Rom*, 535–36. DAI. Tübingen: E. Wasmuth.

Ognenova-Marinova 1975
Ognenova-Marinova, L. 1975. *Statuettes en bronze du Musée national archéologique à Sofia: Statuettes de culte*. Sofia: Éditions de l’Académie bulgare des sciences.

Perdrizet 1911
Perdrizet, P. 1911. *Bronzes grecs d’Egypte de la Collection Fouquet.* Paris: Bibliothèque d’art et d’archéologie.

Perzhita and Peja 2009
Perzhita, L., and Peja, F. 2009. “Mbi disa tipare të zhvillimit kulturor në Dardaninë Perëndimore (shek.I–IV) (Some aspects of the cultural development of Western Dardania (1st–4th century).” *Iliria* 32 (2005–2006): 237–48.

Petit 1975
Petit, J., ed. 1975. *L’Art albanais à travers les siècles*. Exh. cat. Paris, Petit Palais.

Petit 1980
Petit, J. 1980. *Bronzes antiques de la collection Dutuit*. Paris: Musée du Petit Palais.

Poulsen 1984
Poulsen, E. 1984. “Kopenhagen: Probleme der Werkstattbestimmung gegossener römischer Figuralbronzen: Herstellungsmilieu und Materialstruktur.” *Acta Arch* 48: 1–60.

Quantin 1997
Quantin, F. 1997. “La vie religieuse en Epire: sanctuaires, cultes et divinités d’Ambracie à Apollonia de la période archaïque à la conquête romaine.” PhD diss., Université Lumière Lyon 2.

Reinach 1904–1908
Reinach, S. 1904–1908. *Répertoire de la statuaire grecque et romaine*. Paris: E. Leroux.

de Ridder 1894
de Ridder, A. 1894. *Catalogue des bronzes de la Société archéologique d’Athènes*. BÉFAR 69. Paris: Thorin & Fils.

Rolley 1967
Rolley, C. 1967. *Monumenta Graeca et Romana.* Vol. 5: *Les arts mineurs grecs.* Book 1: *Les bronzes*. Leiden: Brill.

Rolley 1994
Rolley, C. 1994. *La Sculpture grecque*. Vol. 1: *Des origines au milieu du Ve siècle*. Paris: Picard.

Schnitzler 1995
Schnitzler, B. 1995. *Bronzes antiques d’Alsace: Musée archéologique de Strasbourg, Musées de Biesheim, Colmar, Haguenau, Mulhouse, Niederbronn, Wissembourg*. Paris: Réunion des musées nationaux.

Shpuza 2015
Shpuza, S. 2015. “Mbishkrime të reja latine nga Dardania.” In *Dardania: Kërkime dhe studime arkeologjike,* ed. M. Korkuti, L.

Përzhita, and K. Luci, 98–113. Tirana: Akademia e Shkencave e Shqipërisë.

Tzouvara-Souli 1993
Tzouvara-Souli, C. 1993. “Common Cults in Epirus and Albania.” In *L’Illyrie méridionale et l’Epire dans l’antiquité II: Actes du Colloque international de Clermont Ferrand (25–27 octobre 1990)*, ed. P. Cabanes, 65–82. Paris: De Boccard.

Tzouvara-Souli 2004
Tzouvara-Souli, C. 2004. “The Cult of Zeus in Ancient Epirus.” In *L’Illyrie méridionale et l’Epire dans l’antiquité: Actes du IV colloque international de Grenoble (10–12 octobre 2002),* ed. P. Cabanes and J.-L. Lamboley, 515–49. Paris: De Boccard.

Veličković 1972
Veličković, M. 1972. *Римска ситна бронзана пластика у Народном музеју* (*Petits bronzes figurés romains au musée national*). Belgrade: Musée National.

Veseli 2014
Veseli, S. 2014. “Les figurines et les vases en bronze de la période archaïque jusqu’à la période romaine retrouves en Albanie.” PhD diss., Université Lumière Lyon 2.

Zadoks-Josephus Jitta et al. 1967
Zadoks-Josephus Jitta, N., W. J. T. Peters, and W. A. Van Es, eds. *Roman Bronze Statuettes from the Netherlands*. Vol. 1: *Statuettes Found North of the Limes*. Groningen: J. B. Wolters.

Zampieri 1986
Zampieri, G. 1986. *Bronzetti figurati etruschi italici paleoveneti e romani del Museo civico di Padova*. Rome: G. Bretschneider.

Abstracts

Roman-Age Casting Techniques of Small Bronzes from Marche

Fabio Fazzini, Italy

This contribution examines the Roman-era bronze artisans' techniques and their methods for overcoming difficulties in casting small objects. In observing a group of small bronzes from the Italian region of Marche, realized with the lost-wax technique, we noticed some interesting features about the methods of production. The techniques for improving the casting involve, primarily, the positioning of the casting and vent channels. They can be seen in proximity to those parts of the casting that were more difficult for the molten metal to reach. During the realization of the wax model, the metal-workers concealed the channels so as to become a part of the final sculpture itself, hidden in columns, trunks, or drapery.

Figural Bronze Statuettes in the Ashmolean Collection and the Aesthetics of Replication

Nicholas West, Colgate University, Hamilton, New York

This paper presents recent research on the Hellenistic and Roman bronze statuettes in the collection of the Ashmolean Museum. A number of individual statuettes are analyzed for the information they provide regarding the repetitive use of figural types developed during the Classical and early Hellenistic periods in later, primarily Roman, contexts.

Two categories of iconography are investigated: types that appear to be dependent on large-scale Classical visual forms, such as the very commonly found standing Mercury motif, and types that were conceived in small-scale format, such as dwarfs and genre figures. The paper provides a brief analysis of the visual relationships that these types have with their earlier models and with images in other media to offer some preliminary conclusions and ask further questions about visual replication in the realm of small-scale bronzes.

IV. The Hellenistic East

21.

The Influence of East and West on Bronze Objects Found in Central Anatolia: Small Bronze Finds from Kaman-Kalehöyük

Alice Boccia Paterakis, Japanese Institute of Anatolian Archaeology, Kaman
Sachihiro Omura, Japanese Institute of Anatolian Archaeology, Kaman

The influences from the East and West manifested in ancient bronze (copper-tin alloy) technology in Central Anatolia are examined, specifically at the site of Kaman-Kalehöyük, which has been excavated by the Japanese Institute of Anatolian Archaeology (JIAA) since 1986. Evidence of copper and bronze refining and manufacture has been found from the Middle Bronze Age (MBA, ca. 1950 BC) through the Middle Iron Age (ca. 600 BC) at Kaman-Kalehöyük. Crucibles, fibula molds, an unfinished fibula, stone molds for casting small bronze objects, and copper slag are considered material evidence of bronze-working and manufacture at the site. The results of analytical studies on bronze objects and slag composition indicate the importation of materials and the selective use of copper ores. Given its location along ancient trade routes, Kaman-Kalehöyük may have served as a conduit for the intraregional exchange of materials and manufacturing technologies. Several fibulae are presented to illustrate these exchanges and the multiethnic influences at Kaman-Kalehöyük. The authors examine some of these influences and movements as they relate to ancient bronze technology in Anatolia.

✦ ✦ ✦

Introduction

This paper reviews the influences from the East and West on bronzes (copper-tin alloys) found in Anatolia while focusing on the archaeological finds from the site of Kaman-Kalehöyük. Given its location along ancient trade routes, Kaman-Kalehöyük may have served as a conduit for the intraregional exchange of materials and manufacturing technologies. We examine some of these influences and movements as they relate to ancient bronze technology in Anatolia.

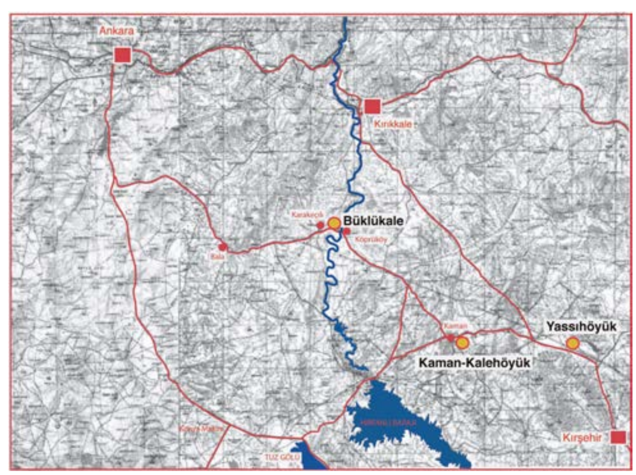


Figure 21.1. Map showing the location of Kaman-Kalehöyük in relation to Ankara in Turkey
Image: © Middle Eastern Culture Center in Japan

Kaman-Kalehöyük consists of a tell, or mound, 280 meters in diameter and 16 meters high (918 x 52 ft.). It was a rural settlement situated 100 kilometers (62 mi.) southeast of Ankara and 3 kilometers (1 ¼ mi.) east of Kaman in Kırşehir Province, in Central Anatolia (fig. 21.1). Since excavation commenced in 1986, cultural levels have been traced from the Early Bronze Age (EBA) through the Ottoman period.[1] The Japanese Institute of Anatolian Archaeology (JIAA) was established near Kaman in 1998 by the Middle Eastern Culture Center in Tokyo. Two new excavations were initiated in 2009: Buklukale to the northwest and Yassihoyuk to the east.[2]

Early Bronze Age

Kaman-Kalehöyük excavations have thus far yielded a total of 9,120 catalogued copper and copper-alloy objects, including arrowheads, spearheads, awls, chisels, axes, pins, rings, stamp seals, and fibulae. A few of these objects have undergone compositional analysis. In the middle of the fourth millennium BC, objects were made from arsenical copper in Anatolia and copper, lead, and silver were mined in the Troad.[3] The earliest instance of bronze in Anatolia dates from the early third millennium BC (EBA). The sources of tin in Bronze Age Turkey have yet to be located; if small deposits of tin did exist in northwest Anatolia, they were soon exhausted.[4] Instead, throughout the Bronze Age, the Anatolians traded their plentiful silver for tin, derived most likely from Afghanistan. In the third millennium BC, pure copper, bronze, and arsenical copper were all being used in Anatolia, though bronze was more common in the Troad than in Central Anatolia.[5] By the second millennium BC (MBA), arsenical copper was still more common than bronze in Anatolia while bronze artifacts were more prevalent at Kanesh-Kültepe in Central Anatolia.[6] The development of copper-alloy metallurgy followed similar paths in Anatolia and Mesopotamia throughout the Bronze Age, with the practice of interring bronze instead of arsenical copper objects in elite burials.

Middle Bronze Age

Bronze-working in the Assyrian Colony period is examined starting with Kanesh-Kültepe, located 192 kilometers (120 mi.) southeast of Kaman-Kalehöyük. Kanesh-Kültepe was the capital of the kingdom of Kanesh and during the Assyrian Colony period in the MBA served as the administrative and distribution center of the colony network in Anatolia.

In 2004, X-ray fluorescence (XRF) analysis of numerous copper-alloy objects from the MBA (1945–1730 BC) at Kanesh-Kültepe identified small ornamental objects as arsenical bronze and larger weapons as leaded bronze, indicating the intentional selection of arsenic and lead.[7] The authors believe these results indicate the selective use of arsenic-bearing sulfide copper ores. Copper-alloy metallurgy during the Assyrian Colony period was heavily influenced by technology in the East.

Trade Networks

Clay tablets from Kanesh-Kültepe document the trade in tin between the East and Anatolia: as much as two tons of tin per year were imported into Kanesh-Kültepe.[8] Metal workshops with crucibles and molds have been discovered at Kültepe.[9] Complex trade networks developed during the Bronze Age. A cuneiform tablet dating from the eighteenth century BC in Syria documents the distribution of tin to Ugarit and as far west as Crete.

A trade route leads from Assur, the capital of the Assyrian Empire (located today in modern Iraq), northwest through Kanesh-Kültepe into Central Anatolia.[10] The three sites being excavated by the JIAA—Kaman-Kalehöyük, Yassihoyuk, and Buklukale—are all situated along this route, which promoted Assyrian Colony trade (see fig. 21.1). In addition to the silver being traded from Anatolia for tin from Afghanistan, there was copper from Cyprus flowing into the Near East in the EBA and MBA (nineteenth century BC).[11] This trade persisted into the Late Bronze Age (LBA), as we know from the Uluburun shipwreck, which sank off the coast of Turkey while carrying ingots of copper and tin, probably on its way to or from Syria.[12]

Evidence of Bronze Manufacture Discovered by the JIAA

Evidence of bronze manufacture consists of numerous crucibles and molds from the three sites excavated by the JIAA: 33 stone molds for the casting of metal objects have been found dating from the Bronze Age and Iron Age, 27 of which derive from Kaman-Kalehöyük. A rectangular, two-sided mold (KL05-34; fig. 21.2) has parallels in Hattusa, the capital during the Hittite Empire period, and dates to the LBA, Hittite Empire period (1400–1200 BC).[13] It was used for casting styli, small figurines, and an eight-spoked wheel.[14] Another rectangular mold (KL88-127) found at Kaman-Kalehöyük was used for casting arrowheads and other unidentified objects.[15]

Figure 21.2. Stone mold from Kaman-Kalehöyük, inv. KL05-34
Image: © Middle Eastern Culture Center in Japan

The copper slags from Kaman-Kalehöyük were analyzed using inductively coupled plasma optical emission spectroscopy (ICP-OES) and electron microprobe metallographic analysis (EPMA).[16] This study revealed the presence of iron and copper sulfide, indicating that copper sulfide ores (such as chalcopyrite) were smelted to obtain copper at the site during the MBA (1950–1400 BC). Differences in chemical composition among the copper slags indicate that copper ore or smelted copper came from different regions during this period.

According to a study in 2005, approximately 40 percent of the slag found at Kaman-Kalehöyük between 1996 and 2004 is copper slag with a glassy matrix, indicating copper refining in crucibles.[17] The slags were recovered in one area dating to the MBA Old Hittite Kingdom period (1700–1400 BC) and in another area from the Early Iron Age (1200–775 BC). Copper ore with lead and zinc impurities was more prevalent in the Early Iron Age than in the MBA, indicating different sources of copper ore throughout history. The selective use of copper ores containing arsenic impurities is evidenced by the detection of copper and tin in one crucible (KL140628) and copper and arsenic in another crucible (KL140710) with XRF analysis.[18]

The Iron Age

The collapse of the Hittite Empire after 1180 BC led to the beginning of the Iron Age and a very complex period in the history of Central Anatolia. The Early Iron Age is often referred to as the Dark Age, in which a Neo-Hittite civilization sprung up. Kaman-Kalehöyük, Hattusa, and Alişar were three main Iron Age sites in what was previously Hittite territory. During the Iron Age, Kaman-Kalehöyük was exposed to diverse ethnic, cultural, and artistic influences, drawing from a wide radius. The Assyrians entered Central Anatolia in 838 BC, bringing with them strong artistic and cultural influences. They took control of Central Anatolia from 744 to 727 BC, forming the Neo-Assyrian Kingdom of Tabal. Concurrently with the Assyrian presence, an ever-growing Phrygian influence was felt at Kaman-Kalehöyük beginning in the late eighth century BC, with the expansion of the Phrygian Empire over the next few centuries.

In the Late Iron Age, the Medes invaded Central Anatolia from northwest Iran and controlled the area to the east of the Halys River in the region of Kaman-Kalehöyük from around 605 to 550 BC. Northwest Iranian fibulae in the Kaman collection are evidence of this occupation. The Achaemenid Empire replaced the Median Empire from 550 to 334 BC; at this point, the Persian Royal road from Susa to Sardis was established that was used later during the Hellenistic period.[19]

Bronze Fibulae

The bronze objects that most readily illustrate the intraregional exchanges and multiethnic influences at Kaman-Kalehöyük are the fibulae dating from the Middle Iron Age to the Hellenistic period. The earliest fibulae come from the Mediterranean area in the thirteenth century BC; they then spread to the Near East, where they were used until the seventh century BC.[20] During the Middle Iron Age, the fibula was introduced to Central Anatolia, where it became very popular. From the beginning of the Kaman-Kalehöyük excavation in 1986, a total of 586 fibulae have been found. The most common type is the Phrygian fibula, followed in order of prominence by north Syrian, northwest Iranian, southeast Anatolian, Greek, and Aegean fibulae (fig. 21.3).[21]

Figure 21.3. Top row, left to right: inv. KL08-8 (Phrygian); inv. KL87-2176 (north Syrian); inv. KL95-16 (northwest Iranian). Bottom row, left to right: inv. KL92-1075 (southeast Anatolian); inv. KL89-322 (Greek); inv. KL91-21 (Aegean)
Image: © Middle Eastern Culture Center in Japan

The Phrygians were the first Anatolians (apart from the Ionians) to adopt the fibula, which they did around 750 BC.[22] Horizontal horns projecting from the sides of the catch and the semicircular shape are the trademarks of the Phrygian fibula, characterized as Blinkenberg Type XII.[23] The pin was usually cast separately and attached by insertion into a drilled hole. It is unusual for the pin to be preserved, as it has been in the Phrygian fibula in the top left of figure 21.3.

Gordion, the capital of Phrygia, had abundant trade with the Greeks, resulting in the influx of Greek fibulae at Gordion and Phrygian metalwork in mainland Greece.[24] Aegean and Greek fibulae have been found in many parts of Anatolia, including Kaman-Kalehöyük, as attested to by the Aegean and Greek fibulae (see fig. 21.3, bottom row, center and right). In the Archaic period, the Anatolian kings, such as Midas of Gordion in Phrygia and Croesus of Sardis in Lydia, commissioned numerous works from Greek artists; by the sixth century BC, the art of Gordion and Sardis showed considerable Greek influence.[25]

Three Phrygian and three north Syrian fibulae from Kaman-Kalehöyük were analyzed with XRF, X-ray diffraction, and X-radiography.[26] The fibulae were found to be copper-tin bronze with traces of arsenic, and some were intentionally leaded. Antinomy was found in the Phrygian fibulae and vanadium in a Syrian fibula. Arsenic and antimony were often added to copper, as was tin, to decrease the melting point, to improve hardness when cold working, to render a particular color to the metal, and to improve the quality of casting.[27] According to John Twilley's analysis, the levels of arsenic and antimony were not high enough to have been intentional additions and therefore none are considered to be arsenical copper.[28] The Anatolian highlands were rich in polymetallic ores containing many elements, including arsenic and antimony, which may account for the Phrygian composition. The fact that vanadium was found only in the north Syrian fibula indicates a diversity of ores being smelted in Syria during this period. Zinc was not found in these Kaman fibulae whereas it was prevalent in several fibulae from Tumulus MM at Gordion.[29]

A few stone and ceramic molds for manufacturing fibulae have been discovered at Kaman-Kalehöyük. The ceramic mold pictured here (KL88-16; fig. 21.4) was for the manufacture of a Phrygian type fibula.[30] Evidence of Greek influence is seen in the unfinished fibula (KL90-62; fig. 21.5) found at Kaman-Kalehöyük.[31] Although it closely resembles Blinkenberg Type XII 9h[32] from the region of Ankara, it preserves the remnants of a transverse piece, similar to Blinkenberg Type XII 10a[33] from Olympia, Greece. A series of studs along the bow and transverse piece would have completed this fibula.

Figure 21.4. Ceramic fibula mold, inv. KL88-16
Image: © Middle Eastern Culture Center in Japan

Figure 21.5. Bronze fibula, inv. KL90-62
Image: © Middle Eastern Culture Center in Japan

Urartian bronzes at Kaman-Kalehöyük

This period in the development of the bronze fibula in Anatolia was accompanied by the growth of the powerful Urartian Empire in eastern Anatolia. Urartu was a prominent metalworking center in the Near East in the first millennium BC. Various casting methods were used, after which articles were embellished with repoussé, engraving, chasing, tracing, inlaying, plating, granulation, soldering, and brazing.[34] First-millennium BC Urartian bronze has a high proportion of copper-zinc-tin alloys, sometimes with lead, which has been attributed to the intentional smelting of polymetallic ores.[35] Comparisons in alloy composition have been made with Greek bronzes from this period.[36]

Urartian bronze objects are found in Gordion and in many areas of Greece. Trade between Urartu and Gordion from 730 to 675 BC followed two east–west routes across northern and southern Anatolia.[37] Given that Kaman is situated between the northern and southern routes, midway between Gordion and Urartu, it is not surprising that Urartian bronzes have been discovered in Kaman-Kalehöyük. A bronze object resembling a quiver (KL03000069) but of undetermined function was discovered in Kaman-Kalehöyük from a Late Iron Age layer dating to the seventh or sixth century BC. It was made from sheet metal that was decorated with repoussé, and it demonstrates several Urartian characteristics such as rows of chevrons alternating with what may be rows of four-legged animals (fig. 21.6).[38]

Figure 21.6. Urartian bronze object, inv. KL03000069
Image: © Middle Eastern Culture Center in Japan

A bronze belt or strap showing strong Urartian characteristics (KL12000010) was found in thirty-four pieces and was reconstructed to a length of 45 centimeters (17 ¾ in.; fig. 21.7a).[39] Double rows of decoration delineating horizontal bands of human and animal figures were a common motif on Urartian belts.[40] In raking light, it is possible to distinguish four-legged creatures on the Kaman belt, similar to those on an Urartian belt fragment in the Metropolitan Museum of Art (fig. 21.7b).[41] Extensive corrosion of the Urartian bronzes found at Kaman-Kalehöyük impedes a more precise iconographical interpretation.

Figure 21.7a. Fragment of Urartian bronze belt with four-legged figure delineated, inv. KL12000010
Image: © Middle Eastern Culture Center in Japan

Figure 21.7b. Urartian bronze belt. New York, Metropolitan Museum of Art, inv. 52.123
Image: © The Metropolitan Museum of Art, New York, www.metmuseum.org

The Hellenistic Period

Following the conquest of Anatolia by Alexander the Great and his death in 323 BC in Babylon, the Seleucid Empire took over much of Central Anatolia, including Kaman-Kalehöyük, from around 312 BC. Under the influence of the ruling Seleucid dynasty, which preserved and promoted Hellenistic culture, a strong Hellenistic influence was felt in Gordion as well as in Kanesh-Kültepe.

In about 279 BC the Celts invaded Central Anatolia from Thrace and established the Galatian Empire. The Galatians took over a small area of the Seleucid Empire, making Ankara their capital city. The Hellenistic cities and King Attalus of Pergamon fought the Seleucids and the Galatians, confining them to their own territories, which included Kaman-Kalehöyük. Galatia was much less affected by the Hellenistic movement than was Pergamon, where Hellenistic influences strongly took hold. These influences are most noticeable in the silver coins minted by the later Galatian rulers.[42]

Habitation during the Hellenistic period appears to have shifted for the most part off the mound and into surrounding areas. A paleo-environmental study by Kaoru Kashima has determined that rising waters from heavy rainfall partially submerged the mound, which is situated on the lowest terrace of an alluvial fan on the side of Mount Baran.[43] In spite of this population displacement, a few Hellenistic artifacts have been recovered from Kaman-Kalehöyük, such as silver coins of Alexander the Great, a small marble bust, and a terracotta figurine.

Skeletal remains of Galatian cult practice in the form of human and animal sacrifices during the Hellenistic period have also been recovered from the mound.[44] Round pits previously used for grain storage were adopted by the

Galatians as repositories for human and animal bodies. The Galatians were known to hold sacrificial rituals during the Hellenistic period in Central Anatolia, and similar burials have been found at Gordion from the Galatian occupation.

Conclusion

Considerable evidence of copper and bronze refining and manufacture has been discovered at Kaman-Kalehöyük from the MBA (1950–1400 BC), when technological and artistic influences came largely from Assyria and Mesopotamia. Copper and bronze refining and manufacture continued there in the Early and Middle Iron Age (ca. 750–ca. 600 BC), a period when fibulae were very popular in Central Anatolia. Greek influence in the Phrygian capital of Gordion preceding the Hellenistic period undoubtedly affected Kaman-Kalehöyük; increased contact with Gordion during the expansion of the Phrygian kingdom is evidenced by the large number of Phrygian fibulae found at the site. The unfinished Phrygian fibula found in Kaman-Kalehöyük, resembling Blinkenberg Type XII 10a found in Olympia, strongly suggests influence from mainland Greece in the eighth century BC (see fig. 21.5).

An in-depth study of copper- and bronze-working is needed at Kaman-Kalehöyük, to examine the relationship between slag, crucibles, molds, copper and bronze artifacts, and related architectural remains. Such study will elucidate the contribution of this site to the development of the metallurgical industry in Central Anatolia during the Bronze and Iron Ages.

✦ ✦ ✦

Notes

1. Omura 2011.
2. Omura 2008.
3. Pernicka et al. 2003, 145.
4. Pernicka et al. 2003, 146.
5. Stech 1999, 64; Pernicka et al. 2003.
6. Stech 1999, 64.
7. Masubuchi et al. 2004, 159–60.
8. Hemingway 2014, 29–30.
9. See Lehner 2014.
10. Barjamovic 2011, map insert in back cover.
11. Hemingway 2014, 31.
12. Pulak 1998.
13. Boehmer 1979, 62, plate 38, no. 3849a–e.
14. Omura 2006, 23, 32–33, color photos 14–15, figs. 59–61 .
15. Mori and Omura 1993, 68, fig. 12.5; 70, plate 1.11.
16. Akanuma 2007.
17. Masubuchi and Nakai 2005.
18. JIAA 2014.
19. French 1998, 22; Sams 2011, 614.
20. Stronach 1959.
21. Yamashita 2000; for KL87-2176, see Mikami and Omura 1992, 48, fig. 11.12, and 57, plate 6.3; for KL89-322, see Omura 1991, 438, Resim 6.5.
22. Muscarella 1988, 425.
23. Blinkenberg 1926; Muscarella 1967, 48.
24. Vassileva 2012, 115, 123.
25. Harl 2011, 757.
26. Twilley 1996.
27. Eremin 2014, 73.
28. Twilley 1996, 238.
29. Steinberg 1981, 289.
30. Mori and Omura 1993, 68, plate 12.6, and 70, plate 1.10.
31. Omura 1992, 331, Resim 7.4.
32. Blinkenberg 1926, 215.
33. Blinkenberg 1926, 217.
34. Piotrovskii 1967; Wartke 2007, 416.
35. Eremin 2014, 81.
36. Hughes et al. 1981, 144.
37. Birmingham 1961, 192.
38. Dubin 2016.
39. Tsatsouli 2016, 124–27.
40. Ergürer 2010, 12, 14, 17, 21, figs. 1, 5, 12, 19 (from Kellner 1991, figs. 8, 122, 182, 185).
41. Muscarella 1988, 433, no. 578; Metropolitan Museum of Art 2016, inv. 52.123; Tsatsouli 2016, 124–27.
42. Darbyshire et al. 2000, 95.
43. Kashima 2008, 262.
44. Matsumura 2007, 97.

Bibliography

Akanuma 2007
Akanuma, H. 2007. “Analysis of Iron and Copper Production Activity in Central Anatolia During the Assyrian Colony Period.” *Anatolian Archaeological Studies* 16: 125–39.

Barjamovic 2011
Barjamovic, G. 2011. *A Historical Geography of Anatolia in the Old Assyrian Colony Period*. Carsten Niebuhr Institute of Near Eastern Studies 38. Copenhagen: Museum Tusculanum Press.

Birmingham 1961
Birmingham, J. M. 1961. “The Overland Route across Anatolia in the Eighth and Seventh Centuries B.C.” *AnatSt* 11: 185–95.

Blinkenberg, C. 1926
Blinkenberg, C. 1926. *Fibules Grecques et Orientales*, Copenhagen: Andr. Fred. Høst & Son, Kgl. Hof-Boghandel; Bianco Lunos Bogtrykkeri.

Boehmer 1979
Boehmer, R. M. 1979. *Die Kleinfunde aus der Unterstadt von Boğazköy*: *Grabungskampagnen 1970–1978*. Berlin: Gebr. Mann.

Darbyshire et al. 2000
Darbyshire, G., S. Mitchell, and L. Vardar. 2000. “The Galatian Settlement in Asia Minor.” *AnatSt* 50: 75–97.

Dubin 2016
Dubin, R. 2016. "Treatment of a Copper Alloy Container from Kaman-Kalehöyük." *Anatolian Archaeological Studies* 19: 175–83.

Ebbinghaus 2014
Ebbinghaus, S., ed. 2014. *Ancient Bronzes through a Modern Lens: Introductory Essays on the Study of Ancient Mediterranean and Near Eastern Bronzes*. Cambridge, MA: Harvard Art Museums.

Eremin 2014
Eremin, K. 2014. "Analytical Approaches to Ancient Bronzes." In Ebbinghaus 2014, 65–92.

Ergürer 2010
Ergürer, H. 2010. "Urartu Kemerleri Üzerindeki İnsan Tasvirleri (Portrayals of Humans on the Belts of Urartu)." *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi* 14.2: 1–22.

French 1998
French, D. 1998. "Pre- and Early-Roman Roads of Asia Minor: The Persian Royal Road." *Iran* 36: 15–43.

Harl 2011
Harl, K. 2011. "The Greeks in Anatolia: From Migrations to Alexander the Great." In *The Oxford Handbook of Ancient Anatolia*, ed. S. R. Steadman and G. McMahon, 752–74. Oxford: Oxford University Press.

Hemingway 2014
Hemingway, S. 2014. "The Age of Bronze in Greece, Cyprus, and the Near East." In Ebbinghaus 2014, 20–37.

Hughes et al. 1981
Hughes, J. M. J., J. E. Curtis, and E. T. Hall. 1981. "Analyses of Some Urartian Bronzes." *AnatSt* 31: 141–45.

JIAA 2014
JIAA 2014. *Conservation Treatment Report*. Unpublished.

Kashima 2008
Kashima, K. 2008. "Palaeo-Environmental Changes at Kaman-Kalehöyük, Kirşehir, Turkey: A Verification of the Humid Periods during the Bronze Age and the Iron Age." *Anatolian Archaeological Studies* 17: 251–63.

Kellner 1991
Kellner, H. J. 1991. *Gürtelbleche aus Urartu*. Stuttgart: Steiner.

Lehner 2014
Lehner, J. W. 2014. "Metal Technology, Organization, and the Evolution of Long-Distance Trade at Kültepe." In *Current Research at Kültepe-Kanesh: An Interdisciplinary and Integrative Approach to Trade Networks, Internationalism, and Identity*, ed. L. Atici, F. Kulakoğlu, G. Barjamovic, and A. Fairbairn, 135–55. Boston: American School of Oriental Research and Lockwood Press.

Masubuchi and Nakai 2005
Masubuchi, M., and I. Nakai. 2005. "Scientific Characterization of Metallurgical Slag Excavated from Kaman-Kalehöyük." *Anatolian Archaeological Studies* 14: 183–94.

Masubuchi et al. 2004
Masubuchi, M., T. Sanada, and I. Nakai. 2004. "X-Ray Fluorescence Analysis of Copper-Based and Noble Metal Artifacts from Kültepe Measured at Kayseri Archaeological Museum." *Anatolian Archaeological Studies* 13: 153–61.

Matsumura 2007
Matsumura, K. 2007. "Animal and Human Skeletons from Late Stratum II Pits at Kaman-Kalehöyük." *Anatolian Archaeological Studies* 16: 97–110.

Metropolitan Museum of Art 2016
Metropolitan Museum of Art inv. 52.123, http://www.metmuseum.org/toah/works-of-art/52.123/ (accessed April 26, 2016).

Mikami and Omura 1992
Mikami, T., and S. Omura. 1992. "A Preliminary Report on the Second Excavation at Kaman-Kalehöyük in Turkey (1987)." *Bulletin of the Middle Eastern Culture Center in Japan* 6: 27–59.

Mori and Omura 1993
Mori, M., and S. Omura. 1993. "Preliminary Report on the Third Excavation at Kaman-Kalehöyük in Turkey (1988)." *Bulletin of the Middle Eastern Culture Center in Japan* 7: 43–74.

Muscarella 1967
Muscarella, O. W. 1967. "Phrygian Fibulae from Gordion." Colt Archaeological Institute Monograph Series 4: 48–57. London: Bernard Quaritch Ltd.

Muscarella 1988
Muscarella, O. W. 1988. *Bronze and Iron: Ancient Near Eastern Artifacts in the Metropolitan Museum of Art*. New York: The Metropolitan Museum of Art.

Omura 1991
Omura, S. 1991. "1989 Yılı Kaman-Kalehöyük Kazıları." *Kazı Sonuçları Toplantısı I* 7: 427–42.

Omura 1992
Omura, S. 1992. "1990 Yılı Kaman-Kalehöyük Kazıları." *Kazı Sonuçları Toplantısı I* 8: 319–36.

Omura 2006
Omura, S. 2006. "Preliminary Report on the 20th Excavation Season at Kaman-Kalehöyük (2005)." *Anatolian Archaeological Studies* 15: 1–61.

Omura 2008
Omura, M. 2008. "Archaeological Surveys at Yassihöyük." *Anatolian Archaeological Studies* 17: 97–169.

Omura 2011
Omura, S. 2011. "Kaman-Kalehöyük Excavations in Central Anatolia." In Steadman and McMahon 2011, 1095–1111.

Pernicka et al. 2003
Pernicka, E., C. Eibner, Ö. Öztunali, and G. A. Wagner. 2003. "Early Bronze Age Metallurgy in the North-East Aegean." In *Troai and the Troad: Scientific Approaches*, ed. G. A. Wagner, E. Pernicka, and H. P. Uerpmann, 143–72. Berlin: Springer.

Piotrovskii 1967
Piotrovskii, B. B. 1967. *Urartu: The Kingdom of Van and Its Art*. New York: Frederick A. Praeger.

Pulak 1998
Pulak, C. 1998. “The Uluburun Shipwreck: An Overview.” *IJNA* 27.3: 188–224.

Sams 2011
Sams, G. 2011. “Anatolia: The 1st Millenium BCE in Historical Context.” In Steadman and McMahon 2011, 604–22.

Steadman and McMahon 2011
Steadman, S. R., and G. McMahon, eds. *The Oxford Handbook of Ancient Anatolia*. Oxford: Oxford University Press.

Stech 1999
Stech, T. 1999. “Aspects of Early Metallurgy in Mesopotamia and Anatolia.” In *The Archaeometallurgy of the Asian Old World*, ed. V. C. Pigott, 59–71. University Museum Symposium Series 7; University Museum Monograph 89. Philadelphia: University of Pennsylvania Museum.

Steinberg 1981
Steinberg, A. 1981. “Analyses of Selected Gordion Bronzes.” In *The Gordion Excavations Final Reports*, vol. 1: *Three Great Early Tumuli*, ed. R. S. Young, 286–89. University Museum Monograph 43. Philadelphia: University of Pennsylvania Museum.

Stronach 1959
Stronach, D. 1959. “The Development of the Fibula in the Near East.” *Iraq* 21: 181–206.

Tsatsouli 2016
Tsatsouli, K. 2016. “Conservation Season Report 2012 Kaman-Kalehöyük, Yassıhöyük and Büklükale Excavations.” *Anatolian Archaeological Studies* 19: 123–36.

Twilley 1996
Twilley, J. 1996. “Scientific Analysis of Six Bronze Fibulae from Kaman-Kalehöyük.” *Anatolian Archaeological Studies* 5: 237–50.

Vassileva 2012
Vassileva, M. 2012. “Early Bronze Fibulae and Belts from Gordion Citadel Mound.” In *The Archaeology of Phrygian Gordion, Royal City of Midas*, ed. Brian Rose, 111–26. Philadelphia: University of Pennsylvania Press.

Wartke 2007
Wartke, R. 2007. “Bemerkungen zur Metallurgie Urartus.” *Acta Iranica*, 411–16.

Yamashita 2000
Yamashita, M. 2000. *Fibeln aus Kaman-Kalehöyük 1986–1999*. Unpublished report, JIAA.

22.

The Portrait of a Hellenistic Ruler in the National Museum of Iran

Gunvor Lindström, Deutsches Archäologisches Institut, Berlin

The portrait of a Hellenistic ruler in the National Museum of Iran (inv. 2477) is the most prominent archaeological testimony of the Hellenistic presence in Iran. It shows the spread of Hellenistic large-scale sculpture in the regions east of the Tigris River, of which there is otherwise very little evidence. Furthermore, it is one of the few preserved original Hellenistic large-scale bronzes. Nevertheless, this extraordinary piece of art is rarely illustrated in handbooks on Hellenistic sculpture or ruler portraits, and only a few specialists are familiar with this bronze. The head represents a ruler, likely a king of the Seleucid dynasty, which ruled Iran in the third and second centuries BC. But due to the portrait's intense deformation, the ruler represented could not be identified until now. In August 2015 a project was started with the aim of reconstructing the original facial features. Although this aim has not been achieved, the investigations at the National Museum of Iran have already yielded extraordinary results.

✦ ✦ ✦

Discovery in 1935 in Ancient Elymais

The portrait head of a Hellenistic ruler (fig. 22.1) was discovered more than eighty years ago in Kal-e Chendar in the valley of Shami, north of Izeh in present-day Khuzistan (ancient Elymais). It is often stated that Sir Aurel Stein (1862–1943), the famous Hungarian-British explorer, excavated the portrait. In fact, it was found accidentally in the course of construction work, shortly before Stein arrived at the site.[1] In 1935 local seminomadic Bakhtiaris had been obliged to settle down, and as they dug the foundations for a dwelling they discovered fragments of ancient statues made of bronze and marble. Of these, the so-called Parthian nobleman—a nearly complete statue of a man in Parthian dress, some 2 meters (6 ½ ft.) high—is the most well known.[2] When the military governor of the district came to learn of the discoveries, he ordered that the site be left undisturbed and transported all the finds to his house at Malamir (modern Izeh). About six months later, Stein visited the region during his Fourth Expedition into Iran. He saw the finds at the governor's house, took some photographs of the statues, and decided to visit the place of their discovery.

Figure 22.1. Bronze portrait head of a ruler. Tehran, National Museum of Iran, inv. 2477

Image: Gunvor Lindström, German Archaeological Institute (DAI), Eurasia Department

Excavations by Sir Aurel Stein in 1936

Stein excavated at Kal-e Chendar for six days between January 28 and February 3, 1936.[3] During this period, he conducted a brief survey of the whole site and opened a trench in the area where the sculptures were found. He found the remains of a quadrangular enclosure, about 12.5 by 23.5 meters (41 x 77 ft.), with an altar built of burnt bricks in the center. These suggested to Stein a shrine with veranda-like halls along the walls and a central area left open to the sky. The structural remains are documented in a sketch plan, with marks for the findspots of the objects recovered during the archaeological investigations and for the earlier excavated sculptural fragments, as reported by the local villagers.[4] Altogether, fragments of seven large-scale bronze sculptures and six smaller figures of bronze and marble were found. Based on the presumed dating of the sculptures, Stein wrote, "it has proved a shrine where local worship, continued into Parthian times, had in a syncretistic fashion common to the Near East combined Hellenistic cult of Greek divinities with the worship of deified royal personages, perhaps from Alexander the Great down to Iranian chiefs for us nameless."[5]

Recent Investigations at Kal-e Chendar by the Iranian-Italian Mission

Despite these extraordinary discoveries, Kal-e Chendar soon fell into oblivion, at least among archaeologists.[6] However, in 2012 the Iranian-Italian Joint Expedition in Khuzistan carried out a new survey and started archaeological investigations.[7] According to their preliminary results, the site consisted of at least three monumental terraces. The photographs taken by Stein in 1936 enabled the archaeologists to determine the approximate spot where Stein excavated, which is now covered over and cultivated. The Stein trench is at a peripheral part of the largest terrace, which extends for more than 6,000 square meters (65,000 sq. ft.). Therefore, the discovered enclosure was hardly the main building of the sanctuary. Rather, the focal point was a large temple, which is attested so far only by column drums and blocks of ancient masonry, scattered on the surface or reused in the walls of modern houses. The sculptures found in 1935 and 1936 most likely belong to the presumed temple, and their number and quality indicate that it must have been one of the most renowned religious places of ancient Elymais. Given the style and date of the ruler portrait in question, the sanctuary must have been established already in Hellenistic times.

The Head

The head was found in two pieces, obviously severed in antiquity. The first published photo shows both fragments lying on their sides, juxtaposed (fig. 22.2). Although Stein noted that the two parts fit together, the side views of the faces differ sufficiently that some scholars assume that they represent two different portraits.[8] In any case, for aesthetic and museum reasons the two parts were fixed together sometime in the 1960s and the join was covered with epoxy. The fragments compose a clean-shaven face with both ears, parts of the hair, and the front part of the neck, which is bent forward. The upper and posterior parts of the head were detached from the face and are not preserved.[9] Although there is a deep dent in the right cheek, the appearance of the right side is still vigorous. The left side is quite different: the jawline is bent outward forming a chubby cheek (see fig. 22.5). The frontal view shows that the entire face is bent toward the right side along the bridge of the nose. All in all, the facial features are so distorted that it is impossible to identify the ruler.

Figure 22.2. Two fragments of the bronze portrait head as published by A. Stein in 1940, pl. IV

Proposed Identifications

Nevertheless, numerous attempts have been made to identify the sitter. The size and the quality of the head indicate that it is a portrait of a ruler. And because it was discovered in Iran, it is most probably a king of the Seleucid dynasty, which ruled the Hellenistic East until the Parthian invasion of 141 BC. Several identifications have been proposed from Alexander the Great[10] to Antiochus I and II or Seleucus II,[11] to Antiochus III,[12] Antiochus IV,[13] and Antiochus VII.[14] It has even been proposed that the head represents Kamnaskires I,[15] the first king of a local Elymaean dynasty ruling under Parthian domination from the middle of the second century BC. But most of these identifications are merely speculations, based on historical considerations rather than on a comparison with the coin portraits of the respective kings. Because of the strong deformation of the face, some scholars admit that it is difficult or even impossible to identify the ruler.[16] So despite Stein's hope that expert examination of the head might lead to a solid identification, the depicted ruler even today is still unknown.[17]

The Deliberate Breakage of the Head

As mentioned above, the head was broken into two pieces, and not merely for the purpose of melting down the metal. A photograph taken by Stein, preserved in the archives of the British Library and published here for the first time (fig. 22.3), shows the assembled parts of the head before restoration. The marks of a chisel are visible at the left side of the forehead (fig. 22.4). From there, the cut runs along the bridge of the nose to the chin. This is not the easiest line along which to divide a bronze head, therefore a nonpragmatic purpose of the partition has to be considered. Moreover, the dent in the right cheek was the result of several heavy blows with an edged tool, presumably a stone. The entire nose is pushed to the right side of the face, compressing the right side of the nose and bulging out the left cheek. The brutality of the actions and the deliberate distortion is obvious. Presumably the damage is a form of *damnatio memoriae* and the performers aimed to destroy the image and the memory of the ruler.

Figure 22.3. Two fragments of the head as assembled in the British Museum in 1937

Image: © The British Library Board, India Office Select Materials, Prints and Drawings Collection, Photo 392/39 (406)

Figure 22.4. Detail of fig. 22.3 showing cut marks made by a chisel

Image: © The British Library Board, India Office Select Materials, Prints and Drawings Collection, Photo 392/39 (406)

A First Reconstruction

A first attempt to reconstruct the original features of the portrait was made soon after its discovery. This is attested only by a photograph taken by Stein in 1937, which is reproduced in Michael Rostovtzeff's *The Social and Economic History of the Hellenistic World* (Rostovtzeff 1941). The caption reads: "photograph of a lead cast supplied by Sir Aurel Stein" and "*pro tempore* in the British Museum."[18] This label seems surprising, because the piece of art was found in Iran and has long since been in the National Museum of Iran. But indeed the head made a short trip to London. Because Stein was a famous explorer, the Iranian authorities allowed him temporarily to send all finds from his expedition to the British Museum for examination.[19] During its time in London, the sculptor Frank Bowcher made a piece mold of the head and produced a lead cast.[20] The sculptor added the eye, squeezed out the depression in the right cheek, and put some parts of the head back in place, such as the neck.[21] Unfortunately, this reconstruction could not be traced in the British Museum or in any other collection in the United Kingdom.

The Intended Reconstruction of the Original Features of the Head

The reconstruction of the original features of the Hellenistic ruler has been attempted again in a project started in August 2015. Based upon a series of digital images and by means of photogrammetry, a three-dimensional state model was created (fig. 22.5).[22] This model, in turn, will serve to reconstruct the original physiognomy of the face by means of computer animation. For example, relatively well-preserved sections such as the upper cheek and eye of the right side of the face can be cut out, mirrored, and inserted on the other side of the head. Dents and bulges can be straightened, and the cracks joined. But it is still a work in progress. The reconstructed portrait should enable comparison to coin portraits of the Seleucid kings. Of course, such an approach has to consider the problems particular to comparison between a three-dimensional representation to two-dimensional coin designs. Nevertheless, we hope to be able to identify the sitter of the bronze portrait in the National Museum of Iran.

Figure 22.5. State model of the head: profiles, front, and back. Photogrammetry & Laser Scanning Lab, HafenCity University, Hamburg

Other Remains of the Sculpture

The photos from the Stein archive show further pieces of bronze sculpture, most likely belonging to the same sculpture as the bronze head in question. Some pieces were already illustrated in Stein's report, but others have not been published until now. Unlike Stein's plates, the photos from the archive provide an exact size scale. Five fragments show similar proportions, which are in turn in accordance with the scale of the head. Using the photos from the archives, colleagues at the National Museum of Iran easily identified the requested pieces, some of which were on display in the museum halls and others located in storage. Gathered together for the first time, it turned out that three fragments fit together.[23] They form a raised left arm, the fingers in the pose of grasping a long object, perhaps a spear (fig. 22.6). Being significantly larger than the arm of an average-size European, the bronze arm indicates a sculpture slightly more than two meters (6 ½ ft.) tall. The inner surface of the sculptural fragment reveals details that are related to the casting process: two parallel raised lines with soft surfaces indicate a wax-to-wax join (fig. 22.7). Apparently two halves of a master mold met there, each lined with rectangular-cut wax sheets, and the seam between these sheets was covered with a wax strip. Fragments of a bare left leg from below the knee to above the ankle and of a right arm show the same technological features.[24] Therefore, they most likely belong to the same sculpture.[25]

Figure 22.6. Raised left arm of the sculpture, compared to the arm of a man 1.76 meters tall
Image: Gunvor Lindström, German Archaeological Institute (DAI), Eurasia Department

Figure 22.7. Back inside view of the left arm
Image: Gunvor Lindström, German Archaeological Institute (DAI), Eurasia Department

Reconstruction of the Statue Type

The preserved bronze fragments represent less than twenty percent of the statue. However, the bare limbs suggest that it was an undraped male. And with the position of the arm, one can infer a statue with a raised arm, leaning on a spear (fig. 22.8). The princely pose and the size of the sculpture indicate that it represented a ruler, even if a diadem is not preserved.

Trudy S. Kawami (1987) noted that "the presence of such an important work so far from a major city is difficult to explain."[26] However, judging from the first results of the Iranian-Italian excavations at Kal-e Chendar, the sculpture was erected at one of the most important religious places of ancient Elymais. From a Mediterranean point of view, the quality and "Greekness" of the reassembled statue may cause surprise, especially given its discovery in Iran. However, this just points out our limited knowledge of Hellenism in the regions east of the Tigris River.

Figure 22.8. Proposed reconstruction of the sculpture using scaled photos of the preserved fragments
Image: Gunvor Lindström, German Archaeological Institute (DAI), Eurasia Department

✦ ✦ ✦

Acknowledgments

This work was supported by the Fritz Thyssen Stiftung. My thanks go also to Dr. Jebrael Nokandeh, the director of the National Museum of Iran, who enabled the investigations, and to the entire museum staff, especially Firouzeh Sepidnameh (head of the Exhibition Department) and Masoumeh Ahmadi (International Affairs). Further thanks go to Ursula Sims-Williams, who drew my attention to the material of the Stein archives in the British Museum.

Notes

1. The account of the discovery follows the report by Stein 1938 and 1940.
2. Godard 1937, 285-305, fig. 115-18; Stein 1940, 130-32, fig. 46-47; Ghirshman 1962, 89, fig. 99; Kawami 1987, 169, plate 11; Canepa 2015, 85–87, fig. 6.4.
3. First reports are Stein 1936 and 1938. The final report is included in Stein 1940, 130–35, 141–58.
4. Stein 1940, 145, plan II.
5. Stein 1940, 155.
6. The director of the Iranian Archaeological Services, André Godard, did a short investigation at the site in 1937, but the results are not published (Ghirshman 1976, 237). The structures recovered by Stein were already spoiled when the site was visited in 1968 by Klaus Schippmann (1971, 230) and in 1971 by Roman Ghirshman (Ghirshman 1976, 236).
7. Messina and Mehr Kian 2014.
8. Ghirshman 1962, 21 ("a seleucid king and his wife"); Colledge 1967, 156, 221 ("perhaps Antiochus IV and his queen"); idem 1987, 152 ("a female and a male portrait head"); Parlasca 1991, 465 ("two bronze heads"); Fischer 1970, 53, n. 111 ("Antiochus VII and his son Seleucus"). Fleischer (2016) considered the present state of the head to be a modern pastiche of two different ancient fragments. But after viewing the image discovered during the present investigation (fig. 22.3), he was convinced that they belong together (personal communication).
9. Stein (1940, 151, plate 5.1) believed a top part of a bronze head with a diadem to belong to the face. Because the fragment could not be traced in the National Museum of Iran, a direct comparison to the face was not possible. In any case, the dissimilarities in the style of the hair and possible overlaps above the left temple suggest that the pieces do not belong together.
10. Stein 1940, 151 (following a suggestion by the numismatist George F. Hill); Colledge 1977, 82; idem 1984, 22.
11. Mørkholm 1963, 67.
12. Herrmann 1977, 39.
13. Rostovtzeff 1941, 66, plate 10.1; Ghirshman 1954, 236, 278, plate 29b; idem 1962, 20–21; 1976, 237; Mussche 1955–56, 61; Berghe 1959, 64, plate 94c; Eddy 1961, 146; Richter 1965, 271; Porada 1962, 180, fig. 89; Lukonin 1967, plate 13; Colledge 1967, 156, 221; idem 1977, 82; idem 1984, 22; Herrmann 1977, 39; Parlasca 1991, 465. Sherwin-White (1984, 160) rules out an identification as Antiochus IV.
14. Fischer 1970, 53 n. 111; Houghton 1989; Smith 1988, 81, 119, 173; idem 1991, 226; Stewart 1990, 1: 218; 2: fig. 768.
15. Godard 1962, 183. Canepa (2015, 85) and, based on historical considerations, Boyce and Grenet (1991, 43) suggest a king of a local Elymaean dynasty.
16. Identifications considered too problematic by Kyrieleis 1980, 22 n. 28; Kawami 1987, 28; Boyce and Grenet 1991, 42–43 ("identifications of the mask are risky"); Fleischer 1991, 105–6; Fleischer 2000; Fleischer 2016; Mathiesen 1992, 88–89.
17. Stein 1938, 325.
18. Rostovtzeff 1941, plate 10.1. The cast was already illustrated by Stein (1938, fig. 9) and Picard (1939, fig. 35) with no reference that it is a reconstruction.
19. Stein 1940, XIV; Sarkosh Curtis and Pazooki 2004, 24; Sims-Williams 2004, 1. Stein incorporated several objects into his own findings, even though they were discovered by the locals.

In 1938 these objects, including the bronze head, were returned to Tehran.

20. This procedure is documented only in correspondence between Stein and Fred Andrews, who supervised the examinations at the British Museum. The letters are published in extracts by Sims-Williams 2004.
21. If compared with the corresponding view of the head, the reconstruction is quite reliable, even if Boyce and Grenet (1991, 43) state that important details appear to have been completed from imagination.
22. The photogrammetry and the creation of the state model were made by Prof. Thomas Kersten and Dr. Maren Lindstaedt of the Photogrammetry & Laserscanning Lab of the HafenCity University in Hamburg. They will also conduct the technical implementation of the reconstruction.
23. National Museum of Iran, inv. 2471: a hand considered by Stein (1940, 151 plate 5.4) to belong to a colossal sculpture; inv. 2874: a large part of the arm not mentioned by Stein but illustrated by Godard (1937, fig. 126); inv. 2473: a fragment of the lower arm mentioned by neither Stein nor Godard.
24. National Museum of Iran, inv. 2478, the leg: Stein 1940, 151 plate 5.6; inv. 2470: a piece of the right arm mentioned by neither Stein nor Godard.
25. Other remains of bronze sculpture from Kal-e Chendar, which were examined within the project, do not show the straight elevated lines on the interior surface.
26. Kawami 1987, 28.

Bibliography

Berghe 1959
Berghe, L. vanden. 1959. *Archéologie de l'Iran ancien*. Leiden: E. J. Brill.

Boyce and Grenet 1991
Boyce, M., and F. Grenet, 1991. *A History of Zoroastrianism*. Vol. 3: *Zoroastrianism under Macedonian and Roman Rule*. Leiden: E. J. Brill.

Canepa 2015
Canepa, M. 2015. "Bronze Sculpture in the Hellenistic East." In *Power and Pathos: Bronze Sculpture of the Hellenistic World*, ed. J. M. Daehner and K. Lapatin, 83–93. Los Angeles: J. Paul Getty Museum.

Colledge 1967
Colledge, M. A. R. 1967. *The Parthians*. London: Thames & Hudson.

Colledge 1977
Colledge, M. A. R. 1977. *Parthian Art.* London: Paul Elek.

Colledge 1984
Colledge, M. A. R. 1984. "The Seleucid Kingdom." In *The Cambridge Ancient History: Plates to Volume VII, Part 1: The Hellenistic World to the Coming of the Romans*, ed. R. Ling, 21–22. Cambridge: Cambridge University Press.

Colledge 1987
Colledge, M. A. R. 1987. "Greek and Non-Greek Interaction in the Art and Architecture of the Hellenistic East." In *Hellenism in the East: The Interaction of Greek and Non-Greek Civilizations from Syria to Central Asia after Alexander*, ed. A. Kuhrt and S. Sherwin-White, 134–62. Berkeley and Los Angeles: University of California Press.

Eddy 1961
Eddy, S. F. 1961. *The King Is Dead: Studies in the Near Eastern Resistance to Hellenism, 334–31 B.C*. Lincoln: University of Nebraska Press.

Fischer 1970
Fischer, T. 1970. "Untersuchungen zum Partherkrieg Antiochos' VII." PhD diss., Eberhard Karls Universität Tübingen.

Fleischer 1991
Fleischer, R. 1991. *Studien zur Seleukidischen Kunst*, vol. 1. Mainz am Rhein: Philipp von Zabern.

Fleischer 2000
Fleischer, R. 2000. "Portraitkopf eines Königs." In *7000 Jahre persische Kunst: Meisterwerke aus dem Iranischen Nationalmuseum in Teheran*, ed. W. Seipel, 227, no. 133. Milan: Skira, and Vienna: Kunsthistorisches Museum.

Fleischer 2016
Fleischer, R. 2016. "Der hellenistische Königskopf aus Šamī, Iran." In *Man kann es sich nicht prächtig genug vorstellen! Festschrift für Dieter Salzmann zum 65. Geburtstag*, ed. H.-H. Nieswandt and H. Schwarzer, vol. I, 269–86, pls. 30–31. Marsberg: Scriptorium.

Ghirshman 1954
Ghirshman, R. 1954. *Iran, from the Earliest Times to the Islamic Conquest*. Harmondsworth, Middlesex: Penguin Books.

Ghirshman 1962
Ghirshman, R. 1962. *Iran: Parther und Sasaniden.* Munich: C. H. Beck.

Ghirshman 1976
Ghirshman, R. 1976. *Les terrasses sacrées de Bard-è Néchandeh et Masjid-i Sulaiman: L'Iran du sud-ouest du VIIIe s. av. n. ère au Ve s. de n. ère*. Mémoires de la Délégation archéologique en Iran 45. Leiden and Paris: E. J. Brill.

Godard 1937
Godard, A. 1937. "Les statues parthes de Shami." *Athar-é Iran* 2: 285–305.

Godard 1962
Godard, A. 1962. *L'art de l'Iran.* Paris: Arthaud.

Herrmann 1977
Herrmann, G. 1977. *The Iranian Revival*. Oxford: Elsevier-Phaidon.

Houghton 1989
Houghton, A. 1989. "A Victory Coin and the Parthian Wars of Antiochus VII." In *Proceedings of the 10th International Congress of Numismatics, London 1986*, ed. I. A. Caradice, 65. London: International Association of Professional Numismatists.

Kawami 1987
Kawami, T. S. 1987. *Monumental Art of the Parthian Period in Iran.* Acta Iranica 26. Textes et Mémoirs (3rd ser.) 13. Leiden: E. J. Brill.

Kyrieleis 1980
Kyrieleis, H. 1980. *Ein Bildnis des Königs Antiochos IV. von Syrien*. Berliner Winckelmann-Programm 127. Berlin: W. de Gruyter.

Lukonin 1967
Lukonin, V. G. 1967. *Persien*, vol. 2. Munich: Nagel.

Mathiesen 1992
Mathiesen, H. E. 1992. *Sculpture in the Parthian Empire: A Study in Chronology*. Aarhus: Aarhus University Press.

Messina and Mehr Kian 2014
Messina, V., and J. Mehr Kian. 2014. "Return to Shami: Preliminary Survey of the Iranian-Italian Joint Expedition in Khuzestan at Kal-e Chendar." *Iran* 52: 65–77.

Mørkholm 1963
Mørkholm, O. 1963. *Studies in the Coinage of Antiochus IV of Syria*. Copenhagen: Munksgaard.

Mussche 1955–56
Mussche, H. F. 1955–56. "De Portretten de Seleuciden." *Gentse Bijdragen tot de Kunstgeschiedenis* 16: 55–69.

Parlasca 1991
Parlasca, K. 1991. "Zur hellenistischen Plastik im Vorderen Orient." In *Ο ελληνισμός στην Ανατολή: Πρακτικά Α' Διεθνούς Αρχαιολογικού Συνεδρίου, Δελφοί 6–9 Νοεμβρίου 1986*, 453–65. Athens: European Cultural Center Delphi.

Picard 1939
Picard, C. 1939. "Courrier de l'art antique." *Gazette des beaux arts* (April): 201–34.

Porada 1962
Porada, E. 1962. *Alt-Iran: Die Kunst in vorislamischer Zeit*. Baden-Baden: Holle.

Richter 1965
Richter, G. M. A. 1965. *The Portraits of the Greeks*. London: Phaidon.

Rostovtzeff 1941
Rostovtzeff, M. 1941. *The Social and Economic History of the Hellenistic World*. Oxford: Clarendon Press.

Sarkosh Curtis and Pazooki 2004
Sarkosh Curtis, V., and N. Pazooki. 2004. "Aurel Stein and Bahmna Karimi on Old Routes of Western Iran." In *Sir Aurel Stein: Proceedings of the British Museum Study Day, 23 March 2002*, ed. H. Wang, 23–28. British Museum Occasional Paper 142. London: The Trustees of the British Museum.

Schippmann 1971
Schippmann, K. 1971. *Die iranischen Feuerheiligtümer*. Religionsgeschichtliche Versuche und Vorarbeiten 31. Berlin: Walter de Gruyter.

Sherwin-White 1984
Sherwin-White, S. M. 1984. "Shami, the Seleucids and Dynastic Cult: A Note." *Iran* 22: 160–61.

Sims-Williams 2004
Sims-Williams, U. 2004. "New Data Relating to Aurel Stein's Expeditions to Iran: Correspondence with Fred Andrews, 1936–37." In *Sir Aurel Stein: Proceedings of the British Museum Study Day, 23 March 2002*, ed. H. Wang, 23–28. British Museum Occasional Paper 142. London: The Trustees of the British Museum.

Smith 1988
Smith, R. R. R. 1988. *Hellenistic Royal Portraits*. Oxford: Clarendon Press.

Smith 1991
Smith, R. R. R. 1991. *Hellenistic Sculpture: A Handbook*. London: Thames & Hudson.

Stein 1936
Stein, A. 1936. "Ancient Ways in Iran: A Fourth Journey I: Traces of Alexander the Great." *The Times* (London) (July 6, 1936): 15–16.

Stein 1938
Stein, A. 1938. "An Archaeological Journey in Western Iran." *The Geographical Journal* 42: 313–42.

Stein 1940
Stein, A. 1940. *Old Routes of Western Īrān: Narrative of an Archaeological Journey Carried Out and Recorded by Sir Aurel Stein, K.C.I.E.* London: MacMillan and Co.

Stewart 1990
Stewart, A. 1990. *Greek Sculpture: An Exploration*. 2 vols. New Haven and London: Yale University Press.

23.

The Influence of Bronze-Working on Roman Provincial Stone Sculpture: The Case of Palmyra

Fred C. Albertson, University of Memphis, Tennessee

The Roman-Syrian city of Palmyra is well known for its extensive corpus of surviving sculpture carved in the locally quarried limestone, dating from the early first century to the middle of the third century AD. Although bronze statuary was subordinate to stone as the Palmyran sculptor's medium of choice, surviving fragments and inscriptional evidence document its existence in the city. However, an examination of Palmyran sculpture reveals that local artists included in their repertoire of stone-carving certain forms drawn from bronze prototypes and that these borrowings are more extensive than previously thought.

The more obvious features are incised grooves outlining the lips, deepened grooves beneath the corners of the mouth, and the sharply defined corkscrew curls with pointed tips found in male hairstyles. Additional features, previously attributed to Near Eastern traditions of stone-carving, may also be included among the group originating in bronze-working. One is the incision of the eyebrows as a herringbone pattern; another is the hollowing out of the iris as a circular cavity with a flat base, clearly intended for the insertion of a different material, which can now be identified as blue glass paste. All these features can be traced to the tradition of Graeco-Roman bronze statuary.

The Palmyran distinction is that the number of examples depicting these features drawn from bronze-working are relatively few and each adaption is chronologically short-lived and not necessarily contemporary, suggesting that their borrowing was not wholesale but selective, probably the result of decisions made by individual artisans or workshops.

✦ ✦ ✦

The prosperity experienced by the elite of the ancient Roman-Syrian city of Palmyra from the late first century BC through the middle of the third century AD is perhaps most visible in their monumental family tombs and the funerary sculpture associated within these tombs. Among the types included within the well-known repertoire of Palmyran funerary reliefs are the distinctive *loculus* plaques: rectangular limestone slabs covering the burial cavity, carved in high relief with a bust depicting the individual interred and often accompanied by an Aramaic inscription denoting the occupant's name, family lineage, and sometimes even the date of death. By about AD 200, the so-called "large banquet relief" and sarcophagi had also become mainstays within the Palmyran tomb.[1]

Palmyra's wealth attracted and supported an active artistic community specializing in the carving of stone, specifically the locally quarried limestone. Yet this is a group that did not exist prior to the late first century BC and therefore had no previous local tradition from which to draw. The evolution of Palmyran sculpture and its portraiture is thus characterized by the borrowing of features from outside sources and the adaptation of forms and techniques to meet local tastes. Argued here is that one of these outside sources was contemporary Graeco-Roman bronze statuary.[2]

The physical evidence for the presence of bronze statuary at Palmyra is sparse. Only a handful of fragments remain: a sandaled foot with part of the lower leg from the Sanctuary of Bel; a section of drapery, a hand, and two feet clad in Parthian shoes from the Agora; and a miniature bust of a priest found in the Sanctuary of Nabû.[3] The context would suggest that the use of bronze was normally confined to honorific statues erected in prominent public areas. A better claim for the wider use of bronze statuary at Palmyra comes from the Tariff Law of AD 137, specifically lines 128–30, which state that bronze statuary coming into the city was to be taxed the same as ordinary bronze, that is, one statue to be taxed based on half of its weight, two statues by the weight of one.[4] These lines would seem to imply that bronze statues were being imported into the city in significant numbers, requiring them not only to be taxed but also to be qualified as to the manner by which they should be taxed.[5]

An examination of the surviving corpus of Palmyran sculpture, particularly that originating from a funerary context and dealing with images of the deceased, would strongly suggest that certain techniques employed on metal were then imitated and adapted by local stone carvers. The features examined here are limited to those that can be documented in works of bronze and are markedly absent in Roman marble sculpture. Such features occur in some 60 to 70 pieces, out of a surviving corpus of some 2,000 examples of Palmyran funerary sculpture.[6]

One prominent bronze feature seen in Palmyran stone sculpture is the incision of the eyebrows into a distinct herringbone pattern, sometimes referred to as caterpillar eyebrows (figs. 23.1–2).[7] One might be tempted to propose a Near Eastern origin for such a rendering of the brows; portraits of Gudea of Lagash instantly come to mind.[8] However, there is no evidence to document a continuity of such a form from the late third millennium BC to the early first millennium AD in the sculpture of the ancient Near East. Instead there are more obvious and chronologically closer examples of incised herringbone eyebrows in Graeco-Roman bronze statuary. Among the examples is a series of Gallo-Roman heads from the first century AD, including two bronze busts depicting male youths now in the Getty Villa (figs. 23.3–4).[9] These can be supplemented by the bronze Doryphoros from the mid-first-century BC context of the Villa dei Papiri at Herculaneum.[10] Within the realm of earlier Greek bronze statuary, the technique can be traced back through the Hellenistic to the late Classical period, as evidenced by the bronze head of a boxer from Olympia.[11]

Figure 23.1. Limestone *loculus* plaque of Repabôl, son of Rustic'â, (son of) Šaddai, from Palmyra. Ca. AD 180–200. Minneapolis, Minneapolis Institute of Arts, MN, USA. Gift of the Miller Family in memory of Dulcy B. Miller, inv. 2008.28.2
Image: Minneapolis Institute of Arts

Figure 23.2. Detail of fig. 23.1. Gift of the Miller Family in memory of Dulcy B. Miller
Image: Minneapolis Institute of Arts

Figure 23.3. Bronze bust of a young male, from Roman Gaul. Ca. AD 50–80. Malibu, J. Paul Getty Museum, Villa Collection, inv. 89.AB.67.2
Image: Courtesy of the J. Paul Getty Museum

Figure 23.4. Detail of fig. 23.3
Image: Courtesy of the J. Paul Getty Museum

A second feature found in Palmyran limestone sculpture that was certainly borrowed from contemporary bronze sculpture is the use of glass paste for the iris and pupil, in place of the more common incised iris and drilled pupil, which were then painted. As seen on the so-called Beauty of Palmyra in Copenhagen, a *loculus* plaque belonging to an anonymous Palmyran matron carved approximately AD 200–210, what normally remains is a large circular cavity with an inner flattened surface (fig.

23.5).[12] The flat surface of the cavity has caused scholars to speculate that such eyes when seen in Palmyran sculpture originally would have had inserted irises of another material.[13] This assumption has proved to be correct, for among the series of ten surviving examples, one retains its original inserted eyes: a female head in the Los Angeles County Museum of Art (fig. 23.6).[14] The extensively pitted material is glass paste, and its color, which appears black at first glance, is actually a dark blue. The insertion of the eyes as a separate entity has a long tradition in Greek statuary, but the insertion of only a circular iris has its best parallels in contemporary Roman statuary, most notably a series of Gallo-British examples, best illustrated by a recently discovered head of Marcus Aurelius now in the Ashmolean Museum (fig. 23.7).[15] The fact that this technique may have been popular regionally in southeast Britain and northern Gaul does not rule out that the source is external and chronologically earlier. A bronze head of Hadrian, originally discovered in the Thames near London and currently in the British Museum, shows the method employed in official portraits of the emperors.[16] Two Etruscan bronze portraits of male youths from Fiesole dating to the third century BC may be the evidence needed to trace this bronze-working method back to Italy.[17]

Figure 23.5. Limestone *loculus* plaque, “The Beauty of Palmyra,” from Palmyra. Ca. AD 200–210. Copenhagen, Ny Carlsberg Glyptotek, inv. 2795

Image: Pictures from History / Bridgeman Images

Figure 23.6. Limestone head of a woman, probably from a banquet relief, from Palmyra. Ca. AD 200–220. 10 ¾ × 7 × 5 in. (27.31 × 17.78 × 12.7 cm). Los Angeles, Los Angeles County Museum of Art, inv. M.82.77.2

Gift of Robert Blaugrund. Image: Courtesy Los Angeles County Museum of Art, www.lacma.org

Figure 23.7. Bronze head of Marcus Aurelius, found near Brackley, Northamptonshire (England). Ca. AD 170. Oxford, Ashmolean Museum, inv. AN 2011.46

Image: Ashmolean Museum, University of Oxford, UK/Bridgeman Images

The third feature associated with Graeco-Roman bronze sculpture and adopted into Palmyran stone sculpture is the finely incised bordering of the lips, physically enhancing the vermilion border and often with a triangular recession denoting the depression between the lobes of the lower lip (see fig. 23.6). This technique is nearly absent in Roman marble portraiture but well known in bronze, as seen on the Croatian Apoxyomenos.[18] This form in metalworking is surely intended to denote a separation of what would be copper lips from the surrounding bronze flesh, and its origins may stem from an early period when the mouth could be cast separately.[19]

While it seems clear that contemporary bronze statuary was the source for certain features seen in Palmyran limestone sculpture, perhaps the more intriguing questions are when and why this influence occurred. Here we are fortunate in that the methodology exists to date each example of Palmyran funerary sculpture relatively securely to within a 20–25 year span. Such a process is made possible by the existence of examples in which the date of the deceased's death, and presumably then the date of the relief's carving, is given in the accompanying inscription.[20] The formulation of an absolute chronology is further assisted by intact tomb groups, where the genealogical context allows each funerary relief to be assigned to its respective generation.[21] These datable examples then serve as chronological data points and, through a process of stylistic and typological comparison, allow the majority of undated examples to be dated. Consequently, a review of the chronology of those individual features discussed so far—herringbone eyebrows, inserted glass pastes for irises, and engraved lips—helps to shed light on the rationale behind the adoption of such features by Palmyran workshops.

Incised herringbone-shaped eyebrows can be documented on at least thirty-two examples at Palmyra (see Appendix 1). The form appears shortly after the middle of the second century. The earliest documented instance is the dated bust of ʼAtêʼaqab, in Istanbul, whose inscription gives AD 157 as the year of death.[22] However, half of the examples cluster roughly between the years AD 180 and 210. After about AD 210, only a handful of examples appear. The last dated example is the relief of Ḥaggûr, son of Malkû, in the American University Museum, Beirut, inscribed AD 236–37.[23] Of note is the fact that all the known examples represent males, suggesting that Palmyran sculptors consciously saw this manner of rendering the eyebrows as a gender signifier. In addition, at Palmyra the apex of the chevron of each individual eyebrow is pointed toward the bridge of the nose (see fig. 23.2), unlike that of any possible Mesopotamian or Graeco-Roman antecedent where the opposite direction is maintained (see fig. 23.4). This suggests a distinctively Palmyran adaptation of the form.

An inserted glass-paste iris and pupil makes its appearance within the Palmyran repertoire of forms in about AD 200. The Beauty of Palmyra in Copenhagen is the earliest (see fig. 23.5). One fragmentary *loculus* plaque of a woman[24] and three female heads, all probably originating from large banquet reliefs and including the example in the Los Angeles County Museum of Art (see fig. 23.6),[25] fall into the period around AD 200–220. The other five remaining examples are male; all are heads originally belonging to either statues or large banquet reliefs, and all date to about AD 230–50, more likely later in this period than earlier.[26] Glass-paste eyes thus show an initial appearance in the Palmyran sculptors' repertoire around AD 200–220, restricted at first to female portraiture. Then, perhaps after a brief pause, they reappear on male portraits for a short time toward the middle of the century.

The earliest documented use of incisions bordering and detailing the lips at Palmyra is from "the month of Ṭebet 466" (January AD 155), the date found on the inscription accompanying the *loculus* plaque of Bênnûr, son of Bar'â, in the Louvre.[27] If we follow the examples listed by Gunhild Ploug, in her catalogue of Palmyran sculpture in the Ny Carlsberg Glyptotek, this relief and six others can be placed chronologically within the period of approximately AD 150–70.[28] Eight of her examples fall in the later decades of AD 170–90.[29] The fashion then quickly fades, with few examples appearing after about AD 200. It ultimately disappears by about AD 220.[30]

Our ability to date Palmyran sculpture rather accurately provides us with an unexpected result when dealing with the proposed influences of bronze on stone. One might expect the influence of bronze statuary to have a collective role; in other words, all the features with bronze antecedents making an appearance simultaneously, then existing side by side to some extent, and ultimately falling out of fashion altogether. Yet at Palmyra this is not the case. Incised lip outlines reach their highpoint of popularity around AD 170–90, then rapidly drop out of use. Incised herringbone eyebrows come into existence around the same time, and show the greatest period of use around AD 180–210, when the lip outlining is already on the decline. Glass-paste eyes appear some fifty years after the other bronze-working features, reaching a peak of popularity around AD 230–50, long after the others have essentially dropped out of use.

Surviving examples thus suggest that the borrowing from bronze statuary was not a wholesale process but one that was done piecemeal. Isolated, individual features were adopted from bronze-working and inserted into what remained a predominantly limestone tradition of carving. In addition, it is extremely rare for more than two of the bronze-derived features to appear together on the same portrait. Only two or perhaps three examples from the entire corpus of Palmyran funerary sculpture fall into this category, the head in the Los Angeles County Museum of Art being one.[31] One could speculate that the allusion to bronze conferred a loftier status on the deceased's image in stone. The large majority of the examples showing the influence of bronze-working fall into the category of "finer" works, that is, those characterized by a greater attention to detail, a softer modeling of features, and an overall finished appearance. Nevertheless, the chronology supports the idea that the process of selecting features from bronze statuary was random. This eclectic selection process in fact reflects the Palmyran sculptors' entire approach. Analysis of Palmyran funerary reliefs has revealed that the sculptor began with a concept of a "portrait," which the sculptor drew from a pre-established repertoire of forms. These forms guided the means of rendering the garments and the arrangement of their folds, the positioning of arms and hands, and the selection of attributes and personal adornment such as jewelry or hairstyle.[32] Even what would normally be considered the distinct, individualized features of the subject—the facial features—are forms repeated from one portrait to another. This strict dependence on typology in Palmyran funerary sculpture sometimes resulted in the creation of identical images representing two different people and different images representing the same person.[33]

The study of Palmyran portraiture shows clearly that there was a continuous process of selection by the artist from a prescribed corpus of forms, perhaps due to the nature of the sculptural environment in which these reliefs were displayed and an emphasis on conveying the identity of the deceased, both as an individual and as a member of a larger community. What perhaps makes Palmyran portraiture so distinct is the fact that this repertoire of forms is constantly being augmented, with new forms drawn externally from Graeco-Roman art, including forms, as shown here, created in imitation of contemporary sculpture cast in bronze.

Appendix 1: Palmyran Reliefs with Incised Herringbone Eyebrows

Items are in chronological order; all are *loculus* plaques depicting males unless otherwise noted.

Date (AD)	Example
157	Istanbul, Archaeological Museum, inv. 3840T (Ingholt 1928, 34–35 PS 11, plate 4; *CIS*, 476 no. 4616, plate 47)
160	Once Berlin, collection von Hahn (Ingholt 1928, 119 PS 252; *CIS*, 462–63 no. 4573) Istanbul, Archaeological Museum, inv. 3837T (Ingholt 1928, 117 PS 237; *CIS*, 363 no. 4299, plate 48)
170	Paris, Louvre, inv. AO 28381 (Dentzer-Feydy and Teixidor 1993, 244 no. 237) Palmyra, Palmyra Museum, inv. B2729/9166: statue (Charles-Gaffiot et al. 2001, 320 no. 26, fig. on 190) Palmyra, Palmyra Museum, inv. 1951/7043 (Sadurska and Bounni 1994, 51–52 no. 59, fig. 114)
180	Palmyra, Palmyra Museum, inv. 1955/7047 (Sadurska and Bounni 1994, 53–54 no. 63, fig. 92) New York, Sotheby's (Sotheby's 2007, lot 31)
187	New Haven, Yale University Art Gallery, inv. 1954.30.3 (*CIS*, 454 no. 4549, plate 61)
189	St. Petersburg, Hermitage inv. 8840 (*CIS*, 360 no. 4292, plate 52)
190	London, British Museum 125032 (Ingholt 1928, 112 PS 201; *CIS*, 362–63 no. 4297, plate 52) Toronto, Royal Ontario Museum, inv. 953x94.4 (Ingholt 1928, 113 n.1 PS 203); Gaziantep, Archaeological Museum, inv. 211 (Parlasca 2005, 143, 148 fig. 4) Damascus, National Museum, from Hypogeum of Yarḥai (Tanabe 1986, plate 280, fig. 249) Jerusalem, Church of St. Anne, Museum, inv. PB 2670: double bust (Ingholt 1928, 110 PS 183; *CIS*, 374–75 no. 4329, plate 54) Minneapolis, Minneapolis Institute of Art acc. 2008.28.2 (*CIS*, 393 no. 4379; Sotheby's 2002, lot 119) Oslo, Museum of Cultural History inv. C42235 (Ingholt 1928, 114 PS 217; *CIS*, 369 no. 4314, plate 53)
200	Copenhagen, Ny Carlsberg Glyptotek, inv. 1043 (Ploug 1995, 174–76 no. 70) New York, Metropolitan Museum of Art acc. 02.29.2 (Ingholt 1928, 109 PS 171) London, British Museum 125020 (Ingholt 1928, 119 PS 246; *CIS*, 372 no. 4323, plate 38) Copenhagen, NCG, inv. 1145: head (Ploug 1995, 222–23 no. 92) Palmyra, Palmyra Museum, inv. 8522/2321 (Charles-Gaffiot et al. 2001, 347 no. 163, fig. on 271) Palmyra, Southeast Necropolis, Tomb H (Taibbôl), relief of Yarḥai London, Christie's (Christie's 2012, lot 190)
210	New York, Metropolitan Museum of Art, inv. 98.19.3 (Ingholt 1928, 122 PS 282; *CIS*, 374 no. 4327, plate 36) Istanbul, Archaeological Museum (Ingholt 1928, 117 PS 237) Once New York, private collection (Ingholt 1928, 112 PS 197; Ingholt 1934, 36 n. 42)
230	Palmyra, Palmyra Museum, inv. 457/1660: head (Colledge 1976, fig. 142; Tanabe 1986, plate 486 fig. 460) Damascus, National Museum, inv. C18: plaster head (Tanabe 1986, plate 484 fig. 458; Charles-Gaffiot et al. 2001, 336 no. 99, fig. on 236) Berlin, Staatliche Museen inv. VA 50 (Ingholt 1928, 122 PS 279; *CIS*, 395 no. 4385, plate 45)
236–37	Beirut, American University Museum, inv. 32.35 (Ingholt 1934, 36–38, plate 9.1) Middlebury (VT), Middlebury College Museum of Art inv. 2009.002 (Sotheby's 2008, lot 68)

Notes

1. For a general discussion, see Colledge 1976, 63–82.
2. Note previous connection made by Colledge 1976, 90, and Parlasca 1989, 206 n. 17.
3. Colledge 1976, 90 and n. 299, with bibliography. The hand from the Agora (Palmyra Museum, inv. 4801/1) is now published: Charles-Gaffiot et al. 2001, 329 no. 64, fig. on 212.
4. *CIS*, no. 3913, 128–30 (Palmyrene version); Matthews 1984, 180.
5. Colledge 1976, 190.
6. Kropp and Raja 2014, 393.
7. Illustrated here: Minneapolis, Minneapolis Institute of Art acc. 2008.28.2: *CIS*, 393 no. 4379; Sotheby's 2002, lot 119. See Appendix 23.1 for additional examples.
8. Examples and illustrations of herringbone eyebrows: Johansen 1978, pls. 43, 44, 47, 59, 70, 71, 84, 92, 94, 97, 99, 101, 105, 113, and 120. They are also found, rarely, in Egyptian sculpture, as seen on the head of Senusret III from Karnak in the Luxor Museum: Romano 1979, 32–35 no. 40, figs. 28–31.
9. J. Paul Getty Museum, inv. 89.AB.67.1 and 89.AB.67.2 (illustrated here). Pollini 2001, with additional examples cited; note specific references to herringbone eyebrows on 137.
10. Naples, Museo Archeologico Nazionale inv. 4885. Daehner and Lapatin 2015, 296–97 no. 50.

11. Athens, National Archaeological Museum no. 6439. Mattusch 1996, 84–87, fig. 3.5.
12. Ny Carlsberg Glyptotek, inv. 2795: Ploug 1995, 188–92 no. 77. Such a form differs from similar large cavities for the iris appearing on other Palmyran examples (e.g., Ny Carlsberg Glyptotek, inv. 1151: Ploug 1995, 234–36 no. 103); in these instances, the hollow is concave and not as deep, and there seems to be a distinction here between the iris and the pupil.
13. Colledge 1976, 120; Ploug 1995, 190 and 229.
14. Los Angeles County Museum of Art, inv. M.82.77.2: Parlasca 1990, 140 no. 10, 139 fig. 10.
15. Ashmolean Museum, inv. AN2011.46; Walker 2008. It should be noted that both Colledge and Ploug (above, n. 13) tentatively suggest a Parthian source, citing inset eyes found on sculptures from Hatra.
16. British Museum, inv. BEP 1848,1103.1. Lahusen and Formigli 2001, 190–92 no. 114, figs. 114.1–4.
17. Paris, Louvre, inv. Br 19, and Florence, National Archaeological Museum, inv. 548: Lahusen and Formigli 2001, 18–19 no. 1, figs. 1.1–4; 20 no. 2, figs. 2.1–4; 462 and 466 figs. 1–3 (eyes).
18. Daehner and Lapatin 2015, 274–75 no. 41.
19. Mattusch 1988, 205.
20. Ploug 1995, 12–13.
21. Sadurska and Bounni 1994.
22. Istanbul Archaeological Museum, inv. 3840T: Ingholt 1928, 34–35 PS 11, plate 4; *CIS*, 476 no. 4616, plate 47.
23. Beirut, American University Museum, inv. 32.35: Ingholt 1934, 36–38 no. 3, plate 9.1.
24. First recorded in the collection of Guillaume Proche in Aleppo, illustrated by Chabot 1897, fig. 10. Present location not confirmed. Included in the series based on Ploug 1995, 229.
25. For the head in Los Angeles, see n. 14 above. The other two are: New York, Metropolitan Museum of Art acc. 65.77 (unpublished); and Palmyra Museum, inv. B2770/9254 (Charles-Gaffiot et al. 2001, 329 no. 66, fig. on 214).
26. Copenhagen, Ny Carlsberg Glyptotek, inv. 1117 (Ploug 1995, 238–39 no. 107); Copenhagen, Ny Carlsberg Glyptotek, inv. 1121 (Ploug 1995, 227–30 no. 97); Palmyra Museum, inv. B2727/9127 (Charles-Gaffiot et al. 2001, 367 no. 252, fig. on 311); Palmyra Museum, inv. B2726/9163 (Fortin 1999, 114 no. 64); Damascus, National Museum, inv. C18, in plaster (Tanabe 1986, plate 484 fig. 458; Charles-Gaffiot et al. 2001, 336 no. 99, fig. on 236).
27. Louvre inv. AO 2201. Dentzer-Feydy and Teixidor 1993, 185 no. 186.
28. Ploug 1995, 142. Another example may be added: London, British Museum 125022 (Ingholt 1928, 110 PS 180).
29. To which three more should be added: Grenoble, Musée de Grenoble, inv. 1578 (Ingholt 1928, 141 PS 442); Pittsfield, Berkshire Museum acc. 1903.7.3 (Albertson 2016, 159–60 fig. 7); Portland (OR), Portland Museum of Art acc. 54.2 (Parlasca 1990, 138–39, 136 fig. 5).
30. The last in the sequence, ca. AD 220, is the relief in Berlin, Staatliche Museen inv. VA 48 (Ingholt 1928, 149 PS 494).
31. The other two would be the relief in Minneapolis (see n. 7), combining incised outlining of the lips and herringbone eyebrows, and a plaster head in Damascus, National Museum, inv. C18 (see above n. 26), with herringbone eyebrows and glass-paste eyes.
32. Kropp and Raja 2014, 403; Albertson 2016, 153.
33. Discussed and examples cited in Kropp and Raja 2014, 403–4; Albertson 2016, 154–55.

Bibliography

Albertson 2016
Albertson, F. 2016. “Typology, Attribution, and Identity in Palmyran Funerary Portraiture.” In *The World of Palmyra*, ed. Rubina Raja, 152–68. Scientia Danica, Serie H. Humanistica 4. Copenhagen: Royal Danish Academy of Sciences and Letters.

Chabot 1897
Chabot, J.-B. 1897. “Notes d’épigraphie et d’archéologie orientale.” *JA* 10: 308–55.

Charles-Gaffiot et al. 2001
Charles-Gaffiot, J., H. Lavagne, and J.-M. Hofman, eds. 2001. *Moi, Zénobie, reine de Palmyre*. Milan: Skira.

Christie’s 2012
Christie’s 2012. *Antiquities*. Auction catalogue 4925. April 26, 2012, London.

CIS
Corpus Inscriptionum Semiticarum. [1926] 1947. Part 2, vol. 3: *Inscriptiones Palmyrenae*, ed. J. B. Chabot. Paris: C. Klincksieck.

Colledge 1976
Colledge, M. A. R. 1976. *The Art of Palmyra*. Boulder: Westview Press.

Daehner and Lapatin 2015
Daehner, J., and K. Lapatin, eds. 2015. *Power and Pathos: Bronze Sculpture of the Hellenistic World*. Los Angeles: J. Paul Getty Museum.

Dentzer-Feydy and Teixidor 1993
Dentzer-Feydy, J., and J. Teixidor. 1993. *Les antiquités de Palmyre au Musée du Louvre*. Paris: Réunion des musées nationaux.

Fortin 1999
Fortin, M. 1999. *Syria: Land of Civilizations*. Trans. J. Macaulay. Montreal: Editions de l’Homme.

Ingholt 1928
Ingholt, H. 1928. *Studier over Palmyrensk Skulptur*. Copenhagen: C. A. Reitzels.

Ingholt 1934
Ingholt, H. 1934. “Palmyrene Sculptures in Beirut.” *Berytus* 1: 32–43.

Johansen 1978
Johansen, F. 1978. *Statues of Gudea: Ancient and Modern*. Mesopotamia 6. Copenhagen: Akademisk Forlag.

Kropp and Raja 2014
Kropp, A., and R. Raja. 2014. “The Palmyra Portrait Project.” *Syria* 91: 393–408.

Lahusen and Formigli 2001
Lahusen. F., and E. Formigli. 2001. *Römische Bildnisse aus Bronze: Kunst und Technik*. Munich: Hirmer.

Matthews 1984
Matthews, J. 1984. “The Tax Law of Palmyra: Evidence for Economic History in a City of the Roman East.” *JRS* 74: 157–80.

Mattusch 1988
Mattusch, C. 1988. *Greek Bronze Statuary: From the Beginnings through the Fifth Century B.C.* Ithaca: Cornell University Press.

Mattusch 1996
Mattusch, C. C. 1996. *Classical Bronzes: The Art and Craft of Greek and Roman Statuary*. Ithaca: Cornell University Press.

Parlasca 1989
Parlasca, K. 1989. “Palmyrenische Bildnisse aus dem Umkreis Zenobias.” In *Festschrift für Robert Werner zu seinem 65. Geburtstag*, ed. W. Dahlheim, W. Schuller, and J. von Ungern-Sternberg, 205–11. Xenia 22. Constance: Universitätsverlag.

Parlasca 1990
Parlasca, K. 1990. “Palmyrenische Skulpturen in Museen an der amerikanischen Westküste.” In *Roman Funerary Monuments in the J. Paul Getty Museum*, vol. 1, ed. M. True and G. Koch, 133–44. Occasional Papers on Antiquities 6. Malibu: J. Paul Getty Museum.

Parlasca 2005
Parlasca, K. 2005. “ Zu palmyrenischen Inschriften auf Reliefs.” In *A Journey to Palmyra: Collected Essays to Remember Delbert R. Hillers*, ed. D. Hillers and E. Cussini, 137–49. Leiden and Boston: Brill.

Ploug 1995
Ploug, G. 1995. *Catalogue of the Palmyrene Sculptures: Ny Carlsberg Glyptotek*. Copenhagen: Ny Carlsberg Glyptotek.

Pollini 2001
Pollini, J. 2001. “Two Bronze Portrait Busts of Slave-Boys from a Shrine of Cobannus in Roman Gaul.” In *Studia Varia from the J. Paul Getty Museum*, vol. 2, ed. M. True and M. Hart, 115–52. Occasional Papers on Antiquities of the J. Paul Getty Museum 10. Malibu: J. Paul Getty Museum.

Romano 1979
Romano, J. 1979. *The Luxor Museum of Ancient Egyptian Art: Catalogue.* Cairo: ASOR.

Sadurska and Bounni 1994
Sadurska, A., and A. Bounni. 1994*. Les sculptures funéraires de Palmyre*. RdA suppl. 13. Rome: G. Bretschneider.

Sotheby’s 2002
Sotheby’s. 2002. *Antiquities*. Auction catalogue 7858. December 11, 2002, New York.

Sotheby’s 2007
Sotheby’s. 2007. *Egyptian, Classical and Western Asiatic Antiquities*. Auction catalogue 8373. December 5, 2007, New York.

Sotheby’s 2008
Sotheby’s 2008. *Egyptian, Classical and Western Asiatic Antiquities*. Auction catalogue 8500. December 10, 2008, New York.

Tanabe 1986
Tanabe, K. 1986. *Sculptures of Palmyra*. Memoirs of the Ancient Orient Museum 1. Tokyo: Ancient Orient Museum.

Walker 2014
Walker, S. 2014. “Emperors and Deities in Rural Britain: A Copper-Alloy Head of Marcus Aurelius from Steane, near Brackley (Northants).” *Britannia* 45: 223–42.

Abstracts

The Transformation of Bronze Sculpture in the Hellenistic East and the Iranian World

Matthew P. Canepa, University of Minnesota, Minneapolis

Bronze enjoyed a special status in Hellenistic Asia both because of its ability to take on a bright finish and for its associations with prestigious cultic and royal contexts. Although the medium was certainly not unknown in the lands of the former Achaemenid Empire and the earlier cultures of ancient Western Asia, the new Graeco-Macedonian modes of representation and royal cultures transformed the role of bronze sculpture in these regions.

This paper examines the dynamic intersection between medium, style, and political and religious power in the dissolution of the Seleucid Empire and rise of the new Iranian political and visual cultures of power under such dynasties as the Arsakids, Orontids, and Mithradatids.

The Hellenistic Heritage of Termez

Djalalitdin Mirzaev, Termez Archaeological Museum, Uzbekistan

According to historical tradition, Bactria was called "the land of a thousand cities," one of which was Termez, Uzbekistan, where a large-scale study of the archaeological monuments of the Hellenistic period is now under way. The materials from the excavations, which allow us to reconstruct the extent and boundaries of the Hellenistic transfers in the region, are stored in the Termez Archaeological Museum.

Analysis of materials from monuments in the region allows us to associate them directly with events that followed the campaign of Alexander the Great and colonization activities of the Greek settlers, who brought to the territory of Central Asia completely new elements of Greek culture. However, the Greeks borrowed a lot of local technologies and practices to adapt to the particularities of nature, climate, and population, which resulted in a transformation. For example in sculpture, technological development was associated with a limited number of materials using local stone types, although preference was given to clay.

The development of technology for clay sculptures on the basis of ancient, preexisting traditions received a powerful boost from the emergence of a new genre of art—painted clay sculptures—the style and iconography of which remained Greek. Thus, the composition of the products of Bactria in the third to first century BC in general corresponds to that in the Greek cities; the emergence of a variety of styles testifies to the intense processing of the imported traditions.

V. Vessels

24.

Bronze Vessels from the Acropolis and the Definition of the Athenian Production in Archaic and Early Classical Periods

Chiara Tarditi, Università Cattolica, Brescia, Italy

The study of a substantial quantity of bronze vessel fragments from the Athenian acropolis provides an opportunity to better define the characteristics, the chronology, and the diffusion of the Athenian bronze vessel production from the late sixth to the mid-fifth century BC.

✦ ✦ ✦

In the study of Greek bronze vessels of the Archaic period, important comparisons are always offered by the fragments found during the excavations carried out on the Athenian acropolis. Until now, these fragments were known mainly from some incomplete publications of the late nineteenth or early twentieth century.[1] To fill this gap, we studied the bronze vessel fragments found on the acropolis more systematically and completely. The results of this research[2] make it possible to draw some conclusions about the extent and features of Athenian bronze vessel production during the Archaic and Classical periods.

Thanks to a fruitful collaboration with the National Archaeological Museum at Athens, it was possible to examine the previously published pieces and to widen the research to include many other fragments housed in the museum storerooms. In all, 1,135 pieces were catalogued. Most of them are solid fragments such as handles (852) and feet (144), while just a few are complete or at least partially preserved vessels (3 basins).[3]

All of the examined pieces were catalogued according to a new typological scheme for each group of objects, highlighting the presence of basic forms and many formal and decorative variations, allowing for more nuanced observations on the style and recurrence of certain elements. For many pieces, formal characteristics made it possible to attribute them to specific shapes: basins (425 fragments), tripod ring bases (100), kraters (3), hydriai (23), *kalpides* (31), *lebetes* (16), oinochoai (19), paterae (38), plates or lids (17), and situlae (4). For many of the fragments (460 handles in the shape of mobile rings, handle attachments, and feet), the original shape remains undetermined; they could have belonged to any of a variety of vessels.

Referring to the full publication (Tarditi 2016) for comments on individual pieces and on the numerous typological variants that were identified, we prefer here to present our conclusions about the pieces attributed to local Athenian workshops, discussing the features, chronology, and diffusion of this production of bronze vessels.

Bronze Vessels of Athenian Production

In the group of examined fragments from the Athenian acropolis, more than six hundred pieces (631) have been recognized as Athenian products.[4] For those with decorative elements, this attribution is based on several formal and stylistic features, while for the great quantity of plain fragments or those with basic and easily reproducible decorative motifs, the attribution to a local Athenian production is justified simply by noting the large number of specimens of a given type attested among the materials of the acropolis, significantly more than in any other Greek context or in areas within the Greek cultural sphere.

The stylistic or formal characteristics recognized as typical of the Athenian bronzes have been recognized on several pieces found in other sites (32 from Athenian demes or Attica; 167 from other areas) or of unknown provenience (40).[5] In all, including pieces from the acropolis and those found in other areas, today we can attribute to Athenian workshops at least 870 pieces, enough to get a better definition of the chronology and diffusion of this high-level production.

Style, Shapes, and Decoration

Athenian bronze vessel production seems to have the same mix of high quality and innovation that characterizes all the handicrafts at Athens in Archaic and Early Classical times. Common traits seem to be the high level of workmanship, outstanding originality, and freedom in the reinterpretation of the usual decorative repertoire.

The basin and the related ring base, usually a tripod, is the most prevalent form, reflecting the importance of this shape in the furniture of Greek sanctuaries and in domestic life, as they were used for many different functions. Peculiar to the Athenian production are some variants in the shape of the handles: extremely numerous are those made from a simple rod, bent at the top to make a triangular form, generally with plain attachments, simply splayed or with a pentagonal section (fig. 24.1).[6] This variant is only sporadically attested in other areas, while the many centuries of examples found on the acropolis clearly indicate its local origin.[7] Other variants of handles also seem to be typical of Athens: the tracery-worked type (fig. 24.2)[8] or those shaped like plain rectangular plaques (fig. 24.3).[9] Yet another type shows a characteristic attachment to the basin, with arched side extensions ending with many variants of the flower or "rosette" motif (fig. 24.4).[10]

Figure 24.1. Basin handle. National Archaeological Museum of Athens, inv. 21225

Figure 24.2. Basin handle. National Archaeological Museum of Athens, inv. 19820

Figure 24.3. Basin handle. National Archaeological Museum of Athens, inv. 21330 β

Figure 24.4. Basin handle. National Archaeological Museum of Athens, inv. 19775

Very numerous too are feet in the shape of lion's paws: these are either high and decorated at the top with palmettes (fig. 24.5), or low and decorated with Ionic capitals. Found always alone, they could have been joined to a variety of objects, such as basins, plates, or wooden boxes.

A notable feature of the Athenian bronze vessels seems to be the taste for figured decoration, which recurs on many different shapes. Examples include basin handles in the shape of animals (lions, snakes, and lizards);[11] patera handles in the shape of a kouros or lion (fig. 24.6);[12] and oinochoai with a female bust on the upper attachment of the handle.[13]

Figure 24.5. Basin feet. National Archaeological Museum of Athens, inv. 23937

Figure 24.6. Patera handle. National Archaeological Museum of Athens, inv. 6651

Many of these decorations were also used on bronze vessels made in other regions at this time, but those from

Athens have their own stylistic character, which made it possible to attribute pieces found elsewhere to Athenian production. Very interesting, for example, is the frequent use of the lion motif. Well attested on Archaic Laconian vessels, it also had great success at Athens.[14] It was used generally on attachments of mobile ring handles and on some handles of paterae. Particularly interesting are some basin handles of the *podanipter* type in the shape of lions attacking deer or of lions lying opposite a central flower (figs. 24.7a–d);[15] these are stylistically distinctive and have a wide geographical spread, from southern Italy to southern Russia.

Figure 24.7a

Figure 24.7b

Figure 24.7c

Figure 24.7d

Basin handle. National Archaeological Museum of Athens, inv. 7133.

A generally accepted opinion[16] attributes to Athens the production of hydriai with a surmounting vertical handle decorated with a lion's head on the upper end and a siren on the lower attachment, made from the end of the sixth century or beginning of the fifth down to the fourth century BC. The study of the bronze vessel fragments from the Athenian acropolis was an opportunity to verify this hypothesis, but only one pair of horizontal handles, probably from the same vessel, can be attributed to this kind of hydria, calling into question the attribution to Athens of the entire group. A subset of this hydria group,[17] stylistically very homogeneous, is characterized by the presence of a lion's head also at the lower attachment of the vertical handle: the significant similarities of this smaller group with some of the lions' heads attributed to Athenian production[18] allow us to propose the same artisanal context.

The Gorgon is another typical motif in figured decorations on Greek Archaic bronze vessels, well attested on Laconian and Corinthian pieces from the late seventh to early sixth century BC.[19] As already noted,[20] many aspects of the production of bronze vessels in Archaic Athens derive from Laconia and Corinth, often mixing stylistic details from both areas. Such is the case with the Gorgoneion, whose Athenian interpretation presents a mix of Laconian (tusks and one fold in the middle of the forehead) and Corinthian traits (hairstyle with short braids ending with an upturned strand and hexagonal face), creating from the middle of the sixth century pieces that are always elegant and organically composed. Examples thereof are the Gorgoneion on a lion's paw foot from the Athenian acropolis;[21] one that appears on the lower attachments of the handles of a *kados* in the Steinhardt Collection;[22] one on the handles of a krater in Munich;[23] and one, slightly later, on a situla-krater from Stavroupolis.[24] The Gorgoneion on an amphora-situla in New York;[25] one on two *lebes* attachments; and one on two basin handles from the Athenian acropolis decorated with raised lizards[26] seem more recent, with more humanized faces: they are so similar in style that it is possible they came from the same Attic workshop.

Chronology

The fragments of bronze vessels found on the Athenian acropolis and attributed to local workshops are not very useful in defining the chronology of the Athenian bronze vessel production, as we lack any information about their find contexts. The only thing known is that they were discovered during archaeological excavations carried out on the acropolis plateau from the first half of the nineteenth century; the fragments were simply collected and stored, sometimes carelessly, in the Acropolis Museum.[27] Stylistic analysis suggests that they are mainly from the Late Archaic or Early Classical period (late sixth and the first half of the fifth century BC); we could not with certainty ascribe any pieces to the late fifth or even the fourth century. As already proposed by André De Ridder,[28] the *terminus ante quem* for the bronze vessels from the excavations of the acropolis could be the mid-fifth century.

The continuity of Athenian production through the fifth century is well attested by pieces thought to be Athenian that were found in other areas and in different contexts, including in southern Italian tombs.[29] Far less common are finds from stratigraphic contexts, as some from Olympia, where individual finds can be tied to precise excavation data,[30] and a couple of handles from Halae, in Boeotia, of the late sixth to early fifth century.[31]

The quality and development of Athenian bronze vessel production has been well defined by the recent work of Beryl Barr-Sharrar. She attributes to Athens the production of the famous Derveni krater (now in the Archaeological Museum of Thessaloniki) and the important series of Type-“A” kraters dating from the beginning of the fifth to the fourth century.[32]

The continuity of Athenian production during the late fifth and fourth centuries is also attested by inventory inscriptions of the acropolis treasure, made from the second half of the fifth century down to the end of the fourth, which mention many silver and even gold vessels belonging to the goddess.[33]

The production of high-quality bronze vessels continued into the fourth century and the Hellenistic period, when it reached a particularly high level of artistry within the refined stylistic *koinè* common to all the cultural centers of the Mediterranean. While it is very difficult to attribute individual pieces to a defined artistic area, it is nonetheless evident that the “Athenian” stylistic influence was felt on every figured decoration in the broader region, reflecting the circulation of styles, iconography, and probably also highly specialized craftsmen.

The Diffusion Area

Athenian bronze vessels were fairly numerous in some Greek sanctuaries, mainly in the Peloponnese: the greatest quantity comes from Olympia (26 pieces), but they are also well attested in finds from Perachora (17). There were far fewer in Argos (5) and Isthmia (4), which is surprising given their location on the road linking the Peloponnese to Attica (fig. 24.8).[34]

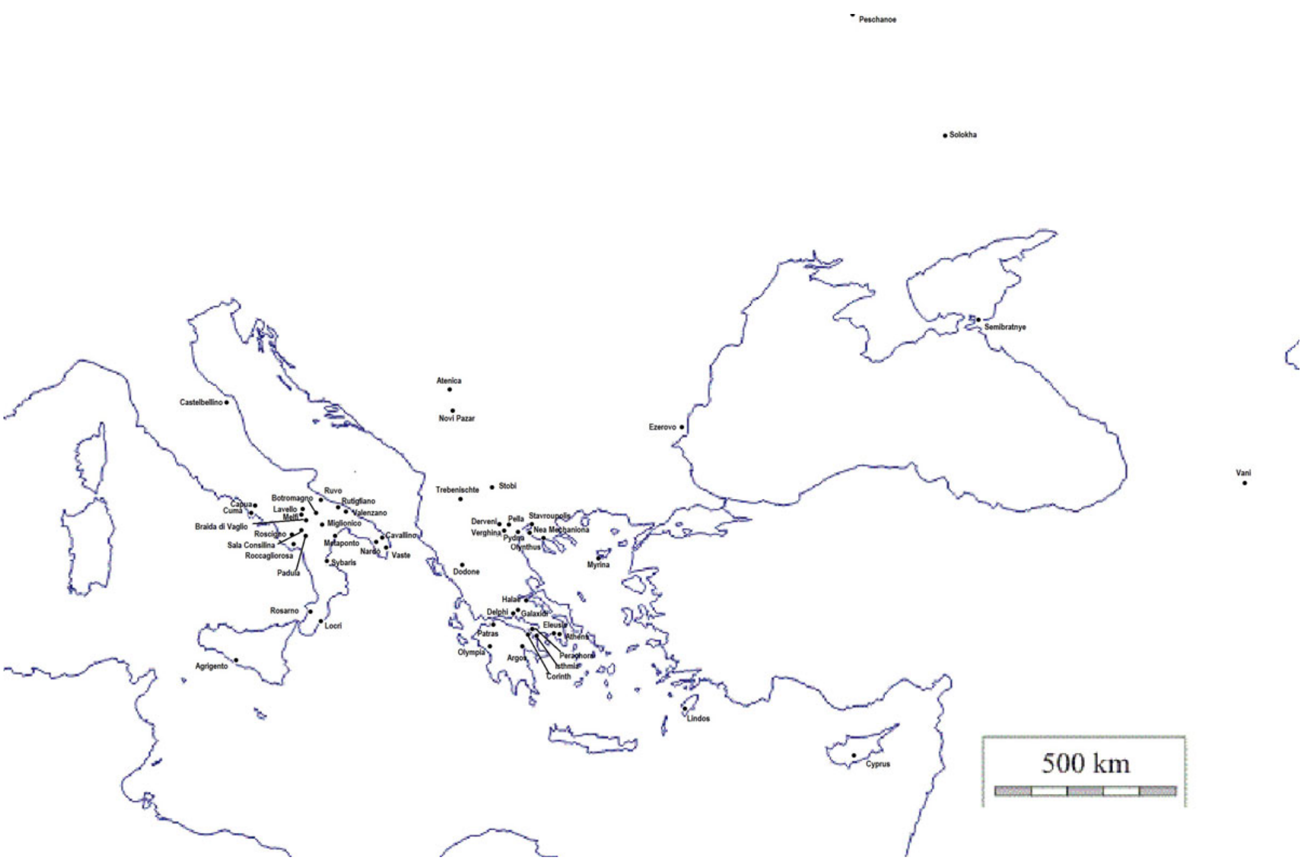


Figure 24.8. Distribution map

Athenian bronze vessels have a relatively small spread in mainland Greece, with the exception of the sanctuary of Dodona (8 pieces). Given the close relation between Athens and Delphi in the Archaic period, the lack of finds from this sanctuary is quite unexpected. However, the study of the bronze vessels fragments is still ongoing and it is possible that some change will occur.

For northern Greece, the most interesting locations in the Archaic period are those in the northern Balkans, as attested by finds from some centers in Macedonia,[35] the northern Aegean,[36] and the interior of the Balkans.[37] In the Peloponnese, Athenian bronze vessels are found only in sanctuaries and are connected with the attendance there of Athenian pilgrims who were offering choice products from their city. In the northern regions, by contrast, the vessels are found only in burial contexts affiliated with land and sea routes followed by Greek goods, which were distributed and redistributed within trade networks since the sixth century.

The objects found in Macedonia and in the northern Aegean are more recent than those from the sites in the inner Balkans, dating from the beginning of the fifth century. This later chronology seems to debunk the hypothesis that already in Archaic times goods were traveling by sea up to Chalkidiki, from whence they were transported overland on long routes to the interior regions,[38] anticipating the future Via Egnatia. Judging from the chronology of the materials, it seems likely that during the Archaic period there was an established trade route by sea from the Peloponnese to Euboea, from there continuing by land: the route toward Chalkidiki must have developed only from the end of the sixth century. The Athenian commercial presence in the area became more intense after the conquest of Lemnos in 510 BC, establishing an outpost for further development of trade to the Black Sea.

Particularly interesting is the presence of a small but significant number of pieces attributable to Athenian production found in several towns along the coast of the Black Sea or just inland: there are two basins with handles in the shape of rectangular plaques—one from Solokha[39] and one from Semibratnye[40]—and at least two amphorae from Peschanoe,[41] but probably also other vases, such as three *kalpides* and a basin on a tripod base.[42] The presence of these objects is certainly related to Athenian interests around the Black Sea, the city's main source of grain. The conquest of Thracian Chersonese in the mid-sixth century contributed significantly to the development of Athenian trade in this region and to the spread of valuable materials, which were used as articles of exchange particularly among the rich elites of the indigenous communities.[43] The objects found in these regions appear to be contemporary with the Athenian pieces from Macedonian sites and Lemnos: it is likely that their distribution is linked to the presence of the same maritime trade routes—running from Attica to the northern Aegean and from there up to the Black Sea—which ensured the circulation of high-quality products from Athenian workshops in those countries politically related to or dependent upon Athens.

Looking west, a significant presence of Athenian vessels is confirmed along the Adriatic coast, especially in the Apulian area, with more than twenty pieces. It seems evident that the distribution of Attic vessels (both bronze and ceramic) mainly follows the Adriatic route. In exchange for grain and other foodstuffs, Greek merchants traded their famous figured pottery and valuable bronze banquet furnishings, which were appreciated by the indigenous elites as symbols of their full adherence to the model of the Greek-type symposium. The only difference between the two classes of materials is that bronze vessels stop at the Piceno, while the pottery travels on to the emporia at the mouth of the Po. Beyond the Marche region, farther to the north, there are no finds of Greek bronze vessels, either from Attica or from other centers; they were probably "filtered out" by the Etruscans to protect their own well-established bronze vessel production.[44]

The trade route from the Ionian Gulf to the interior of Basilicata is well attested. Athenian articles have been found at Metaponto and at indigenous settlements such as Botromagno, Braida di Vaglio, and Miglionico.[45] Greek traders brought to Metaponto not only Attic figured pottery but also some fine examples of bronze vessels, not just Attic: from Metaponto, these pieces were distributed up the Bradano River.

Fewer examples are found along the Tyrrhenian coast of southern Italy and Sicily, from which we have just a few pieces of relatively modest quality: some *paterae* with handles in the shape of kouroi; a handful of precious pieces, such as the krater from Agrigento[46] and from Locri;[47] and the *podanipter* handle in the shape of lions attacking an animal, a fragment of which was found in Locri.[48] We may suppose that here, too, the Etruscans exercised a "monopoly" on fine bronze production, especially from the end of the sixth century, when we can observe the interruption of the spread of Laconian and Corinthian bronze vessels, well attested for the middle decades of the sixth century, and the lack of Athenian production, just starting to assert itself. The distribution of Athenian pieces in southern Italy seems to stop altogether in the second half of the fifth century, probably reflecting a change in trade routes, when exports of Athenian bronze vessels reached the northern Aegean and Black Sea area, following in the wake of Athenian military and colonial activity and the onset of business relationships that could also ensure vital supplies of grain to Athens.

✦ ✦ ✦

Notes

1. De Ridder 1896; Keramopoullos 1915; more recently Gauer 1981; Stibbe 2008.
2. Tarditi 2016.
3. For a complete list with inventory numbers, see Tarditi 2016, appendix 1.
4. Tarditi 2016, appendix 2.
5. For a complete list see Tarditi 2016, appendixes 3 and 4.
6. Tarditi 2016, Type Bh.2.I.A–B.
7. Tarditi 2016, 243–45.
8. Tarditi 2016, Type Bh.4.
9. Tarditi 2016, Type Bh.5.
10. Tarditi 2016, Type Bh.3.
11. Tarditi 2016, Type Bh.3.II.
12. Tarditi 2016, Type PA.2.III–IV; see also Tarditi 2014.
13. Tarditi 2016, Type Oh.1.A.
14. Tarditi 2014.
15. Tarditi 2016, Type Bh.3.II.C.a–b.
16. Gauer 1981; Vokotopoulou 1997, nos. 149–50; Tarditi 2007.
17. Dodona, Athens, Archaeological Museum, Carapanos Collection, inv. 22 (Carapanos 1878, 48, no. 22; tab. XVI, no. 4); Paris, Louvre, inv. Br 4643, catalogue online; New York, Metropolitan Museum, inv. 1981.11.23, catalogue online; Toledo (OH), Toledo Museum of Art, inv. 1964.125, catalogue online.
18. Namely, inv. 7099, 7103, 7104, 7105, and 19997 from the acropolis (Tarditi 2016, catalogue).
19. Stibbe 2000, 62-64; Tarditi 2016, 313–14.
20. Stibbe 2000, 57–99; Stibbe 2006, 312.
21. Tarditi 2016, catalogue, inv. 7080.
22. Stibbe 2000, 153–55.
23. Munich, Antikensammlung, inv. 4262.
24. Thessaloniki, Archaeological Museum, inv. 5124.
25. Metropolitan Museum of Art, inv. 60.11.2a–b, thought also by Stibbe to be Attic. Stibbe 2006, 312.
26. Tarditi 2016, type La.3 (inv. 7107 and 7116) and type Bh.3.II.D (inv. 7128 and 21463).
27. Tarditi 2016, chapter 1, 2.
28. De Ridder 1896, xxiii.
29. For example, the Princely Tomb at Sala Consilina and the tombs from the Rutigliano necropolis, of the late sixth to early fifth century BC, and those from Cavallino, Ginosa, Valenzano, Miglionico, Padula, and Botromagno, all dated mainly to the fifth century BC: for bibliography Tarditi 2016, 317.
30. Athens, Archaeological Museum, inv. 6402; Olympia, Archaeological Museum, inv. Br 12120, both from Late Archaic contexts (Gauer 1991, 203: nos. Le 216 and Le 217); inv. B 10416 and two pieces without number (Gauer 1991, 203: nos. Le 215 and Le 218, both from Late Archaic contexts); inv. B 5934 and B 5792, both Early Archaic (Gauer 1991, 270–71: nos. E 26 and E 27); Olympia, Archaeological Museum, inv. Br. 13417 (Gauer 1991, 243: no. P47) from a Classical context; inv. B 5286, found together with Archaic sherds (Gauer 1991, 238: no. P9, tab. 58); inv. Br 5129 (Athens Archaeological Museum, inv. 6403) (Gauer 1991, 51 and 206: no. Le 244, thought to be Early Archaic); inv. Br 3481 and B 154, from a well that was closed in the last quarter of the sixth century (Gauer 1991, 54; 208: no. Le 262; 212: no. Le 297); inv. Br. 13044 and Br. 14418 (Gauer 1991, 20: nos. Le 229 and Le 230, dated around 530–520 BC).
31. Goldman 1940, 415.
32. Barr-Sharrar 2008, 56.
33. Harris 1995, 1–8.
34. For complete references (museum, inventory number) about the mentioned pieces, see Tarditi 2016, appendix 4.
35. Pella: handle of a krater (Barr-Sharrar 2008, 54); Olinthus, a basin handle (Robinson 1941, no. 816, pl. LXIV); Derveni: probably two kraters, one amphora-situla (Barr-Sharrar 2008, 54) and one patera (Galanakis 2011, 244); Stavroupolis: a situla-krater (Vokotopoulou 1996, 187).
36. Myrina on the island of Lemnos: nine handles and reel for *lebetes* (Marchiandi 2010).
37. Trebeništa: three tripod bases (Filow 1927, 69, nos. 83 and 84; Vulić 1930, fig. 14); Novi Pazar: one *podanipter* (Vasić 2003, 132, figs. 92–94); Stobi: a basin handle (Stibbe 2003, 118, fig. 76).
38. Stibbe 2003, 89–110.
39. Boltrik, Fialko, and Treister 2011, fig. 7.
40. Bilimovitch 1970, 132–35.
41. Reeder 2000, 193–204; Barone 2007; Treister 2010.
42. *Kalpides* and basin on tripod base (Reeder 2000, 192–93; 195, no. 93; Treister 2010, 12).
43. See articles in Trofinova 2007; Bosi 2007.
44. Tarditi 2007.
45. Tarditi 2016, 316–17.
46. Krater from Contrada Mosè: Agrigento, Museo Archeologico Nazionale, inv. 20733 (Barr-Sharrar 2008, 54).
47. London, British Museum, inv. 1865,0103.43 (Bronze 258) (Barr-Sharrar 2008, 54).
48. Reggio Calabria, Museo Archeologico Nazionale, inv. 7375 (Gauer 1981).

Bibliography

Barone 2007
Barone, L. 2007. "Un tesoro riemerso dal Dnepr." In *Ori dei cavalieri delle steppe: Collezioni dai musei dell'Ucraina*, ed. G. L. Bonora and F. Marzatico, 278–81. Exh. cat. Trento, Castello del Buonconsiglio, Monumenti e collezione provincials. Milan: Silvano.

Barr-Sharrar 2008
Barr-Sharrar, B. 2008. *The Derveni Krater: Masterpiece of Classical Greek Metalwork*. Ancient Art and Architecture in Context 1. Princeton: American School of Classical Studies at Athens.

Bilimovitch 1970
Bilimovitch, Z. A. 1970. “Deux cuvettes de bronze de provenence des tumulus dits Sémibratniye.” *Sov. Arkheol*. 1970/73: 128–35 (in Russian).

Boltrik, Fialko, and Treister 2011
Boltrik, Y. V., E. F. Fialko, and M. Treister. 2011. “Imported Bronze Vessels from the East Catacomb in the Berdyansk Barrow.” *Ancient Civilizations from Scythia to Siberia* 17: 255–78.

Bosi 2007
Bosi, F. 2007. “Sulle rive del Mar Nero: Incontri di civiltà.” In *Ori dei cavalieri delle steppe: Collezioni dai musei dell’Ucraina*, ed. G. L. Bonora and F. Marzatico, 272–77. Exh. cat. Trento, Castello del Buonconsiglio, Monumenti e collezione provincials. Milan: Cinisello Balsamo.

Carapanos 1878
Carapanos, C. 1878. *Dodone et ses ruines*. Paris: Hachette.

Filow 1927
Filow, B. D. 1927. *Die archaische Nekropole von Trebenischte am Ochrida See*. Berlin and Leipzig: de Gruyter.

Galanakis 2011
Galanakis, Y., and D. McCarthy, eds. 2011. *Heracles to Alexander the Great: Treasures from the Royal Capital of Macedon, a Hellenic Kingdom in the Age of Democracy*. Exh. cat. Oxford, Ashmolean Museum.

Gauer 1981
Gauer, W. 1981. “Ein spätarchaischer Beckengriff mit Tierkampfgruppe.” *Olympiabericht* 10: 111–65.

Gauer 1991
Gauer, W. 1991. *Die Bronzegefäße von Olympia*, vol. 1. Olympische Forschungen 20. Berlin: de Gruyter.

Goldman 1940
Goldman, H. 1940. “The Acropolis of Halae.” *Hesperia* 9: 381–514.

Harris 1995
Harris, D. 1995. *The Treasures of the Parthenon and Erechtheion*. Oxford: Clarendon.

Keramopoullos 1915
Keramopoullos, A. 1915. “Μουσεῖα.” *ArchDelt* 1: 19–34.

Marchiandi 2012
Marchiandi, D. 2012. “Le consuetudini funerarie dell’élite ateniese: I lebeti bronzei di Myrina (Lemnos).” In *Gli Ateniesi fuori dall’attica: Modi d’intervento e di controllo del territorio*, Proceedings of the Congress at Torino, 2010 (ASAtene 88), ed. E. Culasso Gastaldi and D. Marchiandi, 221–36. Athens: Scuola archeologica italiana di Atene.

Reeder 2000
Reeder, E. D., ed. 2000. *Scythian Gold: Treasures from Ancient Ukraine*. Exh. cat. Baltimore, Walters Art Gallery. New York: Harry Abrams.

De Ridder 1896
Ridder, A. de. 1896. *Catalogue des bronzes trouvés sur l’Acropole d’Athènes*. Paris: A. Fontemoing.

Robinson 1941
Robinson, D. M. 1941. *Excavations at Olynthus X: Metal and Miscellaneous Finds, an Original Contribution to Greek Life*. Baltimore: Johns Hopkins University Press.

Stibbe 2000
Stibbe, C. M. 2000. *The Sons of Hephaistos: Aspects of the Archaic Greek Bronze Industry*. Rome: L’Erma di Bretschneider.

Stibbe 2003
Stibbe, C. M. 2003. *Trebenishte: The Fortunes of an Unusual Excavation*. Studia archeologica 121. Rome: L’Erma di Bretschneider.

Stibbe 2006
Stibbe, C. M. 2006. *Agalmata: Studien zur griechisch-archaischen Bronzekunst*. Dudley, MA: Peeters.

Stibbe 2008
Stibbe, C. M. 2008. “Laconian Bronzes from the Sanctuary of Apollo Hyperteleatas near Phoiniki (Laconia) and the Acropolis of Athens.” *BaBesch* 2008: 17–45.

Tarditi 2007
Tarditi, C. 2007. “La diffusione del vasellame bronzeo greco in Italia e in Europa: Modalità e limiti.” In *Dalla Grecia all’Europa: La circolazione di beni di lusso e di modelli culturali nel VI e V sec. a.C.*, ed. C. Tarditi, 23–52. Milan: V&P.

Tarditi 2014
Tarditi, C. 2014. “Il motivo del leone nell’atene arcaica: Diffusione e stile nella produzione ateniese di vasellame in bronzo.” *Erga-Logoi* 2.2: 31–63.

Tarditi 2016
Tarditi, C. 2016. *Bronze Vessels from the Acropolis: Style and Decoration in Athenian Production between the Sixth and Fifth Centuries BC*. Rome: Edizioni Quasar.

Treister 2010
Treister, M. 2010. “Bronze and Silver Greek, Macedonian and Etruscan Vessels in Scythia.” *Bollettino di Archeologia On Line*, vol. speciale, 17th International Congress of Classical Archaeology (Rome, 2008): 9–26.

Trofimova 2007
Trofimova, A. A., ed. 2007. *Greeks on the Black Sea: Ancient Art from the Hermitage*. Exh. cat. Los Angeles: J. Paul Getty Museum.

Vasić 2003
Vasić, R. 2003. “To the North of Trebenishte.” In Stibbe 2003, 111–35.

Vokotopoulou 1996
Vokotopoulou, I. 1996. *Führer durch das Archäologische Museum Thessaloniki*. Athens: Kapon Editions.

Vokotopoulou 1997
Vokotopoulou, I. 1997. *Αργυρά και χάλκινα έργα τέχνης*. Athens: Ekdotikē Athenōn.

Vulić 1930
Vulić, N. 1930. “Das neue Grab von Trebenischte.” *AA*: 276–99.

25.

Bronze Vessels and Related *Instrumenta* at Delphi: Remarks on Morphology, Provenance, and Chronology

Valeria Meirano, Università degli Studi di Torino, Italy

The recent systematic study of the bronze vessels and the related *instrumenta* retrieved from the sanctuary of Delphi dating from the sixth century BC to Roman times, which is still in progress, offers a fresh look at this extraordinary evidence. Mostly unpublished and never considered in a wide perspective, this corpus of material provides a picture of the presence and circulation of bronze objects in the panhellenic sanctuary, which now can be compared with evidence from other sacred contexts. A general picture of the items attested has now been formed, and aspects related to morphology, style, production, and chronology of bronze vessels and *instrumenta* can be taken into account. The occurrence and reiteration of specific objects allows us to understand offering choices and the ritual practices performed in the sacred area. Remarks about the provenance of some bronzes contribute to our knowledge of who attended the sanctuary and how objects circulated.

✦ ✦ ✦

The circumstances under which the École Française d'Athènes conducted the chief excavation of the sanctuary of Delphi are well known: the so-called *Grande Fouille* represents a foundational page in the history of archaeological excavations in Greece during the nineteenth century. Between 1892 and 1903, French archaeologists brought to light the major part of the site (fig. 25.1), unveiling the ruins of the celebrated monuments described in the literary texts and contributing to the understanding of one of the most famous sanctuaries of the ancient world.[1]

Topography, architecture, and sculpture were of course the main objectives, while the remaining evidence received far less attention during the excavations and in the subsequent studies. The *Journal de la Grande Fouille*, written during the decade of archaeological work, is proof of this attitude. Some pages, like the ones by Paul Perdrizet dealing with ceramics and small bronzes (fig. 25.2), represent exceptions in the general picture one gets from browsing the excavation journal.[2]

Figure 25.1. Delphi at the time of the *Grande Fouille*. The Portico of the Athenians and the polygonal wall
Image: Jacquemin 1992, fig. 66

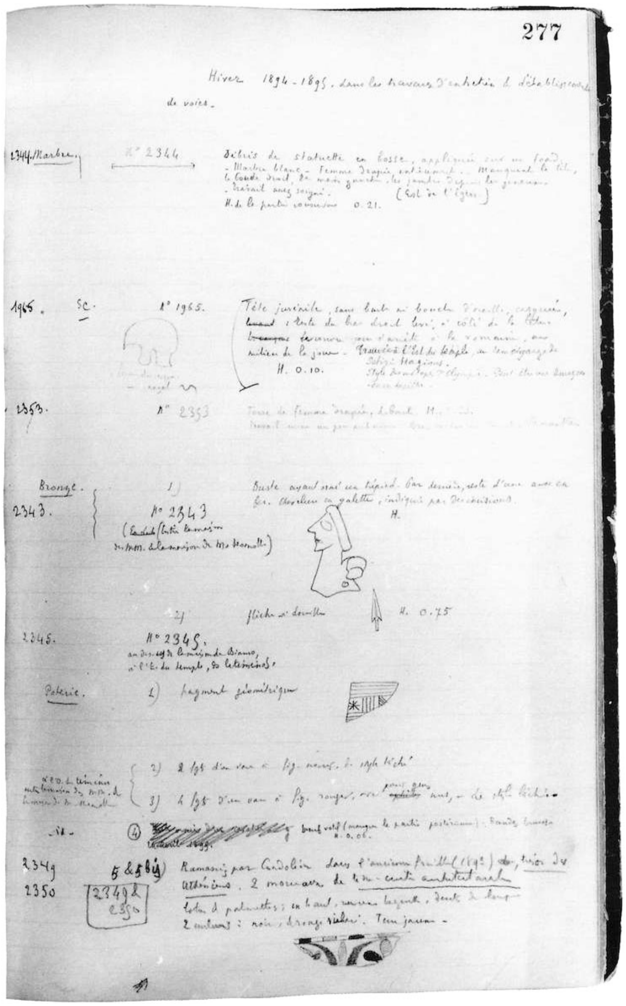


Figure 25.2. *Journal de la Grande Fouille*, by P. Perdrizet, p. 277
Image: Jacquemin 1992, fig. 64

This approach toward exploration and the recording of data—aiming for the grand sweep of history and emphasizing rare treasures while discounting or ignoring smaller, more common artifacts—was widespread at the time and absolutely the norm in the nineteenth century. It inevitably caused the loss of a considerable number of pieces and of a wide body of information regarding the specific, original contexts and depositional conditions from which objects were retrieved. This paucity of information also concerns the association with other *anathemata*. It has hampered our understanding of various aspects related to the presence and use of these items in the sanctuary—for example, the crucial distinction between offerings and ritual devices—and made it difficult to identify assemblages of objects related to specific religious practices performed in the sacred area.

After the *Grande Fouille*, a consistent publication program started, including the small finds, which were published by Perdrizet himself in 1908.[3] In this volume, which is still a fundamental work, a first selection of bronzes was documented. In the following decades, finds from new excavations were presented in preliminary reports in the *Bulletin de Correspondance Hellénique* (BCH)[4], while the majority of the contributions concerning the bronzes at Delphi were left to Claude Rolley. He was responsible for the systematic publication of the statuettes and the geometric tripods[5] and the synthesis in the *Guide de Delphes*[6] and was the author of numerous articles published mainly in the BCH.[7]

In the last few years, some specific categories of objects have seen systematic or at least partial publication, for example the helmets by Heide Frielinghaus[8] and the seventh-century bronzes by Hélène Aurigny.[9] The publication of a recent excavation in *L'aire du pilier des Rhodiens* by Jean Marc Luce (2008)[10] provided fresh evidence concerning bronzes and their contextualization, an issue that previous documentation had made it difficult to approach at Delphi.[11]

Despite this progress, the vessels and the related instruments dating from Archaic to Roman times remained mostly unpublished, apart from some selective or preliminary studies. The aim of my work, which is still ongoing, is to put these *disiecta membra* and unpublished pieces in a wider perspective and to contribute to the understanding of offering choices, ritual practices performed in the sacred place, and the circulation of the metal objects.

Given the space constraints of this volume, I will expand only on some aspects of this broad topic. In light of the recent systematic survey, it is noteworthy that the dossier concerning the bronze vessels is meager compared with evidence coming from other contexts, for example Olympia and the Athenian acropolis, which is now the subject of reappraisal.[12] The melting down of artifacts and the poor preservation of bronze due to the soil conditions at Delphi[13] surely played a role in conservation (or lack thereof) and in determining the selection of the pieces to retrieve from the ground during past excavations.

In order to try to reestablish a reliable picture of the occurrence of bronze vases and *instrumenta* in the sanctuary, we should also take into account the data coming from epigraphic evidence and from literary sources, even on precious vessels. Herodotus mentions the six gold kraters offered by Gyges; the monumental silver krater on an iron stand by Glaukos of Chios, offered by Alyattes; and the golden cups and the two kraters offered by Croesus—one of silver and one of gold, attributed to Theodoros of Samos—which were positioned before the Temple of Apollo.[14] Bronze vases, even monumental ones, must have been a very common sight among the offerings in the sacred area and even among the furniture and ritual tools: bronze tripods, for example, are less numerous than expected among the unearthed objects; nevertheless they play a crucial role in the imagery related to the sanctuary and are evoked during the whole life of the sacred place, long after the Geometric period. The presence of bronze *phialai mesomphaloi* as divine attributes and their use as ritual instruments are also widely reflected in official monuments and iconographies.[15]

Though it is not possible to present it in detail here, a general picture of the occurrence, morphology, and chronology of bronze vessels recovered from Delphi is now available. The quantitative indications are provisional and subject to change as the study progresses; in addition, a range of factors have yet to be taken into account in statistical analysis.[16] Notwithstanding these difficulties, a quantitative approach is crucial and offers a fresh means of investigating the *régime des offrandes*—and their meaning—in the sacred context.[17]

As previously stated, contextualization is problematic at Delphi, but nevertheless it rewards study. Although the majority of the finds of known provenance come from the sanctuaries of Apollo and Athena at Marmaria, some evidence was retrieved from funerary and domestic contexts as well. In general, the number of bronze vases and instruments dramatically decreases starting from the fourth century BC. Among the pieces of known provenance, the Hellenistic and later ones mainly come from profane contexts, a sign of the progressive change in ritual practice and offering strategies.

Open shapes are predominant. Among them we find the drinking vessels and the libation vases par excellence, *phialai mesompaloi*, both in the "plain" and in the "lotus-bowl" versions, together with large, deep bowls (fig. 25.3). Kantharoi, kylikes, and other handled cups, skyphoi, and mugs are far less attested, while handles are the only surviving parts of paterae.

Figure 25.3. Bronze *phiale*. Archaeological Museum of Delphi, inv. 27138
Image: V. Meirano

Various types of large and medium-sized basins are widely documented, as well as *deinoi* with their characteristic profile. I could identify the presence of at least two fragments pertaining to basins with embossed rims, a shape that was not attested previously at Delphi.[18] These vessels provide clues to the attendance at the sanctuary, or rather to the circulation of bronze objects. The shape of these basins is of certain Etruscan origin and the majority of the specimens known so far come from the Tyrrhenian area and from the central Italian peninsula. Nevertheless, the vessel type is widely documented, from the barbarian contexts of central-western Europe to central-eastern Mediterranean. In Greece, these basins are definitely rare and occur in only a few sites, namely sanctuaries, including Olympia.[19] In the last few decades, the version bearing a single row of bosses—like the specimens attested at Delphi—has been noticed in eastern Sicily, where these vessels mainly occur in graves as funerary receptacles:[20] the proposal of local production has been advanced, based on technical and morphological features. In Southern Italy as well, the discovery of a homogeneous group of basins of this type in Greek contexts—mostly coming from the sanctuary of Scrimbia at Hipponion in southern Calabria[21]—showing close affinities with the Sicilian group, corroborates the hypothesis of a western Greek manufacture inspired by Etruscan prototypes. Technical details would in some cases support the Greek colonial provenance of some of the basins found in Greece. In the case of the fragments from Delphi, which do not preserve their entire profile, it would be difficult to ascertain their origin, apart from their western provenance: a south Italian or Sicilian production remains conjectural, though highly probable.

Kraters are attested by a few ascertained fragments, a pale echo of the presence of this shape in the sanctuary as recorded by the ancient sources. Among them, some can be ascribed to volute specimens, which are notoriously rare.[22]

A few pieces attest to the presence of small forms like pyxides, *bombylioi*, bottles, and aryballoi, among which are also bronze disk rims that attached to small vases of perishable material, and one rare figured specimen in the shape of a tortoise.

Large closed shapes, which can be recognized as hydriai, olpai, and oinochoai, are mainly documented by fragments or miniature versions, with some exceptions. One is the known hydria dating to the mid-fifth century BC, which served as a cinerary urn in a tomb unearthed during the excavations for the building of the new museum.[23] Another example is a small, refined trefoil oinochoe, which can be compared with Macedonian specimens of the fourth century BC.[24]

As expected, the number of handles is large. Some are figured specimens with stylistic features that significantly contribute to the identification of production areas and to the definition of circulation dynamics of bronze objects. The various types of attested vertical handles suggest a wider range of closed shapes in comparison to what is documented by other morphological forms (fig. 25.4).

Refined horizontal handles, sometimes with decorative elements, as well as figured appliqués, support the presence of large vases like *podanipteres* or kraters, which are also possibly echoed by fragments of stands with lion paws.[25] Some small tripods were connected to *exaleiptra* and to other small or miniature shapes (figs. 25.5a-b).

Among the *instrumenta*, lamps are attested especially in the Late Hellenistic and Roman times, when we find some figured specimens, like one in the shape of a grotesque figure (fig. 25.6).[26]

Figure 25.4. Handle of a Roman bronze amphora. Archaeological Museum of Delphi, inv. 1159
Image: V. Meirano

a b

Figure 25.5. Small tripod stand. Side (a) and top (b) view. Archaeological Museum of Delphi, inv. 8404.
Image: V. Meirano

Figure 25.6. Figured bronze lamp. Archaeological Museum of Delphi, inv. 1160
Image: V. Meirano

Finally, we find a group of "vertical" instruments, namely candelabra, *kottaboi*, and other such articles. Some pieces—in particular a few curved arms with decorated finials showing serpent heads or floral motifs—are probably to be interpreted as parts of utensil stands, a rare class that is better known in western Greece, thanks to some specimens from Epizephyrian Lokroi (Locri, in Calabria).[27]

Research on Delphic bronze vessels and instruments also seeks to record and explain the detectable traces of actions made during the sacred rituals and the consecrations of offerings, in order to better understand the behaviors performed by devotees and priests in the sacred precinct. The "partial" offering of metal objects has already been demonstrated in various Greek sacred contexts, especially regarding vases and weapons.[28] Modifications of and deliberate damage to bronze objects by breaking, bending, piercing, mutilating, and so on are known at many necropoleis and sanctuaries, including Delphi, where this practice is attested on some helmet cheek-pieces.[29]

✦ ✦ ✦

Acknowledgments

The research on metal vessels and related *instrumenta* at Delphi is conducted in the frame of the Contrat Quinquennal of the École Française d'Athènes under the auspices of the local Ephoria. I would also like to acknowledge the Alexander S. Onassis Public Benefit Foundation in Athens and the Scuola Archeologica Italiana di Atene for their support and the research facilities provided.

Notes

1. For the *Grande Fouille* and its scientific and political implications, see École Française d'Athènes 1992.
2. For the degree of scrutiny by Perdrizet in observing and documenting the small finds, see Jacquemin 1992, 156–57; Meirano 2016.
3. Perdrizet 1908.
4. For example, Hansen 1960; Rolley and Rougemont 1973; Rolley 1999.
5. Rolley 1969 and 1977.
6. Rolley 1991a.
7. For example, Masson and Rolley 1971; Rolley 2002; for the archaeometric program on geometric, oriental, and orientalizing bronzes, including samples taken from objects from Delphi, see Magou et al. 1991 and previous contributions in the BCH.
8. Frielinghaus 2007.
9. Aurigny 2010 and 2011.
10. Luce 2008.
11. Meirano, forthcoming (a), and Meirano 2016.
12. Tarditi 2016a; Tarditi 2016b; and her paper in this volume.
13. See, for example, Rolley 1991b, 187.
14. Herodotus 1.14, 1.25, 1.51.
15. Meirano 2016.
16. The bronze objects are particularly fragmentary at Delphi; they are often badly preserved and in some cases in need of conservation. These circumstances do not facilitate the identification of the "minimum number of individuals": see Meirano, forthcoming (a).
17. See, for example, the remarks about the occurrence of various kinds of weapons in the sanctuary of Olympia—and their implications—recently made by Graells i Fabregat (2016, 149 and fig. 1).
18. Meirano, forthcoming (b).
19. For a review of the find contexts of embossed rim basins in Greece, with further bibliography, see Meirano 2004, 306; Meirano 2012, 96; Baitinger 2013, 251–52.
20. Among the numerous contributions devoted to this topic, see Albanese 1979; Albanese Procelli 1980–81 and 1985.
21. Meirano 2004; 2005, 47–48; 2012, 97–102; 2014. In the same region, a few specimens come from the Greek colonies of Lokroi, Rhegion, and Kroton: see Meirano 2004, 306.
22. See Rolley 2003, 102–3, n. 15, figs. 59–61. For the particular status of the volute krater as a "prestige vase," especially in the metal version, also see: de La Genière 2014.
23. Rolley 1991a, 175, n. 43.
24. For example, see Siganidou 1979, 40, n. 35, plate 9 (from grave 1 of the Kozani necropolis).
25. For example, Rolley and Rougemont 1973, 515–16, n. 5, figs. 21–22; Rolley 1991a, 165, n. 32.
26. Rolley 1991a, 179, n. 49.
27. Meirano 2002.
28. For the practice of selective or partial dedication of metal vessels in western Greek sacred contexts, see Meirano 2014, 34; see also Meirano 2016. Concerning the separated offering of cuirass breastplates and back-plates at Olympia and in other Greek sanctuaries, see Graells i Fabregat 2016, 152–53.

29. Frielinghaus 2007, 147. See Meirano, forthcoming (a) and Meirano 2016 for further bibliography on this practice, also regarding mirrors, vases, and other types of weapons in Greek sanctuaries of southern Italy. For the deliberate damage to bronze objects at Olympia, see Frielinghaus 2006; Frielinghaus 2011, 185–200; about this practice regarding bronze cuirasses at Olympia, the destruction steps, and possible meanings, see Graells i Fabregat 2016.

Bibliography

Albanese 1979
Albanese, R. M. 1979. "Bacini bronzei con orlo perlato del Museo Archeologico di Siracusa." *BdA*: 1–20.

Albanese Procelli 1980–81
Albanese Procelli, R. M. 1980–81. "Intervento." *Kokalos* 26–27: 139–48.

Albanese Procelli 1985
Albanese Procelli, R. M. 1985. "Considerazioni sulla distribuzione dei bacini bronzei in area tirrenica e in Sicilia." In *Il commercio etrusco arcaico: Atti dell'incontro di studio, Salerno 5–7 dicembre 1983* (QArchEtr 9), 179–206. Rome: CNR.

Aurigny 2010
Aurigny, H. 2010. "Delphes au VIIe siècle." In *La Méditerranée au VIIe siècle av. J.-C.: Essais d'analyses archéologiques* (Travaux de la maison René Ginouvès 7), ed. R. Etienne, 234–49. Paris: de Boccard.

Aurigny 2011
Aurigny, H. 2011. "Le sanctuaire de Delphes et ses relations extérieures au VIIème siècle av J.-C.: Le témoignage des offrandes." In *Delphes, sa cité, sa région, ses relations internationales: Actes de la Table Ronde organisée les 24 et 25 septembre 2010* (Pallas: Revue d'études antiques 87), ed. J. M. Luce, 151–68. Toulouse: Presses Universitaire du Mirail.

Baitinger 2013
Baitinger, H. 2013. *Sizilisch-Unteritalische Funde in Griechischen Heiligtümern: Ein Beitrag zu den Votivsitten in Griechenland in spätgeometrischer und archaïscher Zeit*. Mainz: Verlag des Römisch-Germanischen Zentralmuseums.

École Française d'Athènes 1991
École Française d'Athènes. 1991. *Guide de Delphes: Le Musée*. Paris: de Boccard.

École Française d'Athènes 1992
École Française d'Athènes. 1992. *La redécouverte de Delphes*. Paris: de Boccard.

Frielinghaus 2006
Frielinghaus, H. 2006. "Deliberate Damage to Bronze Votives in Olympia during Archaic and Early Classical Times." In *Common Ground: Archaeology, Art, Science and Humanities, Proceedings of the XVIth International Congress of Classical Archaeology, Boston, August 23–26, 2003*, ed. C. C. Mattusch, A. A. Donohue, and A. Brauer, 36–38. Oxford: Oxbow Books.

Frielinghaus 2007
Frielinghaus, H. 2007. "Die Helme von Delphi." *BCH* 131: 139–85.

Frielinghaus 2011
Frielinghaus, H. 2011. *Die Helme von Olympia: Ein Beitrag zu Waffenweihungen in Griechischen Heiligtümern*. Olympische Forschungen 33. Berlin and New York: de Gruyter.

Graells i Fabregat 2016
Graells i Fabregat, R. 2016. "Destruction of Votive Offerings in Greek Sanctuaries: The Case of the Cuirasses of Olympia." In *Materielle Kultur und Identität im Spannungsfeld zwischen mediterraner Welt und Mitteleuropa: Akten der Internationalen Tagung am Römisch-Germanischen Zentralmuseum, Mainz, 22.–24. Oktober 2014*, ed. H. Baitinger, 149–60. Mainz: Verlag des Römisch-Germanischen Zentralmuseums.

Hansen 1960
Hansen, E. 1960. "Les abords du trésor de Siphnos à Delphes." *BCH* 84: 387–433.

Jacquemin 1992
Jacquemin, A. 1992. "En feuilletant le Journal de la Grande Fouille." In École Française d'Athènes 1992, 149–79.

La Genière 2014
La Genière, J. de, ed. 2014. *Le cratère à volutes: Destinations d'un vase de prestige entre Grecs et non-Grecs: Actes du Colloque international du Corpus Vasorum Antiquorum, Paris, 26–27 octobre 2012*. Cahiers du Corpus vasorum antiquorum (France) 2. Paris: de Boccard.

Luce 2008
Luce, J.-M., ed. 2008. *L'aire du Pilier des Rhodiens (fouille 1990–1992) à la frontière du profane et du sacré*. Fouilles de Delphes 2; Topographie et architecture 13. Athènes-Paris: de Boccard.

Magou et al. 1991
Magou, E., M. Pernot, and C. Rolley. 1991. "Bronzes orientaux et orientalisants: Analyses complémentaires." *BCH* 115: 560–77.

Masson and Rolley 1971
Masson, O., and C. Rolley. 1971. "Un bronze de Delphes à inscription chypriote syllabique." *BCH* 95: 295–304.

Meirano 2002
Meirano, V. 2002. "*Utensil stands* da Locri Epizefiri: Nuovi dati dalla necropoli di Lucifero e dal santuario di Mannella." In *I Bronzi antichi: produzione e tecnologia: Atti del XV Congresso Internazionale sui Bronzi Antichi, Grado-Aquileia 22–26 maggio 2001*, ed. A. Giumlia Mair, 117–26. Montagnac: Éditions Monique Mergoil.

Meirano 2004
Meirano, V. 2004. "Bacili ad orlo perlinato: nuovi dati dai contesti sacri della Calabria meridionale." In *The Antique Bronzes: Typology, Chronology and Authenticity: Acta of the 16th International Congress on Antique Bronzes, Bucharest, May 26th–31st, 2003*, ed. C. Muşeteanu, 305–17. Bucharest: Editura Cetatea de Scaun.

Meirano 2005
Meirano, V. 2005. "Vasellame ed *instrumentum* metallico nei santuari di Locri/Mannella, Hipponion/Scrimbia e Medma/Calderazzo." In *Lo spazio del rito: Santuari e culti in Italia meridionale tra indigeni e Greci: Atti delle giornate di studio, Matera 28–29/6/2002*, ed. M. L. Nava and M. Osanna (Siris: Studi e ricerche della Scuola di Specializzaizone in Beni archeologici di Matera, Suppl. 1), 43–53.

Meirano 2012
Meirano V. 2012. “Contributo alla conoscenza del vasellame bronzeo di età arcaica in Calabria meridionale: I bacili ad orlo perlinato.” In *Vincenzo Nusdeo sulle tracce della storia: Studi in onore di Vincenzo Nusdeo nel decennale della scomparsa*, ed. M. D’Andrea, 93–107. Vibo Valentia: AdHoc Edizioni.

Meirano 2014
Meirano, V. 2014. “Vasi, strumenti e altri oggetti: Offerte in metallo e pratiche rituali nei santuari greci della Calabria meridionale.” In *Le spose e gli eroi: Offerte in bronzo e in ferro dai santuari e dalle necropoli della Calabria greca*, ed. M. T. Iannelli and C. Sabbione, 32–38. Vibo Valentia: AdHoc Edizioni.

Meirano 2016
Meirano, V. 2016. “Bronze *phialai mesomphaloi* in Context: Some Recent and Older (Revisited) Case-studies.” In *Greek and Roman Bronzes from the Eastern Mediterranean: Acta of the XVIIth International Congress on Ancient Bronzes, Izmir (Turkey) 2016*, ed. A. Giumlia Mair and C. C. Mattusch, 79–86. Autun: Editions Mergoil.

Meirano, forthcoming (a)
Meirano, V. Forthcoming. “Étude des vases en métal et des instruments apparentés de Delphes, du VIème s. av. n. è. à l’époque romaine: Rapport 2014–2015.” *BCH* 139–40.2.

Meirano, forthcoming (b)
Meirano, V. Forthcoming. “Bassins à rebord perlé à Delphes.” In preparation.

Perdrizet 1908
Perdrizet, P. 1908. *Monuments figurés, petits bronzes, terres cuites, antiquités diverses*. Fouilles de Delphes 5; Monuments figurés 1. Paris: Albert Fontemoing.

Rolley 1969
Rolley, C. 1969. *Le statuettes de bronze*. Fouilles de Delphes 5; Monuments figurés 2. Paris: de Boccard.

Rolley 1977
Rolley, C. 1977. *Les trépieds à cuve clouée*. Fouilles de Delphes 5; Monuments figurés 3. Paris: de Boccard.

Rolley 1991a
Rolley, C. 1991. “Les bronzes: Statuettes et objets divers.” In *Guide de Delphes: Le Musée*, 139–79. Paris: École Française d’Athènes.

Rolley 1991b
Rolley, C. 1991. “Statues de bronze: fragments divers.” In *Guide de Delphes: Le Musée*, 187–89. Paris: École Française d’Athènes.

Rolley 1999
Rolley, C. 1999. “Delphes: Les bronzes.” *BCH* 123: 465–67.

Rolley 2002
Rolley, C. 2002. “Le travail du bronze à Delphes.” *BCH* 126: 41–54.

Rolley 2003
Rolley, C., ed. 2003. *La tombe princière de Vix*. Paris: Picard.

Rolley and Rougemont 1973
Rolley, C., and G. Rougemont. 1973. “Sondage à l’Est du sanctuaire d’Apollon: Catalogue des objets en métal.” *BCH* 97: 512–25.

Siganidou 1979
Siganidou, M. 1979. “Western Macedonia.” In *Treasures of Ancient Macedonia*, ed. K. Ninou, 38–47. Athens: Archaeological Museum of Thessalonike.

Tarditi 2016a
Tarditi, C. 2016. “The Athenian Archaic Bronze Vessel Production: New Evidence from Old Excavations.” In *Greek and Roman Bronzes from the Eastern Mediterranean: Acta of the XVIIth International Congress on Ancient Bronzes, Izmir*, ed. A. Giumlia Mair and C. C. Mattusch, 49–58. Autun: Editions Mergoil.

Tarditi 2016b
Tarditi, C. 2016. *Bronze Vessels from the Acropolis: Style and Decoration in Athenian Production between the Sixth and Fifth Centuries BC.* Rome: Edizioni Quasar.

26.

Toward the Derveni Krater: On the Rarity of Large Bronze Vessels of the Archaic and Classical Periods Bearing Large Figural Registers

Jasper Gaunt, Michael C. Carlos Museum, Emory University, Atlanta

Evidence is presented suggesting that large bronze vessels with figural registers in relief, such as the Derveni krater, were extremely rare in Classical times. The most significant reason for this may not have been technical, since large pieces of armor were decorated using precisely the same techniques at the same time. Rather, this rarity may reflect the high cost of labor-intensive work.

✦ ✦ ✦

Figure 26.1. Bronze volute-krater from Vix (Burgundy, France). Greek, Laconian, ca. 570 BC. Chatîllon sur Seine, Musée du Pays Chatîllonais, inv. nnn

Figure 26.2. Volute-krater from Derveni. Bronze with silver and copper. Greek, early fourth century BC. Thessaloniki, Archaeological Museum, inv. B1

A simple observation provides the point of departure for this paper. The decorative schemes of two Greek bronze volute-kraters—the Archaic one found at Vix in Burgundy (fig. 26.1) and the Late Classical one from Derveni near Thessaloniki (fig. 26.2)—differ radically.[1] The critical distinction lies in the prominent Dionysian frieze in high relief on the body of the latter. It is most unusual to find figural decoration at a large scale on the bodies of substantial Greek bronze vessels of the Archaic and Classical periods. The figural decoration on the body of the Derveni krater, too, was well outside the usual canon even at the time of manufacture, far removed from the generally austere appearance of Archaic and Classical bronze vessels, even when taking into account some important fifth-century developments in surface treatments, notably reeding. The restrained decoration of most Greek bronze vessels was a deliberate aesthetic choice, as suggested by comparison with contemporary pieces of armor: these are often much more elaborately embellished. Contemporary representations of these objects show that this difference is not simply a function of chance survival. This comparison inspires a generalizing rule: plain vessels, but elaborate armor. The contrast, I propose, goes back to the Homeric poems, which clearly articulate such a distinction. The underlying reasons for these profound differences, I will argue, may well have been economic.

In stark contrast to the opulence of the Derveni krater, the surviving large Greek bronze vessels of the Archaic and Classical periods (kraters, amphorae, hydriai, and so forth) are, to a remarkable degree, homogeneous in the restraint of their decoration. Three archaeological contexts are especially illuminating: the series of graves of Balkan chieftains at Trebenischte; the so-called heroon at Paestum; and the finds at Pischane, Ukraine.[2] Collectively, they account for over one hundred completely preserved bronze vessels. Leaving aside restricted pattern-work like shoulder tongues, every one of these vessels has a plain body. The decoration was confined primarily to the cast elements that served utilitarian functions—handles, feet, and bases—while on larger vases appliqués were sometimes also attached to the shoulder or neck. Well-known examples include the volute-krater from Trebenischte, now in Belgrade, and the hydria with a lion peering over the rim from Paestum.[3] This general scheme of decoration is also familiar from other shapes, such as the oinochoe in Budapest whose handle is modeled in the form of an equestrian astride the spout; or the pointed amphora at the Metropolitan Museum in New York (fig. 26.3), whose body is relatively elaborately decorated with shoulder tongues above a guilloche band.[4] Many more examples could easily be found, especially on hydriai.[5]

Figure 26.3. Pointed neck-amphora with stand. Bronze. Greek, ca. 500–450 BC. New York, Metropolitan Museum of Art, inv. 2004.171a–b
Image: © The Metropolitan Museum of Art, www.metmuseum.org CC0

This subdued decoration on larger vessels should, I believe, be respected as the considered choice of Greek metalsmiths and their customers, rather than reflecting any technical limitation. The craftsmen who made the Vix and Derveni kraters, for example, could surely have made anything they chose. Walls of vessels with figural decoration in repoussé like the Derveni krater were prone to crack, thereby causing leaks; but, as Beryl Barr-Sharrar has discovered, that krater was lined after completion with a protective layer of beeswax and a film of clay.[6] Furthermore, the concept of a double-walled vessel—the outer elaborately decorated, the inner a plain liner (familiar from small-scale Hellenistic and Roman silver cups)—is actually already present in the Archaic series of black- and red-figure psykter-amphorai and kraters that were made in Athens and Rhegium. These begin in the mid-sixth century with the Lydos amphora in London and continue until the Troilos Painter's column krater of around 470 BC, now in New York.[7] Earlier still is a series of Phoenician bowls with double walls, some of which found their ways into Greek contexts.[8]

Furthermore, the practice of decorating large areas of metalwork, whether through engraving, casting, repoussé, or a combination of techniques, is familiar from contemporary Greek armor. The famous breastplate from Olympia, with Zeus and Apollo between deities, exemplifies engraved work.[9] The magnificent shield devices document repoussé at a large scale: from the

Archaic griffin suckling her young or the “composite Gorgon” from Olympia to a Late Classical rampant lion in Mougins (fig. 26.4).[10] The shield bands offer a view into small-scale work using the same techniques; one in the J. Paul Getty Museum gives us the earliest of all signatures for metalsmiths, Aristodamos of Argos.[11] Other pieces of armor, notably helmets and their cheekpieces but also greaves, sometimes reveal astonishing decorative metalwork.[12] While a great deal of plain armor does of course survive, other examples were perhaps more for parade than for battle; the helmet in St. Louis (fig. 26.5),[13] for example, was evidently made for a figure of elevated importance, the very same class of persons that commissioned the vessels.

Figure 26.4. Shield device in the form of a rampant lion. Bronze with (missing) inlays. Macedonian, fourth century BC. Mougins, Museum of Classical Art, inv. 648

Image: © Musée d’Art Classique de Mougins (MACM) 2016

Figure 26.5. Helmet from Metaponto. Greek, South Italian, Archaic Period, 525-500 BC. Bronze with ivory and Bronze restoration. 19 ⅜ x 12 ¾ x 6 ¾ inches. Saint Louis Art Museum. Museum Purchase 282:1949

Image: St. Louis Art Museum

The restrained decoration accorded Archaic and Classical Greek bronze vessels stands in marked contrast not only to contemporary Greek armor but also to products of workshops outside Greece making similar vessels. The magnificent Orientalizing cauldrons from North Syria and elsewhere, with figures in high relief on the stands, were familiar enough in Greek sanctuaries.[14] They were also popular in Etruria, where they engendered elaborate local responses, such as the tripod cauldron from the Barberini tomb in Palestrina.[15] From Italy and central-northern Europe comes a series of bronze situlae whose walls are decorated all over with figural registers.[16] These were surely known in Greece because their elite Italic and Celtic owners supplied Greek aristocrats with the thoroughbred horses from the Veneto, which are attested as early as Alkman.[17]

The objection may be raised that, because so few Greek bronze vessels survive, any observations concerning their appearance are largely speculative. To counter this objection, we turn to traditions of representations of these vessels in four different media: coins, gems, terracottas, and back- and red-figure vases. Of these four, two—coins and gems—are interrelated, while images on terracottas and black- and red-figure vases stand apart. All four types, however, suggest independently that metal vessels with major figural decoration were extremely uncommon. Furthermore, the ceramic dinoid krater in the J. Paul Getty Museum (fig. 26.6) demonstrates that surviving examples do indeed correspond closely with their representations.[18] Just this sort of vessel is depicted on contemporary volute-krater fragments near the Pronomos and Talos Painters, now in Würzburg, while a neo-Attic marble version in a private collection evidently derives from the very same models (fig. 26.7).[19]

Figure 26.6. Red-figure dinoid volute-krater with stand, attributed to the Meleager Painter. Greek, Attic, ca. 380 BC. Malibu, J. Paul Getty Museum, Villa Collection, inv. 87.AE.93

Figure 26.7. Marble dinoid volute-krater. Greek, neo-Attic, first century BC–first century AD. Private collection
Image: Courtesy of Sotheby's, Inc. © 2017

On coins and gems, scale alone does not explain why figural decoration on vessels is not shown: these same objects record minute details of ornate hoplite equipment, particularly in the wake of Pheidias's chryselephantine Athena Parthenos.[20] Perhaps the most detailed glyptic example is the rather later intaglio in Rome signed by Aspasios that conscientiously reproduces the helmet of the Parthenos, but similar detail occurs on an earlier carnelian cameo of Perseus of Macedon, now in Paris, in which a centauromachy decorates his helmet.[21] On coins, helmets with elaborate figural decoration first appear on late fifth-century staters of Heraclea (continuing through the fourth century), and on gold twenty-litra coins of Camarina; and, through the fourth century, on staters of Thurium, distaters of Metapontum, and later didrachms of Hyele.[22] Representations of shield devices are encountered on staters minted in late fourth-century Taranto (depicting Pegasos) and Opuntian Locris (griffin); and on didrachms in early third-century Epirus under Pyrrhus (Gorgoneion).[23]

This wealth of figurally decorated armor recorded on gems and coins contrasts markedly with contemporary representations of metal vessels in the same media. Archaic and Classical glyptic representations of kantharoi clearly depict metal rather than ceramic vessels, as we know from the treatment of the handles and also from the aristocratic clientele they were made for.[24] Nevertheless, almost all of these vessels are represented as entirely plain. Just occasionally, as on the beaded rim of the kantharos held by a satyr and the krater that stands beside it on a famous scarab in London, some understated surface elaboration is suggested.[25] An Archaic glyptic representation of a hydria with reeding or tongues on the shoulder, and a Classical version of a calyx-krater with reeded body are preserved; but not, to my knowledge, vessels with figural decoration.[26]

A similar picture emerges in numismatics. The amphorai on Archaic coins from Athens, Chios, Terone, and of unknown Macedonian mint are naturally plain, being "transport" amphorai.[27] Yet so too are the many kantharoi depicted, most famously on early fifth-century staters of Naxos.[28] As with the gems, the only decoration accorded to vessels on coins is reeding, as for example on the shoulders of volute-kraters on fourth-century hemidrachms minted in Lamia and staters minted in Thebes.[29] As Barr-Sharrar has noted, these compare well with the shoulder tongues on the Derveni krater and those of an early Apulian volute-krater by the Painter of the Birth of Dionysos in Ruvo.[30]

Images on coins and gems, therefore, suggest that metal vessels were either plain or only partially decorated with pattern-work such as reeding. The terracotta plaques from Locri would tend to confirm this.[31] Three types depict a variety of vessels together. On one, in which Persephone returns folded cloth to a chest, a plain lekythos and kantharos are shown hanging from pegs.[32] A second type shows a table or cupboard on which stand four vessels: two plain alabastra, a plain pointed oinochoe, and a larger oinochoe with beaded rim, shoulder tongues, and tongues or rays at the foot.[33] A third type, with two women, one enthroned, depicts two phialai and a hydria hanging from pegs, while the seated woman holds a deep bowl. The bodies of all are reeded or, for the phialai, articulated with lobes.[34]

Evidence for the appearance of major figural decoration on metal vessels from representations on vase paintings is more complex, but it, too, strongly suggests its rarity.[35] Plentiful representations of vessels, sometimes washed in dilute glaze to approximate the appearance of polished metal, clearly depict these vases. The bail-handled amphora drawn in the tondo of a cup by Douris in New York (fig. 26.8) is clearly metal because the mechanism for the swinging handle is carefully drawn.[36] The hydriai carried as part of the Ransom of Hektor on the Brygos Painter's skyphos in Vienna furnishes another example.[37] Like surviving examples, the ones drawn are plain.

Figure 26.8. Attic red-figure cup with a woman carrying a bail-handled amphora, attributed to Douris, ca. 480 BC. New York, Metropolitan Museum of Art, inv. 1986.322.1. Gift of Norbert Schimmel

Image: © The Metropolitan Museum of Art, www.metmuseum.org CC0

There is also, however, an important series of images of vases on vases that do bear figural decoration. These are essentially confined in the sixth and fifth centuries to Attic black- and red-figure vases, and proliferate during the fourth century in Apulia. Dirk Oenbrink has compiled a list of around forty Attic examples, a number that, by comparison with the representations of plain vases, is almost insignificant.[38] Among many observations possible, two are pertinent. First, most such images appear in the late fifth and fourth centuries, a time when evidence exists for greater decorative elaboration on works of art in general. Second, while each example is unto itself, nevertheless several of them clearly reference ceramic rather than metal vases. Heading the list are the magnificent mid-sixth-century column-krater fragments in New York with the Return of Hephaistos, where maenads and satyrs fill two volute-kraters with wine.[39] Mary Moore has rightly argued that the ivy on the handles, the rays at the base, and the animal fight on one of them that compares so well with other black-figure kraters, all suggest the artist had ceramic rather than metal vases in mind.

The practice of reeding for toreutic vessels must, by contrast, have been widespread. We have already encountered it on the shoulder tongues of the Derveni krater, and in representations of vessels on coins, gems, terracottas, and even vase paintings. The technique spread to black-glazed pottery during the second quarter of the fifth century.[40] Although most common on small mugs, it is also found on larger vessels, especially hydriai but also on volute-kraters, not only black-glazed but also red-figure.[41] The Parthenon inventories record a golden oinochoe in this technique.[42] Brian Shefton rightly observed that the rising popularity of reeding may reflect emulation of Achaemenid metalwork,[43] but the practice may also follow natural diversification of pattern-work accorded to that most sacred of shapes, the phiale, which can be traced back into the seventh century.[44]

The limited evidence for surviving vessels similarly conceived with major relief friezes, like the Derveni krater, begins with the famous fragment of a late fifth-century cast calyx-krater with maenads in Berlin published by Wolfgang Züchner.[45] To this may be added a few cast statuettes of seated figures that may once have formed parts of kraters like that from Derveni, and an ancient plaster cast from something similar found at the Athenian Agora,[46] with the important proviso that they may or may not have been quite as elaborate.[47] Doubtless more common, being much smaller, were decorated situlae.[48] Yet even here the preponderance of surviving examples suggests that, in general, only small areas of the body at the handles were decorated, whether with figures or simply with palmettes associated with handle attachments. Situlae with larger friezes wrapping around the (upper) body would appear to have been much less common.[49] More recently, a spectacular bronze neck-amphora has come to light at Parion in the Troad. The body is decorated in relief with a Dionysian *thiasos*, while large plaques below the handles (their placement recalling hydriai) show Eros.[50]

A major source of late fifth- and fourth-century evidence must finally be acknowledged: the ceramic vases with figural decoration in relief spread over large surfaces of the body, made in Athenian workshops of the late fifth and fourth centuries. One such is the hydria by the Painter of the Wedding Procession depicting the struggle between Athena and Poseidon for Attica, familiar most recently from Beth Cohen's marvelous exhibition at the Getty, *The Colors of Clay*.[51] In light of the evidence for the rarity of what these ceramic versions appear to be emulating, perhaps we should think of them in terms that include elements of wishful fantasy as well as actual imitation.

This paper has argued for a conscious distinction between the generally restrained appearance of Archaic and Classical Greek bronze tableware and the exuberant decoration of contemporary armor. Symposiast and hoplite are, of course, one and the same person: a sort of ancient commonplace for Dr. Jekyll and Mr. Hyde. It remains to advance some explanation for this phenomenon. Elaborate armor, I suggest, would seem consciously to emulate the legendary examples starting with the most famous of all, the set made by Hephaistos at the request of Thetis for Achilles in the *Iliad*.[52] Such literary descriptions continue via the Shield of Herakles described by Pseudo-Hesiod, to those Aeschylus bestowed upon the shield devices carried by the Seven who fought against Thebes.[53] With these literary descriptions go both surviving examples and representations or derivations of others, not least the Pheidian Shield of Athena Parthenos, that are nothing less than spectacular.[54] Taken together, they make it clear that the Homeric (heroic) vision for going into battle armed with glorious metalwork was very much alive in Archaic and Classical Greece.

In contrast to the epic taste for supremely elaborate armor, the Homeric vision for tableware is notably plain. Many vessels are mentioned in the two epics, but only one is described at any length, the Cup of Nestor.[55] Of that cup's decoration, we learn only that it was beautifully wrought, that it was set with golden nails (rivets), that it had four handles, and that around these handles were fashioned two doves of gold, feeding. In other words, the vessel had a plain body, the decoration was confined to the handles, or near them, and the parts were assembled with rivets. This is precisely the character of bronze vessels of the Archaic and Classical periods that we have seen.

Archaic and Classical bronze vessels circulated in an intellectual climate in which the act of conferring a highly polished surface to the metal was probably more prized than its elaboration: the very gleam of polished metal rendered it intrinsically godlike. In the end, however, it was perhaps not a simple aesthetic preference for plain bronze vessels that was the driving force among Greek bronzesmiths and their customers, nor yet a desire to distinguish the appearance of armor from that of tableware, but rather the forces of raw economic reality. As Demaratus is quoted as saying to Xerxes, it was poverty that was native to Greece: "τῇ Ἑλλάδι πενίη αἰει κοτε συντροφός ἐστι."[56] An Athenian inscription, concerned with commissioning cult statues of Athena and Hephaistos for the Hephaisteion in 421/420 BC, records the price of tin and copper as 230 and 35 drachmae per talent (a talent weighing 25.86 kg or 57 lb.).[57] Put another way, a silver tetradrachm would purchase 448 grams of tin or 2,956 grams of copper. Very approximately, therefore, the cost of the raw materials—that is, the bullion value—of the Derveni krater, which weighs 40 kilograms (88 lb.) and contains 14.88 percent tin, would be 53.14 drachmae for the tin and 46 for the copper.[58] To this must be added provision for silver elements like the wreaths (possibly as much as 40 drachmae?), for a total of more than 140 drachmae for the materials alone. A second inscription, recording accounts for the Erechtheum, indicates that craftsmen in Late Classical Athens were paid one drachma per day.[59] The estimate reported by Barr-Sharrar that the Derveni krater "could well have taken five or six artisans, working together, more than eighteen months to produce,"[60] implies potentially staggering costs for the actual workmanship, something conceivably in the order of 3,000 drachmae. Although this estimate to my mind is greatly exaggerated, it presupposes that the labor costs alone for the Derveni krater could have purchased sufficient silver to make three full-size hydriai of the types mentioned in the Parthenon inventories.[61] Since these labor costs were completely unrecoverable in the frequent emergency situations that precipitated the melting down of metal plate, they must have struck many Greeks as an irresponsible and even profligate use of precious resources.

The impression that the sheer opulence of the Derveni krater is in some ways conceptually un-Greek may be refined by considering the findspots of the most elaborately decorated bronze vessels of the time. The Berlin krater with maenads was found in the northern Caucasus as part of the "Maikop Treasure." The Athenian red-figure vases with relief were made largely for export to the Black Sea or Italy; the situlae for the most part come from northern Greece and Thrace, the new neck-amphora came from the Troad, while the Derveni krater itself was inscribed for one Aristouneios who came from Larisa. Common to these regions is a greater depth of wealth than one would find in Greece itself. In such places, the resources could be found to expend enormous, irrevocable sums on tableware for the purpose of display.

✦ ✦ ✦

Acknowledgments

My warmest thanks to the congress organizers, Jens Daehner, Kenneth Lapatin, and Ambra Spinelli, as well as Jeffrey Spier and Paige-Marie Ketner. For valuable discussions, I thank Günter Kopcke and Andrew Stewart.

Notes

1. For the Vix krater, see Rolley 2003, 77–143. For the Derveni krater, see Barr-Sharrar 2008.
2. For the tombs at Trebenischte, see Filow 1927; Stibbe 2003. For the "heroon" at Paestum, see Rolley 1982, 26–27. For the finds from Pischane, see Hanina 1970; Reeder 1999, 193–205.
3. For the Belgrade krater, see Godart 2010. For the lion hydria from Paestum (Museo Archeologico Nazionale, inv. 49801), see Bennett et al. 2002, 126–29.

4. Budapest, Szépmúvészeti Múzeum, inv. LA 18: von Bothmer 1979, plate 21. New York, Metropolitan Museum of Art, inv. 2004.171a–b: Picón et al. 2007, 101, no. 107, 427.
5. Sowder 2009.
6. Barr-Sharrar 2008, 103.
7. London, British Museum, inv. B 148, by Lydos: *ABV* 109, no. 29; *BAPD* 310175. New York, Metropolitan Museum of Art, inv. 1986.11.12: Padgett 2002; *BAPD* 15922. On the series, see also Pasquier 1999. For the Chalcidian examples, see Rumpf 1927, 121–22.
8. Markoe 1985, 9.
9. Olympia Museum, inv. B 3501: Hampe and Simon 1981, 125–26, figs. 195–96.
10. Olympia Museum, inv. B 104: Hampe and Simon 1981, 110, fig. 170b (drawing); and B 4990 ("composite gorgon"): Rolley 1986, 152, fig. 135. Mougins, Musée d'art classique de Mougins, inv. 648: Merrony 2011, 183 and 196, fig. 40.
11. J. Paul Getty Museum, inv. 84.AC.11: *LIMC* [1992] VI 843, s.v. "Nessos," no. 97, plate 551; Mattusch 2014, 60–61, fig. 37. For shield bands in general, see Kunze 1950; Bol 1989.
12. For elaborately decorated armor, see (for instance) Hoffmann and Raubitschek 1972; Hampe and Simon 1981, 117–28; Pflug 1989 (helmets). For cheekpieces, see Aitken 1982; for a plaster cast in the Akademisches Kunstmuseum, Bonn, see Rolley 1986, 172, fig. 151.
13. St. Louis Art Museum, inv. 282.1949: Neils 1995, 443, fig. 18.
14. Herrmann 1966–79.
15. See n. 13.
16. For example, Bologna, Museo Civico Archeologico, from the Certosa cemetery: Sprenger and Bartoloni 1977, 125, no. 168 and figs. 168–69.
17. P Louvre E 3320, line 51. For an edition of this papyrus, see Page 1951; for a translation, Campbell 1988, 360–76.
18. Malibu, J. Paul Getty Museum, inv. 87.AE.93: Burn 1991; BAPD 44230.
19. Würzburg, Martin-von-Wagner-Museum, inv. H 4781: *ARV*^{2}1338, 1690; Barr-Sharrar 2008, 75, fig. 71; BAPD 217516. Sotheby's, New York, *Antiquities*, June 4, 2009, lot 119.
20. Lapatin 2001, 63–79.
21. Aspasios gem: Rome, Museo Nazionale Romano, Palazzo Massimo alle Terme, inv. 52382: Lapatin 2015, 135, plate 92, 246. Perseus gem: Vollenweider 1995, no. 201.
22. Heraclea: Kraay and Hirmer 1966, 309, nos. 255, 257, 258, plates 88–89. Camarina: Kraay and Hirmer 1966, 294, no. 153, plate 54. Thurium: Kraay and Hirmer 1966, 308–9, nos. 252–54, plates 87–88. Metapontum: Kraay and Hirmer 1966, 307, no. 242, plate 84. Hyele: Kraay and Hirmer 1966, 306, no. 227, plate 80.
23. Taranto: Kraay and Hirmer 1966, 315, no. 313, plate 107. Opuntian Locris: Kraay and Hirmer 1966, 338, no. 465, plate 148. Epirus: Kraay and Hirmer 1966, 339, no. 473, plate 150.
24. These include Archaic: London, British Museum, inv. 466: Boardman 2001, 181, no. 300 (satyr with kantharos and jug). Ex Ionides: Boardman 2001, 181, no. 302 (youth with jug and kantharos). Athens, Numismatic Museum, Tzivanopoulos Coll. 6: Boardman 2001, 183, no. 340 (satyr with amphora on shoulder, with Cypriot inscription). New York, Metropolitan Museum of Art, inv. 42.11.16 inscribed by Anakles: Boardman 2001, 185, no. 373 (reclining satyr holding out kantharos). Baltimore, Walters Art Museum, inv. 42.461: Boardman 2001, 185, no. 376 (kneeling satyr draws bow, a kantharos beside him). Classical: New York, Metropolitan Museum of Art, inv. 21.88.39: Boardman 2001, 199, fig. 205 and 283, fig. 205 (kantharos between dolphins). St. Petersburg, Hermitage inv. П.1850-31: Boardman 2001, 288, no. 470 (Chiot amphora). Once Oxford, Arthur Evans: Boardman 2001, 294, no. 613 (calyx krater). Once London market: Boardman 2001, 301, no. 774 (woman with torch and jug).
25. London, British Museum, Gem 465, inv. 1865,0712.106: Boardman 2001, 181, no. 301.
26. Reeded: Berlin, Antikensammlung, Staatliche Museen Preussischer Kulturbesitz, inv. F 159: Boardman 2001, 184, no. 358 (inscribed by Semon; naked girl kneels to fill hydria). Athens, Agora T 3334: Boardman 2001, 286, no. 271, and 235, fig. 271 (clay impression, on one face a calyx-krater).
27. Early Athenian amphora: Kraay and Hirmer 1966, no. 339, plate 114. Chios: Kraay and Hirmer 1966, 357, nos. 605–6, plate 180: Terone: Kraay and Hirmer 1966, 331, no. 401, plate 130. Uncertain Macedonian mint: Kraay and Hirmer 1966, 328, no. 374, plate 123.
28. Kantharoi are commonly depicted on coins, for example: Sicilian Naxos: Kraay and Hirmer 1966, 282, nos. 6, 7, 9, and 12, plates 2–4. Taranto: Kraay and Hirmer 1966, 314–15, nos. 298, 299, and 303, plates 103–5. Mende: Kraay and Hirmer 1966, 331, nos. 403–6, plates 130–31. Maroneia: Kraay and Hirmer 1966, 334, no. 430, plate 139. Thasos: Kraay and Hirmer 1966, 335, no. 438, plate 141. Thebes: Kraay and Hirmer 1966, 337, nos. 449–50, plate 144. Naxos: Kraay and Hirmer 1966, 345–46, nos. 523–24, plate 162.
29. Lamia: Kraay and Hirmer 1966, 339, no. 469, plate 149. Thebes: Kraay and Hirmer 1966, 337, no. 459, plate 145.
30. Ruvo, Museo Jatta, inv. 1494: *RVAp*, 35, no. 7; Sichtermann 1966, 35, no. 38, plates 56–59. Barr-Sharrar 2008, 74–100 passim.
31. Prückner 1968; Lissi Caronna 1997–2007.
32. Prückner 1968, plate 4.4.
33. Prückner 1968, plate 31.1.
34. Prückner 1968, plate 7.6.
35. On representations of vases on vases, see Gericke 1970.
36. New York, Metropolitan Museum of Art, inv. 1986.322.1: Buitron-Oliver 1995, plate 11; BAPD 1142.
37. Vienna, Kunsthistorisches Museum, inv. 3710: *ARV*^{2} 380, 171; Simon and Hirmer 1976, plates 146–47; BAPD 204068.
38. Oenbrink 1996.
39. Metropolitan Museum of Art, inv. 1997.388: Moore 2010.
40. For reeding, see Sparkes and Talcott 1970, 21–22.
41. For black glaze, see Kopcke 1964; for red-figure, notably the volute-krater, New York, Metropolitan Museum of Art, inv. 24.97.25a–b, and discussion, see Gaunt 2002, 305–18; Barr-Sharrar 2008, 92–95 and passim.
42. Harris 1995, 167, no. 293.
43. Shefton 1971.
44. For the shape, see Luschey 1939.
45. Antikensammlung, Staatliche Museen zu Berlin, Preussischer Kulturbesitz, inv. 30622: Züchner 1938; Barr-Sharrar 2008, 140–43, fig. 127 (part).
46. Agora T 2126: Reeder 1976, 52–53, no. 5, plate 6; Barr-Sharrar 2008, 84, fig. 76.

47. Barr-Sharrar 2008, 87–88 and 74–100 passim.
48. On bronze situlae, see Barr-Sharrar 1982, 2000; Shefton 1994.
49. E.g., Boston, Museum of Fine Arts, inv. 03.1001: Comstock and Vermeule 1971, 302–3, no. 428.
50. Parion PIC 214 from grave TSM2: Basaran 2015, 163–65 (H. Kasapoglu).
51. St. Petersburg, Hermitage, inv. P 1872.130: Cohen 2006, 339–41, no. 105; BAPD 6988.
52. *Iliad* 18.457–616.
53. Hesiod [*Scutum*]; Aeschylus, *Septem contra Thebas* 375–651.
54. Harrison 1981.
55. *Iliad* 11.631–36.
56. Herodotus 7.102.1.
57. *IG* 1^3 456–58, no. 457.
58. For the weight and metallurgical comparison of the Derveni Krater, see Barr-Sharrar 2008, 21, 31.
59. *IG* 1^3 459–76, nos. 474–79.
60. Barr-Sharrar 2008, 103 (quoting conservator Richard Stone and further corroborative conversation with metalworker John Tzelepis).
61. Harris 1995, 153, nos. 215–18, and 158–62, nos. 251–60. Their weights (values) are approximately 1,000 drachmae.

Bibliography

Aitken 1982
Aitken, B. T. 1982. "A New Cheekpiece." *AntK* 25, 58–61.

Barr-Sharrar 1982
Barr-Sharrar, B. 1982. "Macedonian Metal Vases in Perspective: Some Observations on Context and Tradition." In *Macedonia and Greece in Late Classical and Early Hellenistic Times*, ed. B. Barr-Sharrar and E.N. Borza, 123–40. Washington, DC: The National Gallery of Art.

Barr-Sharrar 2000
Barr-Sharrar, B. 2000. "Some Observations on the Cast Bronze Ovoid Situla." In *Antike Bronzen, Werkstattkreise: Figuren und Geräte. Akten des 14. Internationalen Kongresses für antiken Bronzen*, ed. R. Thomas, 277–90. Berlin: Gebr. Mann Verlag.

Barr-Sharrar 2008
Barr-Sharrar, B. 2008. *The Derveni Krater: Masterpiece of Classical Greek Metalwork*. Princeton: Princeton University Press.

Basaran 2015
Basaran, C. 2015. *Parion, The Flourishing City of Ancient Troad*. Istanbul: Ege Yayınları.

Bennett et al. 2002
Bennett, M., A. J. Paul, and M. Iozzo. 2002. *Magna Graecia: Greek Art from South Italy and Sicily*. Exh. cat. Cleveland, Cleveland Museum of Art. New York: Hudson Hills Press.

Boardman 2001
Boardman, J. 2001. *Greek Gems and Finger Rings: Early Bronze Age to Late Classical*. New expanded edition. London: Thames and Hudson.

Bol 1989
Bol, P. C. 1989. *Argivische Schilde*. Berlin: Walter de Gruyter.

von Bothmer 1979
von Bothmer, D. 1979. "A Bronze Oinochoe in New York." In *Studies in Classical Art and Archaeology: A Tribute to Peter Heinrich von Blanckenhagen*, ed. G. Kopcke and M. B. Moore, 63–67. Locust Valley, NY: J. J. Augustin.

Buitron-Oliver 1995
Buitron-Oliver, D. 1995. *Douris: A Master-painter of Athenian Red-figure Vases*. Mainz: Philipp von Zabern.

Burn 1991
Burn, L. 1991. "A Dinoid Volute-Krater by the Meleager Painter: An Attic Vase in the South Italian Manner." In *Greek Vases in the J. Paul Getty Museum, vol. 5,* 107–30. Malibu: J. Paul Getty Museum.

Campbell 1988
Campbell, D. A. 1988. *Greek Lyric*, vol. 2. Loeb Classical Library 476. Cambridge, MA: Harvard University Press.

Cohen 2006
Cohen, B. 2006. *The Colors of Clay: Special Techniques in Athenian Vases*. Exh. cat. Los Angeles, J. Paul Getty Museum.

Comstock and Vermeule 1971
Comstock, M. B., and C. Vermeule. 1971. *Greek, Etruscan and Roman Bronzes in the Museum of Fine Arts, Boston*. Boston: Museum of Fine Arts.

Filow 1927
Filow, B. 1927. *Die archaische Nekropole von Trebenischte am Ochrida-See*. Berlin: Walter de Gruyter.

Gaunt 2002
Gaunt, J. 2002. "The Attic Volute-krater." PhD diss., New York University, Institute of Fine Arts.

Gericke 1970
Gericke, H. 1970. *Gefäßdarstellungen auf griechischen Vasen*. Berlin: Hessling.

Godart 2010
Godart, L. 2010*. L'Italia e il restauro del Magnifico Cratere: Capolavori del Museo Nazionale di Belgrado*. Rome: Presidenza della Repubblica.

Hampe and Simon 1981
Hampe, R., and E. Simon. 1981. *The Birth of Greek Art, from the Mycenaean to the Archaic Period*. New York: Oxford University Press.

Hanina 1970
Hanina, O. D. 1970. *Antychni bronzy z Pishchanoho*. Kiev: Mystetstvo.

Harris 1995
Harris, D. 1995. *Treasures of the Parthenon and Erechtheion*. Oxford: Clarendon Press.

Harrison 1981
Harrison, E. B. 1981. "Motifs of the City Siege on the Shield of Athena Parthenos." *AJA* 85: 281–317.

Herrmann 1966–79
Herrmann, H.-V. 1966–79. *Die Kessel der orientalisierenden Zeit*. 2 vols. Berlin: Walter de Gruyter.

Hoffmann and Raubitschek 1972
Hoffmann, H., and A. E. Raubitschek. 1972. *Early Cretan Armorers*. Mainz: Philipp von Zabern.

Kopcke 1964
Kopcke, G. 1964. "Golddekorierte attische Schwarzfirniskeramik des vierten Jahrhunderts v. Chr." *AM* 79: 22–84.

Kraay and Hirmer 1966
Kraay, C., and M. Hirmer. 1966. *Greek Coins*. New York: Harry N. Abrams.

Kunze 1950
Kunze, E. 1950. *Archaische Schildbänder: Ein Beitrag zur frühgriechischen Bildgeschichte und Sagenüberlieferung*. Berlin: Walter de Gruyter.

Lapatin 2001
Lapatin, K. D. S. 2001. *Chryselephantine Statuary in the Ancient Mediterranean World*. Oxford: Oxford University Press.

Lapatin 2015
Lapatin, K. D. S. 2015. *Luxus: The Sumptuous Arts of Greece and Rome*. Los Angeles: J. Paul Getty Museum.

Lissi Caronna et al. 1999–2007
Lissi Caronna, E., C. Sabbione, and L. V. Borrelli, eds. 1999–2007. *I pinakes di Locri Epizefiri*. Rome: Società Magna Grecia.

Luschey 1939
Luschey, H. 1939. *Die Phiale.* Bleicherode am Harz: Nieft.

Markoe 1985
Markoe, G. 1985. *Phoenician Bronze and Silver Bowls from Cyprus and the Mediterranean*. Los Angeles and Berkeley: University of California Press.

Mattusch 2014
Mattusch, C. C. 2014. *Enduring Bronze: Ancient Art, Modern Views*. Los Angeles: J. Paul Getty Museum.

Merrony 2011
Merrony, M. 2011. *Musée d'art classique de Mougins: La collection famille Levett*. Mougins: Musée d'art classique de Mougins.

Moore 2010
Moore, M. B. 2010. "Hephaistos Goes Home: An Attic Black-figured Column-krater in the Metropolitan Museum." *MMJ* 45: 21–54.

Neils 1995
Neils, J. 1995. "The Euthymides Krater from Morgantina," *AJA* 99: 427–44.

Oenbrink 1996
Oenbrink, W. 1996. "Ein 'Bild im Bild'-Phänomen: Zur Darstellung figürlich dekorierter Vasen auf bemalten attischen Tongefässen." *Hephaistos* 14: 81–134.

Padgett 2002
Padgett, J. M. 2002. "A Unique Vase in the Metropolitan Museum of Art." In *Essays in Honor of Dietrich von Bothmer*, ed. A. J. Clark and J. Gaunt, 249–66. Amsterdam: Allard Pierson Museum.

Page 1951
Page, D. L. 1951. *The Partheneion, Alcman*. Oxford: Clarendon Press.

Pasquier 1999
Pasquier, A. 1999. "Un cratere-rafraichissoir au Musée du Louvre: du vin frais pour un banquet de luxe." *MonPiot* 78: 5–51.

Pflug 1989
Pflug, H. 1989. *Antike Helme: Antikenmuseum Berlin, Staatliche Museen Preussischer Kulturbesitz zu Gast im Rheinischen Landesmuseum*. Bonn: Römisch-Germanisches Zentralmuseum.

Picón et al. 2007
Picón, C., et al. 2007. *Art of the Classical World in the Metropolitan Museum of Art*. New York: Metropolitan Museum of Art; New Haven: Yale University Press.

Pruckner 1968
Pruckner, H. 1968. *Die lokrischen Tonreliefs: Beitrag zur Kultgeschichte von Lokroi Epizephyrioi.* Mainz: Philipp von Zabern.

Reeder 1976
Reeder, E. D. 1976. "Ancient Clay Impressions from Greek Metalwork." *Hesperia* 45: 41–66.

Reeder 1999
Reeder, E. D. 1999. *Scythian Gold: Treasures from Ancient Ukraine*. New York: Harry N. Abrams.

Rolley 1982
Rolley, C. 1982. *Les vases de bronze de l'archaïsme recent en Grande-Grèce*. Naples: Centre Jean Bérard.

Rolley 1986
Rolley, C. 1986. *Greek Bronzes*. London: Sotheby's Publications.

Rolley 2003
Rolley, C. 2003*. La tombe princière de Vix*. Paris: Picard.

Rumpf 1927
Rumpf, A. 1927. *Chalkidische Vasen*. Berlin: Walter de Gruyter.

Shefton 1971
Shefton, B. 1971. "Persian Gold and Attic Black Glaze: Achaemenid Influences on Attic Pottery of the 5th and 4th Centuries BC." *AAS* 21: 109–11.

Shefton 1994
Shefton, B. 1994. "The Waldalgesheim Situla: Where Was It Made?" In *Festschrift für Otto-Herman Frey zum 65 Geburtstag*, ed. C. Dobiat, 583–93. Marburg: Hitzeroth.

Sichtermann 1966
Sichtermann, H. 1966. *Griechische Vasen in Unteritalien: Aus der Sammlung Jatta in Ruvo*. Tübingen: Wasmuth.

Simon and Hirmer 1976
Simon, E., and M. Hirmer. 1976. *Die griechischen Vasen*. Munich: Hirmer.

Sowder 2009
Sowder, A. A. 2009. "Greek Bronze Hydriai." PhD diss., Emory University.

Sparkes and Talcott 1970
Sparkes, B. A., and L. Talcott. 1970. *Black and Plain Pottery of the 6th, 5th, and 4th Centuries B.C*. Athenian Agora 12. Princeton: Princeton University Press.

Sprenger and Bartoloni 1977
Sprenger, M., and G. Bartoloni. 1977. *Die Etrusker: Kunst und Geschichte*. Photography by Max and Albert Hirmer. Munich: Hirmer.

Stibbe 2003
Stibbe, C. M. 2003. *Trebenishte: The Fortunes of an Unusual Excavation*. Rome: L'Erma di Bretschneider.

Vollenweider 1995
Vollenweider, M.-L. 1995. *Camées et Intailles, Les Portraits grecs du Cabinet des médailles*. Catalogue raisonné. Paris: Bibliothèque nationale de France.

Züchner 1938
Züchner, W. 1938. *Der Berliner Mänadenkrater*. Berlin: Walter de Gruyter.

27.

Iconography of the Sea World on Late Hellenistic Bronze Vessels

Klara De Decker, Westfälische-Wilhelms-Universität, Münster

Our research focuses on the evolution of marine iconography in the Late Hellenistic period, as seen on bronze and silver vessels found along the Gulf of Naples. Representations of Triton, Scylla, and Medusa appear at times next to hippocampi, dogs, snakes, dolphins, and octopuses in high or low relief on the handles of various tableware. Compared to their canonical depictions, the deities here have lost their conventional attributes, which have become interchangeable. As part of Early Imperial propaganda, they acquire a new symbolic function, which differs from their original mythological meanings. The deities become ambiguous, more like generalized people with standardized marine features plus mixed or borrowed attributes. Good examples of this type of amalgamation are the Medusa with mussel and shell ears or the Scylla with seaweed on her face, both of which are attributes borrowed from Triton. Another important aspect is the quality of workmanship, which declined due to mass production and competition from cheaper imported vessels.

✦ ✦ ✦

The Mediterranean Sea has always captured the imagination of the Greeks, but at the end of the Hellenistic era, their artistic vision and technical knowledge were transferred to the Italian peninsula, where Roman craftsmen created artifacts that surpassed everything before. These craftsmen portrayed deities such as Poseidon, Amphitrite, Triton, Scylla, and Medusa, who lived in the sea, riding creatures like sea horses (hippocampi), sea wolves (*ketos*), dolphins, and other real and imaginary marine animals.[1] Wealthy Romans ate exotic meals off expensive tableware, in solemn settings;[2] some of their dishes were metal vessels decorated with reliefs (fig. 27.1).[3] The excavations at Pompeii and Herculaneum have led to the discovery of close to seventeen hundred bronze vessels, which can be categorized in any number of ways. Our interest here is in the iconography on the vertical part of the vessels' handles. The subjects can be divided into three main groups:

1. Reliefs depicting only vegetal motifs, such as tendrils, sprouts, and leaves.[4]
2. Reliefs depicting Dionysian objects (*tympanon*, *crotalon*, mask, *thyrsos*, or *narthex*), plants (ivy, grapes, poppies, and pomegranates), or animals (panthers, lions, and goats).[5]
3. Reliefs depicting sea life, such as hippocampi, fish, and sea deities.[6]

The sea themes are used particularly to decorate the handles; the lower attachment often ends with a face or figure of Medusa, Scylla, a Tritoness, or Triton, the faces of the latter two usually covered with kelp and seaweed. We will describe several such vessels, followed by a discussion of their significance.

Figure 27.1. Triton and Nereid on a silver kantharos. Mid-first century BC. Naples, Museo Archeologico Nazionale di Napoli, inv. 144802

Image: Su concessione del Ministero dei Beni e delle Attività Culturali e del Turismo – Museo Archeologico Nazionale di Napoli

A Pathetic Triton[7]

The first vessel under discussion is a bronze calyx-krater with pedestal in the Museo Archeologico Nazionale, Naples, which was found on May 16, 1873, at Pompeii, in the atrium of the house designated II 2.10 (fig. 27.2).[8] It is high-quality imported ware, dating to the second quarter of the first century BC. Its height is 75.5 centimeters (29 ¾ in.) including the handles. The krater has two curled handles, decorated at the top with three acanthus leaves. Below, the handles have oval attachments on each side, with acanthus leaves in low relief covering them. There is an *emblema* in between, which is soldered onto the shoulder of the krater. On it, a somber image of Triton can be seen in high relief; one side has black patina, the other side verdigris. A male face with silver-inlaid eyes (now missing) is framed by tousled hair in which are entangled the fishtails of two sea wolves. The ears are shaped like mussels; seaweed trails over the eyebrows; fins stick out behind the jaw. The open lips show copper inlay, displaying teeth inlaid with silver. Under his chin, two sea panthers hold an octopus. Made at the end of the Late Hellenistic period in open-work technique, the handle has several parts soldered on, namely the head of the sea wolf, lips, and fins. On the black-patinated side, one of the two sea wolves is broken.[9]

Figure 27.2. Bronze calyx-krater with *emblema* showing pathetic Triton with a *ketos* head. Second quarter of the first century BC. Naples, Museo Archeologico Nazionale di Napoli, inv. 109697

Image: Su concessione del Ministero dei Beni e delle Attività Culturali e del Turismo – Museo Archeologico Nazionale di Napoli

A Two-Faced Triton

The calyx-krater with pedestal, now in Berlin, is from Boscoreale.[10] Its height is 64 centimeters (25 ¼ in.) including the handles. The handle was analyzed in 2001 at the Rathgen Labor using atomic absorption spectrometry; it was found to be 84.7 percent copper, 11.47 percent tin, and less than 1 percent lead. The alloy was typical for South Italian bronze casting, according to Josef Riederer.[11] These results confirm Andreas Oettel's earlier supposition that the krater was manufactured in Campania, although Eastern artisans cannot be ruled out.[12] Various dates have been proposed for this vessel; Lucia Pirzio Biroli Stefanelli suggested the second half of the first century BC;[13] Anna Elisabeth Riz suggested the second quarter of the first century BC;[14] Erich Pernice favored a date after the Augustan period.[15]

The handles of the Boscoreale krater are decorated in low relief, displaying acanthus leaves. It has simple, half-oval attachments. Its uniqueness lies in the fact that Triton is depicted as both male and female on the same vessel in high relief. The male face, unlike the female, is covered with seaweed, like the retreating waves; the female face, by contrast, is smooth and peaceful, like a calm sea. In the wavy hair (which they share), there are several snakes, and the ears are mussel-shaped. Under the chin is an octopus; along the face are two sea wolves with gaping mouths. The high relief is made with the utmost care and skill, its light-and-dark contrasts showing up particularly well among the locks of hair. The whole composition consists of a single block. This artifact shows great technical skill but does not use open-worked surfaces. Because of this, we suggest a date the end of the first century BC to the beginning of the first century AD.

A Grim-Faced Deity

Handle fragments (lower attachment) from a calyx-krater, now in Geneva, were retrieved from Ostia (fig. 27.3).[16] The length of the handle is 9.2 centimeters (3 ⅝ in.). It shows a male face in whose tousled hair two serpent heads writhe. The ears are again shaped like mussels, and seaweed clings above the eyebrows; the eyes, once glass or silver, are now lost. The face is covered with kelp; the mouth is slightly open. Two dogs are under his chin, and below that, two dolphins with an octopus between them. As to the iconography, several hypotheses have been advanced. Walther Fol thought it could represent Medusa;[17] Waldemar Deonna suggested Scylla;[18] and finally Christiane Dunant proposed that it might be a Triton or another sea god.[19] The seaweed would be typical for Triton. One is immediately struck by the rather grim expression of the deity. Paired animal figures, like the dog heads and dolphins surrounding an octopus and placed symmetrically, are common motifs (see “The Two-Faced Triton” from Boscoreale). The workshop was likely in Campania or Capua, or in the East.[20] Our estimated date for this handle fragment is post-Augustan to middle of the first century AD. The three works listed so far are in chronological order, the earliest being the Pompeian krater, followed by the Boscoreale krater, and finally this piece.

Figure 27.3. Lower attachment of krater handle. After AD 14 to ca. AD 50. Geneva, Musée d’Art et d’histoire, inv. MF 1207. C. Dunant, Une applique de bronze en relief published in: *Gestalt und Geschichte. Festschrift Karl Schefold zu seinem 60. Geburtstag am 26. Januar 1965*, edited by M. Rohde-Liegle. Beihefte zur Antike Kunst 4 (Bern 1967), Pl. 37

There are numerous comparanda for the shape:[21] a silver kantharos from the northeast Mediterranean, but without handle, dated between 46 and 15 BC;[22] a large krater from the Hildesheim treasure (a collection of silver wares of various origins), surely earlier than the middle of the first century AD;[23] and a kantharos from the West Cemetery at Meroë with Greek inscription.[24] Handles formed from two curled rods were common since the Early Hellenistic period.[25]

Tritons, Young and Old

A silver handle at the J. Paul Getty Museum, which likely once belonged to an askos, shows an older but still very powerful Triton. The length of the handle is 24 centimeters (9 ½ in.). His mustache and beard frame his thick-lipped mouth; he has intense large eyes and equine ears.[26] The pathos in his facial expression is typical of the Hellenistic style. The handle was dated by Beryl Barr-Sharrar between 100 and 50 BC, the region of production being probably around Tarentum in Magna Graecia.[27]

Our next example, in the Petit Palais, Paris, may have been found near Smyrna. It is of a type similar to the Getty handle, but it has a female torso ending in a long scabrous tail. It wears a double crown of acanthus leaves. Judith Petit considers it a Roman work and connects it to art from Asia Minor.[28]

Another interesting bronze is the Triton and hippocampus statuette group in the Elie Borowski collection.[29] Triton is depicted as a muscular youth, with semi-long tousled hair and wearing a loincloth made of three rows of acanthus leaves. The hippocampus is constrained with the crab claws of Triton, his demeanor exuding truculence. The group was made around 180 BC and is considered the work of a Rhodian artist.[30]

The next significant example of a bronze vessel handle is again in the J. Paul Getty Museum,[31] formerly part of the Fleischman Collection. It shows a young woman, perhaps a Tritoness or Scylla (depicted without dogs), which lies above an enlarged face of an old Triton. She holds a rudder in her right hand and appears peaceful; her long hair is parted in the middle, and she is wearing a simple crown or a hair band. She is naked save for a skirt made of long acanthus leaves that ends in a curved, hook-like fishtail. Crab claws typical of pereiopods reach out from underneath Triton’s thick hair; his face is covered in seaweed, his mouth is agape, with two dolphins beneath the chin; the eyes and fins along the jaw are made in silver inlay. This is a manifestation of a solemn or philosophical Triton and can be dated from the late first century BC to the early first century AD.[32]

Figure 27.4. Jug handle with dolorous Triton, silver inlays, and open work. Ca. 50 BC to ca. AD 50. Naples, Museo Archeologico Nazionale di Napoli, inv. 72600

Image: Su concessione del Ministero dei Beni e delle Attività Culturali e del Turismo – Museo Archeologico Nazionale di Napoli

Another handle belonging to Tassinari's Pompeian Type B 1222,[33] in the Archaeological Museum in Naples, is from Herculaneum (fig. 27.4).[34] The length of the handle is decorated in low relief, with a face peering through acanthus leaves, then an unfurling scroll of acanthus leaves from the side, with a bordering bead pattern. The lower attachment, in high relief, bears a mask of a sea god; there are two wings in his tousled hair, with snakes, dogs, and coiled serpents in three sets above. He has mussel ears, silver-encrusted eyes, a seaweed-covered face, an open mouth, inlaid silver teeth, and a chin ending in a knotted serpent's tail. Below this on the left and right are dolphins holding an octopus in the center with their open mouths.[35] The composition in high relief is an open work and the surface is not continuous; these details are characteristic for the period from the second half of the first century BC to the middle of the first century AD.[36]

Then we have two jugs with large mouths, again Type B 1222 and also in Naples, which were found in Pompeii in 1862.[37] Their height is 41.5 centimeters (16 ¼ in.). The jugs are of high quality; the body color is verdigris, and the rim has two grooves. The horizontal part of the handle is flanked, left and right, by birds' heads; in the center of the two attachments is a thumb rest in the form of a curved leaf, originally inlaid with silver. The transverse band consists of three rows of beads, dividing the horizontal and vertical parts. The vertical part of the handle is in low relief with a scroll of twisting leaves on the sides, edged again by a beaded pattern. The lower attachment depicts the face of a sea god; in his tousled hair are two *ketoi*, his face is covered with seaweed, and under his chin are two dolphins and an octopus in high relief, with silver inlay in the eyes.[38] The composition of the Triton is entirely closed. This piece comes from the middle of the first century AD.

Figure 27.5. Jug handle attachment with the head of a Triton on a vine leaf. Mid-first century AD. Pompeii, Soprintendenza Archeologica di Pompei, inv. 55687

Image: Su concessione del Ministero dei Beni e delle Attività Culturali e del Turismo – Museo Archeologico Nazionale di Napoli

One of the bigger jugs of Type B 1222 was found in the cubiculum of the Casa dell'Ara Massima in Pompeii; its height is 42.6 centimeters (16 ¾ in.), including the handles (fig. 27.5).[39] The jug's rim has numerous grooves; the body is large, and its bottom consists of several concentric circles in high relief. The top of the handle depicts horizontal bird heads, rather plainly; the thumb rest in the center has thin leaves around it. The transverse band consists of three lines of beaded decoration; as is often the case, the silver inlay is missing. The vertical part of the handle has a cascade of leaves in low relief. The lower attachment is decorated with a vine leaf in the background, and Triton with his free-flowing hair has been placed over it. He has shell ears, but here the ears look more pointy than shell-like. His face is covered with seaweed. The iconographic significance is that the head of Triton now incorporates many Dionysian elements. The craftsmanship is of lower quality in comparison to the previously mentioned works and, again, the silver inlays in the eyes are missing. The composition is entirely closed. The piece looks very much like something mass-produced or made by an apprentice just learning his craft. The date of manufacture is the middle of the first century AD or somewhat later; the piece was probably produced in Alexandria, as indicated by the engraved leaves and the thumb rest with a crown of leaves.

Still another jug, also belonging to Type B 1222, comes from Pompeii I 9.5, the House of the Orchard (Casa del frutteto).[40] Its height is 37.2 centimeters (14 ½ in.) including the handles; the length of the handle alone is 21.5 centimeters (8 ½ in.). In line with the previous examples, its transverse band consists of three lines of beads, the silver inlay long ago eroded. The vertical part has a line of leaves in low relief; the surface has lost definition and become quite worn over time. The lower attachment is decorated with a male head in high relief, his wild wavy hair with a *taenia* on top with two wings; the forehead is covered with seaweed.[41] The iconographic emphasis here shows once more how Triton appears with Dionysiac elements (e.g., the *taenia*), but his expression is severe. The composition is closed. Manufacturing date seems to be the middle of the first century AD or after, probably from a workshop at Alexandria but fashioned after a different model from the previous handle.

Conclusion

Figure 27.6. Jug handle with Tritoness. Mid-first century AD. Naples, Museo Archeologico Nazionale di Napoli (no inv. no.)

Image: Su concessione del Ministero dei Beni e delle Attività Culturali e del Turismo – Museo Archeologico Nazionale di Napoli

It seems hardly coincidental that the sea world that artistically inspired the various maritime themes discussed here reflects the cultural, financial, and political issues affecting the human realm. It tells a story of artisans from the East looking for patrons who could afford what we call Hellenistic craftsmanship (fig. 27.6). Traveling across the Mediterranean to cities like Naples or Capua, artists set up their workshops close to their clients. It is highly probable that these artisans became specialized, becoming what we will now call Triton Masters (fig. 27.7). Most of the more ostentatious pieces were made in the mid-first century BC, like the kraters, in which the deities were shown in their traditional iconographical contexts. Even if we don’t know him by name, the master behind these works is recognizable; take, for instance, the highly detailed mussel-shaped ear of Triton (see figs. 27.2–5, 27.7). Then came a period from the late first century BC, when artifacts are complex open works in high relief, accentuated with silver inlays. This is where the archetypes become more ambiguous. Augustus’s naval victory at Actium in 31 BC became associated with the figure of Triton, and artisans added qualities of Triton to representations of other deities in support of Augustus’s political propaganda (fig. 27.8). This is also the phase when the pathos of Triton is most eloquently expressed. As prosperity increased in the Early Imperial period, lifestyles of the upper class became more lavish and elaborate. Higher demand during this phase—around the middle of the first century AD—caused an increased production and combined with the public’s interest in Alexandrian style to stimulate the next notable development in craftsmanship. The masters in charge began making tableware series using standardized techniques.[42] It is also likely that they assigned much of the manufacturing to their apprentices, including many migrants from the East. This would explain why there is such a notable range of quality during this period. The distinctive mussel-ear shape inherited from

Figure 27.7. Handle with Medusa/Tritoness head with dolphins and octopus. Mid-first century AD. Naples, Museo Archeologico Nazionale di Napoli, inv. 69081

Image: Su concessione del Ministero dei Beni e delle Attività Culturali e del Turismo – Museo Archeologico Nazionale di Napoli previous masters devolves into pointed ears; even Triton's pathos gets lost in the poor execution.

Figure 27.8. Jug handle with young Triton with seaweed on the front. Late first century BC. Hartford (CT), Wadsworth Atheneum, inv. 1917.864. Gift of J. Pierpont Morgan Jr., 1917.864
Image: Allen Phillips/Wadsworth Atheneum

Finally, vessels produced during the last quarter of the first century AD feature a union between Triton and Dionysos. In doing so, the Triton Masters take this deity to his next transformation.

✦ ✦ ✦

Acknowledgments

Many thanks are due to S. Tassinari, S. Descamps, C. Pouzadoux, V. Sampaolo, A. Villone, F. Miele, A. Milanesi, G. Albano, D. Salzmann, R. Dylka, and J. Chamay.

Notes

1. Andreae 2003, 150–53, 270–72.
2. Dunbabin 2003, 55, fig. 26.
3. De Decker 2007/2008, 93, plate 22.16; Guzzo 2006, 81, no. 8 (Cassetta); 137, no. 168 (Stefani); 140, no. 171 (De Carolis); Stefani 2005, 64, no. 69; Carandini 1977, 166, plate 80.22.
4. Tassinari 1975, 175, fig. 7c (Museo Archeologico Nazionale di Napoli [hereafter MANN], inv. 69491).
5. Tassinari 1975, 167, fig. 3a (MANN, inv. 69488).
6. For example, Balty 1965, 52 no. 25; p. 54, no. 52, plates 6–7; Tassinari 1975, 169, fig. 4d (MANN, inv. 69489); Faider-Feytmans 1979, 177, no. 362; Tassinari 2002, 367, fig. 8; Ratković 2005, 74, no. 21; MANN, inv. 115565 and 115570.
7. *LIMC* 8 (1997), 68–85, s.v. "Triton, Tritones" (Icard-Gianolio).
8. MANN, inv. 109697. History of the find: MANN Archivio storico, folio 47, no. 1. (I am very grateful for the support I received when using the archive.)
9. Riz 1990, 38, plate 5.2.
10. Berlin, Staatliche Museen, Antikensammlung, inv. Misc. 8850. Boscoreale, K. 23, finding group 1: Oettel 1990, 24.
11. Riederer 2001, 177–98. The full results were: Cu 84.7%, Sn 11.47%, Pb 0.8%, Zn 0.002%, Fe 0.13%, Ni 0.11%, Ag 0.08%, Sb 0.02%, As 0.05%, Bi 0.025%, Co 0.005%, Au 0.01%, Cd 0.001%.
12. Oettel 1990, 25–26.
13. Pirzio Biroli Stefanelli 1990, 253, 284, fig. 240, no. 121.
14. Riz 1990, 38, plate 5.2.
15. Pernice 1925, 40–41, figs. 50–51, group III.
16. Geneva, Musée d'Art et d'histoire, inv. MF 1207: Fol 1874, 261, no. 1207.
17. Fol 1874, 261.
18. Deonna 1912, 39.
19. Dunant 1967, 110–14.
20. Riz 1990, 42–48.
21. The typology belongs to Y 1100: see Tassinari 1993, 2: 344–45.
22. Oliver 1980, 159–61, 166, figs. 10–11.
23. Pernice and Winter 1901, 64–65, plate 35.
24. Mielsch and Niemeyer 2001, 3–4, fig. 1.
25. Trofimova 2007, 170–73, nos. 74 and 76, from the Crimea (third century BC). Other comparanda include: Oliver 1977, 48–50, nos. 17–18; Oliver 1977, 64–65, nos. 31–32 (early Hellenistic); Oliver 1977, 100–101, nos. 56–57 (Tivoli hoard, dated mid-first century BC); Oliver 1977, 124–25, nos. 78–79, from a burial at Olbia, dated first century BC; and finally one from Palmi in South Italy, Guzzo 1980, 203, fig. 6, dated first century BC.
26. Los Angeles, J. Paul Getty Museum, inv. 85.AM.163. Barr-Sharrar 1993; cf. Christie's (New York), *Antiquities*, June 16, 2006, lot 158; dated second–first century BC. For an identical pair of Tritons as a vessel handle, see Royal Athena Galleries, *Art of the Ancient World* 73 (1997), 10–11, no. 40, from an Alexandrian workshop.
27. Barr-Sharrar 1993, 99–106.
28. Petit 1980, 79–80, no. 25.
29. Andreae et al. 2002.
30. Andreae et al. 2002, 5.
31. Los Angeles, J. Paul Getty Museum, inv. 96.AC.181.
32. Getty Museum 1994, 272–73, no. 138 (Ariel Herrmann).
33. Tassinari 1993, 2:23–39.
34. MANN, inv. 72600.
35. Tassinari 1975, 175, fig. 7g (face); 189, fig. 14c (the upper attachment of the handle).
36. Drexel 1909, 178.
37. MANN, inv. 69492–93, found in Pompeii on September 26, 1862.
38. Tassinari 1975, 175, 224, fig. 7f, fig. 18e (lower attachment); MANN, inv. 69492.
39. Soprintendenza Archeologica di Pompei, inv. 3169, Pompeii VI 16.15 (Casa dell'Ara Massima); Tassinari 1975, 175, figs. 7e and 18b; Tassinari 1993, 1: 179, plate 135.3–4.
40. Soprintendenza Archeologica di Pompei, inv. 8579; Tassinari 1993, 1: 139, plate 135.1–2.
41. Tassinari 1975, 175 figs. 7d and 18c.
42. Nuber 1972.

Bibliography

Andreae 2003
Andreae, B. 2003. *Antike Bildmosaiken.* Mainz: Philipp von Zabern.

Andreae et al. 2002
Andreae, B., S. Kansteiner, and M. Kunze. 2002. *Meeresgott und Seepferd: Ein neuentdecktes Meisterwerk griechischer Bronzekunst aus Jerusalem*. Exh. cat. Stendal, Winckelmann-Museum.

Balty 1965
Balty, J.-Ch. 1965. "Une anse d'aiguière d'époque romaine à incrustation d'argent." *BMusBrux* 37: 13–77.

Barr-Sharrar 1993
Barr-Sharrar, B. 1993. "A Silver Triton in the Getty Museum." In *Studia Varia from the J. Paul Getty Museum* 1: 99–106. Malibu: J. Paul Getty Museum.

Carandini 1977
Carandini, A. 1977. "Alcune forme bronzee conservate a Pompei e nel Museo Nazionale di Napoli." In *L'Instrumentum domesticum di Ercolano e Pompei nella prima età imperiale*, ed. M. Annecchino et al. (Quaderni di cultura materiale 1), 163–68. Rome: L'Erma di Bretschneider.

Dahy 2005/2006
Dahy, I. 2005/2006. "La collection de bronzes du Musée de l'Arles et de la Provence antiques: Étude du mobilier issu de découvertes récentes." Thesis, Université de Provence, Aix–Marseilles III.

De Decker 2007/2008
De Decker, K. 2007/2008. "Une olpé au Musée Hongrois des Beaux-Arts: La cruche de Budapest." *Boreas* 30/31: 73–103.

Deonna 1912
Deonna, W. 1912. "Bronzes du Musée de Genève." *RA* 1912.2: 32–42.

Di Cresce 1995
Di Cresce, A. 1995. "133 Brocche con imboccatura circolare: B 1240–1260." Thesis, Università Federico II, Naples.

Drexel 1909
Drexel, F. 1909. "Alexandrinische Silbergefässe der Kaiserzeit." *BJb* 118: 176–235.

Dunant 1967
Dunant, C. 1967. "Une applique de bronze en relief." In *Gestalt und Geschichte: Festschrift Karl Schefold zu seinem 60. Geburtstag am 26. Januar 1965* (Beihefte zur AK 4), ed. M. Rohde-Liegle, 110–14. Bern: Francke.

Dunbabin 2003
Dunbabin, K. M. D. 2003. *The Roman Banquet: Images of Conviviality.* Cambridge: Cambridge University Press.

Faider-Feytmans 1979
Faider-Feytmans, G. M. 1979. *Les bronzes romains de Belgique*. Mainz: Philipp von Zabern.

Fol 1874
Fol, W. 1874. *Catalogue du Musée Fol: Antiquités*. Vol. 1: *Céramique et plastique*. Geneva: H. Georg Cherbulier.

Getty Museum 1994
J. Paul Getty Museum. 1994. *A Passion for Antiquities: Ancient Art from the Collection of Barbara and Lawrence Fleischman*. Malibu: J. Paul Getty Museum in association with the Cleveland Museum of Art.

Guzzo 1980
Guzzo, P. G. 1980. "Argenteria da Palmi in ripostiglio del I sec a C." *AttiMGrecia* 18–20 (1977–79): 193–209. Rome: La Società.

Guzzo 2006
Guzzo, P. G. 2006. *Argenti a Pompei*. Verona: Electa Milano.

Mielsch and Niemeyer 2001
Mielsch, H., and B. Niemeyer. 2001. *Römisches Silber aus Ägypten in Berlin*. Winckelmannsprogramm der archäologischen Gesellschaft zu Berlin 139/140. Berlin: Walter de Gruyter.

Nuber 1972
Nuber, H. U. 1972. *Kanne und Griffschale: ihr Gebrauch im täglichen Leben und die Beigabe in Gräbern der römischen Kaiserzeit.* Berlin: de Gruyter.

Oettel 1990
Oettel, A. 1990. *Bronzen aus Boscoreale in Berlin.* Berlin: Antikenmuseum.

Oliver 1977
Oliver, A., Jr. 1977. *Silver for the Gods: 800 Years of Greek and Roman Silver* Exh. cat. Toledo (OH), Museum of Art.

Oliver 1980
Oliver, A., Jr. 1980. "A Set of Ancient Silverware in the Getty Museum." *GettyMusJ* 8: 155–66.

Pernice 1925
Pernice, E. 1925. *Die hellenistische Kunst in Pompeji*. Vol. 4. *Gefässe und Geräte aus Bronze.* Berlin and Leipzig: Walter de Gruyter.

Pernice and Winter 1901
Pernice, E., and F. Winter, eds. 1901. *Der Hildesheimer Silberfund.* Berlin: Spemann.

Petit 1980
Petit, J. 1980. *Bronzes antiques de la Collection Dutuit: Grecs, hellénistiques, romains et de l'Antiquité tardive*. Paris: Musée du Petit Palais.

Pirzio Biroli Stefanelli 1990
Pirzio Biroli Stefanelli, L. 1990. *Il Bronzo dei Romani: Arredo e suppellettile*. Rome: L'Erma di Bretschneider.

Ratković 2005
Ratković, D. 2005. *Roman Bronze Vessels in the Roman Collection of the National Museum in Belgrade*. Belgrade: Narodni Muzej.

Riederer 2001
Riederer, J. 2001. "Die Berliner Datenbank von Metallanalysen kulturgeschichtlicher Objekte III: Römische Objekte." *Berliner Beiträge zur Archäometrie* 18: 139–259.

Riz 1990
Riz, A. E. 1990. *Bronzegefässe in der römsich-pompejanischen Wandmalerei*. Mainz: Philipp von Zabern.

Sarnataro 1998
Sarnataro, T. 1998. "138 Paterae." Thesis, Università Federico II, Naples.

Stefani 2005
Stefani, G. 2005. *Cibi e sapori a Pompei e dintorni*. Exh. cat. Pompeii, Antiquarium di Boscoreale. Pompeii: Edizioni Flavius.

Tassinari 1975
Tassinari, S. 1975. “Pot à anse unique: Étude du décor des anses d’un type de récipients en bronze d’Herculanum et de Pompéi.” *CronPomp* 1: 160–231.

Tassinari 1993
Tassinari, S. 1993. *Il vasellame bronzeo di Pompei.* 2 vols. Rome: L’Erma di Bretschneider.

Tassinari 2002
Tassinari, S. 2002. “Observations et propos sur la fabrication des anses de récipients de Pompéi.” In *I Bronzi Antichi: Produzione e tecnologia: Atti del XV Congresso Internazionale sui Bronzi Antichi organizzato dall’Università di Udine, sede Gorizia Grado-Aquileia, 22–26 maggio 2001*, ed. A. Giumlia-Mair, 363–69. Montagnac: Monique Mergoil.

Tassinari 2009
Tassinari, S. 2009. *Vasi in bronzo, brocche, askoi, vasi a paniere*. Naples: Electa.

Tassinari 2015
Tassinari, S. 2015. “De la spécificité typologique du décor des anses: L’exemple de la catégorie des cruches trilobées D.” In *New Research on Ancient Bronzes: Acta of the XVIIIth International Congress on Ancient Bronzes*, ed. E. Deschler-Erb and P. Della Casa, 235–39. Zürich: Chronos.

Trofimova 2007
Trofimova, A., ed. 2007. *Greeks on the Black Sea: Ancient Art from the Hermitage*. Exh. cat. J. Paul Getty Museum: Los Angeles.

28.

An Anthropomorphic Vessel in the National Museum of Beirut

Zeina Fani, Lebanese University, Beirut

An anthropomorphic vessel depicting a young man wearing a *nebris* (fawn skin) is on display at the National Museum of Beirut (inv. 25422). The man also wears a torque adorned with a crescent pendant, a type of jewelry commonly found in Egyptian painted portraits of the Roman period. The large bead molding at the bottom of the vessel may also indicate that Egypt, and particularly Alexandria, was the place of manufacture. However, the hair and eye treatment suggest that it may have been cast in a Lebanese workshop.

✦ ✦ ✦

A bronze anthropomorphic vessel came onto the art market in Damascus in 1953. It was acquired by the late Émir Maurice Chéhab, then director general of antiquities in Lebanon, who actively sought artifacts that had been excavated in his country and subsequently smuggled into Syria for sale. The vessel (inv. 25422) currently is on display at the National Museum of Beirut.

The Beirut vessel has been discussed in the writings of Frances F. Jones and Valérie Marti-Clercx. Jones compares it to a bronze vessel that the Princeton University Museum acquired in the late 1980s. The bust is one of a group of Roman representations of young men, some of whom wear a *nebris* (fawn skin) over their shoulders and a few of whom wear a torque with a pendant around their necks.[1] In her thesis, Marti-Clercx provides a typology of these vessels.[2] The bust in the National Museum of Beirut was cast from the same mold as three others: one of unknown provenance conserved in the Princeton University Art Museum;[3] one in the Louvre;[4] and one in Sozopol, Bulgaria.[5]

Since the object's location was unknown to these scholars, neither of them had access to the vessel's complete documentation. This paper investigates the crescent pendant motif and the bead molding, which provide clues as to the date and place of casting.

Description

The Bust. The elongated and narrow face, depicted off-center, possesses rough facial features (fig. 28.1). The prominent nose is rather geometric, with sharp edges, an effect formed by a chisel. The nostrils are subtly incised. The asymmetrical arches of the eyebrows reach the temples. The heavy lids of the small almond-shaped eyes are deeply incised to give them greater emphasis. Lines of incision also mark the eyelashes and eyebrows. The latter seem quite restrained, and this accentuates the curved lines of this area of the face. The whites of the eyes show the remains of a different material, probably silver or paste. The thin-lipped mouth seems to have a faint smile, and it is the same width as the nose. A gentle rounded curve constitutes the chin.


Figure 28.1

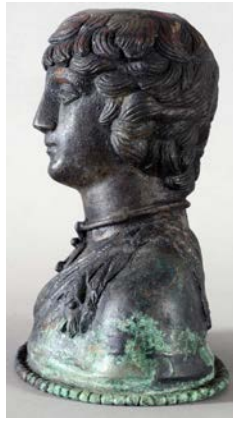


Figure 28.2

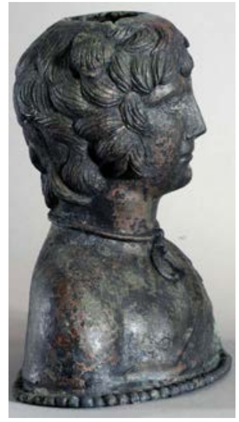


Figure 28.3


Figure 28.4

Figure 28.1. Present condition of the anthropomorphic vessel; Figure 28.2. Left profile; Figure 28.3. Right profile; Figure 28.4. Back of vessel. National Museum of Beirut, inv. 25494

The head of the figure, which is raised slightly to the right, is crowned by a thick cap of hair composed of short, defined locks that hide the forehead, the ears, and the nape of the neck. They frame the face and give it a distinct presence. Although the locks of hair are irregular in direction, they are all pointed, striated, and more or less the same size. The front locks are in two rows. On the left side, the front row is directed back with only one pointing toward the cheek (fig. 28.2); on the right, only two locks fall toward the back (fig. 28.3). One elevated lock is positioned on either side of the round opening at the crown of the head, indicating where the hinges of the handle would have been. Curls of hair in low relief cover the remaining space around the rim opening (fig. 28.4). Below the crown, the strands gain volume and fall in wavy locks at the back of the neck. They are combed in different directions and untangle at the nape.

The young man wears a torque around his thick neck. Suspended from the torque is a crescent-shaped pendant. The crescent is open at the bottom and ornamented with three beads, one at each end and another in the middle, just at the level of the ribbed ring.

The shoulders and chest are roughly modeled, with the lower edge cut straight and delimited by a bead molding. The upper arms of the figure lie flush against the body. They are lightly indicated at the front.

The figure is draped in a *nebris*, the diagonal folds of which gather on the left shoulder, baring the right shoulder and nipple. One or two pairs of hooves fall across his chest and back, and rest near one another. The folds at front and back are almost identical and are decorated with hatching suggesting the texture of the fur. The right nipple is defined by an incised circle.

The Vessel. The 1980s reproduction of a photo from the 1950s shows not only a circular pedestal foot but also a spout affixed to the top of the head. This hexagonal faceted spout has thick molding at the base and a curved rim decorated with a bead molding at the top (fig. 28.5). A zoomorphic (lion?) handle was attached at the back. The pedestal foot and the spout are now detached from the bust and their present location is unknown. On the vessel currently displayed in the museum, there is no sign of an attachment for a handle; likewise the opening in the head shows no indication of hinges. The external black layer of the vessel is flaking, and corrosion is present at the bottom.

Figure 28.5. The anthropomorphic vessel as shown in 1953 (reproduced in Jones 1987, 18)

Making the Artifact

Technique. This bronze vessel was fabricated by indirect casting, using the lost-wax method. The bead molding at the lower part of the bust was added in wax to the model. It varies in thickness from 0.5 to 1 centimeter (¼–⅜ in.). The interior and exterior surfaces of the head conform to one another (figs. 28.6–7). The outer part was polished after casting; the inner surface remains rough and uneven due to the movement of the wax during the casting process (fig. 28.8). The deeply undercut strands of hair and eyelashes were detailed in the wax working-model. Brushstrokes are visible on the interior of the bust, and chaplet holes are present in the interior of the head and bust. In its current state, the vessel measures 18 centimeters high, 17 centimeters long, and 11 centimeters wide (7 x 6 ¾ x 4 ⅜ in.).

Figure 28.6. Locks of hair and chaplet holes appear through the rim opening. National Museum of Beirut, inv. 25494

Figure 28.7. View inside the head revealing the recessed facial features. National Museum of Beirut, inv. 25494

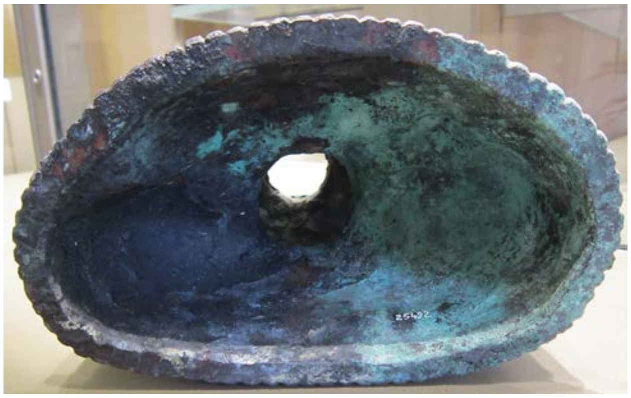


Figure 28.8. The rough interior surface of the bust does not correspond exactly to the exterior contours. National Museum of Beirut, inv. 25494

Image: © Ministry of Culture/Directorate General of Antiquities-National Museum of Beirut

The hatching technique employed to define the eyebrows and the fur, as well as the whitish coloration left in the eyes, are cold work.[6]

The footed pedestal and the spout were also fixed after the casting. The former is attested on a few known examples,[7] while the faceted shape of the spout is unusual; it was evidently soldered to the vessel. However, there is a group of anthropomorphic vessels that were cast with a short spout and two handles.[8] In addition, oinochoai were commonly cast with a neck ending in a spout and a single handle. One anthropomorphic example was found in Banias (Syria) with a zoomorphic handle resembling the Beirut vessel.[9]

Iconographical Inspirations. The young man is characterized by his heavy uncombed hair, hiding his forehead as well as his nape, and crowning his head. This style is common to anthropomorphic vessels that represent a certain type of young man, and was inspired by the hairstyle of Antinous, the deified favorite of the emperor Hadrian. The bust and the tilted face are characteristic of Antinous portraits, but not the facial features and the details on this Beirut vessel.[10] Antinous was sometimes portrayed with attributes of the wine god Dionysos, particularly the *nebris*, which was worn by the god and by his followers. The *nebris* shown on some of these vessels is the only meaningful evidence of a Dionysian affiliation.[11] It is depicted like the one associated with Antinous, one hoof falling forward from the shoulder.

Antinous is also sometimes portrayed with an amulet suspended from a torque around his neck;[12] the torque is unknown as a Dionysian attribute. This type of jewelry is most commonly associated with barbarian tribal people,[13] such as the Celts, Goths, and Thracians. The crescent-shaped amulet is found among artifacts of the latter tribe,[14] but it is not exclusive to them. It is also linked to Eastern deities, as we will now see.

Eastern Connections?

Crescent Pendant. The crescent is an ancient Near Eastern and, later, Hellenistic motif.[15] It is the acknowledged symbol of two main deities: the Graeco-Roman Selene/Luna and the Anatolian god Men. In addition to the obvious lunar symbolism, the crescent may also represent the sky, especially when associated with a circular motif, which can be interpreted as the sun. It can also be considered a fertility symbol[16] or the symbol of the Phoenician goddess Caelestis.[17]

The crescent is attested in both the western and eastern parts of the Roman Empire. In Razgrad (Thrace), a female deity with possible connections to Atargatis or Dea Syria wears the lunar pendant.[18] Examples have also been found in the Danube region dating to the second and third centuries AD,[19] and in England in a second-century AD hoard.[20] Farther east, a goddess in Palmyra wears a prominent crescent;[21] Nabatean deities and humans wear bead necklaces with lunar pendants;[22] and crescents also feature on funerary stelae in South Syria.[23] Crescents appear in the painted portraits of Roman Egypt, where the amulets have ball-shaped terminals like the one here.[24]

In Lebanon, crescents with ball-shaped terminals have not yet been attested in jewelry, but some examples were discovered in a spring in the city of Baalbek/Heliopolis as votive standards.[25] Children wearing torques with other amulets are known from the Beka'a plain.[26]

Most of the anthropomorphic vessels like the one in the Beirut Museum have been found in the western part of the Roman Empire, and especially in the Rheno-Danubian region. Some scholars, however, do not exclude Alexandria (Egypt) as a center of production.[27]

Bead Molding. The only other example of large bead molding occurring on anthropomorphic bronze vessels is a ewer with silver inlays. It depicts the head of a woman whose forehead is adorned by two rows of beads; a third row is strung across her neck.[28] It is part of the Esquiline treasure, consisting mainly of silver artifacts, found in Rome in 1793. The bulk of the treasure has been dated to the fourth or early fifth century AD. The ewer has not been given a precise date within the Roman period,[29] but it seems that it cannot be older than the third century AD.

Bead moldings appeared on silver vessels by the mid-third century AD[30] and were common during the fourth to the fifth century AD.[31] The punch-and-die technique used on these vessels was different from bronze casting.[32] Silver vessels with cast beads have been found in Nubia, in Tomb 37 of Ballana. They were discovered with objects decorated with depictions of Venus and Isis, and they date from the third to the sixth century AD.[33]

The date of the Beirut vessel is probably no earlier than the third century AD, the earliest century in which cast bead molding is attested.

Conclusion

This anthropomorphic bronze vessel with its footed pedestal reminds us of Roman portrait busts similarly placed.[34] The production of this type of bronze vessel is concentrated in Germania, Bulgaria, and Egypt.[35] It is plausible that this particular vessel was cast in Egypt because of the cast bead molding and the numerous crescent-shaped pendants depicted there, albeit in portraits. However, I would like to propose an alternative hypothesis, namely that it was cast in a Lebanese workshop. Numerous inscriptions found in a bronze-workshop active for many generations in Rhodes indicate that it was founded by a family from Tyre.[36] During the Roman period, the legate of Syria, Petronius, is known to have ordered a bronze portrait of Caligula from a Sidonian workshop.[37] The site of another workshop has been excavated in Beirut.[38] Thus it is quite possible for a local artisan to have cast this vessel, especially if a mold was available. The artisan of the Beirut vessel appears to have been unfamiliar with some aspects of his subject: for example, the fawn's hooves are not sculpted accurately. He stressed the eyes by outlining the lid, a feature characteristic of Syro-Lebanese portraits.[39] Finally, the young man's locks of hair can be compared to a bust of Helios found near Sidon.[40]

✦ ✦ ✦

Notes

1. Jones 1987.
2. Marti-Clercx 1999, 71–72, 151.
3. Jones 1987, 17–18.
4. De Ridder 1915, 130, plate 103, no. 2943.
5. Lazarov 1972, 154–55.
6. I am grateful to Iskra Karniš Vidovič and Azza Ali Aquil for their useful remarks.
7. Marti-Clercx 1999, examples Nebr I.2 and Nebr III.6.
8. Radnóti 1938, plate 55, fig. 2; Jones 1987, 23; Marti 1996, 981–82, 988; Marti-Clercx 1999, 172, 192, 194; Marti-Clercx and Mille 2002, 385–86.
9. De Ridder 1905, 192, plate 45, no. 278. There are other numerous examples of plastic oinochoai; see De Ridder 1915, 131–32, plate 104, nos. 2955–56.
10. Mambella 2008, 150, 152, 159, 195, figs. 134–35, 139, 184; Sapelli Ragni 2012, 65. However, we cannot systematically identify the young man so depicted as Antinous. Rather, these are elements inspired by his portraits. See Jones 1987, 17; Nenova-Merdjanova 1995, 55; Marti 1996, 992; Marti-Clercx 1999, 62–64, 79–81, 190; Marti-Clercx and Mille 2002, 385; Mustata 2010, 52.
11. Mambella 2008, 181, figs. 41, 58, 75; Sapelli Ragni 2012, 69, 75, 116–18.
12. Mambella 2008, fig. 139.
13. Williams and Ogden 1994, 137.
14. Tacheva-Hitova 1983, 253–54, 257; Kazanski and Mastykova 2007, 22.
15. Colledge 1976, 212–13; Bernier 1994; Elmasri et al. 2012, 162.
16. Ronzevalle 1934, 109–20, 129–32, 136–40; Bernier 1994, 58–59; Walker et al. 1997, 164.
17. Bernier 1994, 58–59.
18. Tacheva-Hitova 1983, 253, 261–63; *Die Thraker* 2004, 329, no. 302c (identified with the mother goddess).
19. Kazanski and Mastykova 2007, 22.
20. Walker et al. 1997, 164.
21. Colledge 1976, fig. 38; Will 1985, fig. 1.
22. El-Khouri 2002, 163–65; Elmasri et al. 2012, 154–56, 162, 171, figs. 1–2.
23. Sartre-Fauriat 2001, 247–48, 260–61.
24. Walker et al. 1997, 43–46, nos. 17–19; 87–88, no. 77; 163–65. We can also add: an anthropomorphic vase depicting a boy whose neck is adorned with a lunula (190, no. 257); and a bronze bust-vessel (192–93, no. 262).
25. Ronzevalle 1937–38, 129–32; Hajjar 1977, 131–36, plates 39–40.
26. Ronzevalle 1937–38, 75–76, plates 19, no. 2; 20 no. 3; 23 no. 11.
27. Jones 1987, 18; Marti-Clercx 1999, 158, 165–67, 194; Mustata 2010, 52.
28. Shelton 1981, 84, no. 18, plate 32. I am grateful to François Baratte for this reference as well as for the Nubian one.
29. Shelton 1981, 22, 41, 44, 50, 53–55.
30. Baratte and Painter 1989, 123, 127, 132–33.
31. Painter 1977, 12–14; Cahn and Kaufmann-Heinimann 1984, 190–91, 283; Baratte et al. 2002, 20, 28.
32. Lang and Holmes 1983, 201–5.
33. Emery 1948, 33, 58–60, plates 44, 46.
34. Mambella 2008, fig. 160, no. 15.
35. Marti-Clercx 1999, 164.
36. Badoud 2010.
37. Skupińska-Løvset 1999, 28.
38. Discovered during a rescue excavation, it is still under study. Sawaya 2016, 12.
39. Skupińska-Løvset 1999, 91.
40. Fani 2016, 211.

Bibliography

Almasri 2012
Almasri, E. 2012. "Nabataean Jewellery and Accessories." *Ancient Near Eastern Studies* 49: 150–75.

Badoud, N. 2010
Badoud, N. 2010. “Une famille de bronziers originaire de Tyr.” *ZPE* 172: 125–143.

Baratte and Painter 1989
Baratte, F., and K. Painter. 1989. *Trésors d’orfèvrerie gallo-romains*. Exh. cat. Paris, Musée du Luxembourg, Paris; Lyon, Musée de la civilization gallo-romaine. Paris: Réunion des musées nationaux.

Baratte et al. 2002
Baratte, F., J. Lang, S. La Niece, and C. Metzger. 2002. *Le trésor de Carthage: Contribution à l’étude de l’orfèvrerie de l’Antiquité tardive*. Paris: Centre National de Recherche Scientifique.

Bernier 1994
Bernier, J.-F. 1994. “Les divinités lunaires et leurs interactions sous l’Empire Romain.” *Tranquillitas: Mélanges en l’honneur de Tran Tam Tinh*, ed. M.-O. Jentel and G. Deschênes-Wagner, 53–63. Québec: Université de Laval.

Cahn and Kaufmann-Heinimann 1984
Cahn, H. A., and A. Kaufmann-Heinimann. 1984. *Der spätrömische Silberschatz von Kaiseraugst*. Derendingen: Habegger.

Colledge 1976
Colledge, M. A. R. 1976. *The Art of Palmyra*. London: Thames and Hudson.

Die Thraker 2004
Die Thraker: Das goldene Reich des Orpheus. Exh. cat. Bonn, Kunst- und Ausstellungshalle der Bundesrepublik Deutschland. Mainz am Rhein: Zabern.

El-Khouri 2002
El-Khouri, L. S. 2002. *The Nabataean Terracotta Figurines*. BAR International Series 1034.

Elmasri et al. 2012
Elmasri, E., F. Alawneh, and F. Bala’awi. 2012. “Nabatean Jewellery and Accessories.” *Ancient Near Eastern Studies* 49: 150–75.

Emery 1948
Emery, W. B. 1948. *Nubian Treasure: An Account of the Discoveries at Ballana and Qustul*. London: Methuen and Co.

Fani 2016
Fani, Z. 2016. “Les bronzes de Rimat.” In *Greek and Roman Bronzes from the Eastern Mediterranean: Acta of the XVIIth International Congress on Ancient Bronzes, Izmir (Turkey) 2016*, ed. A. Giumlia Mair and C. C. Mattusch, 209–16. Autun: Editions Mergoil.

Hajjar 1977
Hajjar, Y. 1977. *La triade d’Héliopolis-Baalbek: Son culte et sa diffusion à travers les textes littéraires et les documents iconographiques et épigraphiques*. Leiden: E. J. Brill.

Jones 1987
Jones, F. F. 1987. “A Bronze Head-Vase.” *Record of the Art Museum, Princeton University* 46: 17–23.

Kazanski and Mastykova 2007
Kazanski, M., and A. Mastykova. 2007. *Tsibilium: La nécropole apsile de Tsibilium (VIIe av. J.-C. –VIIe ap.J.-C.) (Abkhazie, Caucase): L’étude du site*. Vol. 2. BAR International Series 1721.

Lang and Holmes 1983
Lang, J., and R. Holmes. 1983. “Studies on the Technology of Beaded Rims on Late Roman Silver Vessels.” *Britannia* 14: 197–205.

Lazarov 1972
Lazarov, M. 1972. “Tombes romaines de Sozopol.” *Bulletin de l’Institut d’Archéologie Bulgare* 33: 153–58.

Mambella 1999
Mambella, R. 1999. *Le memorie di Antinoo. Romanzo: La rivelazione di un antico mistero*. Florence: Firenze Libri.

Mambella 2008
Mambella, R. 2008. *Antinoo: “Un dio malinconico” nella storia e nell’arte*. Rome: Colombo.

Marti 1996
Marti, V. 1996. “De l’usage des ‘balsamaires’ anthropomorphes en bronze.” *MÉFRA* 108: 979–1000.

Marti-Clercx 1999
Marti-Clercx, V. 1999. “Les vases anthropomorphes en bronze du monde romain: Recherches sur les ‘balsamaires’.” Thèse de 3ème cycle. Université Paris IV-Sorbonne.

Marti-Clercx and Mille 2002
Marti-Clercx, V., and B. Mille. 2002.“Nouvelles données sur la répartition des ateliers producteurs des vases anthropomorphes d’époque romaine: La nature peut-elle determiner la provenance?” In *I Bronzi Antichi: Produzione e tecnologia, Atti del XV Congresso Internazionale sui Bronzi Antichi, Gorizio Grado-Aquileia, 22–26 maggio 2001*, ed. Alessandra Giumlia-Mair, 385–92. Montagnac: M. Mergoil.

Mustata 2010
Mustata, S. 2010. “The Roman Anthropomorphic Bronze Vessel from Stramba (Turceni, Gorj County): Typological, Functional and Chronological Aspects.” *Muzeul Olteniei Craiova: Oltenia: Studii si communicari: Arheologie-Istori* 17: 51–56.

Nenova-Merdjanova 1995
Nenova-Merdjanova, R. 1995. “Typology and Chronology of the Bronze Vessels Used in the Palaestra and in the Baths from the Roman Provinces Thrace and Moesia.” In *Acta of the 12th International Congress on Ancient Bronzes, Nijmegen 1–4 June 1992*, ed. S. T. A. M. Mols, 51–58. Nijmegen: Provincial Museum.

Painter 1977
Painter, K. S. 1977. *The Mildenhall Treasure*: *Roman Silver from East Anglia*. London: British Museum Publications.

Radnóti 1938
Radnóti, A. 1938. *Die römischen Bronzegefässe von Pannonien*. Budapest: Institut für Münzkunde und Archäologie der P. Pázmány-Universität; Leipzig: Harrassowitz.

De Ridder 1905
De Ridder, A. 1905. *Collection de Clercq.* Vol. 3: *Les bronzes*. Paris: E. Leroux.

De Ridder 1915
De Ridder, A. 1915. *Les bronzes antiques du Louvre.* Vol. 2: *Les instruments*. Paris: E. Leroux.

Ronzevalle 1934
Ronzevalle, S. 1934. “Notes et études d’archéologie orientale: Le prétendu ‘char d’Astarté’ (part 2).” *Mélanges de l’Université Saint-Joseph* 18: 109–47.

Ronzevalle 1937–38
Ronzevalle, S. 1937–38. “Notes et études d’archéologie orientale: Jupiter héliopolitain, *nova et vetera*.” *Mélanges de l’Université Saint-Joseph* 21: 3–162.

Sapelli Ragni 2012
Sapelli Ragni, M. 2012. *Antinoo: Il Fascino della Bellezza*. Milan: Electa.

Sartre-Fauriat 2001
Sartre-Fauriat, A. 2001. *Des tombeaux et des morts: Monuments funéraires, société et culture en Syrie du sud du 1er s. av. J.-C. au VIIe s. apr. J.C.* Beirut: Institut français du Proche-Orient.

Sawaya 2016
Sawaya, Z. 2016. *Les monnaies de JEM 003, JEM 003 et JEM 004 à Jemmayzeh-Beyrouth*. Bulletin d’Archéologie et d’Architecture Libanaises, Hors-Série XIII. Beirut: Ministère de la culture. Direction générale des antiquités.

Shelton 1981
Shelton, K. 1981. *The Esquiline Treasures*. London: British Museum Press.

Skupińska-Løvset 1999
Skupińska-Løvset, I. 1999. *Portraiture in Roman Syria: A Study in Social and Regional Differentiation within the Art of Portraiture*. Lodz: Wydawnictwo Universytetu Łódkiego.

Tacheva-Hitova 1983
Tacheva-Hitova, M. 1983. *Eastern Cults in Moesia Inferior and Thracia (5th century BC–4th century AD)*. Leiden: E. J. Brill.

Walker et al. 1997
Walker S., M. Bierbrier, P. Roberts, and J. Taylor. 1997. *Ancient Faces: Mummy Portraits from Roman Egypt*. London: Trustees of the British Museum.

Will 1985
Will, E. 1985. “La déesse au chien de Palmyre.” *Syria* 62: 49–55.

Williams and Ogden 1994
Williams, D., and J. Ogden. 1994. *Greek Gold: Jewellery of the Classical World*. New York: Harry N. Abrams.

29.

Hellenistic, Roman, and Byzantine Influence in the Consolidation of Fatimid Metalware

Ayala Lester, Israeli Antiquities Authority, Jerusalem

This paper, facilitated by the discovery of two large hoards of metal vessels, examines Fatimid metalware. The first hoard was found at Caesarea and included 136 metal articles, most of which were intact. The cache from Tiberias was found within a dwelling area and comprised 660 items hidden within three large pithoi. These discoveries enabled the study of a metal group previously little known. The paper traces the development of four groups of vessels through the Persian, Hellenistic, Roman, and Byzantine periods up to the Fatimid era (AD 969–1171). The study included lampstands, saucepans (which possibly served as measuring vessels based upon Islamic religious tradition), two types of braziers, and a group of feet and handles. The last group of minor articles underwent a fundamental morphological change into schematized shapes, exemplifying the consolidation of Islamic material culture.

✦ ✦ ✦

Introduction

Until recently, the availability of early Islamic metal vessels was limited to individual pieces in museums and private collections, and the scholarship was always generalized, with very limited information in regard to typology.[1] Metal articles from the early centuries of Islam within the Syrian-Egyptian region are even less common, as Iran and Central Asia attracted the greater portion of attention from researchers.[2]

The Fatimid dynasty[3] is famous for its decorative arts, which have stimulated considerable scholarly interest, and several publications have been dedicated to the subject.[4] Studies of Fatimid metalware, however, were based upon a small number of vessels from a few collections.[5] The situation has entirely changed over the last twenty years with the discovery in Israel of two major hoards. The first was uncovered in Caesarea in 1995 and included 136 metal articles together with glass and ceramic vessels.[6] The second cache was found in 1998 in Tiberias and included 660 metal vessels along with a great deal of production waste.[7]

The hoard from Caesarea was discovered in the southeastern part of the city, in the area of the Temple platform, which was the city's cultural center from Roman times up to the Crusader period. The hoard was found in a cavity near a staircase leading to the Temple platform area and included 136 metal articles, 15 vessels made of clay, and 13 glass articles. The group of metal vessels was composed of lampstands, saucepans, ladles, basins, ewers, round boxes, buckets, braziers, incense burners, and individual handles and feet used to support other vessels. A few of the vessels are splendidly decorated and very well made, while others are much simpler, testifying to a variety of clients. The hoard probably belonged to a merchant who traded in metal and other vessels originating from Palestine, Syria, and Egypt.

The cache from Tiberias was found during the salvage excavation of a dwelling area, within a private house. The vessels were hidden in three large pithoi, two of which were buried under the floor, and the third, the largest, was concealed behind a wall built specially for this purpose. The pithoi included about 660 vessels along with about 100 kilograms (220 lb.) of production waste. The vessels were very similar to those found in Caesarea, while also including parts of articles that had been serially produced, such as rims and necks of bell-shaped bottles, handles and hinges of buckets, legs to support trays, handles for bowls and cauldrons, and so forth. Working tools such as scissors, molds for sand-casting, and an anvil were also uncovered. The walls and floors of the building, comprising two rooms and a courtyard, were encrusted with flecks of base metal, resulting from the extended use of a lathe to polish and decorate the vessels. All these facts confirm that the location served as a workshop. It was most probably active between the end of the tenth century and about AD 1072, when Turkoman tribes invaded Palestine, establishing their base near Tiberias.[8]

This paper focuses on a few types of vessels—lampstands, saucepans, braziers, and feet and handles of vessels—in order to follow their morphological consolidation up to the Fatimid period.

Lampstands

Fatimid lampstands are typically composed of three parts: a tripod base, a shaft, and a tray (fig. 29.1). The shaft is designed to fit into the central socket of the base; the bottom part of the tray was soldered to the shaft. The lampstands are characterized by a stylistic continuity between the base and the shaft; thus a base with a round body was fitted to a round shaft and a polygonal base supported a polygonal shaft.

Figure 29.1. A lampstand from Caesarea, eleventh century. Israel Antiquities Authority, Jerusalem (IAA) reg. no. 1996-625-627-628

Image: Courtesy of the Israel Antiquities Authority, Jerusalem (IAA)

The Fatimid lampstand is the outcome of a long process of adaption, beginning in the Persian period during the late sixth to fifth century BC. The earliest example is a lampstand with three sharply bent legs with cloven hooves, and a long fluted shaft with a bowl attached on the top. Three palmettes or ivy leaves emerge between the legs.[9] This tradition continues to the Early Imperial period (first–third century AD), with lampstands characterized by ivy leaf design between the legs, and a krater-shaped top (fig. 29.2a).[10] In parallel, during the first century AD, we find another subtype of lampstand, with a circular plate that rests on the legs (fig. 29.2b). The decoration of the plate consists of ovolo and other moldings.[11] A lampstand of the same type is dated between the second and third centuries AD; however, the plate has become convex with engraved decoration.[12]

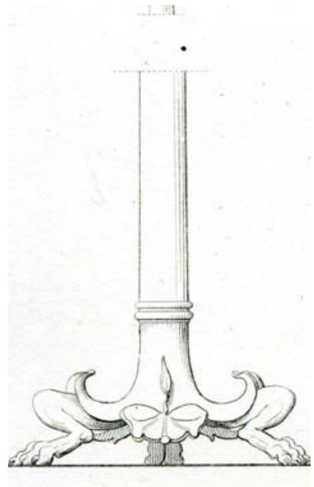


Figure 29.2a. Base of a lampstand from Pompeii. After Ainé 1870, plate 23

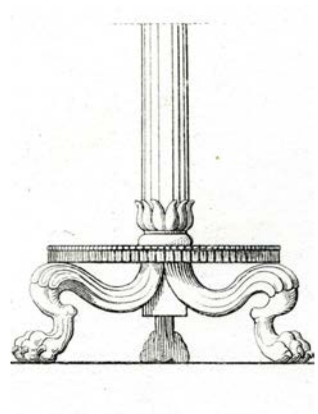


Figure 29.2b. Base of a lampstand with a plate over the feet. Before AD 79. After Ainé 1870, plate 24

Later, during the fifth and sixth centuries AD, the morphology of the lampstand changes. The round horizontal plate transforms into a tent-shaped canopy, with the protruding leaf motif combined amid the legs. The shaft has two variations. One is a solid, hexagonal form with bulges at the edges;[13] the other is baluster in shape and composed of spherical balls soldered together.[14] On the upper part of the lampstand, the bowl was modified into a circular tray, sometimes with a central spike on which a metal lamp was placed.[15]

These versions of lampstands continue during the Fatimid period, but the tripod base becomes semi-spherical or polygonal in shape; the shaft is massive and heavy; and the small upper tray becomes much larger, being flat with a round rim and, in most cases, without an elevated frame. The base, with a round canopy, extends over the upper part of the feet so that the thigh disappears and the base becomes trapezoidal in shape. The shaft is composed of three parts: two balusters flanking the central main part, which is either round in section decorated on the lathe with pairs of fluted circles, or decorated with patterns of lozenges or other shapes. The stylistic identity between the base and the shaft creates sets of matching round bases with round shafts, and polygonal decorated bases and shafts. The tray, seen in profile, is a thin band: it is usually a single round flat surface soldered to the top of the shaft. It rarely bears compatible decorative ornament.

The typological considerations also include the physical perception of sizes, from the largest (diam. 31.3 cm or 12 ⅜ in.) and highest (48.2 cm or 19 in.) to a miniature lampstand with a diameter of just 6.8 centimeters (2 ¾ in.) at the base with a height of 11 centimeters (4 ⅜ in.). The miniature lampstand is in line with the stylistic characteristics of the group and has a round base with a round shaft. A prototype for the miniature circular lampstand can be seen in the collection of the British Museum and is of Egyptian origin, dated from the sixth to the seventh century AD.[16]

In spite of the morphological differences, the production techniques did not change over the centuries. The base and the shaft were produced using the lost-wax technique, and the tray was probably cast in a stone mold.

Saucepans/Measuring Vessels

Saucepans of various sizes were found at both Caesarea and Tiberias. They are trapezoidal in section with an everted rim and a long handle with a clover-shaped termination or a loop for suspension (fig. 29.3). They continue a tradition of saucepans from the first century AD, such as vessels found at Pompeii, dated to the first century AD, which have a convex body with a splayed rim and a long handle (fig. 29.4).[17] They continue to circulate during the second and third centuries, for example in Egypt.[18]

Figure 29.3. A measuring vessel from Caesarea, eleventh century AD. IAA reg. no. 1995-3510
Image: Courtesy of the IAA

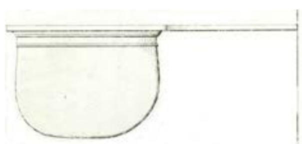


Figure 29.4. A saucepan from Pompeii. Before AD 79. After Ainé 1870, plate 68

These vessels have also been identified as ladles for serving food. John W. Hayes defined the vessel as a saucepan (*trulla*) and was not certain whether it was Roman or Islamic in origin.[19] Géza Fehérvari and Elias Khamis recognized it as a dipper.[20] Some of the vessels are decorated with inscriptions and tendrils. One article from Caesarea bears an inscription on its base: لصاحبه بركة (blessing to its owner). Thus, when it was not in use, it was hung on the wall with the inscription praising the owner facing outward.

These saucepans were displayed at an exhibition at the Hecht Museum in Haifa, about seventeen years ago, where Palestinian women identified the article as a measuring vessel called a *Ṣa‘* (صاع.). Based upon this correlation, I measured the capacity of the vessels in order to determine if their volume is compatible with traditional Islamic measures. I included all the saucepans from Caesarea and one from Tiberias. Two vessels hold 4 liters, one 3.7 liters, and a smaller one 2.2 liters. These measurements correlate with the religious Islamic term *Ṣa‘* or saa'h (صاع), which was used for a measure for grain of about 4.2 liters. The saa'h is connected with one of the commandments of Islam requiring a person to donate a measure of wheat or barley to the poor. It was issued by the Prophet Muhammad during the second year of the Hijra, as part of the ceremonies of I'd al-Fiter (Eid), the festival following the fast during the month of Ramadan.[21]

Furthermore, S. D. Goitein, in his comprehensive work about the Jewish communities in the Mediterranean Basin based upon the documents found at the Geniza of the Ibn-Ezra synagogue at Fustat, discusses the private home and its customs. He mentions that "a small vessel of fixed measurement and durable material such as marble was attached to the jar which enabled the housewife to control the consumption."[22] The combination of the vessel, its capacity, and the description by Goitein, together with the identification by contemporary Palestinian women, provides a firm basis to confirm that the vessel was used as a measuring cup for grain, rather than as a saucepan.

This type of vessel is known in the eastern part of the Islamic world, appearing in miniatures from the sixteenth century. A miniature from an album depicts a nomad's camp with food cooking in a casserole and a ladle alongside.[23] Another miniature from the manuscript of the *Hamsa* of Nizami, shows preparations for a banquet, with a servant holding a ladle and filling a dish from a cauldron.[24]

Braziers

Braziers are known in two versions, square and round. Cooking in both types is based upon the heat reflected from the coals inside the vessel. The square type was used for grilling meat on skewers. It consolidated under Roman influence, as seen in a square brazier that originated in Pompeii, dated to the first century AD (fig. 29.5a). Other examples are dated to the Umayyad period, prior to AD 750, and to the Mamluk period in the second half of the thirteenth century.[25] This type of brazier was used during social events such as outings, as can be seen from a miniature in a manuscript of Galen, dated to the middle of the thirteenth century, and a manuscript of the *Hamsa* by

Nizami, from Tabriz in Persia, dated to the middle of the sixteenth century.

The second type of brazier is round with a base and an upper concave receptacle for coals. Such ceramic braziers are known from the Etruscan period (seventh–sixth century BC). They are characterized by a round container with a thickened rim, triangular in section, decorated in relief with animals walking in procession. According to Lisa Pieraccini, they were used as offerings to the dead within family tombs.[26]

A related version, made of clay, from the Hellenistic period was found in Palestine. The shape is based on a high cylindrical container in which the coals were kept and an upper bowl with three massive handles to support the vessel on top. It was used in private homes both as a hearth and for cooking.[27] A subtype of it is known from the Fatimid period. It appears in different sizes from the very large to the very small. The largest are supported by four feet with spherical extensions that secure the container in place (fig. 29.5b). Smaller versions maintain the idea of a sunken base for the coals, but the square frame is diminished and only a bowl with a broad rim to support the pot remained. It is raised above the floor by three feet that were soldered to the base. The smallest version has an inner diameter of just 10.5 centimeters (4 in.).

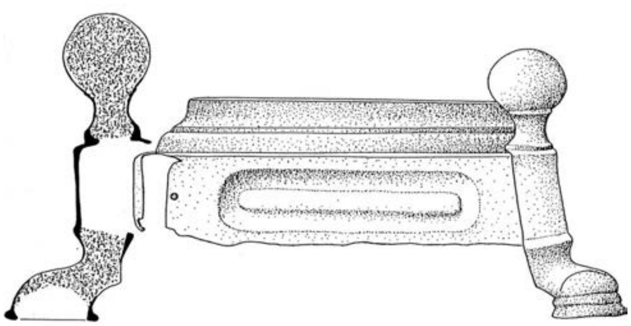


Figure 29.5a. A brazier from Pompeii. Before AD 79. After Ainé 1870, plate 67

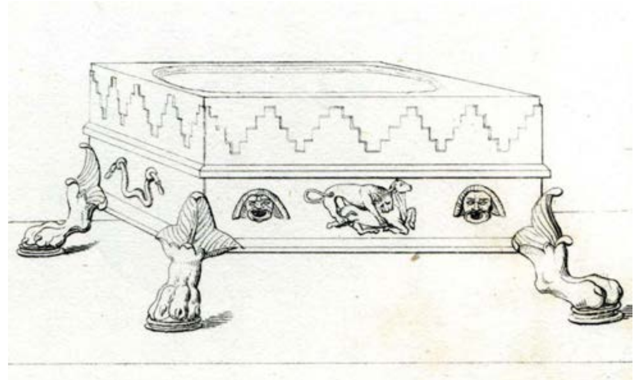


Figure 29.5b. A large brazier from Caesarea, eleventh century AD. IAA reg. no. 1995-3507
Image: Courtesy of the IAA

It seems that these braziers continue a tradition that originated in Etruria and appeared again during the Hellenistic period. Such braziers are not known from the Roman and Byzantine periods. It may be that braziers have not been identified as such or that they were not popular during these periods; but the typological concept somehow survived and it reappears during the Fatimid period. A set including four braziers of different sizes is part of the hoard from Caesarea. The largest brazier is 39 centimeters (15 ⅜ in.) high with a diameter of 26 centimeters (10 ¼ in.). A large bag-shaped container of similar size is part of the Caesarea hoard. The cache from Tiberias includes eight braziers. They all have signs of soldered feet on the base. One of them has traces of a cylindrical receptacle in its center, which resulted in researchers misidentifying the group as candlesticks.[28]

The square brazier was far more popular and, as mentioned above, was used during social events such as outings. The round brazier was used for slow cooking; since it remained in the home, it does not appear in contemporary documents.

Both types are still in use today. The square brazier, made of simple hammered tin, is very popular for outdoor events in the Middle East. A subtype of the large brazier is found in traditional Eastern cooking. Today it is made of stainless steel and is heated by a gas canister sufficient for the long slow cooking of fava beans. This was probably the function of the large brazier originating from Caesarea. The smaller ones were used to cook beans, rice, and sauces.

Feet and Handles

Continuous typological adaptation affected not just vessels and cooking articles but also minor items such as feet and handles of vessels. Vessel feet from the Greek, Hellenistic, Roman, and Byzantine periods are based upon the paw- or hoof-shaped leg, which continues with variations into the Islamic period (see fig. 29.5a). For example, a bronze throne leg dated from the sixth to the fourth century BC is characterized by its lion-paw shape.[29] A box or cista with the figure of Heracles fighting a snake, now in the British Museum, is supported by three cloven hoof–shaped feet; the box is dated to the late fourth to the third century BC. A lampstand with lion's legs dated to the first century AD is also in London.[30]

A base of a lampstand, with three hoof-shaped feet with protruding lion paws, is dated to the Roman period.[31] A lampstand dated to the sixth to seventh century has three feet in the shape of griffin's heads.[32] During the Islamic period, the naturalistic shape was transformed into a symbolic pattern that often only insinuates the original shape. The small feet that were used to raise a vessel above the floor have undergone a change. During the Classical period, they bore a motif of a cloven hoof with a recess on which the vessel rested; now they have become entirely stylized (fig. 29.6), sometimes even being identified as a spike rather than a foot.[33] This reflects the religious ban on the use of figural sculpture and exemplifies its effect on the consolidation of Islamic material culture.

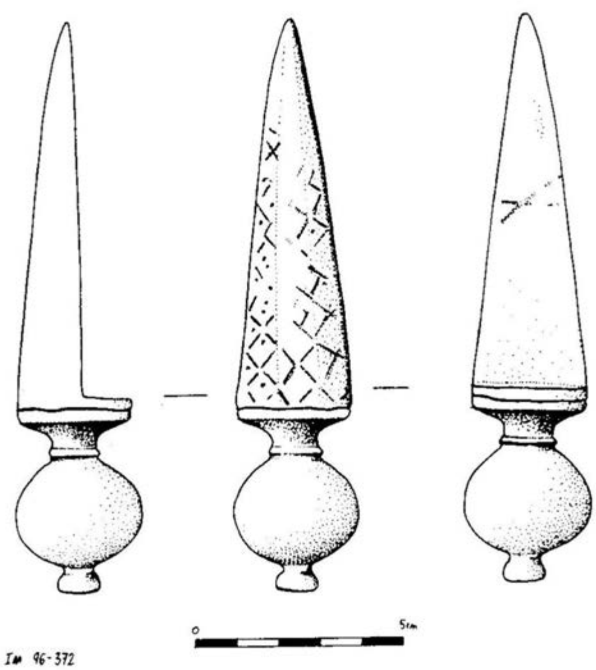


Figure 29.6. A foot with a recess to support a tray or a bucket, from Caesarea, eleventh century AD. IAA reg. no. 1996-372
Image: Courtesy of the IAA

The same effect apparently applied to arch-shaped handles. The tips of the handles change into simple almond-shaped terminations, thus becoming functional rather than decorative (fig. 29.7a).[34] This is a substantial change from earlier handles, which were decorated on the edges with animals, faces of men, ivy leaves, and fruits (fig. 29.7b).

Figure 29.7a. A handle for a bowl from Caesarea, eleventh century AD. IAA reg. no. 1996-381
Image: Courtesy of the IAA

Figure 29.7b. A handle from Pompeii, before AD 79. After Ainé 1870, plate 72

Summary

This paper has surveyed typological changes of vessels and other artifacts from the Persian, Hellenistic, Roman, and Byzantine periods, up to the Fatimid period during the eleventh and twelfth centuries, over a period of more than 1,700 years. Four different groups of vessels were dealt with: lampstands, saucepans, braziers, and feet and handles. They were continuously in use and maintained their broad typological outlines while undergoing morphological changes over the years. The most prominent difference between Byzantine lampstands and Fatimid ones is the replacement of the round canopy-shaped base and the replacement of the upper pricket with a large tray. Although they were found at Tiberias, metal lamps during the Islamic period are rare in comparison to the huge quantities of clay lamps that were placed on the metal trays. This is clearly shown in a miniature from *Kitab al-Diryāq* (Book of Antidotes) by Pseudo-Galen, dated 1199, in which the writer is presented with a lampstand bearing a lamp made of glazed clay, typical of the Ayyubid-Mamluk period.[35] The saucepans, which we suggest are measuring vessels for grain, became trapezoidal in shape and were sometimes decorated with a band of half palmettes, tendrils, and benefactory inscriptions in Arabic. The square brazier subtype continues a Roman tradition. The round subtype has no known prototypes from the Roman and Byzantine periods, but it remained within the typological repertoire and reappeared during the Fatimid era. It should be mentioned that the major influence within the group of metal vessels is from Egypt, during the Roman and Byzantine periods, where there was an established tradition of metal production. The groups of feet and handles exemplify the fundamental consolidation of Islamic material culture. They refrain from any sculpture-like identity and schematize decorative elements into functional shapes that distance themselves from the prototype. This change most likely occurred during the Abbasid period with the establishment of the Islamic regime.

✦ ✦ ✦

Notes

1. Ettinghausen 1943, fig. 2; Jones and Mitchell 1976, nos. 157, 166; Fehérvari 1976, plates 2, 2a; Brend 1991, fig. 16; Enderlein 2003, 27–28.
2. Bloom and Blair 1997, nos. 65–67; Melikian-Chirvani 1982, 7–22; Allan 1983.
3. The Fatimid dynasty emerged from North Africa in 909, conquered Egypt in 969, and founded Cairo as its capital. It took its name from Fatima, the daughter of Muhammad, from whom they claimed descent and adopted the Ismaili branch of Shi'ite belief. They subdued and ruled Sicily, Syria, Palestine, Hejaz, and Yemen. The Fatimid rulers established a strong administrative and financial apparatus with extensive revenues arising from taxes, trade, and an influx of gold from the Nubian mines; see Canard 1965.
4. Ettinghausen and Grabar 1987, 167–208; Contadini 1998; Institut du monde arab 1998; Ettinghausen, Grabar, and Jenkins-Madina 2001, 187–215; Bloom 2007.
5. Fehérvari 1976, 39–54; Baer 1983, 13, fig. 5; Allan 1985; Ward 1993, 60–69; Seipel 1998, 65–72.
6. Lester 2011; Lester 2014.
7. Khamis 2013.
8. Gil 1983, 338; Bijovsky and Berman 2008.
9. Bailey 1996, nos. Q3863, Q3864.
10. Bailey 1996, nos. Q3873, Q3874, fig. 2a.
11. Bailey 1996, nos. Q3870, Q3876.
12. Bailey 1996, no. Q3911, pls. 126–27.
13. Ross 1962, no. 39.
14. Bailey 1996, nos. Q3920, Q3921, pls. 134–5.
15. Ross 1962, no. 38; Weitzmann and Frazer 1979, no. 556; Bailey 1996, nos. Q3920, Q3921, plates 134–35.
16. Bailey 1996, no. Q3912 EA, pl. 134.
17. Tassinari 1993, 98, no. 8689.
18. Wulff 1909, plate LII, nos. 1031–32.
19. Hayes 1984, no. 182.
20. Fehérvari 1976, no. 23; Khamis 2013, 75–76, nos. 356–61.
21. Bel 1995.
22. Goitein 1983, 141.
23. Irwin 1997, fig. 211.
24. Ward 1993, fig. 7.
25. Hillenbrand 1999, fig. 4; Dimand 1944, fig. 90.
26. Pieraccini 2003.
27. Rosenthal-Heginbottom 1981, 110–11.
28. Khamis 2013, 140–47.
29. Dayagi-Mendels and Rozenberg 2010, no. 91.
30. Bailey 1996, no. Q3870, pls. 102, 104.
31. Bénazeth 2008, no. 36.
32. Bailey 1996, no. Q3927 MLA, plate 137.
33. Davidson 1952, 1053, 1054, plate 72.
34. Ainé 1870, 165, plate 84; Hayes 1984, no. 38.
35. Baer 1983, 8, fig. 1.

Bibliography

Ainé 1870
Ainé, H. R. 1870. *Herculanum et Pompéi: Recueil général des peintures, bronzes, mosaiques, etc*. Vol. 12. Paris: Librairie de Firmin-Didot.

Allan 1985
Allan, J. W. 1985. "Concave or Convex? The Sources of Jaziran and Syrian Metalwork in the 13th Century." In *The Art of Syria and the Jazīra 1100–1250*, ed. J. Raby, 126–40. Oxford and New York: Oxford University Press.

Baer 1983
Baer, E. 1983. *Metalwork in Medieval Islamic Art*. Albany: State University Press of New York.

Bailey 1996
Bailey, D. M. 1996. *A Catalogue of the Lamps in the British Museum.* Vol. 4: *Lamps of Metal and Stone and Lampstands*. London: The Trustees of the British Museum.

Bel 1995
Bel, A. 1995. s.v. "Sāʿ." *Encyclopaedia of Islam* 7: 654. 2nd ed. Leiden: Brill.

Bénazeth 2008
Bénazeth, D. 2008. *Catalogue général du Musée copte du Caire*. Vol. 1: *Objets en metal*. Cairo: Institut français d'archéologique orientale.

Bijovsky and Berman 2008
Bijovsky, G., and A. Berman. 2008. "The Coins." In *Tiberias: Excavations in the House of the Bronzes.* Vol. 1: *Architecture, Stratigraphy, and Small Finds*, ed. Y. Hirschfeld and O. Gutfeld, 63–105. Qedem 48. Jerusalem: Hebrew University of Jerusalem.

Bloom 2007
Bloom, J. M. 2007. *Arts of the City Victorious: Islamic Art and Architecture in Fatimid North Africa and Egypt.* New Haven and London: Yale University Press.

Bloom and Blair 1997
Bloom, J. M., and S. Blair. 1997. *Islamic Arts*. London: Phaidon.

Brend 1991
Brend, B. 1991. *Islamic Art*. Cambridge, MA: Harvard University Press.

Canard 1965
Canard, M. 1965. s.v. "Fātimids." *Encyclopaedia of Islam* 2: 850–52. 2nd ed. Leiden: Brill.

Contadini 1998
Contadini A. 1998. *Fatimid Art at the Victoria and Albert Museum*. London: V&A Publications.

Davidson 1952
Davidson, G. R. 1952. *Corinth.* Vol. 12: *The Minor Objects*. Princeton, NJ: The American School of Classical Studies at Athens.

Dayagi-Mendels and Rozenberg 2010
Dayagi-Mendels, M., and S. Rozenberg. 2010. *Chronicles of the Land: Archaeology in the Israel Museum Jerusalem*. Jerusalem: The Israel Museum.

Dimand 1944
Dimand, M. S. 1944. *A Handbook of Muhammadan Art*. New York: Hartsdale House.

Enderlein 2003
Enderlein, V. 2003. *Museum of Islamic Art: State Museums of Berlin, Prussian Cultural Property.* Trans. R. H. Barnes. Mainz: Philipp von Zabern.

Ettinghausen 1943
Ettinghausen, R. 1943. "The Bobrinski 'Kettle': Patron and Style of an Islamic Bronze." *Gazette des Beaux Arts* 24: 193–208.

Ettinghausen and Grabar 1987
Ettinghausen, R., and O. Grabar. 1987. *The Art and Architecture of Islam, 650–1250*. Pelican History of Art. Harmondsworth, Middlesex, and New York: Penguin.

Ettinghausen, Grabar, and Jenkins-Madina 2001
Ettinghausen, R., O. Grabar, and M. Jenkins-Madina. 2001. *Islamic Art and Architecture, 650–1250*. 2nd ed. New Haven and London: Yale University Press.

Fehérvari 1976
Fehérvari, G. 1976. *Islamic Metalware of the Eighth to the Fifteenth Century in the Keir Collection.* London: Faber and Faber.

Gil 1983
Gil, M. 1983. *Palestine during the First Muslim Period (634–1099)* (in Hebrew). Tel Aviv: Tel Aviv University and the Ministry of Defense.

Goitein 1983
Goitein, S. D. 1983. *A Mediterranean Society: The Jewish Communities of the Arab World as Portrayed in the Documents of the Cairo Geniza*. Vol. 4, *Daily Life*. Berkeley: University of California Press.

Hayes 1984
Hayes, J. W. 1984. *Greek, Roman, and Related Metalware in the Royal Ontario Museum: A Catalogue*. Toronto: Royal Ontario Museum.

Hillenbrand 1999
Hillenbrand, R. 1999. *Islamic Art and Architecture.* London: Thames and Hudson.

Institut du monde arabe 1998
Institut du monde arabe. 1998. *Trésors fātimides du Caire.* Exh. cat. Paris: Institut du monde arabe.

Irwin 1997
Irwin, R. 1997. *Islamic Art*. London: Laurence King.

Jones and Mitchell 1976
Jones, D., and G. Mitchell, eds. 1976. *The Arts of Islam*. Exh. cat. London, Hayward Gallery. London: Arts Council of Great Britain.

Khamis 2013
Khamis, E. 2013. *Tiberias: Excavations in the House of the Bronzes*. Vol. 2: *The Fatimid Metalwork Hoard from Tiberias*. Qedem 55. Jerusalem: Hebrew University of Jerusalem.

Lester 2011
Lester, A. 2011. "Typological and Stylistic Aspects of Metalware of the Fatimid Period" (Hebrew with an abstract in English). 2 vols. PhD thesis, University of Haifa.

Lester 2014
Lester, A. 2014. "Reconsidering Fatimid Metalware." *Proceedings of the 8th International Congress on the Archaeology of the Ancient Near East, Warsaw 2012*, ed. Piotr Bieliński et al., 437–54. Wiesbaden: Harrassowitz.

Melikian-Chirvani 1982
Melikian-Chirvani, A. S. 1982. *Islamic Metalwork from the Iranian World: 8th–18th Centuries*. Victoria and Albert Museum Catalogue. London: HMSO.

Pieraccini 2003
Pieraccini, L. C. 2003. *Around the Hearth: Caeretan Cylinder-stamped Braziers*. Rome: L'Erma di Bretschneider.

Rosenthal-Heginbottom 1981
Rosenthal-Heginbottom, R. 1981. "Notes on Hellenistic Braziers from Tel-Dor." *Qadmoniot* 55/56: 110–11.

Ross 1962
Ross, M. C. 1962. *Catalogue of the Byzantine and Early Medieval Antiquities in the Dumbarton Oaks Collection.* Vol. 1: *Metalwork, Ceramics, Glyptics, Painting*. Washington, DC: Dumbarton Oaks Research Library and Collection.

Seipel 1998
Seipel, W. 1998. *Schätze der Kalifen: Islamische Kunst zur Fatimidenzeit*. Exh. cat. Vienna, Kunsthistorisches Museum.

Tassinari 1993
Tassinari, S. 1993. *Il vasellame bronzeo di Pompei*. 2 vols. Rome: L'Erma di Bretschneider.

Ward 1993
Ward, R. 1993. *Islamic Metalwork*. London: British Museum.

Weitzmann and Frazer 1979
Weitzmann, K., and M. E. Frazer. 1979. *Age of Spirituality: Late Antique and Early Christian Art, Third to Seventh Century*. Exh. cat. New York, Metropolitan Museum of Art.

Wulff 1909
Wulff, O. 1909. *Altchristliche und mittelalterliche byzantinische und italienische Bildwerke*. Part 1: *Altchristliche Bildwerke*. 2 vols. Berlin: Reimer.

VI. Artifacts

30.

Minoan Status Symbols: Tweezers, "Weaving Hooks," and Cosmetic Scrapers

Susan C. Ferrence, INSTAP Academic Press, Philadelphia, Pennsylvania
Alessandra Giumlia-Mair, AGM Archeoanalisi, Merano, Italy

For this project a large number of Minoan metal objects of various sizes, belonging to different classes and made of different metals, were analyzed by XRF. The items come from different sites in eastern Crete, one of which, Gournia, was excavated in the early twentieth century. The objects are mostly dated to the Early Minoan I to Middle Minoan IIA periods, with several pieces also coming from Late Minoan I contexts. The exact findspots from the older excavations were seldom recorded, so a few artifacts may be slightly earlier or later.

The equipment employed for the analyses consists of a transportable XRF source on a support with devices to control its position and stability, a transformer, a stabilizer, and a computer with dedicated software. The characteristics of the equipment and its various devices, the dedicated software, and a suitable number of standards (produced ad hoc by AGM Archeoanalisi) greatly enhanced the precision of the system.

The composition, production techniques, and finishing processes of the artifacts have been investigated and allow for the reconstruction of the fabrication procedures and the various stages of production. Among the metal finds were objects that are commonly interpreted as small tools, such as tweezers, the so-called weaving hooks, and cosmetic scrapers.

The analyses have shown that the copper-based alloys employed for personal ornaments and jewelry are much better refined and contain more alloying elements such as tin and arsenic than the copper-based alloys used for simple tools. Further, the tweezers, so-called weaving hooks, and cosmetic scrapers were made of the same good-quality alloys as jewelry. This fact clearly indicates that such small personal items were not simple tools, but they had high value and a special significance in Minoan society. They were apparently worn by their owners as decorative accessories, and they indicated social status. In the special case of the items heretofore known as weaving hooks, their identification as hair pins is confirmed by the existence of gold examples and painted representations in the Grandstand Fresco at Knossos.

✦ ✦ ✦

Introduction

For our project on Minoan metallurgy, many objects of various sizes, belonging to several classes, and made of different metals were analyzed by X-ray fluorescence (XRF). The items come from different sites in eastern Crete, one of which is the Minoan town of Gournia, which was excavated in the early twentieth century.[1] With the support of the University of Pennsylvania Museum of Archaeology and Anthropology (hereafter, Penn Museum) in Philadelphia and private donors, Harriet Boyd Hawes and her collaborators, Richard Seager and Edith Hall, excavated the settlement of Gournia in three campaigns in 1901, 1903, and 1904 and published the discoveries in 1908.

The settlement was situated on a low hill overlooking the Gulf of Mirabello. It thrived from the Early Bronze Age until it was destroyed at the end of Late Minoan (LM) IB (ca. 1450 BC). The town consisted of paved and cobblestone laneways among many irregularly shaped, multiroom houses. Many types of artifacts were found throughout the site including fine examples of Late Minoan IB Marine-style pottery and also earlier examples of silver and ceramic kantharoi.[2] Stone vessels and tools came to light, such as bird's nest bowls, rhyta, lamps, mortars, and pestles. A lapidary workshop probably existed in the town. Additionally, other utilitarian items, especially metal tools and objects such as daggers, double axes, saws, chisels, and sickles, were uncovered during the excavations. Most of these objects were incorporated into the collection of the Candia Museum, which is now the Herakleion Archaeological Museum in Crete, but a smaller number of items also was offered at that time to the Penn Museum as a gift to create a study collection in the United States. This collection is one of the most important groups of Minoan objects outside of Greece, second only to the Knossian collection of the Ashmolean Museum at Oxford University.[3]

The wide range of types of metal objects that were found at Gournia—from ingots to sheets and strips to finished tools to scrap metal—in addition to other finds from the settlement—such as stone hammers and stone molds, which were discovered in a cache in Room Fh—indicate that the people who lived in the town probably manufactured metal objects in one or more workshops. The metalsmiths may have been housed in Rooms Ea and Cg based upon the sheer number of metal objects that were found in those rooms.[4]

The collection of the Penn Museum contains over fifty cataloged metal items, most of which likely date to the time of the destruction of the town at the end of Late Minoan IB. Dating metal objects, however, can be problematic because scholars have documented the continuity of tool type and morphology from the Early through the Late Bronze Age in Greece based solely on stratigraphical contexts.[5] Also, metal objects tend to be long-lived, so the manufacture of some may actually date to earlier periods.

Hawes's excavation report of 1908 set a high standard for quality publication in her day, but unfortunately it does not measure up to modern levels of scholarship. She did not fully catalog the majority of the objects that were found nor completely document their contexts at the site. In the final report, only 72 out of 157 copper-based objects were listed and illustrated from the entire site. The Penn Museum has over 53 of the 157 objects, but not all of them are shown in the original publication, so additional objects were clearly omitted from the final publication.

All of the metal finds from Gournia that are housed in the Penn Museum have been analyzed with XRF,[6] but we will focus here on a few select pieces, namely the small copper-based tools and personal items such as tweezers, cosmetic scrapers, and the so-called weaving hooks. The composition, production techniques, and finishing processes of the artifacts have been investigated and allow for the reconstruction of the various stages of fabrication.

Methodology

Each object chosen for analysis was visually examined under various magnification (x50, x100, x200) devices to determine its current state of preservation and to identify the best locations on the surface for performing the analytical measurements. Comprehensive visual examination also reveals evidence for manufacturing techniques and even indications for the attachment of organic handles that have long since disappeared. Wherever necessary, the chief conservator of the museum removed a small area of the patina layers before taking measurements.

XRF was chosen for the scientific analysis because it is a non-destructive method perfect for use on museum pieces. The particular system employed was also transportable and was specially developed for the analysis of cultural heritage objects. The equipment consisted of an XRF source on a support with devices to control the position and stability of the X-ray beam, a transformer, a stabilizer, and a computer with dedicated software. The characteristics of the equipment, the dedicated software, and the standards specifically created for use with ancient metal alloys (produced ad hoc by AGM Archeoanalisi) greatly enhanced the precision of the system. Each measurement illuminated a spot on the object with X-rays for a short time, usually about 15 minutes, but longer if the location was very small. The irradiated zone measures approximately 1.5–2.0 mm in diameter, but it can be reduced or enlarged depending upon the size and surface texture of the object. An acoustic signal indicates when the distance from the sample is correct, and a laser pointer marks the exact location to be measured.

A wide range of elements—particularly metals and alloys—can be quantified with precision, if proper standards are used.[7] Those utilized in our analytical program represent various compositions of ancient metal alloys. They are an important aspect of evaluating the XRF results. During the project at the Penn Museum, the standards were run each day at regular intervals. Drift and any interference therefore could be identified and accounted for while gauging the results. This procedure maintains precision and assures reliable results. This system is transportable, yet it is as accurate as any classic laboratory XRF.

Results: Composition of Small Decorative Objects of Personal Use

Personal ornaments made of metal were an important type of object during the Cretan Bronze Age. This class commonly shows a better quality of manufacture than everyday objects and tools. Their presence in mortuary contexts dating back to the beginning of the Early Bronze Age indicates that the Minoans had a long history of exhibiting social status through personal adornment with metal items.

The XRF results (table 30.1) show that a small group of four hook-shaped pins (MS4203–MS4205 [fig. 30.1], MS4740), which have been called “weaving hooks” or jewelry in the literature,[8] contain a relatively high amount of tin, at 2–5 percent, with measurable arsenic in a couple of the specimens. The four pieces were manufactured with different techniques. Two of the pins are square in section and therefore seem to have been simple cast objects; the other two examples (MS4203, MS4205) are round in section, so they were most probably hammered into shape after casting. Furthermore, one of these pins (MS4203) was created using a third technique, namely twisting together two lengths of wire, as evidenced by the spiral-form seam visible under magnification. The shaft was hammered and then polished with an abrasive tool. The fabrication techniques rendered delicate decorative forms, while the composition of the alloys containing relatively high amounts of tin with some arsenic would have resulted in a lighter color of the metal, perhaps imitating gold or silver.

Object Type	Museum Inv. No.	Part	Cu	Sn	Pb	As	Sb	Fe	Ni	Ag	Zn	Co	Mn	Au
Scraper	MS4190	Blade	93.2	0.9				1.3		Tr.	4.6			
Scraper	MS4190	Rivet_1	92		Tr.	Tr.	Tr.	1.7			5.8			
Scraper	MS4190	Rivet_2	91.6	Tr.		Tr.		2.4		Tr.	5.5			
Scraper	MS4198		94.7	3.2	0.3		Tr.	1.7						
Tweezers	MS4746K	Frg.	97.2	Tr.		2.4	Tr.	0.3						
Tweezers	MS4196	Blade	96.7	2.1	Tr.	Tr.		1.5		Tr.				
Tweezers	MS4196	Repair	95.6	1.8		Tr.		2.4		Tr.				Tr.
Tweezers	MS4746F	Frg.	99.8					Tr.						
Hook	MS4204		95.6	2.3		1.2	Tr.	1.3		Tr.				
Hook	MS4205		94.2	4.2	0.3			1.2					Tr.	
Hook	MS4203		93.6	5		0.4		0.8		0.5				
Hook	MS4740		93.6	3.8		Tr.	Tr.	2.2		0.2				Tr.

MS = Mediterranean Section, Penn Museum, Philadelphia, PA
Tr. = trace amount
Frg. = fragment

Table 30.1. Results of XRF analyses on metal objects from Gournia

Figure 30.1. Selection of metal objects from the Late Minoan town of Gournia that have been analyzed with XRF at the Penn Museum, Philadelphia, PA.
Image: Courtesy of the University of Pennsylvania Museum of Archaeology and Anthropology, Philadelphia, PA

Hook-shaped pins from the Minoan culture have been construed at times to be weaving hooks, but the metallurgical composition and method of manufacture of those from Gournia are comparable to those of decorative objects instead of utilitarian tools. Furthermore, according to scholars who specialize in textiles of the Aegean Bronze Age, so-called weaving hooks do not actually exist in the repertoire of tools necessary for the fabrication of cloth.[9] Our hook-shaped pins from Gournia are paralleled by examples from other sites made of gold, silver, and ivory.[10] Specifically, a total of ten ivory pins were excavated in a Late Minoan I house at Mochlos, a Minoan harbor town near Gournia, along with an ivory box filled with amethyst, carnelian, and lapis lazuli beads.[11] The entire set must have belonged to a very important lady who was not unlike those depicted with hair accessories in frescoes from Knossos in Crete and Akrotiri on the island of Thera. The Miniature Grandstand Fresco at Knossos[12] illustrates two ladies with hook-shaped pins adorning their hair (fig. 30.2). The "injured adorant" in the Xeste 3 wall-paintings at Akrotiri wears a hook-shaped pin in her coiffure that ends in the form of an iris.[13] These painted parallels support the idea that metal hook-shaped pins probably were not simple tools. They had a special social meaning because the ladies in the frescoes certainly held an elevated status in Minoan society. The use of these decorative items as personal ornaments therefore seems much more logical than as a textile tool without a single parallel.

Figure 30.2. Detail of the Miniature Grandstand Fresco from Knossos in the Archaeological Museum of Herakleion, Crete, Greece
Image: S.C. Ferrence, with permission of J. Sakellarakis

One of the largest classes of metal objects within the Gournia collection at the Penn Museum is the tweezers (see fig. 30.1, upper center). The alloy used to create them was specially prepared with well-purified copper and the addition of higher amounts of tin. Their compositions show 2–3 percent tin, comparable to the alloys used for other personal ornaments. These alloys were commonly manufactured with refined copper that also contained noticeable amounts of tin and some arsenic. The objects were carefully finished and even repaired when broken (e.g., MS4196) instead of being melted down for recycling, indicating that the tweezers were important objects of some significance and perhaps had a special meaning. They could have been worn by the owner, maybe as a pendant or on the belt, and functioned as small personal adornments. The composition of the tweezers can indeed be compared to that of other ornaments. One of the pieces (MS4746K) in particular contains only traces of tin but a higher arsenic content of 2.4 percent. Tools composed of this alloy are just as functional as examples manufactured with tin bronze. The color of the arsenic-rich tweezer also would have been conspicuously lighter, perhaps improving its aesthetics. Unfortunately, this particular example from Gournia is in poor condition, meaning the data should be considered only indicative.

Another object from Gournia is a small "scraper" that was formed with a loop for use as a possible handle (MS4198; see fig. 30.1, upper right). Again, this small personal item was made with a similar kind of metallurgical composition. It may have been used as a cosmetic scraper of some sort, and the loop would have provided a way to wear it as a personal ornament in the same manner as suggested for the tweezers.

Two other examples (MS4190 [see fig. 30.1, upper left], MS4746F) from Gournia are simpler in composition. A small implement with a flaring blade (MS4190) shows evidence for careful finishing. Under magnification, one can also see that the cutting edge exhibits traces of use-wear and reworking. The blade is composed of copper with only traces of tin and no measurable arsenic, while the rivets are less refined unalloyed copper. The presence of relatively high zinc and iron in this object is only due to corrosion. The other small blade (MS4746F) was made of unalloyed copper that contained only traces of arsenic and silver.

Conclusions

Our study has demonstrated that the Minoan metalsmiths were able to purify their copper whenever the need arose. For some classes of utilitarian objects, however, thorough purification was not deemed necessary, so impure copper was used. The arsenic and tin content shown in the XRF results of these copper-based objects from Gournia suggests that tin was a rare and expensive commodity and that recycling scrap metal was relatively common.

Moreover, as the smiths gained empirical metallurgical experience over time, their growing knowledge enabled them to recognize the beneficial properties of arsenic-rich copper, and to appreciate its pale silvery color. This would have contributed to their production of tools that were more resistant and harder than copper, and also to the manufacture of decorative items that could be lighter and more attractive in color.

The XRF analyses have demonstrated that the copper-based objects from Gournia presented here were actually prestige items because the alloys contain certain metals in particular quantities (one of which is a precious metal) to convey the color and status of silver and gold. These alloys used for personal ornaments and jewelry are refined to a higher degree and contain more alloying elements, such as tin and arsenic, than the copper-based alloys usually used for simple utilitarian tools. Additionally, the hook-shaped pins, tweezers, and cosmetic scrapers were manufactured with high-quality alloys comparable to those used in jewelry pieces. These small personal items therefore were not simple tools but were highly valued in Minoan society. The owners would have worn them as decorative accessories for their garments and hairstyles as an indication of their social status.

✦ ✦ ✦

Acknowledgments

We thank the Penn Museum for permission to study, analyze, and publish the metal objects from Gournia. We gratefully acknowledge funding provided by the Institute for Aegean Prehistory (INSTAP), Philadelphia, PA. We are indebted to Philip Betancourt, our friend and colleague, for his support and collaboration.

Notes

1. Boyd 1904; Boyd Hawes et al. 1908.
2. Betancourt 1979; Betancourt and Silverman 1991; Fotou 1993.
3. Boardman 1961.
4. Betancourt et al. 1978, 7.
5. See, for example, Branigan 1974.
6. Giumlia-Mair, Ferrence, and Betancourt 2015.
7. See Hahn-Weinheimer, Hirner, and Weber-Diefenbach 1995; Lutz and Pernicka 1996.
8. Branigan 1974, 35, pl. 17.
9. J. Cutler, pers. comm.
10. Branigan 1974; Soles and Davaras 2010.
11. Soles 2016, 249, pls. LXXX–LXXXIII.
12. Evans 1930, 46–57, plates XVI, XVII.
13. Vlachopoulos and Georma 2012, esp. 40, plate XVIId.

Bibliography

Betancourt 1979
Betancourt, P. P. 1979. "The Pottery Chronology: A Brief Sketch." In *Gournia, Crete: The 75th Anniversary of the Excavations* (Temple

University Aegean Symposium 4), ed. P. Betancourt, 7–10. Philadelphia: Temple University.

Betancourt and Silverman 1991
Betancourt, P. P, and J. S. Silverman. 1991. *The Cretan Collection in the University Museum, University of Pennsulvania*. Vol. 2: *Pottery from Gournia*. University Museum Monograph 72. Philadelphia: University Museum.

Betancourt et al. 1978
Betancourt, P. P., T. S. Wheeler, R. Maddin, and J. D. Muhly. 1978. "Metallurgy at Gournia." *MASCA J* 1: 7–8.

Boardman 1961
Boardman, J. 1961. *The Cretan Collection in Oxford: The Dictaean Cave and Iron Age Crete*. Oxford: Clarendon.

Boyd 1904
Boyd, H. A. 1904. "Gournia: Report of the American Exploration Society's Excavations at Gournia, Crete." *Transactions, Department of Archaeology, University of Pennsylvania* 1.1: 7–44.

Boyd Hawes et al. 1908
Boyd Hawes, H. A., B. E. Williams, R. B. Seager, and E. H. Hall. 1908. *Gournia, Vasiliki, and Other Prehistoric Sites on the Isthmus of Hierapetra, Crete: Excavations of the Wells-Houston-Cramp Expeditions, 1901, 1903, 1904*. Philadelphia: American Exploration Society, Free Museum of Science and Art.

Branigan 1974
Branigan, K. 1974. *Aegean Metalwork of the Early and Middle Bronze Age*. Oxford: Clarendon.

Evans 1930
Evans, A. 1930. *The Palace of Minos: A Comparative Account of the Successive Stages of the Early Cretan Civilization as Illustrated by the Discoveries at Knossos*. Vol. 3. New York: Biblo and Tannen.

Fotou 1993
Fotou, V. 1993. *New Light on Gournia: Unknown Documents of the Excavation at Gournia and Other Sites on the Isthmus of Ierapetra*. Aegaeum 9. Liège: Université de Liège; Austin: University of Texas.

Giumlia-Mair, Ferrence, and Betancourt 2015
Giumlia-Mair, A., S. C. Ferrence, and P. P. Betancourt. 2015. "Metallurgy of the Copper-Based Objects from Gournia, East Crete." In *Archaeometallurgy in Europe III: Proceedings of the 3rd International Conference, Deutsches Bergbau-Museum Bochum, June 29–July 1, 2011 (Der Anschnitt 26)*, ed. A. Hauptmann and D. Modarressi-Tehrani, 145–153. Bochum.

Hahn-Weinheimer, Hirner, and Weber-Diefenbach 1995
Hahn-Weinheimer, P., A. Hirner, and K. Weber-Diefenbach. 1995. *Röntgenfluoreszenzanalytische Methoden: Grundlagen und praktische Anwendung in den Geo-, Material- und Umweltwissenschaften*. Braunschweig: Vieweg.

Lutz and Pernicka 1996
Lutz, J., and E. Pernicka. 1996. "EDXRF Analysis of Ancient Copper Alloys." *Archaeometry* 38.2: 313–23.

Soles 2016
Soles, J. S. 2016. "Hero, Goddess, Priestess: New Evidence for Minoan Religion and Social Organization." In *Metaphysis: Ritual, Myth, and Symbolism in the Aegean Bronze Age. Proceedings of the 15th International Aegean Conference, Vienna, Institute for Oriental and European Archaeology, Aegean and Anatolia Department, Austrian Academy of Sciences and Institute of Classical Archaeology, University of Vienna, 22–25 April 2014* (Aegaeum 39), ed. E. Alram-Stern, F. Blakolmer, S. Deger-Jalkotzy, R. Laffineur, and J. Weilhartner, 247–53. Leuven and Liege: Peeters.

Vlachopoulos and Georma 2012
Vlachopoulos, A., and F. Georma. 2012. "Jewellery and Adornment at Akrotiri, Thera: The Evidence from the Wall Paintings and the Finds." In *Kosmos: Jewellery, Adornment and Textiles in the Aegean Bronze Age: Proceedings of the 13th International Aegean Conference, University of Copenhagen, Danish National Research Foundation's Centre for Textile Research, 21–26 April 2010* (Aegaeum 33), ed. M.-L. Nosch and R. Laffineur, 35–42. Leuven and Liège: Peeters.

31.

Bronze Trees from the Greek to the Roman World

Marina Castoldi, Università degli Studi di Milano

Among the various anathemata that were offered in major Greek sanctuaries are fruits, vegetables, and trees in bronze and precious metals. These objects are well known from literary sources, which mention the bronze palm dedicated to the sanctuary of Delphi by Kypselos, and the one offered by the Athenians after the battle of the Eurymedon. Moreover, various metal trees are known to have functioned as interior decorations for sacred temples, such as the ingenious bronze palm tree in the Erechtheion crafted by Kallimachos. Others were decorative objects displayed in secular settings.

After an earlier study on Greek bronze trees (Castoldi 2014), this new contribution focuses on bronze trees in the Roman world and no longer on anathemata, with the exception of some small trees in *lararia* or domestic shrines, as well as a number of lamp-holders shaped like tree trunks.

It is possible that the secular artworks drew their inspiration from the great Greek plant-shaped anathemata—for example, the golden grapevine and the golden plane tree, which both decorated the palace of the king of Persia until the time of Alexander the Great. Such objects could have been a source of inspiration for many toreutics in the Hellenistic and Roman periods, such as the grapevine offered by Aristobulos II to Pompey the Great, as well as the trunk-shaped lamp-holders found in many wealthy *domus*.

✦ ✦ ✦

It is well known that trees, gardens, and landscapes are not commonly represented in Greek art until the Hellenistic period. In vase painting, the focus is on men, gods, and heroes; war, hunting, labor, rituals, weddings, death, and festivals offer the opportunity to represent humans, who are at the center of philosophy and art in ancient Greece. Nature and landscapes, by contrast, rarely appear in vase painting; floral patterns, tendrils, and leaves only appear as subsidiary decoration. In a few cases, flowers and trees acquire life on their own as gods' attributes or to give emphasis to a sacred setting, as for example the palm tree linked to the birth of Apollo and the sanctuary of Delos.

In the Greek world, fruit and vegetables played an important role as offerings and anathemata. Items such as firstfruits were given to the gods, but these were perishable items meant to be burnt on the altars the same day.[1]

Fruit and vegetables could become more durable offerings if they were modeled from clay, ivory, bronze, or gold,[2] as for instance the famous "golden harvest" dedicated from Metaponto to Delphi; the gold celery from Selinus; or the *silphium* from Ampelos.[3] In addition to such fruits and vegetables given as anathemata, trees made from bronze and precious metals have been reported as offerings at some of the major Greek sanctuaries.

These objects are well known thanks to the ancient sources. For example, Plutarch described the bronze palm dedicated in the sanctuary of Delphi by Kypselos—perhaps a *sphyrelaton*[4]—and one offered by the Athenians after the battle of the Eurymedon (470/469 BC).[5] The base of the latter has been identified to the northeast of the front side of the Apollo temple: a statue of Athena with an owl stood on top of the palm tree, which had bunches of golden dates and was still standing at the time of Pausanias.[6] Another famous bronze palm tree was offered by Nikias at the Apollo sanctuary of Delos around 417 BC, as mentioned by Plutarch; its base is preserved not far from the *oikos* of the Naxians.[7]

However, we also have many *realia*. A good example in bronze was found during the excavations of Karapanos in Dodona; it represents a branch of an oak, the tree sacred to Zeus.[8] Moreover, we may remember the bronze branches and laurel leaves in the sanctuary of Apollo in Klaros, and those found in Magna Graecia, in Kroton, Kaulonia, and Metaponto (fig. 31.1); these testify to the practice of dedicating bronze laurel trees to Apollo.[9]

Figure 31.1. Bronze laurel leaves from the temenos of Apollo and Aristeas on the agora of Metaponto, Italy
Image: By author, courtesy of Soprintendenza Archeologia della Basilicata

Among profane artworks, I would note the golden grapevine adorned with precious stones attributed by some scholars to the versatile artist Theodoros of Samos and the golden plane tree, both decorating the Persian royal palace: the grapevine was hung over the king's bed like a baldachin. According to the majority of sources, this work combined the monumentality of bronze sculptures with the elegance of jewelry.[10]

The ancient texts date these ornaments to the period of Darius I (522–486 BC), but it is likely that they remained in use until the time of Alexander the Great. They might therefore have become a source of inspiration for some of the toreutic art in the Hellenistic and Roman periods, such as a golden grapevine offered as anathema in the Artemision of Delos in the third century BC, and the one offered by Aristobulos II to Pompey when he arrived in Syria: εἴτε ἄμπελος εἴτε κῆπος.[11] This may be the same one that Pliny the Elder remembered as being displayed during a triumph in Rome, "a square mountain of gold with deer, lions and every variety of fruit on it and a golden vine entwined around it," which was then exhibited in the temple of Jupiter Capitolinus.[12]

Moreover, we know that various metal trees served as interior decorations for sacred temples, such as the ingenious bronze palm tree in the Erechtheion crafted by Kallimachos.[13] A famous candelabrum, perhaps trunk-shaped, with lamps shaped like fruits, was once held in the Temple of Apollo Ismenios in Thebes. It was taken away by Alexander the Great, then dedicated in the Temple of Apollo at Cyme (Kyme), and finally carried to Rome to be shown in the Apollo Temple on the Palatine. Pliny may be the only source that refers to this installation, but a *terminus ante quem* for its creation is given by the conquest of Thebes by Alexander the Great in 335 BC.[14]

In Hellenistic art, unlike in Classical Greek art, vegetal themes were very popular, perhaps following the model of the Persian royal gardens, which Alexander himself knew well.[15] Flowers and plants were used, for instance, in the luxurious decoration of the famous pavilion (*skené*) and procession of Ptolemy Philadelphus in the court of Alexandria,[16] whose golden plants and furniture with floral decorations were described by Athenaeus.[17]

Of course, gardens like the one in Alexandria were artificial: the exuberance of nature was subordinated to the rigor of architecture and architectural decoration. The same concept is evident in the wall-paintings of imperial villas, for example in the famous villa of Livia (*Villa ad gallinas albas*) at Prima Porta, where the gardens are depicted according to architectural rules.[18]

The taste for ornamental plants spread in the arts and crafts of Early Imperial Rome. They evoked the spirit of the Alexandrian gardens and the tree-shaped artworks and precious monumental anathemata in the Greek temples and sanctuaries (i.e., laurel trees, palms, and grapevines in bronze or gold) that were still visible in Roman times.

Figure 31.2. Bronze lampstand *a canna* (cane-like) from the *Domus del ninfeo*, Cremona, Italy

Image: With permission of the Ministero dei beni e delle attivitá culturali e del turismo — Soprintendenza Archeologia della Lombardia

Figure 31.3. Trunk-shaped bronze lampstand from Meloria, Livorno, Italy

Image: With permission of the Soprintendenza Archeologia della Toscana

Candelabra in the form of trees, more or less naturalistic, were widespread. The most common were certainly lampstands with slender shafts *a canna* (cane-like), representing bamboo or lopped branches, surmounted by a disk to hold a single lamp (fig. 31.2).[19] This type was most likely produced in central Italy and was manufactured in a small, tabletop version, and in a larger version, to be placed on the floor.[20]

In addition to such stylized variants, however, there is also evidence of more naturalistic representations. There are medium-sized lampstands, trunk-shaped, made to be placed on tables or supports, with small lamps suspended from their branches like fruits, such as the specimens from Pompeii and the famous lampstand from the Meloria (Livorno) (fig. 31.3).[21] It has been noticed that the leaves are poorly represented, but these items are not trees—they are lampstands. Evidently, the lamps, as small bearers of light, replaced the leaves.

Some ornate stands have a large rectangular base upon which statuettes of heroes, satyrs, or gods could be placed, as for instance a beautiful acanthus-shaped candelabrum, with Attis or Alexander Helios, which is now in Geneva.[22] In these examples, the tree can be naturalistic, with twisted trunk and branches, in the manner of Hellenistic art, or modeled with more architectural forms, such as a floral column. In addition to examples of this type from the Early Imperial period, there is evidence of more complex objects in which the tree is the support of statuettes, leaning toward the plant. I recall here examples in Pompeii, Ephesos, Baden (Switzerland), the one now in Kansas City, and perhaps the one from Hungary (Brigetio).[23] These artworks testify to the decorative function of certain metal trees, which is very evident in the Roman world; the tree, after a long life as *agalma* or gift to the gods, is now a “bringer of light” that found its way out of the sanctuaries and into the wealthy *domus* of the Romans as luxury furniture.[24]

Other bronze trees in the Roman world had a votive function: such is likely the case for the candelabrum in the British Museum, a true *signum pantheum*, in which a twisted tree became the support for pantheistic attributes in relief. This is a unique object, as far as I know, which due to its small size should be assigned to a *lararium* or a small domestic shrine setting.[25]

In northern Italy, a group found in the region of Verona is of great interest. It consisted of a small bronze tree and a statuette of Minerva (fig. 31.4): one can assume that they too were likely placed in a *lararium*.[26] Lamps modeled in the form of an acanthus bud are known also from among the famous findings of Montorio Veronese, some of which were likely part of a *lararium*.[27] Individual leaves are represented in Roman times among votive offerings, as we know from many examples from northern Italy.[28]

Some finds derive from the provinces, but these materials are mostly without context; the hypothesis that they belong to *lararia* or domestic shrines is considered here because of the small size of the objects. Small trees have notably been found in the Magdalensberg (Noricum); in Strasbourg (Argentoratae) and in Seltz (both in Alsace); in Hintzerath (Trier); in Zugmantel; and in Bonn.[29] These examples are scattered over a wide area, but always within the Roman Empire; some of them are quite alike (and may have been produced in the same area[30]) and they all attest to the practice of dedicating more or less naturalistic little figures of trees to the gods.

We can gain a sense of the importance of plants from two famous statuettes. One is the miniature silver statuette from northern Italy, considered the *Terra mater/salus*, of the Summano mountain site.[31] The find is linked to transhumance routes but also to practices that evoke the rural fertility cults: the goddess sits on a throne, with a patera, snakes, and branches. The second is the well-known Dea Artio from Muri (Bern), with a tree that seems to represent the wild landscape.[32]

Figure 31.4. Small bronze tree and statuette of Minerva from a *lararium* at Gazzo Veronese (Verona, Italy)
Image: With permission of the Ministero dei beni e delle attivitá culturali e del turismo; riproduzione vietata

If we turn from votive objects to wall-painting, we can see that, at least in southern Italy, branches, plants, and flowers are widespread in *lararia*, in scenes of sacrifice—representing the natural landscape of the ritual—or to recall the ancient *lucus*, the sacred grove.[33]

I would speculate that these small bronze trees, when they were placed in *lararia* or domestic shrines, are more than mere small-sized tree-shaped lamp-holders. Rather they may reference the *lucus* or the ancient offering of firstfruits that was always of great importance in the Roman world.

✦ ✦ ✦

Acknowledgments

This paper was given at the XIXth International Bronze Congress; it is published here without significant changes or additions, except in the bibliography. I would like to thank the Organizing Committee for this extremely interesting Bronze Congress and for the warm welcome in Los Angeles. I would also like to thank all my colleagues who helped me with comments, suggestions, and collaborations: Silvia Amicone, Barbara Arbeid, Margherita Bolla, Brunella Bruno, Antonio De Siena, Federica Grossi, Kurt Gschwantler, Kenneth Lapatin, Lucia Mordeglia, Mara Romaniello, and Ambra Spinelli.

Notes

1. Castoldi 2014, 11–13, with bibliography.
2. Rouse 1902, 66; Kyrieleis 1988; Kyrieleis 1993, 138.
3. See Castoldi 2014, 18–27, with bibliography.
4. The source is Plutarch *De Pythiae oraculis* 399e; idem, *Convivium septem sapientium* 164a; see Castoldi 2014, 44–51.

5. Plutarch *Nicias* 13.5; *De Pythiae oraculis* 397f; Castoldi 2014, 51–58.
6. Pausanias 10.15.4. Amandry 1954; Bommelaer and Laroche 1991, 186, no. 420.
7. Plutarch *Nicias* 3.7. Courbin 1973; Castoldi 2014, 58–60.
8. Carapanos 1878, 91, plate XLIX.8. This beautiful branch is now displayed in the National Archaeological Museum in Athens, Bronze Collection.
9. Castoldi 2014, 32–41.
10. Castoldi 2014, 87–94.
11. *FHG* III 493, 11.
12. Pliny *Historia naturalis* 37.6.14; Eichholz 1971, 175.
13. Pausanias 1.26.6–7. See also Palagia 1984; Gerding 2006, 394–97; Castoldi 2014, 81–85.
14. Pliny *Historia naturalis* 34.8.14; see also Castoldi 2014, 7.
15. Calandra 2015.
16. Calandra 2008; Calandra 2009; Calandra 2011.
17. Athenaeus 5.196a–197c.
18. Slavazzi 2015.
19. For the lampstand from Cremona (*domus del Ninfeo*), see Castoldi 2010, 153, fig. 2.
20. For this lampstand *a canna* (bamboo-shaped), see Bailey 1996, 94–96, plates 109–15; for northern Italy, see Giacobello 2005.
21. For Pompeii, see Pirzio Biroli Stefanelli 1990, and for the candelabrum "della Meloria," see Beschi 1984, 54–55; Castoldi 2005, 197–98. Another lampstand modeled as a tree is one found in Alba Helvorum (France): Clément and Dumoulin 2010, 336, fig. 4.
22. Gentili 2013, 267, no. 62; see also Bailey 1996, 98–99, plate 118–21.
23. Pompeii: Pirzio Biroli Stefanelli 1990, 276, no. 80, fig. 186. Ephesos: Bol 1970, 82–90, figs. 6–7. Baden: Kaufmann-Heinimann and Deschler-Erb 2013, 48, fig. 21. Kansas City: Bieber 1963. Brigetio: Gschwantler 1986, 139, no. 218, fig. 280; given its small size, this piece could have been part of a domestic shrine.
24. We may remember the statues of nude youths in the tradition of the fifth century that have become tray-bearers or lamp-holders: see *supra* the paper by Carol Mattusch.
25. British Museum, inv. Q 3909: Bailey 1996, 99, plates 124–25.
26. See Bolla 2007, 248, figs. 3–4; the tree and the statuette have the same patina; they were found in Predelle (Gazzo Veronese) in a residential setting.
27. Beschi 1962, 102–104; Kaufmann-Heinimann 1998, 293, GF94.
28. See now Bolla 2015, 284–87.
29. Magdalensberg: Deimel 1987, 167, no. 4, plate 32. Strasbourg-Argentoratae: Forrer 1927, 495, fig. 365 C; Schnitzler 1995, 82, no. 87. Seltz: Schaeffer 1927, 38–39, no. 21, plate VIII; Kaufmann-Heinimann 1998, 262, GF45, fig. 219. Hintzerath, Kr. Bernkastel (Trier): Menzel 1966, 80, no. 192, plate 62. Zugmantel: Büttner 1962, 74 (ZM 2750), plate 7.11. Bonn, legion camp: Zieling and Leih 2004, 322, fig. 37.
30. Compare for instance the spiral trees from Brigetio, Hintzerath, and Kansas City; or the specimens from Seltz and Strasbourg-Argentoratae, which are very similar; for bibliography, see nn. 23 and 29 above.
31. Gamba 2012, fig. 4.
32. Kaufmann-Heinimann 2002, 48–53.
33. See Giacobello 2008, 99–100, figs. 2, 9, 11, 13, 18–20.

Bibliography

Amandry 1954
Amandry, P. 1954. "Notes de topographie et d'architecture delphiques. IV. Le palmier de bronze de l'Eurymédon." *BCH* 78: 295–315.

Bailey 1996
Bailey, D. M. 1996. *A Catalogue of the Lamps in the British Museum.* Vol. 4: *Lamps of Metal and Stone and Lampstands*. London: The Trustees of the British Museum.

Beschi 1962
Beschi, L. 1962. *I bronzetti romani di Montorio Veronese*. Venice: Istituto Veneto.

Beschi 1984
Beschi, L. 1984. "Bronzi antichi da un naufragio alla Meloria di Livorno." In *Toreutik und figürliche Bronzen römischer Zeit: Akten der 6. Tagung über antike Bronzen (Berlin 1980),* ed. U. Gehrig, 50–58. Berlin: Staatliche Museen Preussischer Kulturbesitz, Antikenmuseum.

Bieber 1963
Bieber, M. 1963. "A Satyr in Pergamene Style in Kansas City." *AJA* 67: 275–78.

Bol 1970
Bol, P. C. 1970. "Die Herakles-Kentauren-Gruppe in Wien." *AntP* 10: 81–90.

Bolla 2007
Bolla, M. 2007. "Bronzi figurati romani dal veronese: Un aggiornamento." *NumAntCl* 36: 245–85.

Bolla 2015
Bolla, M. 2015. "Arredi e oggetti vari del tempio di età imperiale." In *Archeologia e storia sul Monte Castelon di Marano di Valpolicella*, ed. B. Bruno and G. Falezza, 271–92. Mantua: SAP Società Archeologica s.r.l.

Bommelaer and Laroche 1991
Bommelaer, J. F., and D. Laroche. 1991. *Guide de Delphes: Le site*. Paris: École française d'Athènes.

Büttner 1962
Büttner, A. 1962. "Figürlich verzierte Bronzen von Kastell Zugmantel." *SaalbJb* 22: 62–75.

Calandra 2008
Calandra, E. 2008. "L'occasione e l'eterno: La tenda di Tolomeo Filadelfo nei palazzi di Alessandria. 1. Materiali per la ricostruzione." *Lanx* 1: 26–74. http://riviste.unimi.it/index.php/lanx/index

Calandra 2009
Calandra, E. 2009. "L'occasione e l'eterno: La tenda di Tolomeo Filadelfo nei palazzi di Alessandria. 2. Una proposta di ricostruzione." *Lanx* 2: 1–77. http://riviste.unimi.it/index.php/lanx/index

Calandra 2011
Calandra, E. 2011. *The Ephemeral and the Eternal: The Pavilion of Ptolemy Philadelphos in the Court of Alexandria*. Athens: Scuola Archeologica Italiana di Atene.

Calandra 2015
Calandra, E. 2015. "I giardini di Alessandria." In Sena Chiesa and Pontrandolfo 2015, 256–64.

Carapanos 1878
Carapanos, C. 1878. *Dodone et ses ruines*. 2 vols. Paris: Hachette.

Castoldi 2005
Castoldi, M. 2005. "Cremona e l'*ager cremonensis*: Elementi d'arredo in bronzo." In Slavazzi 2005, 187–204.

Castoldi 2010
Castoldi, M. 2010. "Gli arredi in bronzo della *domus* di Piazza Marconi a Cremona." In *Arredi di lusso di età romana: Marmi e bronzi nelle case della Cisalpina: Atti della Giornata di Studi (Milano 2009)*, ed. F. Slavazzi (*Lanx* 6), 150–60. http://riviste.unimi.it/index.php/lanx/index

Castoldi 2014
Castoldi, M. 2014. *Alberi di bronzo: Piante in bronzo e in metalli preziosi nell'antica Grecia*. Bari: Edipuglia.

Clément and Dumoulin 2010
Clément, N., and F. Dumoulin. 2010. "Deux nouveaux éléments de la statuaire antique d' *Alba Helvorum* sorten de l'ombre." *RANarb* 43: 331–38.

Courbin 1973
Courbin, P. 1973. "Le colosse naxien et le palmier de Nicias." *BCH Suppl* 1.1: 157–72.

Deimel 1987
Deimel, M. 1987. *Die Bronzekleinfunde vom Magdalensberg*. Klagenfurt: Verlag des Landesmuseum für Kärnten.

Eichholz 1971
Eichholz, D. E., ed. and trans. 1971. *Pliny, Natural History X: Libri XXXVI–XXXVII*. London: W. Heinemann Ltd.; Cambridge, MA: Harvard University Press.

Forrer 1927
Forrer, R. 1927. *Strasbourg-Argentoratae: Préhistorique, gallo-romain et mérovingien*. Strasbourg: Istra.

Gamba 2012
Gamba, M. 2012. "Il Monte Summano: Un santuario sulle vie della transumanza." In *La lana nella Cisalpina romana: Economia e società: Studi in onore di Stefania Pesavento Mattioli: Atti del Convegno (Padova-Verona 2011)*, ed. M. S. Busana and P. Basso, 81–95. Padua: Padua University Press.

Gentili 2013
Gentili, G., ed. 2013. *Cleopatra: Roma e l'incantesimo dell'Egitto.* Exh. cat. Rome, Chiostro del Bramante. Milan: Skira.

Gerding 2006
Gerding, H. 2006. "The Erechtheion and the Panathenaic Procession." *AJA* 110: 389–401.

Giacobello 2005
Giacobello, F. 2005. "Portalucerne romani in bronzo dall'Italia settentrionale." In Slavazzi 2005, 119–30.

Giacobello 2008
Giacobello, F. 2008. *Larari pompeiani: Iconografia e culto dei Lari in ambito domestico*. Milan: LED Edizioni Universitarie di Lettere Economia Diritto.

Gschwantler 1986
Gschwantler, K. 1986. *Guss + Form: Sonderausstellung: Bronzen aus der Antikensammlung*. Vienna: Kunsthistorisches Museum.

Kaufmann-Heinimann 1998
Kaufmann-Heinimann, A. 1998. *Götter und Lararien aus Augusta Raurica: Herstellung, Fundzusammenhänge und sakrale Funktion figürlicher Bronzen in einer römischen Stadt*. Forschungen in August 26. Augts: Römermuseum.

Kaufmann-Heinimann 2002
Kaufmann-Heinimann, A. 2002. *Dea Artio, die Bärengöttin von Muri: Römische Bronzestatuetten aus einem ländlichen Heiligtum*. Zürich: Chronos; Bern: Bernisches Historisches Museum.

Kaufmann-Heinimann and Deschler-Erb 2013
Kaufmann-Heinimann, A., and E. Deschler-Erb. 2013. *Göttlich, menschlich: Römische Bronzen der Schweiz*, ed. M. Bürge. Exh. cat. Zürich, Archaologisches Institut der Universität Zürich.

Kyrieleis 1988
Kyrieleis, H. 1988. "Offerings of 'the Common Man' in the Heraion at Samos." In *Early Greek Cult Practice: Proceedings of the Fifth International Symposium at the Swedish Institute at Athens, Athens 1986*, ed. R. Hägg, N. Marinatos, and G. C. Nordquist, 215–21. Stockholm and Göteborg: P. Åströms Förlag.

Kyrieleis 1993
Kyrieleis, H. 1993. "The Heraion at Samos." In *Greek Sanctuaries: New Approaches*, ed. N. Marinatos and R. Hägg, 125–53. London: Routledge.

Menzel 1966
Menzel, H. 1966. *Die römischen Bronzen aus Deutschland*. Vol. 2: *Trier*. Mainz: Verlag des Römisch-Germanischen Zentralmuseums.

Palagia 1984
Palagia, O. 1984. "A Niche for Kallimachos' Lamp?" *AJA* 88: 515–21.

Pirzio Biroli Stefanelli 1990
Pirzio Biroli Stefanelli, L. 1990. *Il bronzo dei Romani: Arredo e suppellettile*. Rome: L'Erma di Bretschneider.

Rouse 1902
Rouse, W. H. D. 1902. *Greek Votive Offerings: An Essay in the History of Greek Religion*. Cambridge, MA: At the University Press.

Schaeffer 1927
Schaeffer, F. A. 1927. *Un dépôt d'outils et en trésor de bronzes de l'époque gallo-romaine découverts à Seltz (Bas Rhin)*. Haguenau: Imprimerie Municipale.

Schnitzler 1995
Schnitzler, B. 1995. *Bronzes antique d'Alsace: Musée archéologique de Strasbourg, Musées de Biesheim, Colmar, Haguenau, Mulhouse,*

Niederbronn, Wissembourg. Inventaire des collections publiques française 37. Paris: Réunion des musées nationaux.

Sena Chiesa and Pontrandolfo 2015
Sena Chiesa, G., and A. Pontrandolfo, eds. 2015. *Mito e natura: Dalla Grecia a Pompei*. Exh. cat. Milan, Palazzo Reale. Milan: Electa.

Slavazzi 2005
Slavazzi, F., ed. 2005. *Arredi di lusso di età romana: Da Roma alla Cisalpina*. Flos Italiae 6. Florence: All'insegna del giglio.

Slavazzi 2015
Slavazzi, F. 2015. "La rappresentazione della natura nelle residenze imperiali: Le immagini dei giardini." In Sena Chiesa and Pontrandolfo 2015, 231–38.

Zieling and Leih 2004
Zieling, N., and S. Leih 2004. "Rheinisches Amt für Bodendenkmalpflege Ausgrabungen, Funde und Befunde 2001 und 2002." *BJb* 204: 273–357.

32.

Bronze Medical and Writing Cases in Classical and Hellenistic Macedonia

Despina Ignatiadou, National Archaeological Museum, Athens

Parexodos is the name ascribed in the Hippocratic Corpus to the portable medical case that every doctor should own to facilitate work outside his premises. In Macedonia, older and recent finds illuminate an important production of medical and writing cases of the Classical and Hellenistic periods. The cases are either single- or multi-compartment constructions, made of bronze sheet. Type A cases are Late Classical and consist of two lidded semi-cylindrical parts, hinged lengthwise to form a cylinder. Type B cases are Late Classical or Early Hellenistic semi-cylindrical cases with a lid and/or a flat top sheet, perforated to give inside access. The cases have been unearthed in elite male burials, most of them of warriors with cultic and healing duties.

✦ ✦ ✦

Introduction

Parexodos is the name ascribed in the Hippocratic Corpus to the portable medical case that a doctor must own to facilitate work outside his premises. In it, he could store prepared medicaments and also his tools: "ἔστω δέ σοι ἑτέρη παρέξοδος ἡ λιτοτέρη πρὸς τὰς ἀποδημίας ἡ διὰ χειρῶν … [Be sure to possess another portable case, simpler and hand-held for travels …]" (*De decente habitu* 8.10–11).[1]

We are familiar with the medical cases of the Roman period, which are rectangular boxes with sliding lids and rectangular compartments,[2] but our knowledge of the medical cases of the Classical and Hellenistic periods remains limited. In Macedonia, older and recent finds illuminate an important production of multi- and single-compartment medical and writing cases of those periods.

Type A Cases: Late Classical Period

Two cases, from Stavroupolis and Derveni, were found in secure Late Classical contexts and remain the only examples of the Classical period and of this particular type: a cylindrical body comprising two lidded parts, hinged lengthwise. It is very probable that both were made in the same workshop.

The first was found in Stavroupolis in Thessaloniki, on Oreokastrou Street, in a cist grave containing a burial of 350–325 BC (fig. 32.1a–b).[3] It is the most complete and sophisticated case, found in an elite male burial of a warrior and priest. It consists of two hinged half-cylinders with lidded compartments and a built-in inkwell. The case is fully portable as it could be latch-locked and suspended from two loops at the far right end. The upper half-cylinder has its own internal lid, which is hinged at its outer edges, a movable arched handle, and locks in three places. The lower half-cylinder is divided by transverse sheets into three compartments; the left is one-half the length of the whole, and the other two are one-quarter each. One of the dividers is made of lead, and it could be interpreted as a repair; but this practice is noticed in the Archontiko case too (see below), therefore another interpretation might apply. The first two compartments have their own hinged lids with handles and locks. The right compartment has a removable flat top with a central perforation. Underneath it are the remains of a black substance within a circle. The case is made of yellowish high-tin bronze and all the inner lids and the periphery of the hole are decorated with triple silver-gilt lines with small incisions. It is 22.5 centimeters long, and 5.5 centimeters in diameter when closed. It has been mended and restored.

Figure 32.1a. Stavroupolis in Thessaloniki. Bronze cylindrical case with hinged lids. 400–350 BC. Archaeological Museum of Thessaloniki, inv. MTH 7437
Image: D. Ignatiadou

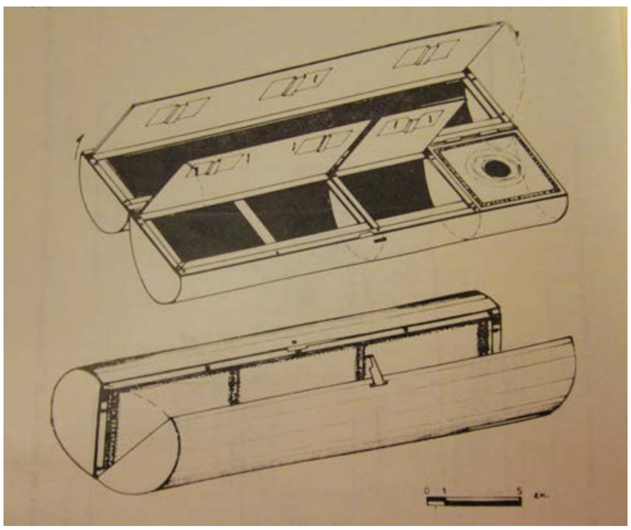


Figure 32.1b. Stavroupolis in Thessaloniki. Bronze cylindrical case with hinged lids. 400–350 BC. Archaeological Museum of Thessaloniki, inv. MTH 7437
Image: After Romiopoulou 1973–74

The deceased in the Stavroupolis burial was a warrior, as we know from his grave goods; however, there are also finds that indicate a religious aspect of his status, such as a set of ritual silver vessels. The most impressive item in the burial was a unique silver-legged stool, a piece of furniture with an established association with the representation of gods, heroes, and priests. The burial had been disturbed by modern digging machinery and the finds were collected rather than excavated. It is probable that the case had been placed in the grave with some other contents that were overlooked or destroyed. As the burial can be dated after the middle of the fourth century BC, the case was probably manufactured in the first half of the same century.

The Stavroupolis case was interpreted as a writing case until recently, when the investigation of the Derveni find, discussed below, led scholars to suspect it was intended instead for medical purposes.

The second case of Type A was found in Derveni, near Thessaloniki, in Cist Grave B with a burial of around 320 BC (fig. 32.2a–d).[4] This burial contained the cremated remains of a man and another individual inside the spectacular Derveni krater. Among the numerous accompanying grave goods was a bronze case (B 35) that still preserved its contents and was interpreted as a cosmetics container. The existence of a second individual in this grave, perhaps a woman, has puzzled researchers because there were no grave goods that could be associated with a woman. In fact, the case presented here was thought to be the main indication for the cremation of a female consort. The find was displayed for more than fifty years with the lid permanently half closed. It is made of high-tin bronze and is divided in three compartments with a flat ledge and a rod fastened on the ledge with copper nails. The lid is made of a single flat sheet, fastened at its extremities with a lengthwise wire rod, and decorated with incised lines along its edges. On the front middle of the lid is an arched handle of ordinary bronze, attached by means of two strips penetrating the sheet and bent underneath. Flanking the handle are two elongated latch holes. One hole and two dents along the right edge of the lid have been patched from behind with a bronze strip. It is 13 centimeters long and 4.9 centimeters wide. Its height when closed is 2.1 centimeters. The lid measures 12.5 by 4.7 by 0.1 centimeter, and the handle is 1.7 by 2.5 centimeters.

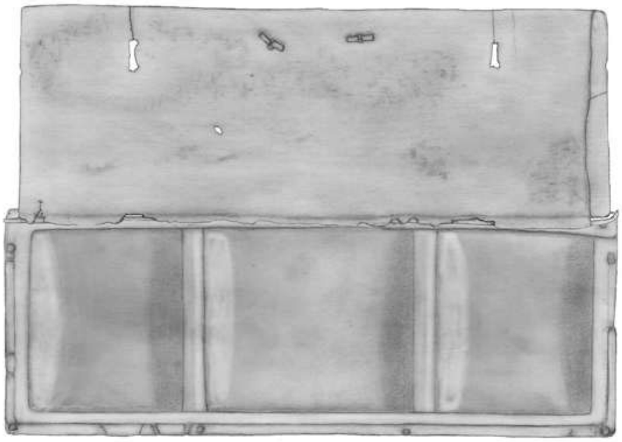


Figure 32.2a

Figure 32.2b

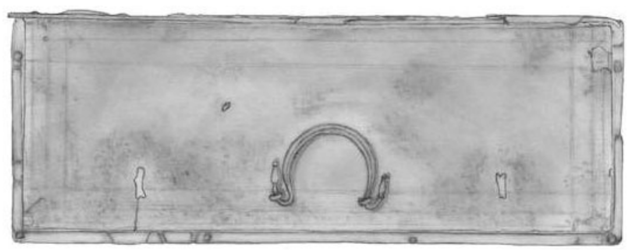


Figure 32.2c

Derveni, near Thessaloniki. Bronze cylindrical case with hinged lids. 400–350 BC. Archaeological Museum of Thessaloniki, inv. B 35, B 90, restored case B 35. Images: A. Thanos

Inside the compartments the original contents are preserved: three masses of "clay." The left and the middle bits appear to have been pinched with naked fingers while the right one had been originally pressed inside a miniature pyxis. On the middle one, a mass of cellulose fibers remains. The inorganic and mineral composition of the three cakes is similar but not identical, and it seems that each one was a deliberate preparation, to be used as medication. Their main constituents are quartz, mica, and chlorite (41–44 percent), plus 16–31 percent of amorphous materials. Fifty-three (53) organic fatty acids were determined in traces, for the moment only chemically, and our efforts continue toward determining their origin in particular herbs, oils/fats, or condiments. The finger impressions on the two cakes show that the healer was taking small amounts to administer in the form of pills.[5]

Other bronze and copper parts related to the Derveni case were retrieved from the same grave (fig. 32.2d):

- Lid B 90a (fig. 32.2d, top) is a second, but longer, bronze lid preserving two latches and also repaired. It is 25.2 centimeters long and 4.5 centimeters wide; the bronze sheet is 0.1 centimeter thick. The handle measures 2.5 by 3.2 centimeters, with latch holes 4.5 centimeters from the corresponding short side.
- Lid B 90b (fig. 32.2d, bottom middle) is a small square bronze lid with a ring handle, perhaps a replacement part. It is 5.3 centimeters long and 4.5 centimeters wide. The bronze sheet is again 0.1 centimeter thick. The diameter of the ring (handle) is 1 centimeter, while the latch holes are 2.5 centimeters from the left side and 2.3 centimeters from the right.
- The bronze lid of B 90c (fig. 32.2d, bottom right) is flat and perforated, decorated with incised lines. It was probably fitted with a small cylinder made of a single flat sheet fastened with a bronze nail; this is evidently the lid of an inbuilt inkwell. It is 5.1 centimeters long and 4.9 centimeters wide, with a sheet thickness of 0.1 centimeter. The diameter of the perforation is 1.4 centimeters.
- Two miniature, undecorated, semi-spherical bowls of hammered copper contained remains of a dark cake, of a nature similar to that of the "clays" in Case B 35. The dimensions of the bowls (4.4 cm in diameter, height 2.1 cm) permit the hypothesis that they could originally have fit inside the compartments of the case.

Figure 32.2d. Derveni, near Thessaloniki. Bronze cylindrical case with hinged lids. 400–350 BC. Archaeological Museum of Thessaloniki, inv. B 35, B 90, original case B 35 + B 90
Image: D. Ignatiadou

Differences in surface preservation resulted when some were mechanically cleaned, some chemically cleaned, while others are still untreated. Nevertheless, all of these non-assembled parts probably belong to the same original case as the restored Case B 35. The long lid of 90a indicates the full length of the complete case, which probably looked similar to the Stavroupolis one. The wear and repairs show that it had been used for a long time before the interment, around 320 BC, and we can therefore date the manufacture of the find to the first half of the fourth century BC. It is further possible that the complete case was modified so that the now restored part had become detachable; it might then be used independently by the healer, who may have inherited it from his father in continuation of a family tradition.

Companion bronze finds in the burial confirm the medical use of the case: these include a miniature pyxis that contained red hematite powder, a spatula probe, a spatula scoop, a rare catheter/clyster, and numerous stone alabastra that probably originally contained medicaments.

The deceased in Derveni Grave B was a high priest, entitled to be buried inside the krater associated with his cultic duties,[6] and also evidently a warrior, since he was buried with his armor and weapons. The inscription on the krater's rim associates him with Larissa, the workplace of Hippocrates, who also died and was buried there, and consequently with the Hippocratic tradition of Thessalian healers.[7]

Type B Cases: Late Classical or Early Hellenistic Period

Several other cases have been found in Macedonian burials. These cases also have a semi-cylindrical body, but their compartments may be lidded and/or topped by a flat sheet perforated to give inside access. These perforations are either rectangular or round.

One such case (Case A) was found in Pydna (Kitros, Alykes), in a Macedonian tomb with burials of the third and second centuries BC. Like the others, it is bronze and a semi-cylindrical case with hinged lid,[8] dating to the late fourth to early third century BC. Its parts are housed in the Archaeological Ephorate of Pieria/Archaeological Museum of Thessaloniki (inv. Py 683, Py 684, Py 686, Py 688) (fig. 32.3).

Figure 32.3. Pydna (Kitros, Alykes). Bronze semi-cylindrical Case A with hinged lid. Late fourth–early third century BC. Archaeological Ephorate of Pieria/Archaeological Museum of Thessaloniki, inv. Py 683, Py 684, Py 686, Py 688
Image: D. Ignatiadou

Three cases were retrieved from this tomb in the south cemetery of ancient Pydna. It was built in the early third century BC but remained in use for successive burials for more than a century. The finds have been treated but not assembled or restored. It is not clear whether Cases A and B (discussed below) were originally used independently or were combined in one cylindrical unit like the Stavroupolis case. Additionally, two bronze lock plates, which may be associated with the cases,[9] one small bronze pyxis, and one bronze probe were found in the tomb.

Case A is a nearly complete lidded and latched case with three compartments made of high-tin alloy. Its top has three circular openings, outlined with incised concentric circles. The lid is undecorated and fastened by means of a flat rod. Flanking the handle are two stepped bosses covering the dowels used to turn the latches. The body (Py 684) is a semi-cylindrical curved sheet preserved in four fragments (fig. 32.3, bottom). As preserved, it is 12 centimeters long, 4.8 centimeters wide, and 1.6 centimeters high. The sheet thickness is less than 0.1 centimeter.

The body side (Py 688) consists of one semi-circular sheet; it is probably one short side of Py 684. It measures about 4.7 centimeters (est. because of broken tip) by 2 centimeters, with a thickness of 0.07 centimeter.

The top (Py 686, Py 691) consists of a flat rectangular sheet with three circular openings (fig. 32.3, middle). It was probably fastened on top of the curved sheet (Py 684). Each opening was approximately 3.6 centimeters wide and is outlined with two incised concentric circles at a distance of 0.4 centimeter from each other. From the largest fragment, preserving nearly half the length, we can estimate the total length of this element to be 15.6 centimeters and its width to be at least 4.8 centimeters. The thickness is 0.07 centimeter.

The lid (Py 683, fig. 32.3, top) consists of a single flat sheet with a moving arched handle. On top of its upper surface and along the back long side is attached a flat rod with pointed ends. Both back corners of the lid are missing; it is therefore not possible to see how it was connected to the body. On the front middle of the lid is an arched moving handle with curved-back terminals. The handle was attached to the sheet by means of two strips penetrating the sheet; these survive only partly. Flanking the handle are two stepped bosses covering the dowel attachments of the latches on the other side of the lid, and probably also used to swivel the latches. The bosses are placed at a distance of 1.7 centimeters from the corresponding short sides and 0.6 centimeter from the long side. The latches are made of a contoured sheet (like two back-to-back C-shaped elements) at the end of a long strip, which survives only partly; the latches were obviously swiveling around the dowel so that the protruding strip would catch against an opposite side. The surface is corroded but from the uncorroded patches it is evident that the lid is not decorated with incisions. It was mended but not restored. The lid measures 16.3 by 5.2 centimeters; the handle is 2.9 by 2 centimeters; the bosses are 0.9 centimeter in diameter. The latches (preserved) are 1.2 by 1.2 centimeters; the rod is 16.7 by 0.3 by 0.1 centimeters.

Case B is also a bronze semi-cylindrical (Py 692), preserved at the Archaeological Ephorate of Pieria/ Archaeological Museum of Thessaloniki. It too comes from Pydna, from the same tomb as Case A (fig. 32.4).

Figure 32.4. Pydna (Kitros, Alykes). Bronze semi-cylindrical Case B. Late fourth–early third century BC. Archaeological Ephorate of Pieria/Archaeological Museum of Thessaloniki, inv. Py 692
Image: D. Ignatiadou

Case B is a semi-cylindrical case with three compartments, but it is shorter than Case A. Only the body is preserved, with visible marks on the places where the compartment dividers once were. It is also possible that some of the top parts attributed to Case A belong to this case instead.

The body consists of one nearly complete semi-cylindrical curved sheet, mended but not restored. It was originally divided lengthwise in three compartments. Their exact original places are still visible on the concave side, as straight corrosion lines. Each of the three compartments was approximately 4.7 centimeters long. It is 14.5 centimeters long and about 4.8 centimeters wide (present but distorted width, 4.2 cm), with a height of 2.3 centimeters. The thickness is 0.05 centimeter.

A third case from the Pydna tomb, Case C, is once again a bronze semi-cylindrical case with a perforated top. It is preserved in the Archaeological Ephorate of Pieria/ Archaeological Museum of Thessaloniki (inv. Py 644, Py 645, Py 687, Py 689, Py 690; fig. 32.5).

Figure 32.5. Pydna (Kitros, Alykes). Bronze semi-cylindrical Case C with perforated top. Late fourth–early third century BC. Archaeological Ephorate of Pieria/Archaeological Museum of Thessaloniki, inv. Py 644, Py 645, Py 687, Py 689, Py 690
Image: D. Ignatiadou

Case C is a single compartment case with a recessed top with a square perforation. In the recess fits a bronze "palette" that can slide to cover or uncover the perforation.

A lid slightly larger than the top and with a similar perforation was probably fitted on it.

The body of Case C consists of one nearly complete semi-cylindrical curved sheet (Py 690), mended but not restored. It is 6.7 centimeters (its present but distorted width is 4.2 cm), and it is 2.3 centimeters high. The thickness is less than 0.1 centimeter.

The body side of Case C consists of one semi-circular sheet (Py 687), about 3.9 by 1.9 centimeters, with a thickness of 0.05 centimeter. Alternatively, this element could be one of the short sides or a divider of Case B.

The top of Case C is a flat rectangular sheet with a recessed rectangular area and a square perforation (Py 689). It measures 6.8 by 4.7 centimeters. The recessed area is 5 by 3 centimeters and about 2.4 centimeters deep. The flat rim is 0.85 centimeters wide. The thickness is 3.1 centimeters, and the thickness of the sheet is 0.7 millimeters. The perforation is 1 by 1 centimeter.

The "palette" of Case C is a rectangular bronze piece that fits inside the recessed area of the top and can slide to the right or left (Py 645). It is decorated with a set of parallel engraved lines visible along one short side, but these may have continued along all sides. The piece is 3.7 by 3 centimeters with a thickness of 1.5 millimeters. The "lid" of Case C is a rectangular bronze sheet with square perforation and two sets of finely engraved circles around it (Py 644). Underneath, a rough deteriorated area along the sides at the center shows a shinier (silver gilt?) area, more or less corresponding to the recessed area of the top. The piece measures 7.2 by 5.2 centimeters; the perforation is 1.3 by 1 centimeters, and the thickness is 0.1 centimeter.

Our next examples come from Archontiko, near Pella, Pit Grave 325 A of the fourth century BC. Two bronze semi-cylindrical cases with hinged lids[10] are preserved in the Archaeological Museum of Pella (fig. 32.6). Two individual lidded cases and two lids were found in a late fourth-century BC burial in the Archaic and Classical cemetery. It is possible that they all belonged to the same sophisticated case. They preserve small quantities of their contents.

Figure 32.6. Archontiko, near Pella. Two bronze semi-cylindrical cases with hinged lids. Fourth century BC. Archaeological Museum of Pella
Image: D. Ignatiadou

Another bronze semi-cylindrical case and stone palette was discovered in Veroia, Building Block 305, on a side street off Ploutarchou Street, in a vaulted rock-cut tomb (Tomb III) with a burial of the late third–early second century BC.[11] It is preserved in the Archaeological Museum of Veroia (fig. 32.7). This case, with three compartments and a perforated top, has a long body with two preserved dividers, making one long compartment in the middle and two short ones at the ends. The top has three perforations: two large rectangular ones left and right, and one smaller rectangular at the center right. Thus the central compartment top features two sets of concentric decoration but only one off-center perforation. A lid is not preserved.

Figure 32.7. Veroia. Bronze semi-cylindrical case. Probably late third century BC. Archaeological Museum of Veroia
Image: Courtesy of A. Koukouvou

Another bronze case with three compartments was unearthed during a rescue excavation at Amphipolis. The dating is uncertain but may be fourth/third century BC.[12] The top features one rectangular and two round perforations.

Finally, from the archaeological site at Edessa comes a small, single-compartment bronze case with feet (fig. 32.8). It was found on a rural road, in Grave II with burial of the second century BC.[13] The semi-cylindrical body is supported on two contoured sheet feet. It has a flat top with a central small round perforation. There is no lid. It is thought to be an inkwell.

Figure 32.8. Edessa. Bronze semi-cylindrical case with feet. Third–second century BC. Edessa, archaeological site
Image: After Chrysostomou 2013, pl. 72

The Greek Tradition of Medical and Writing Cases

Most of the pre-Roman medical cases were probably wooden and have not survived; it is therefore risky to make assumptions as to their shape. Only one, but very important, wooden find testifies to the existence of (semi-)cylindrical cases that appear to have been the forerunners of the Macedonian finds. It is a semi-cylindrical wooden case, unearthed in the "Tomb of the Poet" in Athens, the burial of a musician and author from around 430/420 BC. The case was found together with a bronze stylus, a bronze bowl, remains of five wooden writing tablets, and a papyrus roll.[14] Thus the construction of similar bronze cases in fourth-century BC Macedonia appears to be the evolution of an earlier Greek tradition.

The semi-cylinder is an awkward and unstable shape, unless it is associated with a second semi-cylinder to form a cylinder: the perfect shape around which to roll a papyrus sheet. In addition, it is logical to imagine that some semi-cylindrical cases could have originally been incorporated in wooden cylindrical cases, similar in shape to the Stavroupolis find.

This notion of a writing substratum that is rolled around a pen case is known from historical finds. Such a writing case was in the possession of J. W. Goethe and is exhibited in his Weimar house. A similar case in gold-decorated red leather belonged to Napoleon, who gave it as a gift to his friend Marshal Lannes.[15] The case proper accommodates pens in the middle, while its two metal ends are an inkwell and an ink-powder container. Like our Classical finds, it is a portable case, but used by army officers for writing letters and orders during military campaigns rather than for medical purposes.

✦ ✦ ✦

Notes

1. Translated by the author. See also Bliquez 2015, 24.
2. For example, Boyer, Bel, and Tranoy 1990.
3. On the burial and the case, Archaeological Museum of Thessaloniki, inv. MTH 7437, see Romiopoulou 1973–74; Romiopoulou 1989, 215–6, no. 23, plate 57; Descamps-Lequime 2011, cat. 228 (D. Ignatiadou); Ignatiadou 2014a, cat. no. 384; Ignatiadou (forthcoming).
4. Full publication of the medical set in this burial, Archaeological Museum of Thessaloniki, inv. B 35 and B 90, may be found in Ignatiadou 2015. On the metal composition, see Katsifas et al. forthcoming. On the burial and the case, see Themelis and Touratsoglou 1997, 91, plate 103.
5. A find of similar composition was retrieved from the second-century BC Pozzino shipwreck in Tuscany; see Giachi et al. 2013.
6. Ignatiadou 2014b.
7. See discussion in Ignatiadou 2015.
8. Bessios 1985; Bessios 2010, 246–55. I thank the excavator M. Bessios for the privilege of studying these cases.
9. They are nearly square bronze sheets, each with two rectangular perforations perpendicular to each other. At each corner is one hole for a bronze nail; diameter 3 mm. Plate (Py 631): 4.1 x 4.2 cm. Perforations 0.8 x 1.3 and 3.6 x 1.1 cm. Thickness of sheet 0.1 cm. Preserved total thickness 1.3 cm. Mended but complete. It preserves the four nails that are attached underneath to two wooden strips; the nails are longer than the thickness of the wood and their extra length is bent along the strip they penetrate. Plate (Py 685): 3.8 x 4.1 cm. Perforations 0.7 x 1.4 and 0.3 x 1.0 cm. Thickness of sheet 0.1 cm. Mended, with missing parts.
10. The finds were excavated in the summer of 2004 and are unpublished. For the opportunity to see photographic documentation of their parts and to examine the content remains, I sincerely thank the excavator Pavlos Chrysostomou and the conservator of antiquities Evangelos Chrysostomou. The two-lidded cases were displayed in the exhibition *Before the Great Capital*, in the Archaeological Museum of Pella, in 2016.
11. The find is unpublished. For the opportunity to illustrate it here I thank the excavator Angeliki Koukouvou. For a brief report on the excavation, see Koukouvou 1996.
12. Archaeological Museum of Amphipolis? The find is unpublished. It was shown in a past meeting of the Archaeological Work in Macedonia and Thrace.
13. Chrysostomou 2013, 189, plate 72, cat. 415, 433, 434, and 435.
14. Pöhlmann 2013, 12–4, plate I 8b.
15. Dated 1804–09. 33.2 x 6.3 cm. Fondation Napoléon, Paris. http://www.napoleon.org/en/collectors_corner/object/files/486393.asp (accessed 4-10-2015).

Bibliography

Bessios 1985
Bessios, M. 1985. "Der Grabhügel von Alykes bei Kitros." In *The Archaeologists Speak about Pieria*, 54–58. Katerini: NELE Pierias (in Greek, German summary).

Bessios 2010
Bessios, M. 2010. *Pieridon Stefanos: Pydna, Methone and the Antiquities of North Pieria*. Katerini: AFE Publications (in Greek).

Bliquez 2015
Bliquez, L. J. 2015. *The Tools of Asclepius: Surgical Instruments in Greek and Roman Times*. Leiden: Brill.

Boyer, Bel, and Tranoy 1990
Boyer, R., V. Bel, and L. Tranoy. 1990. "Decouverte de la tombe d'un oculiste à Lyon (fin du IIe s. après J.-C.): Instruments et coffrets avec collyres." *Gallia* 47: 215–49.

Chrysostomou 2013
Chrysostomou, A. 2013. *Ancient Edessa: The Cemeteries*. Volos: Hellenic Ministry of Culture (in Greek).

Descamps-Lequime 2011
Descamps-Lequime, S., ed. 2011. *Au royaume d'Alexandre le Grand: La Macedoine antique*. Paris: Louvre Museum.

Giachi et al. 2013
Giachi G., P. Pallechi, A. Romualdi, E. Ribechini, J. J. Luceiko, M. P. Colombini, and M. Mariotti Lippi. 2013. "Ingredients of a 2,000-y-old Medicine Revealed by Chemical, Mineralogical, and Botanical Investigation." In *Proceedings of the National Academy of Sciences* (January 22), 110.4: 1193–96. http://www.pnas.org/lookup/suppl/doi:10.1073/pnas.1216776110/-/DCSupplemental

Ignatiadou 2014a
Ignatiadou, D. 2014. "The Stavroupolis Priest-warrior." In *The Greeks: Agamemnon to Alexander the Great,* ed. M. Andreadaki-Vlazaki and A. Balaska, 388–401. Athens: Kapon.

Ignatiadou 2014b
Ignatiadou, D. 2014. "The Symbolic Krater." In *Le cratère à volutes: Destinations d'un vase de prestige entre Grecs et non Grecs*, 43–59. Cahiers du Corpus Vasorum Antiquorum (France) 2.

Ignatiadou 2015
Ignatiadou, D. 2015. "The Warrior Priest in Derveni Grave B Was a Healer Too." *Histoire, médecine et santé* 8: 89–113.

Ignatiadou, forthcoming
Ignatiadou, D. Forthcoming. "Burial Practices for Élite Macedonians with Cultic Duties." In *Constituer la tombe: Honorer les défunts en méditerranée hellénistique et romaine: Table ronde organisée par L'Écoloe française d'Athènes et le Centre d´étiudes alexandrines*, *Alexandrie, 29 octobre au 1er novembre 2014*, ed. M. D. Nenna, W. van Andringa, and S. Huber.

Katsifas et al., forthcoming
Katsifas, C., D. Ignatiadou, N. Kantiranis, and G. A. Zachariadis. Forthcoming. "Metal Containers of the 4th century BC: Analysis of Their Composition and Contents." In *9th Aegean Analytical Chemistry Days, 29 September–3 October 2014, Chios, Greece*.

Koukouvou 1996
Koukouvou, A. 1996. "Sidestreet of Ploutarchou Street (Building Block 305)." *ADelt* 51, B: 524 (in Greek).

Pöhlmann 2013
Pöhlmann, E. 2013. "Excavation, Dating and Content of Two Tombs in Daphne, Odos Olgas 53, Athens." *Greek and Roman Musical Studies* 1: 7–24.

Romiopoulou 1973–74
Romiopoulou, K. 1973–74. "Oreokastrou Street (Stavroupolis District)." *ADelt* 29, B 2: 693 (in Greek).

Romiopoulou 1989
Romiopoulou, K. 1989. "Closed Burial Contexts of the Late Classical Period from Thessaloniki." In *Φίλια Έπη εις Γεώργιον Ε. Μυλωνάν* (Festschrift to George Mylonas), 3: 194–218, plates 45–58. Athens: Archaeologiki Etaireia (in Greek).

Themelis and Touratsoglou 1997
Themelis, P. G., and Y. P. Touratsoglou. 1997. *The Derveni Tombs*. Athens: TAP (in Greek, English summary).

33.

A Group of Items from the Campana Collection as an Example of Nineteenth-Century Restoration

Nadežda P. Gulyaeva, The State Hermitage Museum, St. Petersburg

Together with other items from the famous collection of Marquis Giovanni Pietro Campana, three so-called shields appeared in the Antiquities Department of the State Hermitage Museum in 1861. Two "shields" were hammered from a bronze sheet. Their wide, flat rims are decorated with a double-spiral ornament. The third "shield," with a crudely made handle inside, was suspected to be entirely fake. In the center of the shields, Samnite *kardiophylakes* (chest bandoliers) were attached.

Except for the removal of the *kardiophylakes*, no other attempts were made to restore these items. Preliminary examinations of the items were made in 2011 in the conservation laboratory of the Hermitage. It was discovered that some parts of the surface of two similar "shields" were covered with a false green patina. In the center of one "shield," accurate round holes had been made, and on the inside newly fashioned bronze loops with rings had been attached. In the center of the second "shield" was mounted a small metal detail, perhaps for fastening a *kardiophylax*, which at that time may have been believed to be a kind of shield decoration. The bosses covering the surface of the third "shield" were in fact ancient.

✦ ✦ ✦

The major part of Marquis Giovanni Pietro Campana's famous collection came into the Department of Classical Antiquities at the Hermitage Museum in 1861. Among the items were three "shields." There were no detailed descriptions of them, but they were included in a short list of the objects in a special catalogue.[1]

Two of the three were similar: round basins with wide flat rims. The first one was described in Campana's catalogue as "Scudo rotondo con figura di Arpia in mezzo di bello stile";[2] the second one was described as "Scudo rotondo con chimera a basso rilievo nel mezzo."[3] The third "shield" was listed in catalogues as "Scudo grande con cerchi concentrici di borchie rotonde con in mezzo una figura di chimera in rilievo."[4]

In 1925, some items from the Campana collection were disassembled and the parts that were deemed to be ancient were detached. Today we can only guess what the items looked like when they entered the Hermitage. We know that an appliqué relief of a winged deity was removed from the first item (inv. B. 563). This relief was once presumably attached to the wooden surface of a chariot. What the Campana catalogue described as a "harpy" most likely represented the deity Usil, the Etruscan sun god.

The plaque with Usil was attached to a simple flat *kardiophylax*, which in turn was attached to the body of the "shield." Before the *kardiophylax* was restored in 2011, it showed traces of the plaque fixture. The *kardiophylax* with a figure of a fantastic creature was removed from the second "shield" (inv. B. 559), and the same was done with the third "shield" (inv. B. 535).

The plaque with the sun god and the three *kardiophylakes* were thoroughly studied and published.[5] At that time, the other parts, which were thought to be fake, were left inside the cases, and no attempts were made to restore them. Ultimately, though, it was decided to examine them as well. The first modern examinations began in 2011 in the laboratory of ancient metal conservation at the Hermitage.

During this investigation, it was discovered that the surfaces of the two similar "shields" were covered with an artificial green patina. Both objects are shaped like round basins, 48 centimeters (18 ⅞ in.) in diameter. The items were made up of numerous, diverse fragments soldered on tin and blocked on all surfaces by a thick layer of mastic, which began to burst, flake off, and lose its adhesive properties.

During the conservation of the "shield" with Usil (B. 563), the layers of mastic and a fragment of a bronze leaf, which was fixed on a fabric layer and also covered by mastic, were removed. Places where the rim was soldered to the basin were cleaned and the lead-tin solder that nineteenth-century restorers had used to fill losses in the metal was removed. Loops of a copper alloy, holding two rings of different diameters (2 cm and 5 cm) inside the shield, were also soldered on with a lead-tin alloy. On the exterior of the object, traces of soldering the *kardiophylax* remain. There is a spiral ornament, two round holes in the center, and five small holes on the rim.

In the center of the next "shield" (B. 559), a small metal detail was mounted with a screw and nut. The rim was fastened to the basin with a tin spot-solder. The considerable difference in the diameters of the basin and the rim was concealed by means of rags and ropes, which were filled in with a thick layer of mastic and sealing wax. To investigate the object properly, layers of mastics were completely removed from the metal surface. The lead-tin solder from the nineteenth century was removed, and small details and fragments were detached. After this conservation treatment, the "shield" practically broke up into two parts: a basin and a rim.

The nineteenth-century restorers faced a very difficult problem. A lot of fragmentary items found together during excavations were waiting for somebody to understand how to reconstruct them into whole objects. It was as challenging as reassembling mosaics. It was a fascinating but difficult task, considering that sometimes the restorers had only a very vague idea of what kind of objects they were and what exactly they were supposed to look like. Ultimately it was decided to restore our items as shields.

The relief decorations of recently found Etruscan tombs in Cerveteri may have guided the restorers in their decision. Or perhaps, knowing such items as the Certosa situla or the warrior frescoes, the restorers or their clients thought that they were dealing with parts of shields.[6] In any case, they created two round shields with brims, made like broad bands with bent edges and decorated with a number of double-spiral ornaments. They attached *kardiophylakes* of the eighth to seventh century BC, which at that time were perhaps believed to be originally shield decorations. In the internal part of one shield, newly made bronze loops with rings were affixed, possibly for hanging the shield on a wall or just to imitate rings for fastening belts to the inner part of the shield.

However, on the outer side of a vessel under the rim, Hermitage conservators detected traces of tin soldering. It looks as though this object was first intended to be a dish or a basin, and that the nineteenth-century restorers soldered handles to it. This idea was not far off the mark, because such basins existed in ancient Italy; only they had no handles.

For instance, a basin with a flat rim (now in the Römisch-Germanisches Zentralmuseum in Mainz) has a similar shape and its rim is decorated with the same double-spiral ornament.[7] In the Metropolitan Museum of Art, there are twenty-one large shallow bowls coming from an Etruscan tomb.[8] All of them have the same decorations of the rim: three bands of plait pattern. As we can see, the band of our item was attached correctly, with an ornament inside, as if it were a bowl. For the object to be properly restored as a shield, the ornament should have been on the outside, facing the opponent.

The third object can rightfully be called a shield (inv. 535). It consists of a round copper base with a diameter of 89 centimeters, divided into four parts by concentric circles. Each part is decorated with ranks of hemispheres covering the surface. In total there were eighty-five hemispheres, some of which are missing. In the middle of the shield can be seen solder traces where the *kardiophylax* had been removed. On the reverse side of the shield are located two rings and a handle. The shield was previously considered to be entirely fake.

It is now clear that 61 of the 85 bosses are ancient. The remaining 24 hemispheres, the handle, and two rings, as well as the base, were made in brass in the nineteenth century. The ancient hemispheres in the center had tetrahedral spikes, which were sawn off in the nineteenth century, in order to be attached to the base of the shield. Pairs of brass wires with bent ends were soldered with tin to the places where the hemispheres were fastened. Bosses were put on the wires and then fixed by wax-gloss-oil mastic.

We may suppose that when the nineteenth-century restorers decided to make this shield they had in mind large Villanovan embossed shields of a central-handgrip type.[9] In order to carry out this plan, they hammered a bronze sheet and attached various bosses to the body of the shield. Inside they put a crudely made handle and two rings, which had the same functions as in the "shield" with Usil described above.

The walls of Etruscan tombs were sometimes decorated with shields. The walls of the Tomb of Shields and Chairs in the Banditaccha necropolis near Cerveteri, for example, were decorated with cut-out stone shields in relief about a meter in diameter. Under the shields, also carved from stone, stand chairs or thrones.

A throne of the same form was found at the Lippi necropolis near Verucchio.[10] It is decorated with figurative scenes separated by lines of bronze studs. These studs look very much like the ancient bosses on the Hermitage shield.

As a result of our research, it became clear that the items are not entirely fake as was assumed before. Two similar objects in the form of shields most likely are parts of Etruscan paterae or large bowls. It is highly probable that the hemispheres detached from a shield may have been decorations on a wooden item, such as an Etruscan chair.

✦ ✦ ✦

Notes

1. Guédéonow 1861, 41.
2. Cataloghi del Museo Campana 1858, 2, VIII: 5.
3. Cataloghi del Museo Campana 1858, 2, IX: 2.
4. Cataloghi del Museo Campana 1858, 2, VII: 2.
5. Boriskovskaya 1973, 5–15; Haynes 1985, 173, 275–76 n. 81.
6. Connolly 1981, 81, fig. 5; 96.
7. Nazo 2003, 89–91, no. 138, plate 47.
8. http://www.metmuseum.org/Collections/search-the-collections/247024, http://www.metmuseum.org/Collections/search-the-collections/247025
9. Connolly 1981, 94.
10. Eles 2000, 80–81, figs. 81, 82.

Bibliography

Boriskovskaya 1973
Boriskovskaya, S. P. 1973. "Bronzovije plastini ot drevneitalijskogo pantzirnogo nabora." In *Pamjatniki antičnogo prikladnogo iskusstva*, ed. X. S. Gorbunova, 5–15. Leningrad: Avrora.

Cataloghi del Museo Campana 1858
Cataloghi del Museo Campana. 1858. Classe II. *Bronzi Etruschi e Romani*. Rome.

Connolly 1981
Connolly, P. 1981. *Greece and Rome at War*. London: Macdonald Phoebus.

Eles 2000
Eles, P. von. 2000. *Museo Civico Archeologico Verucchio*. Rimini: Province of Rimini.

Guédéonow 1861
Guédéonow, E. 1861. *Notice sur les objects d'art de la Galerie Campana à Rome acquis pour le Musée Impérial de l'Ermitage*. Paris: Raçon.

Haynes 1985
Haynes, S. 1985. *Etruscan Bronzes*. London and New York: Sotheby's Publications.

Nazo 2003
Nazo, A. 2003. *I bronzi Etruschi e Italici del Römisch-Germanisches Zentralmuseum*. Mainz: Römisch-Germanisches Zentralmuseum.

34.

Roman Silhouette Figures: A Contribution to Music Archaeology?

Norbert Franken, Corpus Vasorum Antiquorum, Bayerische Akademie der Wissenschaften, Berlin

This paper is the first overall study of Roman silhouette figures cut out of bronze sheets. The silhouette-shaped figures are mostly reduced to their outlines and show chiseled or engraved detail drawings. Though the figures have a wide distribution throughout the ancient world, they remain extraordinarily rare. The silhouettes tend to represent deities, particularly figures from the Apollonian entourage. Although most of these figures are now deprived of their contexts, a distinct emphasis on music and dance scenes can clearly be observed. Taking technical characteristics as well as information on find contexts into consideration, the author proposes that the silhouette figures were originally used as inlays for wooden musical instruments and furniture.

✦ ✦ ✦

The question of original function is of great importance in our attempts to understand any archaeological object. For many ancient bronzes, this question is not easy to answer. Technical features, context of the discovery, or figural parallels can often provide valuable information. First of all, however, one must search for comparable bronzes. Only when one expands one's view from the individual object to all similar artifacts does it become possible to better understand and assess their shared characteristics.

The following examples provide a useful illustration of this methodological approach. Under consideration here are sheet-metal silhouette figures dating to the Hellenistic and Roman periods. The figures are cut from flat bronze sheets about 1 to 3 millimeters in thickness; internal details are incised. Sheet-metal silhouettes with similar features can also be found in the Archaic,[1] Classical,[2] and early medieval[3] periods, but these sheets and all questionable pieces[4] are only touched upon here for technical and aesthetic comparisons to the silhouettes of individual figures.

Figure 34.1. Armed dancer. H: 10.5 cm. Berlin, Antikensammlung-SMB, inv. 31631

Image: Norbert Franken, Antikensammlung – SMB

I begin my analysis with the silhouette of a dancing warrior in Berlin's Antikensammlung (cat. 1; fig. 34.1). The helmeted warrior (H: 10.5 cm) wears a short cloak slung around his waist, and appears to be holding a short knife in the right hand. Spread across his torso is a row of short, mostly parallel incisions, which, to judge from two similar examples, represents either a tightly fitting vest or body hair.[5]

Also in Berlin is a long vine-leaf sheet with richly incised detail (cat. 2). In the middle, one of two tendrils is framed by an Apollonian cult-statue (a Baitylos); on the edges of the leaf there are masks and ritual objects, including baskets and tympana.

For comparison, I cite nine individual silhouette figures and a group from Tajikistan. The nine are a Mercury from Chur in Switzerland (cat. 3; fig. 34.2); a dancing girl from the excavations in Tel Dor (Israel) (cat. 4; fig. 34.3); an Apollo with kithara and griffin in Lyon (cat. 6; fig. 34.4); a seated griffin facing right (H: 3.9 cm) on the art market (cat. 13); a pantheistic goddess with torch and polos in Munich (so far the only silhouette figure with a border) (cat. 7; fig. 34.5); a dwarf in Parma with very crudely incised interior drawing (cat. 8; fig. 34.6); a Victoria originally shown inscribing a shield in Reggio Emilia (cat. 9; fig. 34.7); a silhouette of a dancing satyr in the Santa Barbara Museum of Art (cat. 11); a satyr with wineskin and kantharos in the Museo Gregoriano Profano at the Vatican (cat. 10; fig. 34.8); and an offering jug in Verona (cat. 12).

Figure 34.2. Mercury. H: 6.5 cm. Chur, Rätisches Museum, inv. 67/112

Image: Archäologischer Dienst Graubünden, Neg. no. 1375-7A

Figure 34.3. Female dancer. H: 8.2 cm. Dor, the Tel Dor Archaeological Expedition

Image: Tel Dor Archaeological Expedition

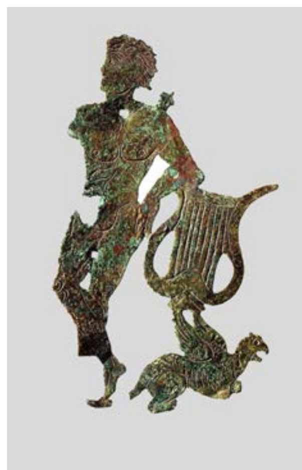


Figure 34.4. Apollo. H: 8 cm. Lyon, Musée gallo-romaine, inv. Br 26

Image: © J.-M. Degueule, Musée gallo-romain de Lyon

Figure 34.5. Goddess. Munich, Staatliche Antikensammlungen und Glyptothek, inv. NI 4536

Image: Staatliche Antikensammlungen und Glyptothek München

Figure 34.6. Dwarf. H: 8.3 cm. Parma, Museo d'Antichità, inv. B 416
Image: Museo Nazionale di Antichità, Parma

Figure 34.7. Victoria. H: 12.9 cm. Reggio Emilia, Museo "Gaetano Chierici," inv. 15242
Image: Reggio Emilia, Museo "Gaetano Chierici" di Paletnologia, Archivio Fotografico

Figure 34.8. Satyr. H: 5.8 cm. Rome, Musei Vaticani, Museo Gregoriano Etrusco, inv. 11510
Image: Musei Vaticani, Archivio Fotografico Neg. no. XXVII.15.146

Of particular interest is a group of silhouette figures from the so-called Oxus Temple in Tajikistan: they show Cupid with grapes, with a kithara, with Psyche, with birds, and so on (cat. 5).

The size of these silhouette figures varies greatly. Their height ranges from barely 6 centimeters (cat. 10; see fig. 34.8) to more than 18 cm (cat. 11). The subjects are equally variable. There are goddesses and gods, for example Victoria (cat. 9; see fig. 34.7), Apollo (cat. 6; see fig. 34.4), and Mercury (cat. 3; see fig. 34.2). Particularly striking are the dancing or cavorting figures: a warrior (cat. 1; see fig. 34.1); a girl (cat. 4; see fig. 34.3); and a satyr (cat. 11).

So far as is known, the backs of the silhouette figures are all flat. We might therefore conclude that most of the sheets were inlaid in or otherwise attached to a wooden base. Many of the sheets are perforated, suggesting that they were nailed in place. Some of the perforations are carefully worked, whereas others are so crude as to suggest that they are the result of later repairs.

The most important features of the silhouette figures can be summarized as follows:

1. Silhouette figures on sheet metal that can be dated to the Late Hellenistic and Roman periods are extremely rare. Despite an extensive search, this catalogue consists of only thirteen examples.
2. The findspots reveal a wide geographic spread, from France (cat. 6) and Switzerland (cat. 3) to Israel (cat. 4) and Tajikistan (cat. 5). A cluster appears to be in northern Italy, as indicated by the silhouette figures in Reggio Emilia (cat. 9), Veleia (cat. 8), and Verona (cat. 12).
3. So far as can be determined, the contexts are exclusively Roman, for example in Chur (cat. 3), Lyon (cat. 6), Veleia (cat. 8), and Verona (cat. 12). There are also two sanctuaries: Tel Dor (cat. 4) and the Oxus Temple (cat. 5).
4. In style and quality, the silhouette figures show considerable differences, pointing to several workshops. Alongside superficial or clumsy incision, as on the dwarf in Parma (cat. 8; see fig. 34.6), there are also original and expressive or routinely conventional interior drawings, as on the Vatican satyr (cat. 10; see fig. 34.8) or the dancing girl in Tel Dor (cat. 4; see fig. 34.3), and a few works of high quality, such as the Munich goddess (cat. 7; see fig. 34.5) and the Victoria in Reggio Emilia (cat. 9; see fig. 34.7).
5. The subjects reveal a clear preference for figures from the Apollinian and Dionysian realms.

Because a number of the sheets must have been affixed to small wooden boxes or other furniture (see cat. 7 and 12), it seems probable that most of the silhouette figures originally served as decoration for wooden musical instruments.

Both literary references and a few figural representations indicate that figural inlays in wooden musical instruments are distinct possibilities. Two examples are a bronze lyre from Kertsch, today in St.

Petersburg, with apparently secondarily used reliefs of Victoria and Mars on the inner side,[6] and a kithara decorated with an image of Marsyas that belongs to a marble statue of Apollo from Bulla Regia, now in Tunis.[7]

Of particular interest is a miniature bronze kithara, which the Akademisches Kunstmuseum of the University of Bonn purchased in 2009.[8] The kithara, which originally must have been the attribute of a statuette of Apollo, preserves inlays in different metals on both sides, in imitation of intarsia. On the inner side is a theatrical mask and on the outer side there is a seated Eros. Similarly, we can propose that most of the silhouette-figures were used to adorn actual wooden musical instruments.

✦ ✦ ✦

Catalogue

Cat. 1: Armed dancer. Berlin, Antikensammlung – Staatliche Museen zu Berlin, inv. 31631. H: 10.5 cm. D: 0.12 cm. Said to be from Etruria. Purchased ca. 1936/37 from the collection of Dr. Albert Figdor, Vienna. Published: Franken 2011 (31631). Fig. 34.1.

Cat. 2. Vine leaf. Berlin, Antikensammlung – Staatliche Museen zu Berlin, inv. Fr. 1552 l. H: 11.4 cm. W: 9.8 cm. D: 0.1–0.3 cm. Findspot unknown. Purchased in 1869 from the estate of Eduard Gerhard. Published: Friederichs 1871, 326, no. 1552 l; Franken 2011 (Fr. 1552 l).

Cat. 3. Mercury, probably inlaid in wood. Chur, Rätisches Museum, inv. 67/112. H: 6.5 cm. Found in 1967 during excavation of the marketplace in Chur. Published: Siegfried-Weiss 1991, 146, plate 55.1; 80.5. H: 6.5 cm. Punched and cut decoration. Dated to the second or third century AD by stylistic similarity to a weapon with inlaid bronze and silver figures on an iron sword. Fig. 34.2.

Cat. 4. Female dancer. Dor, Tel Dor Archaeological Expedition. H: 8.2 cm. Found in 1988 in the excavations of Area F at Tel Dor. Published: Stern 1994, plate 6.1; Wolff 1994, 506, fig. 30. Fig. 34.3.

Cat. 5. Cupids. Dushanbe, National Museum of Antiquities of Tajikistan, inv. TS 264, 265, 269–71, 807, 825, 846, 1250, 2158, 7926, o.Nr./1091. H: 1.5–6.4 cm. W: 1.5–5.3 cm. D: 0.05–0.2 cm. From the Oxus Temple (Tajikistan). Published: Dushanbe 1985, 95, no. 225–32, fig. S. 81; Zürich 1989, 48, no. 19 with fig. (Eros; incorrectly described as gilded bronze, dated to first century AD); Rome 1993, 35–36, no. 18 with ill. (Eros); Lindström 2009, 363, no. 258, with ill. (dated first–second century AD).

Cat. 6. Apollo. Lyon, Musée gallo-romaine, inv. Br 26. H: 8 cm. Said to be from Lyon, given to the museum in 1890. Published: Bazin 1891, 377, fig. 223; Reinach 1910, 50.2; Boucher 1976, 131; Boucher and Tassinari 1976, 34, no. 26, with ill. Fig. 34.4.

Cat. 7. Goddess. Munich, Staatliche Antikensammlungen und Glyptothek, inv. NI 4536. H: 11.1 cm. W: 5.9 cm. D: ca. 0.09 cm. Findspot unknown. Purchased in 2002 from the art market. Published: *Kunstobjekte der Antike* 2002, 64–65, no. 3314, fig. p. 6; Schmölder-Veit 2002, 291–92 (with date in first century AD); Knauß 2002, 313, fig. 21.11; 585, cat. 380. Fig. 34.5.

Cat. 8. Dwarf. Parma, Museo d'Antichità, inv. B 416. H: 8.3 cm. D: 0.5 cm. From Veleia (inv. 1952, no. 345). Published: D'Andria 1970, 100, no. 156, plate 32. Fig. 34.6.

Cat. 9. Victoria. Reggio Emilia, Museo "Gaetano Chierici" di Paletnologia, inv. 15242. H: 12.9 cm. From the surroundings of Reggio Emilia. Published: Bolla 2007/2011, 68–69, no. 46, with ill. Fig. 34.7.

Cat. 10. Satyr. Rome, Vatican Museums, Museo Gregoriano Etrusco, inv. 11510. H: 5.8 cm. Findspot unknown. Published: D'Andria 1970, 100, under no. 156. Fig. 34.8.

Cat. 11. Dancing satyr. Santa Barbara, Santa Barbara Museum of Art, inv. 1981.64.18. H: 18.4 cm. Findspot unknown. Unpublished.

Cat. 12. Offering jug. Verona, Museo Archeologico, inv. 22124. H: 11.6 cm. Found in 1891 in Verona on the banks of the Adige River. Published: Bolla 1999, 210, 230, fig. 54, plate 75.

Cat. 13. Seated griffin. Art market. H: 3.9 cm. Findspot unknown. Published: *Antiken* 2011, 40, no. 1095, plate 74 (there incorrectly identified as Byzantine).

Acknowledgments

A lively discussion followed my presentation on October 17, 2015, at the XIXth International Congress on Ancient Bronzes at the Getty Center, Los Angeles. For suggestions and references, I am grateful to J. Daehner, N. Gulyaeva, D. Ignatiadou, C. Mattusch, and J. Pollini. For images, permissions, and additional information I should also like to thank R. Aleotti (Reggio Emilia), M. Bernabò Brea (Parma), M. Bolla (Verona), S. Culpepper Stroup (Washington), W. Geominy (Bonn), L. Hagel (Santa Barbara), F. Knauß (Munich), G. Lindström (Berlin), R. Macellari (Reggio Emilia), A. Paolucci (Rome), J. Rageth (Chur), M. Sannibale (Rome), E. Stern (Tel Dor Excavation), D. Tisserand (Lyon), and A. Viani (Reggio Emilia).

Notes

1. Massow 1916, 21–22, fig. 4 (boar and bull walking toward the left; said to be from Thebes; formerly in Leipzig, Archäologisches Institut der Universität); Arapoyianni 2007, 25, fig. 24 (two large nude men facing left).
2. Blatter 1964, cols. 811–12, fig. 4 (woman toward the right; from Athens, Pnyx).
3. Fuchs 1940, 110–13, plates 13–16 (sheets serving as shield devices).
4. Among them are a victorious charioteer in a broad frame from Aquileia: Brusin 1934, 137, 139, no. 4, fig. 77; a pigeon on a globe from a tomb in Bavai: Faider-Feytmans 1957, 85, no. 163, plate 32; also a dolphin said to be incised on both sides in Bonn: Menzel 1986, 72, no. 166, plate 83.
5. For instance on the silhouette figure of a griffin (cat. 13; art market).
6. Behn 1954, 85, plate 51, 117 b; Vendries 1999, 50–52, plate 1. A date in the second to third centuries AD, suggested by Vendries on the basis of style, can in the case of the lyre's secondary use provide only a *terminus post quem*.
7. Vendries 1999, 88–95, plate 8c (other examples are at least in part the result of modern restorations).
8. Bonn, Akademisches Kunstmuseum. H: 7.8 cm. W: 6.2 cm: Ars Antiqua 1959, 35, no. 90, plate 43.

Bibliography

Antiken 2011
Antiken. 2011. Gerhard Hirsch Nachfolger, auction catalog 274. September 20–21, 2011, Munich.

Arapoyianni 2007
Arapoyianni, X. 2007. *The Temple of Apollo Epikourios at Bassae*. Athens: Archaeological Receipts Fund, Publications Department.

Ars Antiqua 1959
Ars Antiqua. 1959. *Antike Kunstwerke. Nachlaß Dr. Jacob Hirsch, II. Teil und anderer Besitz*. Auction catalog. May 2, 1959, Lucerne.

Bazin 1891
Bazin, H. 1891. *Vienne et Lyon gallo-romains*. Paris: Hachette.

Behn 1954
Behn, F. 1954. *Musikleben im Altertum und frühen Mittelalter*. Stuttgart: Hiersemann.

Blatter 1964
Blatter, R. 1964. “Ein spätklassisches Athenarelief aus Bronze in Basel.” *AA* 1964: cols. 805–23.

Bolla 1999
Bolla, M. 1999. “Bronzetti figurati romani del territorio Veronese.” *Rassegna di studi del Civico Museo Archeologico e del Civico Gabinetto Numismatico di Milano* 63/64: 193–260.

Bolla 2007/2011
Bolla, M. 2007/2011. “Bronzi figurati romani dal territorio reggiano nel Museo Chierici di Reggio Emilia.” *Pagine di Archeologia* 4: 1–93.

Boucher 1976
Boucher, S. 1976. *Recherches sur les bronzes figurés de Gaule préromaine et romaine*. Rome: BÉFAR 228.

Boucher and Tassinari 1976
Boucher, S., and S. Tassinari. 1976. *Bronzes antiques du Musée de la Civilisation Gallo-Romaine à Lyon.* Vol. 1: *Inscriptions, statuaire, vaisselle*. Musée de la Civilisation Gallo-Romaine Lyon. Paris: Boccard.

Brusin 1934
Brusin, G. 1934. *Gli scavi di Aquileia*. Udine: La Panarie.

D’Andria 1970
D’Andria, F. 1970. “I bronzi romani di Veleia, Parma e del territorio parmense.” In *Contributi dell’Istituto di Archeologia* 3: 3–144.

Dushanbe 1985
Dushanbe. 1985. *Kunstschätze Tadschikistans*, Exh. cat. Dushanbe, National Museum.

Faider-Feytmans 1957
Faider-Feytmans, G. 1957. *Recueil des bronzes de Bavai*. *Gallia*, suppl. 8. Paris: Centre national de la recherche scientifique.

Franken 2011
Franken, N. 2011. *Bilddatenbank Antike Bronzen in Berlin*. http://ww2.smb.museum/antikebronzenberlin/

Friederichs 1871
Friederichs, C. 1871. *Berlins antike Bildwerke.* Vol. 2: *Antike Geräthe und Broncen im Alten Museum.* Düsseldorf: J. Buddens.

Fuchs 1940
Fuchs, S. 1940. “Figürliche Bronzebeschläge der Langobardenzeit aus Italien.” *RM* 55: 100–113.

Knauß 2012
Knauß, F. S., ed. 2012. *Die Unsterblichen Götter Griechenlands*. Exh. cat. Munich: Staatliche Antikensammlungen und Glyptothek.

Kunstobjekte der Antike 2002
Kunstobjekte der Antike. 2002. Gorny & Mosch, auction catalog 119. October 16, 2002, Munich.

Lindström 2009
Lindström, G. 2009. “Silhouettenbleche: Eroten, ungeflügelte Knabenfiguren, Psychen.” In *Alexander der Grosse und die Öffnung der Welt: Asiens Kulturen im Wandel*, ed. by. S. Hansen, A. Wieczorek, and M. Tellenbach, 363, cat. no. 258. Exh. cat. Mannheim: Reiss-Engelhorn-Museen.

Massow 1916
Massow, W. von. 1916. “Die Kypseloslade.” *AM* 41: 1–117.

Menzel 1986
Menzel, H. 1986. *Die römischen Bronzen aus Deutschland*.” Vol. 3: *Bonn*. Mainz: Römisch-Germanisches Zentralmuseum.

Reinach 1910
Reinach, S. 1910. *Répertoire de la statuaire grecque et romaine*. Vol. 4. Paris: Leroux.

Rome 1993
Rome. 1993. *Oxus: Tesori dell’Asia Centrale.* Exh. cat. Rome, Palazzo Venezia.

Schmölder-Veit 2002
Schmölder-Veit, A. 2002. “Bronzenes Beschlagblech mit dem Tierkreiszeichen der Jungfrau (Virgo).” *MüJb* 53: 291–92.

Siegfried-Weiss 1991
Siegfried-Weiss, A. 1991. “Figürliche Bronzeobjekte.” In *Chur in römischer Zeit*. Vol. 2: A. *Ausgrabungen Areal Markthallenplatz*; B. *Historischer Überblick*. Basel: Schweizer Gesellschaft für Ur- und Frühgeschichte.

Stern 1994
Stern, E. 1994. *Dor: The Ruler of the Seas*. Jerusalem: Israel Exploration Society.

Vendries 1999
Vendries, C. 1999. *Instruments à cordes et musiciens dans l’empire romain.* Paris: L’Harmattan.

Wolff 1994
Wolff, S. R. 1994. “Archaeology in Israel.” *AJA* 98: 481–519.

Zürich 1989
Zürich. 1989. *Oxus: 2000 Jahre Kunst am Oxus-Fluss in Mittelasien: Neue Funde aus der Sowjetrepublik Tadschikistan.* Exh. cat. Zürich, Museum Rietberg.

Abstracts

Balancing Artifacts: Incense-Burners and Ponderation in Etruria

Francesco De Angelis, Columbia University, New York

Bronze *thymiateria* produced in Etruria from the Archaic to the Hellenistic age often include in their shapes components that make more or less explicit reference to specific properties of the artifacts themselves. These components can be abstract (e.g., series of superimposed discoid and lenticular elements) or figural (typically, human figures that support the stem of the *thymiaterion*, but also animals and isolated limbs such as legs). In both cases, they appear to underscore the aspects of gravity, lightness, and equilibrium.

This paper will argue that such aspects can be related to the actual functions of the incense-burners. They thereby serve as self-conscious visual commentaries on the perceived nature of these implements. At the same time, their analysis can also shed light on the multifaceted ways in which Greek ponderation was received and understood in Etruria.

Figures on Fire: New Approaches to the Understanding of Roman Lighting Devices in Bronze

Ruth Bielfeldt, Ludwig-Maximilians-Universität, Munich

A distinctive feature of Roman bronze devices is their figural idiosyncrasy: the sometimes charming, sometimes bizarre mixture of anthropomorphic, zoomorphic, and floral forms employed for stems, legs, handles, and bodies. Vitruvius famously criticized such fanciful visual language in the vegetabilized architectures of Roman wall-painting; what has been sidelined in the discussions on Vitruvius and the *monstra* is that the wall-paintings merely elaborated motifs long established in furniture. In scholarship on furnishings, their hybrid composition was first appreciated as delightful and later, under the verdict of twentieth-century aesthetics, dismissed as superfluous ornamentation ("kitsch"). But it was never studied for what it can tell us about the notions associated with banquet accessories: corporeality, skillfulness, movement, and, not least, the physical energy—heat and light—produced by them.

This paper focuses on the figural and sculptural design of floor and table candelabra as well as select lamps from Pompeii and Herculaneum, which are part of a new research and database project on Roman lighting and heating devices in bronze led by the author in collaboration with Norbert Franken (Berlin). A large number of candelabra, largely unpublished, are held by the National Museum of Naples (270 specimens). Starting from this chronologically homogeneous group of lighting devices, the author will explore avenues toward a new conceptual framework that enables us to integrate the objects' intriguing "sculpturalism" with other, often sundered aspects: their energy and matter (fire and metal), their production technique and functionality, their effect on space and ambience, and ultimately their precarious status as objects managed by slaves.

Standspiegel, Figured Appliqués, and Other Bronze Items at Locri Epizefiri (Magna Graecia): Morphology, Style, and Chronology between Local Production and External Influences (Sixth to Fourth Century BC): A Reappraisal

Diego Elia, University of Turin
Valeria Meirano, University of Turin

A considerable number of outstanding bronze artifacts were retrieved from the sanctuaries and the necropolis of Locri Epizefiri, including mirrors with figured handles, rare instruments related to the symposium, and refined appliqués, among others. Notwithstanding the attention these objects have received in the bibliography—especially regarding their function and symbolic values according to find contexts—several aspects still require investigation.

Most of these items are attributed to local workshops due to technical, iconographic, and stylistic considerations and, like other local products, are considered to be almost exclusively intended for the internal market.

The analysis of the features of Locrian bronze objects allows for a reassessment of the local productive milieu between the sixth and the fourth centuries BC, a period that is characterized by traditionalism, external influences, and hybridism, as well as originality in the choice of iconographies and in the creation of specific items. The Locrian case study provided a unique opportunity to understand the eclectic re-elaboration of patterns and morphology, and the adoption of novelty elements coming from different traditions, aimed at satisfying the tastes of the local elite. Besides, the recent reexamination of find contexts—namely the funerary assemblages—offers the opportunity to define an autonomous chronological system to be integrated with considerations deriving from stylistic analysis.

A Multidisciplinary Study of Hellenistic and Roman Bronze Mirrors from the Archaeological Collection of Ancient Messene, Greece

Maria Giannoulaki, Technological Educational Institute of Athens

Ancient Messene in the southern Peloponnese is one of the most impressive and well-preserved cities of the Hellenistic/Roman era in Greece. Archaeological excavations from the early twentieth century to the present have revealed a site spanning around 13 square kilometers with fortifications, public buildings, and impressive burial monuments *intra muros*. Its museum houses a rich collection of metal artifacts dating from the fourth century BC to the fifth century AD, which includes everyday objects related to the activities and the customs of the Messenian society. This poster presents the author's PhD research, a systematic multidisciplinary study of 380 representative copper-alloy objects, including toiletry and decorative objects, tools, instruments, vessels, weapons, figurines, and door and furniture accessories.

The study combines an archaeological (classification/typology), archaeometric (noninvasive scientific analyses), and conservation (condition survey using statistics) approach in order to better understand the technological characteristics of the collection. For the first time, the context of this important copper-alloy collection was related to the technological profile of both local and imported metal production, the function of the objects, and their significance to the local society. Specifically, the poster focuses on 10 bronze mirrors from dated burial contexts (from the third century BC to the first century AD) representing 3 distinct archaeological types. They are luxury items that are associated with the high society of ancient Messene. The technological characteristics, such as manufacturing, decorative, and surface techniques, were investigated using X-radiography, X-ray flourescence (XRF) and μ-XRF, laser induced breakdown spectroscopy (LIBS), and X-ray diffraction (XRD). The chemical and/or mineralogical compositions of the copper alloy and corrosion layers were determined in order to identify techniques used to produce these bronze mirrors. The results indicate that a variety of manufacturing techniques were used to produce the mirrors, with three different methods employed to produce a reflective surface, using three different types of alloys for the metal substrate.

The Gréau Mirror and the Phenomenon of Fakes in Nineteenth-Century Paris

Mireille M. Lee, Vanderbilt University, Nashville, Tennessee

A fine caryatid mirror formerly in the collection of Julien Gréau was recently determined to be a pastiche of Greek and Etruscan, ancient and modern. It is well established that the corpus of bronze caryatid mirrors contains a large number of fakes. This paper analyzes the production of these objects within the social context of nineteenth-century Paris.

After decades of upheaval and transformation as a result of Hausmannization, cultural anxieties surrounding modernity resulted in an increased interest in collecting antiquities. While large numbers of Greek antiquities made their way into the European market as a result of expanded excavations as well as looting, many required heavy restoration in order to make them marketable to an increasingly bourgeois collecting public. The distinction between a restored object, a pastiche, and a total fabrication broke down over time, especially as the diminishing flow of Greek imports failed to keep up with demand.

Within the larger context of the antiquities market in late nineteenth-century Paris, I argue that bronzes were of special interest to collectors. On the one hand, metals were an essential aspect of industrialization, as symbolized most dramatically by the construction of *la tour Eiffel* for the 1889 *Exposition universelle*. In many ways, metals represented both a link with the past and a path to the future. Small-scale bronze sculptures were, like the terracotta Tanagras, easily replicable, affordable for a mass market, and conveniently displayed on a mantel or shelf. Finally, the caryatid mirror held special appeal on account of its functional familiarity, but also because the female figure provided a model for women just as the French feminist movement was redefining modern femininity.

The Ancient Chariot from Serbia

Dragan Milanović, Institute of Archaeology, National Museum in Belgrade
Deana Ratković, Institute of Archaeology, National Museum in Belgrade
Miroslav Petelin, Institute of Archaeology, National Museum in Belgrade
Milan Čolović, Institute of Archaeology, National Museum in Belgrade

The remains of a two-wheeled chariot were found accidentally in 2013 during work on the highway running between Niš and Dimitrovgrad in southeastern Serbia, at the Mađilka site near the village of Staničenje. More than forty iron objects, richly decorated, were discovered at a depth of about 6.5 meters during the mechanical removal of the southern half of a hillock on the right bank of the Nišava River. Right next to these items, partial skeletal remains of two horses were found. Archaeological investigation of the site revealed an elevated mound, 5 meters high and approximately circular, with a diameter of around 40 meters.

The chariot has the Roman suspension system. It is lavishly engraved with floral decoration made of inlaid brass and presents a work of art with high artistic value. The finds are dated to the first century AD (by radiocarbon method) and may be associated with the burial of a person of high social status.

The remains of the chariot were restored in the Conservation Department of the National Museum in Belgrade, and a reconstruction model of this unique ancient chariot was simultaneously built.

Bronze Warfare from the Hellenistic Period: A Study of the Acqualadroni Naval Ram

Philippe Tisseyre, Soprintendenza del Mare, Palermo

A rostrum (*embolos* in ancient Greek, "naval ram" in English) was an offensive naval weapon mounted on the prow of a ship at the waterline and was used to damage enemy warships. The rostrum was probably a Greek invention dating back to the sixth century BC and was considered a formidable offensive weapon for centuries. Its use required an experienced captain and a disciplined crew. Other rostra have been found in the Mediterranean and are not to be confused with cutwaters, also used to damage enemy warships. The Hellenistic Athlit rostrum was found south of Haifa (Israel) in 1980 and was dated to 220 BC. Its archaeological and metallurgical analysis data, based on physico-chemical and metallographic analyses, provided unique information about bronze-casting and the construction of warships during the Hellenistic period.

The present study is a scientific investigation of a rostrum found at a depth of 6 meters at Acqualadroni, 200 meters off the coast of Messina (Italy) in September 2008. Following its recovery, the rostrum was placed in a glass container full of demineralized water in constant flow to preserve the wooden parts.

The Acqualadroni rostrum is a metallic artifact with a fragile wooden part from the original warship still inside it. A blackish substance is present on some areas of the wood surface. The rostrum is 162 centimeters long and weighs about 250 kilograms. The thickness of the metal is approximately 2 centimeters. The rostrum is finely decorated on both sides with very faithful drawings of two *kopis* (single-edged curved swords) and a sword similar to a Hellenistic or Greek *xiphos* (a double-edged, single-handed sword) measuring 86 and 88 centimeters, respectively. The deformation of the blade on the right-hand side is attributable to collisions with other ships. It is possible to date the rostrum on the basis of such stylistic elements. Thus, its production date may range from the fourth to the second century BC. If the rostrum dates to the third century BC, it may have been mounted on a warship used in a naval battle during the Punic Wars (e.g., the battles of the Lipari Islands and Mylae). The metallic part was investigated by the University of Palermo (CGA) using inductively coupled plasma optical emission spectroscopy (ICP–OES) and inductively coupled plasma mass spectrometry (ICP–MS) for lead isotope analysis. The two wooden samples were investigated by Fourier transform infrared (FTIR) spectroscopy, 13C{1H} cross-polarization magic angle spinning (CP MAS), NMR spectroscopy, energy-dispersive X-ray spectroscopy (EDX), ICP–OES, gas chromatography–mass spectrometry (GC–MS), and X-ray diffraction (XRD). The present investigation aims to provide information about the state of preservation of the wooden and metallic parts and to give some hints that could prove useful in conservation of the rostrum.

For more information on this topic, see https://www.academia.edu/3782220/

VII. Conservation and Analysis

35.

Sustainable Conservation of Bronze Artworks: Advanced Research in Materials Science

Maria Pia Casaletto, Istituto per lo Studio dei Materiali Nanostrutturati, Consiglio Nazionale delle Ricerche (CNR-ISMN), Palermo
Vilma Basilissi, Istituto Superiore per la Conservazione ed il Restauro, Rome

The development of nontoxic, reliable, and long-lasting materials and the design of tailored methods for the conservation of bronze artworks are now professional mandates. The presently used hazardous materials and processes need to be replaced by environmentally friendly approaches due to the increasing importance of environmental protection and for the safety of professionals working in the conservation of cultural heritage.

Long-term stability of copper-based archaeological artworks is deeply affected by the nearly constant presence of chlorine in the corrosion layers that can induce the active cyclic copper corrosion known as "bronze disease." The conventional conservation method applied to ancient bronzes uses a benzotriazole (BTA) alcoholic solution, which unfortunately is toxic and a suspected carcinogen. In order to reduce or overcome the toxicity of BTA, we adopted various tailored strategies of chemical research. Novel chemically synthesized and naturally derived products and suitable nanocarriers of corrosion inhibitors were purposely designed and tested by X-ray photoemission spectroscopy (XPS), scanning electron microscopy coupled with chemical analysis (SEM-EDS), optical microscopy, DC polarization, and electrochemical impedance spectroscopy (EIS).

✦ ✦ ✦

Introduction

Conservation Science is a field that has been in continuous evolution since the late twentieth century. The study of ancient bronzes has long focused on archaeometry, addressing technological aspects and production concerns. Casting cores, alloys, joins, surface patinas, and corrosion products have been intensively investigated by various analytical techniques in order to improve our knowledge of the original materials, processes, manufacturing techniques, and degradation phenomena. Scientific results provided very useful information to archaeologists, art historians, and conservators about the artistry, craftsmanship, production, conservation, and restoration of ancient bronze artifacts.

Today, ecological, economic, and social aspects must also be considered when looking at the solutions that scientific research could bring in this field. Taking these new obligations into account, it is clear that a certain number of best practices must be reevaluated and new studies in the field of conservation are required.

Understanding the processes that lead to deterioration is a fundamental element of the concept of conservation. Immediately after its manufacture, any object starts to interact with the atmosphere and the environment and is subject to increasing stress due to normal use. With few exceptions, all metals are subject to corrosion by chemical reaction with the environment.

In some cases, corrosion effects on historic and artistic artifacts can be seen as positive, as for example when a patina is considered aesthetically pleasant; in most cases, however, corrosion produces irreversible damage resulting in the loss of specific values (historic, artistic, scientific, social, etc.) of the object.[1] Corrosion induces alteration of the original patinas, and continuous deterioration results in irreplaceable loss of details. A metal may suffer from two different types of corrosion: “dry corrosion,” usually in the form of a thin surface patination or tarnishing, and “aqueous corrosion,” where the metal is attacked more vigorously.

“Bronze Disease”: A Post-burial Degradation Phenomenon

Degradation processes occur as the object reacts to its archaeological burial and post-excavation environments (storage or exhibition). These reactions represent a big challenge for the conservation of metallic artworks, especially in the case of ancient bronzes. Copper-based artifacts may suffer from a pronounced electrochemical corrosion caused mainly by the presence of unstable species (chlorine) that could induce active cyclic copper corrosion, also known as “bronze disease.”

In the framework of several international and national projects carried out in the last decade,[2] we investigated the corrosion products of a large number of ancient bronze artifacts excavated in the Mediterranean Basin as a function of the chemical composition, the metallurgical features of the alloy, the archaeological context, and the post-burial degradation. The chemical, physical, morphological, and metallurgical characterization of bronzes sampled in different conservation conditions was performed by means of scanning electron microscopy coupled with energy dispersive spectrometry (SEM-EDS), X-ray photoelectron spectroscopy (XPS), X-ray diffraction (XRD), and optical microscopy (OM). The results provided good insight into the corrosion layers and evidenced the nearly universal presence of chlorine as cuprous chloride (CuCl). A complex microchemical structure of the corrosion products, grown during the long archaeological burial, was frequently detected. The most common copper corrosion products are listed in table 35.1. The dangerous basic chlorides resulting from “bronze disease” are marked with asterisks.

Chemical Compound	Mineralogical Name	Chemical Formula	Color
Oxides	Cuprite	Cu_2O	Red/Orange
	Tenorite	CuO	Black Gray
Carbonates	Malachite	$CuCO_3\ Cu(OH)_2$	Green
	Azurite	$2\ CuCO_3Cu(OH)_2$	Blue
	Chalconatronite	$Na_2(CuCO_3)_2\ 3\ H_2O$	Green/Blue
Chloride	Nantokite	$CuCl$	Green/White
*Basic Chlorides	*Atacamite	$Cu_2(OH)_3Cl$	Green
	*Paratacamite	$Cu_2(OH)_3Cl$	Pale Green
	*Botallakite	$Cu_2(OH)_3Cl$	Pale Green/Blue
Sulphides	Chalcocite	Cu_2S	Black
	Covellite	CuS	Black
Sulphate	Brochantite	$CuSO_4\ 2\ Cu(OH)_2$	Green

Table 35.1. List of the most common copper corrosion products

Long-term stability of Cu-based artworks is deeply affected by the cyclic copper (Cu) corrosion induced by air exposure (RH>35%) of the reactive cuprous chloride (CuCl) that is located at the interface between external corrosion products and the surviving core metal matrix.[3] Pitting corrosion attacks develop underneath the corrosion products, deep in internal areas of the alloy, with typical pinpoint forms (pits) or craters, and only later appear on the surface. At this point, the state of conservation of the artifacts is irremediably compromised (fig. 35.1), and an appropriate stabilization intervention is necessary to prevent further damage.

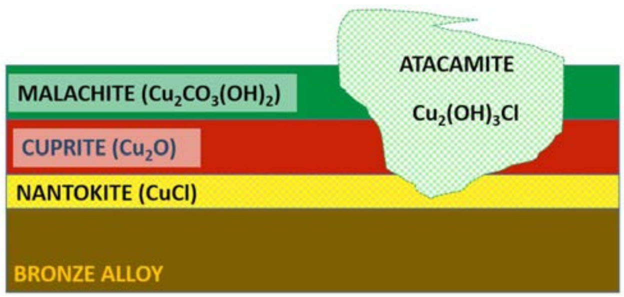


Figure 35.1. Corrosion of archaeological bronzes: schematic illustration of "bronze disease"

Results of the XPS curve-fitting of the Cu $2p_{3/2}$ photoelectron peak from the surface of a pure bronze alloy and from various archaeological artifacts corroded by "bronze disease" are shown here (fig. 35.2). In a pure bronze alloy, the Cu $2p_{3/2}$ photoelectron signal consists of a single component centered at a binding energy (BE) value around 932.0 eV, that is assigned to Cu^0, Cu^{+1} species on the surface (see fig. 35.2a). In corroded bronze samples, the presence of a second component located at BE = 934.5 eV in the XPS Cu $2p_{3/2}$ spectrum clearly indicates a fraction of Cu^{+2} species on the surface, whose relative quantity is related to the extent of corrosion suffered by the ancient bronzes (see figs. 35.2b–c).

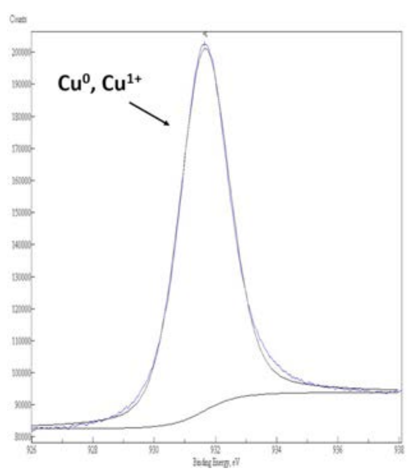


Figure 35.2a. XPS curve-fitting of the Cu $2p_{3/2}$ photoelectron peak from the surface of a pure bronze alloy

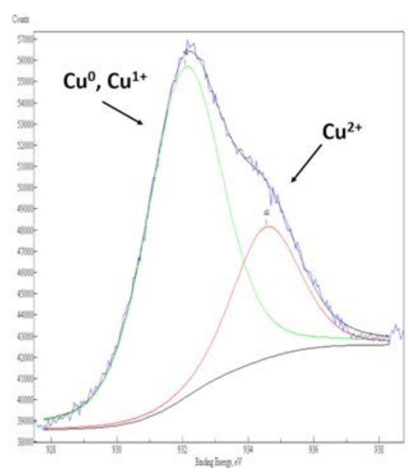


Figure 35.2b. XPS curve-fitting of the Cu $2p_{3/2}$ photoelectron peak from different archaeological artifacts corroded by "bronze disease"

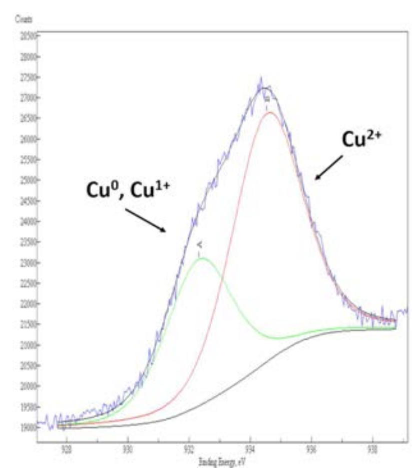


Figure 35.2c. XPS curve-fitting of the Cu $2p_{3/2}$ photoelectron peak from different archaeological artifacts corroded by "bronze disease"

Conservation Requirements

Restoration and conservation of ancient metals can be carried out by specialists in different ways. However, the identification of an appropriate project of restoration, addressing specific and defined problems of deterioration, is not a simple task. A huge bibliography has developed regarding the relevance, reversibility, and efficacy of traditional and modern methods, products, and materials for restoration.

Various strategies can be used to prevent or reduce corrosion. Since the physical nature of the historic or artistic object cannot be changed, the modification of the environment should be the first choice: preventive conservation strategies involve no action on the object itself (passive techniques) and are therefore preferable from the point of view of current conservation ethics.[4]

In outdoor environments, this approach is very difficult to implement: atmospheric humidity cannot be controlled, so the main conservation method consists of protecting the artifacts from direct precipitation[5] and keeping them under constant maintenance. This strategy is more easily applied in indoor environments, such as museums, where the microclimate (relative humidity, temperature, lighting, and pollution) can be controlled. But even there it is sometimes not economical or practical to act on the environment, especially for objects kept in storage. In this case conservation science offers protocols to either protect the metal surface from contact with the environment and/or reduce the electrochemical reaction rates (active techniques).

In the conservation of metals, one of the most difficult tasks is the stabilization of copper-based alloys coming from archaeological artifacts or from artworks in indoor or outdoor exhibitions. Generally, the treatment consists of the following steps: pre-consolidation; mechanical/chemical/electrochemical/physical cleaning; washings and soluble salts control; dehydration and final stabilization, commonly by using 1-H benzotriazole (BTA) as a corrosion inhibitor. Control in a humidity chamber; consolidation; assembly; filling; surface coating; and mount-making are subsequent treatments to complete a restoration process.

The stabilization of a bronze artifact to slow the natural process of corrosion is one of the most difficult phases of the metal conservation process. The treatment options are varied and can work directly on the pitting phenomenon or on the extraction, to the extent possible, of chlorides before adding chemicals to the system to prevent cyclic corrosion and to prolong the life of the ancient bronzes. Many chemical products can form a protective layer of molecular thickness that prevents the metal from reacting with the environment. Other chemicals, acting as corrosion inhibitors, may take the form of deposits or films that form over the metal, passivating it[6] and hence preventing any further corrosion; or they may work as vapors (vapor phase inhibitors, or VPIs)[7] by bombarding the metal with molecules.[8]

Since the first papers dealing with the BTA application for copper appeared in the late 1960s,[9] the number of scientific studies on the application of corrosion inhibitors to bronze heritage conservation has increased hugely and their quality has significantly improved, especially in the last fifteen years. Nevertheless, the conventional method used by restorers worldwide for the stabilization of the active corrosion of copper-based artifacts involves ethanolic solutions of BTA as a corrosion inhibitor. These BTA solutions, often concentrated (3–6 wt.%) and heated to 60°C, are usually applied to the objects by brushing, immersion, or spraying. After treatment the object is lacquered to prevent the physical rupture of BTA films and contamination by dirt and sweat. Since BTA is destabilized by UV light, a special commercially available lacquer (Incralac) is commonly used because it contains a reserve of BTA and also a UV screening agent (Paraloid B44 + BTA 3%).

Unfortunately, even though it has been extensively used as a copper corrosion inhibitor, BTA has not always proved effective. Furthermore, BTA is highly toxic and a suspected carcinogen, representing a severe health and environmental risk.[10] Since environmental concerns and the safety of conservators should be prioritized in the conservation of cultural heritage, hazardous materials should no longer be used in daily practice. Instead, wherever possible, safe alternatives using environmentally friendly and sustainable materials and processes should be employed.

The stabilization and protection of heritage metals have specific needs and requirements and, necessarily, all the scientific studies on corrosion inhibitors for this application should address and follow these specifications. Commercial corrosion inhibitors satisfy some of these requirements, and in most cases the inhibitor protective layers are transparent. Unfortunately, in other cases, application of the inhibitors produces visible changes. In addition, due to their low thickness, they are susceptible to mechanical removal, so they must in many cases be used in combination with protective coatings, which increase the barrier effect of the whole system. The combination of different inhibitors seems to be a promising way to take advantage of their synergetic effects and to reduce the dosage of chemicals. Still, the toxicity of bronze corrosion inhibitors remains an open question that urgently needs a solution.

Recent Advancements in Material Science

For more than a decade, research activities in our group at CNR-ISMN were devoted to studies of archaeological bronzes in order to find conservation strategies tailored to their chemical composition, structure, archaeological sites, and degradation mechanisms.[11] Our scientific approach, represented schematically in fig. 35.3, started with the identification of the degradation agents and mechanisms based on a large-scale diagnostic investigation of different bronze artifacts selected from several archaeological sites of the Mediterranean Basin. These scientific results were extremely important for the production of sustainable nanostructured materials with corrosion inhibition properties to be used as possible alternatives to BTA. In order to test their efficacy as corrosion inhibitors, reference bronze alloys and artificially corroded samples were also produced as sacrificial materials.[12] Only the most promising and low- or nontoxic materials resulting from our tests were then submitted to the final validation performed by a conservator on a real ancient bronze artifact.

Figure 35.3. Innovative scientific approach to the conservation of ancient bronzes

Experimental Conditions

Reference and/or commercial bronze alloys were used as metallic substrates, after mechanical polishing by silicon carbide abrasive papers with different roughness. Formulations of synthetic or naturally derived products were prepared in ethanol solutions. Films were produced by immersion of the bronze substrate for 2 hours at room temperature. The corrosion treatment was performed by immersion for 2 hours in an aqueous solution of NaCl 3% wt. A detailed surface and electrochemical investigation was performed by using XPS and SEM/EDX, and potentiodynamics and electrochemical impedance spectroscopy (EIS), respectively. Toxicity studies were carried out by assessment of the acute toxicity (LD50) after oral administration or injection to a population of cavies, according to standard pharmacological protocols. Furthermore, the viability of human bronchial and epithelial cells was tested after exposure.

Organic Corrosion Inhibitors

In order to find a possible substitute for BTA, we synthesized different functionalized organic compounds with protective and/or inhibition properties for the conservation of archaeological bronzes.[13] In the molecular design of a new organic compound, containing nitrogen and/or sulfur moieties (fig. 35.4), there were certain requirements to be fulfilled for application as corrosion inhibitor. The ideal molecule should have high efficiency in the inhibition of bronze corrosion, low toxicity, environmentally friendly behavior, and long-term stability. Since this product is meant to be applied on real archaeological bronzes, other conservation requirements needed to be considered, such as the preservation of the aesthetic value, the ease of application, and the long-term performance.

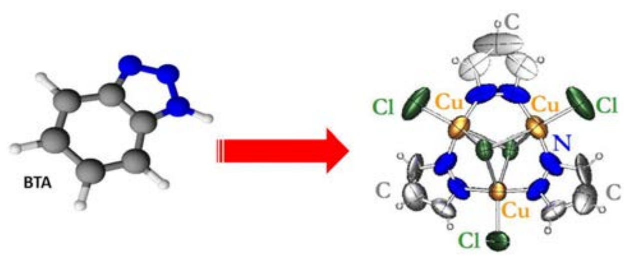


Figure 35.4. Chemical synthesis of organic corrosion inhibitors (right) as possible alternative to BTA

A large number of chemical compounds belonging to different classes of organic molecules (e.g., imidazoles, malonamides, oxalamides, aminoalcohols, aminopyrroles) were purposely synthesized for application in bronze conservation. Unfortunately, we encountered many failures, due to to synthetic problems (accessibility of reagents, difficult synthetic routes, low yield of the product); low solubility; the formation of a colored solution; the toxicity of the molecule; and the cost of the production. Since this strategy of chemical synthesis proved to be very time-consuming, with too many requirements to be fulfilled and, consequently, with a high risk of failures, we tried to follow a different approach by investigating natural compounds extracted from the seeds of endemic plants.

"Green" Corrosion Inhibitors

Using eco-friendly compounds derived from extracts as "green" corrosion inhibitors represents a very up-to-date trend.[14] They are readily available, usually environmentally friendly, and also biocompatible. Unfortunately, they have a complex chemical nature that, together with the complexity of the heritage bronzes, makes it difficult to understand the mechanisms of protection and/or inhibition or the reasons for their failure. In this field of scientific research, a fundamental screening of literature data should be performed according to what part of the natural species is considered. Essential oils or extracts from the seeds or from leaves yield different chemical compositions which in turn result in different performances and properties. In our laboratories we focused on new formulation based on oil extracted from the seeds of plants widely available in the Mediterranean Basin (fig. 35.5).[15]

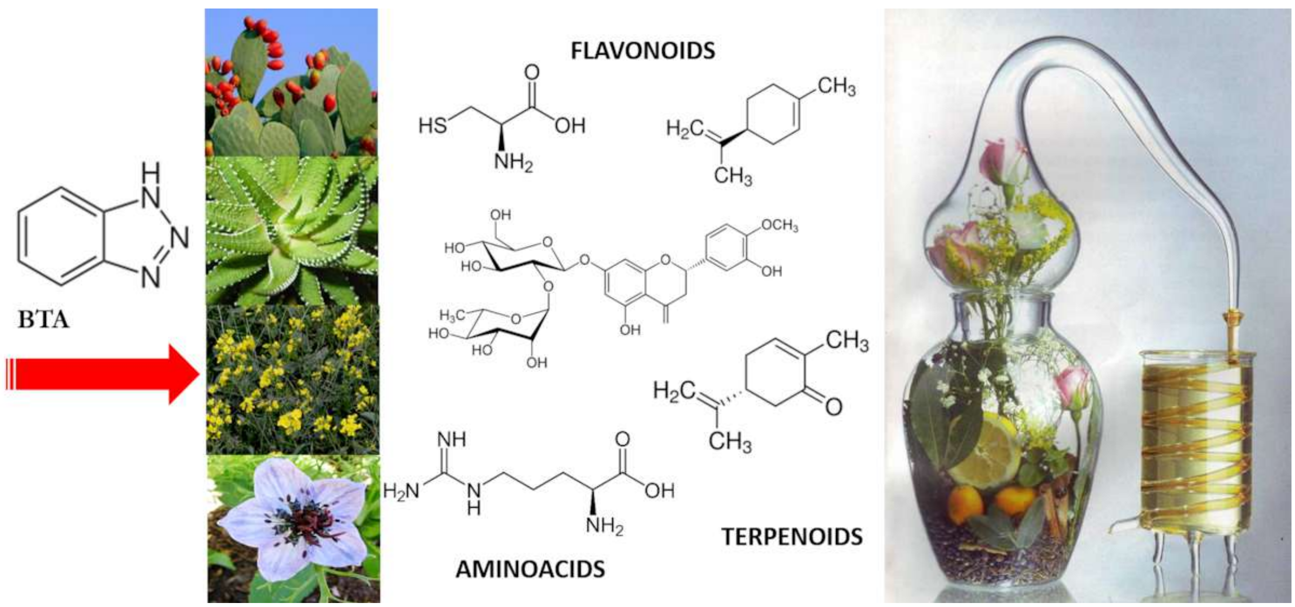


Figure 35.5. "Green" corrosion inhibitors as possible alternative to BTA. Top left: *Opuntia ficus indica* (Barbary fig); bottom left: *Nigella sativa* (black cumin)

New formulations based on the oil extracted from the seeds of *Opuntia ficus indica* and the seeds of *Nigella sativa* were investigated for bronze corrosion in a marine environment (3% NaCl solution).[16] The *Opuntia ficus indica* formulation performed best, and the product was regularly licensed. Our good result allowed the application of this "green" formulation on some bronzes from the Roman collection of the Archaeological Museum of Rabat (Morocco), which are on display in the exhibition rooms in good conservation conditions.

Smart "Self-Healing" Coatings

Due to the encountered problems (solubility, colored solutions, toxicity, etc.) that limited or excluded the possible application of some chemicals and formulations on archaeological items, we decided to use a totally different scientific approach: using suitable nanocontainers of corrosion inhibitor to reduce BTA toxicity for the production of smart coatings, as schematically represented in fig. 35.6.

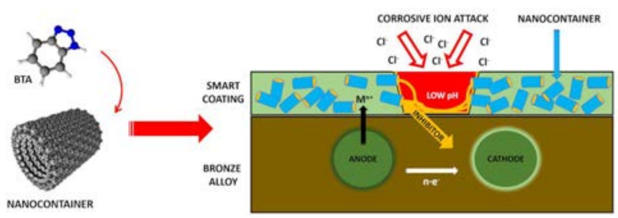


Figure 35.6. Nanostructured self-healing coatings for the conservation of ancient bronzes

Technologies of encapsulation, delivery, and release of various materials (e.g., drugs, oils, or perfumes) are among the most rapidly developing areas of modern materials science, biotechnology, nanomedicine, and cosmetics. A key point is the development of nanocontainers able to effectively encapsulate the desired active materials, successfully maintaining them in the inner cavity over long time periods and preventing their leakage into the environment. An immediate or prolonged release of the encapsulated active material can be triggered by specific changes in the external environment or directly in the container shell.

Halloysite clay ($Al_2Si_2O_5(OH)4 \cdot nH_2O$) nanotubes were investigated as tubular containers of BTA.[17] They represent one of the most promising materials among other cylindrical nanocontainers, due to their availability, low cost ($4/kg; supply of 50,000 tons per year), environmentally friendly and biocompatible nature, and ease of processing with many polymeric materials.[18] The release properties of the nanocontainer could be fruitfully used for the delivery and targeting of BTA toward the main active corrosion site. The release of BTA is triggered by the corrosion process, which prevents the spontaneous leakage of the corrosion inhibitor out of the coating. If BTA-loaded nanocontainers are incorporated into an organic matrix, the "smart" coating can act both as protection barrier and corrosion inhibitor. We tested this possibility by using hydroxycellulose as the organic compound, just to check the feasibility of our system.[19]

Conclusion

The scientific literature on bronze corrosion inhibitors is huge, but the vast majority of studies deal with fundamental aspects of corrosion inhibition or industrial applications. Recently, there is an open field of studies in continuous evolution, based on the problem of bronze stabilization by means of eco-compatible and safe new products. In most cases, research is still confined to experimental context and to model surfaces. Usually the inhibitors are applied to pure standard bronze alloys, even though in heritage conservation they would be applied on real ancient surfaces, often over pre-existing corrosion products (or patinas) that have to be preserved with a specific conservation protocol. Advancements are required in the investigation of other properties of the coating, including long-term stability, and in the testing on artificially corroded bronze surfaces, in order to mimic the real behavior of archaeological bronze artifacts. The final validation of these products should be made by the conservator using a specific methodology adapted to the particular needs and conditions of their use on precious ancient bronzes.

✦ ✦ ✦

Acknowledgments

Financial support from the PON03PE_00214_1 Project: "Nanotecnologie e nanomateriali per i Beni Culturali," TECLA, Distretto di Alta Tecnologia per l'Innovazione nel settore dei Beni Culturali della Regione Sicilia, is gratefully acknowledged.

Notes

1. Basilissi and Marabelli 2008.
2. Ingo et al. 2007, ATENA Project final report; Casaletto et al. 2007, 20–25; Degrigny et al. 2007, 31–37.
3. Angelucci et al. 1978.
4. Preventive conservation is defined as "all measures and actions aimed at avoiding and minimizing future deterioration or loss. They are carried out within the context or on the surroundings of an item, but more often a group of

items, whatever their age and condition. These measures and actions are indirect—they do not interfere with the materials and structures of the items. They do not modify their appearance." From ICOM-CC, "Terminology to Characterize the Conservation of Tangible Cultural Heritage," resolution adopted by the ICOM-CC membership at the 15th Triennial Conference, New Delhi, 2008.

5. Cleaning followed by coating with acrylic lacquers or waxes has become a common method for preserving outdoor bronze sculpture.
6. Passivation is obtained by forming a protective and homogeneous layer of corrosion products on the surface of the metal that isolates the metal from the environment.
7. It should be noted that in high concentrations, VPIs are toxic.
8. Skerry 1985; Turgoose 1985.
9. For example, Madsen 1967; Greene 1971.
10. Oddy 1974; Sease 1978; Pillard et al. 2001; Selwyn 2004.
11. Casaletto et al. 2007; Degrigny et al. 2007.
12. Casaletto et al. 2006; Casaletto et al. 2010.
13. Ingo et al. 2007, ATENA Project final report; Dermaj et al. 2011; Salvaggio et al. 2012; Dermaj et al. 2015.
14. Zaferani et al. 2013, 652.
15. Casaletto and Hajjaji 2010; Casaletto et al. 2012.
16. Hammouch et al. 2007; Chellouli et al. 2016.
17. Lazzara and Milioto 2010; Casaletto et al. 2013.
18. Abdullayev et al. 2013.
19. Casaletto et al. 2016; Metal 2016.

Bibliography

Abdullayev et al. 2013
Abdullayev, E., V. Abbasov, A. Tursunbayeva, V. Portnov, H. Ibrahimov, G. Mukhtarova, and Y. Lvov. 2013. "Self-Healing Coatings Based on Halloysite Clay Polymer Composites for Protection of Copper Alloys." *Applied Materials & Interfaces* 5(10): 4464–71.

Angelucci et al. 1978
Angelucci, S., P. Fiorentino, J. Kosinkova, and M. Marabelli. 1978. "Pitting Corrosion in Copper and Copper Alloys: Comparative Treatment Tests." *Studies in Conservation* 23: 147–56.

Basilissi and Marabelli 2008
Basilissi, V., and M. Marabelli. 2008. "Le patine dei metalli: implicazioni teoriche, pratiche, conservative." In *L'arte fuori dal museo: Problemi di conservazione dell'arte contemporanea*, ed. S. Rinaldi, 74–89. Rome: Gangemi.

Casaletto and Hajjaji 2010
Casaletto, M. P., and N. Hajjaji. 2010. "Development of New Non-toxic Corrosion Inhibitors for Protecting Copper-based Archaeological Artefacts." *Bulletin of Research on Metal Conservation (BROMEC)* 32: 5.

Casaletto et al. 2006
Casaletto, M. P., T. De Caro, G. M. Ingo, and C. Riccucci. 2006. "Production of Reference 'Ancient' Cu-based Alloys and Their Accelerated Degradation Methods." *Applied Physics* A 83(4): 617–22.

Casaletto et al. 2007
Casaletto, M. P., F. Caruso, T. de Caro, G. M. Ingo, and C. Riccucci. 2007. "A Novel Scientific Approach to the Conservation of Archaeological Copper Alloys Artifacts." In *Proceedings of Metal 2007, International Conference on Metals Conservation, Interim Meeting of the ICOM-CC Metals Working Group, Amsterdam, 17–21 September 2007*, 2: 20–25. Amsterdam: ICOM-CC Metal WG.

Casaletto et al. 2010
Casaletto, M. P., G. M. Ingo, C. Riccucci, and F. Faraldi. 2010. "Production of Reference Alloys for the Conservation of Archaeological Silver-based Artefacts." *Applied Physics A* 100(3): 937–44.

Casaletto et al. 2012
Casaletto, M. P., R. Licciardi, A. Lombardo, G. M. Ingo, H. Hammouch, M. Chellouli, N. Bettach, N. Hajjaji, and A. Srhiri. 2012. "Surface and Electrochemical Investigation of New Green and Low Toxic Bronze Corrosion Inhibitors." In *Proceedings of European Corrosion Congress EUROCORR 2012, Istanbul (Turkey), 9–14 September 2012.* Istanbul: Istanbul Technical University.

Casaletto et al. 2013
Casaletto, M. P., R. Schimmenti, and G. Lazzara. 2013. "Smart Nanostructured Corrosion Inhibitor Coatings for the Protection of Cu-based Artifacts." In *Proceedings of the 8th International Conference on Surfaces, Coatings and Nanostructured Materials - NANOSMAT 2013, Granada, 22–25 September 2013*, 237. Amsterdam: Elsevier.

Casaletto et al. 2016
Casaletto, M. P., C. Cirrincione, A. Privitera, and V. Basilissi. Forthcoming. "A Sustainable Approach to the Conservation of Bronze Artworks by Smart Nanostructured Coatings." In *Proceedings of Metal 2016, 9th interim meeting of the ICOM-CC Metals Working Group, New Delhi, 26–30 September 2016*, in press.

Chellouli et al. 2016
Chellouli, M., D. Chebabe, A. Dermaj, H. Erramli, N. Bettach, N. Hajjaji, M. P. Casaletto, C. Cirrincione, A. Privitera, and A. Srhiri. 2016. "Corrosion Inhibition of Iron in Acidic Solution by a Green Formulation Derived from *Nigella sativa L*." *Electrochimica Acta* 204: 50–59.

Degrigny et al. 2007
Degrigny, C., V. Argyropoulos, P. Pouli, M. Grech, K. Kreislova, M. Harith, F. Mirambet, N. Haddad, E. Angelini, E. Cano, N. Hajjaji, A. Cilingiroglu, A. Almansour, and L. Mahfoud. 2007. "The Methodological Approach for the PROMET Project to Develop/Test New Non-toxic Corrosion Inhibitors and Coatings for Iron and Copper Alloy Objects Housed in Mediterranean Museums." In *Proceedings of the ICOM-CC Metal 2007, International Conference on Metals Conservation, Amsterdam, 17–21 September 2007*, 5: 31–37. Amsterdam: ICOM-CC Metal WG.

Dermaj et al. 2011
Dermaj, A., D. Chebabe, N. Bettach, N. Hajjaji, A. Srhiri, M. P. Casaletto, G. M. Ingo, C. Riccucci, and T. de Caro. 2011. "Electrochemical Study of a New Non-toxic Inhibitor Formulation for the Conservation of Archaeological Bronze." In *Proceedings of the 5th International Congress Science and Technology for the Safeguard of Cultural Heritage in the Mediterranean Basin, Istanbul (Turkey), 22–25 November 2011*, 237. Rome: Centro Copie L'Istantanea.

Dermaj et al. 2015
Dermaj, A., D. Chebabe, M. Doubi, H. Erramli, N. Hajjaji, M. P. Casaletto, G. M. Ingo, C. Riccucci, and T. de Caro. 2015. "Inhibition of Bronze Corrosion in 3% NaCl Media by Novel Non-toxic 3-phenyl-1,2,4-triazole thione Formulation." *Corrosion Engineering Science and Technology* 50(2): 128–36.

Greene 1972
Greene, V. 1972. *The Use of Benzotriazole in Conservation: Problems and Experiments*. ICOM Report 2/72/2. Paris: ICOM Committee for Conservation.

Hammouch et al. 2007
Hammouch, H., A. Dermaj, M. Goursa, N. Hajjaji, and A. Srhiri. 2007. "New Corrosion Inhibitor Containing *Opuntia ficus indica* Seed Extract for Bronze and Iron Based Artefacts." In *Strategies for Saving Our Cultural Heritage: Papers Presented at the International Conference on Conservation Strategies for Saving Indoor Metallic Collections, Cairo*, ed. V. Argyropoulos, A. Hein, and M. A. Harith, eds. 149–55. Athens: TEI.

Ingo et al. 2007
Ingo, G. M., M. P. Casaletto, T. de Caro, F. M. Mingoia, C. Riccucci, and G. Chiozzini. 2007. Relazione finale del Progetto ATENA: "Applicazione di metodologie innovative per la conservazione di manufatti metallici e ceramici da scavo archeologico ed il recupero delle relative tecniche di produzione." CNR-ISMN (2002–2006).

Lazzara and Milioto 2010
Lazzara, G., and S. Milioto. 2010. "Dispersions of Nanoclays of Different Shapes into Aqueous and Solid Biopolymeric Matrices: Extended Physicochemical Study." *Langmuir* 27: 1158–67.

Madsen 1967
Madsen, L. B. 1967. "A Preliminary Note on the Use of Benzotriazole for Stabilizing Bronze Objects." *Studies in Conservation* 12.4: 163–67.

Metal 2016
Proceedings of Metal 2016, 9th Interim Meeting of the ICOM-CC Metals Working Group, New Delhi, 26–30 September 2016, in press.

Oddy 1974
Oddy, W. A. 1974. "Toxicity of Benzotriazole." *Studies in Conservation* 19: 188–89.

Pillard et al. 2001
Pillard, D. A., J. S. Cornell, D. L. Dufresne, and M. T. Hernandez. 2001. "Toxicity of Benzotriazole and Benzotriazole Derivatives to Three Aquatic Species." *Water Research* 35(2): 557–60.

Salvaggio et al. 2012
Salvaggio, G., M. P. Casaletto, M. L. Testa, G. Ingo, C. Riccucci, and T. De Caro. 2012. "Surface Characterization of New Corrosion Inhibitors for the Conservation of Archaeological Bronze Artifacts." Paper delivered at *Youth in COnservation of CUltural Heritage (YOCOCU) 2012, Antwerpen (Belgium), 18–20 June 2012*.

Sease 1978
Sease, C. 1978. "Benzotriazole: A Review for Conservation." *Studies in Conservation* 23: 76–85.

Selwyn 2004
Selwyn, L. 2004. *Metals and Corrosion: A Handbook for Conservation Professionals*. Ottawa: Canadian Conservation Institute.

Skerry 1985
Skerry, B. 1985. "How Corrosion Inhibitors Work." In *Corrosion Inhibitors in Conservation: The Proceedings of a Conference Held by UKIC in Association with the Museum of London*, ed. S. Keene, 5–12. London: UKIC.

Turgoose 1985
Turgoose, S. 1985. "Corrosion Inhibitors for Conservation." In *Corrosion Inhibitors in Conservation: The Proceedings of a Conference Held by UKIC in Association with the Museum of London*, ed. S. Keene, 13–17. London: UKIC.

Zaferani et al. 2013
Zaferani, S. H., M. Sharifi, D. Zaarei, and M. R. Shishesaz. 2013. "Application of Eco-friendly Products as Corrosion Inhibitors for Metals in Pickling Processes – A Review." *Journal of Environmental Chemical Engineering* 1(4): 652–57.

36.

Investigating Ancient "Bronzes": Non-Destructive Analysis of Copper-Based Alloys

Robert H. Tykot, University of South Florida, Tampa

Identification of the composition of "bronze" objects—many of which are not in fact bronze—is fundamental for studying the technology and intentions of the maker and the availability of tin and other alloys, and for providing accurate descriptive information for museum displays. There are many methods of elemental analysis, but most require the removal of a sample, which increasingly is not allowed for museum-quality objects. The use of a portable X-ray fluorescence spectrometer (pXRF) avoids this, but unfortunately provides results only on the near surface. Readings may be inaccurate due to heterogeneity caused by the cooling process, degradation/weathering, and cleaning or other preservation treatment.

In this study, a Bruker pXRF has been used to analyze hundreds of copper-based objects from different countries and many museums, and the advantages and limitations of this method are discussed in accordance with the research questions being addressed. These include (1) the initial technological transition from copper to arsenical copper and tin bronze alloys, and later to brass; (2) the availability of the secondary metals; and (3) analyses in American museums to assess authenticity and provide accurate descriptive information for display cases.

✦ ✦ ✦

X-Ray Fluorescence

X-ray fluorescence (XRF) is one of many analytical methods used to determine the composition of copper-based metal objects. When used non-destructively, however, care must be taken to understand the principles of this method and thus the significance of the results. XRF analysis involves primary X-rays striking the sample and creating electron vacancies in an inner shell of the atoms; these vacancies are then filled by lower-energy electrons from an outer shell, while producing secondary X-rays. A detector in the XRF instrument measures the energy of these secondary X-rays, which may be identified as coming from specific elements, and the intensity of the peaks, which is proportional to the quantity for each element.[1] The depth of penetration of the primary X-rays, and opposite direction for secondary X-rays reaching the detector, are limited to millimeters or less, so that alteration of the metal object's surface may not quantitatively represent the original composition. Many bronze objects may include more than just copper and tin among the many elements that may be identified (fig. 36.1).

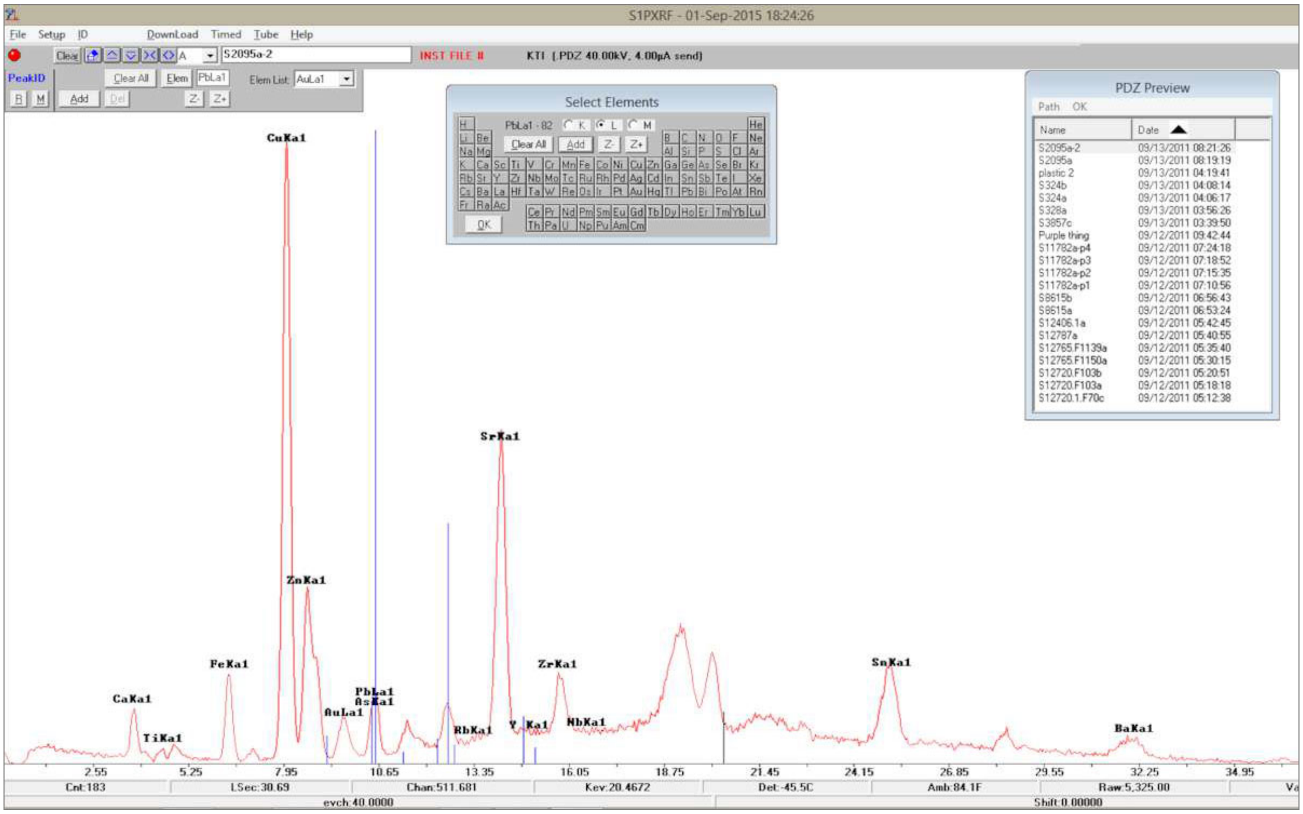


Figure 36.1. X-ray energy peaks for a "bronze" Viking artifact from Norway

The energy difference between specific atomic shells varies between elements, so that secondary X-rays have characteristic transition energies. The strongest X-ray intensity results from an L-shell electron replacing a K-shell vacancy, and is called K_{α}, while an M-shell electron replacing a K-shell vacancy is called K_{β}. The replacement of L-shell vacancies by M-shell electrons is called L_{α}. There are also energy differences among the orbitals within each shell, so the X-ray spectra include separate $K_{\alpha 1}$ and $K_{\alpha 2}$ lines. There are more L-lines than K-lines for metal elements, and there are substantial energy differences between $L_{\alpha 1}$, $L_{\alpha 2}$, $L_{\beta 1}$, $L_{\beta 2}$, and L_{γ}.

Elemental analysis of copper-based objects requires that the intensity of the primary X-rays be high enough to produce sufficient secondary X-rays for the elements of interest, which for ancient metals include copper (Cu), arsenic (As), tin (Sn), zinc (Zn), lead (Pb), iron (Fe), silver (Ag), antimony (Sb), gold (Au), and mercury (Hg). To quantify the analytical results, filters may be used to reduce the background signal and increase detection limits and precision. For all XRF spectrometers, energy level and intensity are measured by a detector, and the raw data produced may then be calibrated using standards and appropriate software. The standards must also be of copper-based material, as the ability of the secondary X-rays to reach the detector is affected by the composition of the matrix. Standards with a range of values for the other elements (e.g., copper with 0, 5, 10, 20, and 30 percent tin; same for lead and others) are also required to produce the most accurate results.

When comparing the different analytical instruments that measure secondary X-rays, there are differences in the size sample that can be accommodated, and the actual area that is analyzed. Scanning electron microscopes and electron microprobes are well known for conducting microanalysis, but in most cases only on small objects that will fit inside the sample chamber. Full-size and desktop XRF instruments analyze a greater area but also have size limitations, while portable XRF spectrometers have no maximum size limit since they are simply held adjacent to the object. While the detection limits of a pXRF may be an order of magnitude less than for regular XRF spectrometers, this does not affect results for major and minor elements in copper-based metal alloys.

Limitations of Non-Destructive Analysis

One important issue to consider is conducting non-destructive surface analyses on potentially heterogeneous samples. Copper-based metals become patinated, and over time may be seriously degraded on the surface, while conservation often involves metallic-based treatments, thus affecting the composition of the object's surface. When it is not possible to remove a clean sample for elemental analysis, the analysis of multiple spots can quickly reveal if there is significant variability in composition that is not characteristic of the original cast object. Also, the K/L intensity ratios for elements such as tin and copper have fixed values, but these are noticeably altered by corrosion and those spots with irregular values may be excluded. Ideally in such circumstances, it may be permissible to at least clean a small area for reanalysis. Such cleaning is necessary for artifacts known to have been treated with conservation chemicals that contain zinc or other metal elements.

Using a Portable X-Ray Fluorescence Spectrometer (pXRF)

Over time, a variety of portable XRF spectrometers have been developed,[2] while just in the last decade commercially produced models have been marketed by several major companies. In addition to the limitations of non-destructive XRF on potentially heterogeneous materials, the use of portable XRF spectrometers for archaeological applications has raised some issues about the reliability and comparability of different instruments. In recent years, however, it has been recognized that pXRF spectrometers are as consistent and precise as regular models, and developing calibration for different materials allows for direct comparison with analyses by other analytical methods.[3] At this point, the use of pXRF on archaeological metal materials has become widespread, and its regular users have a better understanding of both its potentials and limitations.[4]

Two different models of the pXRF have been used for the projects discussed in this paper, starting with the Bruker III-V+ in 2007 and the Bruker III-SD in 2012.[5] The differences are that the III-SD model uses a silicon drift detector, which is more sensitive and has better resolution than the Si-PIN detector on the III-V+ model. This results in less analytical time necessary per sample and better element identification from the calibration software. For both, the beam size is 5 by 7 millimeters, so that a substantial horizontal area is being analyzed. For the analysis of copper-based metals, a filter made of 12 mil Al and 1 mil Ti was used to enhance the precision of the readings, while settings of 40 kV, 1.5 or 4 μA, and 30–60 seconds were used to provide a full range of metal element peaks with sufficient responses for consistent precise measurements. Experimental testing of the same spot many times has shown that element concentration differences (variation, precision) between analyses are only a fraction of the actual variation in the object.[6]

Analyses of Copper-Based Alloys

The main purpose of elemental analysis of copper-based metal artifacts is to determine the quantity of elements intentionally included in the alloy. Results obtained from assemblages of copper-based objects may be used for assessing changes in production technology, access to tin and other metals, consistency in alloying different materials (e.g., tools, weapons, jewelry), and recycling practices. Many such artifacts, whether they are tools, weapons, or jewelry, have great artistic and/or archaeological value and are on display in museums. Even for small numbers of objects, analyses provide proper identification and description for both museum exhibits and publications.

One example is a small bronze head (inv. 1984.6) in the collections of Emory University, for which non-destructive analyses were done on three different spots (fig. 36.2). All show that copper is by far the major metal, while the amounts of tin, lead, and silver vary significantly. The crown of hair has much more lead (~14%) and tin (~11%) than the lip area, which has only about 1% lead and 3% tin; neither have any silver. The eye area, however, has about 2–3% silver (and about 4% lead and 7% tin). Several more examples of non-destructive elemental composition research using a portable XRF are presented below.

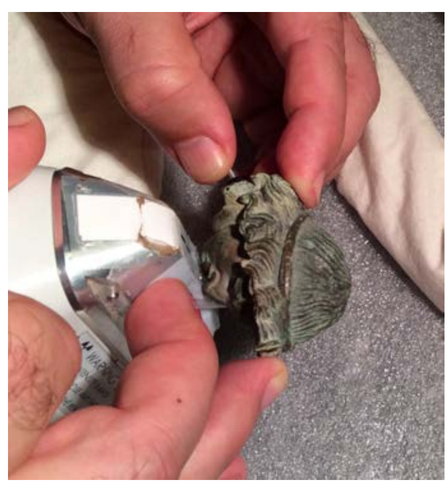


Figure 36.2. Portable X-ray fluorescence analysis of a small "bronze" head at Emory University

Figure 36.3. “Bronze” objects in the Paolo Orsi Museum, Siracusa, Sicily

Bronze Age Sicily

Copper-based artifacts have been infrequently found at Copper-Bronze Age sites in Sicily, whether as tools, weapons, or ornaments, and little if any study has been done on their actual composition. Permission was obtained to conduct non-destructive pXRF analysis on the large collection in the Paolo Orsi Museum in Siracusa, and others in Sicily. Two bowls from the site of Caldare (inv. 16290, 16291) were tested on multiple spots on the inside, outside, and separately attached handles (fig. 36.3). The heavy patina could not be avoided, and the readings for tin on each ranged from 0.7 to 5.7%, and 1.8 to 9.6%. One of the handles had notably more lead (3.0%) and arsenic (0.9%), suggesting a separate initial production process, perhaps with copper from a different source. For a dagger (Caldare inv. 16292), the tin ranges from 1.0 to 7.9% for six spots tested, including a rivet at the base. One spot had a measurable amount of zinc (1.6%), suggesting the use of a preservative. These examples illustrate the limitations of conducting surface analysis on bronzes with heavy patination and/or conservation treatment. Nevertheless, the preliminary results on more than one hundred artifacts analyzed show a great variation in the amount of tin used in the original alloys, which may be explained by tin’s irregular availability in a place so far from any source, and/or the absence of larger-scale production centers and standardized alloying practices.

Viking Age Norway

By the Viking Age, both bronze and brass were widely used. Non-destructive analyses using a pXRF were conducted in the Stavanger Museum, Norway, to test for any patterns and provide information for the museum’s catalogue and display. Among the nearly thirty copper-based objects tested, a cruciform brooch copy stands out as a typical bronze with only tin (9.4%) intentionally added (fig. 36.4). All other items tested were brass, with zinc ranging from just a few percent to more than twenty, and more than half also had tin and/or lead (table 36.1). The range among the percentages for each of these three elements also supports the likelihood of recycling rather than primary production of brass objects.

Figure 36.4. Viking Age cruciform brooch, Stavanger Museum, Norway. Analysis of inner edge by pXRF

Sample	Cu	Zn	As	Pb	Sn	Fe
Cruciform brooch	89.9	0.1	0.0	0.5	9.4	0.0
S411	73.6	24.3	0.2	0.9	0.5	0.0
S826-1	88.1	9.1	0.1	0.9	1.2	0.1
S826-2	80.0	16.8	0.1	0.9	1.6	0.1
S828	80.7	6.1	0.1	1.9	9.5	0.1
S1009	86.0	11.7	0.1	0.7	0.6	0.2
S1558	80.7	16.5	0.2	1.4	0.6	0.1
S1882	85.6	8.2	0.0	4.3	1.2	0.2
S1889	88.2	9.8	0.1	0.7	0.5	0.1
S2095	65.6	2.8	0.0	10.0	17.4	2.6
S2272	85.9	8.7	0.4	1.3	2.6	0.5
S2351	77.2	19.8	0.1	0.4	2.0	0.0
S2552	81.4	10.4	0.5	4.3	2.7	0.3
S2820	81.9	16.4	0.0	0.5	0.5	0.1
S2852	85.1	11.8	0.0	0.6	1.8	0.1
S3162-a	92.1	4.9	0.2	1.4	0.7	0.1
S3162-b/c	88.3	9.1	0.1	1.1	0.6	0.1
S3168	82.4	11.8	1.5	1.7	0.9	1.0
S3237	75.8	22.7	0.2	0.3	0.4	0.0
S3426	82.4	15.7	0.1	0.6	0.5	0.1
S3857	81.7	16.5	0.0	0.6	0.5	0.0
S4083	80.1	10.1	0.0	8.4	1.8	0.0
S4140	76.5	14.0	0.1	1.2	7.7	0.2
S4690	82.5	13.5	1.6	0.8	0.5	0.4
S7129	84.8	6.0	0.5	2.9	4.2	1.1
S8352	84.8	9.6	1.0	2.0	1.2	0.8
S12295	67.8	6.2	1.0	15.9	5.3	2.5
S12720	70.6	8.0	2.6	10.7	5.9	1.0

Table 36.1. Elemental composition of copper-based objects in the Stavanger Museum, Norway. The values are averages of the multiple spots tested; those in italics were inconsistent between spots.

On-site Analysis in Calabria Using pXRF

In most cases, a sample should be cleaned prior to compositional analysis, to avoid contamination issues. But for copper-based objects, any "dirt" is not likely to affect significantly the proportions of copper, tin, lead, and other metallic elements other than iron. On-site analyses can therefore produce reliable estimated results that may immediately be shared with the excavation team, local officials, and visitors. At the Greek settlement site of Francavilla Marittima in Calabria, Italy, excavations uncovered a burial (grave 14) with what appeared to be copper-based metal artifacts (objects 999–1000) (fig. 36.5). Analyses were conducted at the site the same day, revealing both to be tin bronzes (11 and 13% Sn) with no arsenic, lead, or zinc added.

Figure 36.5. Excavated burial at Francavilla Marittima, Calabria with multiple grave offerings (left) analyzed by pXRF in the field (right)

Analysis of a Native American Tablet

An incised Native American–style metal tablet was found at the near-contact-period Blueberry site (8HG678) in the Kissimmee Valley of south-central Florida (fig. 36.6). Analyses were conducted to determine whether it had been made by the Belle Glade people using native copper (that is, pure, geologically natural copper), or using smelting and casting technology, which was introduced to North America after European contact. Multiple spot analyses on both sides by pXRF showed virtually pure copper, more so than for typical smelted copper artifacts, which often have some iron, calcium, and other elements left from the slag. It also would have been more likely that the use of European-produced metal would have come from an alloy rather than pure copper.

Figure 36.6. Native American copper tablet from the Blueberry site, Florida

"Bronzes" in Florida Art Museums

Most of the Greek, Roman, Latin American, and other metal artifacts on display in museums in the United States were acquired through purchase or by donation and not from excavations, so there are questions about their original archaeological context as well as their authenticity. Using a pXRF, nearly all metal artifacts in the Tampa Museum of Art (80 objects, mostly Greek and Roman) and the Orlando Museum of Art (125 South American objects) were analyzed to assess authenticity and in all cases to provide compositional information for display labels and future research.

In the Tampa Museum, two northern Greek bracelets (TMA 1996.024.001/2) have consistent values with about 8% tin and 1% lead, which was common in the Iron Age (fig. 36.7b). A Roman "bronze" strigil (TMA 1982.022) has no tin but more than 20% zinc, so it is actually brass (fig. 36.7a). Retesting is planned to check if the zinc may be from a conservation treatment prior to its donation to the museum, but the lack of tin would make it unusual for first-century AD Roman finds. Each of the seven pieces of the chatelaine (TMA 1986.204a–g), also assigned to about 100 AD, has a substantially different tin composition, and thus may be interpreted as a compilation of separately made items (fig. 36.7c–d). All have high copper and tin, while one has especially high lead content (1986.204e). A "bronze" crossbow fibula (TMA 1993.004.010), assigned to the fourth century AD western Roman Empire at least needs much better labeling, as it includes zinc, gold, mercury, and silver, but no tin (fig. 36.8)!

Figure 36.7a. Analysis of classical archaeology objects in the Tampa Museum of Art, Florida. Roman strigil

Figure 36.7b. Analysis of classical archaeology objects in the Tampa Museum of Art, Florida. Greek bracelet

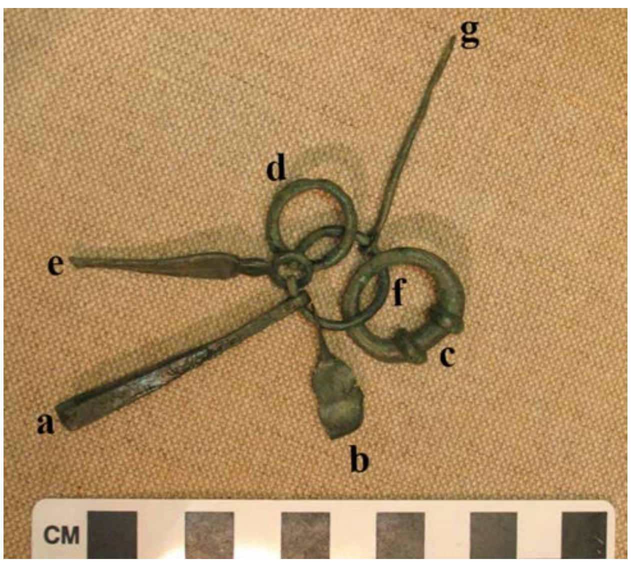


Figure 36.7c. Analysis of classical archaeology objects in the Tampa Museum of Art, Florida. Chatelaine

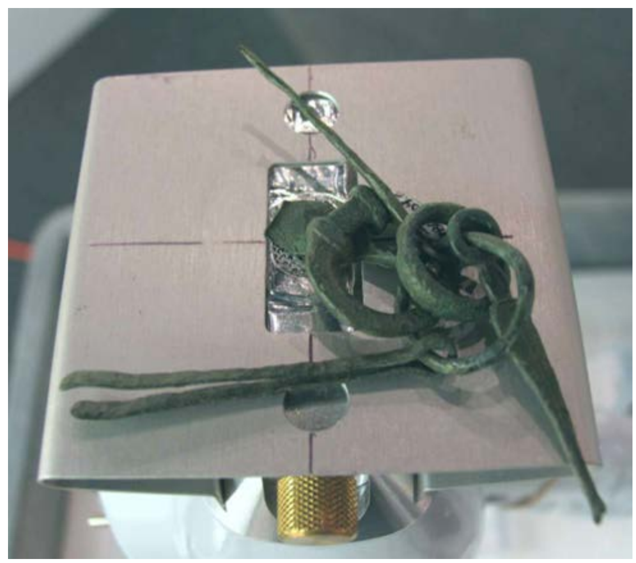


Figure 36.7d. Analysis of classical archaeology objects in the Tampa Museum of Art, Florida. Chatelaine

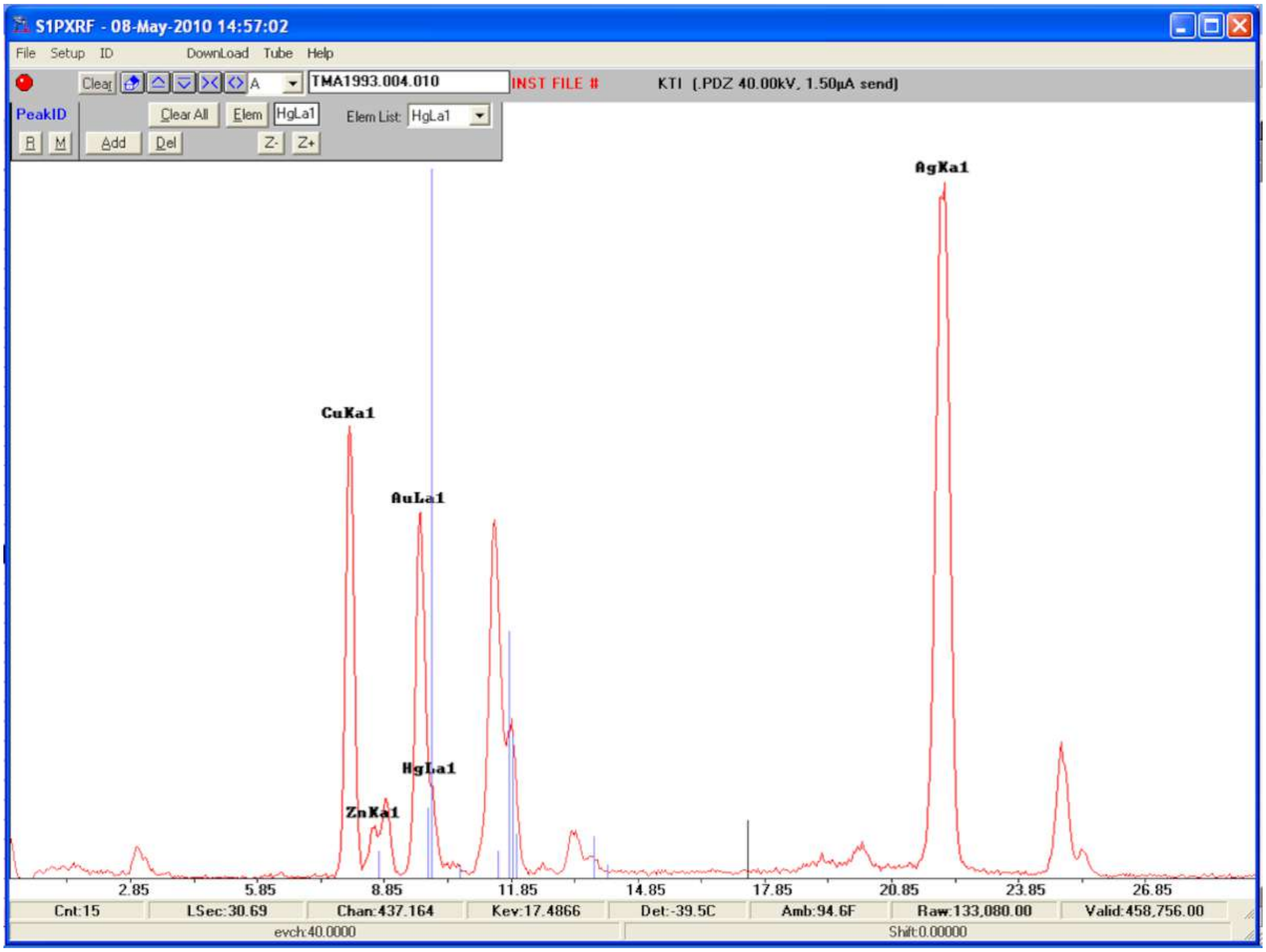


Figure 36.8. X-ray energy peaks showing Cu, Zn, Au, Hg, Ag in a "bronze" Roman crossbow fibula, Tampa Museum of Art

The Orlando Museum has many metal objects labeled as "gold" but analyses by pXRF show that most are actually alloys, with high percentages of silver and copper as well (OMA 2003.078.1-2) (fig. 36.9a). Many others are listed as tumbaga (Cu-Ag-Au alloy), but contain no gold or silver (table 36.2). Starting in pre-Inca times, depletion gilding—involving acid treatment and oxidation of the surface—was used to make the immediate surface mostly gold, so XRF analyses result in varying concentrations depending on depth. Many other objects in the museum were simply labeled as "copper" or "metal," with analyses revealing many that are arsenical copper (OMA 2004.104.1-4), fig. 36.9b), and just a few that are bronze (with just 2–3% Sn) (OMA 2004.032) (fig. 36.9c). One artifact, a knife (OMA 2004.074), has a high percentage of zinc, which was not used in Moche (pre-Columbian) times in the Americas, and thus is not authentic (fig. 36.9d).

OMA No.	Object Description	Cu	Sn	As	Pb	Ag	Au	Fe	Zn	Ca
2002.018	Botanical frog bead, AD 700–1000, Moche. Gold	13.2				14.6	72.3			
2002.057	Teeth design mouthpiece, AD 300–700, Moche. Gold	27.8				17.0	55.2			
2003.078.1	Plume, AD 300–700, Nasca. Gold	1.9				29.8	68.3			
2003.078.2	Plume, AD 300–700, Nasca. Gold	4.5				23.0	72.6			
2004.029	Ornament, AD 100–300, Chimu. Copper	93.0		4.1				3.0		
2004.03	Ring with two birds, AD 1100–1400, Chimu.	97.4	2.6							
2004.032	Crocodile tumi, AD 1100–1400, Chimu. Copper/tumbaga	97.7	2.3							
2004.052	Tumi, AD 1100–1400, Lambayeque/Chimu. Copper	90.4		5.7				2.0		1.9
2004.053	Tumi, AD 200–700, Lambayeque/Chimu. Copper/tumbaga	98.1		1.9						
2004.054	Tumi, AD 200–700, Lambayeque/Chimu. Copper/tumbaga	98.5		1.5						
2004.071	Spoon, AD 200–500	95.0		5.0						
2004.074	Top of knife, AD 450–550, Moche. Copper	46.4			1.7			8.0	35.2	8.7
2004.080.1	Ear spools, AD 1100–1400, Moche? Copper	60.4		1.0		38.5				
2004.080.2	Ear spools, AD 1100–1400, Moche? Copper	42.7		0.7		56.6				
2004.096	Vessel of a figure, AD 200–400, Nasca	2.4				31.2	66.4			
2004.097	Tweezers, AD 500–800, Nasca. Gold	3.7				24.9	71.4			
2004.104.1	Metal needle, AD 1000–1500, Chancay	92.6		7.4						
2004.104.2	Metal needle, AD 1000–1500, Chancay	98.1		1.9						
2004.104.3	Metal needle, AD 1000–1500, Chancay	95.0		5.0						
2004.104.4	Metal needle, AD 1000–1500, Chancay	94.3		5.7						
2004.112.1	Bird bead, AD 1100–1400, Chimu. Metal	97.2		2.8						
2004.112.2	Bird bead, AD 1100–1400, Chimu. Metal	94.6		5.4						
2004.112.3	Bird bead, AD 1100–1400, Chimu. Metal	97.0		3.0						
2004.112.4	Bird bead, AD 1100–1400, Chimu. Metal	86.4				11.7		1.8		

Table 36.2. Elemental composition of copper-containing objects in the Orlando Museum of Art. Most are pure or arsenical copper, or tumbaga, rather than tin bronze.

Figure 36.9a. Analyzed plumes in the Orlando Museum of Art

Figure 36.9b. Analyzed needles in the Orlando Museum of Art

Figure 36.9c. Analyzed tumi in the Orlando Museum of Art

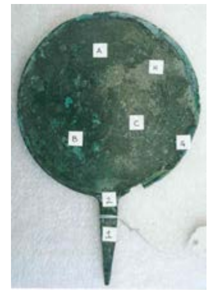
Figure 36.9d. Analyzed knife in the Orlando Museum of Art

Etruscan Bronze Mirrors in the Southeast United States

Shiny bronze mirrors were widely produced by the Etruscans, and many have been found in their tombs. Typically decorated on one side and smooth on the other, there are many now in American museums (fig. 36.10a–b). Testing by pXRF has been used to assess the composition for Etruscan mirrors in American museums, as well as to further test the hypothesis that many may be fakes.[7] Analyses have been done on more than thirty mirrors in the Smithsonian, Johns Hopkins University, the Walters Art Museum, the Baltimore Museum of Art, Emory University, the Tampa Museum of Art, and the Ringling Museum in Sarasota. Many are known to have been treated with a preservative, but analyzing multiple spots has allowed us to avoid that issue while addressing potential differences between the mirror sides and also with attached decorated handles (fig. 36.10c). From the results obtained, it appears that in earlier Etruscan times, the amount of tin used was similar to that for bronze tools (~8–15%), while by the third century BC there was a big increase in the tin (~20–30%) and therefore the reflectiveness of the mirror. While many of the mirrors in these museums are thought to be fakes, based on their style, only a few have incompatible chemical compositions (with zinc).

a

b



c

Figures 36.10a–c. Three examples of Etruscan bronze mirrors with multiple spots tested on both sides

Conclusion

The use of non-destructive analytical techniques provides many opportunities for studying bronze and other objects in museums and other places around the world. The examples presented here illustrate some of the specific questions that knowledge of the composition of copper-based materials can answer. The user and readers of their reports, however, must realize that while the precision and accuracy of pXRF instrumental results are high, there remain limitations in the interpretation of the values taken from copper alloys with patinated and degraded surfaces.

✦ ✦ ✦

Acknowledgments

I appreciate very much the assistance of Robert Bowers on creating copper-based metal calibration curves; colleagues Nancy de Grummond, Martin Guggisberg, Mads Ravn, Renee Stein, and Andrea Vianello for their roles in the case studies presented in this article; and the many officials and museum staff involved in providing permission and access to the objects for these non-destructive analyses. Funding for some of this research comes from Emory University, Florida State University, and the University of South Florida.

Notes

1. Ciliberto and Spoto 2000; Pollard et al. 2007; Pollard and Heron 2008; Missouri University Archaeometry Lab 2015.
2. Karydas 2007.
3. Gliozzo et al. 2010, 2011.
4. Dylan 2012; Goodale et al. 2012; Shugar and Mass 2012; Liritzis and Zacharias 2013; Shugar 2013; Charalambous,

Kassianidou, and Papasavvas 2014; Dussubieux and Walker 2015; Orfanou and Rehren 2015; Freund, Usai, and Tykot 2016; Garrido and Li 2016.

5. Bruker 2015.
6. Tykot 2016.
7. Tykot, de Grummond, and Schwarz 2012

Bibliography

Bruker 2015
Bruker. 2015. "Tracer Series pXRF Spectrometer" (April 30, 2015). https://www.bruker.com/products/x-ray-diffraction-and-elemental-analysis/handheld-xrf/tracer-iii/overview.html

Charalambous, Kassianidou, and Papasavvas 2014
Charalambous, A., V. Kassianidou, and G. Papasavvas. 2014. "A Compositional Study of Cypriot Bronzes Dating to the Early Iron Age Using Portable X-ray Fluorescence Spectrometry (pXRF)." *JAS* 46: 205–16.

Ciliberto and Spoto 2000
Ciliberto, E., and G. Spoto, eds. 2000. *Modern Analytical Methods in Art and Archaeology*. New York: Wiley.

Dussubieux and Walker 2015
Dussubieux, L., and H. Walker. 2015. "Identifying American Native and European Smelted Coppers with pXRF: A Case Study of Artifacts from the Upper Great Lakes Region." *JAS* 59: 169–78.

Dylan 2012
Dylan, S. 2012. "Handheld X-ray Fluorescence Analysis of Renaissance Bronzes: Practical Approaches to Quantification and Acquisition." In Shugar and Mass 2012, 37–74.

Freund, Usai, and Tykot 2016
Freund, K. P., L. Usai, and R. H. Tykot. 2016. "Early Copper-Based Metallurgy at the Site of Monte d'Accoddi (Sardinia, Italy)." 41st International Symposium on Archaeometry, Kalamata, Greece, May 15–20. Abstract published in *41st International Symposium on Archaeometry Book of Abstracts*, ed. N. Zacharias and E. Palamara, 258–59. Kalamata, Greece.

Garrido and Li 2016
Garrido, F., and T. Li. 2016. "A Handheld XRF Study of Late Horizon Metal Artifacts: Implications for Technological Choices and Political Intervention in Copiapó, Northern Chile." *Archaeological and Anthropological Sciences* 8:1–8. DOI: 10.1007/s12520-016-0315-2.

Gliozzo et al. 2010
Gliozzo, E., R. Arletti, L. Cartechini, S. Imberti, W. A. Kockelmann, I. Memmi, R. Rinaldi, and R. H. Tykot. 2010. "Non-invasive Chemical and Phase Analysis of Roman Bronze Artefacts from Thamusida (Morocco)." *Applied Radiation and Isotopes* 68: 2246–51.

Gliozzo et al. 2011
Gliozzo, E., W. A. Kockelmann, L. Bartoli, and R. H. Tykot. 2011. "Roman Bronze Artefacts from Thamusida (Morocco): Chemical and Phase Analyses." *Nuclear Instruments and Methods in Physics Research Section B* 269: 277–83.

Goodale et al. 2012
Goodale, N., D. G. Bailey, G. T. Jones, C. Prescott, E. Scholz, N. Stagliano, and C. Lewis. 2012. "pXRF: Study of Inter-instrument Performance." *JAS* 39: 875–83.

Karydas 2007
Karydas, A. G. 2007. "Application of a Portable XRF Spectrometer for the Non-invasive Analysis of Museum Metal Artefacts." *Annali di Chimica* 97: 419–32.

Liritzis and Zacharias 2013
Liritzis, I., and N. Zacharias. 2013. "Portable XRF of Archaeological Artifacts: Current Research, Potentials and Limitations." In *X-ray Fluorescence Spectrometry (XRF) in Geoarchaeology*, ed. M. S. Shackley, 109–42. New York: Springer.

Missouri University Archaeometry Laboratory 2015
Missouri University Archaeometry Laboratory. 2015. "Overview of X-ray Fluorescence" (April 30, 2015). Missouri University Archaeometry Laboratory. http://archaeometry.missouri.edu/xrf_overview.html

Orfanou and Rehren 2015
Orfanou, V., and T. Rehren. 2015. "A (Not So) Dangerous Method: pXRF vs. EPMA-WDS Analysis of Copper-based Artefacts." *Archaeological and Anthropological Sciences* 7: 387–97.

Pollard et al. 2007
Pollard, A. M., C. Batt, B. Stern, and S. M. M. Young. 2007. *Analytical Chemistry in Archaeology*. Cambridge: Cambridge University Press.

Pollard and Heron 2008
Pollard, A. M., and C. Heron, eds. 2008. *Archaeological Chemistry*. Cambridge: The Royal Society of Chemistry.

Shugar 2013
Shugar, A. N. 2013. "Portable X-ray Fluorescence and Archaeology: Limitations of the Instrument and Suggested Methods to Achieve Desired Results." In *Archaeological Chemistry VIII*, ed. R. A. Armitage and J. H. Burton, 173–95. Washington, DC: American Chemical Society.

Shugar and Mass 2012
Shugar, A. N., and J. L. Mass, eds. 2012. *Handheld XRF for Art and Archaeology*. Leuven: Leuven University Press.

Tykot 2016
Tykot, R. H. 2016. "Using Non-Destructive Portable X-Ray Fluorescence Spectrometers on Stone, Ceramics, Metals, and Other Materials in Museums: Advantages and Limitations." *Applied Spectroscopy* 70(1): 42–56.

Tykot, de Grummond, and Schwarz 2012
Tykot, R. H., N. T. de Grummond, and S. J. Schwarz. 2012. "XRF Analysis of Metal Composition of Etruscan Bronze Mirrors." Abstract published in *Archaeological Institute of America 113th Annual Meeting Abstracts* 35: 71–72.

37.

A Scientific Assessment of the Long-Term Protection of Incralac Coatings on Ancient Bronze Collections in the National Archaeological Museum and the Epigraphic and Numismatic Museum in Athens, Greece

Stamatis C. Boyatzis, Technological Educational Institute of Athens, Department of Conservation of Antiquities & Works of Art, Egaleo, Greece
Andriana Veve, Technological Educational Institute of Athens, Department of Conservation of Antiquities & Works of Art, Egaleo, Greece
Galateia Kriezi, Technological Educational Institute of Athens, Department of Conservation of Antiquities & Works of Art, Egaleo, Greece
Georgia Karamargiou, National Archaeological Museum, Greece
Elena Kontou, Epigraphic and Numismatic Museum, Athens, Greece
Vasilike Argyropoulos, Technological Educational Institute of Athens, Department of Conservation of Antiquities & Works of Art, Egaleo, Greece

Thirteen ancient bronze artifacts coated with Incralac between 1976 and 2003 were examined using FTIR (Fourier transform infrared spectroscopy) and SEM-EDX (scanning electron microscopy coupled with energy dispersive spectrometry). The coated artifacts were selected as having no visible coating failure, and FTIR was used to determine whether there were any chemical changes to the coatings. The bronze objects are figurines, vessels, tools, jewelry, and mirrors, preserved at the National Archaeological Museum from many periods and places; and coins from the Epigraphic and Numismatic Museum in Athens, dating from the Hellenistic, Roman, and Byzantine periods. In parallel, Incralac was analyzed and tested on artificially aged coupons from six different distributors in Greece that sold the product to the museums between 1983 and 2002. According to the distributors, the product came from manufacturers in Italy, Australia, and the United States. The results showed that the Incralac formulation varied depending on the Greek distributor. Also, the long-term performance of the coating on the bronze artifacts was not always consistent. Some coated artifacts showed little chemical change after 25 years of coating, while others showed significant chemical change after just 15 years. FTIR was successful at detecting chemical changes to Incralac coatings not yet visible to the naked eye, serving as an early warning tool. Also, FTIR was able to verify the quality of product sold by Greek distributors.

✦ ✦ ✦

Introduction

Among the main criteria for selecting a coating for cultural heritage metal artifacts are (1) long-term insulation of their surfaces from contaminants due to environmental pollutants and handling; (2) the filtration of light through absorption of radiation; (3) considerable adhesion to the metal surface and elasticity; and finally (4) chemical stability. Ease of application and reversibility are also among the highly sought requirements.

Incralac was introduced by INCRA (International Copper Research Association) in 1964 as a metal protective coating based on the acrylic resin Paraloid B44 (an ethylacrylate –methylmethacrylate copolymer) with benzotriazole (BTA) as a main additive. It has been widely used in conservation as meeting the above requirements.[1] In addition to these compounds, small quantities of a stabilizer (i.e., crosslinker) such as epoxidized soybean oil (ESO), as well as hindered amine light stabilizers (HALS) such as Tinuvin 292, are occasionally added for conservation application.[2] Long-term for Incralac coating typically means 5 to 8 years according to the manufacturers; however, museums rarely find the time to recoat their objects, and coatings are routinely used for longer periods of time than normally recommended by the manufacturer.

Conservation practice studies have shown that the protection that Incralac offers to outdoor bronze objects is only temporary, as various problems can arise with prolonged use, such as brittleness of the coating and irreversibility with solvents.[3] On the other hand, its indoor use appears to result in more enduring protection, as attested by many conservators.

A survey in 2006[4] found that museums in Greece show a preference for Incralac as a coating for ancient bronze objects in museums. Also, this coating has been routinely applied on both indoor and outdoor bronzes worldwide. As most conservators in Greece attest to its good performance as a long-term coating on ancient bronzes, this study was initiated to better understand the behavior of this coating for indoor bronze collections. Many studies have looked at the stability of this coating, with varying results.[5] One major study tested various coatings, such as Incralac (with and without corrosion inhibitors) and BTA, on copper-alloyed panels with accelerated aging (indoor and outdoor conditions), and at outdoor test sites at the J. Paul Getty Museum in Malibu, the Swedish Corrosion Institute in Stockholm, and in Tirgu Jiu in Romania.[6] The study found Incralac to be one of the best coatings in both outdoor tests and indoor accelerated-aging trials, but the prior application of a corrosion inhibitor such as BTA was found not to have any beneficial effect on the coating's behavior.

Aims of the Work

This work aims to better understand the condition of Incralac coatings on bronze artifacts on display or in storage at the National Archaeological Museum and the Epigraphic and Numismatic Museum, both located in Athens, Greece, on the basis of year of application and treatment practice. Also, the research tried to correlate the results with artificial aging of Incralac on bronze coupons from different vendors in Greece.

Experimental Section: Materials and Specimens

Solvents: All solvents were Sigma-Aldrich, reagent grade: acetone, methyl-ethyl ketone, dichloromethane.

Coatings and Bronze Coupons: A number of Incralac products were acquired especially for this research from typical distributors throughout Greece that sell conservation materials. For the sake of anonymity, these distributors are referred to below as A, B, C, D, and E.

Bronze coupons (63.81% Cu and 36.19% atom by SEM-EDX analysis) were prepared from larger bronze blocks and were cut into smaller specimens (2.0 x 2.0 x 0.03 cm). Accordingly, they were polished using SiC sandpapers successively with decreasing mesh diameter (P2400 and P4000).

Incralac coatings were applied to the bronze coupons using a do-it-yourself spin coater at an average of 1000 rpm (measured by a laser tachometer). This way, uniform films of 1.16–1.36 μm thickness were cast from their methyl-ethyl ketone (MEK) solutions (10% w/w) on each coupon.

Artificial Aging Conditions: An artificial aging protocol was employed involving heat, moisture, and UV-visible light to simulate average external conditions on a day-night succession basis. In particular, the following cycles were utilized: Low-to-mid humidity cycle (Cycle 1): 70°C, 60% RH, 7.5 days (UV-vis light was turned on and off every 22.5 min). High humidity cycle (Cycle 2): 70°C, 95% RH, 7.5 days (UV-vis light was turned on and off every 22.5 min).

Analytical Techniques: SEM-EDX analysis was done with a JEOL JSM-5310 system. Fourier transform infrared (FTIR) spectra of Incralac films were recorded (64 scans, 4 cm cm^{-1} resolution) using a PerkinElmer Spectrum GX I FTIR spectrometer as follows: (a) reflection-absorption spectra of artificially aged films on polished bronze were recorded using a PerkinElmer fixed angle (approx. 218) reflection accessory; the two mirrors allowed for manual angle optimization to achieve maximum energy throughput. The variability of film thickness in spin-coated bronze coupons was tested with recording FTIR spectra (64 acquisitions using a circular window of 2 mm diameter on the fixed angle accessory) of five different spots on each coupon and the absorbance areas at 1740–1720 cm^{-1} range were accordingly calculated.

FTIR spectra of corrosion products from museum objects were recorded from detached powder samples, wherever possible, which were accordingly pressed into a KBr disc. Spectra of coatings from museum objects were recorded from their acetone (Merck, Pro-analysis) extracts, which were accordingly applied on clean KBr discs.

Results and Discussion: Incralac Formulations and Artificial Aging

It is crucial to investigate the actual formulations of the materials available in the market, as well as their behavior under simulated aging conditions, before any further analysis is conducted on actual artifacts in order to ensure that results do not vary due to different formulations. Incralac has been formulated as a coating containing acrylic resin (Paraloid B44) as its base component and additives such as BTA or an aryl-substituted derivative. A few other materials are frequently added, such as ESO and Tinuvin 292 (T). Chemical structures of involved materials are shown (fig. 37.1); FTIR spectra of studied Incralac formulations are shown in fig. 37.2a; FTIR peak assignments are given in table 37.2.

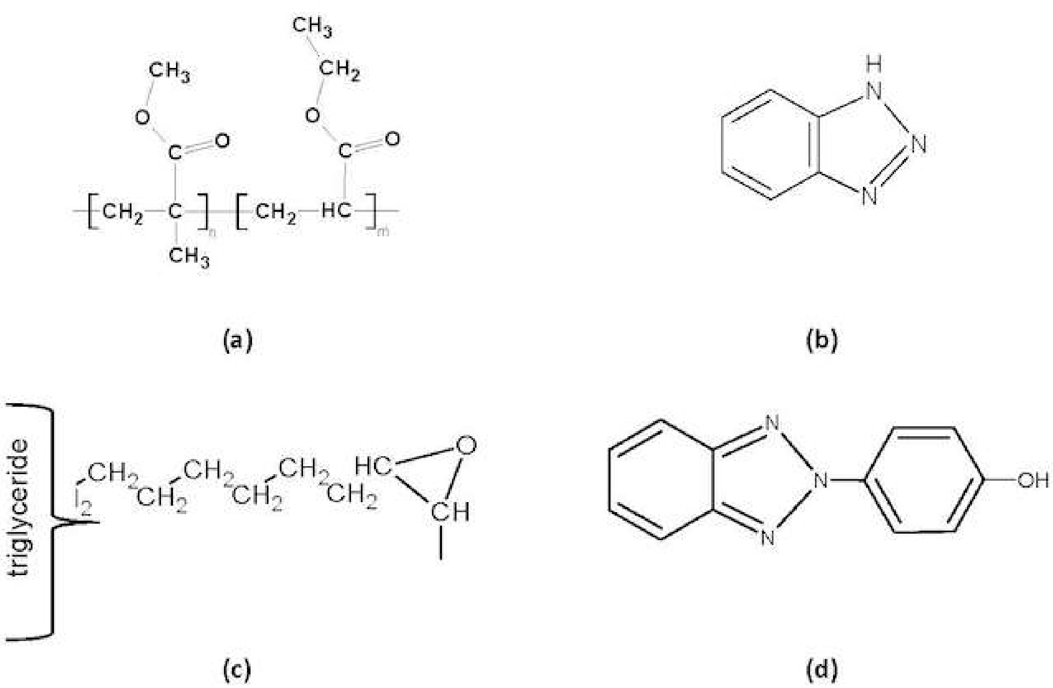


Figure 37.1. Chemical structures of materials studied, used and/or mentioned in this work. (a) Paraloid B44; (b) benzotriazole; (c) epoxidized soybean oil (ESO) basic functional structure; (d) Tinuvin 600 (aryl-substituted benzotriazole)

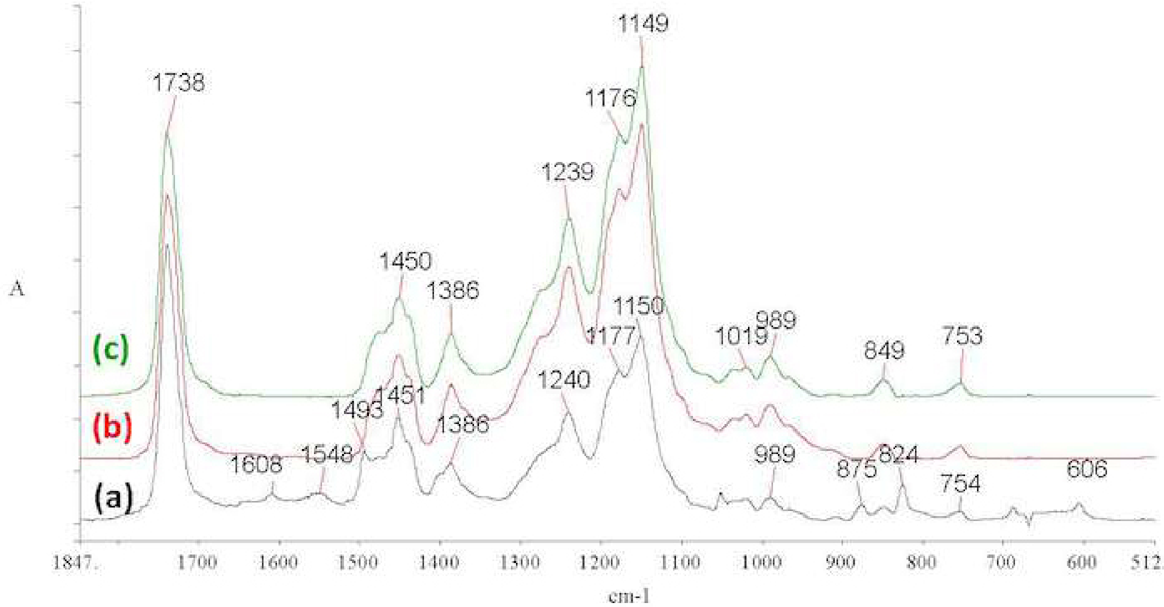


Figure 37.2. FTIR spectra of Incralac (distributor B) after two consecutive artificial aging cycles, focusing on the range 1847–512 cm^{-1}. Curves indicate different stages of the material: (a) initial stage; (b) after Cycle 1; and (c) after Cycle 2. For aging conditions, see Experimental Section

It has been previously suggested that Incralac formulations, at least at the acrylic resin level, may vary from supplier to supplier.[7] In our investigations, a number of Incralac batches were analyzed with KBr-FTIR and results confirm this suggestion. Figure 37.2a shows the recorded spectra of Incralac products acquired from various distributors in Greece (table 37.1). It can be seen that the basic formulation is similar in most cases, with Paraloid B44 being the base acrylic resin, with main absorptions at 2989, 2953, and 2846 cm^{-1} (antisymmetric stretching of CH_3 and CH_2 and symmetric stretching of CH_2, correspondingly); 1732 cm^{-1} (ester carbonyl stretching); 1474, 1449, and 1387 cm^{-1} (CH_2 and CH_3 bending); and 1238, 1177, and 1147 (C-O-C stretching).

Distributor	Base acrylic resin	Additives
A	Paraloid B44	Very low amounts of substituted benzotriazole, epoxidized soybean oil
B	Paraloid B44	Substituted benzotriazole, epoxidized soybean oil
C	Paraloid B44	Substituted benzotriazole, epoxidized soybean oil
D	Different resin, possibly Paraloid B48N	Substituted benzotriazole, epoxidized soybean oil
E	Paraloid B44	Substituted benzotriazole, epoxidized soybean oil
F	Paraloid B44	Substituted benzotriazole, epoxidized soybean oil

Table 37.1. Incralac formulations based on FTIR analysis

Incralac Absorption Maxima (cm^{-1})	Assignment[1]
	Carbonyl ester harmonic
2989, 2953, 2846(sh)	ν_{as} CH_3, $\nu_{as}CH_2$, ν_sCH_2 in base acrylic resin (Paraloid B44) [2]
2926	ν_{as} CH_2 from oil, possibly ESO[4]
2875	ν_s CH_3 (due to presence of t–butyl methacrylate in Paraloid B48N; found in one case, see text) [2]
1732	ν C=O in base acrylic resin[2]
1604	ν C=C in aromatic ring of BTA[3]
1548	δ NH
1494	ν C=C (aryl ring)
1474	δ CH_2 main chain in base acrylic resin[2]
1449	δ CH_3-CH_2-O side chain + δ_{as} CH_3 in base acrylic resin[2]
1387	δ_s CH_3 side chain in base acrylic resin[2]
1265	ν C-O in epoxy ring in ESO[5]
1238, 1177, 1147	ν C-O-C in base acrylic resin[2]
1027	ν C-C-O in base acrylic resin[2]
990	δ H-C-H, τ CH_3 in base acrylic resin
875	δ_{oop} C-H in substituted aryl ring in BTA[3]
848	δ C-C-CH_3 (α-CH3 of EMA in base acrylic resin)[2]
824	δ (CCO) in epoxy ring in ESO[5]
753	δ_{oop} C-C=O
688	Aromatic ring vibration in BTA[3]
606	Triazole ring vibration in BTA[3]

[1] Abbreviations: BTA: benzotriazole; ESO: epoxidized soybean oil; v: stretching vibration; δ: bending vibration; s: symmetric; as: anti-symmetric; oop: out-of-plane; ip: in-plane.
[2] Lazzari and Chiantore 2000.
[3] Brostoff 2003.
[4] Ioakimoglou et al. 1999, Boyatzis et al. 2002.
[5] Argitis et al. 1998.

Table 37.2. FTIR assignments of key materials

Added quantities of BTA (possibly an aryl-substituted derivative as evidenced by the peaks at 1604, 1548, and 1494 cm^{-1}) and of an epoxy-oil compound (possibly epoxidized soybean oil, based on distributors' data sheets and the literature, and evidenced by the 2926 and 1265 cm^{-1} peaks) are also detected. (For FTIR peak assignments, see table 37.2.) In one specific case (distributor A), lower amounts of additives were detected through FTIR analysis than for the other distributors, while in another (distributor D), a different base polymer seems to have been used or added, possibly Paraloid B48N (based on its 2961, 2876 C-H stretching absorption peaks pattern).[8] On this basis, it may be hypothesized that some manufacturers or distributors formulate their own Incralac-type products by employing primarily Paraloid B44 (and in one case a different resin) and adding substituted BTA and/or epoxidized soybean oil (ESO); also, addition of other unspecified additive(s) in small quantities cannot be ruled out.

The performance of various Incralac formulations was evaluated through artificial aging of spin-coated films on polished bronze coupons, where accelerated aging simulating day-night sequences was applied in two consecutive overall aging cycles (see Experimental Section for conditions). As seen in reflection FTIR spectra of their films (figs. 37.2b–c), after artificial aging Cycle 1 (see fig.

37.2b) all coupons showed dramatically lower BTA levels as compared to those of the initial materials (see fig. 37.2a), while after Cycle 2, BTA seems to have been completely removed (see fig. 37.2c). Sublimation of the material is a possible explanation as suggested in the literature and may lead to depletion of the anti-corrosion components in the formulation.[9] Therefore, the decrease and eventual disappearance of BTA in the coating over prolonged application times is possibly a more significant factor than the aging of the resin material itself.

Investigating the Condition of Incralac in Bronze Museum Objects

Objects from the National Archaeological Museum, Athens: Eight bronze objects from the collection of the National Archaeological Museum were selected on the basis of their previous conservation treatments with Incralac formulations (see object photos in fig. 37.3). In particular, the sample contained a jug (fig. 37.3a, X 7934, Greece, fifth century BC); a statuette complex with goddess Isis with Horus (fig. 37.3b, X 1974, Egypt, 26th–30th Dynasty, 600–300 BC); a mirror (fig. 37.3c, X 21039, unknown origin); a kyathos (fig. 37.3d, X 26175, Greece, end of 7th–beginning of 6th century BC); a ring (fig. 37.3e, X 25604, unknown origin); a spiral bracelet (fig. 37.3f, X 17166, Greece, possibly Geometric era); a strigil (fig. 37.3g, X 8297, Greece, fifth century BC); and a sword (fig. 37.3h, Π 7317, Greece, end of fifteenth–fourteenth century BC).

Figure 37.3. Objects from the National Archaeological Museum of Athens. Conservation Report: (a) jug, inv. X 7934; (b) statuette with goddess Isis, X 1974; (c) mirror, X 21039; (d) kyanthos, X 26175; (e) ring, X 25604; (f) spiral bracelet, X 17166; (g) strigil, X 8297; (h) sword, Π 7317. The copyright of the item(s) in illustration belongs to the Greek Ministry of Culture and Sports.

Image: Ministry of Culture and Sports – Archaeological Receipts Fund, and National Archaeological Museum

FTIR spectra were recorded from acetone-extracted coating samples (see Experimental Section). As shown in figure 37.4, no BTA could be detected in all cases in the coating, as no characteristic peaks of the component were present; this may be due either to decrease or removal of the additive in a manner similar to that of artificial aging of coated bronze coupons (see above), or to the limited or ineffective extraction of this particular component through the selected solvent during sample collection. In addition, in some cases (objects X 1974, X 21039, and X 8297) the condition of coatings was found to be only slightly changed or totally unchanged compared to the initial condition of the base acrylic resin. However, in other cases (objects X 26175, X 17166, and X 25604), significant formation of hydroxyl absorptions (broad features at 3500–3200 cm^{-1}) indicate oxidation and/or hydrolytic degradation of esters. The latter can be ruled out, as absorption of polyacrylate copper salts at the 1600–1550 cm^{-1} range[10] is not evident. The newly formed band at ca. 1646 cm^{-1}, which was particularly intense in the case of object X 17166 (conserved in 1998–99 using Incralac material from distributor E), was assigned to C=C absorptions due to oxidation-induced unsaturation in the acrylic resin backbone; additionally, the dark reddish appearance of this object's coated surface (see fig. 37.3f) supports this assignment. Relatively high degradation levels were also detected in objects X 25604 and X 25175, which were attributed to the same factors. In accordance with the conservation records, it can be assumed that the poor coating performance resulted from the failure to stabilize the object with corrosion inhibitor BTA, rather than being an effect of the coating itself, as material from the same distributor performed better in other cases. This assumption contradicts another study,[11] but that study was on test panels and not on real archaeological bronzes as in our case. Stabilization of bronzes using corrosion inhibitor BTA is routinely carried out in Greece prior to Incralac application, and the combined use of BTA and Incralac is highly recommended by conservators in Greece for its effectiveness.

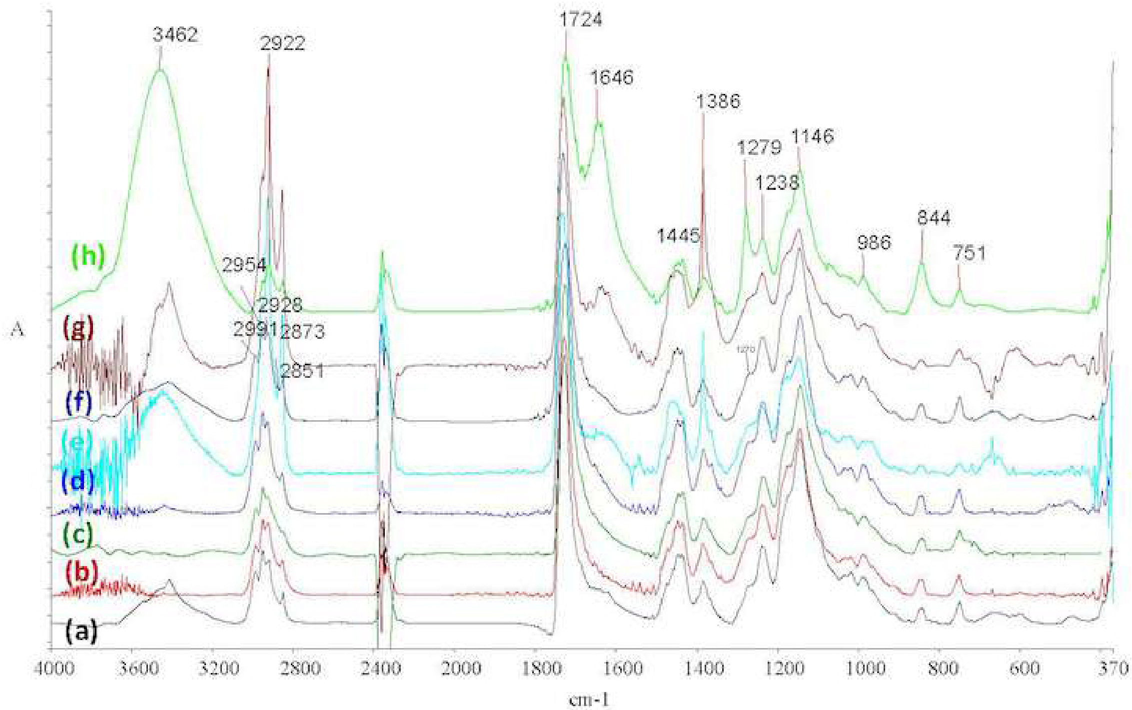


Figure 37.4. FTIR spectra of coatings, for objects from the National Archaeological Museum of Athens. Inventory numbers are followed by year of conservation, and age of coating application at time of analysis (in parentheses). (a) X 7934 (1979; 28 years), (b) X 1974 (1985; 22 years), (c) X 21039 (1991; 16 years), (d) X 8297 (1997; 10 years), (e) X 26175 (1998–99; 8–9 years), (f) Π 7317 (2003; 4 years), (g) X 25604 (2000; 7 years), (h) X 17166 (1999; 8 years). The copyright of the item(s) in illustration belongs to the Greek Ministry of Culture and Sports.
Image: Ministry of Culture and Sports – Archaeological Receipts Fund, and National Archaeological Museum

Registry #	Description	Region and Historical Period	Year of Conservation	Pre-treatment			Application of Coating							Arbitrary grading	
				Mechanical	Chemical	Stabilization	Incralac Solvent	Incralac Concentration (%)	Matting Agent	Distributor	SEM Analysis[1]	FTIR Analysis of Corrosion Products[1]		FTIR Analysis of Coating	Degradation Grading[2]
X 7934	Jug	Greece, 5th c. BC	1979	Yes	No	BTA	Toluene	?	Yes	E or F	Cu, Al, Si, Fe, Mg, Ca, S	Calcite, silicates, copper oxides		Low levels of degradation: mainly hydrolytic and depolymerization	4
X 1974	Statuette, Isis with Horus	Egypt, 26th–30th Dynasty (600–300 BC)	1985	Yes	Yes	BTA	Toluene	?	No	E or F	Cu, Sn, Pb, Al, Ca, Cl	Copper oxides and hydroxides, traces of organic coating, moisture		No sign of degradation	0
X 21039	Mirror	?	1991	Yes	No	BTA	Toluene	?	No	E or F	Cu, Pb, Al, Si, Fe, Ca	Copper oxides, malachite		Very low levels of degradation	1
X 26175	Kyathos	Greece, end of 7th – beginning of 6th c. BC	1998	Yes	No	BTA	Toluene	8–10	Yes	A	N.A.	N.A.		Low levels of degradation: mainly hydrolytic and depolymerization; also signs of bio-degradation (formation of nitrates)	4
X 25604	Ring	?	2000	Yes	No	No	Toluene	8–10	Yes	E	N.A.	N.A.		High levels of degradation: mainly hydrolytic and depolymerization; also signs of bio-degradation (formation of nitrates)	5
X 17166	Kringle	Greece, possibly Geometric period	1999	No	Yes	No	Toluene	8–10	Yes	E	N.A.	N.A.		Significantly high levels of degradation: mainly hydrolytic and depolymerization	9
X 8297	Strigil	Greece, 5th c. BC	1997	Yes	No	BTA	Toluene	?	Yes	E	Cu, Sn, Al, Ca , S, P, Si	Malachite, organic coating residue		Very low levels of degradation	[BLANK]
Π 7317	Sword	end of 15th–beginning of 14th c. BC	2003	Yes	No	No	Toluene	8–10	No	A	Cu, Sn Al, Si, Fe, Ca, As, S, P	Malachite		Low levels of degradation	3

[1] Corrosion products were analyzed when detaching powder particles from the objects' surface was feasible.
[2] Arbitrary scale, based on the absorption of C=C at approx. 1646 cm^{-1} as a marker for oxidative degradation (see main text).

Table 37.3. Condition of coatings on objects from the National Archaeological Museum as investigated through FTIR spectroscopy

Group	Description	Region/ Historical Period	Year of Conservation	Pre-treatment			Application of Coating						Arbitrary grading	
				Mechanical	Chemical	Stabilization	Coating Thickness (μm)	Coating Layers	Incralac Solvent	Incralac Concentration (%)	Matting Agent	Distributor	FTIR Results	Degradation Grading[2]
A	Coin	Byzantine	2002	Yes	No	BTA	1.5	2	Toluene	10–15	Second layer, only	D	Very low levels of degradation	1
B	Coin	Greek Imperial	1997	Yes	No	BTA	2	2	Toluene	10–15	Yes	C	Low levels of degradation	2
C	Coin	Hellenistic	1992	Yes	Yes	Noi	2	2	Toluene	10–15	Yes	E	Significant degradation mainly due to oxidation	5
D	Coin	Ancient Greek and Greek Imperial	1987	Yes	No	Yes	2	2	Toluene	10–15	Yes	E	Low levels of degradation	2
E	Coin	Late Roman and Byzantine	1982	Yes	No	?	3	2	Toluene	10–15	No	E	Very low levels of degradation	1
A	Coin	Byzantine	2002	Yes	No	BTA	1.5	2	Toluene	10–15	Second layer, only	D	Very low levels of degradation	1
A	Coin	Byzantine	2002	Yes	No	BTA	1.5	2	Toluene	10–15	Second layer, only	D	Very low levels of degradation	1

Table 37.4. Condition of coatings on objects from the Epigraphic and Numismatic Museum as investigated through FTIR spectroscopy

Objects from the Epigraphic and Numismatic Museum, Athens: Selected coins originating from several archaeological periods and categorized according to their conservation treatments (between 1982 and 2002) were investigated (fig. 37.5; table 37.3–4). They were categorized as follows: Byzantine (group A, conserved 2002), Greek Imperial (group B, conserved 1997), Hellenistic (group C, conserved 1992), Ancient Greek and Greek Imperial (group D, conserved 1987), and Late Roman and Byzantine coins (group E, conserved 1982). It was not possible in every case to detach powdered samples from the coin surface for analysis. Therefore, the analysis was only based on FTIR spectra of the extracted coating using the method described in the Experimental Section. In all cases, little or no BTA was detected, while minor amounts of ESO were found through the epoxy-ring absorption at 1265–1270 $^{-1}$ absorption (fig. 37.6). Moreover, in this case, too, oxidative degradation of the coating materials was evidenced through the 1642 cm^{-1} absorption due to oxidation-induced unsaturation, that is, formation of C=C; this was found to be more intense in the case of Hellenistic coins (group C) conserved during 1992 using Incralac acquired from distributor E. From the data in table 37.4, it can be inferred that the poor performance of the coating can be attributed to lack of stabilization of coin surfaces (with BTA) after chemical cleaning as well as possible surface morphology issues such as pitting and cracks in the specific object.

Figure 37.5. Coins from the Epigraphic and Numismatic Museum, Athens. Conservation Report. Representative coins from (a) group A (inv. 4149); (b) group B (inv. 2778); (c) group C (inv. 396); (d) group D (inv. 5800); and (e) group E (inv. 5806). Obverse and reverse are denoted as “1” and “2,” respectively. Scales are shown in cm.

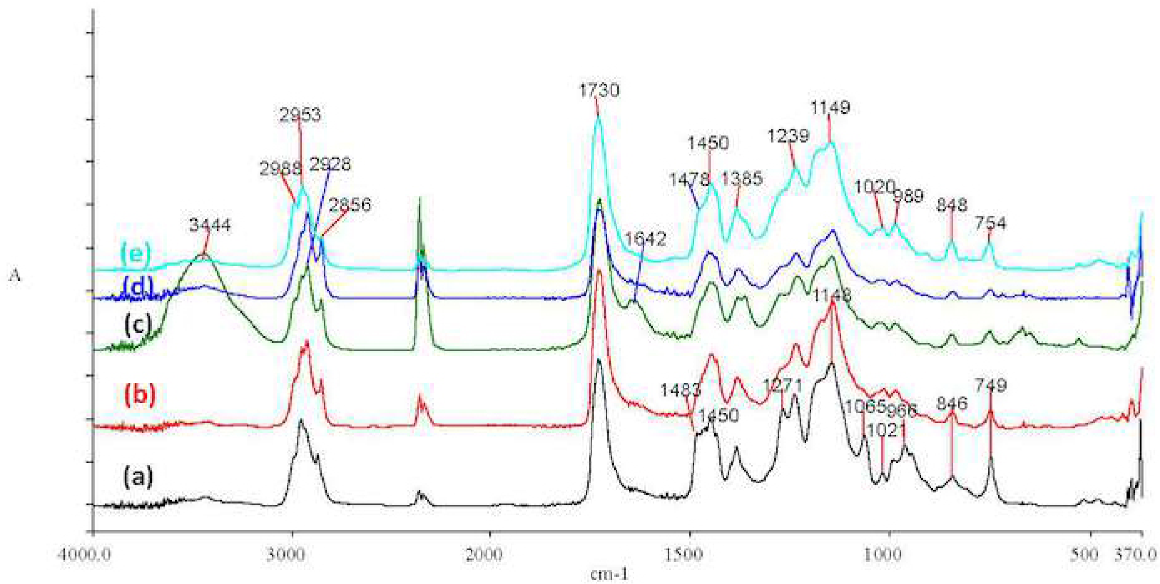


Figure 37.6. FTIR spectra of coatings, from the Epigraphic and Numismatic Museum. Group numbers are followed by year of conservation, and age of coating application at time of analysis (in parentheses). (a) group A (2002; 5 years); (b) group B (1997; 10 years); (c) group C (1992; 15 years); (d) group D (1987; 20 years) and (e) group E (1982; 25 years)

Conclusions

Scrutiny of the conservation records, visual inspection, SEM-EDX analysis, and FTIR analysis of the studied objects resulted in a comprehensive assessment of the condition of the objects' surfaces, including their coatings. The results from the National Archaeological Museum are listed in table 37.3, while those of the Epigraphic and Numismatic Museum are in table 37.4. It can be seen that in specific cases from both museums, a combination of factors—the product purchased from distributor E, the application method in combination with the treatment practice (i.e., mechanical treatment and stabilization of bronze surface or chemical treatment), and the preservation state of the objects—resulted in poor coating condition. FTIR spectra of extracted coating material in these cases showed oxidative degradation, which resulted in deeply yellowed coating (as evidenced by visual inspection). The fact that in other cases the product from the same distributor (E) performed better leads to the conclusion that pre-treatment of bronze surface by immersing the object in BTA solution helped to form a thin protective film of a copper-BTA complex, which improved the coating's performance.[12] However, it has not been shown whether the absence of BTA in the investigated solvent-extracted coatings is responsible for the overall coating performance at any level. At this point, reflection-absorption FTIR spectroscopy performed in situ and non-destructively on the artifacts' surfaces could yield a more conclusive assessment; in this study, however, this was not possible. The decision to coat or not to coat museum bronze artifacts is left to the conservator, who must decide the best protocol based on the conditions of the museum environment and handling of the objects. Our study tried to highlight that coating changes may occur long-term and may not yet be visible to the naked eye. Since the conclusion of this study, the conservators of the National Epigraphic and Numismatic Museum have decided to discontinue use of any coatings on their coin collection. Conservators from the National Archaeological Museum still use Incralac coatings on their bronzes, and attest to its good performance relative to other types of coatings.

✦ ✦ ✦

Notes

1. Madsen 1971, Scott 2002, Brostoff 2003.
2. Erhardt et al. 1984, McNamara et al. 2004.
3. Scott 2002, Craine, Severson, and Merritt 1992, Brostoff 2003, McNamara et al. 2004, Bierwagen, Shedlosky, and Stanek 2002.
4. Argyropoulos et al. 2008.
5. Brostoff 2003, Erhardt et al. 1984, McNamara et al. 2004.
6. Scott 2002, 390.
7. Brostoff 2003.
8. Lazzari and Chiantore 2000.
9. Madsen 1971.
10. Boyatzis et al. 2012, Gotoh et al. 2000.
11. Scott 2002, 390.
12. Madsen 1971, Brostoff 2003.

Bibliography

Argitis et al. 1998

Argitis, P., S. Boyatzis, I. Raptis, N. Glezos, and M. Hatzakis. 1998. "Post-Exposure Bake Kinetics in Epoxy Novolac-Based Chemically Amplified Resists." *Micro- and Nanopatterning Polymers*, ACS Symposium Series, 706, ed. H. Ito, E. Reichmanis, O. Nalamasu, and T. Ueno, 345–57. Washington: ACS Publications.

Argyropoulos et al. 2008

Argyropoulos, V., M. Giannoulaki, G. P. Michalakakos, and A. Siatou. 2008. "A Survey of the Types of Corrosion Inhibitors and Protective Coatings Used for the Conservation of Metal Objects from Museum Collections in the Mediterranean Basin." In *Strategies for Saving Our Cultural Heritage: Papers Presented at the International Conference on Conservation Strategies for Saving Indoor Metallic Collections (CSSIM),* Cairo 25 February–1 March 2007, ed. V. Argyropoulos, A. Hein, and M. A. Harith, 166–70. Athens: TEI.

Bierwagen, Shedlosky, and Stanek 2002

Bierwagen, G. P., T. J. Shedlosky, and K. Stanek. 2002. "Developing and Testing a New Generation of Protective Coatings for Outdoor Bronze Sculpture." In *Proceedings 28: 2002 Athens Conference on Coatings Science and Technology*, July 1–5, 2002, Vouliagmeni (Greece), 289–96. Athens: Institute of Materials Science.

Boyatzis, Ioakimoglou, and Argitis 2002

Boyatzis, S., E. Ioakimoglou, and P. Argitis. 2002. "UV Exposure and Temperature Effects on Curing Mechanisms in Thin Linseed Oil Films: Spectroscopic and Chromatographic Studies." *Journal of Applied Polymer Science* 84(5): 936–49.

Boyatzis et al. 2012

Boyatzis, S. C., A. M. Douvas, V. Argyropoulos, A. Siatou, and M. Vlachopoulou. 2012. "Characterization of a Water-Dispersible Metal Protective Coating with Fourier Transform Infrared Spectroscopy, Modulated Differential Scanning Calorimetry, and Ellipsometry." *Applied Spectroscopy* 66(5): 580–90.

Brostoff 2003

Brostoff, B. L. 2003. "Coating Strategies for Protection of Outdoor Bronze Art and Ornamentation." PhD diss., Universiteit van Amsterdam.

Craine, Severson, and Merritt 1992

Craine, C., K. Severson, and S. Merritt. 1992. "Prospects for the Long-Term Maintenance of Outdoor Bronze Sculpture: The Shaw Memorial Nine Years after Cleaning and Coating." In *Abstracts, 20th Annual Meeting of the American Institute for Conservation of Historic and Artistic Works, Buffalo, NY, June 4–7, 1992*, 30. Washington: AIC.

De la Rie 1992

De la Rie, E. R. 1992. "Stability and Function of Coatings Used in Conservation." In *Polymers in Conservation*, ed. N. S. Allen, M. Edge, and C. V. Horie, 62–81. Cambridge: Royal Society of Chemistry.

Derrick, Stulik, and Landry 1999

Derrick, M. R., D. Stulik, and J. M. Landry. 1999. *Infrared Spectroscopy in Conservation Science*. Scientific Tools for Conservation Series. Los Angeles: Getty Conservation Institute.

Erhardt et al. 1984

Erhardt, D., W. Hopwood, T. Padfield, and F. N. Veloz. 1984. "Durability of Incralac: Examination of a Ten-Year-Old Treatment." In *Preprints, ICOM Committee for Conservation, 7th Triennial Meeting, Copenhagen, 10–14 September, 1984*, ed. D. de Froment, 22.1–3. Paris: ICOM.

Gotoh et al. 2000

Gotoh, Y., R. Igarashi, Y. Ohkoshi, M. Nagura, K. Akamatsu, and S. Deki. 2000. "Preparation and Structure of Copper Nanoparticle/Poly(acrylic acid) Composite Films." *Journal of Materials Chemistry* 10(11): 2548–52.

Griffiths and de Haseth 2007

Griffiths, P. E., and J. A. de Haseth. 2007. *Fourier Transform Infrared Spectrometry*. 2nd ed. Hoboken: Wiley.

Horie 2010

Horie, C. V. 2010. *Materials for Conservation: Organics Consolidants, Adhesives, and Coatings*. 2nd ed. London and New York: Routledge.

Ioakimoglou et al. 1999

Ioakimoglou, E., S. Boyatzis, P. Argitis, A. Fostiridou, K. Papapanagiotou, and N. Yannovits. 1999. "Thin-Film Study on the Oxidation of Linseed Oil in the Presence of Selected Copper Pigments." *Chemistry of Materials* 11(8): 2013–22.

Lazzari and Chiantore 2000

Lazzari, M., and O. Chiantore. 2000. "Thermal-Ageing of Paraloid Acrylic Protective Polymers." *Polymer* 41(17): 6447–55.

Madsen 1971

Madsen, H. B. 1971. "Further Remarks on the Use of Benzotriazole for Stabilizing Bronze Objects." *Studies in Conservation* 16(30): 122.

McNamara et al. 2004

McNamara, C. J., M. Breuker, M. Helms, T. D. Perry, and R. Mitchell. 2004. "Biodeterioration of Incralac Used for the Protection of Bronze Monuments." *Journal of Cultural Heritage* 5: 361–64.

Merklin 2002

Merklin, G. 2002. "Infrared Spectrometry of Thick Organic Films on Metallic Substrates." *Handbook of Vibrational Spectroscopy*, ed. J. M. Chalmers and P. R. Griffiths. Vol. 2: *Sampling Techniques*, 1033–43. New York: Wiley.

Scott 2002
Scott, D. A. 2002. *Copper and Bronze in Art: Corrosion, Colorants, Conservation*. Los Angeles: Getty Conservation Institute.

Stuart 2004
Stuart, B. 2004. *Infrared Spectroscopy Fundamentals and Applications*. Chichester: Wiley.

38.

New Approaches in Stabilizing Chloride-Contaminated Ancient Bronzes Using Corrosion Inhibitors and/or Electrochemical Methods to Preserve Information in the Patinas

Vasilike Argyropoulos, Technological Educational Institute of Athens, Department of Conservation of Antiquities and Works of Art
Soussani Mavroforaki, Technological Educational Institute of Athens, Department of Conservation of Antiquities and Works of Art
Maria Giannoulaki, Technological Educational Institute of Athens, Department of Conservation of Antiquities and Works of Art
Stamatis C. Boyatzis, Technological Educational Institute of Athens, Department of Conservation of Antiquities and Works of Art
Thanasis Karabotsos, Technological Educational Institute of Athens, Department of Conservation of Antiquities and Works of Art
Aggeliki Zacharopoulou, Department of Materials Science and Engineering, School of Chemical Engineering, National Technical University of Athens
Elodie Guilminot, EPCC Arc'Antique, Nantes, France

The goal of the research is to find an alternative approach to stabilize chloride-contaminated copper-alloy artifacts, while retaining information preserved in the patina layers. Local electrolysis and the use of an alternative corrosion inhibitor, L-cysteine, were applied to treat bronze disease at specific locations on marine copper-alloy artifacts, while trying to preserve evidence of tinning on their surfaces. Cysteine as a nontoxic corrosion inhibitor has recently been tested and was found to be effective, but like all corrosion inhibitors, color changes to the patina can occur. Its application to intentionally tinned bronze surfaces was further investigated and combined with the application of local electrolysis using sodium sesquicarbonate to stabilize the areas where the surfaces are not covered with tin. The new approach was tested on a marine thirteenth-century copper-alloy cooking vessel excavated from a shipwreck found in the sea off the port of Rhodes in Greece. The approach was successful at stabilizing the object and no signs of active corrosion were visible one year after treatment.

✦ ✦ ✦

Introduction

Ancient bronzes often contain surface decoration in the corrosion layers or show evidence of tinning, niello, gilding, paint, or organic materials in the corrosion layers. Depending on the quantity of chlorides in their surfaces, traditional conservation methods to stabilize bronze disease are either used locally to treat the artifact with Ag_2O particles or zinc dust, with complete immersion in sodium sesquicarbonate (pH 10) solutions with or without electrolysis to convert cupreous chloride to more stable corrosion product(s);[1] and/or incorporate the use of corrosion inhibitors, such as benzotriazole.[2] Our goal was to develop alternative conservation methods to treat such objects in order to preserve information by minimizing the overall changes that may occur to the patina surfaces with such treatments.

The paper presents a novel treatment approach for a thirteenth-century Byzantine copper frying pan that was excavated from a shipwreck off of Rhodes and retains what appears to be intentional tinning on its surface. The paper examines the black surface to determine its nature and the condition of the artifact. It further discusses the treatment of the object with the aim of preserving this black layer, which serves as an archaeological record providing evidence of its use in food preparation. Traditional chloride removal methods for marine copper-alloy artifacts may result in unwanted removal of these types of compounds/ corrosion products. Our treatment involved the application of local electrolysis with 1% (w/v) of sodium sesquicarbonate solution on areas with no evidence of tinning, and the application of L-cysteine as a nontoxic corrosion inhibitor to help preserve the artifact over the long term.

Local Electrolysis and L-Cysteine as a Corrosion Inhibitor for Ancient Copper Alloys

The Metals Conservation Lab (TEI-A) in Egaleo, Greece, carried out research from 2006 to 2015 in collaboration with the National Technical University of Athens (NTUA) and Arc'Antique of Nantes, France, to develop the methods of local electrolysis of metals to either extract chlorides or reduce corrosion products back to their metal state during treatments. This approach offers better control for the conservator than the traditional methods that use complete immersion of marine artifacts in electrolytes involving either chemical or electrochemical methods. In 2008, TEI-A was commissioned to treat an eight-ton iron paddle wheel recovered from the 1868 shipwreck Patris in the Aegean Sea. To extract chlorides, conservators used a cost-effective method that has been traditionally used by industry to stabilize reinforced concrete. The scientific results both in the laboratory and in the field on the paddle wheel (in a dry state) indicated that the technique is capable of removing the majority of the chlorides with two applications of impressed current (applied as local electrolysis) for 24 hours each time.[3] The method was also applied to remove chlorides locally from a wet marine copper-alloy composite artifact with textile remaining on the surface, applying 1% (w/v) sodium sesquicarbonate solutions to selected areas.[4] Using this localized approach, areas on the artifacts with organic remains could be avoided and thus preserved.

L-cysteine has already been investigated in metals conservation as a replacement for benzotriazole (BTA) applied to corroded bronze coupons (with nantokite formation) by immersion in water at 0.15M for 24 hours;[5] by immersion in ethanol at 0.01M for 24 hours;[6] and during PEG400 treatments for a marine copper-alloy composite artifact with organic remains.[7] Gravgaarda and van Lanschot (2012) also carried out tests on real bronze artifacts in comparing cysteine to BTA. All these studies found color changes to the corrosion layers (graying effect) with the cysteine application, which darkens to a black color with longer immersion exposures. With their electrochemical measurements, Abu-Baker et al. (2013) found that, with increasing amounts of tin in the bronze alloy, the strength of the inhibitor's chemisorption on the surface of the alloy, or its corrosion inhibition efficiency, increases. Further research found that immersion in cysteine for copper alloys results in producing cystine from the oxidation of cysteine, where the presence of iron or copper ions serves as a catalyst in this reaction. This oxidation reaction results in reducing metal ions, which form a metal ion cystine complex on the surface of the material, and producing either a soluble or insoluble cysteine/cysteinate complex with metal ions and cystine precipitate respectively in the solutions.[8] The graying effect is most likely a result of the metal ion cystine complex on the surface.

Scientific Investigation of a Marine Byzantine Frying Pan

The frying pan was exposed to an open-sea environment as well as buried in the marine sediment for centuries. As a result, there has been substantial loss of metal with cracks and deformation to its shape. The pan was made from a copper sheet of approximately 98 wt.% copper and 1 wt.% tin (analyzed by scanning electron microscopy with energy dispersive X-ray analysis [SEM-EDAX]; see below), which was hammered into shape with a base diameter of around 19 to 21 cm as shown in figure 38.1. A riveted 10.5 cm handle also made of copper sheet metal was folded and hammered into a tube shape. Given the poor condition of the object, it is difficult to assess whether the sides of the pan were straight or angled; they have a preserved maximum height of 3.7 cm. The interior of the object is covered with a black surface (see fig. 38.1), which is assumed to be evidence of intentional tinning. Copper cooking wares were always intentionally tinned, usually with a hot-tinning process in their interior, to prevent the copper from contaminating food during cooking.

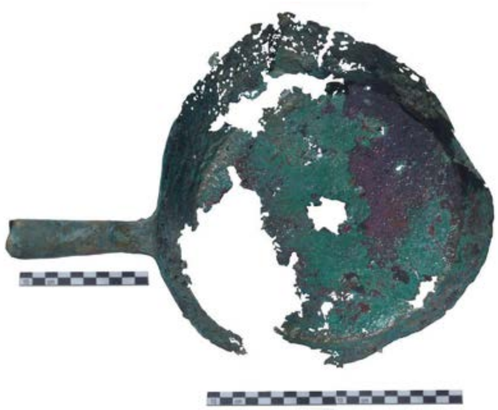


Figure 38.1. Tinned copper-alloy frying pan from a Byzantine shipwreck in Rhodes, Greece, manufactured by hammering technique. Athens, Ephorate of Underwater Antiquities, object ID 651/10.11.2013

Image: © Dr. George Koutsouflakis, Ephorate of Underwater Antiquities. Author: Susana Mavroforaki, TEI of Athens

Corrosion samples were analyzed non-destructively from five different locations with a two-step process: first, SEM-EDAX to identify the micromorphology of the compounds/corrosion products on the surface as well as their elemental concentrations; second, X-ray diffraction (XRD) analysis to identify their mineralogical composition. SEM-EDAX type GEAN GSM 6510 low vacuum with X-ART detector (working distance: 20 mm) was used. Also, XRD analysis was carried out using the Olympus BTXII Benchtop XRD/XRF (Co source) with software (XPowder) for processing the resulting XRD data (XRD range 5–55^{o} 2Ø), including the AMSCD mineral database. The sample for XRD analysis needs to be around 15 mg and running times from 20 to 60 minutes depending on the type of sample. Also, a very small piece from the base of the pan containing metal and corrosion, which was separated from the main object due to burial conditions, was examined using a stereomicroscope with digital camera.

Figures 38.2 and 38.3 show the microscopic images of this cross-section of the copper metal with the black surface as well as other types of corrosion products. In both images, there appears to be a thin tin metal or intermetallic compound covering the copper metal. Manti and Watkinson (2011) concluded that such black surfaces are the result of intentional tinning rather than surface corrosion of low-tin archaeological bronzes.

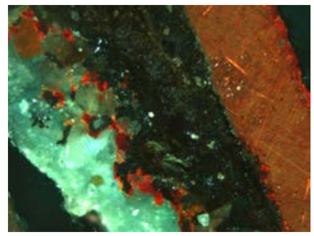


Figure 38.2. A cross-section of the frying pan in fig. 38.1 viewed under a stereomicroscope at x10 magnification

Image: © Dr. George Koutsouflakis, Ephorate of Underwater Antiquities. Author: Susana Mavroforaki, TEI of Athens

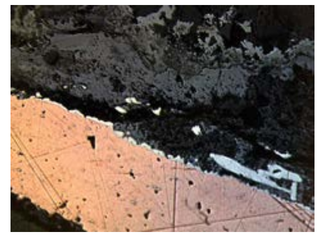


Figure 38.3. Microscopic image of the cross-section of frying pan in fig. 38.1 at x20 magnification

Image: © Dr. George Koutsouflakis, Ephorate of Underwater Antiquities. Author: Susana Mavroforaki, TEI of Athens

Black corrosion products from another area of the interior surface were further analyzed using SEM-EDAX and XRD. Figure 38.4 shows the micromorphology of the corrosion products, with small round globules indicating the possibility of intermetallic compound η-Cu_6Sn_5 with around a 57 wt.% tin concentration, suggesting a hot-tinning process. However, XRD was unable to confirm this compound due to the small sample size and the complexity of the diffraction pattern due to the fact that it was difficult to isolate this compound from other mineral species present in the sample.

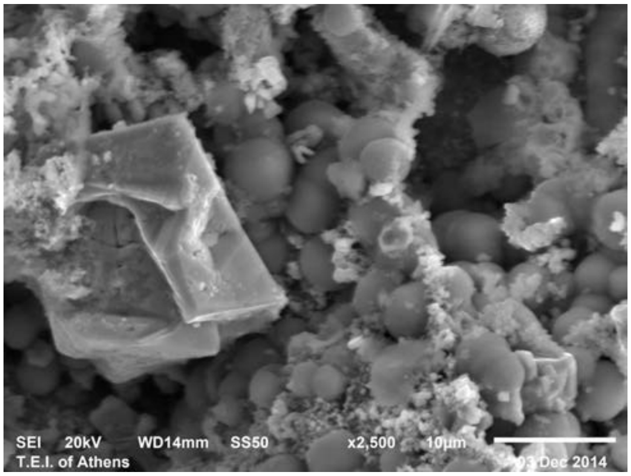


Figure 38.4. SEM image of black surface of the frying pan where small round globules indicate the possibility of intermetallic compound η-Cu_6Sn_5 with around 57 wt.% Sn concentration analyzed by SEM-EDAX

Image: © Dr. George Koutsouflakis, Ephorate of Underwater Antiquities. Author: Susana Mavroforaki, TEI of Athens

XRD analyses of corrosion taken from five different areas on the object found copper oxides, chlorides, carbonates, and sulphides: tenorite, cuprite, clinoatacamite, paratacamite, malachite, chalcocite, covellite, and digenite. The presence of copper sulfides indicates that the object was buried under marine sand, with the eventual result that the main cathodic reaction was hydrogen evolution stimulated by sulfate-reducing bacteria.[9] An adherent protective film of copper sulfides resulted on the surface. The large holes in the surface of the frying pan indicate that pitting corrosion was prevalent due to the presence of cuprous chlorides (nantokite), although its presence was not confirmed by XRD analysis. Nantokite is found next to the metal, and sampling may not have reached the area containing this corrosion product, since it is always present in wet marine copper alloys.

Treatment Approach

Cathodic polarization was carried out at a constant potential of –0.76 V vs. SSE using an EG&G Verstat II potentiostat (applied as local electrolysis) for 3 hours each time before changing the electrolyte (1% w/v sodium sesquicarbonate solutions) in the sponge to remove chlorides locally from the frying pan on selected areas (fig. 38.5). The areas treated were the base of the pan and its handle, which did not show any evidence of tinning (black surface). In this way, areas on the artifact with tinned surface could be avoided by the procedure and thus preserved. The artifact was maintained wet during treatment with deionized water. Cathodic polarization was applied to the handle a total of seven times (for 3 hours each time) until a minimum quantity of chlorides was found in the electrolyte solution, each time changing the sponge and using fresh electrolyte solution. However, for the base of the pan the procedure was repeated 3 times for 3 hours each time. The number of applications also depended on the visual changes to the patina after each application of local electrolysis. After the end of the treatment procedure, the object was thoroughly rinsed with deionized water.

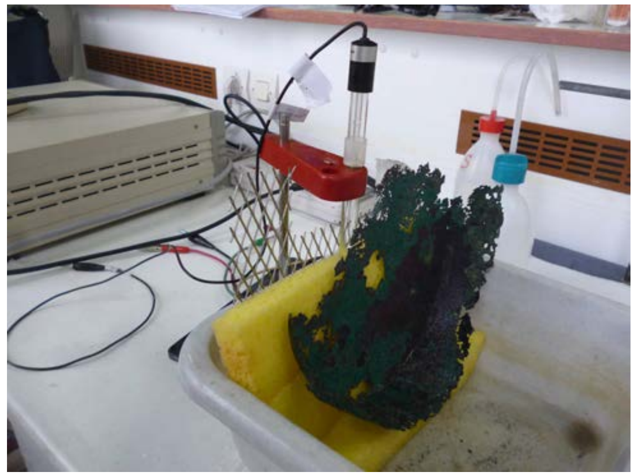


Figure 38.5. Local electrolysis of the frying pan

Image: © Dr. George Koutsouflakis, Ephorate of Underwater Antiquities. Author: Susana Mavroforaki, TEI of Athens

After each application, the electrolytic solution used was collected to check the amount of chlorides extracted during the electrolysis, using the HANNA chloride electrode and Mohr's method for chloride determination. The quantities of chlorides removed after each 3-hour application of cathodic polarization were plotted vs. time and are shown in figures 38.6 and 38.7 for the handle and base, respectively. The results show that the technique removed around 7 and 8 g of chlorides from each surface, respectively. The electrolytic treatment could have continued, since the slope of each plot continued to increase, but it was decided to stop the treatment and use L-cysteine instead so as to minimize surface patina changes. After the electrolysis, any calcium carbonate concretions from the object's surface were removed using dental tools, and finally cysteine as a corrosion inhibitor was applied to ensure the object would be stable after treatment.

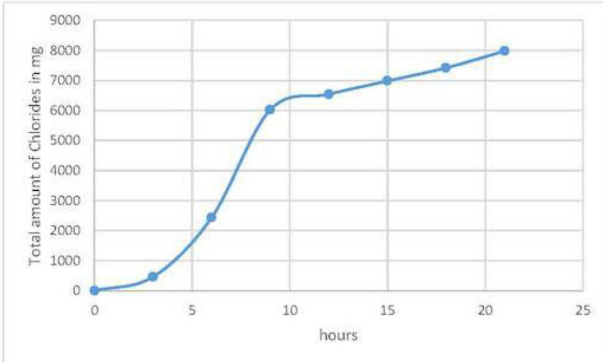


Figure 38.6. Plot of the total amount of chlorides versus duration of treatment for the handle of the frying pan undergoing local electrolysis
Image: © TEI Athens

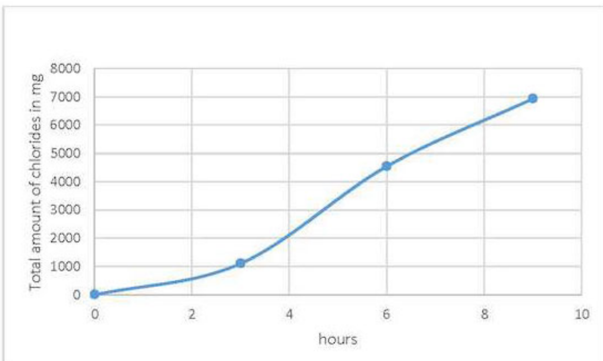


Figure 38.7. Plot of the total amount of chlorides versus duration of treatment for the base of the frying pan undergoing local electrolysis
Image: © TEI Athens

Cysteine was tested on another fragment of a tinned copper-alloy artifact from the same marine site. The piece was immersed in 1% (w/v) solution of cysteine in deionized water for 3 hours as opposed to 24 hours as tested by the other studies. After slight rinsing with a soft brush, it was placed in a climatic chamber for 24 hours at 70% RH with an untreated fragment from the same artifact, for comparative purposes. The cysteine-treated piece was found to be stable while the other had signs of active corrosion. For the frying pan, it was decided to apply the cysteine with a paintbrush every 2 hours over 3 days. Again after light rinsing with a soft brush, it was left to dry in a polystyrene box on top of polyethylene foam, with silica gel to help dry it gradually. Figure 38.8 shows the base of the frying pan before (a) and after (b) treatment, and indicates that, apart from a slight graying effect, both electrolysis and the application of L-cysteine maintained the patina appearance. One year after treatment, the frying pan remains stable in storage with no signs of active corrosion.

The conservation work for the object still needs to be completed by deciding whether a coating will be used as well as the best method for restoring it for future display in a museum in Rhodes.

Figure 38.8a. The frying pan before treatment with local electrolysis and the corrosion inhibitor L-cysteine
Image: © Dr. George Koutsouflakis, Ephorate of Underwater Antiquities. Author: Susana Mavroforaki, TEI of Athens

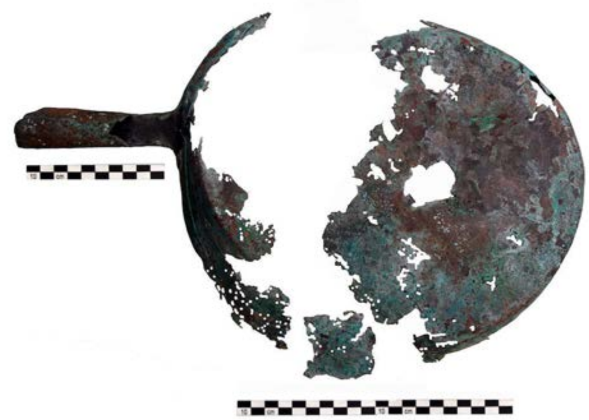


Figure 38.8b. The frying pan after treatment with local electrolysis and the corrosion inhibitor L-cysteine
Image: © Dr. George Koutsouflakis, Ephorate of Underwater Antiquities. Author: Susana Mavroforaki, TEI of Athens

Conclusions

The paper presented a case study in which local electrolysis and the use of L-cysteine, an alternative corrosion inhibitor to BTA, can successfully be applied to stabilize a marine copper-alloy artifact with evidence of a tinned surface. Such a treatment approach can be applied to marine copper-alloy artifacts when the aim is to preserve information in the patina of such objects, which may traditionally be sacrificed during conservation treatment in order to stabilize the artifact. The treatment approach was successful at stabilizing a thirteenth-century marine copper-alloy frying pan with evidence of tinning.

✦ ✦ ✦

Acknowledgments

The authors would like to thank P. Manti for her useful comments regarding the analyses of the tinned surface. We also thank G. Koutsoflakis from the Ephorate of Underwater Antiquities for his support of our work. The authors would also like to acknowledge that this conservation work was supported by the MERMAID research project that was operated under the THALES action and coordinated by the TEI-A. The research on cysteine and local electrolysis has been co-financed by the European Union (European Social Fund – ESF) and Greek national funds through the Operational Program "Education and Lifelong Learning" of the National Strategic Reference Framework (NSRF) - Research Funding Program: ARCHIMEDES III: Investing in the knowledge society through the European Social Fund.

Notes

1. Adriaens and Dowsett 2013.
2. Cano and Lafuente 2013.
3. Argyropoulos and Batis 2013.
4. Argyropoulos et al. forthcoming.
5. Gravgaarda and van Lanschot 2012.
6. Abu-Baker et al. 2013
7. Zacharopoulou et al. 2016; Argyropoulos et al. forthcoming.
8. Argyropoulos et al. forthcoming.
9. North and MacLeod 1987, 82.

Bibliography

Abu-Baker et al. 2013
Abu-Baker, A. N., I. D. MacLeod, R. I. Sloggett, and R. Taylor. 2013. "A Comparative Study of Salicyaldoxime, Cysteine, and Benzotriazole as Inhibitors for the Active Chloride-based Corrosion of Copper and Bronze Artifacts." *European Scientific Journal* 9 (33): 229–51.

Adriaens and Dowsett 2013
Adriaens, A., and M. Dowsett. 2013. "Electrochemical Analysis of Metallic Heritage Artefacts: Time-lapse Spectroelectrochemical Techniques." In *Corrosion and Conservation of Cultural Heritage Metallic Artefacts*. Cambridge: Woodhead.

Argyropoulos and Batis 2013
Argyropoulos, V., and G. Batis. 2013. "Saving a Marine Iron Paddle Wheel Removed from the 1868 Steam Engine Shipwreck 'Patris' during an Economic Crisis in Greece." Big Stuff Conference. Ottawa, 25–27 Sep, 2013. http://cstmuseum.techno-science.ca/doc/content/cstm/argyropouloubigstuffpaper.pdf

Argyropoulos et al. forthcoming
Argyropoulos, V., S. Boyatzis, M. Giannoulaki, A. Malea, A. Pournou, S. Rapti, A. Zacharopoulou, and E. Guilminot. Forthcoming. "Preliminary Investigation of L-cysteine as a Corrosion Inhibitor for Marine Composite Artefacts Containing Copper or Iron Alloys." *ICOM-CC WOAM 2016*. Florence.

Cano and Lafuente 2013
Cano, E., and D. Lafuente. 2013. "Corrosion Inhibitors for the Preservation of Metallic Heritage Artefacts." In *Corrosion and Conservation of Cultural Heritage Metallic Artefacts*, ed. P. Dillmann, D. Watkinson, E. Angelini, and A. Adriaens, 570–90. Cambridge: Woodhead.

Gravgaarda and van Lanschot 2012
Gravgaarda, M., and J. van Lanschot. 2012. "Cysteine as a Non-toxic Corrosion Inhibitor for Copper Alloys in Conservation." *Journal of the Institute of Conservation* 35(1): 14–24.

Manti and Watkinson 2011
Manti, P., and D. Watkinson. 2011. "Hot-tinning of Low Tin Bronzes." In *METAL 2010: Proceedings of the Interim Meeting of the ICOM-CC Metal Working Group*, ed. P. Mardikian, C. Chemello, C. Watters, and P. Hull, 92–98. Clemson: ICOM-CC and Clemson University.

North and MacLeod 1987
North, N. A., and I. D. MacLeod. 1987. "Corrosion of Metals." In *Conservation of Marine Archaeological Objects*, ed. C. Pearson, 68–98. Oxford: Buttersworth.

Zacharopoulou et al. 2016
Zacharopoulou, A., G. Batis, V. Argyropoulos, and E. Guilminot. 2016. "The Testing of Natural Corrosion Inhibitors Cysteine and Mature Tobacco for Treating Marine Composite Objects in PEG400 Solutions." *Journal of Conservation Science* 7 (1): 259–64.

39.

Conservation Treatments and Archaeometallurgical Insights on the Medici Riccardi Horse Head

Nicola Salvioli, Conservator, Florence
Stefano Sarri, Museo Archeologico Nazionale di Firenze
Juri Agresti, Istituto di Fisica Applicata "N. Carrara," Consiglio Nazionale delle Ricerche, Florence
Iacopo Osticioli, Istituto di Fisica Applicata "N. Carrara," Consiglio Nazionale delle Ricerche, Florence
Salvatore Siano, Istituto di Fisica Applicata "N. Carrara," Consiglio Nazionale delle Ricerche, Florence

The large equine protome from the Museo Archeologico Nazionale of Florence, called the Medici Riccardi horse head, has recently undergone conservation treatment sponsored by the Friends of Florence. The work was aimed at removing localized accretions and altered waxy layers. Materials were studied using traditional techniques and portable analytical devices, which identified hexogen materials, permitted their removal, and determined the composition of the underlying copper alloys. This maintenance intervention also provided an opportunity to extend the archaeometallurgical study carried out in the 1990s. The removal of the stratifications allowed a more accurate identification of the ancient repairs and modern integrations. A number of previously unknown cold plugs have been recognized, along with widespread traces of gold leaf, whose analysis unequivocally demonstrates that the artifact was originally gilded. Three-dimensional models of the outer and inner surfaces allowed examination of the thicknesses of the metal walls and careful mapping of surface features. The present conservation intervention improved the legibility of the artwork while the analysis of the data collected allows a thorough interpretation of its historical and archaeometallurgical aspects.

History of the Artifact

The equine bronze protome known as the Medici Riccardi horse head in the Museo Archeologico Nazionale of Florence is likely a surviving part of a Hellenistic life-size equestrian sculptural group, which has been dated around the second half of the fourth century BC.[1] The sculpture entered the antiquarian collections of the Medici in the fifteenth century and was cited for the first time in 1495 as part of Lorenzo il Magnifico's antiquarian collection,[2] although it had certainly been found well before that. Its close resemblance to the colossal Carafa horse head in Naples, executed by Donatello between 1456 and 1458 in imitation of this original, provides an indirect *terminus ante quem*.

The head is also cited in the Confiscation Decree by the Republican Government as being among the artifacts of the garden of the Palazzo Medici. Between 1495 and 1512 it was in Palazzo Vecchio (perhaps in the Cortile della Dogana); then it returned to the aforementioned garden,[3] where it was admired by Lorenzo Bernini in 1665.[4] In 1672 the artwork was restored and adapted as a fountain mouth by Bartolomeo Cennini.[5]

After being moved to Palermo in 1800 in order to avoid confiscation by Napoleon,[6] the head returned to Florence in 1815, when it was displayed at the Galleria degli Uffizi.[7] Finally, in 1890, it was transferred to the Regio Museo Archeologico, now the Museo Archeologico Nazionale of Florence.

Figure 39.1. The Medici Riccardi Horse Head (a) before and (b–c) after the present restoration

State of Conservation

Before the recent cleaning treatments, the sculpture appeared rather dark and many of its details were obscured by a complex superposition of random materials (fig. 39.1). A sequence of irregular material levels was recognized within the stratification using portable Raman spectroscopy. Beeswax and oily substances applied in maintenance treatments; residues of calcareous growths (due to the use of the sculpture as a fountain mouth); and underlying corrosion layers (Cu-carbonates on tenorite and cuprite) were identified along with some residues from molding operations made using gypsum or silicone rubber.

Widespread calcareous growths were present on both the outer and inner surfaces. On the inside, these growths descended behind the eyes and the forehead just below the tuft (fig. 39.2a), which likely hosted the fountain pipe. Accumulations on the outer surface were mainly concentrated on the frontal part and skinfolds (fig. 39.2), while a smaller amount was present on the neck. However, before the sculpture entered museum collections, the outer calcareous encrustations were probably roughly removed using mechanical tools and just a small amount of residue was left flattened on the metal surface. Tool marks and deep scratches associated with this cleaning are evident, along with marks of sharp blades, rhomboidal tips of darts, or arrows—concentrated on the head but also present elsewhere (see for example fig. 39.2b)—which can be linked to the ancient vicissitudes of the artwork.

Figure 39.2a. Detail of the inside of the head showing, the tuft, forehead, and right eye

Figure 39.2b. A macro of the calcareous encrustation among the skinfolds before conservation treatment

In various areas, traces of gilding were found. Analysis by scanning electron microscopy coupled with energy dispersive X-ray spectrometry (SEM-EDX) of some minute fragments of this gilding (fig. 39.3) allowed assessment. Results showed it to be a very thin (not more than a few microns), irregular gold film, which was well adhered to the underlying corrosion products (see fig. 39.3a). No traces of glue or mercury amalgam were found (the gold is pure). This, along with the imprint of the inner side of the gold leaf produced by the texture of the bronze surface (see fig. 39.3b), suggests it was likely applied using heat and mechanical means. The residual leaf fragments are very fragile and required special attention during the cleaning operations in order to safeguard this important evidence of decoration.

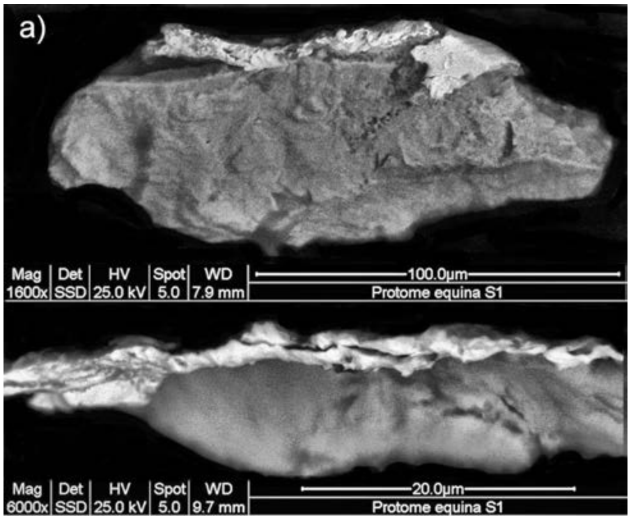


Figure 39.3a. Electron microscopy images of very small gilding fragments

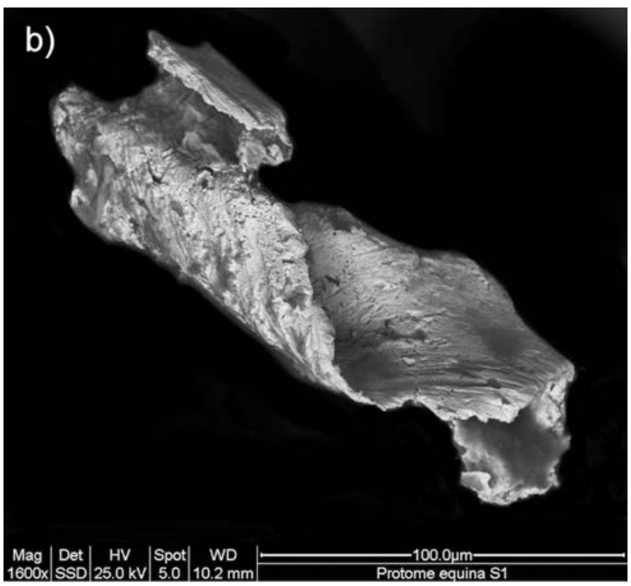


Figure 39.3b. Electron microscopy images of very small gilding fragments

Conservation Intervention

The recent restoration was mainly aimed at removing aggressive exogenous substances and recovering the complete legibility of the object. The intervention was carried out in a dedicated room of the archaeological museum between January and March 2015. Visitors had the opportunity to see most of the intervention, though the use of dangerous substances and noisy tools was restricted to closed periods.

After preliminary material removal tests, which were carried out in order to optimize the treatment, the following operational sequence was performed on the outer surface, leaving the interior untouched.

1. Removal of powder and of the outer layer of the aged protective organic materials by washing the surface using cotton pads soaked in a solvent blend of petroleum ether (80–120°C) and methyl ethyl ketone (75/25 volume ratio).
2. Application of agar gel supporting an aqueous solution of sodium bicarbonate with pH8. The application time was 4–7 minutes, which was sufficient for softening and saponification of the oleo-waxy superposition.
3. Removal of the agar gel and softened materials using soaked pads as in step 1.
4. Repetition of the washing treatment reinforced with a blend of cyclohexane and butyl acetate using a volume fraction of 55/45, respectively. This made it possible to safely expose the oxidized bronze surface and residual calcareous spots by safeguarding the traces of gilding (fig. 39.4a–b).
5. Exposed calcareous spots were removed using a piezoelectric ablator and sharp tools such as metal tips, wooden sticks, and porcupine spines. The surface was then homogenized using plastic-bristle brushes.
6. Protection with microcrystalline wax (1% in petroleum ether at 140–180°C), which is reversible and easily replicable, and finishing using natural-bristle brushes and cotton fabric. The general views of fig. 39.1b–c and the details of figs. 39.5–6 show the significant improvement of legibility achieved.

Figure 39.4a

Figure 39.4b

Details of gilding residues during conservation treatments: (a) throat; (b) skinfolds

Figure 39.5. Detail after conservation treatment. Note the gilding remains on lower eyelid and in skinfolds

Figure 39.6. Detail of the muzzle after conservation treatment

In some areas, minor watercolor retouches were also needed in order to smooth the abrupt chromatic variation (in the area of the phalerae) or to veil calcareous residues trapped within the surface roughness. In a few cases, suitably pigmented microcrystalline wax was also used to fill microcraters and other irregularities of the surface.

A small rectangular area on the collar of the horse (left side), which includes the old inventory number (1639), was intentionally left untouched as a witness to the previous appearance of the protome.

The present restoration also provided the opportunity to create a new mechanical support and to recover a more natural anatomical posture for the protome relative to its previous display. The structure was designed using 3D simulations and crafted using steel. This support was intended as a temporary solution for the exhibition *Power and Pathos: Bronze Sculpture of the Hellenistic World*, allowing for a better view of the object and easy movability. However, the new support is also suitable for installation on the previous eighteenth-century pedestal.

Notes on the Sculptural Subject

The treatment described above recovered some of the original expressive strength of the Medici Riccardi horse head, with its pronounced realism and minimal use of stylization. Such a precise naturalism is not observed in other ancient bronze horses.

Unfortunately, despite the many studies of ancient horses, the surviving part of the original artwork does not allow us to determine the equine race of the horse or even whether it was pulling a chariot or mounted by a rider. We can only say that the horse was well proportioned, since the length of its head (65 cm from the forehead to the muzzle) relative to the neck (80.5 cm from the poll to the withers) is quite realistic. The right side of the protome shows the powerful, tense muscular structure of the neck terminating at the poll with a realistic muscle bulge, which makes more evident the link between the buzz-cut mane, the combed tuft, and the ears. The latter with their dense internal hairs are well proportioned and oriented in opposite directions: the right ear is directed forward at full attention, while the left is turned and tilted back, which suggests that the original sculptural theme was highly dynamic. Apart from the latter peculiar detail, the expressive tension of the subject and its formal solution recall the two small prancing horses of Herculaneum found in the area of the theater during the Bourbon excavations of the second half of the eighteenth century.[8]

The structural equilibrium of the forehead, temples, and eyebrow arch was certainly useful in accentuating the eyes (which were likely made using nonmetallic materials) and the direction of the gaze, while the relatively thin nose—with nostril dilated by impetuous breath—reinforces the notion that the object was conceived as part of a very dynamic ensemble.

The open mouth and the retracted tongue allow us to see the short teeth, which are typical of a young horse at the height of its strength. The energy that the animal holds back is also evidenced by the veins bulging all over the muzzle and the tense head. The head and neck are turning to the left, where there are more skinfolds on the throat and lips than on the corresponding right side. Thus the reins could have been stretched from the left side at the height of the withers or around the middle zone of the neck, which corresponds to the typical position of a rider's hands.

Technical Examination

Various surface textures and chromatic features provide at first glance evidence of two different periods of the artwork's life. Greenish mineralizations are observable all over the head and the upper part of the neck (those of the left side appear relatively irregular, due to interment conditions and previous invasive cleaning treatments), which shade toward the lower part of the neck; there, the modern integrations resulted in changes of color from red to brown to black. A number of losses were repaired with modern additions, including a large missing area at the left side, the entire collar (including its front banderole), which is partially superimposed on the ancient metal, and the upper part of the right ear. Furthermore, integrations are recognizable on the muzzle in the form of three recastings. Both ears were cropped in the past, and only the right one arrived to us restored, whereas the left only includes an internal uncorrelated repair. A number of intentional cuts, along with the extensive damage to the left side and the evident marks of weapons, indicate that the original sculpture likely was vandalized by being beheaded near the typical neck joint of bronze horses.

The aforementioned integrations were executed mainly by means of recasting, which involved significant heating of the original part and then the formation of a significant amount of cuprite and tenorite by redox reactions. Similarly, the subsequent cold smoothing of the patches and collar were extended to the adjacent original parts. However, the final result of this restoration remains technically rather far from the richness of detail and quality of the original, including precise casting and fine chasing of the whole surface. The ancient bronzesmiths lavished particular attention on the finishing of the mouth, the skinfolds, and the hair of the tuft and mane, which also include dense punch work between the two levels of locks achieved using a triangular punch.

The repairs, as well as the two functional holes in proximity of the withers (see the dark spots in fig. 39.1), which were likely needed to adapt the sculpture as a fountain, have to be attributed to the restoration by Bartolomeo Cennini in 1672.

The crownpiece, eyes, upper terminal of the tuft, and reins are missing. The former likely included nine phalerae whose position is evident from the set of large plugs and surface abrasions corresponding to the holes where the ancient anchoring elements of the phalerae were secured. There is also evidence of soft soldering along a linear stretch of the left cheek.

All the relevant technical features were precisely mapped on the 3D model of the outer surface, which was achieved using a range camera (Artec Eva) and suitable software. As shown in fig. 39.7, the contours of the modern integrations of the protome, including a number of plugs, were recognized. Most of them are randomly distributed, whereas the nine associated with the phalerae are arranged regularly along the missing metal strips of the crownpiece.

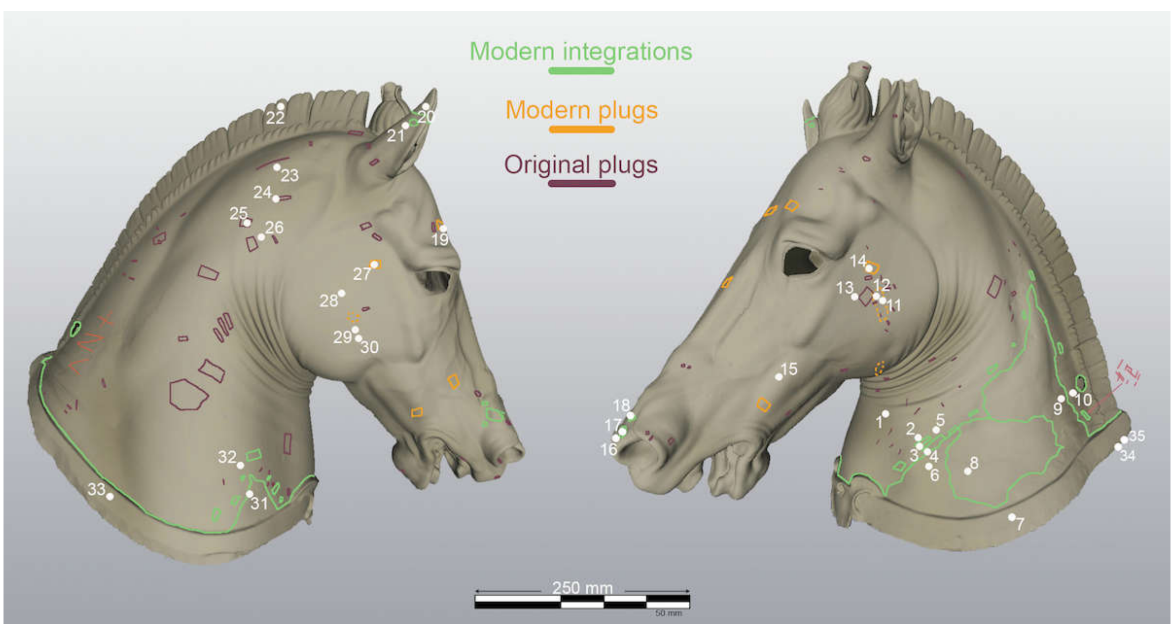


Figure 39.7. Maps of the repairs and integrations, including two graffiti in proximity of the withers at the right side (pink) and on a plug of the right side (olive), and a stretch of the soft soldering of the crownpiece (orange dashed lines on the left cheek)

The tongue was likely executed by means of a casting-on operation, as suggested by its close proximity to the surrounding part of the mouth.

Apart from the areas of the modern integrations of the neck, the inner surface of the protome is relatively smooth, roughly reproducing the exterior, and does not exhibit any traces of wax joins. Minor reliefs, such as those of the locks of the mane, present corresponding modulations of the inner surface (fig. 39.8). This suggests that the wax model was formed using liquid wax. However, the lack of satisfactory radiographic data (only a few unclear images are available from the investigation of the 1990s[9]), the apparently strange imprint observed at the inner surface of the mane where its shape is rather sharp, and other features led us to a detailed interpretation of the preparation procedure of the wax model for casting.

Figure 39.8. Detail of the inner surface of the right side (the flat zone corresponds to the right cheek)

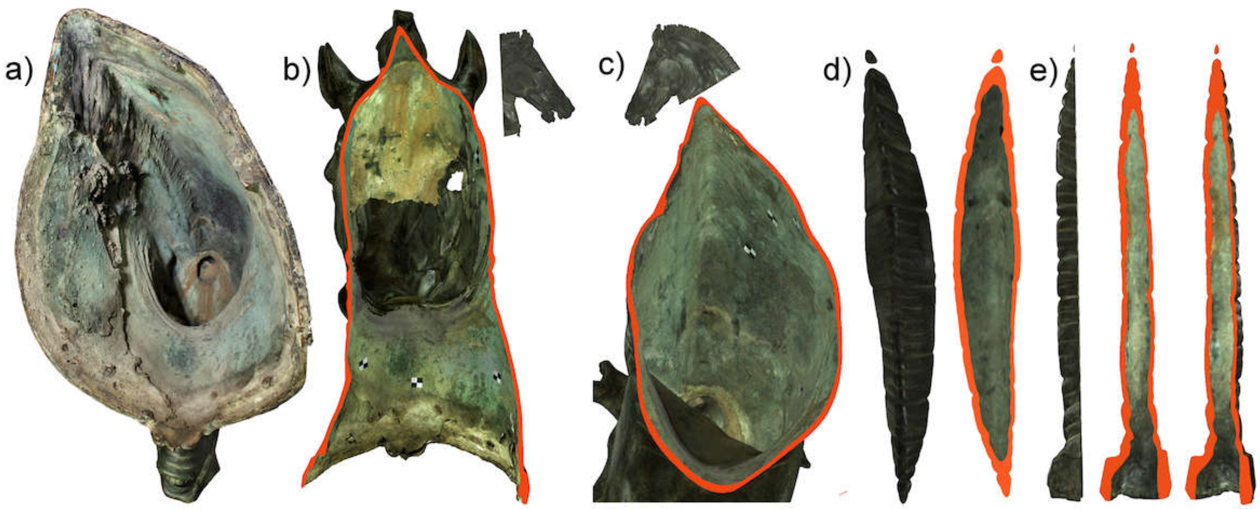


Figure 39.9. (a) Internal view of the protome; (b) virtual cross-sections of the textured 3D model achieved by intersection of the protome with the frontal plane, (c) a plane orthogonal to the neck, and planes almost parallel to the tangent at the crest of the mane in proximity of its (d) maximum and (e) minimum curvature radius

Both interior and exterior surfaces were scanned and digitally reconstructed. These two 3D models were merged by exploiting the visible cross-section of the neck, thus achieving a complete volume model of the bronze wall that allowed examination of its thickness. Figure 39.9 summarizes some meaningful cross sections, such as those of the front (fig. 39.9b), the neck (fig. 39.9c), and the mane (fig. 39.9d–e). The front shows moderate thickness variations and then a good correspondence between the outer and inner profiles of the right side and mane (original parts), while more pronounced thickness variations are observed in the mane. However, the mane also shows the congruence between reliefs and indentations, although the thickness variations observed are significant; note for example that in fig. 39.9e, the left side is much thicker than the right at the upper zone. This observation, along with the sharp crest of the mane at the inner surface (fig. 39.9b), led us to consider the possibility of significant direct modeling work. However, the aforementioned features depend on many material parameters, such as possible thinning during the finishing of the wax model; the possible differences in terms of mineralization and encrustation of the two inner sides of the mane; the type of wax; and the casting process. After a critical evaluation of the data collected, we conclude that the present protome was executed according to the typical copy process wherein the wax replica was made by slush casting and direct finishing.[10] The detail reported in fig. 39.8, showing the very smooth internal undulation of the right side of the head and the thickness profiles of figs. 39.9b–c, seem convincing evidence of slush casting. Probably the cleaning of the internal surface or a detailed radiographic examination would also bring to light the drips that were expected but not observed in the present study.

For the sake of completeness, let us also observe that the radiographic images collected during the investigation of the 1990s[11] show a very straight wax join in proximity to the terminal part of the muzzle. Assuming this is not an accidental effect, it could be interpreted as a consequence of an intentional cut into the wax needed in order to build and dry the core structure.

Chemical Analysis of the Alloys

The alloy compositions were thoroughly investigated using laser induced plasma (or breakdown) spectroscopy (LIPS or LIBS). In this noninvasive technique, short laser pulses are focused on the material of interest, and its elemental weight fractions are derived through the spectral analysis of the bright plasma plumes generated at the laser focus.[12] In some details a compositional depth profile is collected along typical depths of several hundred microns; then the bulk composition is derived by averaging the concentrations of the deeper part of this profile. (This innovative approach has also been exploited to study the Chimaera of Arezzo.[13]) The measurement points are mapped in fig. 39.7 (white numbers and dots), and the corresponding results are listed in table 39.1. Two distinct type of bronze alloys were measured using LIPS, with the following average compositions: (1) tin 11 wt%, lead 1.0 wt%, trace of iron for the main casting (most of the protome); (2) tin 4.3 wt%, lead 2.4 wt%, nickel 1.5 wt%, traces of zinc and iron for repairs already preliminarily attributed to the Cennini restoration, including the integration of the left side (main recasting), the collar, and the plugs closing the anchoring holes of the phalerae (measured sites: 14, 19, and 27). By contrast, the plugs corresponding to sites 24 and 25 have an alloy similar to the main one and are hence interpretable as ancient repairs.

Site	Sn (wt%)	Pb (wt%)	Zn (wt%)	Ni (wt%)	Fe (wt%)	Comments
1 Throat (f)	11.8 ± 1.0	0.5 ± 0.2	-	-	-	Main alloy
5 Neck (l)	11.8 ± 1.0	0.6 ± 0.2	-	-	-	
13 Cheek (l)	10.8 ± 1.3	1.1 ± 0.4	-	-	0.1 ± 0.05	
15 Muzzle (l)	10.9 ± 1.3	1.6 ± 0.4	-	-	0.13 ± 0.04	
16 Muzzle (f)	10.8 ± 1.0	1.0 ± 0.3	-	-	0.15 ± 0.05	
21 Ear (r)	10.7 ± 1.4	1.2 ± 0.3	-	-	0.13 ± 0.05	
22 Mane (u)	11.0 ± 0.7	0.8 ± 0.2	-	-	-	
23 Neck (r)	11.3 ± 1.2	1.2 ± 0.5	-	-	-	
26 Neck (r)	9.2 ± 1.2	1.6 ± 0.5	-	-	0.12 ± 0.05	
28 Cheek (r)	11.3 ± 1.0	1.0 ± 0.3	-	-	0.14 ± 0.04	
29 Cheek (r)	11.3 ± 1.0	1.0 ± 0.4	-	-	0.07 ± 0.03	
30 Cheek (r)	11.9 ± 1.3	1.1 ± 0.3	-	-	0.1 ± 0.05	
30 Chest	10.8 ± 1.1	1.1 ± 0.4	-	-	0.12 ± 0.04	
35 Collar (inner)	11.4 ± 0.6	0.3 ± 0.1	-	-	-	
10 Mane (l)	16.0 ± 1.0	0.7 ± 0.2	-	-	-	Visible residues of tin used to solder the crownpiece
11 Tin (l)	35.4 ± 3.3	1.4 ± 0.3	-	-	0.13 ± 0.04	
12 Tin (l)	29.1 ± 3.7	1.1 ± 0.3	-	-	0.14 ± 0.05	
2 Anchoring (l)	4.9 ± 0.4	2.3 ± 0.3	0.1 ± 0.07	1.4 ± 0.2	0.13 ± 0.03	Repair patches by recastings
3 Anchoring (l)	4.7 ± 0.4	2.3 ± 0.3	-	1.4 ± 0.2	-	
4 Main recasting (l)	4.7 ± 0.3	2.1 ± 0.3	0.1 ± 0.06	1.4 ± 0.2	0.14 ± 0.03	
6 Minor patch (l)	3.7 ± 0.5	2.3 ± 0.4	-	1.6 ± 0.2	-	
4 Collar (outer l)	4.5 ± 0.4	2.2 ± 0.3	-	1.4 ± 0.1	-	
8 Minor patch (l)	4.4 ± 0.5	3.0 ± 0.4	0.5 ± 0.1	1.6 ± 0.2	-	
9 Main recasting (l)	4.0 ± 0.5	2.6 ± 0.5	0.14 ± 0.1	1.7 ± 0.2	-	
17 Muzzle repair (f)	3.9 ± 0.3	2.3 ± 0.3	0.11 ± 0.06	1.7 ± 0.2	-	
18 Muzzle repair (f)	4.7 ± 0.5	2.8 ± 0.3	0.14 ± 0.07	1.8 ± 0.2	0.14 ± 0.04	
20 Ear repair (f)	4.2 ± 0.5	2.5 ± 0.4	0.2 ± 0.1	1.5 ± 0.2	-	
31 Main recasting (f)	4.0 ± 0.5	2.1 ± 0.3	-	1.5 ± 0.2	-	
33 Collar (r)	4.3 ± 0.4	2.2 ± 0.3	-	1.5 ± 0.2	-	
34 Collar (outer l)	4.6 ± 0.4	2.8 ± 0.4	-	1.7 ± 0.2	-	
24 Plug (r)	10.6 ± 1.1	0.9 ± 0.3	-	-	-	Ancient plugs
25 Plug (r)	11.7 ± 1.1	0.6 ± 0.3	-	-	-	
14 Phalerae plug (l)	4.5 ± 0.6	2.6 ± 0.4	-	1.6 ± 0.2	-	Plugs corresponding to the anchoring

Site	Sn (wt%)	Pb (wt%)	Zn (wt%)	Ni (wt%)	Fe (wt%)	Comments
19 Phalerae plug (r)	3.5 ± 0.5	2.6 ± 0.5	0.5 ± 0.2	1.5 ± 0.2	-	holes of the phalera
27 Phalerae plug (r)	3.6 ± 0.3	1.7 ± 0.2	-	1.2 ± 0.1	-	

Table 39.1. Chemical analysis of the alloys as measured using LIPS (see maps in fig. 39.7). r: right. l: left. f: front. Note that the collar belongs to the main recasting, and at the left side it is superimposed to the ancient metal wall along most of the right side and for a shorter stretch of the left side in proximity of the withers.

The coherence of the modern integration and plugs is very strong: besides having a similar amount of tin and lead, the relatively high nickel content and the frequent traces of zinc are very significant. These data are in substantial agreement with those reported by De Marinis (1998).

Conclusions

The present conservation treatments carried out on the Medici Riccardi horse head recovered the realism and dynamism of the original part of the sculpture and allowed to us to uncover and safeguard minute traces of gilding all over the artwork. These elements were previously obscured by waxy patinations, calcareous growths, and deposits. The formal features and the details of the protome are now more legible, while the modern repairs have been made more evident than before.

The gilding traces uncovered are much greater than expected. The widespread presence of gold-leaf microfragments among the skinfolds; on the throat, mane, and tongue; in the ears; and elsewhere, along with the lack of a mordant, prove that the head was gilded in ancient times. The former presence of a crownpiece with phalerae is also evident. Thus, we believe the reconstruction of fig. 39.10 is reliably supported by the present data. Most of the gold leaf was lost due to the burial conditions, the use of the sculpture as a fountain, and the aggressive mechanical and chemical cleaning treatments, which eroded the surface.

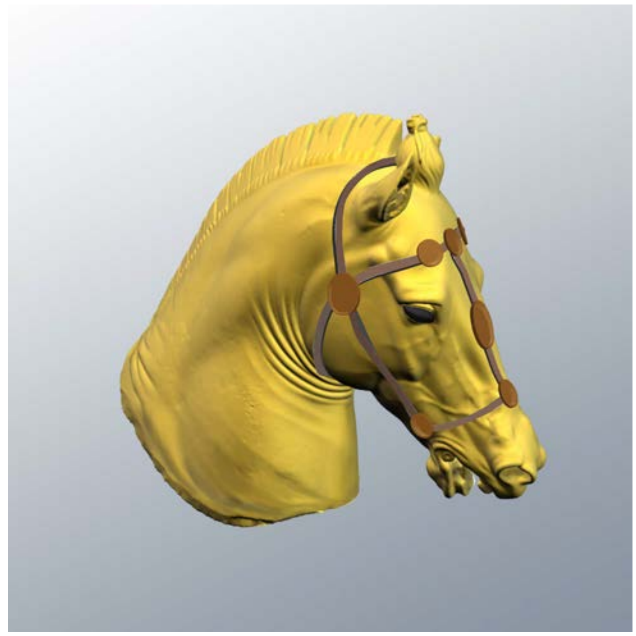


Figure 39.10. Reconstruction of the ancient appearance

The archaeometallurgical study also allowed us to identify all the additions introduced during the seventeenth-century restoration by Bartolomeo Cennini. The data show the main alloy is very close to the conventional 90–10 (here Sn 11 wt% and Pb 1 wt%) traditionally used for large bronzes from the Classical period and up to the Roman Republican period. Examination of the metal wall thicknesses through the virtual sectioning of the double surface-3D model provided important evidence about the wax model for casting and definitively demonstrated indirect casting.

✦ ✦ ✦

Acknowledgments

The conservation project and archaeometallurgical investigation of the Medici Riccardi horse head was funded by the Friends of Florence, a U.S. 501(c)(3) nonprofit organization supported by individuals who are dedicated to preserving and enhancing the cultural and historical integrity of the arts in the city and surrounding area of Florence, Italy.

Notes

1. Cianferoni 2015; Borrelli 1992, 67; Coarelli 1981, 246 n. 88.
2. Borrelli 1992, 67: "la cosiddetta testa Medici-Riccardi, che figura già fra i beni confiscati a Piero de' Medici nel 1495, e quindi dovette appartenere a Lorenzo il Magnifico."
3. Cianferoni 2015.
4. Baldinucci 1812, 91: "… oltre alla meravigliosa testa, e collo di bronzo del cavallo, che per comun parere, e dicesi anche per sentenza dello stesso Bernino, è della stessa mano di quegli, che fece il famoso cavallo di Campidoglio"
5. De Marinis 1998, 283.
6. Romualdi 1996.
7. Pasquinelli 2008.
8. In particular the riderless horse with the head turned to left: Naples, Museo Archeologico Nazionale, inv. 4894.
9. De Marinis 1998, 288–94.
10. In addition to refining the minute details of the sculpture, a correction of the curvature and folds of the right side was also probably performed, as suggested by some signs of manual shaping.
11. De Marinis 1998, 288–94.
12. Agresti, Mencaglia, and Siano 2009.
13. For further details on the technique, see Siano et al. 2012.

Bibliography

Agresti, Mencaglia, and Siano 2015
Agresti, J., A. A. Mencaglia, and S. Siano. 2015. "Development and Application of a Portable LIPS System for Characterising Copper Alloy Artefacts." *Analytical and Bioanalytical Chemistry* 395 (7): 2255–62.

Baldinucci 1812
Baldinucci, F. 1812. *Notizie dè Professori del Disegno da Cimabue in quà Firenze, 1681–1728*. Milan: Società Tipografica dè Classici Italiani.

Borrelli 1992
Borrelli, L. V. 1992. "Considerazioni su tre problematiche teste di cavallo." *Bollettino d'Arte* 71 (ser. 6): 67–82.

Cianferoni 2015
Cianferoni, G. C. 2015. "Horse Head (Medici Riccardi Horse)." In *Power and Pathos: Bronze Sculpture of the Hellenistic World*, ed. J. M. Daehner and K. Lapatin, 190–91, no. 3. Los Angeles: J. Paul Getty Museum; Florence: Giunti.

Coarelli 1981
Coarelli, F. 1981. "Alessandro, i Licini e Lanuvio." In *L'Art decoratif à Rome: À la fin de la Republique et au dèbut du Principat*, 229–84. Collection de l'Ècole Francaise de Rome 55. Paris: Ècole Francaise de Rome.

De Marinis 1998
De Marinis, G. 1998. "La protome di cavallo Medici-Riccardi: Il contributo delle indagini chimico-fisiche." In *In memoria di Enrico Paribeni*, ed. G. Capecchi, O. Paoletti, C. Cianferoni, A. M. Esposito, and A. Romualdi, 281–94. Rome: Giorgio Bretschneider.

Pasquinelli 2008
Pasquinelli, C. 2008. *La Galleria in Esilio: Il trasferimento delle opere d'arte da Firenze a Palermo a cura del Cavalier Tommaso Puccini (1800–1803)*. Pisa: ETS.

Romualdi 1996
Romualdi, A. 1996. "La testa di cavallo Medici Riccardi." In *Bronzi greci e romani dalle collezioni del Museo Archeologico Nazionale di Firenze*, ed. A. Rastrelli and A. Romualdi, 8. Exh. cat. Florence, Museo Archeologico Nazionale di Firenze.

Siano et al. 2012
Siano, S., M. Miccio, M. Giamello, S. Mugnaini, and J. Agresti. 2012. "Journey through the Material Layers of the Chimaera from Arezzo." In *Myth, Allegory, Emblem: The Many Lives of the Chimaera of Arezzo*, ed. G. C. Cianferoni, M. Iozzo, and E. Setari, 185–222. Rome: Aracne.

40.

The Cleveland Apollo: Recent Research and Revelations

Colleen Snyder, The Cleveland Museum of Art
Ernst Pernicka, Curt-Engelhorn-Zentrum Archäometrie, Mannheim, Germany
Peter Northover, Metallurgy and Archaeology, October House, Stonehill Lane, Southmoor, Abingdon, Oxfordshire, UK

The Cleveland Apollo (Cleveland Museum of Art, inv. 2004.30) has continued to be the subject of extensive research since just prior to its acquisition in 2004. The life-size (H 150 cm or 59 in.) artwork depicts a youthful god of the *sauroktonos* type, including a small, serpent-like creature, now detached. The sculpture is nearly complete, missing only parts of both arms and the accompanying tree. This paper details the most recent research conducted in 2014 and, incorporating data from previous studies, provides a preliminary interpretation of the results. Research included extensive visual analysis, X-radiography, X-ray fluorescence spectrometry, metallography, and lead-isotope analysis of the bronze. These analyses had three primary goals. The first was to better understand the original manufacture, including how the indirect lost-wax bronze was cast, patched, and finished. The second aim was to reconstruct the history of the object before, during, and after burial. This included furthering the understanding of the bronze's corrosion layers and remaining traces of archaeological materials, and also determining when and how the figure had been exposed to fire. Lastly, this research endeavored to elucidate decades of post-excavation display and interventions, including joining the sculpture to a bronze sheet as a display base, and reconstruction using modern materials.

✦ ✦ ✦

Introduction and Pre-accession Investigation

The only life-size bronze version of the sculptural type traditionally known as *Apollo Sauroktonos* (*Apollo the Lizard-Slayer*), now renamed *Apollo the Python-Slayer* and attributed to Praxiteles, is part of the permanent collection of the Cleveland Museum of Art (inv. 2004.30; fig. 40.1a–d).[1] There are approximately twenty other known sculptures of this type that exist, all in marble with one reduced-scale bronze copy.[2]

Figure 40.1a. *Apollo the Python-Slayer*, ca. 350 BC. Attributed to Praxiteles (Greek, ca. 400 BC–ca. 330 BC). Front; bronze, copper, and stone inlay; overall: 150 x 50.3 x 66.8 cm (59 x 19 ¾ x 26 ¼ in.). The Cleveland Museum of Art, Severance and Greta Millikin Purchase Fund, 2004.30

Image: © The Cleveland Museum of Art

Figure 40.1b. *Apollo the Python-Slayer*, ca. 350 BC. Attributed to Praxiteles (Greek, ca. 400 BC–ca. 330 BC). reverse; bronze, copper, and stone inlay; overall: 150 x 50.3 x 66.8 cm (59 x 19 ¾ x 26 ¼ in.). The Cleveland Museum of Art, Severance and Greta Millikin Purchase Fund, 2004.30

Image: © The Cleveland Museum of Art

Figure 40.1c. *Apollo the Python-Slayer*, ca. 350 BC. Attributed to Praxiteles (Greek, ca. 400 BC–ca. 330 BC). Detail of detached left hand; bronze, copper, and stone inlay; overall: 150 x 50.3 x 66.8 cm (59 x 19 ¾ x 26 ¼ in.). The Cleveland Museum of Art, Severance and Greta Millikin Purchase Fund, 2004.30
Image: © The Cleveland Museum of Art

Figure 40.1d. *Apollo the Python-Slayer*, ca. 350 BC. Attributed to Praxiteles (Greek, ca. 400 BC–ca. 330 BC). Detail of detached python; bronze, copper, and stone inlay; overall: 150 x 50.3 x 66.8 cm (59 x 19 ¾ x 26 ¼ in.). The Cleveland Museum of Art, Severance and Greta Millikin Purchase Fund, 2004.30
Image: © The Cleveland Museum of Art

The Cleveland bronze was carefully studied before its acquisition in 2004, and initial visual examinations noted the inlaid copper lips and nipples, the inlaid stone eyes (the right is original), and the separately cast and welded-on front half of the right foot. Numerous rectangular patches and square chaplet holes were noted as evidence of original manufacture. The head had been joined to the neck and the lower left leg joined to the calf in a recent restoration, as evidenced by the use of modern adhesives and a modern internal armature. Most surfaces had been mechanically cleaned except for areas of the hair that retained layers of corrosion and dirt. A dent on the right leg exhibited fracturing and appeared to be something that had occurred post-excavation. Clumps of metal on the back and legs seemed to be related, at least in part, to the tree, now missing. The openings at the arms and feet revealed wax manipulation marks in locations not obscured by modern resin repairs, indicating that the sculpture had been created by the indirect casting process. The bronze plate serving as a base appeared to have been added, as it could never have supported the sculpture on its own, but it was sufficiently corroded to have been in place for some time.

Radiographs clarified areas of modern repair, such as plaster and resin fills around the neck and shoulders, demonstrating that the figure was nearly complete. Also noted were the thick walls (about half a centimeter in many locations) and large individually cast sections of bronze. The radiographs taken at that time did not appear to show that the head was joined at the jawline, and, despite much damage to the neck, written reports concluded that the head was likely cast to the mid-neck (fig. 40.2a–b). This visual analysis and radiography provided important basic information about the figure, yet many questions about *Apollo*'s original manufacture, subsequent excavation, and display remained.

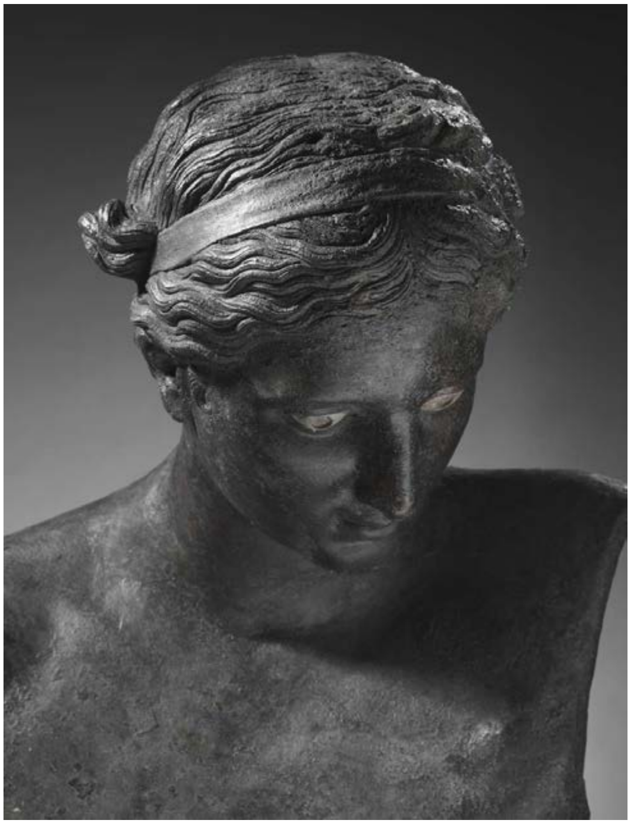


Figure 40.2a. *Apollo the Python-Slayer*, ca. 350 BC. Attributed to Praxiteles (Greek, ca. 400 BC–ca. 330 BC). Detail of detached python; bronze, copper, and stone inlay; overall: 150 x 50.3 x 66.8 cm (59 x 19 ¾ x 26 ¼ in.). The Cleveland Museum of Art, Severance and Greta Millikin Purchase Fund, 2004.30

Image: © The Cleveland Museum of Art

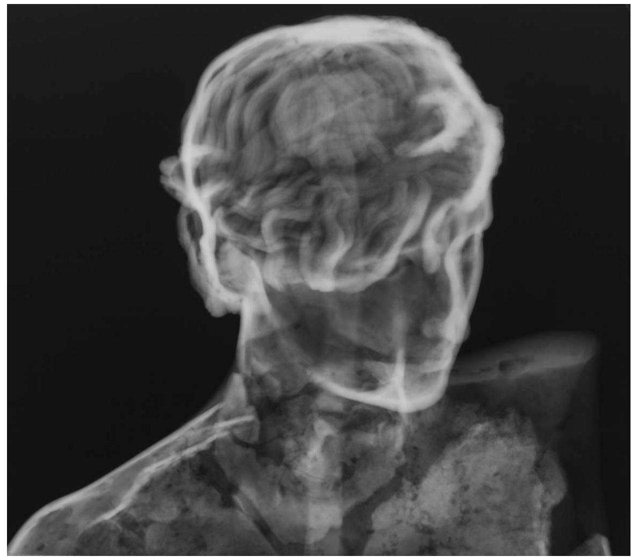


Figure 40.2b. X-ray of *Apollo* showing extensive repairs around neck and shoulders, as well as the internal armature from a recent restoration

Image: © The Cleveland Museum of Art

In 2004, two of the authors, Peter Northover and Ernst Pernicka, were invited to collaborate. This earlier phase of research is summarized briefly here so that the focus of the paper can remain on the most recent analysis. Three samples of bronze were selected from the detached hand, the right shoulder, and the base. Northover analyzed the samples by electron probe microanalysis with wavelength dispersive spectrometry, and afterward the samples were also examined metallographically in both polished and etched states. It was concluded that the hand and shoulder belonged to the same object and were thoroughly corroded, with almost all the lead having been replaced by corrosion products. In contrast the base was found to be barely corroded at all. What corrosion was present on the base was natural but different in character, suggesting that the base dated from a more recent remounting; based on the known history of the artifact, a date between the seventeenth and the nineteenth centuries is suggested (fig. 40.3). In addition, the corrosion products excluded the possibility that the sculpture had been buried in a marine environment. The lizard (now identified as a python) was subsequently sampled in 2006, taking pieces from the front proper left leg and rear proper left leg, to compare either side of the central join.[3]

Figure 40.3. *Apollo the Python-Slayer*, ca. 350 BC. Attributed to Praxiteles (Greek, ca. 400 BC–ca. 330 BC). Detail of feet and bronze baseplate; bronze, copper, and stone inlay; overall: 150 x 50.3 x 66.8 cm (59 x 19 ¾ x 26 ¼ in.). The Cleveland Museum of Art, Severance and Greta Millikin Purchase Fund, 2004.30. The circle in the corner may indicate where a bronze tree was once attached. Image: © The Cleveland Museum of Art

The compositional analysis of the five samples showed the torso and python belonged together, but the base had a different history. The corrosion products on the figure were consistent with an object that was buried for an extended time and then re-exposed to atmospheric corrosion and precipitation. Interestingly, analysis indicated that early in its history the figure was exposed to extreme heat, while the base did not show evidence of having been in a fire. The two halves of the python seemed to have been cast from the same melt, with some differences in composition due to segregation of lead. The alloy was found to be a low- to medium-tin bronze with 6.7–7.6% tin and 8.6–16.3% lead and was related to the main figure, which had similar tin and lead contents. At that time, it was not possible to determine whether the hand was related, with only one extensively corroded sample having been examined.

Pernicka tested four samples of lead solder in order to determine how the baseplate might relate to the figure: three from the proper right foot that was separately cast and one sample from the body of the figure. They were analyzed by energy dispersive x-ray fluorescence (EDXRF), and the sample from the figure was additionally analyzed by neutron activation analysis, essentially confirming the electron microprobe analyses. Two solder samples were tested for a radioactive signal of ^{210}Pb (see below for test description). One sample did not yield a usable result and was inconclusive. Another showed measurable radioactivity, which would indicate that the lead and/or the tin were produced within the last hundred years.

Recent Testing: Bronze Compositional Analyses

In 2013 a Cleveland Museum of Art focus exhibition on *Apollo* provided an opportunity to continue analysis of the sculpture, and Northover and Pernicka traveled to Cleveland for study and sampling. Additional cross-sections were taken from numerous areas of the figure, the detached forearm and hand, and the python. Seventeen samples in all were carefully selected for location and accessibility, with the goal of obtaining as much information from as few samples as possible, and these were mechanically removed from the bronze. As many as 11 areas on every sample (30 x 50 μm) were analyzed with wavelength dispersive spectrometry and electron probe microanalysis, and 16 elements were recorded as individual compositions of each sample in weight percent. Electron probe microanalysis of the samples verified that the figure was composed of a high-lead, low-tin bronze, as found in earlier analyses (see table 40.1 for percentages).[4] After analysis the mounted samples were studied in both polished and etched states. The results of the metallographic analysis are consistent with the figure, hand, and python being ancient, as they all have thick corrosion crusts and deep penetration that developed during burial and subsequent outdoor exposure. In fact, some samples were too corroded to be etched and could only be examined as polished.

Sample	Object	Part	Fe (wt%)	Co	Ni	Cu	Zn	As	Sb	Sn	Ag	Bi	Pb	Au	Cd	S	Al	Si	Mn
R2318/1	Apollo	Proper left hand	0.01	0.00	0.04	74.57	0.00	0.02	0.16	4.83	0.00	0.00	19.81	0.01		0.52	0.00	0.00	0.02
R2318/2			0.10	0.00	0.00	56.87	0.14	0.00	0.03	17.13	0.00	0.01	2.69	0.00		0.09	0.01	0.16	0.00
R2318/3			0.03	0.00	0.00	66.48	0.01	0.03	0.12	3.19	0.01	0.00	12.66	0.05		0.45	0.04	0.19	0.00
R2318/4			0.02	0.00	0.00	67.55	0.05	0.00	0.01	14.92	0.00	0.00	2.73	0.11		0.09	0.01	0.03	0.00
R2318/5			0.00	0.00	0.00	86.41	0.00	0.00	0.03	0.96	0.00	0.02	0.52	0.09		0.01	0.02	0.14	0.00
R2318/6			0.08	0.03	0.00	53.91	0.64	0.01	0.09	19.79	0.00	0.00	8.91	0.00		0.04	0.03	0.04	0.00
R2318/7			0.03	0.02	0.00	73.58	0.00	0.03	0.02	7.43	0.39	0.00	0.00	0.00		5.36	0.00	0.01	0.00
R2318/8			0.04	0.00	0.00	73.81	0.01	0.07	0.13	3.65	0.00	0.04	1.67	0.00		0.02	0.01	0.25	0.00
R2318/9			0.00	0.00	0.00	84.09	0.00	0.08	0.02	0.05	0.00	0.04	1.02	0.05		0.01	0.01	0.01	0.00
R2318/10			0.15	0.00	0.00	0.11	0.07	0.05	0.00	0.04	0.00	0.00	66.84	0.02		0.00	0.17	0.22	0.00
R2318/11			0.00	0.00	0.01	0.30	0.00	0.05	0.06	0.59	0.00	0.01	63.99	0.02		0.00	0.16	0.23	0.00
R2319/1	Apollo	Proper right arm	0.03	0.00	0.03	90.12	0.18	0.40	0.18	7.15	0.02	0.00	1.71	0.05		0.07	0.00	0.05	0.00
R2319/2			0.18	0.02	0.02	73.88	0.15	0.11	0.34	9.85	0.00	0.00	14.87	0.10		0.20	0.01	0.27	0.00
R2319/3			0.00	0.00	0.00	92.42	0.16	0.17	0.17	6.79	0.05	0.05	0.16	0.03		0.00	0.00	0.01	0.00
R2319/4			0.05	0.00	0.02	87.88	0.12	0.15	0.17	6.27	0.42	0.00	4.65	0.02		0.26	0.00	0.00	0.00
R2319/5			0.02	0.00	0.00	88.17	0.16	0.14	0.13	7.19	0.04	0.02	4.04	0.00		0.02	0.00	0.07	0.00
R2319/6			0.01	0.00	0.01	95.15	0.04	0.05	0.12	3.01	0.02	0.00	1.50	0.00		0.09	0.00	0.00	0.00
R2319/7			0.01	0.03	0.03	88.52	0.09	0.13	0.16	7.07	0.00	0.00	3.67	0.07		0.12	0.00	0.08	0.01
R2319/8			0.016	0.02	0.00	74.95	0.12	0.09	0.35	11.61	0.13	0.00	11.87	0.00		0.45	0.00	0.24	0.01
R2319/9			0.06	0.00	0.01	83.54	0.13	0.24	0.13	4.93	0.47	0.00	4.33	0.09		6.05	0.00	0.00	0.02
R2319/10			0.01	0.01	0.07	92.18	0.19	0.29	0.13	6.90	0.00	0.00	0.22	0.00		0.01	0.00	0.00	0.00
R2320/1	Apollo	Base	0.00	0.00	0.02	69.00	0.04	0.05	0.06	3.07	0.03	0.00	27.68	0.00		0.02	0.00	0.01	0.03
R2320/2			0.00	0.01	0.00	64.39	0.00	0.09	0.03	3.02	0.00	0.00	32.40	0.00		0.04	0.00	0.01	0.00
R2320/3			0.02	0.00	0.00	61.98	0.00	0.08	0.13	3.44	0.11	0.00	34.02	0.00		0.20	0.00	0.00	0.02
R2320/4			0.05	0.00	0.05	90.43	0.00	0.06	0.11	2.99	0.00	0.00	5.82	0.00		0.47	0.01	0.00	0.02
R2320/5			0.00	0.01	0.04	95.32	0.04	0.14	0.05	2.42	0.02	0.03	1.87	0.00		0.01	0.00	0.00	0.00
R2320/6			0.00	0.00	0.00	87.59	0.00	0.25	0.21	6.83	0.11	0.00	4.48	0.03		0.40	0.00	0.01	0.00
R2320/7			0.00	0.00	0.11	50.31	0.11	0.02	0.05	2.81	0.04	0.00	46.51	0.10		0.00	0.00	0.00	0.03
R2320/8			0.00	0.00	0.00	87.64	0.00	0.11	0.10	5.21	0.00	0.00	6.88	0.00		0.00	0.00	0.00	0.00
R2320/9			0.01	0.00	0.04	67.31	0.04	0.00	0.05	1.48	0.02	0.00	31.04	0.02		0.00	0.00	0.00	0.00
R2320/10			0.02	0.00	0.00	92.03	0.00	0.08	0.06	3.04	0.23	0.00	4.51	0.00		0.01	0.00	0.00	0.00
R2940/1	Lizard	Front leg	0.06	0.01	0.04	71.18	0.10	0.05	0.13	6.40	0.04	0.02	21.54	0.00	0.00	0.41	0.01	0.00	0.03
R2940/2			0.05	0.00	0.04	85.74	0.10	0.05	0.09	7.24	0.00	0.01	6.63	0.00	0.00	0.06	0.00	0.00	0.00
R2940/3			0.01	0.00	0.02	74.19	0.14	0.06	0.11	6.65	0.09	0.00	18.69	0.02	0.02	0.00	0.00	0.00	0.00
R2940/4			0.05	0.01	0.01	79.30	0.11	0.04	0.10	7.00	0.05	0.00	13.27	0.00	0.00	0.03	0.01	0.02	0.00
R2940/5			0.03	0.00	0.06	78.03	0.07	0.03	0.11	7.02	0.00	0.00	14.60	0.01	0.00	0.03	0.00	0.01	0.00
R2940/6			0.13	0.00	0.00	71.56	0.10	0.04	0.07	6.06	0.01	0.00	21.21	0.00	0.00	0.81	0.00	0.00	0.00
R2940/7			0.06	0.01	0.04	85.44	0.05	0.03	0.11	7.17	0.07	0.01	6.73	0.05	0.01	0.23	0.00	0.00	0.00
R2940/8			0.03	0.02	0.04	54.10	0.04	0.03	0.11	5.52	0.06	0.00	40.04	0.00	0.00	0.00	0.00	0.00	0.00
R2940/9			0.05	0.01	0.05	78.05	0.15	0.06	0.13	6.77	0.01	0.08	14.55	0.00	0.00	0.08	0.00	0.00	0.00
R2940/10			0.04	0.00	0.02	86.90	0.11	0.13	0.12	7.30	0.02	0.02	5.25	0.03	0.00	0.03	0.00	0.01	0.00
R2941/1	Lizard	Rear leg	0.04	0.00	0.04	88.75	0.07	0.13	0.08	8.72	0.07	0.00	2.05	0.00	0.00	0.02	0.00	0.02	0.01
R2941/2			0.08	0.00	0.02	84.64	0.15	0.05	0.11	8.22	0.52	0.02	6.06	0.05	0.02	0.06	0.00	0.00	0.00
R2941/3			0.04	0.01	0.07	88.57	0.11	0.08	0.10	7.56	0.00	0.06	3.25	0.04	0.00	0.09	0.00	0.01	0.01
R2941/4			0.03	0.00	0.09	82.69	0.07	0.05	0.10	7.78	0.04	0.00	9.06	0.01	0.02	0.01	0.01	0.03	0.01
R2941/5			0.01	0.00	0.03	79.49	0.07	0.09	0.11	7.76	0.57	0.00	11.54	0.00	0.00	0.02	0.04	0.26	0.00
R2941/6			0.00	0.01	0.01	86.50	0.08	0.10	0.12	7.58	0.05	0.03	5.41	0.00	0.00	0.00	0.01	0.10	0.00
R2941/7			0.06	0.00	0.00	76.88	0.10	0.09	0.08	6.91	0.00	0.04	14.97	0.00	0.00	0.24	0.02	0.61	0.00
R2941/8			0.02	0.00	0.03	62.00	0.08	0.09	0.08	5.93	0.00	0.04	31.58	0.02	0.00	0.07	0.00	0.05	0.00
R2941/9			0.03	0.00	0.05	89.55	0.12	0.14	0.07	7.68	0.05	0.11	2.10	0.00	0.02	0.03	0.02	0.01	0.00
R2941/10			0.04	0.00	0.09	91.58	0.06	0.08	0.11	7.55	0.00	0.00	0.34	0.07	0.00	0.01	0.01	0.03	0.02

Sample	Object	Part	Fe (wt%)	Co	Ni	Cu	Zn	As	Sb	Sn	Ag	Bi	Pb	Au	Cd	S	Al	Si	Mn
R2318/Metal	Apollo	Proper left hand	0.01	0.00	0.04	74.57	0.00	0.02	0.16	4.83	0.00	0.00	19.81	0.01		0.52	0.00	0.00	0.02
R2318/Corr	Apollo	Proper left hand	*0.04*	*0.00*	*0.00*	*56.31*	*0.09*	*0.03*	*0.05*	*6.77*	*0.04*	*0.01*	*16.10*	*0.03*		*0.61*	*0.05*	*0.13*	*0.00*
R2319/Mean	Apollo	Proper right arm	0.05	0.01	0.02	86.68	0.13	0.18	0.19	7.08	0.12	0.01	4.70	0.04		0.73	0.00	0.07	0.00
R2320/Mean	Apollo	Base	0.01	0.00	0.02	76.60	0.02	0.09	0.09	3.44	0.06	0.00	19.52	0.02		0.12	0.00	0.00	0.01
R2340/Mean	Lizard	Front leg	0.05	0.01	0.03	76.45	0.10	0.05	0.11	6.71	0.03	0.01	16.25	0.01	0.00	0.17	0.00	0.00	0.00
R2341/Mean	Lizard	Rear leg	0.04	0.00	0.04	83.06	0.09	0.09	0.10	7.57	0.13	0.03	8.64	0.02	0.01	0.06	0.01	0.11	0.00
R2319/Mean	Apollo	Proper right arm	0.05	0.01	0.02	86.68	0.13	0.18	0.19	7.08	0.12	0.01	4.70	0.04		0.73	0.00	0.07	0.00
R2340/Mean	Lizard	Front leg	0.05	0.01	0.03	76.45	0.10	0.05	0.11	6.71	0.03	0.01	16.25	0.01	0.00	0.17	0.00	0.00	0.00
R2341/Mean	Lizard	Rear leg	0.04	0.00	0.04	83.06	0.09	0.09	0.10	7.57	0.13	0.03	8.64	0.02	0.01	0.06	0.01	0.11	0.00
R2318/Metal	Apollo	Proper left hand	0.01	0.00	0.04	74.57	0.00	0.02	0.16	4.83	0.00	0.00	19.81	0.01		0.52	0.00	0.00	0.02
R2320/Mean	Apollo	Base	0.01	0.00	0.02	76.60	0.02	0.09	0.09	3.44	0.06	0.00	19.52	0.02		0.12	0.00	0.00	0.01

Table 40.1. Compositional analysis of bronze samples. This table includes data from both samples obtained in 2004 and samples taken in 2013.

In order to ascertain whether parts of the figure derived from the same casting or the same raw metal source, multiple small samples from locations throughout the figure were obtained with a steel drill bit to be analyzed with inductively-coupled plasma mass spectrometry (ICP-MS) and EDXRF. This combination of analyses confirmed that the bronze samples had a uniform composition with the exception of the baseplate, which had more lead and less tin than the rest of the figure.[5] The uniformity of the figure, the left hand, the forearm, and the python was further confirmed by lead-isotope ratios, with only the lead solder on the baseplate having a clearly different lead isotope signature.

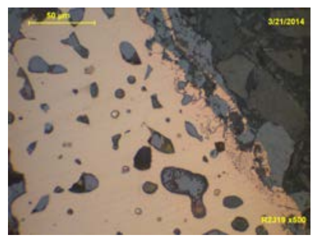


Figure 40.4a. Etched metallographic cross section from the figure's torso. This sample contains a band of cuprite particles that was noted beneath the metal surface. The particles were formed by the inward diffusion of oxygen at high temperature (internal oxidation) and indicate the object has been in a fire.
Image: Peter Northover

Figure 40.4b. *Apollo the Python-Slayer*, ca. 350 BC. Attributed to Praxiteles (Greek, ca. 400 BC–ca. 330 BC). Detail of torso; bronze, copper, and stone inlay; overall: 150 x 50.3 x 66.8 cm (59 x 19 ¾ x 26 ¼ in.). The Cleveland Museum of Art, Severance and Greta Millikin Purchase Fund, 2004.30. Detail of *Apollo*'s torso where sample was obtained.
Image: © The Cleveland Museum of Art

Evidence of a Fire

In addition, parts of the figure's body, especially the right arm and shoulder, appear at some point in their history to have been exposed to a high-temperature oxidizing atmosphere, such as in a fire. The evidence for this is a band of cuprite particles beneath the metal surface, which was formed by the inward diffusion of oxygen at high temperature (internal oxidation) (fig. 40.4a–b). Another sign of exposure to a high temperature environment is the lump on the back of the left thigh (fig. 40.5). While previously believed to be fractured supports for the missing tree, these amorphous bits of metal attached to the figure are now known to have solidified from an oxygen-rich melt, as demonstrated by the presence of cassiterite crystals in cross sections.[6]

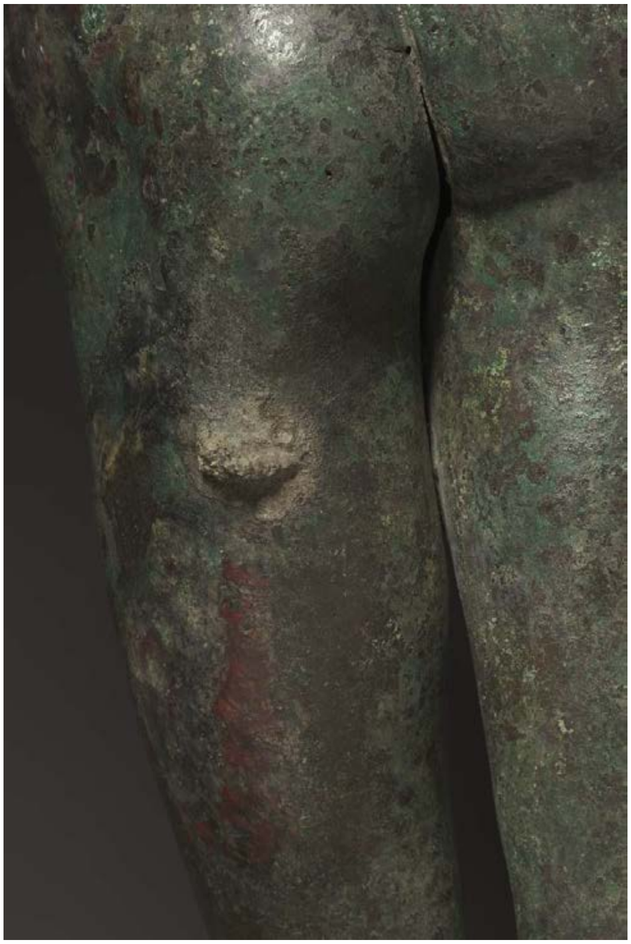


Figure 40.5. Reverse of *Apollo*, left thigh, showing lump of metal. This also indicates exposure to a high-temperature environment. Cleveland Museum of Art, Severance and Greta Millikin Purchase Fund, 2004.30

Image: © The Cleveland Museum of Art

Analysis of the Baseplate

The irregularly cut bronze plate now serving as a base required additional research, as most ancient bronze statue bases are made of stone. Moreover, the few extant bronze bases, such as that of the Croatian Apoxymenos, are considerably larger. The thin bronze plate used to secure *Apollo*, together with the remains of an applied solder on the top surface, was not likely to function on its own as the original base. Analysis of the baseplate indicated that though it was composed of high-lead, low-tin bronze, the composition was markedly different than that of the figure, the detached hand and forearm, and the python.[7]

Unlike the rest of the figure, the baseplate shows no sign of exposure to fire. The relative lack of corrosion on the baseplate further indicates that it was not the original base. Where the plate has not been protected by the solder, the corrosion layer is thin and of a generally uniform depth (about 50 μm), with no deeper penetration of the interdendritic lead. By contrast, the samples from the figure are very deeply corroded with interdendritic and intergranular corrosion extending to a depth of several millimeters, while the corrosion products are stratified in such a way as to suggest a significant change in environment at some point in the figure’s history. The plate has been exposed to the environment for long enough that some fine-scale transgranular corrosion has developed; this could be expected from exposure to the elements since the eighteenth or nineteenth century.

Interpreting the history of the solder use on the figure and baseplate is a challenge because there has been little compositional analysis of ancient solders. All the solders identified in this study are tin-based. Pure tin was used as a soft solder in the ancient world since the seventh century BC, but the original solder on *Apollo* would most likely have been a lead-tin mixture.[8] When molten tin comes into contact with a bronze surface, a bi-layer of the epsilon and eta phases of the copper-tin system forms very rapidly, with the epsilon phase bonded to the bronze; above the eta phase will be a layer of unreacted tin. This tin corrodes quite rapidly, and within the thick layer of solder remaining on the baseplate it has largely disappeared. The eta phase is preserved on the baseplate but is missing in the other locations of solder. Substantial remains of the epsilon phase survive on the feet of the python, and this is consistent with it having been reattached to the tree when the statue was first displayed after excavation. Conversely, only a thin layer of the epsilon phase remains in the solder under the little toe of *Apollo*’s left foot, separated from the heavily corroded bronze by up to 100 μm of corrosion product. Since bronze must have initially been adjacent to the solder for the epsilon phase to form, and the thickness of corrosion seems greater than what might form during two centuries of exposure to an inclement European climate, it has been concluded that the solder on the foot is ancient. In turn, it follows that the toe was once attached to a piece of metal, suggesting that we must now reconsider how the statue was displayed in antiquity.

Lead-Isotope Analyses

Additional samples of the solder on the baseplate, as well as samples of the bronze alloys of the baseplate and right foot of the statue, were also analyzed by alpha spectrometry to determine if the radioactive nuclide ^{210}Pb was present. This test for the authenticity of metal artifacts is based on the disturbance of the radiochemical equilibrium of the ^{238}U decay chain during the smelting process. Ores and minerals accompanying the ore usually contain small amounts of uranium. In the decay chain of uranium, elements with different geochemical and metallurgical behavior occur. While lithophile trace elements like uranium, thorium, and radium remain in the slag, chalcophile and siderophile elements, like bismuth and lead, are taken up by the metal phase. Thus the short-lived radionuclide ^{210}Pb (half-life = 22.3 years) is efficiently separated from its long-lived ancestors ^{238}U (half-life = 4.4 x 10^9 years) and ^{226}Ra (half-life = 1,600 years). The concentration of ^{210}Pb in the metal depends on the origin of the ore and the manufacturing process and is variable and unknown, so it cannot be used for dating. The ^{210}Pb in the metal then decays with its own half-life of 22.3 years and as a result of the disrupted decay chain it cannot be renewed. This means that radioactivity is usually only measurable in metals younger than about 110 years (relating to five half-lives of the nuclide).[9] Since no measurable activity was detected in the *Apollo* samples, it was concluded that not only the lead in the solder but also the lead in the bronze of the baseplate and the cast-on front half of the right foot are all older than about 110 years.[10] It should be noted that in principle old metal could have been used to produce the objects in modern times. However, this is quite unlikely in this case considering the amounts and types of corrosion products present.

The relation of the bronze baseplate to the figure had puzzled scholars since the acquisition, and questions had persisted about whether it was a recent addition. However, recent results point to it having been attached to the figure in the eighteenth or nineteenth century, based on a few key facts. Compared with the corrosion of the solder remnants on *Apollo*'s foot and on the python, the solder on the baseplate is much less corroded, with the eta phase still preserved. In addition, the composition of the soft solder on the baseplate is inappropriate for an ancient solder.[11]

However, most unexpected of all was the finding that the stable lead-isotope ratios of the plate were consistent with the other parts of the sculpture. In fact, all bronze parts of the statue are isotopically virtually indistinguishable, although one could argue that the two samples of the python and the sample from the cast-on right foot are slightly different from the remaining samples (fig. 40.6). This may indicate that the same batch of lead was used but there were two different casting charges. Only the lead solder on the feet and baseplate has a clearly different lead-isotope signature. All of this information may suggest that perhaps the baseplate was reused or recast from the original sculptural assemblage, which would also be consistent with the ^{210}Pb result.

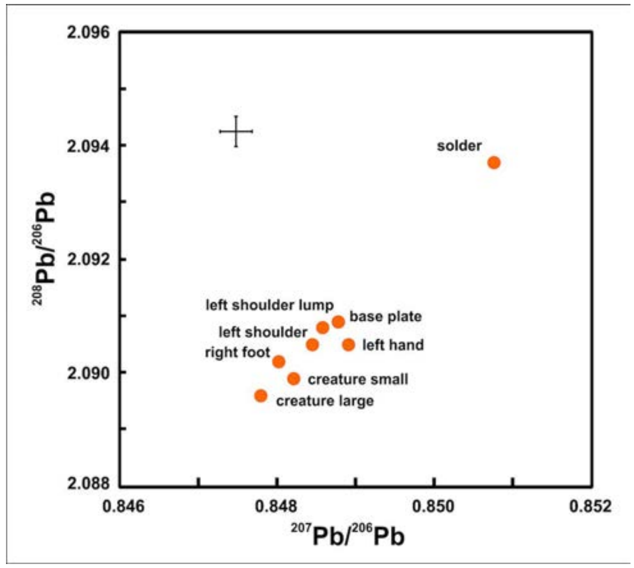


Figure 40.6. Lead-isotope ratios of the analyzed samples. In the lower right corner a cross indicates the 2σ uncertainties of measurements. The six samples in the lower left are isotopically indistinguishable.

Lead-isotope ratios can also be used to determine the provenance of the lead in the alloy, because much data are available for lead deposits in the Aegean region, in southeastern Europe, and in the eastern Mediterranean.[12] The lead-isotope ratios of both the statue and the solder exclude a geological provenance of the lead from the Aegean and therefore Laurium, the largest source of Aegean lead in antiquity. There are not many lead ore deposits that would match the *Apollo*. The Cevennes in France and the Balkans are two possibilities (table 40.2).[13]

Lab No.	$^{206}Pb/^{204}Pb$	$^{207}Pb/^{204}Pb$	$^{208}Pb/^{204}Pb$	$^{208}Pb/^{206}Pb$	$^{207}Pb/^{206}Pb$
MA-141326	18.379	15.636	38.479	2.0937	0.85077
MA-141328	18.429	15.640	38.522	2.0902	0.84864
MA-141330	18.427	15.642	38.519	2.0903	0.84885
MA-141331	18.456	15.649	38.570	2.0899	0.84794
MA-141332	18.439	15.644	38.545	2.0904	0.84843
MA-141333	18.320	15.634	38.397	2.0959	0.85339
MA-141334	18.444	15.644	38.548	2.0900	0.84819
MA-141336	18.435	15.640	38.529	2.0900	0.84839

Table 40.2. Lead-isotope ratios of the investigated samples. Uncertainties are about ± 0.05% for $^{208}Pb/^{204}Pb$ and better than 0.03% for the other two ratios.

Interpretation of Results and Conclusion

Recent analyses of *Apollo* have successfully resolved several questions that have persisted since its acquisition by the Cleveland Museum of Art over ten years ago. All of the reassembled bronze fragments of the figure, hand and forearm, and python belong together and were cast from the same melt, confirmed by metal composition, lead-isotope ratios, and corrosion history. In addition, the corrosion seems to support the figure's purported history of use, suggesting that it was exposed to an exterior atmosphere for an extended time after excavation. The figure also displays evidence of having been in a fire, which appears to have happened after its excavation; this may be partially responsible for some of the damage that is now evident on the right side. The recent testing was also successful in revealing more information about the baseplate, which does not appear to be entirely original. Though the baseplate's corrosion differs from that of the remainder of the figure, it shares a lead-isotope signature, leading to the conclusion that the base may be a repurposed part of the original sculptural assemblage. The lead-tin solder used to attach the sculpture to the baseplate has tested as over 110 years old, and it appears to have been done around the eighteenth or nineteenth centuries. An incised line cut into the baseplate to follow the contour of the right foot is corroded over but not sufficiently corroded to indicate that the join is ancient, further supporting this claim.

As for the fire that may have damaged *Apollo*, an attempt was recently made to explore when that occurred. Two samples of charcoal were obtained from the edge of the separated forearm for carbon dating, but the results produced dates that were substantially older than the Greek or Roman periods (see fig. 40.7). One possible explanation for this is contamination of the samples with modern, oil-based materials used during previous restoration efforts. These restorations have also made it difficult to document evidence of manufacture, such as wax-to-wax joins, drips, and tool marks often seen on the interior of bronzes. Recently, CT scans were obtained in an effort to better document features that may lie beneath the plaster, wire mesh, and modern resins used to reassemble the figure over the years. However, the high lead content has made imaging a challenge. A few scans of the detached hand and python have been obtained, but more work is necessary to improve the clarity of the images. In fact, the attempt to image *Apollo* is exemplary of the multiple efforts over a dozen years to better understand the figure; each step forward in obtaining more information leads to additional questions. While we have certainly advanced our understanding of the sculpture, it is clear that the Cleveland *Apollo* will continue to provide new opportunities for research for years to come.

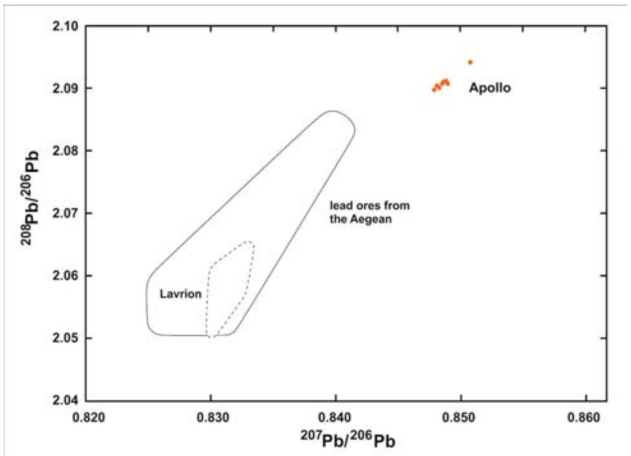


Figure 40.7. Lead-isotope ratios of the analyzed samples compared with lead ores from the Aegean and from Laurium in Attica.

✦ ✦ ✦

Acknowledgments

The authors would like to thank Michael Bennett; the Cleveland Clinic and Dr. Andrew Godley; Per Knutås; Jeffrey Maish; Mannheim, Matthew Notarian; John Ranally; Erik Risser; and Roland Schwab.

Notes

1. Bennett 2013.
2. Preisshofen 2002.
3. Bennett 2013, 80.
4. Metallography of the figure, detached hand and forearm, lizard, and baseplate was performed by Peter Northover in early 2014 with a report submitted on March 31, 2014. These analyses were compared with published compositional analyses of classical sculpture, including Craddock 1985; Mattusch 1996. For standardization between methods of analyses, see Mattusch 1996 and Northover and Rychner 1998.
5. Eight samples were selected and removed with a stainless-steel drill bit and analyzed by Ernst Pernicka in the spring and summer of 2014. The final report of these analyses was submitted August 28, 2014. The samples were first cleaned mechanically under magnification to remove corrosion and nonmetallic material before analyzing with EDXRF. The lead-isotope ratios were determined with a multicollector-inductively coupled plasma mass spectrometer (MC-ICP-MS) after chemical separation of the lead.
6. A bronze melt sufficiently rich in oxygen will solidify as a mixture of copper, cuprite, and cassiterite; it is possible that fragments of building debris or ash are also included, and this may make the lump more of a slag. In nonequilibrium conditions, cassiterite can exist in contact with bronze. The temperature suggested by this lump is approaching 1000ºC.
7. Refer to table 40.1 for percentages. The first sample taken from the base, no. R2320, had 3.4% tin and 19.5% lead, and the alloy was confirmed by the second cross-section obtained in 2013, no. R4780.
8. Only a few quantitative analyses of ancient solder have been undertaken, but these suggest that lead-tin solder was regularly used from the late first millennium BC onward: Drescher 1959; Fasnacht and Northover 1991; Wolters 1996.
9. Further details of the method are published in Pernicka et al. 2008.
10. The seeming inconsistency with the first measurement of ^{210}Pb is probably due to the very small sample size (less than 5 mg) that was first submitted and may have been taken from the surface of the object where it could have been contaminated with ^{210}Pb from the environment. Furthermore, this sample had a rather unusual and different composition from the other solder samples. The sample was described in an earlier conservation report as “Apollo figure: from the base, proper right foot, instep near the toes,” but no further detailed documentation is available.
11. All samples of solder that were mechanically removed from both the top and bottom of the baseplate consist of a lead-tin alloy with about 30–40% tin.
12. Pernicka et al. 1984; Stos-Gale, Gale, and Annetts 1996; Gale et al. 1997; Pernicka et al. 1997.
13. Bode, Hauptmann, and Mezger 2009 and unpublished data from the Balkans.

Bibliography

Bennett 2013
Bennett, M. 2013. *Praxiteles: The Cleveland Apollo*. London and Cleveland: The Cleveland Museum of Art in association with D. Giles Ltd.

Bode, Hauptmann, and Mezger 2009
Bode, M., A. Hauptmann, and K. Mezger. 2009. “Tracing Roman Lead Sources Using Lead Isotope Analyses in Conjunction with Archaeological and Epigraphic Evidence: A Case Study from Augustan/Tiberian Germania.” *Archaeological and Anthropological Sciences* 1: 177–94.

Craddock 1977
Craddock, P. T. 1977. “The Composition of the Copper Alloys Used by the Greek, Etruscan and Roman Civilisations: 2. The Archaic, Classical and Hellenistic Greeks.” *JAS* 4: 103–23.

Craddock 1985
Craddock, P. T. 1985. “Three Thousand Years of Copper Alloys from the Bronze Age to the Industrial Revolution.” In *Application of Science in the Examination of Works of Art*, ed. P. England and L. Van Zelst, 59–67. Boston: Museum of Fine Arts.

Craddock, Pichler, and Riederer 1987–88
Craddock, P. T., B. Pichler, and J. Riederer. 1987–88. “Legierungszusammensetzung in naturwissenschaftlichen Untersuchungen an der Bronzestatue ‘Der Jüngling vom Magdalensberg’.” In *Wiener Berichte über Naturwissenschaft in der Kunst* 4/5: 262–95.

Drescher 1959
Drescher, H. 1959. “Untersuchungen zur römischen Löttechnik.” *Technische Beiträge zur Archäologie* 1: 65–77.

Fasnacht and Northover 1991
Fasnacht, W., and P. Northover. 1991. “Metallkundliche Untersuchungen.” *Berichte der Zürcher Denkmalpflege, Archäologische Monographien* 9: 239–51.

Gale et al. 1997
Gale, N. H., Z. A. Stos-Gale, G. Maliotis, and N. Annetts. 1997. “Lead Isotope Data from the Isotrace Laboratory, Oxford: *Archaeometry* Data Base 4, Ores from Cyprus.” *Archaeometry* 39: 237–46.

Mattusch 1996
Mattusch, C. C., ed. 1996. *The Fire of Hephaistos: Large Classical Bronzes from North American Collections.* Cambridge, MA: Harvard University Art Museums.

Northover and Rychner 1998
Northover, J. P., and V. Rychner. 1998. “Bronze Analysis: Experience of a Comparative Programme.” In *L’atelier du bronzier en Europe du XXe au VIIIe siècle avant notre ère: Actes du colloque “Bronze ‘96”,*

Neuchâtel et Dijon, 1996. Vol. 1: *Les analyses de composition du métal*, ed. C. Mordant, M. Pernot, and V. Rychner, 19–40. Paris: Èditions du Comité des travaux historiques et scientifiques.

Pernicka 1987
Pernicka, E. 1987. "Erzlagerstätten in der Ägäis und ihre Ausbeutung im Altertum. Geochemische Untersuchungen zur Herkunftsbestimmung archäologischer Metallobjekte." *JRGZM* 34: 607–714.

Pernicka et al. 1984
Pernicka, E., T. C. Seeliger, G. A. Wagner, F. Begemann, S. Schmitt-Strecker, C. Eibner, Ö. Öztunalı, and I. Baranyi. 1984. "Archäometallurgische Untersuchungen in Nordwestanatolien." *JRGZM* 31: 533–99.

Pernicka et al. 1997
Pernicka, E., F. Begemann, S. Schmitt-Strecker, H. Todorova, and I. Kuleff. 1997. "Prehistoric Copper in Bulgaria: Its Composition and Provenance." *Eurasia Antiqua* 3: 41–180.

Pernicka et al. 2008
Pernicka, E., R. Schwab, N. Lockhoff, and M. Haustein. 2008. "Scientific Investigations of West African Metal Castings from a Collection in Bochum." In *Original-Copy-Fake? Examining the Authenticity of Ancient Works of Art: Focusing on African and Asian Bronzes and Terracottas; International Symposium Stiftung Situation Kunst/Ruhr University Bochum, February 17th and 18th, 2007*, ed. E. Pernicka and S. von Berswordt-Wallrabe, 80–98. Mainz: Von Zabern.

Preisshofen 2002
Preisshofen, R. 2002. "Der Apollon Sauroktonos des Praxiteles." *AntP* 28: 41–115.

Stos-Gale, Gale, and Annetts 1996
Stos-Gale, Z. A., N. H. Gale, and N. Annetts. 1996. "Lead Isotope Data from the Isotrace Laboratory, Oxford: *Archaeometry* Data Base 4, Ores from the Aegean, Part 1." *Archaeometry* 38: 381–90.

Wolters 1996
Wolters, J. 1996. "Löten im Mittelalter." In *Europäische Technik im Mittelalter*, ed. U. Lindgren, 187–203. Berlin: Mann.

41.

The Getty Herm of Dionysos: Technical Observations, Review, and Interpretation

Jeffrey Maish, J. Paul Getty Museum, Los Angeles

Technical studies of the bronze Herm of Dionysos (J. Paul Getty Museum, inv. 79.AB.138) using microscopy, endoscopy, radiography, and tomography are summarized in the context of previous studies beginning in 1989. Internal rod remains may represent remnants of a casting sprue system and several areas of miscasting and larger repairs appear to be associated with the rods. Visible bronze spillage may be associated with reworking in the head drapery and suggests repair to the back of the head. Added materials include lead at the base, presumably from the original installation, as well as remains of a composite copper-and-marble eye assembly. Tomographic images taken at one height show some internal correspondences with the Mahdia herm (Bardo Museum, inv. F 107) although there are many dimensional discrepancies. This suggests the two herms may be associated generationally, but indirectly. The object's surface alteration (from burial), bronze-alloy composition (previously reported), and lead-isotope data are consistent with ancient production.

✦ ✦ ✦

Introduction

Ancient Athenians are reported to have been the first to erect herms that served as boundary markers in both urban and rural settings and also stood in the entrances of private homes and temples; at one location herms became so numerous that one structure near the Agora was named the Stoa of the Herms. This proliferation and high demand perhaps led to the development of copying and serial reproduction methods, and the Getty Herm of Dionysos (J. Paul Getty Museum, inv. 79.AB.138, dated 200–100 BC) may therefore represent one of many examples in both marble and bronze. Further visual, endoscopic, and radiographic examinations provide important details regarding its production technology.

Background

Studies of the Getty herm (fig. 41.1) have characterized the alloy and many casting features. Metallographic study revealed elements of the bronze cast structure and chemical analysis quantified the base alloy.[1] Further comparative technical and art historical studies have focused to an extent on its similarities to the closely related bronze herm from the Mahdia wreck now in the Bardo Museum.[2] Lead-isotopic studies classified sources for lead found in both the bronze alloy and lead fill, and provided baseline information on the smelting history of the bronze. These studies have led to further scholarly discussion on the role of copying and serial production in ancient bronze production.[3]

Figure 41.1. Herm of Dionysos, 200–100 BC, front view. Malibu, J. Paul Getty Museum, Villa Collection, inv. 79.AB.138

Structure: The herm is characterized by a bearded head topping a tall architectonic shaft. The shaft of the Getty herm was probably cast from a construction of wax slabs, and an internal wax-to-wax join was observed connecting the upper portion of the shaft to the head.[4] Additionally, a series of horizontal ridges or flashings is present at various heights on the interior. The shaft also includes remnants of a rod system attached to the inner walls. The remains have been considered variously to have been part of an armature support used during the building of the shaft in wax, or a sprue system for casting, a feature considered anomalous for ancient foundry work. Metallographic study of a tube-wall section shows a contiguous structure throughout indicating that the rods and wall were cast in the same pour.[5] Woody material found within the cross section has also led to speculation that the rods were initially modeled of wood or reed, which disintegrated during the wax burnout. Carbonized remains may have partially blocked bronze flow during the pour, creating hollow tubes as bronze flowed around charred organic material.[6]

Copper Alloy Analysis: The most recent analysis of interior samples (1 and 2) shows compositions consistent with ancient lead-tin bronze alloys (table 41.1).[7] Lead concentrations range from 14 to 22% with tin concentrations ranging approximately from 8 to 14%. Cobalt levels were determined to be less than 0.005 weight percent in the internal lead deposit (sample 3) while present in higher concentration in the bronze alloy itself (at 0.15 and 0.20 weight percent).

Sample No.	Cu	Sn	Pb	Fe	Co	Ni	Zn	As	Se	Sb	Te	Bi	Ag	Sb
FG 050587 (alloy)	74	8.8	17	0.26	0.16	0.04	0.1	0.22	0.01	0.164	<0.005	0.02	0.039	0.164
FG 050587 (lead)	0.7	39	60	0.3	<0.01	<0.01	<0.1	<0.5	<0.01	0.02	0.02	<0.1	0.03	0.02
Results after Schwab et al. 2008.														

Table 41.1. Elemental analysis of Getty herm (ICP-MS weight percent)

Lead Isotopes: Lead-isotope studies provided both lead sourcing (^{206}Pb, ^{207}Pb, ^{208}Pb) and smelting information (^{210}Pb).[8] Isotopic ratios suggest different lead sources for the alloy lead and a lead deposit on the herm interior. While the alloy falls within the Aegean field, the purer lead lies outside this grouping. Lead 210 (^{210}Pb) was also evaluated in the three samples (two alloy, one lead) to better understand the smelting history of the bronze. If present in sufficient amounts, ^{210}Pb, with a half-life of 22.2 years, could indicate smelting in the last 75–100 years. The study concluded there was negligible ^{210}Pb in the bronze alloy, and none was detected in the sample of purer lead.

Technical Comparisons to Mahdia Herm: Studies of the Getty and Mahdia herms point to physical similarities as well as differences between the two sculptures.[9] Comparative facial measurements show close correspondences, although the beard and drapery show greater variation.[10] The physical similarities have led to discussion of ancient serial production and even speculation that the Getty herm is a twentieth-century copy.[11] In the end, there are many similarities but few of the exact correspondences that would be expected from a directly molded copy. The drapery on the heads of the two bronze herms have generally similar masses and proportions, but are completely different in method of execution. While the complex and undercut Mahdia herm drapery is generally attributed to direct working of the wax, the Getty herm drapery, with its simpler and softer form, is seen as the product of molding and indirect casting. As Carol Mattusch succinctly states, “Neither herm is the original, and neither one is a replica of the other, ancient or modern.”[12]

Further Observations

The Getty herm was studied in an effort to clarify and provide further insights into its production technology and burial alteration. Selected tomographic images of localized areas of the head were used to compare wall cross sections. Microscopic examination of the extant eye also shows a complex assembly consistent with other ancient composite eyes.

Condition and Mineralization of Bronze: Inspection of the interior and exterior surfaces reveals a range of copper corrosion types and thicknesses. The exterior patina is generally green (malachite) with scattered blue deposits (azurite); isolated thinly patinated areas reveal bronze metal. Corrosion on the interior is relatively intact where azurite has formed thicker botryoidal deposits, in particular where conditions may have favored its formation, for example, within the head (fig. 41.2).[13] The torn area around the missing boss is heavily mineralized as is the fractured bottom edge of the shaft. A large, gray oxidized deposit on the lower inner wall is a lead remnant possibly related to the original installation (fig. 41.3; see table 41.1). A smaller unanalyzed gray deposit, presumably lead, can also be noted farther up the shaft.

Figure 41.2. Bronze spillage and azurite buildup on herm boss and head interior
Image: J. Maish

Figure 41.3. Lead deposit possibly from ancient mounting. Interior, lower shaft
Image: J. Maish

Herm Pillar: Discussion of the internal rods has focused on the hollow rod remains, although solid remains are extant as well. The remains are centered vertically on each wall of the shaft, although there are many sections where the rods are only suggested by extant attachment points. Spanning the height of each of the four shaft walls, the total length of rod would have originally reached approximately 320 cm (4 x 80 cm); extant partial remains represent approximately 20% of this total. Preliminary observation indicates more solid rod remains on the side walls, while tubular remains predominate on the front and rear walls.

Large repaired flaws visible in radiographs indicate casting problems below the phallus, at the rear center and on the lower rear wall (fig. 41.4). The founder filled most of the voids by casting in bronze; in some instances, cast repairs were mechanically repaired with rectangular patches. Perhaps coincidentally, the large repairs are collinear with the vertical rod remains. Small rectangular patches (approximately 140) are visible elsewhere on the herm (fig. 41.5), while some areas of porosity, particularly on the more complex head, were left uncorrected.[14] A curvilinear flow feature is also visible in radiographs extending around the pillar below the head.

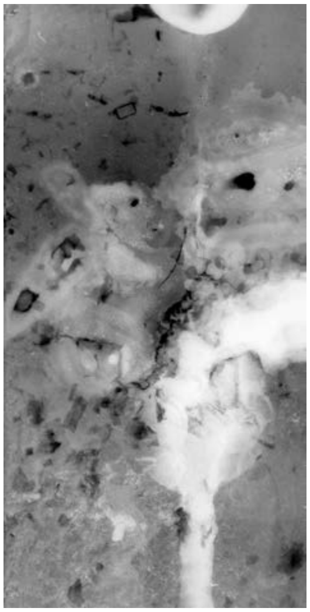


Figure 41.4. Radiographic detail of repair below phallus (cast and rectangular patching). Note internal “sprue” at bottom center.
Image: J. Maish

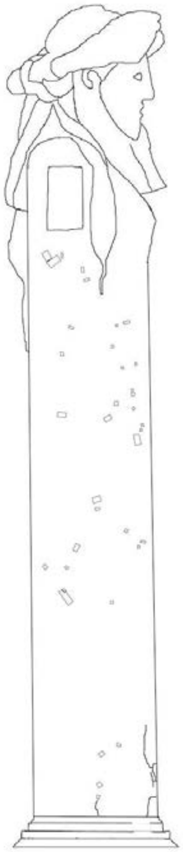


Figure 41.5. Schematic of rectangular patch distribution on proper right side
Image: E. Ohara and J. Maish

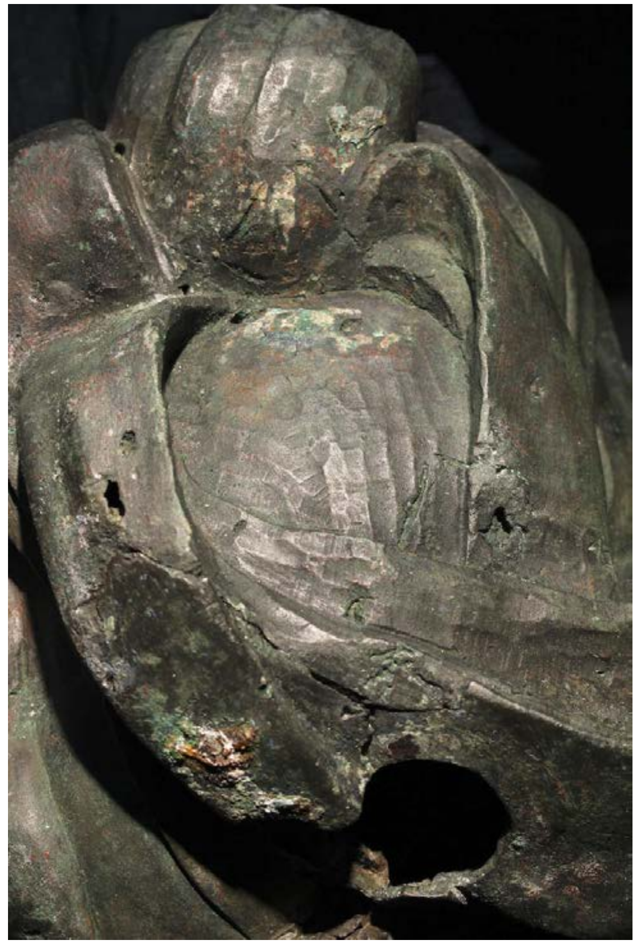


Figure 41.6. Cold-working marks from probable repairs, top of head
Image: J. Maish

Herm Head: Interior inspection of the boss and beard cavity reveals extensive metal spattering. The morphology of the metal clusters suggests spillage into an open space, as opposed, for example, to seepage into a cracked or damaged section of core. The splatter is localized toward one side of the head and is absent in other parts of the herm. Perhaps related, the herm head has areas of casting porosity, and external markings at the top rear drapery of the head suggest possible cold working by a flat chisel.[15] These marks are absent from the smoother cast surfaces of adjoining drapery folds (fig. 41.6).

Remnants of the extant eye were investigated microscopically and with X-ray fluorescence spectroscopy (fig. 41.7). Use of calcareous stone (not ivory as previously reported) is indicated by high calcium levels,[16] shiny inclusions, and faint abrasion marks.[17] Remnants of broken copper eyelashes surround the eye and are pressed into the eye socket. Inspection from the interior reveals that the eye has been reattached with a modern resin.

Several CT cross sections of the Getty head confirm a fairly uniform wall thickness indicative of a molded wax model. Comparison to the Mahdia head CT at eye level also shows some close internal profile correspondences (fig. 41.8).[18] An outer drapery fold of the Mahdia herm (direct work) generally corresponds to a fold on the Getty herm.

Figure 41.7. Herm eye, detail (calcitic stone and copper-alloy lashes; pupil and iris missing)
Image: J. Maish

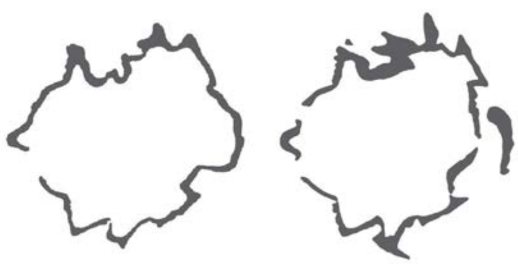


Figure 41.8. CT comparison at eye level: (left) Getty Herm; (right) BAM Berlin (Mahdia Herm)
Image: J. Maish

Discussion

The Herm Model and Ancient Molding: The herm type is distinct in combining natural and architectonic shapes. The heads themselves could vary in type, style, and material (marble, terracotta, bronze) and some marble versions of herms (of Hermes for example) have lower relief and simpler detail. From the perspective of a copyist/molder, the shaft is perhaps of less consequence than the characteristic face and beard whose production might be expedited through molding. The simpler face and frontal beard could be molded with a single mold section while a more complete mold of the head including any drapery would require a more sophisticated approach. This could be accomplished using a range of materials such as clay, plaster, and possibly pitch/bitumen.[19] Fired clay was typically used for smaller, less complex molds as dimensional instability (warpage and shrinkage) precluded use for multipart and complex undercut molds. In contrast, plaster piece-molding was a more advanced method and, combined with outer mother molds, could capture a higher degree of detail and undercutting.

Internal Spillage and Casting Quality: Bronze spillage within the head initially suggested separate metallurgical attachment of the head. Bronze joining around the perimeter of the head would have been hidden in part by the undercut beard. However, further internal and radiographic inspection shows little further evidence of a continuous seam around the lower head. Although separate joining of the head remains a possibility, the bronze splatter may in fact be associated with repair to a miscast at the top rear of the head. Post-cast cold-worked repair is further suggested by the tool marks visible on the rear drapery. The general assumption is that the figure would have been cast upright. Radiographs reveal several areas of repaired damage with some such areas in alignment with the internal rod remains. Combined with variably filled sprues and flow features visible in radiographs, this introduces the possibility that the figure was cast horizontally (possibly facedown). This would have ensured a less turbulent pour and more uniform introduction of molten bronze to the entire mold with less heat loss.[20]

Tubular Remains: The tubular remains present a more puzzling feature of the herm. As wax model supports, they would have attached to the wax slabs to provide stability (although supports are generally not present in more complex wax models). The approach may also represent an attempt to cast smooth outer walls, reduce post-cast surface finishing, and provide for more easily removable sprues. Scholars have hypothesized that the hollow tubes may have formed as bronze flowed around a carbonized organic (wood, reed, etc.) core during casting,[21] although unimpeded bronze flow would rely on near complete burnout of the organic material. Localized exterior cooling against the investment wall may also have developed variable temperatures within the rod/tube cross section producing a solidified exterior bronze skin while the interior metal remained in a liquid state and continued to flow.[22] Internal sprues may also have functioned as reservoirs supplying the outer walls with molten bronze during cooling and shrinkage.[23] Intermittent sprue/runner attachment along the internal walls would have eased post-cast removal although in instances there was excessive wall contact, possibly a result of outward pressure applied during core introduction. In the end, use of internal sprues may have inadvertently introduced another problem, as points of attachment produced thicker bronze walls that contracted and solidified more slowly than surrounding areas (resulting in large flaws).

Review of Analysis: Analysis of the herm alloy points to a lead-tin bronze with traces of cobalt, and radiographic images suggest the composition may actually be quite variable.[24] The higher amount of cobalt in the bronze-alloy samples as compared to the lead sample suggests that cobalt was present within the source copper ore.[25] Initial studies of Bronze Age copper sources traced higher cobalt ores to Anatolia, although further studies demonstrate the more widespread occurrence of cobalt in copper ores (including on Cyprus). Combined with more recent lead-isotope studies, this may indicate other points of origin for the herm and its raw materials.[26]

Comparison to the Mahdia Herm

To produce a bronze copy of an original work of art, an artisan may (1) use methods similar to those of the original artist; (2) use an old mold; or (3) generate a new mold from the original bronze.[27] Production of the Getty herm in antiquity may have entailed a combination of these approaches. Comparisons between the Getty and the Mahdia herms have demonstrated the general similarities in the proportions and heads, with the closest correspondences in the more easily molded faces. Comparison of plaster reproductions of the two heads shows a general similarity of the drapery masses at the rear although they are slightly offset with different overall volumes. This suggests a less direct relationship. Additionally, one-to-one width comparisons of the drapery bands show little to no dimensional correspondence. Some contour similarities noted in CT sections may however suggest a relationship to a common source in the initial wax production (to produce a similar inner profile) with greater variation resulting from further modeling of the exteriors. The initial basic model may have been a herm with simplified head drapery as, for example, might be found in some marble types (e.g., herms of Hermes). Artisans may therefore have started with the same general model but interpreted more freely (and directly) in the drapery modeling process. Facial similarity may have been achieved through molding with clay, plaster, or pitch-containing material (fig. 41.9).[28]

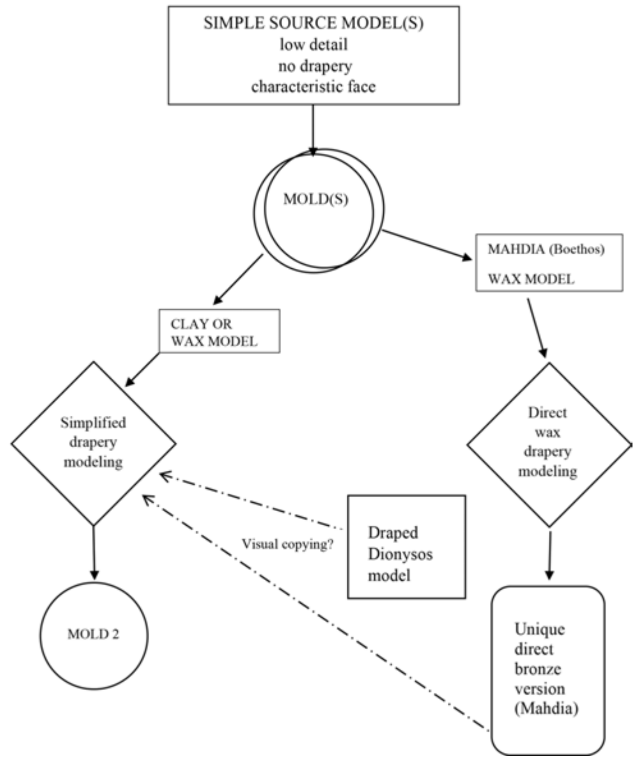


Figure 41.9. Flowchart showing proposed production process of Getty vs. Mahdia herms
Image: J. Maish

Conclusions

As concluded in previous studies, the Getty herm with slightly undercut detail suggests molding and an indirect cast. The herm shaft would be easily formed by pouring bronze into a mold formed from joined wax slabs but the more complex head required a more complex process. This work may have focused on more simply formed elements, such as the face and frontal beard, and possibly the molding of a simpler head model. The internal rods were most probably designed as casting runners/sprues aiming to reduce the finishing of the outside wall and feeding the bronze during cooling. The approach created some problems as evidenced by several wall repairs in line with the vertical internal tube remnants. These flaws may have developed in areas where too much wax was used to join the sprue/gate to the inner wall, increasing overall wall thickness and causing variable wall shrinkage on cooling. Additionally, the wax sprues may have contacted and bonded to the inner walls at different points during core introduction. Variable bronze flow through the mold may have resulted in both solid and hollow rod sections (piping). Metal splatter in the head initially suggested separate molding of the head and metallurgical attachment. However, the absence of a clear seam/join and probable repaired porosity at the rear of the head indicate some casting problems. This may also indicate horizontal casting, facedown.

Previously published analytical results for the herm (isotopic and alloy composition) are consistent with ancient production and, although the lead-tin bronze composition is broadly similar to that of the Mahdia herm, it does not present the same alloy composition. Isotopic results suggest an Aegean origin for lead in the bronze alloy, although the origin of the separate lead deposit is different and perhaps associated with the installation locality. The cobalt concentration in the bronze is higher than in the lead, possibly associating the cobalt with the copper ore and a more specific copper source, possibly Anatolian. Considered in combination with stylistic Aphrodisian and Pergamene parallels and a signature by Boëthos of Kalchedon (on the Mahdia herm), more consideration should be given to possible workshop origins in the eastern Mediterranean for both figures.

✦ ✦ ✦

Notes

1. Scott and Podany 1989.
2. Willer 1994b; Mattusch 1994; and Mattusch 1995.
3. See Mattusch 2002.
4. Scott and Podany 1989.
5. Scott and Podany 1989.
6. Scott and Podany 1989; Willer 1994b.
7. Initial analysis was conducted by Scott and Podany (1989). Subsequent analyses of the Getty and Mahdia herms' alloys show a very general alloy correspondence (see Pernicka and Eggert 1994; Schwab et al. 2008. Comparison of cobalt traces has led to speculation regarding specific bronze-alloy sourcing and workshop control of the alloying process.
8. Schwab et al. 2008.
9. Willer 1994b; Mattusch 1994; Mattusch 1995.
10. Willer 1994a, 1994b.
11. See Ridgway 2015 and 2016; and Barr-Sharrar 2016. Barr-Sharrar recently postulated the herm is a Roman copy (publication forthcoming).
12. Mattusch 1995.
13. Azurite forms as a conversion product of malachite within specific oxygen, pH, and carbonate burial conditions; see Vink 1986.
14. The author thanks Eli Ohara, Getty graduate intern 2015–16, for her study and tracings of the herm patches.
15. See Willer 1994a, 1994b.
16. Lee 2015.
17. As observed by author.
18. Interior contours may be truer to the mold shape.
19. Although mentioned in ancient sources (Lucian *Zeus Tragoidos* 33, see Richter 1951), there is no material evidence for the use of pitch for molding in Classical antiquity. Pitch was used centuries earlier nearer to its Near Eastern sources as a component of adhesives, coatings, and caulks (Connan 1999). Pitch may also have been combined with other materials (such as clay fillers and fiber strengtheners) to create a stronger and more effective flexible mold material.
20. S. Decker, pers. comm. 2016.
21. Scott and Podany 1989; Willer 1994a, 1994b.
22. See Kalpakjian and Schmid 2008. The formation of thin bronze layers during shrinkage is also termed "piping" (S. Decker, pers. comm. 2016). However, leaded copper-tin alloys with wide solidification ranges (due to separation between solidus and liquidus) may, to an extent, inhibit formation of thin skins (D. Scott, pers. comm. 2016).
23. S. Decker, pers. comm. 2015.
24. Correlation of smelted copper to a specific source using trace elements is somewhat problematic. Gale and Stos-Gale (1992, 66) point out that "ore deposits are not homogeneous in chemical composition, even on the small scale" and "the smelting of ores under primitive conditions also introduces poorly controlled changes in the pattern of minor and trace elements in copper metal when compared with the pattern in the copper ore, especially when one considers the contribution of elements contained in the added flux" (1982, 11–12).
25. Gale and Stos-Gale 1982; Wheeler et al. 1975.
26. Interestingly, plots of isotopic fields for Tunisian sources also correlate generally with the herm lead deposit. See Skaggs 2012.
27. Allison and Pond 1983.
28. A parallel marble Herm head from Aphrodisias (H: 35 cm) is illustrated by Mattusch 2015, 117, fig. 8.4. The author would also like to acknowledge F. Bewer of the Harvard Art Museums for sharing her thoughts on the complex production genealogy of Renaissance bronzes and inspiring this hypothetical flowchart (fig. 41.9).

Bibliography

Allison and Pond 1983
Allison, A., and R. Pond. 1983. "On Copying Bronze Statuettes." *Journal of the American Institute for Conservation* 23: 32–46.

Barr-Sharrar 2016
Barr-Sharrar, B. 2016. "Barr-Sharrar on Ridgway on Daehner and Lapatin, *Power and Pathos: Bronze Sculpture of the Hellenistic World*." *BMCR* 2016.02.29.

Connan 1999
Connan, J. 1999. "Use and Trade of Bitumen in Antiquity and Prehistory: Molecular Archaeology Reveals Secrets of Past Civilizations." *Philosophical Transactions of the Royal Society B: Biological Sciences* 354(1379): 33–50.

Daehner and Lapatin 2015
Daehner, J. M., and K. Lapatin, eds. 2015. *Power and Pathos: Bronze Sculpture of the Hellenistic World*. Los Angeles: J. Paul Getty Museum.

Gale and Stos-Gale 1982
Gale, N. H., and Z. Stos-Gale. 1982. "Bronze Age Copper Sources in the Mediterranean: A New Approach." *Science* (2 April 1982), 216(4541): 11–19.

Gale and Stos-Gale 1992
Gale, N. H., and Z. Stos-Gale. 1992. "Lead Isotope Studies in the Aegean (The British Academy Project)." *Proceedings of the British Academy* 77: 63–108.

Goldman 1942
Goldman, H. 1942. "The Origin of the Greek Herm." *AJA* 46: 58–68.

Hellenkemper Salies 1994
Hellenkemper Salies, G., ed. 1994. *Das Wrack: Der Antike Schiffsfund von Mahdia*. Exh. cat. Bonn, Rheinisches Landesmuseum. Cologne: Rheinland Verlag.

Kalpakjian and Schmid 2008
Kalpakjian, S., and S. Schmid. 2008. *Manufacturing Processes for Engineering Materials*. 5th ed. Upper Saddle River, NJ: Pearson Education. http://www.slideshare.net/jagdeep_jd/manufacturing-engineering-and-technology-schmid-and-kalpakjian

Lee 2015
Lee, L. 2015. Getty Conservation Institute, Internal Report.

Mattusch 1994
Mattusch, C. 1994. "Bronze Herm of Dionysos." In Hellenkemper Salies 1994, 431–50.

Mattusch 1995
Mattusch, C. 1995. "Two Bronze Herms: Questions of Mass Production in Antiquity." *ArtJ* 54:2 (Conservation and Art History [Summer]): 53–59.

Mattusch 1996
Mattusch, C. 1996. *The Fire of Hephaistos: Large Classical Bronzes from North American Collections*. Cambridge, MA: Harvard University Art Museums.

Mattusch 2002
Mattusch, C. 2002. "In Search of the Bronze Original." In *The Ancient Art of Emulation: Studies in Artistic Originality and Tradition from the Present to Classical Antiquity*, 99–115, MAAR Supplementary vol. 1. Ann Arbor: University of Michigan Press.

Mattusch 2015
Mattusch, C. 2015. "Repeated Images: Beauty with Economy." In Daehner and Lapatin 2015, 110–25.

Pernicka and Eggert 1994
Pernicka, E., and G. Eggert. 1994. "Die Zusammensetzung der Bronzeobjekte von Mahdia." In Hellenkemper Salies 1994, 1041–61.

Richter 1951
Richter, G. M. A. 1951. "Who Made the Roman Portrait Statues – Greeks or Romans?" *PAPS* 95.2: 184–91.

Ridgway 2015
Ridgway, B. S. 2015. "Review of Jens M. Daehner, Kenneth Lapatin (eds.), *Power and Pathos: Bronze Sculpture of the Hellenistic World*, Los Angeles: J. Paul Getty Museum 2015." *BMCR* 2015.09.02.

Ridgway 2016
Ridgway, B. S. 2016. "Ridgway on Barr-Sharrar on Ridgway on Daehner and Lapatin, *Power and Pathos*." *BMCR* 2016.02.47.

Schwab et al. 2008
Schwab, R., G. Eggert, E. Pernicka, and F. Willer. 2008. "Zu den Bronzefunden aus dem Schiffswrack von Mahdia: Alte Proben, neue Untersuchungen." *BJb* 208: 5–21.

Scott and Podany 1989
Scott, D., and J. Podany. 1989. "Ancient Copper Alloys: Some Metallurgical and Technological Studies of Greek and Roman Bronzes." In *Small Bronze Sculpture from the Ancient World: Papers Delivered at a Symposium*, 31–60. Malibu: J. Paul Getty Museum.

Skaggs 2012
Skaggs, S. 2012. "Local Mining or Lead Importation in the Roman Province of Africa Proconsularis? Lead Isotope Analysis of Curse Tables from Roman Carthage, Tunisia." *JAS* 39: 970–83.

Vink 1986
Vink, B. W. 1986. "Stability Reactions of Malachite and Azurite." *Mineralogical Magazine* (Mineralogical Society, London) (March 1986) 50: 41–47.

Wheeler et al. 1975
Wheeler, T. S., R. Maddin, and J. Muhly. 1975. "Ingots and the Bronze Age Copper Trade in the Mediterranean: A Progress Report." *Expedition* 17(4): 31–39.

Willer 1994a
Willer, F. 1994. "Die Restaurierung der Herme." In Hellenkemper Salies 1994, 953–58.

Willer 1994b
Willer, F. 1994. "Zur Herstellung der Herme." In Hellenkemper Salies 1994, 959–70.

42.

A Technological Reexamination of the Piombino Apollo

Benoît Mille, Centre de Recherche et de Restauration des Musées de France (C2RMF) & UMR7055 Préhistoire et Technologie, Paris

Sophie Descamps-Lequime, Musée du Louvre, Département des Antiquités grecques, étrusques et romaines, Paris

Important advances have recently been made in the study of the Piombino Apollo, thanks to the rediscovery in 2010 of a fragmentary inscribed lead tablet with the partial names of two sculptors, initially found in the statue during the 1842 restoration ordered by the Louvre museum. The new results fully support the assumption of an Archaizing creation and moreover confirm the Rhodian origin of the statue. They allow us to propose a very narrow dating for its manufacture (120–100 BC) and to suggest that the statue was erected in the Rhodian sanctuary of Athena Lindia.

Such an accurate context is rarely achieved for an ancient large bronze statue. Henceforward, the Piombino Apollo may be regarded as an essential milestone for the knowledge of bronze manufacturing techniques in the Late Hellenistic period. Because technological data on the Piombino Apollo were lacking, a complete reexamination was undertaken. X-radiography, bulk-metal analyses by ICP-AES, and nondestructive analysis of the copper and silver inlays—by particle-induced X-ray emission (PIXE) with the AGLAE particle accelerator—were conducted in 2014, seeking specific technological markers of a Rhodian workshop at the end of the second century BC.

✦ ✦ ✦

Epigraphic and Stylistic Reevaluation of the Piombino Apollo

The Piombino Apollo (fig. 42.1) was among the statues gathered for the exhibition *Power and Pathos: Bronze Sculpture of the Hellenistic World* at the J. Paul Getty Museum and the accompanying symposium.[1] It is an Archaizing work, as was already suggested by Jean Letronne in 1834, just two years after the bronze was discovered in the sea off the west coast of Piombino, Italy. Letronne's interpretation was not accepted at the time, as the debate was then focused on the question of whether it was an Archaic or an Archaistic work. Later scholars moved on to another question: was it an Archaistic work from the fifth century BC or from the Hellenistic period? Even after Brunilde Sismondo Ridgway published a fundamental study of the statue in 1967, in which she convincingly argued in favor of a date at the end of the Hellenistic period, there were still those who doubted her conclusions. This was particularly so because a subsidiary question remained without an answer. This question was linked with the loss, more than a century before, of a fragmentary inscribed lead strip, said to have been found within the statue, on which the names of two Hellenistic sculptors were said to have been engraved. Because that lost inscription had been declared a fake—and this assertion could no longer be verified—Ridgway's dating was not accepted as proved. A further step supporting a Late Hellenistic date was the discovery in 1977 of another bronze Apollo[2] at Pompeii, in the House of Gaius Julius Polybius, that appeared to be so close in attitude and style that the two statues were declared virtual twins, possibly elaborated from the same master molds.[3]

Figure 42.1. Piombino Apollo, 120–100 BC. Bronze, H: 115.5 cm. Paris, Musée du Louvre, Département des Antiquités grecques, étrusques et romaines, inv. Br2
Image: © C2RMF, Anne Maigret

One of the opportunities afforded by the exhibition *Power and Pathos* was to accommodate close comparisons between similar statues put on display together. For the first time, the two Apollos were shown in the same room, and it appeared that, even if they obviously hark back to the same prototype and both are associated with the same Late Hellenistic and Early Imperial retrospective trend, their differences are as important as their similarities. The Piombino Apollo is squatter and less slender, while the Pompeian Apollo is taller. Unearthed with bronze tendrils, the latter was originally conceived as a *trapezophoros lychnouchos*, a decorative tray-bearer for adorning and lighting a triclinium.[4] The tendrils, when fixed in the statue's hands, were intended to support a *ferculum* (a table top) on which to place lamps or other items for the banquet. No traces in the hands of the Piombino Apollo indicate that he too would have been a *lychnouchos* by original intent.

The fragments of the inscribed lead strip, which were rediscovered in the Louvre's storerooms in 2010, were shown close to the statues in *Power and Pathos*. During the restoration of the bronze in 1842, the lead strip had been extracted in four fragments with great difficulty through the empty eye sockets, at the same time that very hard material remaining in the chest was removed. Three of these fragments had been preserved. As noted above, they retain two partial Greek names, which were deciphered in the year of their discovery but immediately declared a forgery.

However, once rediscovered, the strip as well as the sculptors' names were proved authentic by the historian and epigraphist Nathan Badoud, who recently republished the inscription.[5] He confirmed the name of the first artist, Menodotos of Tyre, and proposed Xenophon of Rhodes for the second one. The fragment that did not survive was the longest, and the second in sequence. The inscription is currently read as "Menodotos of Tyre and Xenophon of Rhodes made it." Menodotos belonged to a well-known Rhodian family workshop. He was the son of Artemidoros, the founder of the workshop, who had emigrated from Tyre and had settled on Rhodes in the 150s BC. According to Badoud, Menodotos was active from about 129 to 100 BC. Other known signatures, which survive on stone bases, attest that he worked with his father and with his younger brother Charmolas.[6] The lead strip from inside the Piombino Apollo reveals a third collaboration, which could have been with Xenophon, son of Pausanias. (The signature with Charmolas comes from Athens.) When he worked with his father, Menodotos elaborated a bronze portrait of Pasiphon, son of Epilykos, who was priest of Athana Lindia and therefore eponymous for the year 124 BC. This portrait was erected in the Rhodian sanctuary of Athana (or Athena) Lindia. And indeed, according to Badoud, regarding the Piombino Apollo, another clue might lead to the same Rhodian sanctuary. The votive three-line silver inlaid inscription, cut after casting into the statue's left foot, gives not only the two last letters of the dedicator's name but also two lines indicating that the statue was offered to Athena as a tithe. Thus, it is a statue of Apollo dedicated to Athena. The alphabet, the letters' shapes, and the meaning of the dedication point to the Rhodian sanctuary of Athana Lindia where a tradition of visiting gods is firmly attested.[7]

Actually, the Piombino Apollo fits in well with an Eastern Archaizing sculptural tradition of the Late Hellenistic period, as illustrated by a marble head from Rhodes, larger than life-size and echoing a bronze in having inserted eyes, now lost (fig. 42.2).[8] The similarities lie in the particular rendering of the sophisticated parted hair, with the presence of a thin fillet; in the two overlapping rows of corkscrew curls around the forehead; in the sinuous and broad incised lines that start from the top of the head; and even in the rendering of the ears.

Figure 42.2. Marble Head, Rhodes. Archaeological Museum of Rhodes, inv. E. 127
Image: © S. Descamps

Thus, the fact that the statue was most probably made in Rhodes during the last quarter of the second century BC is supported by external evidence. This accurate context justified a scientific reexamination of the statue, which is the subject of this paper.

Laboratory Reexamination of the Piombino Apollo

Analytical Procedure: An endoscopic examination was first performed during a kind of multidisciplinary brainstorming session within the bronze gallery of the Louvre Museum and then at the sickbed of the statue, as it were, in the laboratory, around which a number of eminent scholars gathered.[9] This day marked the beginning of the technological reexamination of the statue. In addition to endoscopy and a very careful examination by eye, extensive X-radiography was carried out at the Centre de Recherche et de Restauration des Musées de France (C2RMF) (fig. 42.3). Fourteen bronze samples were also taken by microdrilling in order to document and to compare the elemental composition of the different parts of the statue; these samples were analyzed by inductively coupled plasma atomic emission spectroscopy (ICP-AES).[10] Non-destructive analyses of the silver and copper inlays were performed by particle-induced X-ray emission (PIXE), thanks to the AGLAE particle accelerator.

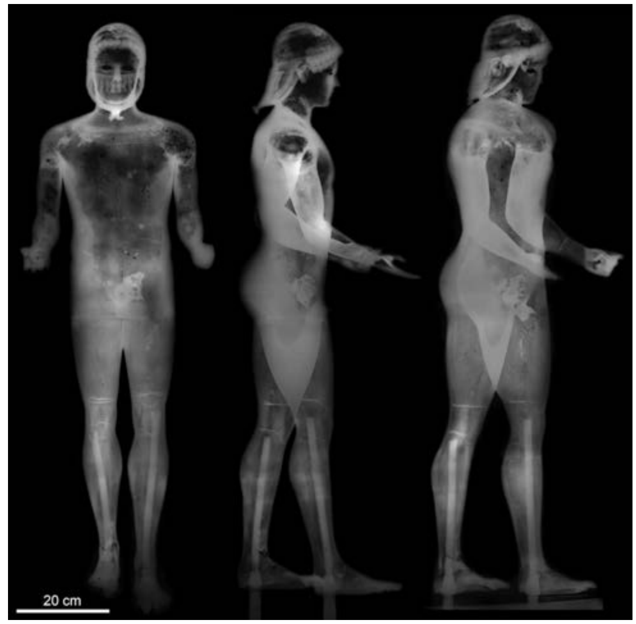


Figure 42.3. X-radiograph of the Piombino Apollo
Image: © C2RMF, E. Lambert

Metal Composition: A high-lead bronze was chosen for the primary castings, and the composition is virtually the same for all parts of the statue (head, body, arms, legs, fingers): 6% tin and 19.5% lead. The lips, eyebrows, and nipples are made of unalloyed copper: no tin, up to 2% lead. The letters of the inscription on the foot are inlaid with silver slightly alloyed with copper (3%), and containing 0.5% gold as its main impurity (fig. 42.4a; see also table 42.1 and table 42.2 for the complete results).

Analysis No.	Sample location	Casting type	Cu	Sn	Pb	Ag	As	Fe	Ni	S	Sb	Zn	Au	Ba	Bi	Cd	Co	Cr	Ge	Hg	In	Mg	Mn	Mo	P	Se	Te	Ti	U	V	W
				(in wt. %)									(in wt. ppm)																		
FZ20669-a	Head (curl)	PC	X	6.3 ±0.6	21 ±2	0.046 ±0.005	0.16 ±0.02	0.045 ±0.005	0.075 ±0.008	0.15 ±0.01	0.059 ±0.006	nd <0.00069	55 ±5	nd <0.2	140 ±14	nd <0.2	228 ±23	nd <0.9	nd <3.3	4.1 ±0.4	10 ±4	nd <3.1	nd <0.0	2.6° <8.4	nd <24 >2.5	12 ±2	27 ±5	nd <0.3	nd <9.3	nd <0.2	nd <2.2
FZ20669-b	Welding: head - body (left basin)	SC (welding)	X	6.5 ±0.7	21 ±2	0.047 ±0.005	0.17 ±0.02	0.041 ±0.004	0.076 ±0.008	0.15 ±0.01	0.061 ±0.006	nd <0.00080	42 ±4	nd <0.3	138 ±14	nd <0.3	227 ±23	nd <1.0	nd <3.9	4.1 ±0.4	8.2 ±1.7	nd <3.6	nd <0.1	nd <2.9	nd <28	9.9 ±1.1	31 ±3	nd <0.3	nd <11	nd <0.3	nd <2.6
FZ20669-c	Body (right flank)	PC	X	5.1 ±0.5	20 ±2	0.043 ±0.004	0.17 ±0.02	0.12 ±0.01	0.068 ±0.007	0.13 ±0.01	0.055 ±0.006	nd <0.00079	37 ±4	nd <0.3	63 ±6	nd <0.3	204 ±20	nd <1.0	nd <3.8	4.2 ±0.5	5.5° <8.0 >2.4	nd <3.6	nd <0.1	nd <2.9	nd <28	12 ±1	32 ±9	nd <0.3	nd <11	nd <0.3	nd <2.5
FZ20669-d	Welding: right arm - body	SC (welding)	X	9.3 ±0.9	13 ±1	0.081 ±0.008	0.51 ±0.05	0.11 ±0.01	0.071 ±0.007	0.26 ±0.03	0.11 ±0.01	0.047 ±0.005	27 ±3	nd <0.3	122 ±12	nd <0.3	40 ±4	nd <1.1	nd <4.3	4.2 ±1.3	9.6 ±4.8	nd <4.0	nd <0.1	nd <3.3	nd <31	24 ±2	26 ±9	nd <0.4	nd <12	nd <0.3	nd <2.9
FZ20669-e	Right arm	PC	X	6.5 ±0.6	21 ±2	0.045 ±0.005	0.16 ±0.02	0.043 ±0.004	0.073 ±0.007	0.19 ±0.02	0.059 ±0.006	nd <0.00096	27 ±3	nd <0.3	138 ±14	nd <0.3	228 ±23	nd <1.2	nd <4.6	4 ±0.4	9.4° <9.7 >2.9	nd <4.3	nd <0.1	nd <3.5	nd <34	9.1° <11.5 >3.4	28 ±3	nd <0.4	nd <13	nd <0.3	nd <3.1
FZ20669-f	Pinkie finger	PC	X	6 ±0.6	19 ±2	0.042 ±0.004	0.15 ±0.02	0.035 ±0.003	0.069 ±0.007	0.13 ±0.01	0.054 ±0.005	nd <0.00096	24 ±2	nd <0.3	128 ±13	nd <0.3	208 ±21	nd <1.2	nd <4.6	3.7 ±0.7	3.7° <9.7 >2.9	nd <4.3	nd <0.1	nd <3.5	nd <34	6.5° <11.5 >3.4	21 ±4	nd <0.4	nd <13	nd <0.3	nd <3.1
FZ20669-g	Welding: pinkie finger - right arm	SC (welding)	X	8.1 ±0.8	7.4 ±0.7	0.051 ±0.005	0.35 ±0.03	0.00081 ±0.00008	0.031 ±0.003	0.051° >0.020 <0.067	0.078 ±0.008	nd <0.00070	18 ±2	nd <0.2	57 ±6	nd <0.2	25 ±3	nd <0.9	nd <3.4	3.9 ±0.4	2.2° <7.0 >2.1	nd <3.1	nd <0.0	nd <2.5	nd <24	36 ±4	16 ±6	nd <0.3	nd <9.3	nd <0.2	nd <2.2
FZ20669-h	Left leg	PC	X	5.1 ±0.5	16 ±2	0.04 ±0.004	0.18 ±0.02	0.13 ±0.01	0.068 ±0.007	0.13 ±0.01	0.053 ±0.005	nd <0.00066	29 ±3	nd <0.2	57 ±6	nd <0.2	220 ±22	nd <0.8	nd <3.2	4.5 ±0.6	9.7 ±1.1	nd <3.0	nd <0.0	nd <2.4	nd <23	12 ±2	28 ±3	nd <0.3	nd <8.9	nd <0.2	nd <2.1
FZ20669-i	Welding: left foot - left leg	SC (welding)	X	6 ±0.6	19 ±2	0.044 ±0.004	0.17 ±0.02	0.025 ±0.003	0.075 ±0.007	0.13 ±0.01	0.056 ±0.006	nd <0.00073	63 ±6	nd <0.3	66 ±7	nd <0.2	112 ±11	nd <0.9	nd <3.6	4 ±0.6	4.3° <7.4 >2.2	nd <3.3	nd <0.0	nd <2.7	nd <26	12 ±2	35 ±7	nd <0.3	nd <9.9	nd <0.3	nd <2.3
FZ20669-j	Left foot (forefoot)	PC	X	6.3 ±0.6	21 ±2	0.047 ±0.005	0.16 ±0.02	0.056 ±0.006	0.075 ±0.007	0.15 ±0.02	0.06 ±0.006	nd <0.00068	39 ±4	nd <0.2	141 ±14	nd <0.2	224 ±22	nd <0.9	nd <3.3	4 ±0.7	6.9 ±1.7	nd <3.1	nd <0.0	nd <2.5	nd <24	10 ±2	33 ±6	nd <0.3	nd <9.2	nd <0.2	nd <2.2
FZ20669-k	Right leg	PC	X	6.3 ±0.6	19 ±2	0.045 ±0.005	0.18 ±0.02	0.024 ±0.002	0.072 ±0.007	0.12 ±0.01	0.057 ±0.006	nd <0.00089	40 ±4	nd <0.3	60 ±6	nd <0.3	110 ±11	nd <1.1	nd <4.3	4.4 ±0.4	4.8° <9.0 >2.7	nd <4.0	nd <0.1	nd <3.3	nd <31	13 ±2	30 ±4	nd <0.4	nd <12	nd <0.3	nd <2.9
FZ20669-l	Welding: right foot - right leg	SC (welding)	X	5.5 ±0.5	17 ±2	0.041 ±0.004	0.16 ±0.02	0.025 ±0.003	0.075 ±0.008	0.13 ±0.01	0.051 ±0.005	nd <0.00072	35 ±4	nd <0.2	54 ±7	nd <0.2	114 ±11	nd <0.9	nd <3.5	4.4 ±0.7	6.2° <7.3 >2.2	nd <3.2	nd <0.0	nd <2.6	nd <25	9.8 ±1.0	29 ±9	nd <0.3	nd <9.7	nd <0.3	nd <2.3
FZ20669-m	Right foot (forefoot)	PC	X	6.5 ±0.7	19 ±2	0.046 ±0.005	0.17 ±0.02	0.06 ±0.006	0.077 ±0.008	0.16 ±0.02	0.061 ±0.006	nd <0.00078	31 ±3	nd <0.3	135 ±14	nd <0.3	229 ±23	nd <1.0	nd <3.8	4 ±0.4	9 ±3.5	nd <3.5	nd <0.0	nd <2.8	nd <27	9.8 ±3.7	33 ±13	nd <0.3	nd <10	nd <0.3	nd <2.5
FZ20669-n	Fourth toe of the right foot	SC (repair)	X	4.2 ±0.4	13 ±1	0.18 ±0.02	0.4 ±0.04	0.0082 ±0.0008	0.087 ±0.009	0.15 ±0.02	0.28 ±0.03	0.69 ±0.07	52 ±5	nd <0.3	393 ±39	nd <0.3	103 ±10	nd <1.0	nd <3.9	5.3 ±0.5	9.3 ±3.3	nd <3.6	nd <0.1	nd <3.0	nd <28	21 ±3	31 ±6	nd <0.3	nd <11	nd <0.3	nd <2.6

° = below the limit of quantification. PC = primary casting. SC = secondary casting.

Table 42.1. Results of the ICP-AES analyses made at the C2RMF on the bronze parts of the Piombino Apollo. Results in wt% or wt. ppm. X = base metal (not quantified). nd = below the limit of detection.

Analysis No.	Location	Cr	Mn	Fe	Co	Ni	Cu	Zn	As	Se	Mo	Ag	Cd	In	Sn	Sb	Te	Au	Hg	Pb	Bi
07mai006	Cu - right eyebrow	<0.3	<0.05	0.33	<0.0058	0.067	**98.3**	<0.017	0.032	<0.0071	<0.0098	0.071	<0.015	<0.009	<0.022	<0.021	<0.02	<0.0085	<0.0094	0.96	<0.0099
07mai007	Cu - left eyebrow	<0.26	<0.066	0.28	<0.0026	0.077	**99.1**	<0.018	<0.021	<0.0023	<0.0053	0.076	<0.0087	<0.0073	<0.013	0.07	<0.0091	<0.011	<0.0041	0.098	<0.0063
07mai008	Cu - upper lip	<0.32	<0.048	0.42	<0.012	0.066	**97.6**	<0.025	0.19	<0.0084	<0.0052	0.055	<0.019	<0.0053	<0.045	<0.016	<0.029	<0.013	<0.0094	**1.7**	<0.014
07mai010	Cu - lower lip	<0.21	<0.077	0.47	<0.017	0.072	**98.8**	<0.024	0.2	<0.005	<0.011	0.029	<0.0098	<0.0032	<0.031	<0.031	<0.024	<0.014	<0.0079	0.18	<0.0086
07mai011	Cu - right nipple	<0.29	<0.057	0.28	<0.014	0.093	**98.9**	<0.018	0.14	<0.0042	<0.011	0.056	<0.026	<0.008	<0.016	<0.051	<0.021	<0.012	<0.0082	0.17	<0.0064
07mai012	Cu - left nipple	<0.28	<0.065	0.46	0.097	0.095	**98.7**	<0.018	0.2	<0.0049	<0.0048	0.048	<0.018	<0.0069	<0.0059	<0.029	<0.025	<0.01	<0.004	0.07	<0.0066
07mai013	Ag - left foot	<0.36	<0.039	0.33	<0.013	0.067	**9.8**	<0.011	0.085	<0.0036	<0.0024	**85.8**	<0.036	<0.084	**2.9**	<0.047	<0.031	0.45	<0.0051	**2.1**	<0.0072
07mai014	Ag - left foot - no scan	<0.35	<0.059	0.024	<0.0086	0.054	**3.1**	<0.0059	<0.014	<0.0036	<0.0021	**95.9**	<0.027	<0.074	<0.59	<0.04	<0.023	0.48	<0.0026	0.41	0.029

Table 42.2. Results of the PIXE analyses made at the C2RMF on the copper and silver inlays of the Piombino Apollo. Results in wt%.

The alloy used as filler metal for welding (the so-called secondary casting) matches perfectly the one used for primary castings (head to body, left and right feet to the corresponding legs), with two exceptions: the join of the right arm to the body (sample FZ20669-d), and the join of the pinkie finger to the right hand (sample FZ20669-g), which contain more tin and less lead (see fig. 42.4a).

Last but not least, the fourth toe of the right foot (sample FZ20669-n) was repaired in antiquity, as can be seen very clearly on a detail of the X-radiograph: a tenon was inserted in the foot at the base of the broken toe, and the missing part was directly cast on the tenon. Here, the alloy is also different, only 4% tin and 12% lead (see fig. 42.4a). Given the difference in the alloy, it seems more likely that the toe repair was not made in the original workshop but was part of a later restoration, during the ancient "lifetime" of the statue.

When we look at the main impurities in the metal, the first thing to notice is that the primary and secondary castings share identical impurities spectra: a global level of 0.6%, with arsenic and sulfur as the main impurities (fig. 42.4b).

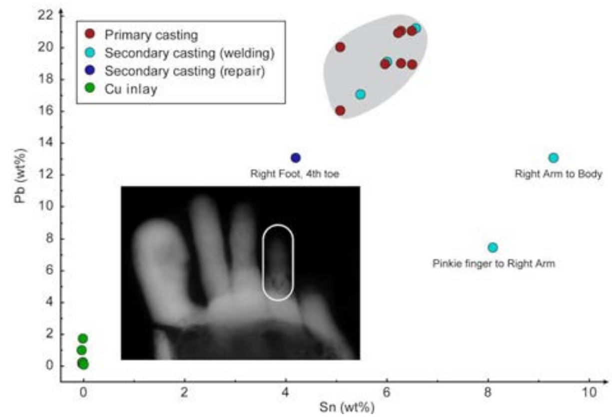


Figure 42.4a. Metal composition of the Piombino Apollo, alloy and impurities pattern. Tin and lead contents of the different parts of the statue

Image: © C2RMF, B. Mille

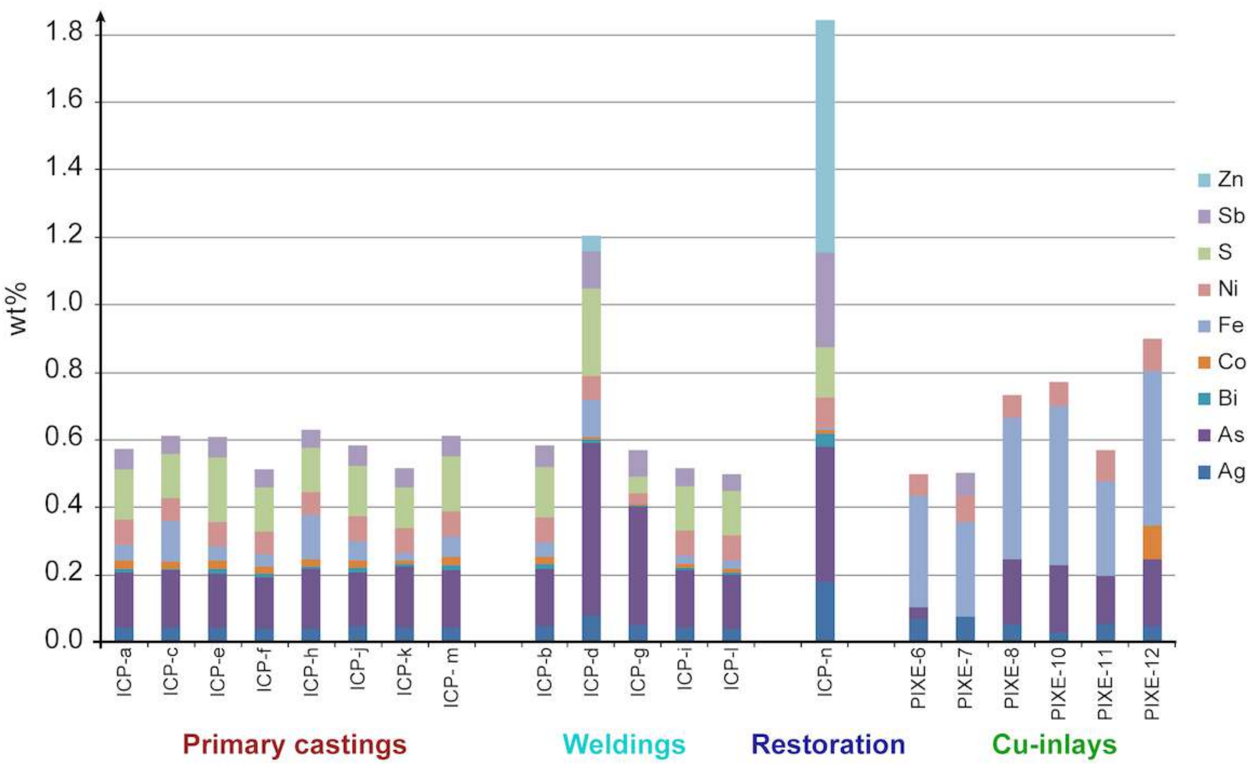


Figure 42.4b. Metal composition of the Piombino Apollo, alloy and impurities pattern. Cumulated content of main impurities for each analysis

Image: © C2RMF, B. Mille

The pattern observed for the fourth toe is very different, with high levels of arsenic, bismuth, antimony, and zinc, confirming the hypothesis of a later repair. Interesting is the fact that the weld join of the right arm, which shows a peculiar alloy, is also distinctive for its impurities, and quite close to the pattern of the fourth toe. This may suggest that the restoration was not limited to the replacement of the fourth toe, but that the statue underwent a major intervention.

As to the copper inlays, at least two impurities patterns stand out from that of the primary castings: iron-rich without arsenic for the eyebrows; and arsenic- and iron-rich for the lips and the nipples (see table 42.2).

Casting Technique: Working the Wax

The wax was primarily worked by the indirect process, resulting in thin and even metal walls. We were able to take a limited number of direct measurements using a thickness gauge, through the eyes of the statue and at the aperture of the feet. The walls were between 3 and 4 mm thick, and X-radiography confirmed that the metal walls were of a consistent thickness throughout (see fig. 42.3).[11] Based on X-radiography combined with surface and endoscopic examinations, we concluded that wax was used to fill the inside of smaller details in relief, such as the nose, the ears, the toes, and the fingers. Given also the fact that no wax-to-wax joins were detected, except for a bib-like shape below the neck, the artisans probably used the slush technique: some liquid wax was poured into the corresponding molds of each section to deposit a layer of uniform thickness, the excess liquid wax being subsequently removed by inverting the mold.

A noticeable exception to the indirect process is the complex hairstyle, which shows some extra work done in the positive of the wax (fig. 42.5). In the skull area, each strand of hair has been very finely figured and engraved in the wax. Hair undulations combine with slight indentations of the head to produce the effect of a stepped hairstyle in four successive waves. At the forehead, from ear to ear, the strands end in a double row of corkscrew curls, which were directly carved and then added to the head one by one (fig. 42.6).

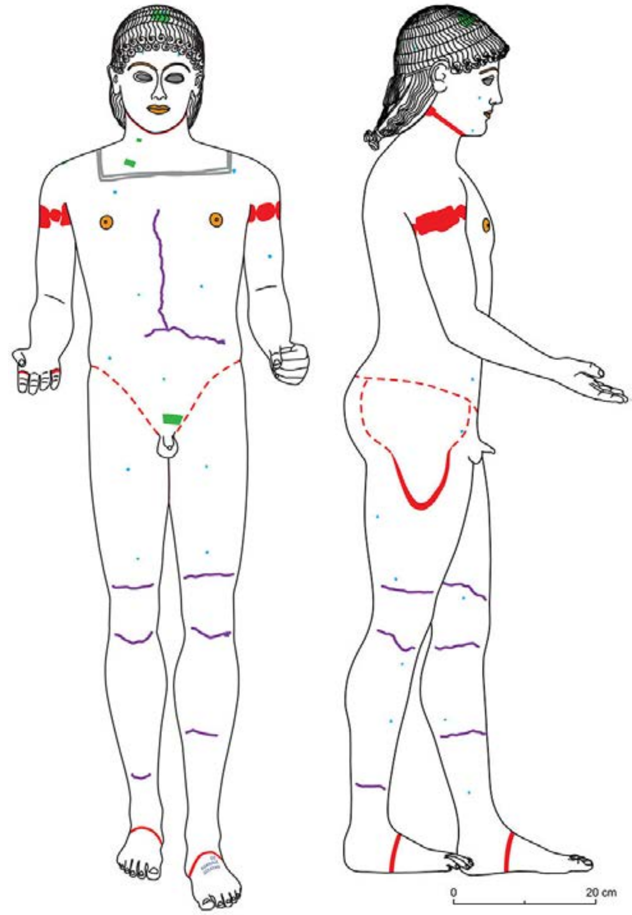


Figure 42.5. Piombino Apollo, drawing of the technological features, showing the hair details done in the positive of the wax (black lines), the primary castings (white), the wax-to-wax joins (gray),the flow fusion welds (red), the core flashing lines (purple), the core pins (light blue), the repairs (rectangular patches or casting on, green), the copper inlays (orange), and the silver inlays on left foot (dark blue)

Image: © C2RMF, B. Mille

Figure 42.6. Piombino Apollo, three-quarter view detailing the work done in the positive of the wax and the copper inlays
Image: © C2RMF, G. Parisse

The bib-like shape below the neck previously mentioned corresponds to the only detectable wax-to-wax join. The Piombino Apollo is not the only case to present this peculiar feature: other examples of statues from the Late Hellenistic and Early Imperial periods are also known.[12] It is possible that this join could indicate a certain division of labor in the workshop, where the most intricate parts such as face and hair, requiring extensive, delicate work on the wax, were made by a very skilled craftsman and then added to the other parts of the statue.

Casting Technique: Joining the Parts

X-radiographs helped to determine the join locations (see fig. 42.3), allowing us to infer a casting map, which lists the separately cast parts and shows where the wax model was cut.[13]

We know that the statue was cast in nine or ten sections: head, body, arms, legs, two fingers, and the anterior parts of the feet. At least one of the legs would likely have been cast separately. But the join is so perfect that we were unable to detect it. Thus, one leg may or may not have been cast together with the body (fig. 42.7).

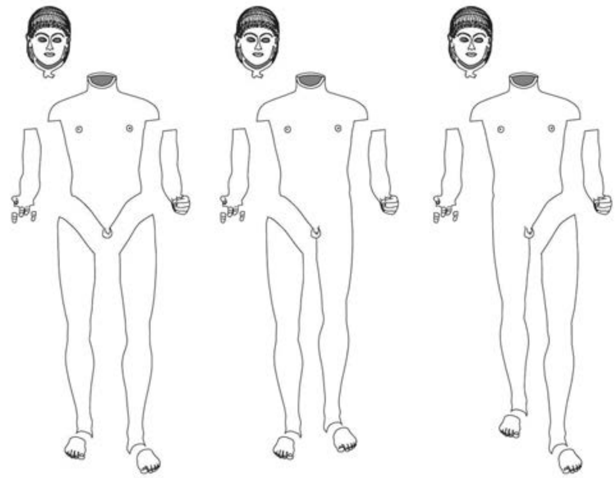


Figure 42.7. Casting map of the Piombino Apollo: three options are possible depending on the way legs were joined.
Image: © C2RMF, B. Mille

A flow fusion welding process was used to join the different sections of the statue, involving a filler metal of the same composition as the one used for the primary castings (see also "Casting Technique: Working the Wax").[14] The high-level mastery in joining is a very meaningful aspect to record: not only were the bronze casters able to use a broad array of preparation techniques, but they also achieved welds without any defects. Three different preparations for the joins were observed. First, welding in basins for the arms (see fig. 42.5): such joins are known from at least the fifth century BC to the third century AD.[15] Second, platform welding for the head and between the legs (see fig. 42.5 and fig. 42.8): this kind of preparation is not known before the Hellenistic period.[16] Third, linear joins are observed on the feet (see fig. 42.5). Such joins are totally atypical for the Late Hellenistic period but are very well known on statues from the Severe style period (ca. 480–450 BC), as for example on the Poseidon statue from Cape Artemision.[17] This technical trait, purposefully adopted from statues of the first half of the fifth century BC, reinforces the notion that the Apollo was executed in Archaic-revival style, as it would have been easily visible by anyone on close examination.

Figure 42.8. Endoscopic image showing the platform welding of the head from the inside
Image: © C2RMF, B. Mille

Casting Technique: Core Pins and Repairs to the Casting Defects

Important observations were made concerning the core pins, or chaplets (square rods measuring 3.5 x 3.5 mm in section), since they were made not of iron but of a copper alloy. Even with the help of X-radiography, they are particularly difficult to detect, and we probably missed a few of them. From those that have been detected, it seems that they were very regularly arranged, every 20 centimeters or so (see fig. 42.5). Due to their metal composition, the core pins were often partially melted during the cast. It was therefore unnecessary to remove them or to hide the corresponding holes, saving the workshop a lot of labor-intensive repairs. Such a practice is just the kind of technological marker we are looking for, as the core pins evidenced here seem very specific to the workshop that manufactured the statue.

Exceptional is the fact that the Apollo statue was cast virtually free of defects, compared to other statues from the Hellenistic period. The smallest defects were hidden by quadrangular bronze patches, whereas a larger lacuna on top of the head was filled by a secondary casting (see fig. 42.5).

Conclusion

Certain questions concerning the Piombino Apollo remain open. Why did the sculptors hide their signatures inside the bronze? Let us remember that it was common for craftsmen to have their names inscribed on the bases that supported their works. This tradition was particularly well attested in Rhodes where there are numerous stone bases for bronze statues, from the fourth century onward, some of them signed not only by the sculptor but by the bronze-caster as well.[18] They could have engraved their names on the actual statues or on their plinths if there were any.

The hidden signatures were never supposed to be read again. But this was not the case for the votive inscription on the left foot, which could be read by anyone looking at the statue. This inscription could be interpreted as witnessing the fact that the statue once stood in a Rhodian sanctuary. If so, did the pilgrims visiting Rhodes see the Apollo statue as a true Archaic ex-voto and were thus deceived by the style? Or, on the contrary, did they understand it as an Archaizing creation?

Another question concerns the shipment to Italy. The statue was found in a shipwreck, but we have no evidence that it was taken as booty or was displaced by looting. Still, the bronze does bear traces of repair. If the new study confirms that the left foot was never broken and restored in antiquity, as has been suggested more than once,[19] it is still clear that the fourth toe was recast and that this took place most probably when the right arm was reattached to the shoulder, since the weld join seems to come from the same metal batch. This means not only that a certain time had passed between the creation of the statue and this secondary intervention, but also that there was enough peaceful time for a restoration to be planned and completed. This doesn't fit well with the violent desecration of a sanctuary followed by a shipment as booty.

Another solution can't be ruled out: the possibility that Menodotos and Xenophon intentionally fabricated a forgery. The red copper inlays on the eyebrows were intended to suggest a Late Archaic or Early Classical sculpture, and so do the linear joins on the feet. In this scenario, the Apollo would have been executed directly for commercial purposes and purchased to adorn a Roman place. The votive inscription, which bestowed a Rhodian sacred origin to the statue, could have been added in order to deceive the viewer and the potential buyer regarding the true importance of the bronze.[20] No one can tell, however, whether the Apollo was intended to be displayed in a Roman house as a genuine work of art or, if slightly modified with attributes, as a *lychnouchos*. Be that as it may, it offers the first and, up to now, only testimony of the practice of hiding signatures in a bronze statue.

It is rare to be able to pinpoint the context of production for an ancient large bronze statue. Thus, from now on, the Piombino Apollo is to be regarded as an essential reference point not only for the study of Rhodian bronze manufacture but more generally for the knowledge of large bronzes' manufacturing techniques during the Late Hellenistic period.

Very few bronze statues have been uncovered on Rhodes.[21] Technological data of such finds should be compared with data revealed by the examination of the Piombino Apollo in order to verify the extremely high level and mastery of Rhodian workshops.[22] As a work dated to the very end of the second century BC, the Piombino Apollo was cast with a distinctive low-tin and high-lead copper alloy with a readily identifiable pattern of impurities. The slush process was used to achieve the thin, even wax walls of the main parts of the statue, thus eliminating two possible sources of casting defects of the indirect lost-wax technique: (1) the wall thickness cannot be less than the minimum chosen by the foundryman (here 3 mm); and (2) there are no wax-to-wax joins. Distinctive core pins made of a copper alloy rather than iron are in evidence: removing them was unnecessary, thus eliminating one common cause of defects needing repair. Last but not least, the joins are extremely well executed. As a consequence, the statue appears to be virtually free of casting defects. Could these results, which reveal a high skill in casting, characterize the Rhodian industry as evoked by Carol C. Mattusch already in 1998?[23] In other words, given the well-attested intensive production of Rhodian workshops, was there something like a Rhodian bronze technique? In point of fact, statues said to have been found in Rhodes, such as the *Eros Sleeping* at the Metropolitan Museum,[24] also present very few casting defects. This is also the case for the fragments excavated within the remains of ancient Rhodian foundries, which, moreover, are all characterized by a low-tin and high-lead copper alloy.[25]

Very detailed comparative studies are still required before a distinct Rhodian bronze technique can be defined. The next step for research will be to explore the possible Rhodian origin of other large bronze statues and to compare the Piombino Apollo with other bronzes coming (or supposedly coming) from Rhodes or its vicinity. More works have to be investigated, in order to associate them, potentially, with the same production (fig. 42.9).[26]

Figure 42.9. *Eros and Psyche*. Roman, possible Rhodian production. Bronze, H: 72.5 cm. Paris, Musée du Louvre, Département des Antiquités grecques, étrusques et romaines, inv. Br4105
Image: © RMN-Grand Palais (musée du Louvre) / Hervé Lewandowski

✦ ✦ ✦

Notes

1. Descamps-Lequime 2015, no. 47, with related bibliography.
2. Lapatin 2015, no. 48.
3. Mattusch 1996a, 139–40, plates 5–6.
4. Queyrel 2012, 67–68.
5. Badoud 2010, 137–38; Badoud 2015, 281, no. 105.
6. Badoud 2015, 281, 285, 430–31, nos. 99, 103.
7. Badoud 2017.
8. Rhodes, Archaeological Museum, inv. E. 127; Konstantinopoulos 1977, 83, no. 137, fig. 119.
9. This examination was part of the workshop "Originaux, répliques et pastiches: Techniques d'élaboration et datation des grands bronzes antiques," held in Paris on February 13, 2013; to be published in 2017.
10. For a similar analysis, see Bourgarit and Mille 2003.
11. The lighter gray shade that appears in the X-ray of the legs area is linked to a modern restoration filling.
12. Analogous wax-to-wax joins are visible on X-radiographs of the Child Dionysos (Mattusch 1996b, 240–41, fig. 26c), the Salamis Youth (Heilmeyer 1996, plate 20), and the Eros from Agde (Mille et al., 2012, fig. 14).

13. The number and placement of the cuts is the choice of the bronze caster. It depends partly on his ability to cast large pieces and manufacture complex molds and sprue systems, and partly on his mastery of efficient joining processes.
14. Azéma et al. 2011.
15. Examples of welding in basins are far too numerous to be cited here. See the Riace bronzes for fifth-century BC examples (Formigli 1984, fig. 24) and the horse from Neuvy-en-Sullias for a later Imperial one (Mille 2007).
16. For joining heads: drawing, explanation of the technique, and known examples in Mille et al. 2012, sections 44 and 49, figs. 17–20, 23–24, nos. 62–63. For legs, see Azéma et al. 2012, 156–59 and figs. 2, 4.
17. Azéma 2013, 143.
18. Goodlett 1991, 673.
19. Dow 1941, 358: the author proposed that the two names were those of the restorers who repaired the statue. If so, this would have meant that the eye sockets were already empty at the time of the restoration. More probably and as usual, the verb form "ἐποίησαν" was used to designate the sculptors who conceived the statue.
20. Ridgway 1996, 129.
21. *Statue of Eros Sleeping* (New York, Metropolitan Museum of Art, inv. no. 43.11.4): Hemingway 2015a; *Portrait Statue of an Aristocratic Boy* (idem. inv. 14.130.1): Hemingway et al. 2002; Hemingway 2015b. In Berlin, *Statue of a Boy Athlete* (Praying Boy), Berlin, Antikensammlung, inv. Sk 2: Zimmer and Hackländer 1997; Mattusch 1998, 149–50. On bronze fragments of different statues, see Zimmer and Bairami 2008, 99–107, plates 2–6.
22. Mattusch 1998; Zimmer and Bairami 2008, 208–10.
23. Mattusch 1998, 156: "We have no evidence for a Rhodian 'school' of sculptors, but we have plentiful evidence for a Rhodian sculptural industry."
24. See above n. 21.
25. Zimmer and Bairami 2008, 208.
26. Such as the group of *Eros and Psyche*, Paris, Musée du Louvre, Département des Antiquités grecques, étrusques et romaines, inv. no. Br 4105 (see fig. 42.9).

Bibliography

Azéma 2013
Azéma, A. 2013. "Les techniques de soudage de la grande statuaire antique en bronze: étude des paramètres thermiques et chimiques contrôlant le soudage par fusion au bronze liquide." Thèse de doctorat, Université Pierre et Marie Curie (Paris 6).

Azéma et al. 2011
Azéma, A., B. Mille, P. Echegut, and D. De Sousa Meneses. 2011. "An Experimental Study of the Welding Techniques Used on the Greek and Roman Large Bronze Statues." *Historical Metallurgy* 45(2): 71–80.

Azéma et al. 2012
Azéma, A., B. Mille, F. Pilon, J.-C. Birolleau, and L. Guyard. 2012. "Étude archéométallurgique du dépôt de grands bronzes du sanctuaire gallo-romain du Vieil-Évreux (Eure)." *Archéosciences* 36: 153–72.

Badoud 2010
Badoud, N. 2010. "Une famille de bronziers originaires de Tyr." *ZPE* 172: 125–43.

Badoud 2015
Badoud, N. 2015. *Le temps de Rhodes: Une chronologie des inscriptions de la cité fondée sur l'étude de ses institutions*. Munich: C. H. Beck.

Badoud 2017
Badoud, N. 2017. "La lame de plomb découverte à l'intérieur de l'Apollon de Piombino." In *Originaux, répliques et pastiches: Techniques d'élaboration et datation des grands bronzes antiques (Paris, Musée du Louvre-C2RMF, February 13, 2013)*, ed. S. Descamps-Lequime and B. Mille. *Technè* 45.

Bourgarit and Mille 2003
Bourgarit, D., and B. Mille. 2003. "The Elemental Analysis of Ancient Copper-based Artefacts by Inductively-Coupled-Plasma Atomic-Emission-Spectrometry (ICP-AES): An Optimized Methodology Reveals Some Secrets of the Vix Crater." *Measurement Science and Technology* 14: 1538–55.

Daehner and Lapatin 2015
Daehner, J. M., and K. Lapatin, eds. 2015. *Power and Pathos: Bronze Sculpture of the Hellenistic World*. Exh. cat. Los Angeles, J. Paul Getty Museum. Florence: Giunti; Los Angeles: J. Paul Getty Museum.

Descamps-Lequime 2015
Descamps-Lequime, S. 2015. "Statue of Apollo (Piombino Apollo)." In Daehner and Lapatin 2015, 288–91, no. 47.

Dow 1941
Dow, S. 1941. "A Family of Sculptors from Tyre." *Hesperia* 10: 351–60.

Formigli 1984
Formigli, E. 1984. "La tecnica di costruzione delle statue di Riace." In *Due Bronzi da Riace: Rinvenimento, restauro, analisi ed ipotesi di interpretazione 1–2,* ed. L. Vlad Borrelli and P. Pelagatti, 107–42. Bollettino d'Arte, serie speciale 3. Rome: Libreria dello Stato.

Goodlett 1991
Goodlett, V. C. 1991. "Rhodian Sculpture Workshops." *AJA* 95: 669–81.

Heilmeyer 1996
Heilmeyer, W.-D. 1996. *Der Jüngling von Salamis: Technische Untersuchungen zu römischen Großbronzen*. Mainz: Philipp von Zabern.

Hemingway 2015a
Hemingway, S. 2015. "Statue of Eros Sleeping." In Daehner and Lapatin 2015, 228–29, no. 20.

Hemingway 2015b
Hemingway, S. 2015. "Portrait Statue of an Aristocratic Boy." In Daehner and Lapatin 2015, 260–61, no. 35.

Hemingway et al. 2002
Hemingway, S., E. Milleker, and R. E. Stone. 2002. "The Early Imperial Bronze Statue of a Boy in the Metropolitan Museum of Art: A Technical and Stylistic Analysis." In *I Bronzi Antichi: Produzione e tecnologia: Atti del XV Congresso Internazionale sui Bronzi Antichi, Grado-Aquileia, 22–26 maggio 2001*, ed. A. Giumlia-Mair, 200–207.

Monographies instrumentum 21. Montagnac: Editions Monique Mergoil.

Konstantinopoulos 1977
Konstantinopoulos, G. 1977. *Musées de Rhodes*. Vol. 1: *Musée archéologique*. Athens: Apollo.

Lapatin 2015
Lapatin, K. 2015. "Statue of Apollo (Kouros)." In Daehner and Lapatin 2015, 292–93, no. 48.

Mattusch 1996a
Mattusch, C. C. 1996. *Classical Bronzes: The Art and Craft of Greek and Roman Statuary*. Ithaca and London: Cornell University Press.

Mattusch 1996b
Mattusch, C.C. 1996. *The Fire of Hephaistos: Large Classical Bronzes from North American Collections*. Exh. cat. Cambridge (MA), Harvard University Art Museums.

Mattusch 1998
Mattusch, C. C. 1998. "Rhodian Sculpture: A School, A Style or Many Workshops?" In *Regional Schools in Hellenistic Sculpture*: *Proceedings of an International Conference Held at the American School of Classical Studies at Athens, March 15–17, 1996*, ed. O. Palagia and W. Coulson, 149–56. Oxbow Monograph 90. Oxford: Oxbow Books.

Mille 2007
Mille, B. 2007. "Étude technique du cheval de bronze de Neuvy-en-Sullias." In *Le cheval et la danseuse: À la redécouverte du trésor de Neuvy-en-Sullias*, ed. C. Gorget and J.-P. Guillaumet, 88–99, 264–65. Paris: Somogy; [Orléans]: Musée des beaux-arts d'Orléans; [Bavay]: Musée/site d'archéologie.

Mille et al. 2012
Mille, B., L. Rossetti, and C. Rolley. 2012. "Les deux statues d'enfant en bronze (Cap d'Adge): Étude iconographique et technique." In *Bronzes grecs et romains: Recherches récentes: Hommage à Claude Rolley (Actes de colloque, INHA, 16–17 juin 2009)*, ed. M. Denoyelle, S. Descamps, B. Mille, and S. Verger. http://inha.revues.org/3949

Queyrel 2012
Queyrel, F. 2012. "L'Alexandre d'Agde: Un porte-plateau ou un porte-flambeau." In *De l'Éphèbe à l'Alexandre d'Agde*, 61–69. Agde: Musée de l'Éphèbe & d'Archéologie sous-marine.

Ridgway 1996
Ridgway, B. S. 1996. "Roman Bronze Statuary: Beyond Technology." In Mattusch 1996b, 122–37.

Zimmer and Hackländer 1977
Zimmer, G., and N. Hackländer. 1977. *Der Betende Knabe: Original und Experiment*. Frankfurt am Main: P. Lang.

Zimmer and Bairami 2008
Zimmer, G., and K. Bairami. 2008. *Ροδιακά εργαστήρια χαλκοπλαστικής* (Rhodian Bronze Workshops). Athens: TAPA.

43.

New Results on the Alloys of the Croatian Apoxyomenos

Iskra Karniš Vidovič, Hrvatski restauratorski zavod (HRZ: Croatian Conservation Institute), Zagreb, Croatia
Benoît Mille, Centre de Recherche et de Restauration des Musées de France (C2RMF) & UMR7055 Préhistoire et Technologie, Paris

Following the cooperation initiated in 2012 between the Croatian Conservation Institute (HRZ) and the Centre de Recherche et de Restauration des Musées de France (C2RMF), the two institutions furthered their common investigation of the Croatian Apoxyomenos, a bronze male statue of the second or first century BC found in the sea in 1999. A new set of metal analyses was performed in order to clarify the alloy composition of the statue. In previous analytical campaigns, problems were encountered due to the heterogeneity of the metal and the heavy corrosion of the statue. We concluded that for a correct determination of the metal composition, a larger sample size was required. In addition, great care had to be taken to avoid inclusion of corrosion products in the samples, and that sample locations had to be chosen according to the results of a detailed investigation into the manufacturing technique of the statue.

✦ ✦ ✦

Introduction

The statue of an Apoxyomenos (fig. 43.1), raised from the Adriatic Sea off Croatia in 1999, has been thoroughly restored and investigated at the Croatian Conservation Institute (HRZ). It has been exhibited in Zagreb, Osijek, Rijeka, Split, and Zadar in Croatia, as well as in Florence, Ljubljana, Paris, London, and Los Angeles. Results of conservation-restoration works and investigations have been published and presented at several conferences, including international congresses on ancient bronzes in Bucharest (2003) and Zurich (2013).

Figure 43.1a. The statue of the Apoxyomenos after conservation. Right three-quarter view
Image: Lj. Gamulin, 2015 Croatian Conservation Institute (HRZ)

Figure 43.1b. The statue of the Apoxyomenos after conservation. Front
Image: Lj. Gamulin, 2015 (HRZ)

Figure 43.1c. The statue of the Apoxyomenos after conservation. Left three-quarter view
Image: Lj. Gamulin, 2015 (HRZ)

In 2012, during the exhibition of the statue at the Louvre, the HRZ established a collaboration with that institution, which led in 2013 to new insights into the technology of the Croatian Apoxyomenos,[1] and continued in 2015 with a new campaign to analyze the alloys used to produce the statue.

Alloy Investigation Prior to 2013

After the statue had been raised from the sea in 1999, and before its conservation, the most important tasks were to determine its state of preservation, to prepare it for transport to the HRZ in Zagreb, and to determine a conservation methodology. Therefore, while it was still on the island of Lošinj in 1999, μ-radiography with an iridium-192 source was performed, using a portable device. This process yielded images that not only showed problematic areas on the statue, such as fractures and lacunae, but also illustrated the technique by which the statue was manufactured.

The conservation treatments and research performed at the HRZ in Zagreb in cooperation with the Opificio delle Pietre Dure (OPD) lasted for six years until 2006.[2]

In 1999, more than a hundred different samples were collected from the interior and exterior of the statue. However, the amount of metal in these samples was very small and mostly included corrosion products.

After a first and necessary desalination, several sampling and analytical campaigns were conducted between 1999 and 2003, by taking metal samples and by performing surface analyses during the conservation-restoration treatments. The aim was to provide information about the elemental composition of the alloys used for primary and secondary castings (including welding and repairs), soldering, patches, and inlays.

In the first phase of sampling, between 1999 and 2002, during the initial conservation treatment, some 43 samples were analyzed at the Scientific Laboratory of the OPD: 14 metal fragments, 9 solder and welding alloy samples, 20 samples of corrosion products and crystals on the internal and external surface of the bronze (fig. 43.2).

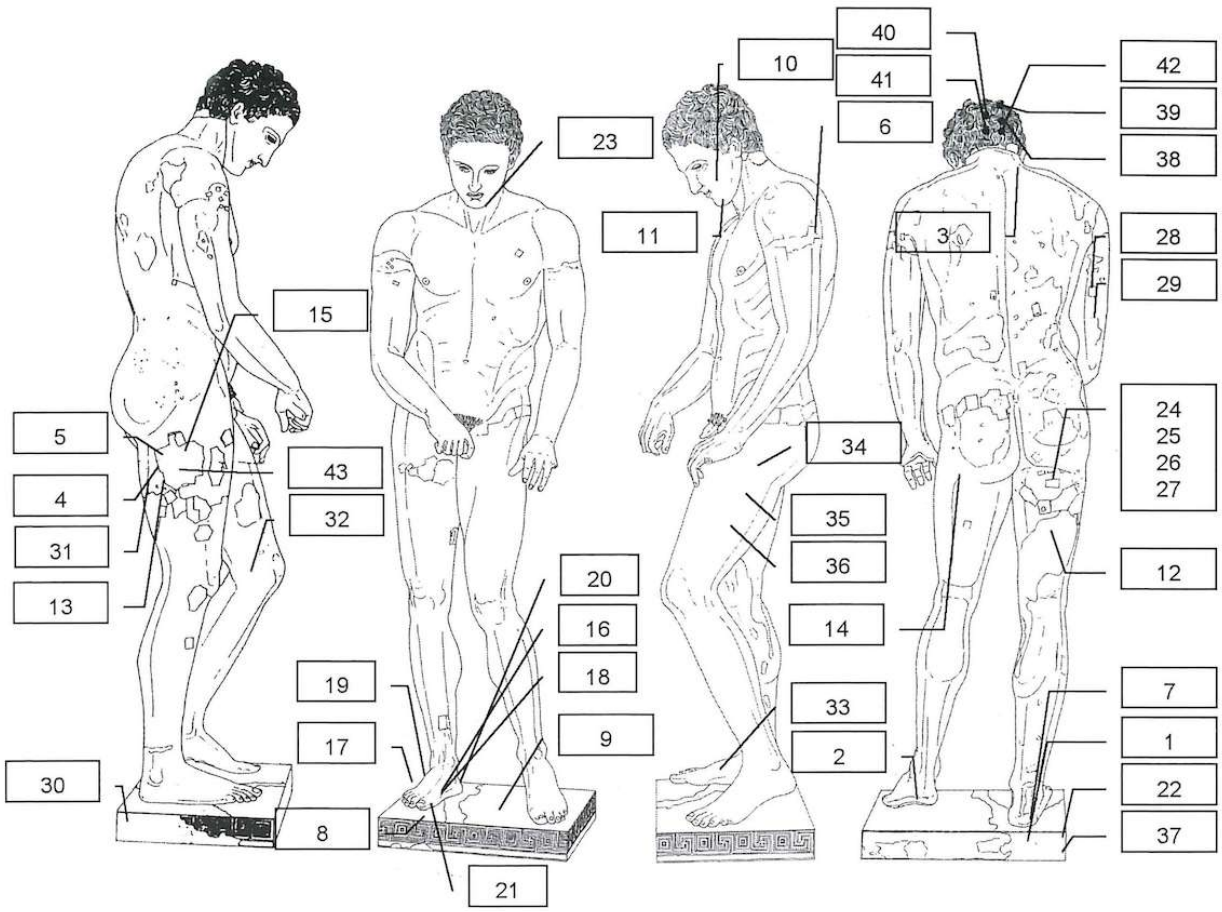


Figure 43.2. Location of the samples taken during the sampling sessions between 1999 and 2002. From Lalli et al. 2006

The metal structure in the samples was found to be very heterogeneous and spongy, showing penetration of corrosion into the bronze wall on both sides (interior and exterior), especially on the rear of the statue that had been buried in sand on the seabed. Experts from the OPD performed several analyses to examine the samples, using stereomicroscopy, stratigraphic investigation under an optical microscope, Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), scanning electron microscopy coupled with energy dispersive spectrometry (SEM-EDS), and inductively coupled plasma atomic emission (ICP-AES).

The most significant and interesting analyses and results were provided by ICP-AES and SEM-EDS, which were performed in parallel for some samples. For ICP-AES, the entire samples were dissolved in acid mixtures at a temperature of 350°C, meaning that they included "deteriorated" areas. The results showed that the bronze alloy is highly leaded.

Since lead appears concentrated in globules of 50–200 μm and in surface areas, SEM-EDS was preferred, and only sound areas deep in the samples were investigated. Only very small areas (500 μm² or even only 100 μm²) were analyzed in the samples. SEM-EDS only gave results for major elements, but they showed a very different metal composition, with a low percentage of lead in the bronze alloy.[3]

In addition to the analyses performed by the OPD before 2003, further analyses were performed by the Ruđer Bošković Institute in Zagreb and by the HRZ, based on 5 samples and applying PIXE spectroscopy. Again, the samples were heterogeneous and only one—sample no. 5859, taken from the interior of the chin—gave results similar to the ICP-AES analyses:

- Cu 76.4% (58.9–92.5%)
- Sn 7.1% (4.7–8.5%)
- Pb 16.1% (2.12–32.1%)
- Si 0.19% (0.14–0.26%)
- Cr 0.01% (0.0–0.2%)
- Fe 0.13% (0.7–0.17%)
- Ni 0.03% (0.0–0.6%)

In 2003, after the complete removal of the calcareous encrustations from the statue, a second campaign of investigation was carried out by the HRZ and the Ruđer Bošković Institute, applying three different analytical techniques based on X-ray: portable XRF spectrometry (70 points), external beam PIXE (same areas as XRF) and micro-PIXE using the Zagreb proton microprobe facility. These tests yielded elemental maps on cross sections obtained from two selected samples (head and right leg).

The X-ray surface analysis proved to be not representative of the bulk alloy, showing a heavily corroded surface with large discrepancies in element concentrations, thus indicating that such measurements could not estimate the original metal composition. X-ray maps on cross sections showed a typical structure of high-lead bronzes, but also that corrosion deeply affected the metal walls on both sides, up to a depth of 600 μm.[4]

In all of these prior investigation methods and procedures, the main problems preventing a correct determination of the elemental metal composition were metal heterogeneity, especially regarding the lead distribution, and the heavy corrosion of the statue. SEM-EDS analysis was unable to ascertain the lead level since only a volume of 0.5 mm^3 (at the most) had been analyzed. Furthermore, SEM-EDS is not sensitive enough to detect trace elements. ICP-AES analysis was unfortunately performed on samples including "deteriorated" areas and at a very high temperature for sample digestion, leaving some doubt as to the obtained results. Given the thickness of the corroded bronze walls, surface analyses by XRF or PIXE never reached a sound metal composition. PIXE maps and other techniques based on metallographic sections required large samples, which could not be taken in significant numbers given the damage they cause to the statue.

Reexamination of the Manufacturing Techniques (2013)

As noted above, we concluded that for an accurate determination of the metal composition, and especially the lead level, a "volumic" method was required. We also knew that great care had to be taken to avoid inclusion of corrosion products, which can strongly bias the results. But these conditions are not sufficient: before choosing appropriate locations for new samples, a comprehensive technological understanding of the statue was also needed. A reexamination of the manufacturing technique of the statue was therefore undertaken: How many separately cast sections (primary castings) are there? Where are the joins located? Were the sections soldered or welded? Where and how was the statue repaired?

Our examination confirmed that the statue had been produced by an indirect lost-wax process. It is a hollow cast; that is, the casting core was removed and only minor traces of it remained. Hence the total weight of the statue is only about 125 kg, making it easily transportable.

The statue is made of seven main parts (head, torso, legs, arms, and genitals). Arms, legs, and genitals were joined to the torso by flow fusion welding. The head was soldered onto the neck. The plinth parts were also soldered together and the feet were then soldered to the plinth (fig. 43.3).

The head was cast in one piece, with a bronze wall 5 to 8 mm thick. A large casting defect under the left eye was repaired by a secondary casting; smaller rectangular patches closed the core pin holes. The head-to-neck join has a very typical path with right-angle corners below the ears and platforms between the head and the neck in order to accommodate the soldering. The eye inserts are unfortunately lost but the lips are still there. They are made of unalloyed copper that was inserted into rectangular mounting channels, and finally hammered in place.

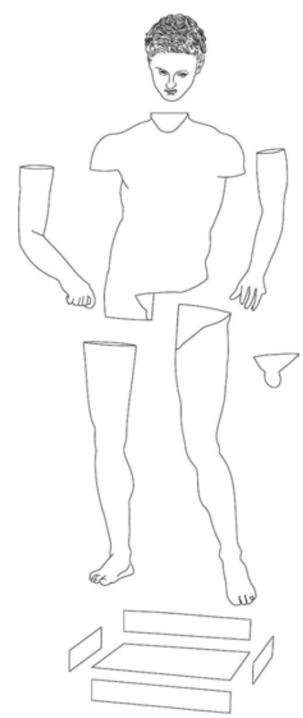


Figure 43.3. Separately cast sections of the statue
Image: I. Karniš Vidovič, K. Certić, 2015. Courtesy Croatian Conservation Institute (HRZ)

The torso is interesting for visible traces of manual work on the wax from the inside, in the mold. Here also, the bronze wall thickness ranges from 5 to 8 mm. There are copper inlays also for the nipples, hammered into shallow round recesses cut into the bronze surface.

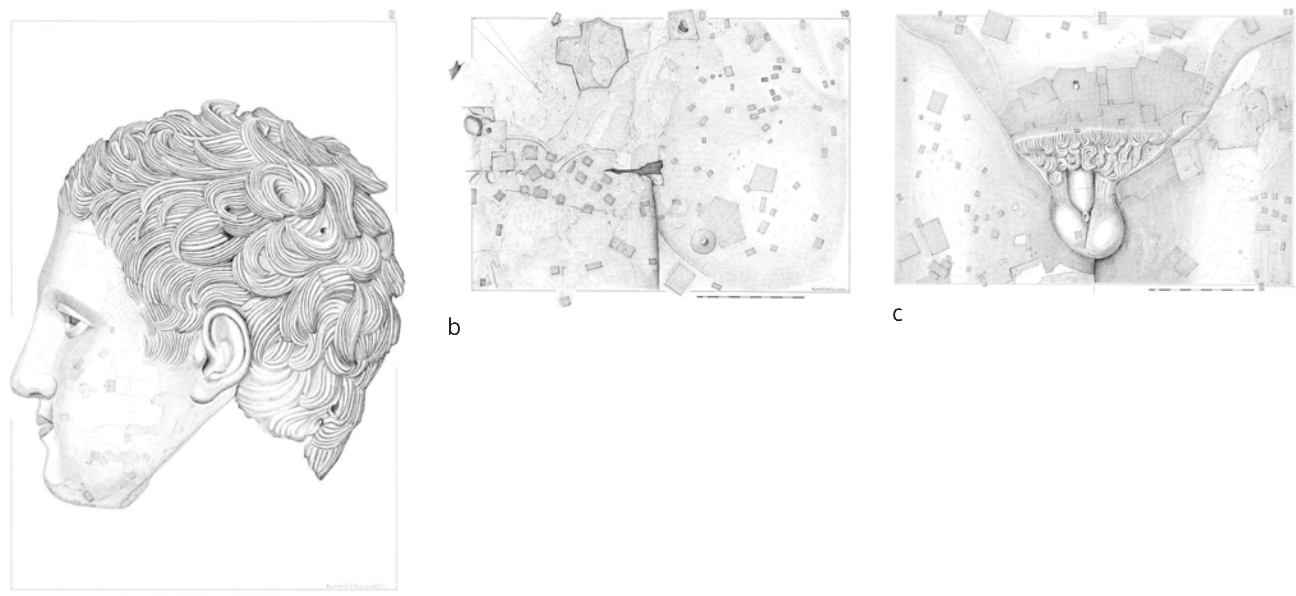
The legs show different thicknesses of the bronze wall: 4–6.5 mm for the right leg and 8–11 mm for the left. They were cast in an upright position and the majority of the casting defects, caused by massive gas emission, are visible in their upper parts. The right leg in particular shows that repairs to the cast leg as well as in the welding area were made using multiple patches—both smaller rectangular ones and larger polygonal ones.

The hands were joined to the arms by a wax-to-wax method. Some of the fingers were cast separately. The small finger of the left hand is lost and the interior of the left hand is accessible through the hole only at this point, since the hand-to-arm join is closed on the left side. On the right side, however, it is open.

Before assembly, the casting core was removed from all parts of the statue. The statue was joined in five phases: (1) the arms to the torso; (2) the complex leg area (first the right leg, then the left); (3) the pubic area and genitals; (4) soldering the head onto the neck; and (5) soldering the feet onto the plinth. Joins 1–3 were performed using a flow fusion welding technique in basins for legs and arms (secondary castings of bronze). All welding areas had to be repaired with multiple patches.

All joins and repairs are now easily followed thanks to γ-radiography, the archaeological drawings (fig. 43.4a–c), and new X-ray images made by the C2RMF (complete frontal and profile views).[5]

This reexamination confirmed that the Croatian Apoxyomenos is a typical product of the Late Hellenistic period,[6] though the original prototype is dated to the mid-fourth century BC according to stylistic features.[7]



b

c

a

Figure 43.4a–c. Joining areas: (a) head, (b) right arm-torso, (c) pubic area-torso-left leg.
Image: K. J. Rončević, 2005. Courtesy Croatian Conservation Institute (HRZ)

New Sampling Campaign (2013–2015)

Taking into consideration the previous metal analyses and our better understanding of the casting and welding techniques, we decided to perform additional analyses using ICP-AES. Seven new samples were taken by microdrilling (fig. 43.5a–d), some of them from the previously examined areas: 6 from primary castings (head, body, foot, pubic hair, decorated plinth, undecorated plinth) and 1 from a weld join (the pubic area onto the legs and the body area).

Figure 43.5a. New sampling for ICP/AES at C2RMF: head
Image: I. Karniš Vidovič, 2013. Courtesy Croatian Conservation Institute (HRZ)

Figure 43.5b. New sampling for ICP/AES at C2RMF: neck
Image: I. Karniš Vidovič, 2013. Courtesy Croatian Conservation Institute (HRZ)

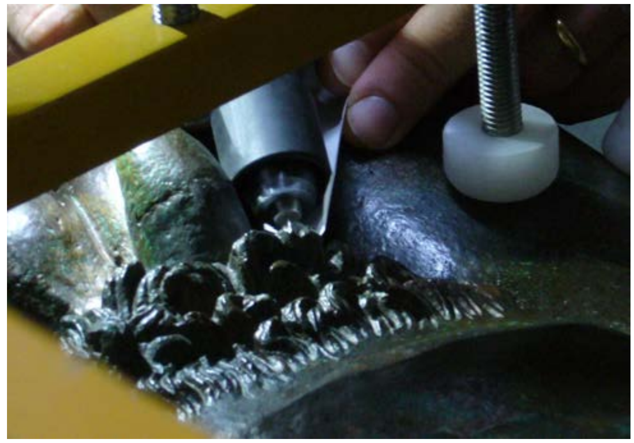


Figure 43.5c. New sampling for ICP/AES at C2RMF: pubic area
Image: I. Karniš Vidovič, 2013. Courtesy Croatian Conservation Institute (HRZ)

Figure 43.5d. New sampling for ICP/AES at C2RMF: left foot
Image: I. Karniš Vidovič, 2013. Courtesy Croatian Conservation Institute (HRZ)

Analyses were performed by ICP-AES at the C2RMF. About 20 mg of metal was taken for each sample (1 mm diameter, 10 mm deep) after eliminating most surface corrosion products. The drillings were carefully controlled under the stereomicroscope to avoid any corrosion product or dust. About 10 mg of the drillings were precisely weighed and digested in 5 ml aqua regia solution (hydrochloric and nitric acids). The solution was then nebulized in the argon plasma and 29 chemical elements were quantified.[8] The detailed results of the ICP-AES analyses can be found in table 43.1.

Analysis No.	Sample location	Cu	Sn	Pb	Ag	As	Fe	Ni	S	Sb	Zn	Au	Ba	Bi	Cd	Co	Cr	Ge	Hg	In	Mg	Mn	Mo	P	Se	Te	Ti	U	V	W
			(in wt. %)									(in wt. ppm)																		
C2RMF72247-1	Head: under the chin (in the platform)	X	7.1 ±0.7	18 ±2	0.056 ±0.006	0.1 ±0.010	0.16 ±0.02	0.04 ±0.004	0.071 ±0.007	0.11±0.01	0.23 ±0.02	42 ±4	nd <0.2	77 ±8	nd <0.2	67 ±7	nd <0.9	nd <3.4	4.1 ±0.4	6.4 <7.0 >2.1	nd <3.1	nd <0.0	nd <2.5	nd <24	32 ±3	23 ±3	nd <0.3	nd <9.3	nd <0.2	nd <2.2
C2RMF72247-2	Plinth: right side (decorated)	X	9.5 ±0.9	11 ±1	0.052 ±0.005	0.015 ±0.002	0.0072 ±0.0007	0.005 ±0.0005	0.021¡ >0.20 <0.067	0.069 ±0.007	nd <0.00067	16 ±2	nd <0.2	45 ±4	nd <0.2	nd <0.2	nd <0.9	nd <3.3	4.4 ±0.4	3.0 <6.8 >2.0	nd <3.0	nd <0.0	nd <2.4	nd <2.4	17 ±2	17 ±2	nd <0.3	nd <9.0	nd <0.2	nd <2.1
C2RMF72247-3	Plinth: back side (not decorated)	X	7.6 ±0.8	23 ±2	0.059 ±0.006	0.069 ±0.007	0.12 ±0.01	0.022 ±0.002	0.12 ±0.01	0.099 ±0.010	0.24 ±0.02	21 ±2	nd <0.3	68 ±7	nd <0.3	22 ±2	nd <1.1	nd <4.3	3.2 <3.4 >1.0	4.2 <8.9 >2.7	nd <4.0	nd <0.1	nd <3.2	nd <31	35 ±4	20 ±3	nd <0.4	nd <12	nd <0.3	nd <2.8
C2RMF72247-4	Body: neck (in the platform)	X	4 ±0.4	17 ±2	0.062 ±0.006	0.055 ±0.005	0.0005 ±0.00005	0.027 ±0.003	0.042¡ >0.020 <0.067	0.1 ±0.01	0.014 ±0.001	25 ±2	nd <0.3	72 ±7	nd <0.3	2.2 ±0.3	nd <1.0	nd <3.7	4.4 ±0.4	3.6 <7.6 >2.3	nd <3.4	nd <0.0	nd <2.8	nd <26	19 ±2	22 ±5	nd <0.3	nd <10	nd <0.3	nd <2.4
C2RMF72247-5	Pubic hair	X	6.5 ±0.7	21 ±2	0.02 ±0.002	0.024 ±0.002	0.0017 ±0.0002	0.011 ±0.001	0.075 ±0.007	0.061 ±0.006	0.039 ±0.004	nd <4.4	nd <0.3	29 ±6	nd <0.3	0.6 <0.6 >0.2	nd <1.0	nd <3.79	3.5 ±0.7	3.8 <8.1 >2.4	nd <3.6	nd <0.1	nd <2.9	nd <28	64 ±6	18 ±11	nd <0.3	nd <11	nd <0.3	nd <2.6
C2RMF72247-6	Welding: genital & pubic hair - legs	X	4 ±0.4	18 ±2	0.061 ±0.006	0.051 ±0.005	0.038 ±0.004	0.028 ±0.003	0.047¡ >0.020 <0.067	0.099 ±0.010	nd <0.00067	20 ±2	nd <0.3	65 ±6	nd <0.3	1 ±0.4	88 ±9	nd <4.1	4.3 ±0.8	nd <2.6	nd <3.8	2.2 ±0.2	nd <3.1	nd <30	16 ±2	13 ±4	nd <0.4	nd <11	nd <0.3	nd <2.7
C2RMF72247-7	Left foot	X	5.7 ±0.6	18 ±2	0.048 ±0.005	0.048 ±0.005	0.041 ±0.004	0.02 ±0.002	0.072 ±0.007	0.1 ±0.01	0.071 ±0.007	14 ±1	nd <0.3	52 ±5	nd <0.3	8.6 ±0.9	nd <1.0	nd <3.6	4.2 ±0.5	4.4 <7.6 >2.3	nd <3.4	nd <0.0	nd <2.7	nd <26	36 ±4	32 ±6	nd <0.3	nd <10	nd <0.3	nd <2.4

Table 43.1. Results of the ICP-AES analyses made at the C2RMF on the bronze parts of the Croatian Apoxyomenos. Results in wt% or wt ppm. X = base metal (not quantified). nd = below the limit of detection. ° = below the limit of quantification.

By using this analytical procedure, we achieved a very consistent new set of results. Regarding major elements, we observed that the same alloy has been used for the primary castings of all parts of the statue, including the undecorated rear face of the plinth (fig. 43.6). It appears that the alloy of the Croatian Apoxyomenos is a highly leaded bronze (Sn 6.7 ± 1.9%; Pb 18.0 ± 4.0%); this alloy was also used for welding. A noticeable exception is the decorated side of the plinth, showing higher tin contents and lower lead (Sn 9.5%; Pb 11.0%).

Furthermore, all high-lead bronze parts share the same trace-elements pattern (fig. 43.7) and are made from the same copper: a typical 0.1% level of silver, arsenic, and antimony and about 0.03 % nickel. One notable discrepancy is in the iron and zinc levels. As these two elements are very easily oxidized from bronze in the liquid state, a possible explanation could be a delayed casting for some parts of the statue, that is, some liquid metal was left at high temperature for too long, thus leading to some oxidation of the metal batch.

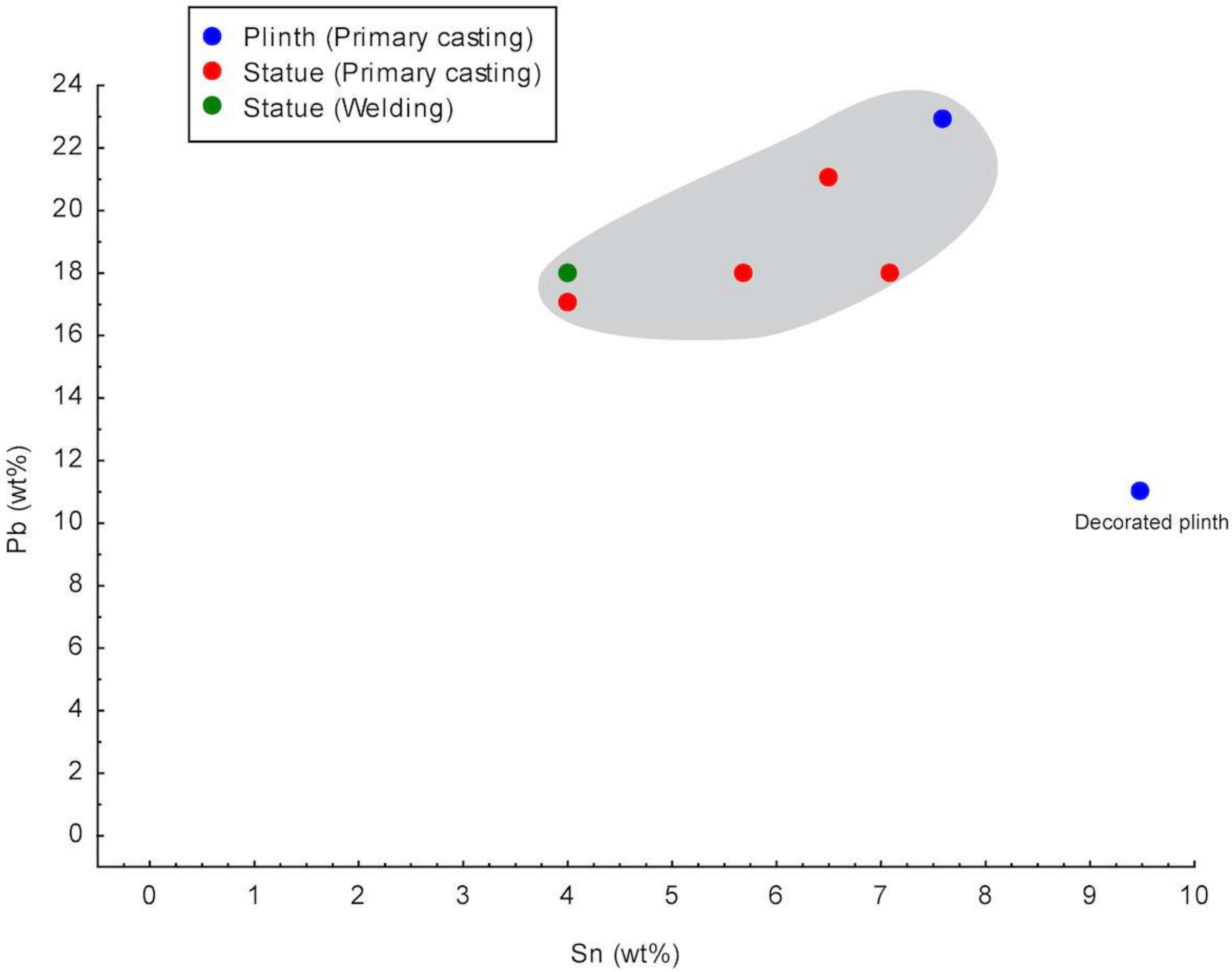


Figure 43.6. Alloy composition of the Croatian Apoxyomenos: tin and lead contents of the different parts of the statue
Graph: B. Mille, 2015 (C2RMF)

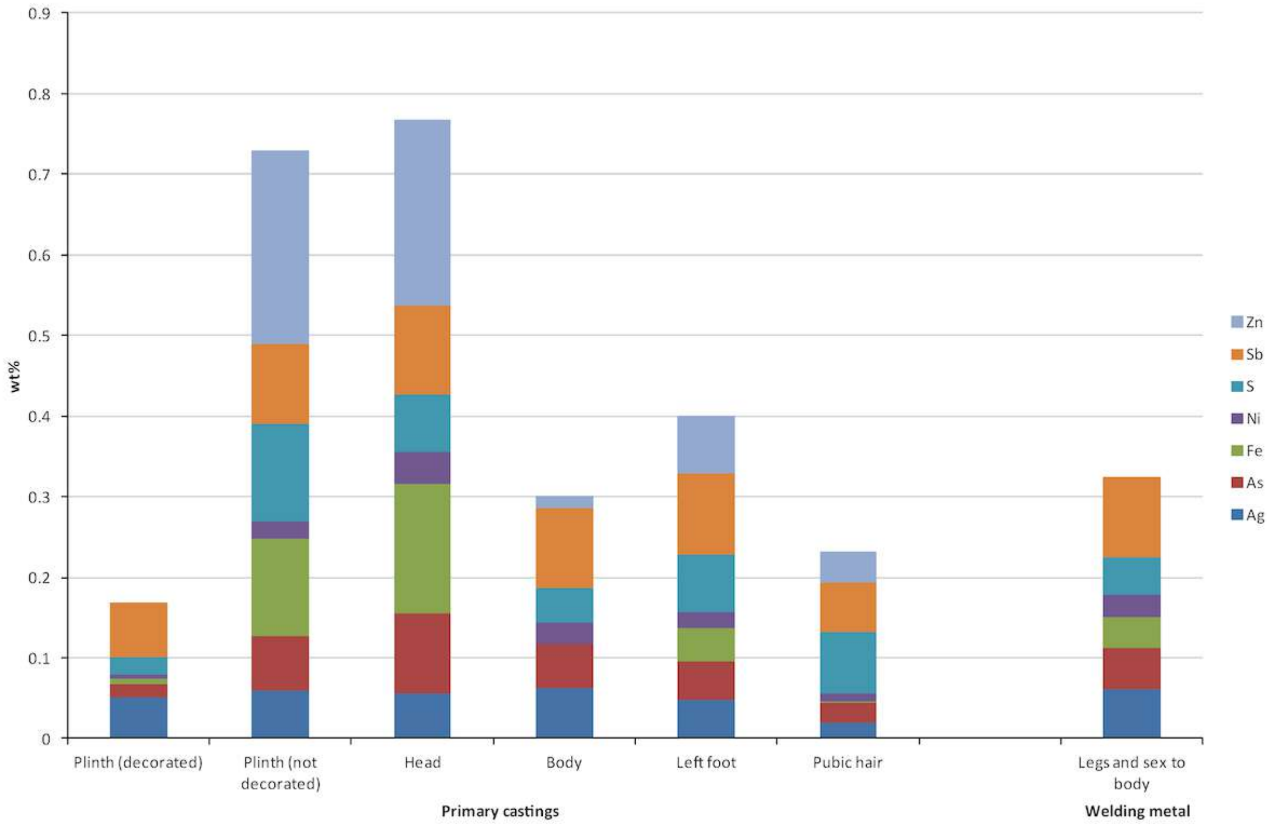


Figure 43.7. Trace-element composition of the Croatian Apoxyomenos: cumulated content of main impurities for each analysis
Graph: B. Mille, 2015 (C2RMF)

Very interesting is the fact that the corresponding impurities pattern is not only consistent for all parts of the statue itself, but also for the undecorated side of the plinth. We can therefore deduce that this part of the plinth was cast at the same time as the rest of the statue.

Given the distinct alloy of the decorated plinth face and its lower impurities pattern (Ag/Bi/Sb only), it is very likely that the decorated parts of the plinth were manufactured in a later phase. It seems possible that a major restoration and/or modification of the plinth occurred already during the ancient life of the statue.

✦ ✦ ✦

Notes

1. Karniš Vidovič and Mille 2015.
2. Karniš and Domijan 2006, Michelucci 2006.
3. Lalli et al. 2006.
4. Mudronja et al. 2010.
5. See Karniš Vidovič and Mille 2015, figs. 3–4.
6. Karniš Vidovič and Mille 2015.
7. Cambi 2006.
8. The operating conditions are described in Bourgarit and Mille 2003.

Bibliography

Bourgarit and Mille 2003
Bourgarit, D., and B. Mille. 2003. "The Elemental Analysis of Ancient Copper-Based Artefacts by Inductively-Coupled-Plasma Atomic-Emission-Spectrometry (ICP-AES): An Optimized Methodology Reveals Some Secrets of the Vix Crater." *Measurement Science and Technology* 14: 1538–55.

Cambi 2006
Cambi, N. 2006. "The Athlete Cleaning the Strigil." In Michelucci 2006, 21–33.

Karniš and Domijan 2006
Karniš, I., and M. Domijan, eds. 2006. *The Croatian Apoxyomenos*. Zagreb: Hrvatski restauratorski zavod.

Karniš Vidovič and Mille 2015
Karniš Vidovič, I., and B. Mille. 2015. "The Croatian Apoxyomenos: New Insights into Its Manufacturing Technique." In *New Research on Ancient Bronzes: Acta of the XVIIIth International Congress on Ancient Bronzes*, ed. E. Deschler-Erb and P. Della Casa. Zurich Studies in Archaeology 10: 97–105. Zurich: Chronos.

Lalli et al. 2006
Lalli, C., G. Lanterna, D. Pinna, S. Porcinai, M. Rizzi, and I. Tosini. 2006. "Diagnostic Tests." In Michelucci 2006, 113–18.

Michelucci 2006
Michelucci, M. ed. 2006. *Apoxyomenos: The Athlete of Croatia*. Florence: Giunti.

Mudronja et al. 2010
Mudronja, D., M. Jakšić, S. Fazinić, I. Božičević, V. Desnica, J. Woodhead, and Z. A. Stos-Gale. 2010. "Croatian Appoxiomenos Alloy Composition and Lead Provenance Study." *JAS* 37(7): 1396–1402. DOI: 10.1016/j.jas.2009.12.0.

44.

The Bronze Sculpture of Alexander the Great on Horseback: An Archaeometallurgical Study

Salvatore Siano, Istituto di Fisica Applicata "N. Carrara," Consiglio Nazionale delle Ricerche, Florence
Luigia Melillo, Museo Archeologico Nazionale di Napoli
Stefano Sarri, Museo Archeologico Nazionale di Firenze
Juri Agresti, Istituto di Fisica Applicata "N. Carrara," Consiglio Nazionale delle Ricerche, Florence

We report here the results of the archaeometallurgical study of the bronze equestrian statuette of Alexander the Great, which was found broken in many pieces during various phases of excavation carried out in Herculaneum around the end of 1761; it was subsequently reassembled in the Royal Foundry of Naples. This famous masterpiece, now in the National Archaeological Museum of Naples, recently underwent a thorough material characterization, which was carried out during a static consolidation treatment at the restoration laboratory of Tuscany's Archaeological Superintendency. This investigation was aimed mainly at interpreting the original execution processes and modern restorations. Although the authenticity of the artifact is supported by its formal coherence and archival information referring to the two figures (Alexander and his horse Bucephalus) and the base, analytical insights were considered of interest in order to assess the material coherence of the many fragments (about fifteen) composing the statuette. The results provide objective material evidence of the antiquity of most of the fragments and shed light on its ancient execution and modern restoration processes.

✦ ✦ ✦

The equestrian bronze group of Alexander on horseback in the National Archaeological Museum of Naples (inv. 4996), which is dated around the first century BC, was found in Herculaneum during the Bourbon excavation campaigns of the second half of the eighteenth century (fig. 44.1a–b). According to the sources, the statuette, whose restored height is 49 centimeters, was mostly excavated on October 22, 1761, within a tunnel at the Theater under the Casa dei Colli Mozzi. Upon discovery, the legs and tail of the horse, as well as the legs and right arm of the rider, were missing. Subsequently, between October 24 and November 21, 1761, these were brought to light.[1]

Figure 44.1a. Alexander the Great battling on horseback: lateral view showing fine sculptural quality, rich decorations, and dynamism of the group. Bronze. First century BC. National Archaeological Museum of Naples, inv. 4996. H: 49 cm; W: 47 cm; D: 29 cm

Image: Salvatore Siano by permission of Museo Archeologico Nazionale di Napoli, Italy

Figure 44.1b. Alexander the Great battling on horseback: front detail showing fine sculptural quality, rich decorations, and dynamism of the group. Bronze. First century BC. National Archaeological Museum of Naples, inv. 4996. H: 49 cm; W: 47 cm; D: 29 cm

Image: Salvatore Siano by permission of Museo Archeologico Nazionale di Napoli, Italy

The eyes of the horse and rider, the rosette that holds the mantle (on the right shoulder rather than on the left, as indicated in the excavation report), and the mask that decorates the horse's breastplate were described as inlaid in silver.

The restoration was carried out shortly thereafter in the Reale Fonderia of Portici, as evidenced by the three rosettes painted on the base (the logo of the foundry), under the direction of Camillo Paderni, Custodian of the Royal Museum, where all of the fragments were transferred. In a report dated June 5, 1762, Paderni writes that "the restoration proceeds very well and that the statuette would become one of the most important items of the Royal Museum."[2] In 1762, while the restoration was in progress, J. J. Winckelmann, in a letter to Count Heinrich von Bruel,[3] provides an interesting description of the statuette. He says that "an arm of the rider and two legs of the horse are missing," which, however, "have been restored," that "the eyes of the horse and rider and bridle are inlaid in silver and that the base is preserved." Winckelmann also adds that the equestrian group and a prancing horse, found in the same area of the Theater of Herculaneum, "are not shown to visitors because of the restoration, which is still ongoing."[4]

In 1764, in a letter to Heinrich von Fuessly, Winckelmann once again describes the statuette, which was still under restoration: "missing left arm"; "the right arm is raised"; "the legs are both present"; "the feet are shod"; "lacks the hind legs of the horse"; "the rudder is present"; "the base is decorated with silver inlays on one of the short sides." By the 1770s, the restoration had been completed and the statuette of Alexander on horseback was exhibited in the middle of the eleventh room of the Herculanean Museum.[5] In 1820, finally, it was displayed among the bronzes in the Real Museo Borbonico in Naples,[6] although the vicissitudes of the various fragments of the artworks were not yet over.[7]

The perception that the Alexander on horseback was an exceptional find is also attested by the fact that a cast of the statue was the first to be created and sent to King Charles III in Madrid. The object had been brought to light, in fact, after the king's departure for Spain in 1759, and the replica was crafted in order to inform him of the exceptional discovery. The plaster was executed and signed by Antonio Reder (employed in the Reale Fonderia under the direction of Paderni), who made the work so masterfully that it may be considered a sculpture in its own right rather than a simple copy. During transport from Portici to Madrid, however, despite careful packaging, the plaster, currently on display in Madrid in the Real

Academia de Bellas Artes de San Fernando, was badly damaged: the arms and legs of the knight and part of the horse's tail were broken and lost.[8]

The statue of Alexander on horseback, which represents one of the most complete representations of the Macedonian leader, is considered by many to be a miniature copy of the central figure of the bronze group by Lysippos dedicated by Alexander in the sanctuary of Zeus at Dion in Macedonia to commemorate the twenty-five Companions who in 334 BC lost their lives in the battle against the Persians on the Granicus River. The original bronze group, which was renowned in Hellenistic and Roman times, was brought to Rome in 146 BC by Quintus Caecilius Metellus, who exhibited it in the Porticus Metelli. The discovery in Herculaneum, also in the Theater, of two other bronze equestrian statuettes—a prancing horse and an Amazon on horseback—might, according to some scholars, evoke the story told by Kleitarchos of Alexandria of the love between Alexander and Thalestris, queen of the Amazons. Alexander on horseback could be, therefore, a Roman adaptation of Hellenistic prototypes.[9]

Visual Examination of the Technological Features

The static consolidation intervention recently undertaken on this work required the temporary disassembly of the four main constituent pieces: rider, horse, base, and rudder (supporting piece), which are mechanically assembled by means of several screws and five bolts. This allowed a careful visual and radiographic examination and the identification of most of the independent metal pieces constituting the statuette.

Base: The base (about 230 × 430 mm) is a relatively thin casting (a few millimeters thick) reinforced with a peculiar diagonal metal cross (saltire-like), well joined on its inner surface. The latter exhibits greenish encrustations along with residues of mortar and lead, which were likely intended to fix the piece on a larger base. Two symmetric plugs in proximity of the short sides are also recognizable on the base, the inner surfaces of which present corrosion phenomena similar to those of the surrounding metal. Very interestingly, one of these plugs is traversed by the threaded end of the rudder (one of the aforementioned bolts).

Floral and geometrical decorations made with white metal are visible on the upper surface of the base, although some motifs are deeply worn and others are obscured by dark patination layers.

Horse: The body of the horse appears rather well preserved, while its limbs and tail include very obvious joins. These were executed using various anchoring techniques: small copper-alloy inserts, rivets, and soft soldering.[10] The use of a small metal insert is particularly evident on the left hind leg (fig. 44.2a).[11] This restoration technique is also attested in other objects from the Vesuvian area, such as the famous Tripod with Sphinxes from Herculaneum preserved in the Naples Archaeological Museum.[12]

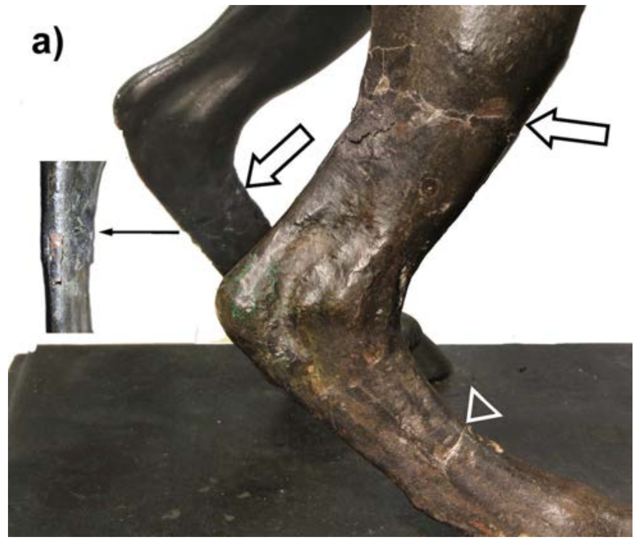


Figure 44.2a. Repair zones of the horse highlighted with arrows
Image: Salvatore Siano by permission of Museo Archeologico Nazionale di Napoli, Italy

Figure 44.2b. Repair zones of the rider highlighted with arrows
Image: Salvatore Siano by permission of Museo Archeologico Nazionale di Napoli, Italy

The saddlecloth, girth, harness, and reins are fashioned from perfectly shaped thin copper foils and strips, soldered onto the body of the horse with tin-lead alloys (fig. 44.3). However, the breastplate up to its lateral soft-soldered phalerae seems more refined than the saddlecloth and girth and presents a clear join at the right point of the shoulder. There are objective clues suggesting that the saddlecloth was likely added during the eighteenth-century restoration. As shown in figure 44.3a, it is shaped from two copper laminae and then carefully cut out and filed along the back and the contour of the terminal part of the mane at the withers.

Figure 44.3 also evidences another crucial feature. The locks of the mane were suitably cut and smoothed (fig. 44.3a) in order to better fit the rider's skirt (fig. 44.3b).

Figure 44.3a. Detail of the saddlecloth and mane

Image: Salvatore Siano by permission of Museo Archeologico Nazionale di Napoli, Italy

Figure 44.3b. Detail of the skirt fitting to the withers

Image: Salvatore Siano by permission of Museo Archeologico Nazionale di Napoli, Italy

Rider: Examination of the rider indicates that its limbs were anchored to the body by molten copper alloys poured from the inner side, while two damaged zones of the skirt were fixed using a copper foil, which was soft-soldered to the inner side of the skirt (see the left side-arrows in fig. 44.2b). The thighs with the integrated stretches of the skirt perfectly fit the curvatures of the garment and of the ribs at the inner and outer sides, respectively. The limbs were likely originally cast separately and then joined to the trunk of the figure.

Radiographic Examination

Several radiographic images were taken in order to identify each of the independent pieces composing the sculpture and to interpret its execution and repair history.

Base: In addition to a detailed assessment of features that were already evident to the naked eye, the radiography of the base provided crucial information regarding its authenticity. The base has a variable thickness and moderate porosity. As shown in figure 44.4a, the two large plugs mentioned above are very thin and present the typical perimetric housing. The white metal decorations were achieved via a heat process: after creating suitable recesses and cutting the decorative motives from a silver foil,[13] the latter were soldered by first immersing them in a tin-lead bath (see the round porosities in fig. 44.4b), and then hammering them into place. Thus, the damascening of the base was not achieved simply by mechanical inlay but rather through a more elaborate decorative process, in order to increase the durability of the artwork. The authenticity of this decoration and thus of the entire base is also supported by the random consumption of the silver foils and the total loss of some details (see the different radio-opacity of the petals in fig. 44.4b).

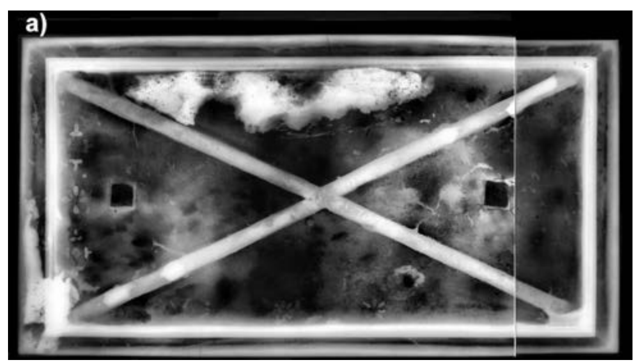


Figure 44.4a. Radiographic images of the base, showing round porosities beneath the silver foils and various degrees of consumption of the flower petals

Image: Salvatore Siano by permission of Museo Archeologico Nazionale di Napoli, Italy

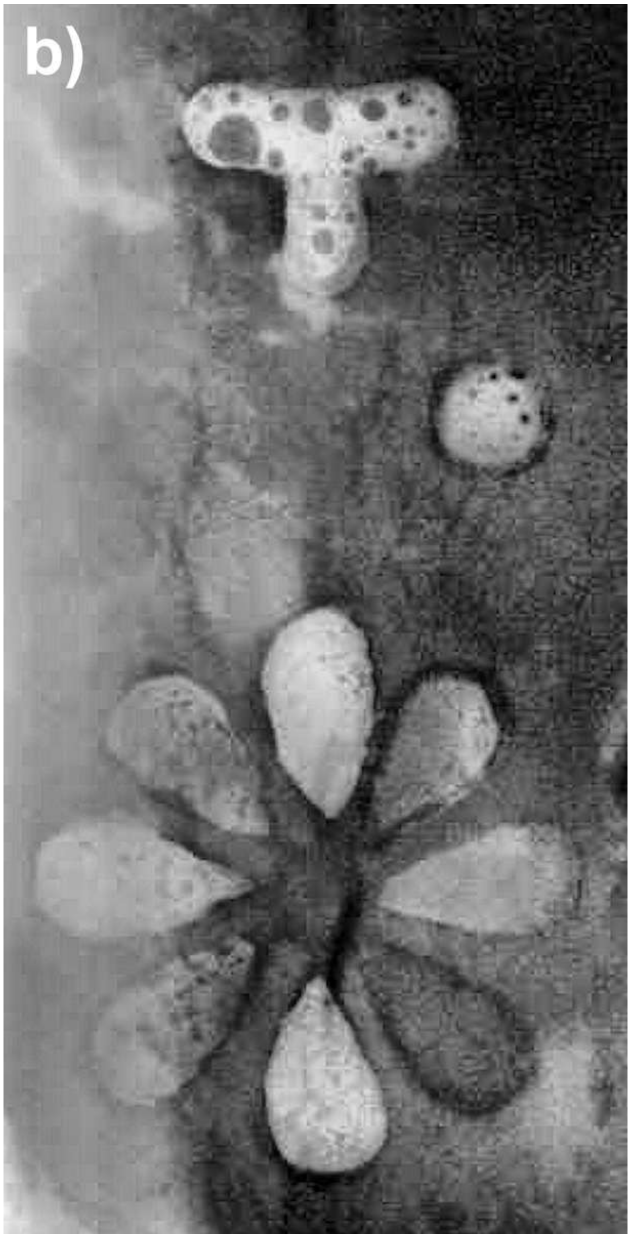


Figure 44.4b. Radiographic images of a detail of the silver decoration, showing round porosities beneath the silver foils and various degrees of consumption of the flower petals

Image: Salvatore Siano by permission of Museo Archeologico Nazionale di Napoli, Italy

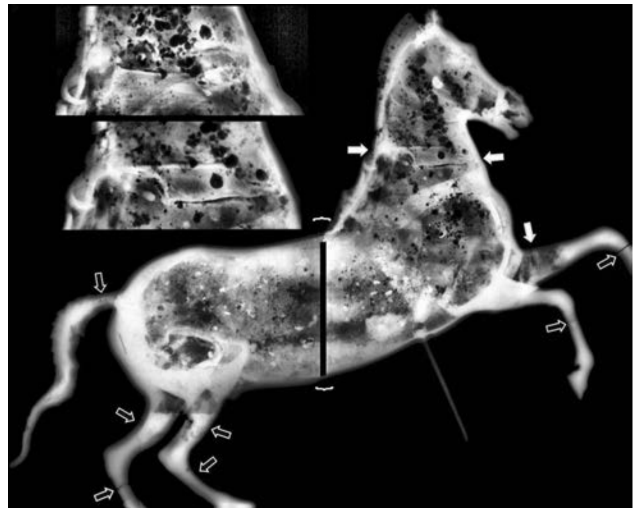


Figure 44.5. Two adjacent X-ray plates of the horse and two detail images (upper left) of the joining zone of the neck. The joints identified are highlighted by arrows.

Image: Salvatore Siano by permission of Museo Archeologico Nazionale di Napoli, Italy

Horse: Figure 44.5 shows the reconstructed general view of the horse composed from two images as well as two side details of its neck. These confirm that this artifact is a hollow casting including several interesting structural details described below. The thicknesses of the metal walls are not entirely contrasted in X-ray images because of the radio-opacity of the core, which is mostly still inside the horse; note the abrupt change of radio-opacity at the ideal line between the chest and the withers. A significant macroporosity, produced by fragments of the core materials and air bubbles trapped in the metal, extends from the head to the chest and shoulders of the horse, while the rest of the body shows a higher casting quality. Joint stretches are evident in the repair zones of the limbs and tail (see arrows in fig. 44.5). Furthermore, figure 44.5 proves that the head, body, and limbs of the horse were originally cast independently and then joined by means of hard heat joins (i.e., by filling the gaps with molten bronze). The intentional cut of the wax model before casting can be argued from the straight stretches of unfilled zones of the joins of the neck and left forearm (solid arrows in fig. 44.5). The join of the neck includes a kind of parallelogram-shaped bronze patch at the right side, which exhibits a slightly higher radio-opacity than the main metal wall, possibly due to a higher lead content and/or thickness. Drips are also recognizable in this join zone. They descend from the apex of the joint itself. However, the latter also shows a relatively high radio-opacity, thus making it difficult to determine the origin of the drips: they could have been produced either by cutting wax with a hot tool or by a modern repair using a tin-lead alloy.

All the joins of the limbs and tail were thoroughly investigated. In each case, the repair includes the preparation of suitable housings to be used as mechanical anchors. In particular, the assembly of the forelegs and cannon bones are apparently purely mechanical, while other joins also involved soft solder, such as those at the level of gaskins (see fig. 44.5) and tail (fig. 44.6).

Figure 44.6. Three radiographic views of the joining zone of the tail. Salvatore Siano by permission of Museo Archeologico Nazionale di Napoli, Italy.

Radiographic investigation also demonstrated the perfect fit of the middle stretch of the hind legs and tail, which definitely belong to the original artifact. It is also evident that the lower parts of the limbs were originally solid, although nothing can be said about the authenticity of the present terminal zones from cannons to heels and cannon to hoofs, respectively.

Rider: The cast of the rider is mostly hollow, with the exception of most of the limbs, whose initial hollow stretches (see for example the right leg in fig. 44.7b) were exploited by Bourbon restorers for anchoring them to the body of the figure by pouring in molten bronze. These modern repairs were not entirely successful since the limbs are not perfectly blocked. The neck seems to show traces of a possibly original heat join, although this cannot be objectively demonstrated.

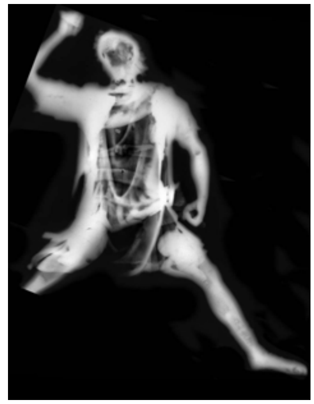


Figure 44.7a. Radiographic plates of the rider from the front
Image: Salvatore Siano by permission of Museo Archeologico Nazionale di Napoli, Italy

Figure 44.7b. Radiographic plates of the rider from behind
Image: Salvatore Siano by permission of Museo Archeologico Nazionale di Napoli, Italy

The wall thicknesses of the body vary considerably. In particular, thickenings are observed at the reliefs of the armor and draping of the mantle, suggesting the direct shaping of the wax model for casting.

Chemical Analysis of the Alloys

The results of the examinations described above allow us to identify most of the individual pieces composing the present sculptural group. These are rendered in different colors in figure 44.8, where the sites of the compositional characterization are also marked. The latter was carried out using laser induced plasma spectroscopy (LIPS or LIBS). In this noninvasive technique, short laser pulses are focused on the material of interest and its elemental weight fractions are derived through spectral analysis of the bright plasma plumes generated at the laser focus. Several spectra are usually collected at the measurement point, which allows for an elemental depth profile within several hundred microns, thus providing information on corrosion processes and bulk composition.[14] In addition to LIPS, X-ray fluorescence (XRF) was used for quick qualitative assays of the silver decorations.

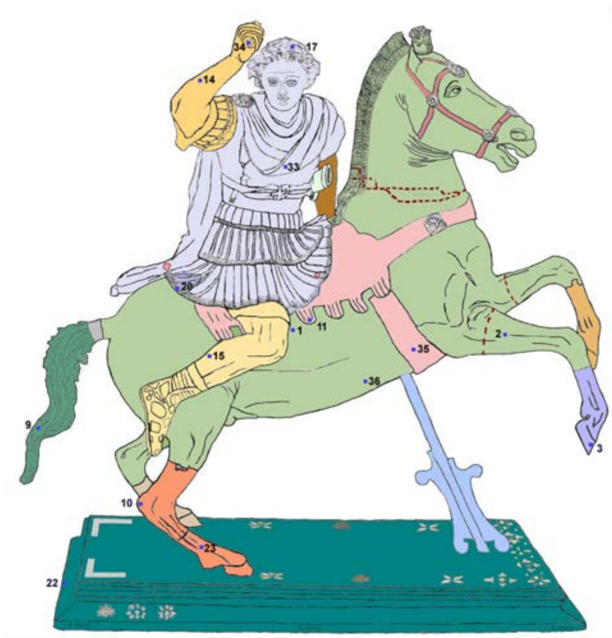


Figure 44.8a. Reconstruction of the various pieces making up the group of Alexander, and map of the LIPS measurements
Image: Salvatore Siano by permission of Museo Archeologico Nazionale di Napoli, Italy

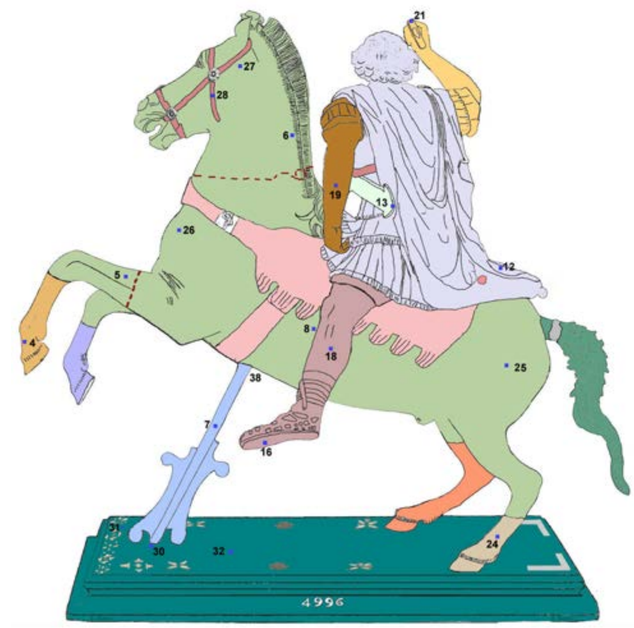


Figure 44.8b. Reconstruction of the various pieces making up the group of Alexander, and map of the LIPS measurements
Image: Salvatore Siano by permission of Museo Archeologico Nazionale di Napoli, Italy

The results are summarized in tables 44.1–2, where the main alloys and those of plausible independent castings are grouped. The average composition of the horse (table 44.1) is 11.7 ± 0.7 wt% tin and 3.6 ± 0.7 wt% lead. The lead content of the limbs and tail is significantly higher, thus supporting their probable independent casting, although the only clear evidence of an ancient join is that of the left foreleg (fig. 44.5, far right). The saddlecloth, breastplate, and reins were crafted in pure copper (impurities <1%).

Meas. no./site	Sn (wt %)	Pb (wt %)	Comments
1 Right ribs	12.0 ± 1.2	3.3 ± 0.4	Main alloy
6 Crest (left side)	12.3 ± 0.8	3.2 ± 0.4	
8 Right ribs	10.8 ± 0.8	3.3 ± 0.4	
25 Left hind thigh	11.8 ± 1.4	3.2 ± 0.5	
26 Left breast	11.8 ± 0.8	3.5 ± 0.4	
27 Head (left side)	12.4 ± 0.8	3.2 ±0.3	
36 Chest (right side)	10.6 ± 1.1	5.2 ± 0.7	
2 Right forearm	10.3 ± 1.1	9.2 ± 0.9	Compatible with independent casting with respect to the body of the horse
5 Left forearm	12.7 ± 1.3	8.1 ± 1.1	
3* Right forehoof	8.1 ± 0.5	15.4 ± 1.4	
4* Left forepastern	8.4 ± 0.5	14.9 ± 1.6	
9 Tail	13.3 ± 1.0	8.8 ± 0.6	
10 Right point of hock	13.3 ± 0.8	8.5 ± 0.4	
23 Right hind pastern	14.8 ± 0.9	8.0 ± 0.4	
24* Left hind cannon	8.5 ± 0.9	13.7 ± 1.2	
11 Saddle	0.2 ± 0.1	0.7 ± 0.3	Pure copper
28 Rein (left side)	0.4 ± 0.2	0.4 ± 0.3	
35 Girth	0.4 ± 0.1	0.3 ± 0.3	
37 Bolt (hind foot)	0.1 ± 0.1	0.2 ± 0.2	
* Fe 0.1–0.2 (wt %)			

Table 44.1. LIPS chemical analyses of the horse

The rider (table 44.2) has an average tin weight fraction similar to that of the horse and a higher lead content: 11.0 ± 0.9 wt% tin, 10.4 ± 1.5 wt% lead. The right arm and the lower part of the sword, which is an integral part of the hand, is the only piece with a slightly different composition: 7.3 wt% tin, 7.6 wt% lead. Finally, the base has an intermediate composition between rider and horse—12.0 ± 0.2 wt% tin, 7.6 ± 0.5 wt% lead—while that of the rudder is similar to the main alloy of the horse.

Meas. no./site	Sn (wt %)	Pb (wt %)	Comments
17 Head	9.8 ± 0.7	10.9 ± 0.8	Main alloy of the rider
20 Skirt (broken part)	10.9 ± 0.7	11.4 ± 1.1	
33 Mantle	10.7 ± 0.6	11.4 ± 1.0	
19 Left forearm	10.5 ± 0.9	9.4 ± 1.1	
15 Right calf	10.5 ± 1.1	11.3 ± 1.0	Although the legs could have been cast independently, their composition is similar to that of the main alloy
16 Left foot	10.4 ± 1.0	9.7 ± 0.9	
18 Left calf	14.1 ± 0.8	10.0 ± 0.5	
13 Scabbard	10.7 ± 0.8	9.9 ± 0.9	Independent with the same composition
14 Right forearm	7.1 ± 0.4	7.8 ± 1.0	Compatible with independent casting
21 Sword guard	7.1 ± 0.5	7.8 ± 0.5	
34 Sword knob	7.5 ± 0.7	7.6 ± 0.8	
14a Anchoring casting	7	7.9	(SEM-EDX) As the right arm anchored
22 Base	12.3 ± 1.0	7.7 ± 0.6	Main alloy of the base
30 Base	11.8 ± 0.9	7.0 ± 0.5	
32 Base	12.0 ± 0.9	8.2 ± 0.8	
7 Rudder	11.8 ± 0.7	3.3 ± 0.3	The same as the main alloy of the horse
38 Rudder	13.4 ± 1.0	3.9 ± 0.5	

Table 44.2. LIPS chemical analyses of rider and base

The areas where traces of silver decorations were found using XRF are: pupil, sword pommel, phalerae, and pendant of the rider; right phalera of the breastplate and pupil of the horse. The presence of silver was confirmed for most of the base decoration, while in areas where the foil was consumed or completely lost, tin-lead alloys were detected.

The elemental depth profile used to derive the above-reported compositions included approximately 1,500 spectra collected at each measurement point. They mostly exhibited the typical broad modulations associated with the corrosion effects observed in archaeological objects. The only anomalous behaviors of the tin content were those of the horse's left hind cannon (meas. 24), right forehoof (meas. 3), and left forepastern (meas. 4). The depth profiles measured in these areas were rather flat, something that is typically observed in bronzes that have aged for a relatively short period.

Very interestingly, the rudder exhibited a broad profile congruent with lengthy burial. This piece has threaded ends and the top is screwed into a threaded copper insert in the girth of the horse.

Conclusions

The equestrian group of Alexander the Great is composed of four authentic ancient bronze sculptures: rider, horse, rudder, and base. They demonstrate known as well as new aspects of the ancient foundry production. The rider and the horse were cast in pieces, and the main alloy of the latter recalls those used in the Hellenistic period for large bronzes. The alloys of the rider, base, and independent castings of the horse are more leaded, as is usual for ancient statuettes and other small bronze objects. The technological examinations and the study of the elemental depth profiles indicate that the terminal parts of three limbs were likely cast and integrated after the discovery of the artifact. The saddlecloth was either adapted to the horse or completely fabricated in modern times, while at least the front part of the breastplate is ancient.

None of the three sculptural pieces of the group presents traces of slush casting of the waxes, and the rider exhibits clues of direct shaping (i.e., it seems an original model). Further investigations are needed in order to assess whether the rider and horse belong together. In particular, we suggest that future studies include the other prancing horse found in the same area of Herculaneum in order to gain further insights.

✦ ✦ ✦

Notes

1. Excavation daybook notes for the relevant dates are as follows: October 24, 1761: "part of the sword." October 31, 1761: "the metal base and a fragment of the embellishments of the horse." November 3, 1761: "the right leg of the rider." November 19, 1761: "a hoof of the horse." November 21, 1761: "the right hoof, two feet of the horse, sword, right arm, right leg and left leg of the rider."
2. Scatozza 1982.
3. Winckelmann 2011, 94.
4. Winckelmann 2011, 186.
5. Allrogen-Bedel and Kammerer-Grothaus 1980, 207.
6. Gelas 1820, 32.
7. Ruggiero 1885, 372–75. In 1897 the decoration of the chest disappeared for several years as evidenced by the note C5 IV, 24, unpublished, of the Historical Archive of the Soprintendenza Archeologia of Campania. Even the sword is no longer preserved. It appears in Brogi's photographs of the late nineteenth century and even in those of 1959 preserved at the Photographic Archive of the Soprintendenza Archeologia of Campania. After that date, it is no longer recorded.
8. Alonso Rodriguez 2005.
9. Lapatin 2015, 189.
10. Using tin-lead alloys as the filler.
11. Similar studies on the presence of mechanical joints were carried out both at the Restoration Center of Florence and at the Getty Center, where the bronze group underwent a further static consolidation carried out by conservator Jeffrey Maish before the exhibition *Power and Pathos: Bronze Sculpture of the Hellenistic World* (2015).
12. It was considered for a long time that the Tripod with Sphinxes, National Archaeological Museum of Naples (NAMN), inv. 72995, dated between the end of the first century BC and the beginning of the first century AD, came from the Temple of Isis in Pompeii. Recent studies attribute it instead to Herculaneum. In 1997, the Tripod underwent restoration at the Laboratory of Conservation and Restoration of the NAMN under the direction of Luigia Melillo by the restorer Giovanni Cirella. The data are unpublished.
13. See the compositional analysis reported below.
14. More details on this technique can be found in Agresti, Mencaglia, and Siano 2009, and Siano and Agresti 2015, S107–S108.

Bibliography

Agresti, Mencaglia, and Siano 2009
Agresti, J., A. A. Mencaglia, and S. Siano. 2009. "Development and Application of a Portable LIPS System for Characterising Copper Alloy Artefacts." *Analytical and Bioanalytical Chemistry* 395(7): 2255–62.

Alonso Rodriguez 2005
Alonso Rodriguez, M. C. 2005. "Vaciados del siglo XVIII de la Villa de Los Papiros de Herculano en la Real Academia de Bellas Artes de San Fernando." *Academia: Boletin de la Real Academia de Bellas Artes de San Fernando, Primer y Segundo Semestre de 2005* 100–101: 25–64.

Allrogen-Bedel and Kammerer-Grothaus 1980
Allrogen-Bedel, A., and H. Kammerer-Grothaus. 1980. "Das Museo Ercolanese in Portici." *CronErcol* 10: 175–217.

Gelas 1820
Gelas, M. 1820. *Catalogues des statues en bronze exposées dans une grande salle du Musée Bourbon à Naples*. Naples.

Lapatin 2015
Lapatin, K. 2015. "Alexander the Great on Horseback." In *Power and Pathos: Bronze Sculpture of the Hellenistic World*, ed. J. M. Daehner and K. Lapatin, 188–89. Los Angeles: J. Paul Getty Museum; Florence: Giunti.

Ruggiero 1885
Ruggiero, M. 1885. *Storia degli scavi di Ercolano ricomposta su' documenti superstiti.* Naples: Tipografica dell'Accademia reale delle scienze.

Scatozza 1982
Scatozza, L. M. 1982. "Restauri alle collezioni del Museo Ercolanese di Portici alla luce di documenti inediti." *Atti della Accademia Pontaniana* n.s. 31: 495–540.

Siano and Agresti 2015
Siano, S., and J. Agresti. 2015. "Archaeometallurgical Characterisation of Donatello's Florentine Copper Alloy Masterpieces Using Portable Laser-Induced Plasma Spectroscopy and Traditional Techniques." *Studies in Conservation* 60 (suppl. 1): S106–19.

Winckelmann 2011
Winckelmann, J. J. 2011. *J. J. Winckelmann: Letter, and Report on the Discoveries at Herculaneum*. Introduction, trans., and commentary by C. C. Mattusch. Los Angeles: J. Paul Getty Museum.

45.

The Auloi from Meroë: Preliminary Notes on the Conservation, Technical Examination, and Interpretation of a Cache of Ancient Musical Instruments

Susanne Gänsicke, J. Paul Getty Museum, Los Angeles
Stefan Hagel, Austrian Academy of Sciences, Vienna

This paper summarizes preliminary results of an extensive, multidisciplinary conservation project at the Museum of Fine Arts, Boston (MFA) of a large cache of ancient musical instruments also known as "the auloi from Meroë." The objects were discovered in 1921 during excavations by the Harvard University–Museum of Fine Arts Expedition of the burial site of Queen Amanishakheto (10 BC) in Meroë, Sudan. Multiple layers of tubing were recovered, consisting of exterior bronze sleeves encasing resonators of wood and bone. Due to the thin-walled structure of the objects, their exposure to long-term burial, and subsequent transport and handling, the pipes were fragmented virtually beyond recognition.

To date, the fragments have been documented and sorted, and many broken sections are now reconnected. Scientific examination of the materials included radio-carbon dating, identified textile fibers and wood types, and allowed insights into the complex nature of the metalwork.

Music-archaeological methods, combining the material evidence with the physics of ancient musical scales, have identified twelve individual pipes forming six pairs representing three different types of pipes, of varying length and with diverse mechanisms. The project's long-term goal, in addition to physical reconstruction and stabilization of the ancient materials, is the fabrication of modern, functional replicas to discover the musical potential of these instruments.

✦ ✦ ✦

Discovery and Introduction

In 1921, Harvard Egyptologist George A. Reisner excavated Pyramid N 6 (also called Beg. N. 6), the burial of Queen Amanishakheto, in Meroë, Sudan.[1] This pyramid had been discovered in the early nineteenth century by the Italian physician and explorer Giuseppe Ferlini. While investigating the pyramid, much of which was destroyed during the process, Ferlini came upon a rich trove of gold jewelry.[2]

A few objects however remained in the tomb, to be discovered only when excavations were undertaken in the stairway leading to the underground burial chamber. Most notable among these was a cache of wind instruments. Given the degraded state of their materials, the pipes must have been very brittle and difficult to handle. Unfortunately, little information is available about the circumstances of the find or how the objects were retrieved from the soil. The expedition diaries allow a few glimpses into the discovery. The entry of March 23, 1921, reads in part: "found a number of bone tubes cased in bronze plate. These have holes and may have been a flute (or similar)."[3] On March 24, 1921, the writer elaborates: "came on a bunch of 'flutes' (?) about a meter or so further on. Photo and careful notes. Appear to be made in sections (bronze casing over reed or bone tubes)."[4] The last excavation entry of March 25, 1921, adds further information: "recording the bunch of flutes (about 18). Removed them late in the day (Sanborn and Story)."[5] Two high-resolution excavation photographs taken in situ are invaluable today as they show the cache both when first exposed (fig. 45.1) and after a number of pipes had been removed.

Figure 45.1. Flutes of bone and bronze, as found in original filling in stairway facing west, March 1925. Harvard University—Boston Museum of Fine Arts Expedition

Photo taken at: Begrawiya. Image: © Museum of Fine Arts, Boston. Photographer: Mohammedani Ibrahim

The Object Register of the excavation of March 23–25, 1921, provides a number of drawings of the more complex and interesting sections of the instruments and the following text entry: "Many fragments of at least four (probably five) flute like musical instruments. Straight tubes of ivory encased in bronze, made in sections, with round and oblong holes, mouthpieces, stops, and fittings. Length not obtainable but cannot be less than ca. 45 cm. Jointed section preserved of L. 13.1. Appear to be large and small (cf. two end pieces of different Diameters)."[6]

These quotes help to illuminate the confusion of the excavators when encountering this find. Up to the present day, this is by far the largest group of ancient double-reed double pipes ever found together. They clearly belong to the Mediterranean types attested all over the Hellenized world, called *auloi* in Greek and *tibiae* in Latin.[7] The instruments consist of two separate pipes played simultaneously, each held in one hand and equipped with its own double reed. Innumerable ancient depictions of auloi are found in diverse media: in painted scenes on ceramics, in sculptures, engraved in gems, and in wall-paintings and mosaics. Early aulos finds are made from wood or bone, often with metal enforcement over the joints, but construction evolved over time; by the Hellenistic and especially the Roman Imperial periods, mechanically sophisticated systems made of various metals, bone, and wood were in use.

Although Meroë is located hundreds of miles south of the Mediterranean Sea, trade routes along the Nile and the Red Sea provided paths for cultural and commercial exchange with the north, as well as with western and central Asia. The metropolitan quality and sophistication of the city is reflected in surviving art and artifacts. That its inhabitants must also have enjoyed the increasingly globalized music culture known from the Mediterranean is further emphasized by a smaller group of aulos fragments excavated by John Garstang in the Royal City of Meroë, as well as by the standing figure of a nude aulete, carved from Nubian sandstone and covered with polychrome gesso (pink for flesh tones and yellow for the instrument), found, again by Garstang, in the "Royal Baths" of Meroë.[8]

The first scholarly investigation of the auloi was undertaken by Nicholas Bodley in about 1939. He came to the conclusion "that a complete restoration, even of a single instrument, is not possible."[9] He believed the group to be the personal instruments of a professional musician, who may have participated in the funerary rites for the queen.[10] The fragmentary instruments were subsequently revisited by Maurice Byrne in the 1990s, and in 2012 by Olga Sutkowska. By 2013, funds were raised by the Museum of Fine Arts (MFA) that allowed the beginning of the current conservation project, whose preliminary results will be discussed below.[11]

Conservation: Approaches and Treatment

When the project began, most of the elements were still stored in the wooden trays in which they were shipped from the Sudan in the 1920s (fig. 45.2). Interspersed between the fragments were small pieces of paper with notes from the excavators, some written in Arabic. We may assume that in general each tray originally contained one instrument, except for a small number of tubes that were fused by corrosion and were lifted as an agglomerate. In Boston over the following ninety years, a certain amount of undocumented handling and sorting of the various elements and materials occurred. Some bone and bronze fragments were sorted and separated into trays; in the process, many original associations were lost.

Figure 45.2. Set of fragmentary auloi – Storage Container 6 (before treatment) 10–1 B.C. Bronze, ivory, bone, wood. SC 285264, SC 285267, SC 285268, SC 285269. Harvard University—Boston Museum of Fine Arts Expedition
Image: © Museum of Fine Arts, Boston

Even if the retrieval of the pipes left much to be desired, the excavators at least did not impregnate the fragments with wax or other materials favored during excavation retrieval at the time. Furthermore, prior to the beginning of the current project, no attempts at treatment had been made. We are working here with highly degraded matter, but the material is uncontaminated and unaltered by recent intervention—in other words, virgin matter.

Our initial assessment indicated that the project would access a group of elements consisting of cylindrical wooden or bone resonators, encased in thin bronze tubing, and supplemented with non-encased bone bulbs and encased reed inserts, similar to ones known from Pompeii.[12] Furthermore there appeared to be a variety of types, not only based on their different diameters as already stated by Reisner, but also in terms of the numbers and density of finger holes, the length of sections, the shapes, and the types of mechanics (figs. 45.3–4).[13]

Figure 45.3. A selection of the better-preserved aulos segments, including long bronze tubes with attached sliders, short tube sections that were connected by internal sockets and tenons, detached bronze knobs from rotary metal sleeves, bone bulbs, and bone reed holders, which are incorrectly placed at the bottom end of the pipes. 10–1 BC. Bronze, bone, wood. SC65062. Harvard University–Boston Museum of Fine Arts Expedition
Image: © Museum of Fine Arts, Boston

Figure 45.4. The end of a pipe's slider mechanism carries a small three-dimensional sculpture of a dolphin holding a seashell in its snout. There are four such slider terminals in the collection.
Image: © Museum of Fine Arts, Boston

Rehousing

Further analysis, documentation, and interpretation of these fragments could only be carried out after the elements were stabilized and rehoused. The initial phase of rehousing and removal from the shipping containers was recorded in detail and was comparable to a controlled excavation, completely preserving information such as location and associated notes that may lead to further understanding of the fragments.

The wooden trays in which the fragmentary auloi had traveled the long distance from the site of Meroë in northern Sudan to Boston were recorded using high-resolution digital photography. Next, all fragments were removed from their old containers, which had permitted them to jostle against each other since their arrival in Boston almost one hundred years ago. The pieces were rehoused in state-of-the-art archival storage trays with an interior modular system of smaller boxes that allowed constant reconfiguration to serve the needs of each original particular tray. Since connections to be made between fragments during this project would lead to longer individual pipe sections, the new storage systems required the flexibility for constant adjustment. In the process, the individual pieces were cross-checked against earlier images, and their locations noted to record adjacencies that may prove to be important for future reconstruction.

Joining

The interior bone resonators, bulbs, and reed-holder fragments could now be handled fairly safely. Viewed against a cleaner background, many fragments now begged to be joined.[14] The bone parts, especially, exhibit specific shapes, textures, and sometimes incised surface decorations, all of which greatly helped to identify joins. The green stain observed on many parts and of varying hues was caused by contact with copper tubes in burial, and not by an original dye, as previous researchers had assumed. Many of the bulbs carried decorative silver sleeves, now mineralized to a brown, warty appearance.

The outer bronze sleeves and tubes were far more difficult to join. The thin walls of the heavily corroded, and sometimes also mineralized, metal have occasionally warped, complicating the reconstruction of the original forms. The thin-walled copper-alloy tubes, however, also show distinctive corrosion patterns, related to the burial environment and its variable micro-conditions. These features occasionally allow identification of pieces that belong to one tube, but may more often help corroborating hypotheses built on different grounds. Many pipes consisted of numerous short bronze tubes, joined with socket-and-tenon joins of the inner bone lining. In cases where the bone lining was separated from the metal tubes, joining of tube sections based on the material evidence alone was almost impossible.

The wood is so fragile that for the time being any manipulation of it is avoided.

Material Analysis

X-radiography: To date, all metal elements have been examined by X-radiography (fig. 45.5). The radiographs provide insight into the highly sophisticated fine mechanics of the auloi: uniform sections of extremely thin and straight bronze tubing (some less than 0.3 mm thick) were fitted into each other to form an airtight system. As with other aulos finds, wall thickness is basically homogeneous and none of the straight tube sections shows seams, with the single exception of a long piece of tubing without any mechanism.[15] The generally mottled appearance of the tubes is due to corrosion, which led to uneven loss of metallic substance. One particularly interesting feature seen first in the radiographs as dark lines, are straight slits or cuts on many short tubes, where thin partial rings were intentionally cut from the tube's end. These presumably mechanical features are so far unique to the Meroë double pipes, and although we have developed hypotheses about their function,[16] these remain to be verified by experimental reconstruction.

Figure 45.5. (above) Photo of Box 11 containing auloi fragments; (below) X-radiography of Box 11 in an (almost) identical arrangement
Image: © Museum of Fine Arts, Boston

Alloy Analysis: Surface analysis by energy-dispersive X-ray fluorescence, a non-destructive analytical technique, provided initial semiquantitative information on the elemental composition of various elements of the instruments: of straight tubes, knobs, and metal encasing on the bone bulbs. It appears that large sections of the round tubes were made from a copper-tin bronze. Lead was detected in areas that were once joined by soldering, and silver was found on various bone bulbs.

Cross Section: A polished and etched metal cross-section of one narrow tube revealed a highly stressed metal structure that was cold worked and annealed during manufacture. Based on this observation, it is assumed that the seamless tubes were cast from tin bronze and then likely further hammered, possibly around a metal core. Final turning and smoothing of the surface with a lathe-like instrument facilitated the perfect fitting of extremely thin, straight tubes, leaving distinctive parallel marks on the metal surface (fig. 45.6); these can be seen in a few locations on the bronze tubes that have not been mineralized by corrosion. Quantitative elemental analysis on the cross section determined that they were made of tin bronze with about 90% copper and 10% tin.[17]

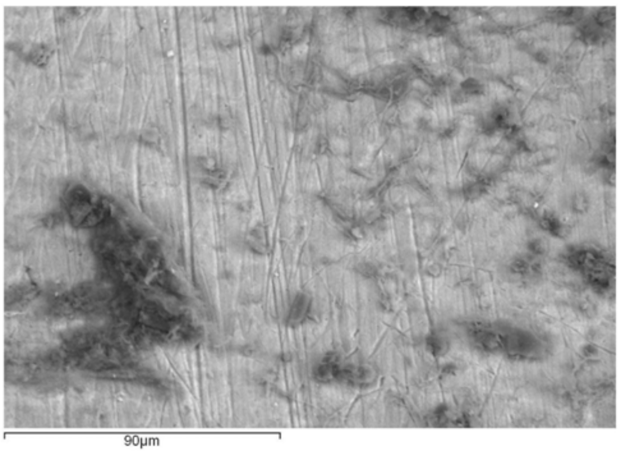


Figure 45.6. Photomicrograph taken in a scanning electron microscope showing a small section of an almost metallic, uncorroded surface of a bronze tube, which retains parallel lines caused by lathe turning

Image: © Museum of Fine Arts, Boston

Carbon 14 Dating: Samples from wooden core material were dated by radiocarbon analysis to between 52 BC and AD 54, congruous with the burial of Queen Amanishakheto. Her instruments were au courant![18]

Wood Identification: Analysis was carried out by Caroline Cartwright of the British Museum on five wood samples from different original storage boxes, some of them associated directly with specific bronze tubing. She identified the wood as that of *Olea europaea*, the European olive, which is not native to the Sudan. This suggests that the double pipes were manufactured far north of Meroë utilizing wood from the Mediterranean sphere.[19]

Bone: Based upon initial visual examination, the lining of many pipes, as well as their bulbs and bells, appears to have been primarily carved from bone; as mentioned above, these parts are sometimes light green in color. Different parts of the pipes appear to have been carved from different types of bone, judging by their surface textures. Such slight variances and the occasional surface decoration in the form of thin incised lines aid in establishing joins between the numerous small fragments.

Fiber Analysis: Textile fibers were found on both the rotating sleeves of the instruments and the knobs by aid of which these were operated. Some of the fibers appear to wrap repeatedly around the rotating sleeve or knobs, while others are inserted into the holes of knobs (fig. 45.7). The exact use of the fibers is not known, but it was postulated that the yarns might assist in the rotation of the sleeves in some way (perhaps by giving the player a way to turn the sleeves by pulling the yarns), or cushion the sharp top edge of the knob with wrapped fibers to make playing more comfortable. Alternatively, the yarn may have simply been used as decoration. Preliminary analysis by Joel Thompson, associate conservator in textile conservation at the MFA, has identified the fibers as extremely fine flax, although much more detailed studies are required to map the location of all fibers associated with the instruments.

Figure 45.7. Rotating bronze sleeve with soldered-on bronze knob. The hole in the knob contains ancient flax twine.

Image: © Museum of Fine Arts, Boston

Music-Archaeological Interpretation

In late spring 2015, a group of music archaeologists, leading researchers of ancient music and in particular of auloi—Stefan Hagel of the Austrian Academy of Sciences, Peter Holmes of Middlesex University London, and Olga Sutkowska of the Universität der Künste Berlin—joined the project.[20] The expertise of the music archaeologists and their previous detailed studies of auloi in European collections have been indispensable.[21] The goal for their work was twofold: to assemble as many complete or near-complete instruments as possible, and to prepare detailed documentation that will hopefully lead to the production of playable replicas.

After sorting tube sections by internal and external diameters and other distinctive features, tentative arrangements of the first double pipes were made. For a couple of sections, the two above-mentioned photographs taken of the fragments in situ were helpful, and corrosion patterns on the outer bronze tubes were taken into account throughout. Most of the material, however, found its likely place only with the help of a grid of relative finger-hole distances for the various notes of the ancient musical system, in combination with information on how these may have worked together, both from the remnants of ancient scores and from theoretical treatises. In addition, it needed to be assessed whether any proposed arrangement of finger holes could possibly be played by the human hand—taking into account the highly trained hands of ancient professional players with considerable finger spans evidenced from other aulos finds. As a first result, by June 2015, hypothetical layouts of eight pipes forming four instruments had been created, with at least four more pipes and additional tubing sections remaining to be studied.

Stefan Hagel returned in the fall of 2015 for a second study session and now six instruments are tentatively identified, consisting of twelve pipes and accounting for nearly all of the section fragments. Each double pipe is distinguished by different features, including length and mechanisms.

The reconstruction of the two longest pairs—longer than any other ever found—was greatly helped by the fact that these instruments were musically very similar, differing only in the musical capabilities of their bass regions, far below the playing position of the hands. Their four tubes were also equipped with identical slider mechanisms that end in small dolphin sculptures, each one holding a seashell in its snout (see fig. 45.4). These shells would have covered sound holes and could be pushed up and down along the tubes to switch between two different bass notes.

After the reconstruction of these four pipes had reduced the pool of fragments by twelve feet worth of tubing, the remaining eight pipes belonging to shorter instruments became easier to tackle. Four of these belonged to a previously unknown type of aulos without a bulb, terminating at their upper ends in a reed insert whose flare is nearly reciprocated at the lower ends. These came mostly with a wooden core and with hardly any rotating sleeves, forming the simplest instruments in the cache.

In contrast, the remaining two pairs had rotating sleeves throughout, resulting in relatively high-pitched and highly chromatic modulating instruments. Their reconstruction was encumbered by the sheer number of very small sections, where the short distances between the finger holes sometimes required compromises on the part of the makers, sacrificing exact intonation for the sake of fingering. However, in the end it proved possible to arrive at a musically meaningful interpretation of this group as well, which currently awaits corroboration first by physical modeling and then by experimental reconstruction. The former is done with specialized software that allows the assessment of pitches and scales of such instruments based on their physical parameters, establishing the optimal measurements of the lost reed mouthpieces as well as the likely placement of lost holes, in the very few cases where this may be required.[22]

Numerous smaller stray bronze elements, mostly broken away from the external layers of existing sections, still must be considered. These have now been sorted, rather like a jigsaw puzzle, into groups with specific edges, such as end sections of tubes, pieces with remnants of sound holes, small ring sections, and the like.

Concluding Remarks

Future study sessions with the team members within the next year are anticipated. With the completion of reasonably accurate copies, the musical potential of such instruments could be rediscovered, adding immeasurably to our knowledge of music in the Roman period. A first trial by Stefan Hagel playing 3D-printed replicas of the "Wooden Pipes" took place in January 2016 in Paris during a conference focused on the making of ancient musical instruments, in part organized by the Institut français d'archéologie orientale (IFAO).[23]

✦ ✦ ✦

Acknowledgments

Special thanks for contributions and support of the project are due to Damon Beale, Lawrence Berman, Michele Derrick, Denise Doxey, Rita Freed, Christine Kondoleon, Jayme Kurland, Darcy Kuronen, Meredith Montague, Richard Newman, Matthew Siegal, Joel Thompson at the Museum of Fine Arts, Boston, and to many other scholars including Raj Gupta, Peter Holmes, Deborah Schorsch, David A. Scott, Bradley Strauchen-Scherer, Olga Sutkowska, Michael Tarkanian, Frank Willer, Michael Zach.

Thanks are also due to Richard Newman, head of scientific research, and Michele Derrick, Schorr Family Associate Research Scientist, MFA, Boston, for the alloy analysis and examination of the cross section.

Notes

1. Excavation numbers 21-3-350, 21-3-702. Dunham 1957, 109, plate LIX A, B.
2. Priese 1993, 12–15. Today, the preserved gold jewelry is primarily divided between the collections of the Staatliche Sammlung Ägyptischer Kunst München and the Ägyptisches

Museum und Papyrussammlung, Staatliche Museen zu Berlin – Preussischer Kulturbestitz.
3. Harvard University–Museum of Fine Arts 1920–21a, 253. See also West 1992, 81–107. It is worthwhile to point out that the term “flutes” used by Reisner (and others) in connection with the Meroë auloi is incorrect. The instruments are predominantly referred to as “double pipes” in this article, each formed by two “pipes.”
4. Harvard University-Museum of Fine Arts 1920–21a, 255.
5. Harvard University-Museum of Fine Arts 1920–21a, 256.
6. Harvard University-Museum of Fine Arts 1920–21b, 302. Thanks are due to Denise Doxey for helping to read the handwriting in this register.
7. West 1992, 81–107.
8. Southgate 1915. The object was mounted and photographed by the Liverpool Institute of Archaeology. The short sections visible in the published image appear to show close similarities to some of the sections from Meroë. See Dixon and Wachsmann 1964 for a discussion of the aulete from Meroë, now in the Petrie Museum, London (inv. UC 8964).
9. Bodley 1946, 218.
10. Bodley 1946, 217.
11. This project was funded by generous donations from members of the Visiting Committees of the Departments of Musical Instruments, Art of the Ancient World, and Conservation and Collections Management, Museum of Fine Arts, Boston. http://www.mfa.org/collections/conservation/feature_auloiofmeroe.
12. Hagel 2012a.
13. Most recently the instruments were included in an MFA Highlights book on musical instruments; see Kuronen 2004, 61. It should be noted that prior to the collaboration with the music archaeologists in 2015, small bone cones have been repeatedly misinterpreted as bells, that is, bottoms of flutes, also by Bodley (1946, 235). See also Byrne 2002.
14. The adhesive used in the treatment is Rohm+Haas Paraloid B 72 (a conservation grade ethyl-methacrylate copolymer). It can be prepared in a variety of concentrations in a number of solvents, remains reversible, and does not darken or prevent future treatment or reversal of joins.
15. In contrast, solder seams were found on a Gallo-Roman trumpet by Mille (2007).
16. Sutkowska 2015, 412–22.
17. Byrne (2000) quotes the alloy of the C2AD aulos from London as 91% copper and 9% tin.
18. Christine Prior, Rafter Radiocarbon Laboratory, National Isotope Centre, GNS Science, 30 Gracefield Road, Lower Hutt, New Zealand.
19. See also Cartwright 2015.
20. All of them take part in the European Music Archaeology Project (EMAP), which has among other things allowed the reconstruction of one of the Pompeii double pipes as well as the investigation of the fragments from Poetovio. Their work to date has laid the foundations critically required for the interpretation of the Meroë pipes.
21. Hagel 2008, 2009, 2012a, 2012b; Sutkowska 2012, Sutkowska 2015.
22. Hagel 2004; 2014.
23. *Sound Making: Handcraft of Musical Instruments in Antiquity*. IFAO, Paris, January 14–16, 2016.

Bibliography

Bodley 1946
Bodley, N. B. 1946. “The Auloi of Meroe.” *AJA* 50: 217–40; plates i–viii.

Byrne 2000
Byrne, M. 2000. “Understanding the Aulos.” In *Studien zur Musikarchäologie* 2 (Orient-Archäologie 7), ed. E. Hickmann, I. Laufs, and R. Eichmann, 279–85. Rahden/Westfalia: M. Leidorf.

Byrne 2002
Byrne, M. 2002. “Understanding the Aulos II: Extended Pipes and Drone.” In *Studien zur Musikarchäologie* 3 (Orient-Archäologie 10), ed. E. Hickmann, A. D. Kilmer, and R. Eichmann, 367–73. Rahden/Westfalia: M. Leidorf.

Cartwright 2015
Cartwright, C. R. 2015. “The Principles, Procedures and Pitfalls in Identifying Archaeological and Historical Wood Samples.” *Annals of Botany* 116: 1–13.

Dixon and Wachsmann 1964
Dixon, D. M., and K. P. Wachsmann. 1964. “A Sandstone Statue of an Auletes from Meroe.” *Kush* 12: 119–25.

Dunham 1957
Dunham, D. 1957. *Royal Tombs at Meroë and Barkal.* Royal Cemeteries of Kush 4. Boston: Museum of Fine Arts.

Eichmann, Fang, and Koch 2012
Eichmann, R., J. Fang, and L.-Ch. Koch, eds. 2012. *Studien zur Musikarchäologie* 8 (Orient-Archäologie 27). Rahden/Westfalia: M. Leidorf.

Hagel 2004
Hagel, S. 2004. “Calculating Auloi: The Louvre Aulos Scale.” In *Studien zur Musikarchäologie* 4 (Orient-Archäologie 15), ed. E. Hickmann and R. Eichmann, 373–90. Rahden/Westfalia: M. Leidorf.

Hagel 2008
Hagel, S. 2008. “Re-evaluating the Pompeii Auloi.” *JHS* 128: 52–71.

Hagel 2009
Hagel, S. 2009. *Ancient Greek Music: A New Technical History*. Cambridge and New York: Cambridge University Press.

Hagel 2012a
Hagel, S. 2012. “The Pompeii Auloi: Improved Data and a Hitherto Unknown Mechanism. In Eichmann, Fang, and Koch 2012, 103–14.

Hagel 2012b
Hagel, S. 2012. “How to Shoot an Aulos: Taking Measurements from Photographs.” In Eichmann, Fang, and Koch 2012, 405–13.

Hagel 2014
Hagel, S. 2014. “Better Understanding the Louvre Aulos.” In *Studien zur Musikarchäologie* 9 (Orient-Archäologie 33), ed. R. Eichmann, J. Fang, and L.-Ch. Koch, 131–42. Rahden/Westfalia: M. Leidorf.

Harvard University–Museum of Fine Arts 1920–21a
Harvard University–Museum of Fine Arts Expedition. 1920–21. *Expedition Diary*. Vol. 10: *Sudan*; Part 6: Begarawiya. Archives of the Department of Art of the Ancient World, MFA.

Harvard University–Museum of Fine Arts 1920–21b
Harvard University–Museum of Fine Arts Expedition. 1920–21. *Object Register*, Sudan IX, Begarawiyeh (Meroe) 20-4-1 to 21-3-716. Archives of the Department of Art of the Ancient World, MFA.

Kuronen 2004
Kuronen, D. 2004. *Musical Instruments: MFA Highlights*. Boston: MFA Publications.

Mille 2007
Mille, B. 2007. “Les trompes gallo-romaine de Neuvy-en-Sullias Just sur-Dive, apport d’une étude de laboratoire.” In *Le cheval et la danseuse, à la redécouverte du trésor de Neuvy-en-Sullias*, ed. C. Gorget and J.-P Guillaumet, 146–55, 267. Paris: Somogy.

Priese 1993
Priese, K. H. 1993. *The Gold of Meroe*. Mainz: Zabern.

Southgate 1915
Southgate, T. L. 1915. “Ancient Flutes from Egypt.” *JHS* 35: 12–21.

Sutkowska 2012
Sutkowska, O. 2012. “One of Nine Tibiae from a Villa Rustica in the Vesuvian Area Rediscovered.” In Eichmann, Fang, and Koch 2012, 115–26.

Sutkowska 2015
Sutkowska, O. 2015. “Archäologische Auloi/Tibia Funde mit Mechanismen.” *Die Tonkunst* 9 (4): 412–22.

West 1992
West, M. L. 1992. *Ancient Greek Music.* Oxford: Clarendon Press.

46.

A Defined Protocol for In Situ Micro-XRF Compositional Analysis of Bronze Figurines from the National Museum of Damascus, Syria

V. Kantarelou, Institute of Nuclear and Particle Physics, NCSR Demokritos, Athens
A. G. Karydas, Institute of Nuclear and Particle Physics, NCSR Demokritos, Athens
L. Mahfoud, Ministry of Culture, Directorate General of Antiquities & Museums, Damascus
A. Qurdab, Ministry of Culture, Directorate General of Antiquities & Museums, Damascus
M. Al-Saadi, Ministry of Culture, Directorate General of Antiquities & Museums, Damascus
V. Argyropoulos, Technological Educational Institute of Athens (TEI), Department of Conservation of Antiquities & Works of Art, Athens

The use of portable and handheld XRF analyzers has been widely adopted in metal compositional studies by cultural heritage professionals. However, studies have shown that the lack of certified reference materials and standardized quantification approaches has contributed to rather poor reproducibility of quantitative results among end-users in the analysis of historic and ancient copper alloys. The limited depth resolution of XRF analysis can impose additional difficulties for proper interpretation of analytical data obtained for ancient metal alloys, due to stratified corrosion layers at the metal-corrosion interface.

During the PROMET European FP6 project, a customized micro-XRF spectrometer was transported to the National Museum of Damascus, Syria, to study its unique bronze collection. Analyses were carried out on many important artifacts, such as Late Bronze Age gilded-bronze figurines from the site of Ugarit. The paper focuses on the micro-XRF analyses of two of these bronze figurines and highlights the methodological issues regarding the optimization and validation of the micro-XRF analytical approach for ancient copper alloys. The XRF analyses of these unique Mesopotamian figurines are presented with an emphasis on best practices for micro-XRF measurement protocols, data analysis, and interpretation.

✦ ✦ ✦

Introduction

During the PROMET European FP6 project, a micro-XRF mobile spectrometer was transported to the National Museum of Damascus, Syria, where it was applied and validated for the quantitative noninvasive analysis of unique museum metal collections across the Mediterranean region, successfully addressing archaeological and conservation questions. Given the value of these collections, transport of objects or sampling for analysis is generally not permitted. Thus, the development and validation of a reliable portable technology is critical for comparisons of analytical compositional results, especially for similar museum collections or objects housed around the world.

The mobile micro-XRF spectrometer of NCSR "Demokritos" was utilized in campaigns at the Archaeological Museum of Ancient Messene (Peloponnese), the Palace Armoury Museum in Malta, the

Umm Qais and Numismatic Museums in Jordan, and the National Museum of Damascus, Syria. These studies revealed important information about their metals collections concerning the manufacturing techniques and the condition of objects from various periods, but more importantly developed a standard approach for validating the precision and accuracy of compositional data for ancient and historic copper and iron alloys, as well as gilding techniques from various periods. At the Archaeological Museum of Ancient Messene, high-tin bronze mirrors dating from the second century BC were analyzed to identify the composition of the alloy and corrosion products, as well as to characterize the reflecting gray-silverish and black-colored surface finishes of the mirrors.[1] The Palace Armoury campaign included the XRF analysis of steel armor elements with emphasis on manufacturing techniques such as surface gilding.[2] At Yarmouk University in Jordan, Roman copper-alloy artifacts from the Umm Qais Museum were analyzed to characterize the metal composition and corrosion products,[3] while gold coins from the collection of the Numismatic Museum were also analyzed in order to identify compositional differences and elucidate the use of raw materials and processing practices through different historical periods. At the National Museum of Damascus, gilded copper and gold artifacts of the third millennium BC and from about 1500 BC were studied. The micro-XRF analysis was used for the first time to investigate the composition of copper and gold alloys and their corrosion products, the thickness of the gold foil used for the gilding, and finally to assess their state of preservation.[4]

The results of these studies introduced and validated universal semiquantitative criteria for the analysis of bronze artifacts using a certifiable quantification model, which was also tested during a comparison exercise organized by the Getty Museum.[5] This approach is discussed here, based on the scientific examination of two unique Bronze Age figurines from the National Museum of Damascus. These gilded copper-alloy figurines represent the El god (the principal god of Ugarit) and the god Baal, both dated to the Late Bronze Age (fourteenth century BC) (fig. 46.1a–b). Compositional results of the copper alloys are presented to highlight the main problems in micro-XRF analysis of ancient bronzes, such as the heterogeneity of the alloys; the importance of using filters in the excitation path; and the production of reliable quantitative results. The scientific examination of the figurines allowed us to develop practical guidelines for micro-XRF users on how to generate good quality XRF analytical data that are representative of the bulk composition of the metal alloy.

Figure 46.1a. Statuette representing the El god, principal god of Ugarit. The figure was originally gilded bronze but many gold parts are missing and the exposed areas are covered by a thick green corrosion layer. H: 13.5cm, Late Bronze Age (fourteenth century BC). National Museum of Damascus, inv. RS23

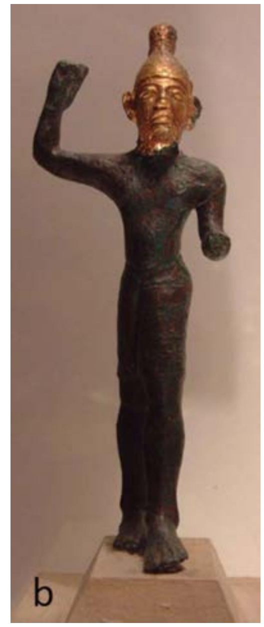


Figure 46.1b. Statuette of the weather god Baal. The figurine was originally gilded bronze but only a few gold parts are preserved in the head area. H: 12.5cm, Late Bronze Age (fourteenth century BC). National Museum of Damascus, inv. 3572

Background

XRF spectrometry is the most popular technique for the elemental analysis of culture heritage (CH) objects,[6] since it is noninvasive and can detect a wide range of elements, providing fast qualitative and in some cases validated quantitative results.

Despite the obvious advantages, the technique does have limitations, in particular when it is used for the analysis of CH metal objects utilizing an exciting X-ray beam with a size at the order of 0.1mm or below. The high spatial resolution of the exciting X-ray may produce misleading results for specific metal alloys. This is due to their microscale heterogeneity, which originates from the degree of solubility of the individual constituent elements and/or from the formation of corrosion products on the surface.[7]

In the case of quaternary copper (Cu) alloys with significant lead (Pb) concentration, segregation effects appear due to the immiscibility of the Cu and Pb phases, resulting in the concentration of Pb globules at the Cu grain boundaries.[8] Also, surface finishing techniques may result in partial removal of Pb from the intergranular regions or to cause Pb smearing across the surface.[9] In the case of bronzes, the corrosion process may alter the surface in particular due to the phenomenon of decuprification. For binary bronze alloys, the alteration of the surface is very well described by Luc Robbiola and colleagues, who proposed a factor to transform the analytical results obtained from the surface (corrosion layer) to those that represent the bulk of the metal alloy.[10] Another way to achieve reliable quantitative results is to distinguish corroded from "corrosion-free" surfaces, if such exist. In the case of binary (Cu-Sn) bronzes, the ratio of Sn Kα to Lα lines of the examined alloy was suggested[11] in order to access a finishing technique or/and the alteration of the original alloy. Later on, this ratio was further developed as a robust semiquantitative criterion to assess the presence or absence of surface alteration, which can be used for different XRF spectrometers and operational conditions.[12] Another way to approach the original composition of the alloy is by using energy dispersive X-ray fluorescence (EDXRF) measurements combined with Monte Carlo methods.[13]

Another problem with the micro-XRF analysis of metals is the presence in the spectrum of peaks that energetically coincide with constituent elements' characteristic X-rays. The surface of a "corrosion-free" metal alloy exhibits a rather polycrystalline structure. Therefore, when the X-ray tube continuum-Bremsstrahlung radiation is utilized as an excitation source, it is probable that the Bragg equation will be fulfilled at certain energies under a particular geometrical setup configuration. More specifically, according to Bragg's law:

- $2d \sin \theta = n\lambda$, where
- d = sample crystal lattice spacing;
- 2θ = angle between the incident and the reflected beam from the sample; and
- λ = wavelength of the incident radiation.

Thus, it might be possible that, for certain values of d and θ, the aforementioned equation may be fulfilled by an incident wavelength λ contained within the polychromatic tube spectrum. As a consequence, various undesirable peaks that correspond to different orders of diffraction will appear in the spectrum and possibly interfere with characteristic X-rays of interest. The phenomenon is significantly enhanced with the highly focused exciting beam produced by X-ray lenses in micro-XRF spectrometers. In this case, due to the well-defined excitation geometry, the Bragg condition will be fulfilled by the majority of the incident flux at a particular energy, whereas with broader beams the diffraction peaks are less pronounced. The appearance of the diffraction peaks can be identified in the XRF spectra based on the following criteria:

1. Usually a Bragg peak does not coincide with the tabulated energy of any characteristic X-ray, or if it does, it is not accompanied by the rest of the transition lines following the decay of an inner shell (K-, L-) hole. For example, if the energy of the diffraction peak coincides with the Kα line of one element, then depending on the presence of this particular element within the analyzed sample, the respective Kβ line either has an abnormal relative intensity with respect to the Kα line intensity or it would be completely absent.
2. Typically the diffraction peaks exhibit a broader shape than the typical characteristic X-ray peaks, which are modulated by the detector energy resolution and natural linewidth and not by the sample irradiation geometry.
3. If the sample orientation is changed slightly with respect to the exciting beam, a respective shift in their energy is observed.

A standard methodology to minimize or even eliminate the presence of Bragg peaks in the spectrum is to introduce a strong absorber between the source and the sample/spot to filter the interfering part of the exciting radiation. Usually the low energy continuum (10 k eV) has a more pronounced probability of undertaking Bragg diffraction.

In micro-XRF analysis, a polycapillary X-ray lens is usually utilized in the excitation channel to collect efficiently, propagate, and focus to a few tens of micrometers the exciting X-ray beam radiation. Nevertheless, the X-ray lens introduces major difficulties in quantification, since its transmission efficiency—being highly dependent on the transmitted X-ray energy—results in significant and not easily predicted modifications of the energy distribution of the primary tube spectrum. Although quantitative analysis by direct comparison with a certified reference material (CRM) is a rather simple and straightforward approach, it assumes the availability of CRMs with a compositional profile (matrix) similar to the unknown one. This necessity can be avoided, however, by applying for the micro-XRF quantification analysis a fundamental parameters approach that utilizes an analytical description of the lens transmission efficiency.[14]

This methodology is applied below for the compositional analysis of two gilded-bronze figurines from the National Museum of Damascus in Syria.

The Gilded Bronze Figurines from the Late Bronze Age

This paper focuses on the analysis of two gilded-bronze figurines using micro-XRF during the in situ campaign. The figurines belong to the Late Bronze Age (1400–1300 BC) and were discovered at the southern area of Ugarit, which was first excavated in 1929 by French archaeologists. Site research suggests that the city acted as a link between the Near East and the ancient Mediterranean world.[15] Ugarit became the center of interaction between Egypt, Crete, Cyprus, and Anatolia, promoting an exchange of the earliest artistic styles within the ancient world. These statues represent ancient gods: the first one represents the El god (inv. RS23) and the other, the Baal god (inv. 3572) (see fig. 46.1). The El god figurine is in a seated position with its right hand raised, apparently in blessing, and its crown resembles the crown of Osiris. The stance of the Baal god is borrowed from Egyptian images of triumphant kings striding over their fallen enemies.[16] At that time, Ugarit art was highly influenced by Egyptian art, as can be observed in the examined artifacts. In another paper,[17] we discussed the methodology for the micro-XRF analysis of the gilded parts of the objects. The examination of gilded areas showed the use of the foil gilding technique, determined the composition of the gilded areas, and revealed the use of different gold sheets on these objects.

Measurement Setup

The scientific examination of the bronze figurines was carried out by a portable micro-XRF spectrometer (fig. 46.2). This instrument was developed based on a commercial spectrometer (Bruker-Nano ARTAX) with optimized features regarding the design of the spectrometry head and the lens transmission efficiency at high energies (20 k eV). The spectrometer probe consists of an X-ray microfocus Rh-anode tube (spot size 50 μm x 50 μm, max 50 kV, max 1 mA, 30W maximum power consumption, Be window 0.2 mm thickness); and a polycapillary X-ray lens as a focusing optical element (IFG), with focal distance equal to 21.2 mm and with spatial resolution of ~40–100 μm. The X-ray detection chain consists of an electrothermally cooled 10 mm^2 silicon drift detector (X-Flash, 1000B) with FWHM equal to 146 eV at 10 kcps coupled with a digital signal processor. A color CCD camera (ca. 13x magnification) is used for sample illumination and a dimmable white LED to produce a laser spot. Three different stepping motors, coupled with the spectrometer head, allow its movement in three dimensions to facilitate 2D scanning measurements. Finally, a portable supporting stand for the micro-XRF spectrometer (developed in-house) allows its vertical movement in a range of about 50 cm. The portable stand can be easily disassembled, packed, and transported to a museum or a site.

Figure 46.2. The area on the Baal god figurine was analyzed with (thin line) and without (thick line) the use of a filter in the excitation path. When using filtered excitation, the pile-ups were eliminated, the background noise was reduced, and the presence of traces of selenium and lead was revealed

Results/Discussion

The Problem of Heterogeneity: The microscale heterogeneity of CH metals was validated during the PROMET campaign and was reported in the book *The Preservation of Metal Museum Collections from the Mediterranean Region: The PROMET Approach*.[18] In this study, the examination of ancient copper alloys highlights the necessity of area mapping to deduce mean values of elemental intensities compared to single-spot micro-XRF analysis. It is very characteristic that the homogeneity of the SRM BCR-691 copper alloys is ensured only for a beam-spot size at the order of 5 mm due to their microscale heterogeneity. Typical copper alloys were analyzed by performing micro-XRF mapping in small (~0.5 x 0.5 mm^2) and large (~5 x 5 mm^2) areas. Table 46.1 reports the systematic area scans performed for the copper BCR-691A alloy. The elemental intensities deduced from each area scan were averaged and the respective standard deviations (STDMV %) are presented. In addition, the table gives the standard deviation (%) of the mean value determined by averaging the individual mean values of all the area scans for a specific elemental intensity.

Scans	Step (mm)	Area (mm^2)	No. of spots	Standard Deviation of the Mean Value (STDMV %) of the elemental intensities measured from area scans				
				Cu-Kα	Zn-Kα	Sn-Kα	Sn-Lα	Pb-Lβ
1	0.02	0.14 x 0.14	64	6	13	7	14	68
2	0.02	0.14 x 0.14	64	7	6	20	18	30
3	0.02	0.24 x 0.24	156	6	8	15	16	59
4	0.02	0.32 x 0.32	289	6	12	20	19	62
5	0.02	0.5 x 0.5	110	6	9	21	22	69
6	0.08	0.8 x 0.8	121	8	18	22	22	75
7	0.1	1 x 1	110	7	14	12	13	60
8	0.2	3 x 3	225	10	19	15	16	75
9	0.25	5 x 5	441	10	22	20	20	70
10	1.0	5 x 5	36	9	18	22	21	63
				4.2	**5**	**5**	**4**	**31**

Table 46.1. Results from micro-XRF area scans on standard reference bronze alloys BCR-A-691 with Cu: 78.73%, Zn: 6.02%, Sn: 7.16%, Pb: 7.9%, As: 0.194%. STDMV (%) represents the standard deviation of the mean value of the elemental intensities measured from an area scan. The highlighted values estimate the standard deviation (%) of the mean values obtained from the respective individual area scans.

Given these results, what would be an appropriate measurement methodology that would generate representative results of the metal alloy bulk composition? The following practical guidelines should be taken into account:

1. The scanning micro-XRF analysis should be conducted in at least three different areas ~1 mm x 1mm or larger, containing an adequate number of spot measurements (30) with step size equal to or slightly larger than the spatial resolution of the exciting beam (~0.1 mm in our case), and the respective mean average elemental intensities should be averaged.
2. If a scanning mode of analysis cannot be applied, as many single-spot measurements as possible should be taken at different areas of the analyzed surface to deduce mean elemental intensities that represent more accurately the bulk composition of the alloy.

The Need for Filtered Excitation: As discussed above, the surface of a bronze object exhibits a polycrystalline structure that may produce parasitic XRD peaks on the XRF spectrum that sometimes coincide with the energy region in which characteristic X-ray lines appear. The use of a filter in the excitation path can eliminate the influence of this phenomenon. Another advantage to using a filter is the improvement of peak-to-background at the energy region where minor or even trace elements (such as zinc, arsenic, or selenium) may be expected, and also the reduction of pile-up peaks.

As an example, a single-spot measurement was taken on the surface of the El-god figurine using unfiltered versus filtered excitation. In the case of bronze alloy analysis, the selected filter consisted of a sandwich of the following materials: cobalt (Co) (17.7 ± 1.3) μm, titanium (Ti) (23.64 ± 0.18) μm, and palladium (Pd) (11.3 ± 0.3) μm.

Both spectra (fig. 46.3) showed that the statue is made of a binary copper-tin alloy with some traces of iron, zinc, and arsenic. In the case of the filtered excitation, the background was reduced, and the presence of selenium and lead traces in the alloy was revealed. The detection of trace elements is extremely important in archaeometric studies, because it can give clues about the provenance of raw materials and the manufacturing process.

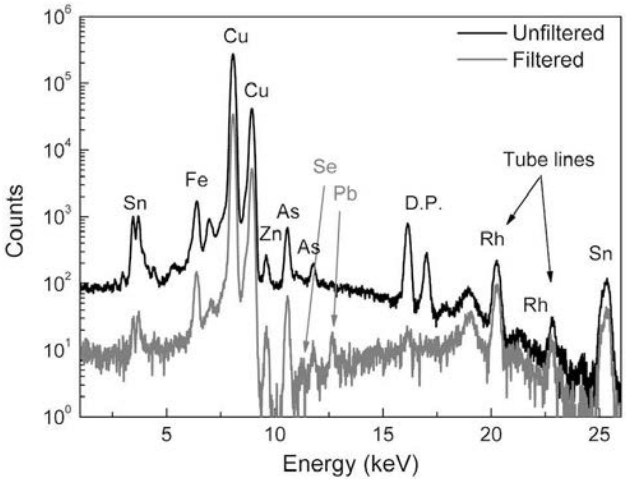


Figure 46.3. microXRF spectra

Surface Corrosion Products: The identification of a patina layer or surface corrosion products in XRF analysis relies on the detection of particular elements, mostly of elements with low atomic number like sulfur (S) or chlorine (Cl), which are signs/fingerprints of certain types of copper- or tin-related corrosion products. Another criterion is applicable when medium atomic number elements like tin are included in the bulk composition of the metal alloy. For example, in bronze alloys the variation of the (L/K) intensity ratio for the Sn-characteristic X-rays among different corroded and corrosion-free areas can indicate the presence of an alteration of the original alloy surface. The intensity of L X-ray lines, due to their significantly lower energy relative to the K-lines, is mostly affected by the depth distribution of the element, that is, whether it is on the surface layer or below; thus, a higher value probes a surface location of tin, whereas a lower- or negligible-value L-intensity gives direct evidence that a surface layer without tin acts as an absorbing layer. Moreover, in order to probe efficiently the elements S, Cl, and Sn L-X-rays, an unfiltered tube radiation is suitable as an exciting X-ray source. It should be stressed that the XRF analysis cannot identify the mineralogical type of a corrosion product, as the XRD or FTIR analysis can. However, through the elemental analysis, XRF can reveal elemental associations compatible with particular types of corrosion products.

An area map was performed at the back of the El god figurine (see fig. 46.1a). The black quadrangle in figure 46.4a defines the area of analysis, which shows both black and green coloration. The measurement conditions were set at 50 kV, 600 μA, 30 s/step, and 0.1 mm/step, total area of analysis 0.5 × 0.8 mm^2 (42 measurements). In figures 46.4b–c, the Cu Kα and the ratio of Sn Lα/Kα elemental intensities in each analyzed area are presented. The warm colors correspond to higher intensity values: therefore in the green region (on the right side of the scan) the increment of Cu Kα line points to the formation of a green copper-corrosion product (possibly malachite due to absence of S and Cl from the recorded spectra); whereas in the black area (down and left) the increment of Sn characteristic lines reveals the formation of a black tin corrosion products (possibly tin oxides).

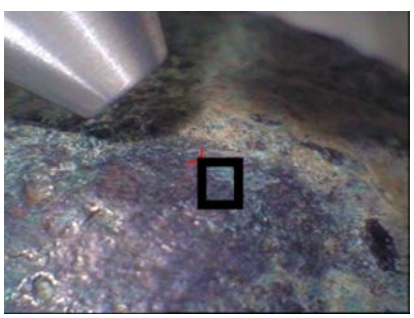


Figure 46.4a. Photo of the analyzed area (back side of El god figurine), outlined by the black quadrangle. From the photo, it is clear that the examined area contains a green (upper right) and a black (lower left) region

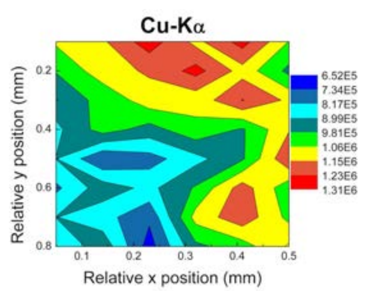


Figure 46.4b. Elemental intensity of Cu-Kα line

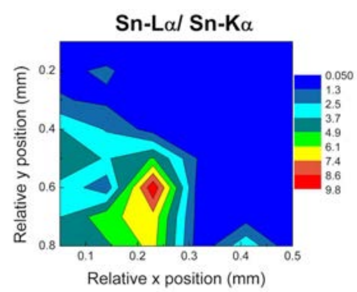


Figure 46.4c. Ratio of the elemental intensities of Sn-Lα to Sn-Kα lines. In the graphs, the warm colors correspond to higher values

Certifiable Quantitative Results: The XRF screening of reddish-brown areas on the surface of the Baal god figurine (see for example photos of three selected areas in table 46.2) could indicate (in principle) corrosion-free areas as opposed to those with the presence of reddish corrosion products (most likely cuprite). It is not possible to discriminate such areas by visual examination alone. This new methodology for screening was previously proposed,[19] wherein the relative ratio of Sn Kα/Lα to the respective value obtained by a reference binary Cu-Sn alloy was used as a criterion for identifying an area altered by corrosion. This ratio was theoretically calculated and experimentally found to be rather constant, being independent of the tin content, the measurement/excitation conditions (filtered/unfiltered excitation, operational voltage, irradiation geometry, micro- or milli-beam), and the type of the XRF spectrometer (anode material, detection system, etc.). Since the established criterion was fulfilled for only one spot (2b in table 46.2), quantitative results obtained for other analyzed spots were abandoned. In order to have an idea of the errors that could be introduced in the quantitative results for the bronze alloy, table 46.2 reports also the elemental concentrations as deduced from the analytical micro-XRF data obtained for spots (2a) and (2c). It is clear that without incorporating the universal screening criterion developed for the bronze alloys, the compositional results could indicate much higher Sn concentration (260% and 156%, respectively) than the actual value, suggesting a different manufacturing technology.

Photo of the analyzed area	Analyzed area	Concentration (%w.w)	
		Cu	Sn
	2a	89.2 ± 1.0	9.82 ± 0.5
	2b	92.5 ± 1.0	6.32 ± 0.3
	2c	81.9 ± 1.0	16.4 ± 0.8

Table 46.2. Elemental composition of the base bronze metal for Baal God figurine. Although all analyzed areas look similar, only the area 2b was screened to represent best the true alloy surface providing quantitative results representative of the original alloy composition.

Conclusions

Within the PROMET project, a portable micro-XRF spectrometer, based on an industrial prototype but with custom-selected hardware components and measurement head, was utilized on two bronze figurines housed at the National Museum of Damascus. Optimized analysis protocols were developed with the aim of achieving an accurate and precise compositional analysis of the Cu alloys, overcoming spectral interferences that arise due to the polycrystalline nature of the alloy's surface. Filters for the detection of bronze alloys should first be tested and the minimum representative area of analysis should be examined and specified on reference bronze alloys. Finally, the quantification procedure should only be used on corrosion-free areas in order to produce reliable analytical results. This paper outlined this methodological approach to carry out verifiable and reproducible compositional analysis.

✦ ✦ ✦

Acknowledgments

We would like to thank Mr. Eythimios Bistekos for his technical assistance during the in situ campaign in Damascus, Syria, and Dr. Demetrios Anglos for providing us with the reference bronze standards. We are also grateful to Dr. Maamoun Abdulkarim, Mr. Maher Azar, the staff of the Ministry of Culture of Syria, and the curators of the National Museum of Damascus for granting us the permission to study the unique gilded bronze figurines, for their hospitality, and for overall assistance during our campaign.

Notes

1. Giannoulaki et al. 2007, Kantarelou et al. 2007a, Kantarelou et al. 2007b.
2. Degrigny et al. 2007.
3. Arafat et al. 2013.
4. Kantarelou et al. 2015.
5. Heginbotham et al. 2010.
6. Karydas et al. 2007, Potts and West 2008, Trentelman et al. 2010.
7. Figueiredo et al. 2013, Ferretti 2014, Nicholas and Manti 2014.
8. Ingo et al. 2004.
9. Ingelbrecht et al. 2001.
10. Robbiola et al. 1998.
11. Kantarelou et al. 2007a, Gianoncelli and Kourousias 2007.
12. Kantarelou et al. 2015.
13. Manso et al. 2015.
14. Kantarelou and Karydas 2016.
15. Aruz, Benzel, and Evans 2008.
16. Al Moadin and Diez-Fuentes 2006.
17. Kantarelou et al. 2015.
18. Karydas, Anglos, and Harith 2008.
19. Kantarelou et al. 2015.

Bibliography

Al Moadin and Dîez-Fuentes 2006
Al Moadin, M., and H. Dîez-Fuentes. 2006. *Highlights of the National Museum of Damascus*. Lebanon: Media Minds LLC.

Arafat et al. 2013
Arafat, A., M. Naes, V. Kantarelou, N. Haddad, A. Giakoumaki, V. Argyropoulos, D. Anglos, and A. G. Karydas. 2013. "Combined in situ Micro-XRF, LIBS and SEM-EDS Analysis of Base Metal and Corrosion Products for Islamic Copper Alloyed Artefacts from Umm Qais Museum." *Journal of Cultural Heritage* 14: 261–69.

Aruz, Benzel, and Evans 2008
Aruz, J., K. Benzel, and J. M. Evans, eds. 2008. *Beyond Babylon: Art, Trade, and Diplomacy in the Second Millennium B.C.* New York: Metropolitan Museum of Art.

Degrigny et al. 2007
Degrigny, C., A. G. Karydas, S. Golfomitsou, V. Kantarelou, Ch. Zarkadas, and D. Vella. 2007. "Methodology for the *in-situ* Analyses of Historic Steel Armours with Portable Milli- and Micro-XRF Spectrometers." In *METAL-07*, vol. 2: *Innovative Investigation of Metal Artifacts*, 26–34. Amsterdam: Rijksmuseum.

Ebel 1999
Ebel, H. 1999. "X-ray Tube Spectra." *X-Ray Spectrometry* 27: 255–66.

Ferretti 2014
Ferretti, M. 2014. "The Investigation of Ancient Metal Artefacts by Portable X-ray Fluorescence Devices." *Journal of Analytical Atomic Spectrometry* 29: 1753–66.

Figueiredo et al. 2013
Figueiredo, E., M. Fatima Araujo, J. C. Silva, and R. Raquel Vilaca. 2013. "Characterisation of a Proto-historic Bronze Collection by Micro-EDXRF." *Nuclear Instruments and Methods in Physics Research B* 296: 26–31.

Giannoulaki et al. 2007.
Giannoulaki, M., V. Argyropoulos, G. P. Michalakakos, Th. Panou, V. Kantarelou, C.. Zarkadas, A. G.. Karydas, V. Perdikatsis, and Ch. Apostolaki. 2007. "A Conservation Survey of Museum Metals Collections: A Case Study of Ancient Messene Museum, Greece." In *METAL-07*, vol. 1: *When Archaeometry and Conservation Meet*, 67–72. Amsterdam: Rijksmuseum.

Gianoncelli and Kourousias 2007
Gianoncelli, A. and G. Kourousia. 2007. "Limitations of Portable XRF Implementations in Evaluating Depth Information: An Archaeometric Perspective." *Applied Physics A* 89: 857–63.

Heginbotham et al. 2010
Heginbotham, A., A. Bezur, M. Bouchard, J. M. Davis, K. Eremin, J. H. Frantz, L. Glinsman, L. A. Hayek, D. Hook, V. Kantarelou, A. G.. Karydas, L. Lee, J. Mass, C. Matsen, B. McCarthy, M. McGath, A. Shugar, J. Sirois, D. Smith, and R. J. Speakman. 2010. "An Evaluation of Inter-laboratory Reproducibility for Quantitative XRF of Historic Copper Alloys." In *Proceedings of the International Conference on Metal Conservation, METAL 2010*, ed. P. Mardikian, C. Chemello, C. Watters, and P. Hull, 178–88. Charleston, SC: Clemson University.

Ingelbrecht et al. 2001
Ingelbrecht, C., A. Andriaens, and E. A. Maler. 2001. "The Certification of Arsenic, Lead, Tin and Zinc (Mass Fractions) in Five Copper Alloys, BCR-691." *EUR 19778/1EN*.

Ingo et al. 2004
Ingo, G. M., E. Angelini, T. de Caro, G. Bultrini, and I. Calliari. 2004. "Combined Use of GDOES, SEM + EDS, XRD and OM for the Microchemical Study of the Corrosion Products on Archaeological Bronzes." *Applied Physics A* 79: 199–203.

Kantarelou et al. 2007a
Kantarelou, V., Ch. Zarkadas, A. Giakoumaki, M. Giannoulaki, A. G. Karydas, D. Anglos, and V. Argyropoulos. 2007. "A Novel Approach on the Combined in-situ Application of LIBS and μ-XRF Spectrometers for the Characterization of Copper Alloy Corrosion Products." In *METAL-07*, vol. 2: *Innovative Investigation of Metal Artifacts*, 35–41.

Kantarelou et al. 2007b
Kantarelou, V., A. G. Karydas, Ch. Zarkadas, M. Giannoulaki, and V. Argyropoulos. 2007. "Micro-XRF Analysis of High Tin Bronze Mirrors at the Museum of Ancient Messene in Greece." In *Proceedings of the International Conference on Conservation Strategies for Saving Indoor Metallic Collections (CSSIM)*, ed. V. Argyropoulos, A. Hein, and M. A. Harith, 93–99. Athens: Department of Conservation of Antiquities and Works of Art.

Kantarelou et al. 2015
Kantarelou, V., A. G. Karydas, D. Sokaras, L. Mahfouz, A. Qurdab, M. Al-Saadi, M. Giannoulaki, and V. Argyropoulos. 2015. "In situ Scanning Micro-XRF Analyses of Gilded Bronze Figurines at the National Museum of Damascus." *Journal of Analytical Atomic Spectroscopy* 30: 1787–98.

Kantarelou and Karydas 2016
Kantarelou V., and A. G. Karydas. 2016. "A Simple Calibration Procedure of Polycapillary Based Portable Micro-XRF Spectrometers for Reliable Quantitative Analysis of Cultural Heritage Materials." X *Ray Spectrometry* 45: 85–94.

Karydas 2007
Karydas, A. G. 2007. "Application of a Portable XRF Spectrometer for the Non-Invasive Analysis of Museum Metal Artefacts." *Annali di Chimica* 97: 419–32.

Karydas, Anglos, and Harith 2008
Karydas, A. G., D. Anglos, and M. A. Harith. 2008. "Mobile Micro-XRF and LIBS Spectrometers for Diagnostic Micro-Analysis of Ancient Metal Objects." In *Metals and Museums in the Mediterranean: Protecting, Preserving and Interpreting*, ed. V. Argyropoulos, 141–77. Athens: Department of Conservation of Antiquities and Works of Art.

Manso et al. 2015
Manso, M., N. Schiavon, I. Queralt, A. M. Arruda, J. M. Sampaio, and A. Brunetti. 2015. "Alloy Characterization of a 7th Century BC Archeological Bronze Vase Overcoming Patina Constraints Using Monte Carlo Simulations." *Spectrochimica Acta B* 107: 93–96.

Nicholas and Manti 2014
Nicholas, M., and P. Manti. 2014. "Testing the Applicability of Handheld Portable XRF to the Characterisation of Archaeological Copper Alloys." In *Proceedings of ICOM-CC 17th Triennial Conference, Melbourne*, ed. J. Bridgeland. International Council of Museums.

Potts and West 2008
Potts, P. J., and M. West, eds. 2008. *Portable X-ray Fluorescence Spectrometry: Capabilities for In Situ Analysis*. Cambridge: RSC Publishing.

Robbiola et al. 1998
Robbiola, L., J. M. Blengino, and C. Fiaud. 1998. "Morphology and Mechanisms Formation of Natural Patinas on Archaeological Cu-Sn Alloys." *Corrosion Science* 40: 2083–111.

Trentelman et al. 2010
Trentelman, K., M. Bouchard, M. Ganio, C. Namowicz, C. Schmidt Patterson, and M. Walton. 2010. "The Examination of Works of Art Using in situ XRF Line and Area Scans." *X-Ray Spectrometry* 39: 159–66.

47.

Is There an Ultimate Authority in Authenticity? Testing and Retesting Alexander the Great

Lisa Anderson, Division of Asian and Mediterranean Art, Harvard Art Museums, Cambridge, Massachusetts
Katherine Eremin, Straus Center for Conservation and Technical Studies, Harvard Art Museums, Cambridge, Massachusetts
Henry Lie, Straus Center for Conservation and Technical Studies, Harvard Art Museums, Cambridge, Massachusetts
Francesca Bewer, Division of Academic and Public Programs, Harvard Art Museums, Cambridge, Massachusetts
Patrick Degryse, Centre for Archaeological Sciences, Division of Geology, KU Leuven, Belgium

Many different methods of analysis—art historical, technical, and scientific—must be considered at one time in order to determine the authenticity of an ancient metal artifact. But what should we do when multiple analytical methods are employed but no consensus can be reached? In this paper, we consider this question as applied to the Alexander Nelidow (inv. 1956.20), one of the most confounding and often questioned copper-alloy pieces in the collection of the Harvard Art Museums.

The piece has been examined and debated by art historians, conservators, and materials scientists for decades with no clear consensus having been reached about its authenticity. Thought by some to be a Roman-period copy of an original bronze statue of Alexander the Great created by Lysippos in the fourth century BC, the piece has also been attributed on stylistic grounds to the Renaissance. Although the surface of the statuette was stripped and partially recarved in the late nineteenth century, patches of thick cuprite remain in many areas. While the alloy is consistent with a Roman date (leaded bronze with only a trace of zinc), the lead-isotope composition is not consistent with known ancient ore sources.

In this paper, we discuss the sometimes conflicting results of the visual and analytical tests that have been conducted on the Alexander statuette. We compare these with results from other pieces in Harvard's collection of equally uncertain date and of known replicas in order to achieve a better understanding of the different methods of authentication.

✦ ✦ ✦

On display in the Harvard Art Museums is a statuette of Alexander the Great, sometimes referred to as the Alexander Nelidow after its first known owner.[1] The statuette first appeared in the Istanbul bazaar sometime before 1897.[2] The original condition of the surface when excavated can only be guessed at: the surface had already been cleaned of any unsightly burial accretions by the time the first images appear.[3] Alexander is depicted as a nude youth, standing with his left arm raised, probably to grasp a spear. His head is turned sharply toward the left, while his right arm is bent with his hand placed on his right hip (fig. 47.1a–b). His torso is heavily muscled on the front and back. The legs below the knee are restorations. The statuette was sold at auction in 1911.[4] By 1954, it was in the possession of C. Ruxton Love Jr.,[5] who donated it to Harvard's Fogg Art Museum in 1956.[6]

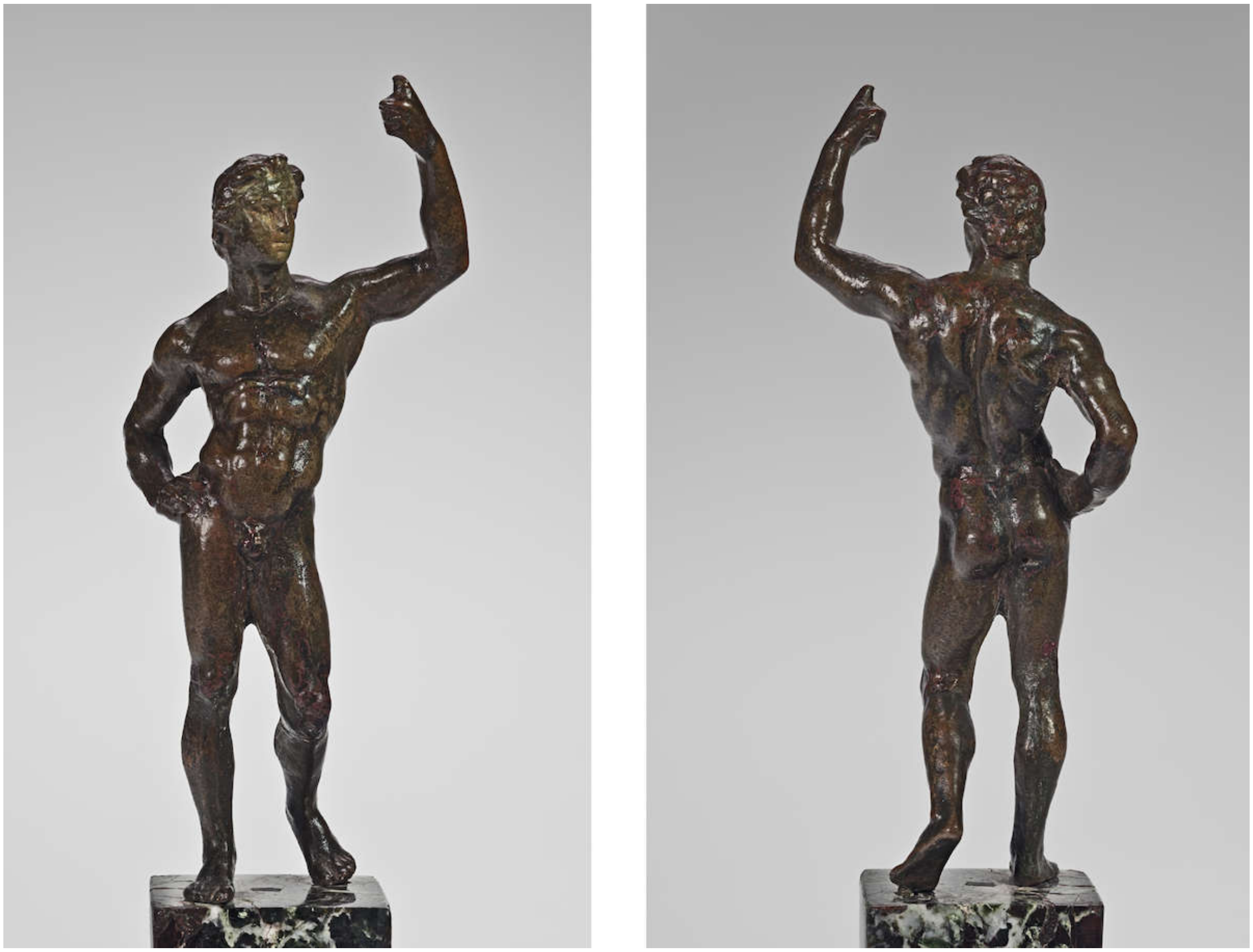


Figure 47.1a–b. Alexander the Great statuette. Bronze. Harvard Art Museums/Arthur M. Sackler Museum, Gift of Mr. C. Ruxton Love, Jr., inv. 1956.20. (a) Front and (b) back views

The Alexander statuette's authenticity as an ancient work has been called into question on occasion, most recently in 2014 when the results of lead-isotope analysis indicated that the statuette had an isotopic composition distinct from that of ore sources believed to have been used in Graeco-Roman times and from that of published copper alloy and lead objects of the period.[7] These analytical results provided the impetus to reevaluate the Alexander and to wonder if there is a final authority in authenticity studies. Is there ever going to be a point where one can look at objects and say, definitively, this one is fake and this one is an authentic antiquity?

Some light can be shed on this question using the work that curators, conservators, and material scientists have been doing for almost fifty years on bronzes at the Harvard Art Museums, particularly on the almost 1,300 copper alloy objects in the museums' Ancient Art Department in preparation for the online special collection *Ancient Mediterranean and Near Eastern Bronzes at the Harvard Art Museums*.[8] All objects were examined by members of the Straus Center for Conservation and Technical Studies for information on manufacture and condition, almost 1,000 were written up by art historians, and about 900 were tested for alloy composition using a variety of destructive and non-destructive methods. These techniques included ICP-MS/AAA, XRF, EMPA, SEM-EDX, and ICP-OES.[9] For this paper, we shall also draw on the data of a group of modern copper-alloy objects and pieces of uncertain antiquity for comparison with data from the Alexander, in order to explore issues that might help determine the statuette's authenticity.

Previous doubts about the Alexander Nelidow have come from the art historical perspective. The statuette has been published about thirty times between 1897 and the present.[10] In his 1898 monograph on the statuette, Oskar Wulff suggested that it is a copy of a statue known to us as

"Alexander with a Lance" by Lysippos (a work that was possibly described by Plutarch[11]). The identification is based on the arrangement of his hair, the stance—holding a spear now lost—and the left turn of his head, which would fit the possible descriptions of the statue.[12] Although most publications of Harvard's statuette accept that it does represent Alexander the Great (or a Hellenistic ruler), that it may be a copy after a Lysippan original, and that it was made in the Hellenistic or Roman periods, questions remain as to whether it is a copy based on "Alexander with a Lance," and indeed if such a statue even existed. A few of these publications reascribed the Alexander Nelidow from an ancient date to a more recent, even modern, one. The most important of these was by Diana Buitron, who suggested that the Alexander is a Renaissance piece based on stylistic similarities, particularly in the musculature, that she saw with certain fifteenth- to sixteenth-century AD bronze statuettes.[13] Stylistic criteria can be highly subjective, however, and Buitron's arguments are not concrete enough to securely date the Harvard statuette.

Copies

When looking at comparative pieces for more objective criteria by which to identify fakes, one fact that has emerged is that some of the statuettes in Harvard's ancient art collection are modern or likely modern copies (exact or only slightly adapted) of other statuettes. Of course, close copies of large-scale bronze sculptures are known,[14] but the statuettes in question are not copies of standard statue types. It is worth stressing that the antiquity of these statuettes was not called into question based solely on their status as duplicates, but was based on a combination of criteria, including lack of corrosion or alloy composition that is inconsistent with securely dated ancient pieces.

There are statuette types that are known "souvenir" replicas, like Harvard's copy of the Dancing Faun from Pompeii, which was probably made as a souvenir of the Grand Tour.[15] Its corrosion pattern does not suggest long-term burial, and its alloy composition is inconsistent with that of ancient pieces. Another example of this type may be a plaque of a sacrificial ram with attendant, which entered Harvard's collection as an antiquity.[16] This piece lacks corrosion and contains over 5% zinc, both of which are red flags for fakes;[17] it was nevertheless accepted as likely ancient until a very similar version from Pompeii was identified in the Museo Archeologico Nazionale, Naples. The similarity of the pieces suggests that the Harvard version was copied from the Naples bronze. As a result, the Harvard example was reclassified as modern.[18]

Another questionable object, of a Sardinian shepherd and ram group,[19] is probably a forgery meant to appear ancient. Its constituent alloy is completely unlike other Sardinian pieces, containing around 15% zinc: of about 130 such objects with published alloys, only one other has more than 1% zinc.[20] The corrosion is thick, up to 1.5 mm in some areas, but jumbled and uneven, sometimes lacking the usual layer of red cuprite under the green corrosion. It was found to have great similarities to a wrestler group in the Museo Archeologico Nazionale di Cagliari: the Harvard statuette mimics one of the wrestlers and replaces the other figure with a ram.[21] A draped female figure in the Harvard collection, which also lacks indications of corrosion from long-term burial and has an alloy containing over 30% zinc, is identical to at least 4 and up to 11 other statuettes.[22] It is also uncertain which statuette in this case would be the original upon which the others are based.

While the authenticity of a statuette is not immediately confirmed or undermined by being a close copy (or not) of another piece, this is often a cause for concern, particularly when combined, as in the above cases, with other reasons to doubt the objects' antiquity. In contrast, although it has close cousins, both large and small scale,[23] the Alexander Nelidow is not an exact copy of any other known statuette, so we must turn to other evidence to support, or refute, its antiquity.

Manufacture

In the process of examining objects for the ancient bronzes special collection, the conservation team identified some oddities related to methods of manufacture that have implications for the authenticity of some objects. One piece that has been difficult to authenticate portrays a comic actor in the role of a kitchen slave (inv. 2001.257).[24] The raised ridges along the exterior of the legs appear to be traces of piece-mold lines, a feature one would not expect to find on a Graeco-Roman bronze and which may be an indication that it was cast from a mold taken from an existing copper-alloy statuette. Filed-down mold lines were also observed on the statuette of the draped female figure mentioned above (inv. 1932.56.27).

The conservation team was recently able to compare Harvard's statuette of the orator Demosthenes (inv. 2007.221), based on a famous statue of the third century BC by Polyeuktos,[25] with an aftercast of the statuette made in Germany in the early twentieth century.[26] Comparison of X-radiographs of the ancient Demosthenes statuette and the aftercast reveals very different interiors, with a clear armature on the inside of the aftercast (figs. 47.2a–b, 47.3a–b). Study of the object at the Straus Center for Conservation and Technical Research revealed that the thick corrosion on the surface of the original is replicated on the aftercast as a rough, bumpy surface with no indication of corrosion products; a similar surface also appears on the draped female statuette described above (inv. 1932.56.27).

Figure 47.2a–b. (a) Demosthenes. Bronze. Harvard Art Museums/Arthur M. Sackler Museum, Gift of John W. Straus in honor of David Mitten, inv. 2007.221. (b) X-radiograph of Demosthenes statuette

Image: (a) Imaging Department © President and Fellows of Harvard College. (b) Straus Center for Conservation © President and Fellows of Harvard College

Figure 47.3a–b. (a) Aftercast of Demosthenes statuette. Private Collection. (b) X-radiograph of the aftercast

Image: (a) Imaging Department © President and Fellows of Harvard College. (b) Straus Center for Conservation © President and Fellows of Harvard College

In terms of manufacture, there is nothing unusual about Alexander: the statuette is solid cast, probably by a lost-wax technique, although due to the surface condition it cannot be determined with certainty whether it was a direct or indirect cast. Again, the Alexander shows none of the concerns that were noted for other suspect pieces and were used to help condemn these as modern.

Corrosion

The presence of corrosion cannot be used by itself to authenticate or date an object, but its total absence is a very good indication, in combination with other data, that a piece may not be ancient. The mineralized surface of the Alexander statuette was pared down to the interface of preserved metal before its earliest photograph was published in 1898.[27] In spite of this extensive “restoration” treatment, Alexander retains thick patches of red and green corrosion products usually associated with cuprite and malachite, although we have tended not to use analysis to confirm the identification of corrosion products (fig. 47.4a–b). Thick corrosion layers and intergranular corrosion can both be good indicators of long-term burial—and thus great age—but it is impossible to extrapolate from these the exact length of time an object was buried. That said, one must bear in mind that corrosion or patination can be created or enhanced artificially.[28] The cuprite on another Harvard bronze—a modern copy of half of a fifth-century BC Etruscan candelabrum group portraying a standing warrior—also has some red and green corrosion; in this case, the red corrosion was confirmed by Raman spectroscopy to be cuprite (fig. 47.5a–b).[29] As with the Sardinian shepherd-and ram-group, the thickness of the corrosion varies. The corrosion on the standing-warrior bronze could be mistaken for evidence of long-term burial if we did not know that the piece was a copy of an original candelabrum group excavated at Marzabotto, Italy, currently in a private collection, which the owners had reproduced for the Marzabotto Museum.[30] Harvard's warrior could easily have been made at the same time as the other known copies. Harvard also owns a copy of another candelabrum finial from Marzabotto of a youth carrying an amphora, which was also replicated and sold.[31] Results of compositional and isotopic analysis indicate that the metal composition of the two replicas of Marzabotto bronzes at Harvard is very similar, perhaps from the same batch of metal, though not the same pour.

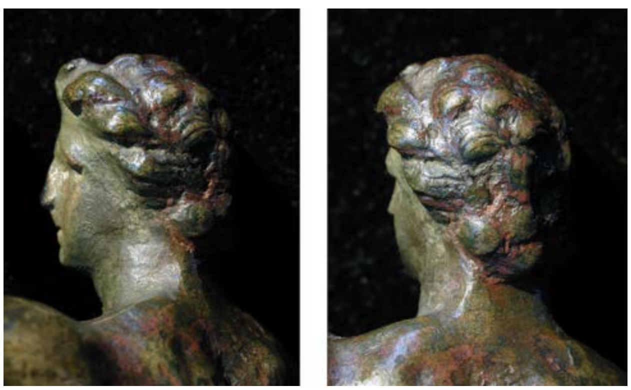


Figure 47.4a–b. (a–b) Details of head of the Alexander the Great statuette (see fig. 47.1) showing cuprites. Harvard Art Museums/Arthur M. Sackler Museum, Gift of Mr. C. Ruxton Love Jr.
Image: Straus Center for Conservation © President and Fellows of Harvard College

Figure 47.5a–b. (a) Standing Warrior, Harvard Art Museums/Arthur M. Sackler Museum, Gift of Frederick M. Watkins, inv. 1961.143. (b) Detail of Standing Warrior head, showing cuprite. Harvard Art Museums/Arthur M. Sackler Museum, Gift of Mr. C. Ruxton Love Jr.
Image: (a) Tony Filipe © President and Fellows of Harvard College. (b) Straus Center for Conservation © President and Fellows of Harvard College

Metal Alloy

The usefulness of alloy analysis to date bronzes has been debated due, among other things, to the recycling of metal throughout history.[32] Nevertheless, alloy analysis has revealed broader patterns and helped to identify anachronisms. Certain alloys seem not to have been used during specific periods: brass, an alloy of copper and zinc, for instance, has long been thought to be uncommon in antiquity before the Roman times. Yet, even there, as we use different tools to gather more data on the composition of copper alloy objects, the overall picture becomes more complex. Brass, we now know, does occur before the Roman period—but is still rare and occurs only in certain contexts or in certain types of objects.[33]

In the 1970s, Harvard's Alexander was sampled and tested by X-ray fluorescence spectroscopy (XRF), which suggested that it contained 1% zinc. More recent tests give quite different results, with only a trace or no zinc detected.[34] The variation between the datasets probably reflects improvements in analytical methods since the 1970s and the benefits of sampling for clean metal versus surface analysis, as the readings of surface composition are often distorted by the presence of corrosion. As a leaded bronze with trace zinc, Alexander's alloy composition is entirely normal for a Roman statuette. Based on data gathered at Harvard and further afield, it can be noted that the presence of (1) zinc above a few percent, (2) cadmium above the detection limit, and (3) high zinc without tin are all suspicious for ancient copper-alloy statuettes.[35] Of the 600 Harvard objects tested, around 80 objects had 5% zinc or higher (with a maximum of 48% zinc): 80% of these high-zinc pieces are known or suspected to be fakes or are known to date from the Byzantine to Islamic periods, and almost all of the statuettes with zinc above 5% are believed to be fake based on analyses of their corrosion products and art historical comparanda.[36]

Lead-Isotope Analysis

Lead isotope analysis relies on the fact that ore sources containing lead have a characteristic isotopic "fingerprint," which can help to pinpoint the source of a lead-containing copper alloy or lead deposit. However, interpretation of the isotopic composition of an object is complicated because more than one lead-containing source may be present, either due to mixing of metal ores in the original alloy or (more commonly) as a result of mixing from the recycling of metal objects. Lead isotope analysis of Harvard's Alexander and Demosthenes statuettes was performed in 2014. Both of these statuettes contain over 5% lead, so the measured isotopic composition of both reflects the ores of the lead that was deliberately added as an alloying ingredient, rather than being inherited from trace lead within the copper ores. A comparison of the lead isotopes of the two statuettes to known Graeco-Roman lead ore sources shows that the Demosthenes and the ores plot along the same line, while Alexander's lead is notably separate (fig. 47.6).[37] In order to better understand the lead isotopes of modern or fake copper-alloy objects, we sampled several known and suspected later copper-alloy objects at Harvard, as well as a few authentic pieces for comparison (fig. 47.7).[38] While the modern pieces and replicas cluster to higher values, they still plot along the line of possible Graeco-Roman lead ores. Even when we enlarged the plot to include more exotic ores from outside Europe and the Mediterranean, such as those from India[39] and Australia,[40] and modern gasoline lead,[41] from lead added to gasoline, which gives a good average for available modern lead (fig. 47.8),[42] the isotopic composition of lead from the Alexander Nelidow remained separate. This separation cannot be explained by the melting down and reuse of metals with different lead sources: recycling would simply give values that plot along the same line. The only way to produce such an anomalous value is to find an exotic source plotting above the line. One such possibility is provided by lead ores from Morocco, which do fall in a distinct field above the main isotopic line close to the value of the Alexander statuette (fig. 47.9).[43] Although more research is needed to determine whether Moroccan ores were actually exploited in the Roman period, studies of lead curse tablets from Roman Carthage show that Tunisian lead was used in these objects, proving exploitation of at least some lead sources local to North Africa in the appropriate period.[44]

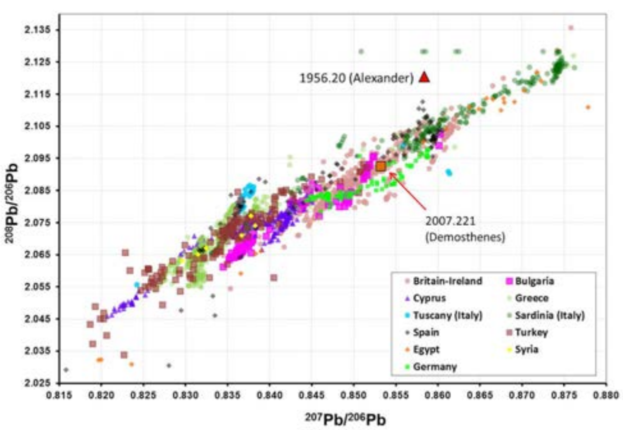


Figure 47.6. Lead isotopes of statuettes of Alexander the Great (inv. 1956.20) and Demosthenes (inv. 2007.221), compared to lead ore sources used in antiquity

Graph: Patrick Degryse and Katherine Eremin © Centre for Archaeological Sciences at KU Leuven and President and Fellows of Harvard College

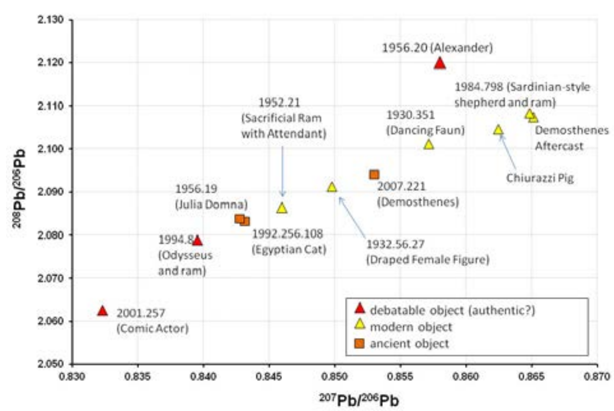


Figure 47.7. Lead isotopes of objects at the Harvard Art Museums

Graph: Patrick Degryse and Katherine Eremin © Centre for Archaeological Sciences at KU Leuven and President and Fellows of Harvard College.

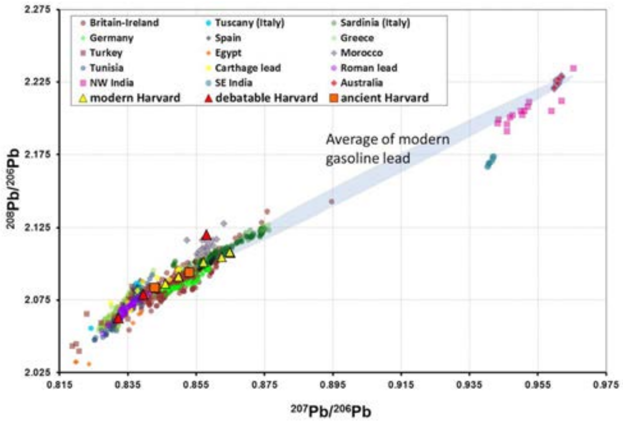


Figure 47.8. Lead isotopes of the objects in fig. 47.7 compared to lead ore sources used in antiquity, exotic/modern sources, and averaged modern lead (gasoline lead)

Graph: Patrick Degryse and Katherine Eremin © Centre for Archaeological Sciences at KU Leuven and President and Fellows of Harvard College.

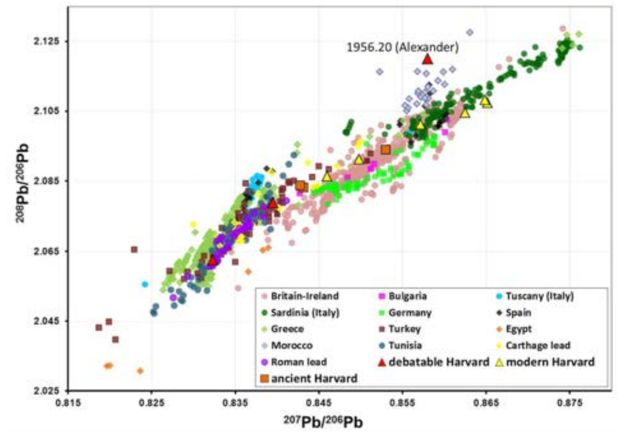


Figure 47.9. Detail of fig. 47.8, showing the area in which the Alexander value plots

Graph: Patrick Degryse and Katherine Eremin © Centre for Archaeological Sciences at KU Leuven and President and Fellows of Harvard College

In the end, this unusual lead-isotope analysis result is not enough to condemn the statuette, as it had seemed at first, but neither should one use this result to make statements about its date, origin, or authenticity. There is still a surprising lack of available lead-isotope analysis of Roman copper-alloy objects. In order to better interpret the isotopic composition of suspect pieces, a reliable database of well-provenanced Roman bronzes (ideally statuettes and similar objects) on the one hand, and of modern and late bronzes of similar typology on the other, is required to characterize more clearly how the data may vary. This would seem to be an ideal research project for the future.

Conclusions

This paper has given a very brief overview of a large trove of data in order to explore issues of authenticity in relation to copper-alloy objects generally, and to revisit earlier doubts concerning the antiquity of the Alexander Nelidow in particular. Research into the style, method of manufacture, surface corrosion, alloy, and lead isotopes produces no definitive evidence that this statuette is other than ancient. While a copper-alloy artifact can never be completely vindicated once questions have been raised about its authenticity, the systematic collaboration between curators, conservators, and material scientists can significantly elucidate and clarify our understanding of the piece. But it is important that these professionals work closely together, understanding each other's methodologies, aims, and conclusions.[45] More careful examination of objects under microscopes, more sampling, and more research and analysis by such interdisciplinary teams can vastly improve knowledge of our collections.

✦ ✦ ✦

Notes

1. Aleksandr Nelidov/Nelidow (1838–1910), a Russian ambassador, had a substantial collection of ancient art; see Pollak 1903 and Galerie Georges Petit 1911.
2. Arndt and Amelung 1897, 30; Wulff 1898, 2.
3. Wulff 1898, 65; Pollak 1903, 3, 139, 184, and 198.
4. Galerie Georges Petit 1911, lot 43.
5. *Ancient Art* 1954, 118.
6. Inv. 1956.20. For the statuette's full provenance and publication history, see the object page at http://www.harvardartmuseums.org/collections/object/312306. The records for all Harvard Art Museums objects mentioned in this paper can be accessed by searching their accession numbers at http://www.harvardartmuseums.org/ancientbronzes.
7. See the section "Lead-Isotope Analysis."
8. See http://www.harvardartmuseums.org/ancientbronzes.
9. Some objects were tested with multiple techniques, in-house and externally. For more information on these techniques, please see the special collection pages concerning "Alloy Analyses" (see supra n. 8).
10. See http://www.harvardartmuseums.org/collections/object/312306.
11. See Buitron 1973, 395; and Stewart 1993, 161–71.
12. See ibid.
13. Himmelmann 1989, 135–36, also argued that the statuette was a late copy, in which case it was influenced by the rediscovery of the Terme Ruler, which had come to light approximately a dozen years earlier.

14. See, for example, the Apoxyomenoi or the Getty and Mahdia Herms in the *Power and Pathos* exhibition; Daehner and Lapatin 2015, 270–85, nos. 40–46.
15. Inv. 1930.351, http://www.harvardartmuseums.org/collections/object/310752.
16. Inv. 1952.21, http://www.harvardartmuseums.org/collections/object/312303.
17. See n. 36.
18. See Kreilinger 1996, 199, no. 194, plate 41, with earlier bibliography.
19. Inv. 1984.798, http://www.harvardartmuseums.org/collections/object/304153.
20. See Balmuth and Tykot 2002.
21. See Lilliu 1966, 56–57, no. 10.
22. Inv. 1932.56.27, http://www.harvardartmuseums.org/collections/object/303869. Some of the reported versions may be duplicates, as the ownership histories of these pieces are not entirely clear. For references to the other pieces, see the statuette's object page.
23. Along with the Terme Ruler (see Himmelmann 1989, 135–36), see the Fouquet Alexander and the Stanford Alexander in Stewart 1993, 163, figs. 32 and 39.
24. Inv. 2001.257, http://www.harvardartmuseums.org/collections/object/146546.
25. Inv. 2007.221, http://www.harvardartmuseums.org/collections/object/4842.
26. Private collection. Another copper-alloy aftercast made in Munich in the 1920s is kept in the Staatliche Antikensammlungen, Munich; see Ohly-Dumm 1973, 240 and 245, fig. 13. It is likely that both aftercasts were created at the same time, in the early twentieth century when Harvard's statuette is known to have been in Germany. The aftercast from the private collection is a mixed copper alloy; it was tested with XRF (alloying elements: copper, lead, zinc, tin; other elements: nickel, iron, antimony) and ICP-OES (Cu, 80.09%; Sn, 5.17%; Pb, 2.55%; Zn, 7.81%; Fe, 0.20%; Ni, 0.28%; Ag, 0.01%; Sb, 0.24%; As, 0.10%; Co, 0.001%; Au, not detected; Cd, 0.003%). The second aftercast in Munich was also tested by XRF and has a similar composition to the aftercast from the private collection. Thanks are due to Susanne Ebbinghaus and Josef Riederer for providing information about the aftercast in Munich and to Josef Riederer for providing the analysis of the Munich piece.
27. See n. 3 above.
28. See Bewer and Lie 2014, 60–61; Eggert 2008, 74.
29. Inv. 1961.143, http://www.harvardartmuseums.org/collections/object/311124.
30. See Muffatti 1969, 264–66, no. 489, plate 55.a–b. The owners also had a colossal copy of the woman and warrior group made for their villa (see http://www.federgev.it/primosito/Docs/parchi/montesol/completo.html under "Misa"). A statuette replica of the woman from the group was on the art market in the 1960s, but its present whereabouts are unknown.
31. Inv. 1962.62, http://www.harvardartmuseums.org/collections/object/304002. For the original finial, see Muffatti 1969, 266–67, no. 490, plate 56.a–b.
32. Eremin and Riederer 2014, 71 and 88.
33. See Eremin and Riederer 2014, 76–78.
34. Buitron 1973, 393. For the recent results, see the object record.
35. Eremin and Riederer 2004, 89.
36. Inv. 1932.56.29, a statuette of Ares, has 44–48% zinc. Other statuettes with high zinc are: **1930.351**, 1932.56.2, 1932.56.13, 1932.56.16, **1932.56.27**, 1932.56.28, **1952.21**, 1955.122, 1960.485, 1972.328, 1973.18, 1973.19, 1973.20, 1977.216.3411, 1977.216.3418, **1984.798**, *1987.132*, *1992.297*, and **1994.8** (objects mentioned elsewhere in this paper are in bold; late objects or objects not currently suspected to be fake are in italics).
37. The lead-isotope signatures of the two statuettes were compared to a database of lead ores and copper ores compiled by one of the authors (P. Degryse) from published data. For a subset of these publications, see http://oxalid.arch.ox.ac.uk/bibliography/bibliography.htm.
38. This includes all the comparative pieces mentioned in this paper as well as inv. 1956.19, an authentic large-scale late second- to early third-century AD Roman head of the empress Julia Domna; inv. 1992.256.108, a Roman period Egyptian statuette of a cat that seems suspicious but is probably authentic; inv. 1994.8, a Roman period (or modern) statuette showing Odysseus escaping Polyphemus's cave strapped to a ram; and a pig purchased from the Chiurazzi foundry, which copied many of the bronzes from Pompeii and Herculaneum. For the full lead-isotope analyses of these objects, see their object pages at http://www.harvardartmuseums.org/ancientbronzes.
39. Srinivasan 1999; Pryce et al. 2014.
40. Gulson 1984.
41. Monna et al. 1997; Kober et al. 1999.
42. Figs. 47.8–9 use a subset of the database shown in fig. 47.6, removing isotopes for lead in copper ores and other low-lead copper alloys, adding from artifacts provided by Kuleff et al. 2006.
43. Jébrak et al. 1998.
44. Skaggs et al. 2012.
45. For an essay dealing with the problems that can arise when these specialists come to conflicting conclusions, see Muscarella 2008.

Bibliography

Ancient Art 1954
Ancient Art in American Private Collections. 1954. Exh. cat. Cambridge, MA: Fogg Art Museum.

Arndt and Amelung 1897
Arndt, P., and W. Amelung. 1897. *Photographische Einzelaufnahmen antiker Sculpturen*, vol. 3. Munich: Verlagsanstalt für Kunst und Wissenschaft vormals F. Bruckmann.

Balmuth and Tykot 2002
Balmuth, M. S., and R. H. Tykot. 2002. "Recipes for Sardinian Bronzes." In *From the Parts to the Whole: Acta of the 13th International Bronze Congress*, ed. C. C. Mattusch, A. Brauer, and S. E. Knudsen, 19–26. Portsmouth, RI: JRA Suppl. 39.

Bewer and Lie 2014
Bewer, F. G., and H. Lie. 2014. "Ex Aere Factum: Technical Notes on Ancient Bronzes." In *Ancient Bronzes through a Modern Lens*, ed. S. Ebbinghaus, 38–63. Cambridge, MA: Harvard Art Museums.

Buitron 1973
Buitron, D. M. 1973. "The Alexander Nelidow: A Renaissance Bronze?" *ArtB* 55: 393–400.

Daehner and Lapatin 2015
Daehner, J. M., and K. Lapatin, eds. *Power and Pathos: Bronze Sculpture of the Hellenistic World*. Los Angeles: J. Paul Getty Museum.

Eggert 2008
Eggert, G. 2008. "Patina: Case Studies in Bronze Corrosion." In Pernicka and von Berswordt-Wallrabe 2008, 74–79.

Eremin and Riederer 2014
Eremin, K., with J. Riederer. 2014. "Analytical Approaches to Ancient Bronzes." In *Ancient Bronzes through a Modern Lens*, ed. S. Ebbinghaus, 64–91. Cambridge, MA: Harvard Art Museums.

Galerie Georges Petit 1911
Galerie Georges Petit. 1911. *Catalogue des ojects antiques provenant de la collection de Son Exc. Mr. de Nelidow*. Auction catalogue. May 23–24, 1911, Paris. Paris: C. & E. Canessa.

Gulson 1984
Gulson, B. L. 1984. "Uranium-Lead and Lead-Lead Investigations of Minerals from the Broken Hill Lodes and Mine Sequence Rocks." *Economic Geology* 79: 479–90.

Himmelmann 1989
Himmelmann, N. 1989. *Herrscher und Athlet: Die Bronzen vom Quirinal*. Milan: Arnoldo Mondadori.

Jébrak et al. 1998
Jébrak, M., É. Marcoux, M. Nasloubi, and M. Zaharaoui. 1998. "From Sandstone- to Carbonate-Hosted Stratabound Deposits: An Isotope Study of Galena in the Upper-Moulouya District (Morocco)." *Mineralium Deposita* 33: 406–15.

Kober et al. 1999
Kober, B., M. Wessels, A. Bollhöfer, and A. Mangini. 1999. "Pb Isotopes in Sediments of Lake Constance, Central Europe." *Geochimica et Cosmochimica Acta* 63.9: 1293–303.

Kreilinger 1996
Kreilinger, U. 1996. *Römische Bronzeappliken: Historische Reliefs im Kleinformat*. Archäologie und Geschichte 6. Heidelberg: Archäologie und Geschichte.

Kuleff et al. 2006
Kuleff, I., I. Iliev, E. Pernicka, and D. Gergova. 2006. "Chemical and Lead Isotope Compositions of Lead Artefacts from Ancient Thracia (Bulgaria)." *Journal of Cultural Heritage* 7: 244–56.

Lilliu 1966
Lilliu, G. 1966. *Sculture della Sardegna nuragica*. Cagliari: Ilisso.

Monna et al. 1997
Monna F., J. Lancelot, I. W. Croudace, A. B. Cundy, and J. T. Lewis. 1997. "Pb Isotopic Composition of Airborne Particulate Material from France and the Southern United Kingdom: Implications for Pb Pollution Sources in Urban Areas." *Environmental Science and Technology* 31: 2277–96.

Muffatti 1969
Muffatti, G. 1969. "L'instrumentum in bronzo." *StEtr* 37.2: 247–72.

Muscarella 2008
Muscarella, O. W. 2008. "The Veracity of 'Scientific' Testing by Conservators." In Pernicka and von Berswordt-Wallrabe 2008, 9–18.

Ohly-Dumm 1973
Ohly-Dumm, M. 1973. "Berichte der Staatlichen Kunstsammlungen: Glyptothek und Antikensammlungen." *MüJb* 24: 239–46.

Pernicka and von Berswordt-Wallrabe 2008
Pernicka, E., and S. von Berswordt-Wallrabe, eds. 2008. *Original – Copy – Fake? Examining the Authenticity of Ancient Works of Art*. Mainz: Philipp von Zabern.

Pollak 1903
Pollak, L. 1903. *Klassisch-Antike Goldschmiedearbeiten im Besitze Sr. Excellenz A. J. von Nelidow*. Leipzig: Karl W. Hiersemann.

Pryce et al. 2014
Pryce, T. O., S. Brown, B. H. M. Bellina, P. S. Bellwood, N. Chang, P. Chattopadhyay, E. Dizon, E. Hamilton, C. F. W. Higham, A. A. Kyaw, V. Laychour, S. Natapinto, V. Nguyen, J.-P. Pautreau, E. Pernicka, V. C. Pigott, M. Pollard, C. Pottier, A. Reinecke, T. Sayavongkhamdy, V. Souksavatdy, and J. White. 2014. "More Questions Than Answers: The Southeast Asian Lead Isotope Project 2009–2012." *JAS* 42: 273–94.

Skaggs et al. 2012
Skaggs, S., N. Norman, E. Garrison, D. Coleman, and S. Bouhlel. 2012. "Local Mining or Lead Importation in the Roman Province of Africa Proconsularis? Lead Isotope Analysis of Curse Tablets from Roman Carthage, Tunisia." *JAS* 39: 970–83.

Srinivasan 1999
Srinivasan, S. 1999. "Lead Isotope and Trace Element Analysis in the Study of over a Hundred South Indian Metal Icons." *Archaeometry* 41.1: 91–116.

Stewart 1993
Stewart, A. 1993. *Faces of Power: Alexander's Image and Hellenistic Politics*. Berkeley: University of California Press.

Wulff 1898
Wulff, O. 1898. *Alexander mit der Lanze*. Berlin: A. Asher & Co.

Abstracts

The Riace Bronze Statues: Chemical, Textural, and Isotopic Investigation of the Metals

Ivana Angelini, University of Padua
Massimo Vidale, University of Padua
Gilberto Artioli, University of Padua
Giuseppe Guida, Istituto Superiore per la Conservazione ed il Restauro (ICR), Rome
Mario Micheli, Università Roma Tre, Rome

Two exceptional Greek original bronze statues were discovered underwater at Riace Marina (Calabria, Italy), in 1972. The statues represent a pair of warriors or athletes and are commonly labeled Statue A and Statue B. On the basis of stylistic studies, many authors date Statue A to 470–460 BC, and Statue B to 440–430 BC (Arias 1986).

During the restoration campaign carried out in Rome at the ICR, the inner cavities of the bronzes were explored and cleaned by remote-controlled mechanical arms. Here we report the archaeometric investigation of 12 metal samples taken from the inside of the statues: 3 bronze and 1 lead samples from Statue A; and 3 welding alloys, 3 bronze, and 2 lead samples from Statue B.

Chemical and textural investigation of the Cu-alloy samples was performed by SEM-EDS, EPMA, and metallographic analyses on polished cross sections. The data are discussed and compared with literature data available for coeval statues. Moreover, the lead isotopic compositions of selected samples were investigated by MC-ICP-MS. Comparison of the results with existing Pb-isotope databases (OXALID; BRETTSCAIFE.net; Alpine Archaeocopper Project) shows that the copper used for Statue A is compatible with western Mediterranean deposits, whereas the copper of Statue B fit with eastern Mediterranean ores. The isotopic signals of the welding samples from Statue B show a different provenance, possibly related to the age of the welding operations. The lead of the tenons of both statues has a very well defined isotopic signal compatible with a Greek source.

Balancing Artifacts: Incense-Burners and Ponderation in Etruria

Aurélia Azema, Laboratoire de Recherche des Monuments Historiques, Champes-sur-Maine
Benoît Mille, Centre de Recherche et de Restauration des Musées de France (C2RMF), Paris
Sophie Descamps-Lequime, Musée du Louvre, Paris

The fragmentary bronze statue (Louvre Museum, inv. Br 4388; 63.5 cm x 29 cm) was discovered in ploughed land near a rich Roman villa in Epiais-Rhus, northwestern France, which preserves the remains of a Gallo-Roman city. After being used as a flowerpot for some years, the statue was acquired by the Louvre in 1959 (Piganiol 1961, 295). A wing was discovered around the same area in 1977, which has been attributed to this statue and reattached to its back. The bronze sculpture depicts Eros as a baby; its prototype derives from a Hellenistic model (Mattusch 1996, 160–68). The Sleeping Eros type is rare among extant large bronzes: only few other examples are known, such as the remarkable Sleeping Eros in the Metropolitan Museum of Art in New York (Hemingway 2015) and a head from Volubilis (Boube-Piccot 1969, no. 174, 160–61, plates 90–92).

In order to investigate the manufacture and the dating of the Louvre's statue, a technological study was carried out at the C2RMF. Study of the inner wall was eased by the open access at the back of the statue, and completed by X-radiography. Elemental composition was determined on micro-samples analyzed by PIXE. The statue appears to have been cast in nine separate hollow parts mainly by the indirect lost-wax process. A tin bronze with a high lead content (Sn: 7 wt%; Pb: 25 wt%) was used. The separately cast parts were then assembled using flow fusion welding or brazing, depending on the shape of the join (in basins or using a platform). Some other clues (such as fingerprints in the wax) helped to reconstruct each step of the manufacture with more detail and to qualify the Sleeping Eros from Epiais-Rhus as a large bronze statue elaborated during the second century AD.

Copper, War, and Art in Ancient Greece

Soledad Díaz, Instituto del Patrimonio Cultural de España (IPCE), Madrid

This study compares analytical and methodological variations present in the copper alloys (bronze and brass) used to craft weapons (i.e., helmets, swords, spearheads) and ornaments (i.e., Classical Greek sculptures). IPCE's Scientific Department made numerous analytic studies to evaluate the chemical stability and physical integrity of the artifacts. X-ray, XFR, and MEB-SEM were performed to determine composition and the presence of active corrosion.

The study is made by comparing pieces from various Spanish state museums, which have been analyzed and have undergone restoration and conservation during recent years by the Subdirectory of the Spanish Historical Heritage Institute.

Modern and Ancient Metal Fakes: Composition, Patina, Production Technology, Technical Details

Alessandra Giumlia-Mair, AGM Archeoanalisi, Merano, Italy

Since ancient times, the discovery of fakes has been a hot topic: in the course of our scientific research we quite often discover interesting examples of ancient imitations of valuable items or coins. They give us a glimpse into what was considered precious at the time in which they were produced, and represent a welcome addition to our knowledge.

The discovery of modern fakes or forgeries (i.e., fraudulently altered ancient pieces) is a very different matter. Unrecognized fakes mar our perception of antiquity and must be identified and removed from the cases of our museums.

Identification studies of fakes are just as different and variable as the multitude of objects that come under our eyes while studying museum collections. In this paper, some of the most skillful ways of aging freshly made objects, for example, by applying some kind of a fake patina, are presented; "wrong" technical details are described; and several examples of ancient and modern fakes are discussed by highlighting their peculiarities.

Examination, Conservation, and Analysis of a Composed Egyptian Ibis Statue

Shimaa Mahmoud, Grand Egyptian Museum, Egypt
Yasunori Matsuda, Japan International Cooperation Agency, Egypt

This poster discusses the major issues related to modern studies on objects and materials of historical or cultural heritage. These usually involve the use of non-destructive and microanalytical techniques, which are employed for various purposes and particularly for cultural heritage. The conservation and restoration of materials and artifacts require analytical methods that can yield information on the chemical nature and composition of selected parts of artifacts to elucidate their provenance; on the state of alteration of the object as a result of short-, medium-, and long-term exposure to environmental conditions; and on the effectiveness of conservation strategies during and after application. This poster describes the application of non-destructive and microanalytical techniques to an ibis statue of the Late Period in Egyptian civilization, which was excavated from Tuna el-Gabal in Al-Minya Governate by Cairo University in 1946; the object is currently in the inorganic storeroom at Grand Egyptian Museum Conservation Center. It is obvious from visual examination and analytical techniques that the object was made from a variety of materials. Previous interventions showed contemporary support by the wooden base with iron pins and wire, and determined the nature of the corrosion product on the statue's metal surface (identified by XRD analysis and SEM-EDS). The statue is missing part of a leg, and this poster will discuss possible and suitable ways to extend the statue's life with safe and stable material (Plexiglas), which does not react with any material used in the artifacts of the ancient Egyptian civilization.

Technical Examinations on the Parthian Bronze Coffin from Chubtarash Archaeological Site, Khorramabad, Western Iran

Omid Oudbashi, Art University of Isfahan, Iran
Morteza Hassari, Art University of Isfahan, Iran
Ata Hassanpour, ICHTO office of Lorestan Province, Khorramabad, Iran

In the winter of 2005, an emergency archaeological excavation was carried out at the village of Chubtarash, in the Kargah Valley near the city of Khorramabad, western Iran. Some artifacts from the middle of the Parthian period (about first century AD) were found. The most important find of the excavation was a large metallic bathtub-like coffin in which a skeleton was found with two gold strips covering its eyes and mouth. The coffin has four handles that are joined to the tub-like body with pins. The coffin now is preserved in Falak-ol-Aflak Museum of Khorramabad.

To identify the manufacturing process of the coffin, a technical examination was performed by visual examination, SEM-EDS analysis, and optical microscopy (metallography).

The results showed that the coffin's body is made of binary copper-tin (bronze) alloy. Other elements such as arsenic, lead, zinc, and nickel are detected as minor/trace elements. The handles also are made of tin bronze alloy, but with a different amount of tin. The observations and microstructural examination of samples revealed that the tub-like body of the coffin was manufactured in one piece, and a cycle of mechanical working and heat treatment was applied in order to shape the coffin. The bronze handles were made by casting, and some work was done on them to finish the final shape. The technical examinations on this individual bronze coffin from Iran illuminated some aspects of archaeometallurgical activities in the Parthian period of Iran.

The Material Interpretation of Ancient Large Bronzes: The Case of the Florentine Masterpieces

Salvatore Siano, Istituto di Fisica Applicata "Nello Carrara," Consiglio Nazionale delle Ricerche, Sesto Fiorentino, Florence

The archaeometallurgical study of the metal artifacts is fundamental to their analysis and valorization. Material analyses and technological interpretations can contribute substantially to the revelation of cultural contents, which are complementary to historical and archaeological interpretations. Archaeometallurgy, in addition to reconstructing the history of objects' technological development based on compositional and structural evidence, can allow discrimination between originals and replicas, recognizing possible integrations. It can also shed light on the creative process.

After about half a century of investigations into the manufacturing processes of ancient large bronzes, a great deal of material data has been collected on several masterpieces. However, the interpretation of the evidence and analytical measurements can sometimes be very complex, and results are often equivocal. Naked-eye observations, radiography, and some chemical analyses rarely permit the prompt determination of raw materials, crafting procedures of the wax model, core structure, casting setup, assembly, and finishing. On the contrary, thorough objective morphological and structural examinations, accurate compositional mapping, and very critical interpretation of the data are needed in order to reduce the range of the compatible technical interpretations. With the growing body of data comes an increasingly complex technological picture; some execution processes, which were once believed to be well-established practices in ancient times, today represent only a rather partial list of the methods used in Classical and Hellenistic art foundries.

Within this framework, the large bronzes of the Medici collections, exhibited at Florence's National Museum of Archaeology, offer noteworthy examples of the methodological variability and of hitherto unknown peculiarities of ancient production, which significantly broaden the interpretational perspective. The Idolino from Pesaro (Iozzo 1998), the Minerva (Cygielman 2008) and the Chimaera of Arezzo (Siano et al. 2012; Siano 2013), the Arringatore (discovered in the environs of Lake Trasimeno), and the Horse's Head (see essay 39 of this volume) have been thoroughly investigated during the last two decades. The present contribution discusses the main aspects of these studies along with their general implications in terms of methodological approach and knowledge of the ancient art foundry.