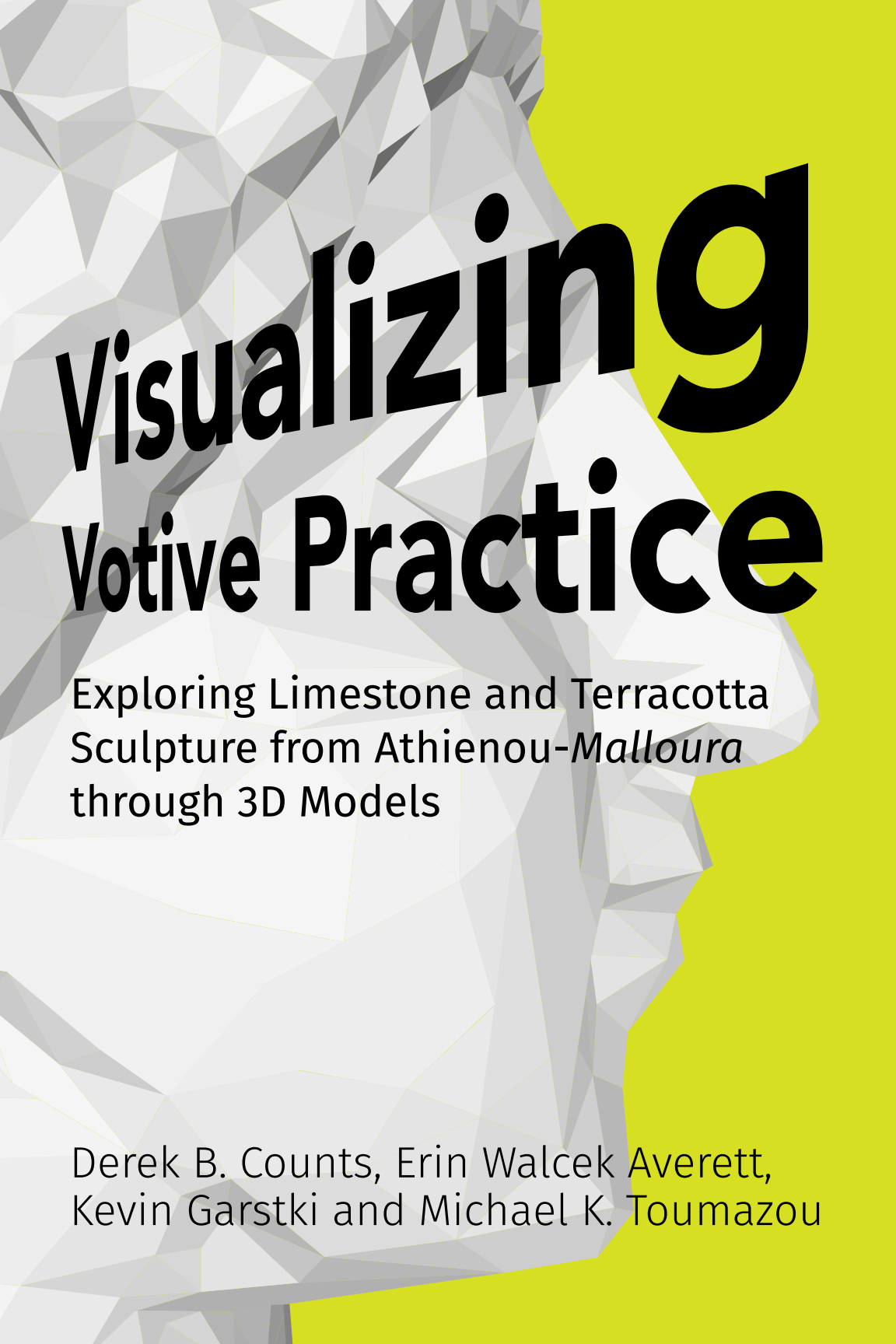

Visualizing Votive Practice

Exploring Limestone and Terracotta Sculpture from Athienou-*Malloura* through 3D Models

Derek B. Counts, Erin Walcek Averett, Kevin Garstki and Michael K. Toumazou

Visualizing Votive Practice

Visualizing Votive Practice: Exploring Limestone and Terracotta Sculpture from Athienou-*Malloura* through 3D Models

Derek B. Counts, Erin Walcek Averett,
Kevin Garstki, and Michael K. Toumazou

With contributions by
Clay M. Cofer and Katherine A. P. Iselin

The Digital Press at the University of North Dakota
Grand Forks, ND

2020 The Digital Press @ The University of North Dakota

Unless otherwise indicated, all contributions to this volume appear under a Creative Commons Attribution 4.0 License:

https://creativecommons.org/licenses/by/4.0/legal-code

Book Design: William Caraher
Cover Design: Daniel Coslett

ISBN-13: 978-1-7345068-7-7

Visualizing Votive Practice
Contents

Acknowledgments iii
List of Figures v
Chronological Chart ix
Abbreviations xi

Introduction 1

The Birth and Development of the Archaeological Catalogue
A New Approach
Organization of the Book
How to Use This Book

Chapter 1
Visualizing Votive Practice in the Sanctuary of Athienou-*Malloura* 13
Derek B. Counts, Erin Walcek Averett, Kevin Garstki, and Michael K. Toumazou

The Athienou Archaeological Project: A Brief History and Background of Investigations
The Rural Sanctuary at Athienou-*Malloura*
Visualizing Votive Practice at Malloura: Limestone and Terracotta Sculptures in Context

Chapter 2
Cypriot Limestone and Terracotta Sculpture: An Excursus 35
Erin Walcek Averett and Derek B. Counts

Κύπριος χαρακτήρ: A Brief Overview of Cypriot Sculpture
The Materials
Dedications in Stone and Clay

Chapter 3
A Catalogue of Selected Limestone and Terracotta Sculptures from Athienou-*Malloura* 45
Derek B. Counts and Erin Walcek Averett
with contributions by Clay M. Cofer and Katherine A. P. Iselin

Guide to the Catalogue
Catalogue Format

The Catalogue
- Male Votaries with Conical Helmets and Other Headgear
- Male Votaries with Diadems and Cypriot Shorts
- Male Votaries with Vegetal Wreaths and Fillets
- Warriors, Horses, and Chariots
- Female Figures and Other Types
- Masks and Masked Figures
- Divine Images: An Introduction
  - Divine Images: Cypriot Herakles
  - Divine Images: Zeus-Ammon
  - Divine Images: Cypriot Pan
  - Divine Images: Bes
  - Divine Images: Artemis

Chapter 4
Imaging the Past: Methods, Process, and Impact 255
Kevin Garstki, Erin Walcek Averett, and Derek B. Counts

Imaging in Archaeology
AAP 3D Models: Process and Production
A Call for Transparency

Conclusion
The Future is Now: Archaeological Digital Publication 283
Erin Walcek Averett and Derek B. Counts

Works Cited 287

Metadata Index 326

The Authors 344

ACKNOWLEDGMENTS

A project of this scope could not have been accomplished without the many institutions and colleagues who provided valuable financial, logistical, intellectual, and emotional support. First and foremost, our work in Athienou would not be possible without the support of the Municipality of Athienou and its residents. Each summer they welcome us with open arms, but also facilitate our work in town, in the field, and every place in between. We would especially like to thank former and current Athienou mayors Dimitris Papapetrou and Kyriakos Kareklas, respectively, and the town hall staff for their tireless support of our work, Giannis Germanos for his unwavering assistance and guidance, and Noni Papasianti, curator of the Kallinikeio Municipal Museum of Athienou, for her collegiality and for facilitating work in the Kallinikeion.

Funding for the Athienou Archaeological Project, as well as for our 3D scanning project in particular, has been generously provided by: Davidson College, the National Science Foundation (REU Award #1156968), the University of Wisconsin-Milwaukee (FRACAS and RGI grants from the Office of Research, summer research support from the College of Letters and Science), and Creighton University (Dr. George F. Haddix President's Faculty Research Fund, Summer Faculty Research Fellowship Awards, The Kripke Center fellowships, and the Department of Fine and Performing Arts Scheerer Fund).

Our research in the field and in the museum were made possible with the permission and support of the Director of the Department of Antiquities of the Republic of Cyprus, Dr. Marina Solomidou-Ieronymidou, and the Department staff, in particular Dr. Anna Satraki and the wonderful staff of the Larnaka District Archaeological Museum who provided space, advice, and the opportunity for our scanning work. We are indebted to the Cyprus American Archaeological Research Institute (CAARI) and the CAARI Directors, Dr. Andrew McCarthy and Dr. Lindy Crewe, in Nicosia for the use of their unparalleled library and opportunities to present preliminary results of this project at CAARI's annual workshop.

We are also grateful for help in the testing phase of this project from the University of Kentucky's Center for Visualization and Virtual Environments, especially Brent Seales, Ruigang Yang, Bo Fu, Qing Zhang, and Alyx Whidden for their advice and collaboration in our pilot project. Special thanks are due to Joan Mertens and the Metropolitan Museum of Art (New York) for providing fig. 2.1. We would also like to thank several individuals who helped us with various tasks (copyediting initial drafts, bibliography, background research, logistics, etc.): Adrienne Frie, Ina Kielley, Kayla Olson, and Gretchen Stricker.

Finally, we are especially appreciative of our collaborators in this experimental endeavor. Bill Caraher at The Digital Press at the University of North Dakota was excited to work with us when this project was still in its most formative stages and he helped us determine the shape of the final product. His enthusiasm and patience while we worked through variations and expansions of this publication allowed us to think through different approaches. We also thank Eric Kansa and Sarah Whitcher Kansa at Open Context for being willing to experiment with 3D models and work with us through that learning process.

LIST OF FIGURES

Introduction

Figure i — Title page and plate CXXIII from L. P. di Cesnola, *A Descriptive Atlas of the Cesnola Collection of Cypriote Antiquities in the Metropolitan Museum of Art, New York* (New York: Metropolitan Museum of Art, 1885) (Archive.org, CC BY 3.0).

Chapter 1

Figure 1.1 — Map of the eastern Mediterranean showing the location of Cyprus as well as other sites mentioned in the text. (Map by K. Garstki, 2019)

Figure 1.2 — Map of Cyprus showing Athienou-*Malloura* and other sites mentioned in the text. (Map by K. Garstki, 2019)

Figure 1.3 — Plan of the Athienou-*Malloura* sanctuary. (Plan by R. Breuker, 2013; updated by K. Garstki, 2019)

Figure 1.4 — Cross section of a 20th-century looter's pit in a baulk in the eastern part of the sanctuary.

Figure 1.5 — White Painted IC amphora (left) and Bichrome IV pitcher (right), CA I, from EU 48. Sherd inv. nos. 4803.1 and 4803.2. (Drawings by J. Ravenhurst)

Figure 1.6 — Malloura sanctuary plan (CA II–CC). Large, open structure (red); smaller structure (blue). (Plan by R. Breuker, 2013; updated by K. Garstki, 2019)

Figure 1.7 — Malloura sanctuary plan with Hellenistic–Roman peribolos and pisé altar highlighted. (Plan by R. Breuker, 2013; updated by K. Garstki, 2019)

Figure 1.8 — Malloura sanctuary plan with the northwestern entrance of the Hellenistic-Roman Sanctuary highlighted. (Plan by R. Breuker, 2013; updated by K. Garstki, 2019)

Figure 1.9 In-progress excavation of the northwestern entrance to the Hellenistic–Roman sanctuary with ashlar post block, horizontal threshold block and standing stone and circular feature outside the entry. Photograph taken from the north, 2013.

Figure 1.10 Hellenistic–Roman pisé platform altar. Photograph from the west, 2014.

Figure 1.11 Fourth-century BCE limestone votive relief from Golgoi-*Ayios Photios* depicting scenes of worship, dancing, and banqueting, MMA inv. no. 74.51.2338. (The Cesnola Collection, Purchased by subscription, 1874–76; CC0 1.0)

Figure 1.12 Roman mold-made lamp fragments from the western part of the sanctuary (EU 52). Left: Lamp with Aphrodite on discus (AAP-AM 4532); Middle: Lamp with "ΕΥΤΥΧΗΤΟΣ" stamped on its base (AAP-AM-4496); Right: Lamp with Christian cross on discus (AAP-AM-4108). Larnaka District Archaeological Museum. (Drawings by J. Ravenhurst)

Figure 1.13 Collection of in situ limestone statue bases overlaying earlier CA–CC structure in the central-western portion of the sanctuary.

Figure 1.14 Limestone statue bases (including one with statue plinth and feet in situ) in the northwestern portion of sanctuary. Note in situ head of Cypriot Pan (AAP-AM-5444) visible directly east of the two statue bases.

Figure 1.15 Hellenistic Cypriot Pan statue (AAP-AM-1076) directly beneath a CA limestone male statue wearing Cypriot shorts (AAP-AM-1075) on the surface of the hard-packed floor layer associated with the Hellenistic–Roman phase of the sanctuary.

Chapter 2

Figure 2.1 Original exhibition of Cypriot art in the Metropolitan Museum of Art. (Photo courtesy of MMA, CC0 1.0)

Chapter 3

Figure 3.1 Plan of the Athienou-*Malloura* sanctuary with excavation units (EUs) delineated. (Plan by R. Breuker, 2013; updated by K. Garstki, 2019)

Chapter 4

Figure 4.1 Top: Giulio de Musi, "Bird's Eye View of Rome," 1553, engraving, Metropolitan Museum of Art, inv. no. 49.97.525 (The Elisha Whittelsey Collection, The Elisha Whittelsey Fund, 1949; CC0 1.0); Bottom: Giovanni Battista Piranesi, "Another View of the Temple in the City of Paestum, Believed to Be Dedicated to Juno," 1778. (from Wikiart.org)

Figure 4.2 Watercolor reconstruction of figure from the Painted House at Gordion by Piet de Jong. (Courtesy of the Penn Museum, image # 153729)

Figure 4.3 Plate 31, "Aphrodite in Petworth," from A. Furtwängler, *Meisterwerke der griechischen Plastik: Kunstgeschichtliche Untersuchungen* (Leipzig: Giesecke & Devrient, 1893). (from Universitätsbibliothek Heildelberg: https://digi.ub.uni-heidelberg.de/diglit/furtwaengler1893ga)

Figure 4.4 Plate 20, from W. J. Stillman's *The Acropolis of Athens: Illustrated Picturesquely and Architecturally in Photography 1869/1870*. (London: F. S. Ellis, 1870). (National Gallery of Art, 2006.86.3, Robert B. Menschel Fund, CC0 1.0)

Figure 4.5 Figure 46, "Foundation deposit, laid out horizontally," and Figure 47, "Bracelet of King Zer, 7 and 9 ins. from lens," from W. M. F. Petrie, *Methods and Aims in Archaeology* (London: Macmillan, 1904). (public domain, after https://archive.org/details/methodsaimsinarc00petruoft/page/80/mode/2up)

Figure 4.6 HDI Advance R1X system setup, including projector (center), Point Grey cameras (left and right), and Canon DSLR (right).

Figure 4.7 Screenshot of Flexscan3D, used to run the HDI Advance R1X scanner, with "Project Mode" view after the artifact had been scanned and the scanner is disconnected from the laptop.

Figure 4.8 Workstation setup in a Bronze Age gallery of the Larnaka District Archaeological Museum, 2016.

Figure 4.9 Two scans of the same object illustrating the differences in scale resulting from improper calibration.

Figure 4.10 Two models of terracotta robed female figurine AAP-AM-1366+1595: Left: Low-resolution model created using HDI Advance R1X system in 2016, which lacks fine details; Right: Model created using HDI Advance R1X system in 2017, which includes the coroplast's fingerprints.

Figure 4.11 Reconstruction of the Arch of Triumph from Palmyra in 2016 by the Institute for Digital Archaeology using 3D printing technology. (Soulfingerclivey / CC BY-SA 4.0)

CHRONOLOGICAL CHART

Chronological Period	Abbreviation	Absolute Date
Cypro-Geometric	CG	1050–750 BCE
Cypro-Geometric I	CG I	1050–950 BCE
Cypro-Geometric II	CG II	950–900 BCE
Cypro-Geometric III	CG III	900–750 BCE
Cypro-Archaic	CA	750–480 BCE
Cypro-Archaic I	CA I	750–600 BCE
Cypro-Archaic II	CA II	600–480 BCE
Cypro-Classical	CC	480–310 BCE
Cypro-Classical I	CC I	480–400 BCE
Cypro-Classical II	CC II	400–310 BCE
Hellenistic		310–30 BCE
Hellenistic I		310–150 BCE
Hellenistic II		150–30 BCE
Roman		30 BCE–330 CE

ABBREVIATIONS

This book follows abbreviations for journals and standard reference works used by the *American Journal of Archaeology*.

See Chronological Chart for period abbreviations.

AAP	Athienou Archaeological Project
BM	British Museum (London)
CCEC	*Cahier du Centre d'Études Chypriotes*
CM	The Cyprus Museum (Nicosia)
EU	Excavation Unit
Louvre	Musée du Louvre (Paris)
MMA	Metropolitan Museum of Art (New York)
MFA	Museum of Fine Arts (Boston)
SCE	Swedish Cyprus Expedition
SU	Stratigraphic Unit

Author Initials for Catalogue Entries:

CMC	Clay M. Cofer
DBC	Derek B. Counts
EWA	Erin Walcek Averett
KAPI	Katherine A. P. Iselin

Figure i: Title page and plate CXXIII from L. P. di Cesnola, *A Descriptive Atlas of the Cesnola Collection of Cypriote Antiquities in the Metropolitan Museum of Art, New York* (New York: Metropolitan Museum of Art, 1885) (Archive.org, CC BY 3.0).

INTRODUCTION

The Birth and Development of the Archaeological Catalogue

From antiquarian travel journals and monumental folio collections to contemporary scientific investigations in serial reports and peer-reviewed journals, the publication and presentation of archaeological material recovered from excavations has been at the core of the discipline since its inception in the 19th century. The artifact catalogue (fig. i), replete with descriptive formal analyses, brought to life by photographs and illustrations, exemplifies a rich and venerable tradition in publication that spans more than three centuries. Throughout this long history, illustrations and, later, photographs became more seamlessly integrated with texts as publishing technology evolved (Pillsbury 2012: 6). In her study of Roman copies of Greek original sculptures, Miranda Marvin (2008: 56–144) traced the development of artifact catalogues from their origins (celebrating Early Modern collections as self-aggrandizing reflections of aristocratic owners) to the systematic organization and presentation of antiquity made possible by 19th-century innovations in technology (photography), the critical methods in philology and art history that accompanied the development of *Altertumswissenschaft*, and the first "big digs" in Mediterranean lands (see also Whitley 2001: 129–36). As early as 1782, a catalogue of sculpture in the Museo Pio Clementino in Rome was produced by Ennio Quirino Visconti, whose entries were "the first for ancient art that read like modern ones. Each begins with the provenance of the work, identifies it through iconography, discusses its formal qualities, relates it to similar works, indicates modern restorations, and includes a large and handsome engraving" (Marvin 2008: 129). The basic presentation structure and "academic" concerns of Visconti remained essentially unchanged 130 years later when H. Stuart Jones (1912) published his catalogue of sculptures in the Museo Capitolino; his entries combined images (black-and-white photographs in separate plates) with title, dimensions, material, state of preservation, descriptive commentary, provenience, and bibliography. And, almost a century later, publications

such as Nikolaos Kaltsas's (2002) lavishly illustrated, color catalogue of the sculpture in the National Archaeological Museum in Athens attest to the stamina of this long-standing tradition in artifact presentation (for problems with the archaeological monograph tradition, see Opitz 2018).

Not surprisingly, given the flurry of archaeological activity that commenced in 19th-century Cyprus and continues to this day (Goring 1988; Karageorghis 2015; Tatton-Brown 2001; Toumazou and Counts 2011: 68–69), the publication of Cypriot artifacts mirrors the general development of archaeological catalogues in Europe as they moved from "antiquarian" to "academic." For example, the Cesnola Collection of the Metropolitan Museum of Art in New York was first published in a late 19th-century mode of lavishly produced folios by Luigi Palma di Cesnola (1885–1903). The same collection later received a more scientific organization and critical analysis by J. L. Myers (1914). Definitive, proper treatments of this important collection were only more recently compiled: a general overview of selected artifacts in 2000 (Karageorghis 2000), followed by a series of catalogues focusing on specific artifact types (limestone sculpture [Hermary and Mertens 2015], terracotta sculpture [Karageorghis et al. 2018], and glass [Lightfoot 2017]). The cataloguing of the significant holdings of Cypriot limestone sculpture in the British Museum followed a similar path. Beginning in 1878, R. H. Lang provided an account of his excavations at Idalion, including a catalogue of selected pieces, which would eventually be accessioned by the British Museum, illustrated with drawings and brief commentaries (Lang 1878). Fifty years later, the collection received its first comprehensive catalogue by F. N. Pryce (1931), who included standard artifact data coupled with professional, standardized, black-and-white photography. More recently, Pamela Gaber (1986) and Reinhard Senff (1993) republished the sculptures in monographs, providing much-needed, critical assessments of the collection. At both institutions, web platforms now offer digital access and open-use, downloadable images to users across the globe. Another important project, which rather auspiciously straddles the 19th and 20th centuries, was the organization and cataloguing of the Cyprus Museum in Nicosia by Myres and Max Ohnefalsch-Richter (1899). In addition to bringing order to the new museum's holdings, the catalogue also represented a rigorous attempt to apply a scientific classification system to the collection while, significantly, linking style and typology to sites and archaeological contexts.

The most critical moment for the history of artifact catalogues in Cypriot archaeology, however, was the publication of extensive archaeological reports by the Swedish Cyprus Expedition (SCE), whose excavations occurred from 1934 to 1937 with a series of monumental volumes appearing in the following decades. In addition to establishing a standard typological system for Cypriot material culture, the SCE linked objects to narrative accounts of excavations and archaeological

contexts, while at the same time placing the island's material culture within a broader historical milieu. Mention should also be made of the Herculean efforts of the A. G. Leventis Foundation to publish collections of Cypriot antiquities worldwide from Dublin to St. Petersburg and the equally important *Corpus of Cypriote Antiquities* in the series Studies in Mediterranean Archaeology (Karageorghis 2015; see also the comments in Counts 2001: 130–49).

Artifact catalogues have thus acted as the primary agents for the visualization and interpretation of the archaeological record by not only providing supplements to written analyses, but also building significant sources of comparative data (for the evolution of illustrated archaeological publication more generally, see Pillsbury 2012: 23–25). Nevertheless, traditional print catalogue models lay bare two significant drawbacks that limit their use as primary research tools. On the one hand, commercial and academic presses increasingly pass along the high, at time prohibitive, costs of publishing fully illustrated print volumes to authors (and, of course, ultimately the consumer). In this type of publication model, front-end expenses, small print runs, and high price tags combine to limit access to specialists and research libraries. On the other hand, such volumes, which present fixed, 2D visual data, are now being asked to respond to the digital turn in archaeological data collection and recording, especially new modes of access (nonlinear and linked) as well as new ways of imaging artifacts and sites for presentation in both public and scholarly fora (Opitz 2018; Opitz et al. 2016; Sapirstein 2017). In short, there is an increasing awareness and demand for more dynamic publications that integrate 3D illustrations as data, not merely as representations. John Rick (2012: 416) summarizes the radical potential of digital illustration: "Far beyond some simple geometric increase in resolution, accuracy, or some other quality, the move into dimensional modeling capabilities has the potential to change modes of data acquisition, analysis, illustration, and publication, and indeed the overall structure of the research process."

The first drawback has been addressed by the increasing adoption of open-access policies in scholarly research (although, admittedly, there are often subvention costs associated with open-access; see Opitz 2018) and the exploration of more dynamic forms of digital publishing. Traditional artifact catalogues can now be published print-on-demand and distributed for cost via third parties, while simultaneously made available for free digital download or viewing (e.g., Halbertsma and Pilides 2019; Hermary and Mertens 2015; Karageorghis et al. 2018; see also Counts 2017). In the case of this monograph, it is especially gratifying that this project was supported by a Research Growth Initiative (RGI) grant through the University of Wisconsin-Milwaukee; in essence, public funds led to the creation and dissemination of open-access knowledge. The second drawback to traditional catalogues has been more difficult to allay. A shift away from 2D visualization not only requires new tools and methods of

capturing artifact data, but also necessitates dynamic new platforms for dissemination (for the pros and cons of print versus digital publishing, see Rick 2012: 417–18).

A New Approach

Visualizing Votive Practice represents an innovative, problem-oriented approach to publishing archaeological material that seeks to build a more robust platform for scholarly study and interaction with 3D data. To move away from the static, and often detached and mono-vocal, models of 2D presentation found in printed artifact catalogues, we created an interactive and stable open-access digital publication of a selection of limestone and terracotta sculptures recovered from the Athienou Archaeological Project's excavations of the sanctuary at Athienou-*Malloura*, Cyprus. In addition to the standard formal description, contextual information, and brief analysis that accompanies each artifact, the catalogue incorporates 3D digital models of the artifact through multiple visualization platforms that allow user-friendly manipulation and study. The publication has three components (see "How to Use This Book" below for more details):

(1) this digital monograph in 3D PDF format that retains a traditional print publication framework but, significantly, is born digital and published open access;
(2) the catalogue (Chapter 3) published in this PDF is also published online by Open Context, which allows users to query the database, explore linked data, and view and download high-resolution 3D models through a built-in visualizer; and
(3) high-resolution 3D models uploaded to Sketchfab, which provides a public-facing point of access to the objects and also offers a more photo-realistic visualization of the sculptures with key features annotated.

Photo-realistic 3D digital models supplement other forms of data (e.g., description, context, date, commentary), providing new information for researchers not available through 2D images alone. These 3D models can be actively used by researchers compared to more static forms of study from 2D representations. For example, since 3D models of artifacts created using structured light technology retain the absolute geometry of the original artifact, they can be digitally measured using tools available in visualization software. One can adjust lighting conditions or turn off the photo-texture to accentuate variations in surface details, such as subtleties of carving/modeling, toolmarks, or fingerprints that might otherwise be invisible from a fixed angle or lighting source. Significantly, users are granted 100% access to each artifact through rotation and zoom at any scale, providing unlimited remote investigation in more depth than a photograph. The implications for secondary research applications are immense. In the end, this publication is a traditional catalogue (which,

as a primary mode of disseminating archaeological data, has admittedly not lost much of its practical advantages) enhanced by a hybrid, digital format.

The objects used in this publication represent a sample of the dominant types and styles of figural votive offerings dedicated at the sanctuary of Athienou-*Malloura* in south-central Cyprus. The total number of limestone and terracotta votive fragments is in the thousands, and the full assemblage will be published in subsequent AAP excavation final volumes. This publication, however, is an experiment in publishing a small, yet representative corpus of AAP's limestone and terracotta sculptures with 3D models. That some of the objects have been published previously provides a unique opportunity to consider the ways in which viewer interaction with 3D models differs from 2D presentation, but also creates an unprecedented experience and access that one might argue is only one step removed from holding the artifacts in one's own hand. Exploring this method of publishing with a small sample has allowed us to consider best practices for the final publication, dissemination, and archiving of 3D data, and serves as a stepping-stone for the comprehensive publication of 30 years of excavation by AAP. This is not the final publication of the sculpture from the site, but rather it serves an entry point to a particular assemblage of archaeological material. The full range of AAP's research and data will be published in final excavation reports. Still, our hope is that this experimental volume will help determine the best way to include 3D data in the final reports, while at the same time promoting more innovative ways to publish the large and diverse corpus of sculptures excavated from the site. As 3D representational technologies continue to become more accurate and accessible, the publication platform we have established here will allow for future artifact models to be added to the digital collection.

The publication of a 3D image archive for a selection of the Malloura sculptures counteracts two significant obstacles to their study: (1) the sheer number of fragments makes repeated observation of each fragment time-consuming and hinders our ability to match joins and make other stylistic/typological links within the assemblage; and (2) accessibility is limited by the fact that, with the exception of a small group of objects displayed in the Kallinikeio Municipal Museum of Athienou, all AAP artifacts are accessioned and stored in a local archaeological museum in Cyprus. These obstacles are of course common for the study of any archaeological artifacts; as a result, developing guidelines and best practices for the dissemination of 3D data is imperative. Our hope is that publishing this small catalogue as open and digital, while at the same time establishing an avenue for the publication of 3D models and their metadata, will provide a template for future archaeological publications and, more specifically, take a step forward in the centuries-long development of artifact catalogues.

As noted above, 3D visualization technologies have emerged as essen-

tial tools for providing public and scholarly access to the material culture of the past. For example, a recent project utilized 3D models of terracotta figurines from the House of Orpheus, Nea Paphos (Cyprus) not only for digital storage of artifact data, but also for alternative public engagements (through virtual reality) with material culture (Papantoniou et al. 2017). Not surprisingly, equipped with innovative technologies, born-digital data, and stable, digital archives, researchers in the humanities and sciences are exploring new publication models. In particular, the possibilities for publication of archaeological data are expanding alongside the adoption of 3D visualization tools. For example, a growing number of academic journals (e.g., *Advances in Archaeological Practice*, *Antiquity*, *Digital Applications in Archaeology and Cultural Heritage*, *Internet Archaeology*, *Studies in Digital Heritage*, and the *Journal of Field Archaeology*) now publish 3D models to supplement articles, and a few select publishers (e.g., University of Michigan Press, White Rose University Press) are currently publishing 3D models as supplemental material to traditional print and digital publication. Still, the difficulty in publishing 3D data in a user-accessible, integrated, peer-reviewed, archival, and reproducible way remains challenging even as the potential of 3D models to enhance the documentation and analysis of archaeological material grows (e.g., Opitz 2018; Opitz et al. 2016; Štular and Štuhec 2015; Tringham 2004; Trimgham and Stevanović 2012). *Visualizing Votive Practice* is an attempt to leverage a broad range of digital tools and platforms to rethink how archaeological material can be presented in an open and accessible manner. In many ways, the variety of user interfaces—from PDF to digital repository to popular web-based 3D platform—reflects the collaborative nature of the monograph publication team, which includes AAP, The Digital Press of the University of North Dakota, and Open Context.

Organization of the Book

Chapter 1 presents the context of the votive objects: the rural sanctuary at Athienou-*Malloura* in the Malloura Valley excavated by AAP. Since excavations are ongoing, this introduction presents research and results in progress and necessarily builds upon more comprehensive reports that have recently been published. Because the limestone and terracotta sculptures presented in this catalogue were discovered through the excavation of the Malloura sanctuary, an overview of the site, its chronology and development over time, as well as the disposition, use, and afterlife of the votive statuary dedicated there provides essential background information for the objects presented in the catalogue (Chapter 3).

Chapter 2 introduces the reader to some of the nuances of Cypriot sculpture as the subject of scholarly inquiry. Following a discussion of the reception of Cypriot limestone and terracotta sculpture in 19th- and

20th-century scholarship, particular attention is given to the importance of medium (limestone and clay). On the one hand, questions of style/typology, production, and distribution are inextricably linked to materials; on the other hand, the differences in material has meant that limestone and terracotta have been published separately despite the clear parallels in placement, function, and meaning.

Chapter 3 presents the catalogue of 50 limestone and terracotta votive sculptures. Each entry includes artifact measurements, contextual information, a formal description, brief commentary, and bibliography. The embedded 3D model provides enhanced visual interaction with each object. The 3D models that are embedded in this PDF are scaled-down, low-resolution versions of the original artifact scan. The reason for this is usability: to keep the file sizes manageable for use on a variety of devices. For readers wanting more detailed, higher-resolution models, each catalogue entry provides a link to the same models published on two different platforms: Open Context and Sketchfab. While this publication provides traditional dissemination of archaeological data, the multiple platforms used to present these data provide a more immersive research experience. To make the best use of the different platforms, please refer to "How to Use This Book" below.

Chapter 4 offers some background on the history of visualization in archaeology and how our 3D initiative fits into this long tradition. This overview provides the epistemological context for AAP's creation of 3D models and offers a critical discussion of the efficacy of digital 3D artifact models in scholarship. Questions that address broader issues of representation, reproduction, authenticity, and authorship, as they pertain to the production and publication of 3D artifact models, are also explored.

The book concludes with a brief discussion about the future of digital publication in the academy. We situate our own publication in a broader framework of 21st-century academic publication that has the potential to utilize the many benefits that digital platforms offer scholarship, while also acknowledging the challenges that accompany these transitions in archaeological publication.

How to Use This Book

On its surface, this monograph reproduces the experience of many archaeological volumes: the PDF simply puts into digital form what would normally occupy the pages of a traditional artifact catalogue. Yet, just as archaeology has responded to new digital tools and methods that shape how data are collected, analyzed, and stored, archaeological publications must also respond and take advantage of new digital data and methods of dissemination. These new approaches to publication, such as this monograph, inevitably become a complex web of linked information that can be difficult to navigate. Not only can this network of informa-

tion be accessed from multiple entry points leading to an organic, linked, reader experience, but the data itself can be mined and consumed using tools along a host of diverse digital pathways. Accordingly, we have put together this how-to section that previews how the content of our book is organized and presented—from a user's perspective—with the ultimate goal of helping the reader successfully maximize the monograph's potential. Three engines drive the reader's experience:

(1) The digital monograph in the form of a 3D PDF: https://thedigitalpress.org/VVP/
(2) The Open Context online database publication of the catalogue with high-resolution 3D models: https://opencontext.org/projects/116-visualizing-votive-practice-exploring-limestone-and-te
(3) The Athienou Archaeological Project's Sketchfab collection with high-resolution, annotated 3D models: https://sketchfab.com/AthienouArchaeologicalProject.

These platforms are designed to work together, each provides the user with a different mode of accessing and digesting information. While effortless movement from one platform to the other is intended, the information is structured differently.

The Digital Monograph

The digital monograph is the most holistic and traditional presentation of the Malloura artifacts. It includes not only a full catalogue of the 50 votives, but also chapters that introduce the Malloura sanctuary, explore terracota and limestone votives more generally, and summarize the history of visualization in archaeology and the details of AAP's digital initiative. Interaction with this digital monograph will be fairly straightforward; it is formatted in the mode of traditional print monographs, which leads the user through a linear progression from title page and table of contents to chapters and appendices. The enhanced functionality of a digital PDF platform, however, also allows users to: move in and out of chapters; search and find key terms; access internal and external hyperlinks to comparative information; and, most importantly, manipulate the 3D models directly in the PDF (no internet is necessary). To keep the size of the digital monograph reasonable for ease of use on a variety of devices, only low-resolution 3D models are included to preview each artifact. Each entry, however, contains links to access high-resolution models published on the two online platforms.

In the catalogue section of this digital monograph, each artifact entry includes a 3D visualization of the artifact. To access the embedded model, the user must use Adobe Acrobat Reader which can be downloaded here: https://get.adobe.com/reader/. Other PDF readers do not have the ability to read 3D PDFs. To ensure that the 3D model can be viewed, the document must be "Trusted" by the user's computer and the embedded

3D window must be activated by clicking on it. Once active, the user can manipulate the 3D model in any direction and zoom in and out. The background color of the visualization can also be changed — we recommend choosing a dark background for contrast with the surface features of the model. For variations on the object views, the toolbar for the 3D viewer provides different lighting and shading options. Additionally, one of the most useful features in this viewer is the measuring tool, which allows the user to measure (in mm) any aspect of the model. Since these 3D models were produced using a structured light system, the surface geometry captured is absolute, and therefore this tool provides accurate measurement. All of these features (manipulation, zoom ability, various lightings, and the measurement tool) allow researchers to use these models in a more robust way than the typical photograph or illustration that accompanies traditional catalogues.

As noted above, the 3D models used in this digital monograph are of a *lower resolution* than the original models created through FlexScan3D. For example, the original model created for AAP-AM-4929 contains 1,100,933 faces, while the model used in this PDF contains 49,999 faces. During the production of the models used in this monograph, the high-resolution models were decimated in order to lower their file sizes. The lower-resolution models still maintain the integrity of data from the original object for research purposes, and this smaller file allows the digital monograph to be read and accessed off-line on a variety of devices. Due to the limitations of these lower-resolution models and the Adobe 3D visualizer, however, we link to Open Context and Sketchfab for higher-resolution visualizations of each object. The Open Context links go directly to each individual published artifact record online, where one can view the same catalogue information and view and download a high-resolution model. Each visualization software displays the original models differently; we believe the Sketchfab visualizer showcases the 3D artifact models the most realistically. For closer, in-depth examination of each model, we strongly encourage readers to click the Sketchfab link provided.

In addition, there are links to both internal (elsewhere in the publication) and external locations. Links inserted throughout the catalogue entries in both the digital monograph and the Open Context publication connect to comparanda in various museums (e.g., MMA, Louvre, BM) when available online. Additionally, chronological periods, sites, and descriptive terms used are linked to external sources (PeriodO, Pleiades, and Getty Research Institute), providing the reader with metadata.

Open Context Online Database

To supplement and complement the digital monograph, there is a concurrent publication of the catalogue through Open Context. This online publication presents the catalogue's associated metadata in a stable, searchable, and linked database. Each Open Context catalogue entry mir-

rors the data presented in the digital monograph, but in database form and with a link to a high-resolution model at the bottom of each record that allows for enhanced viewing. Unlike the digital monograph, the Open Context publication can be continually updated and expanded as future final AAP publications appear. As with the 3D PDF, the 3D viewer used in Open Context (3DHOP) allows users to manipulate the model by changing the view, zooming in and out, measuring, and altering the lighting conditions. Users can additionally download the higher-resolution model from this site (as a Wavefront OBJ file). The 3D data published through Open Context are archived in a digital repository (the California Digital Library) and each entry is given a unique persistent identifier (Archival Resource Key, or ARK) for stable hosting and individual citation. Moreover, the Open Context publication uses Linked Open Data (LOD), which ties content to museum collections and research data and allows a network of users to publish and communicate certain types of archaeological information (places, periods, terms, etc.) using the same language even if they are bound, individually, to a different vocabulary (Kansa 2014). The important principle is that it is not enough to simply put archaeological data online. Rather, it needs to connect to a larger web of information. This model of open data is particularly appealing because it distributes the onus of archiving and maintenance across institutions and allows new datasets to be continuously integrated into the larger collection of data (see the ARIADNEplus research infrastructure as one example of this). Thus, like the digital monograph, the data within the entries connect to existing external data.

Sketchfab

The final component of this publication is the presentation of high-resolution models on Sketchfab. Sketchfab is a popular platform for sharing, buying, and selling 3D models online and many museums and archaeological projects have uploaded their models to this site. The models are presented in AAP's Sketchfab collection with contextual information. The primary value of this venue is a superior visualization of the models, providing the most photo-realistic viewing platform, as well as the ability to array all models together in a thumbnail view. An added feature is the use of annotations that point viewers to specific aspects of each model. The "Matcap" choice will allow users to view the models without photo-texture. Due to textual limitations in Sketchfab, readers are directed to either the digital monograph or Open Context for complete archaeological context for each model.

Citation

Due to the multiple access points to the content of this publication (PDF, Open Context, Sketchfab), we find it necessary to say a few words about the citation of this publication. Likewise, it is important to recognize authorship for both text and image with respect to our sculptures, recognizing the intellectual and subjective input that both require. This digital monograph PDF is the primary format of the publication since it includes background chapters in addition to the full catalogue. Information cited from the text may be cited like any other print publication; chapter authors are listed in the table of contents and the author(s) of catalogue entries are listed at the end of each entry. To reference these data in the Open Context platform, a suggested citation is provided in the top-right corner of each Open Context entry. For example, when referencing the catalogue entry for AAP-AM-4360 on Open Context, the following citation is suggested:

> Averett, Erin, D.B. Counts, and Kevin Garstki. Released 2020. "Catalogue Entry for AAP-AM-4360, Quadriga Chariot Group." In *Visualizing Votive Practice: Exploring Limestone and Terracotta Sculpture from Athienou*-Malloura *through 3D Models*, D. B. Counts, E. W. Averett, K. J. Garstki, and M. K. Toumazou. Open Context (https://opencontext.org/subjects/9aff8812-9aef-4561-8db6-7ba7d065f3af)

To reference the 3D model of AAP-AM-4360 specifically (rather than the catalogue entry itself), please use the following citation:

> Garstki, K. J. Released 2020. "3D Model for AAP-AM-4360, Quadriga Chariot Group." In *Visualizing Votive Practice: Exploring Limestone and Terracotta Sculpture from Athienou*-Malloura *through 3D Models*, D. B. Counts, E. W. Averett, K. J. Garstki, and M. K. Toumazou. Open Context (https://opencontext.org/media/892c8d8e-14f1-4305-b180-2d0b81baaf9d)

Because of our concern with digital persistence and maintaining our data within a stable repository, we recommend that researchers restrict citations to the digital monograph (PDF) or Open Context. If one feels it necessary to reference the 3D model that appears in Sketchfab, it should be accompanied by a citation to one of these more stable publications.

Finally, on a related note, endnotes, where appropriate, provide perma.cc URIs (Uniform Resource Identifiers) for externally linked online sources to archive them and make them permanently accessible to readers in the case of link rot.

Final Note

This publication strategy allows us to have our cake and eat it too. The digital monograph retains the unified and linear structure, as well as the familiar narrative, of a print volume, but allows for embedded, lower-resolution 3D models that can be manipulated by users without the need for specialized software or internet access. The Open Context component permits a stable archive for full-resolution models that are available for viewing or downloading while also providing de-structured, open, and linked data that can be queried, manipulated, and mined. Finally, Sketchfab provides a high-quality viewing experience that complements the full presentation of data through the digital monograph and Open Context publication. As you navigate through *Visualizing Votive Practice*, we encourage making use of these additional features outlined above to enhance interaction with the material. In this way, our publication contributes to the new and dynamic avenues that archaeological research can be published and disseminated in robust, open, and user-friendly ways.