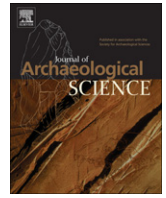




Contents lists available at ScienceDirect

Journal of Archaeological Science

journal homepage: <http://www.elsevier.com/locate/jas>

Book review

From Mine to Microscope. Advances in the Study of Ancient Technology. Andrew J. Shortland, Ian C. Freestone, Thilo Rehren (Eds.). Oxbow Books, Oxford (2009). xvi + 230hdbkUK£60.00; USS120.00, ISBN: 978-1-84217-259-9

Michael Tite's deep appreciation of new scientific data that illuminate various aspects of ancient societies is certainly rewarded by the festschrift in his honor. The book is a collection of twenty papers (and one response) presenting work done by colleagues and friends of Mike who were influenced by his enthusiasm for the application of scientific techniques to archaeological problems. The result, as may very well be expected given Mike's wide range of interests, is a medley of topics of which the only common ground is the very broad definition of 'archaeological science' (p. vii and elsewhere), a rather unfortunate term intended to cover any research that includes analytical investigation using techniques derived from the Natural Sciences (in that case, how should we call archaeological investigations done without such techniques? Is the term 'science' reserved merely to the natural disciplines?). It would have been appropriate to mention Tite in the book's title, not only for announcing it as a festschrift (a detail revealed only to those who read the editorial introduction), but rather as an aid for deciphering the book's content. As it is, the title is rather misleading; there is not a single paper directly related to ancient mining *per se*.

The book covers an extensive array of archaeological problems, including a wide range of periods (Paleolithic to Medieval), geographic locations (Europe, Middle East and China) and materials (ceramic, flint, frits and glazes, glass, metal and slag, niello, alum and sugar production waste). Evaluation of the different contributions requires the expertise of many scholars, and this short review attempts to introduce the book and some observable trends rather than assessing any individual paper. In general, because of the wide scope of issues, the book embodies a current representation of the 'archaeological science' as a discipline, including introduction of the state-of-the-art analytical techniques available for the study of most types of archaeological materials (indeed, one chapter [13] is devoted only to the description of such technology), and engagement in some broader methodological concerns.

In several places throughout the book (in particular chapters 2 and 17) the authors explicitly go back to the fundamental question of justifying the application of scientific techniques as part of *archaeological investigation*, a long-standing issue that has accompanied the discipline since its inception in the middle of the 20th century and stems from the often complex link between data produced and derived archaeological/anthropological insights, as well as from the type of questions asked in different academic milieus (see discussion in e.g., Pollard, 2004). Such defensiveness hovering over researches of the sort is still positive, as even some studies in the present volume give rise to similar concerns (e.g.,

the complex link between lead isotope analysis and provenance of metal ingots [chapters 16 and 17]; the suggestion to look for the 'elusive sugar compounds' in a waste dump of sugar processing [what for?, chapter 20] and the manual-like description of the application of laser induced plasma spectroscopy for microanalysis of glass, omitting discussion of any meaningful implications to archaeology [chapter 13]).

In that respect, the discussion by Mark Pollard on lead isotope analysis (LIA) ('What a long, strange trip it's been', chapter 17) is very useful. As a continuation of the long and 'sensitive' debate regarding the applicability and implication of this method in archaeological research (see discussion in e.g., Budd et al., 1996; Knapp, 2000; Gale, 2001), Pollard encourages further research as more advanced technology has recently become available (this in itself introduced a new problem of comparability between old and new datasets, see chapter 16, p.164), while considering a change in the type of questions we have been used to ask. According to Pollard, the focus should be on recognizing variations in the archaeological record (reflecting technological/social/economic changes), rather than on the painstaking and not always efficient attempts to pinpoint the exact location from which the ore (or some of it) was mined. In addition, he calls for final publication of the vast dataset produced mostly by the Isotrace Laboratory at Oxford during the last 20 years, and points to the advantages of having less 'centralized' research groups in this particular field and generally in scientific investigations. These are all important points, and the response to this paper by Noel Gale, which corrects some inaccuracies in Pollard's account, missed seeing the broader significance of the attempts to revive LIA, especially among young scholars. The controversy over LIA has indeed discouraged many from pursuing such investigations, as is evident for example in the absence of interpretive LIA papers in the recent BUMA VII conference and the lack of new LIA studies in the southern Levant, where intensive archaeometallurgical research has been conducted in the last 10 years. Chapter 16 by Zofia Stos also deals with LIA and presents cautious synthesis and interpretation of isotopic data from the shipwrecks of Uluburun and Gelidonya as well as from Cretan copper. It is a concise and up to date summary of a decades long research aiming at parsing out the flourishing trade routes and international connections of the Late Bronze Age Mediterranean, and a potent demonstration of the methodology, while stressing the magnitude of future needed research ('[all data accumulated so far] is only the tip of an iceberg', p. 176).

In accordance with one of Tite's major interests, papers about the study of ancient ceramic and ceramic glazes constitute a considerable portion of the festschrift. The overview given by Maniatis (chapter 2) details the well-established analytical techniques and methodologies available for the study of ancient ceramics and manages well to demonstrate their vital contribution to archaeological research (using mostly examples from Greece). Regarding

Maniatis's cursory survey of the origin and evolution of ceramic production, 'the first technological revolution in human history', it is worth mentioning here the new evidence for very early production in China (ca. 18,000 BP) introduced recently by Boaretto et al. (2009). The 'set of unique developed methodologies and background knowledge obtained by the previous archaeometric generation' (with substantial contributions by Tite himself) is further illustrated by the following paper of Maggetti (chapter 3), who discusses manufacturing process of Neolithic pottery from Switzerland (with a good synthesis of related archaeometric papers published so far). In addition to conclusions regarding provenance of clay, typology and quality of pottery production, Maggetti deals briefly with the manufacturing of the crucibles of the Pfyn culture, and the question of their function (smelting vs. melting). While he does not provide a definite answer for the latter, Rehren (chapter 15) concludes that these types of crucibles were most likely used for melting, as the observed chalcopyrite was found to be a result of post depositional processes (using optical microscopy).

Several papers deal with various aspects of glazes. The paper by Paynter (chapter 9) examines the origins of glazing technology for clay-based ceramics and confirms (using analytical methods and ancient literature accounts) the common presumption of connection to the contemporaneous development of glass technology in the Ancient Near East (mid 2nd millennium BCE). The paper by Kakoulli (chapter 8) concerns an early product of glazing technique, Egyptian blue. The Egyptian pigment was used in Greek painting, but the diversity of the chemical characteristics and manufacture procedures (of which the previous studies are nicely summarized in the paper, in addition to the new analytical data) 'mask any patterns that could be indicative of provenance or trade'. The glazing technology of Islamic and Hispano-Moresque Spain is analyzed in the papers by Molera et al. (chapter 1) and Pérez-Arantequi et al. (chapter 6). While the latter is almost a strict tracking of 'technological recipes', the former also presents an interesting case in which the analytical/archaeological evidence does not correspond to the literature accounts, revealing more diversity of practice. These results demonstrate the importance of analytical investigations even in well documented periods. The paper by Wood (chapter 5) investigates the possible connection between the technology used as part of the long-running ash-glazed stoneware tradition in China (1500 BCE–1200 CE) and consequent environmental change. Calculations of the amount of ash needed for the industry suggest severe deforestation that may explain extinctions and relocations of ash-glazed kiln-complexes. The last paper about glazes deals with provenance (chapter 4). While stressing the connection between technological variations and typology of the final products, Manson attempts to source and subsequently date glazed ceramic tesserae from churches in Medieval Amalfi (Italy) using an 'eyeball' technique. The results prove that even such a 'low tech' approach can yield interesting insights into ancient commercial connections and artistic practices.

Five papers deal with faience and glass. Middleton (chapter 7) shows that faience beads from 'Isis Tomb' at Vulci, Italy (7–6th c. BCE) were made of the same raw materials and by the same technology as contemporary products in Egypt, and thus originate there. The paper by Shortland (chapter 10) is about an early artistic glass object, a fish from Amarna (14th c. BCE Egypt). In addition to the interpretation of the fish and associated finds as representing a glassworker's cache, the paper raises an interesting possibility that the glassworkers were of Asiatic origin and that artisans traveling between courts have contributed to the spread of the innovation that is glass technology. The paper by Barber et al. (chapter 11) concerns with the origin of copper red color in glass. Applying microbeam technique to artifacts from entirely different periods

and locations, the main conclusion is that copper red colorations in glass were achieved in antiquity by diverse mechanisms and is not the result of one specific 'know-how'. The paper by Henderson (chapter 12) deals with provenance of plant ash glazes with case studies from various periods. While 'there are promising signs' that chemical composition may indicate origin in some cases, complementary isotopic studies may be needed as well. The paper by Walton (chapter 13) is a short account regarding the usage of Laser Induced Plasma Spectroscopy for microanalysis of glass.

The rest of the papers deal with various other materials. Northover and La Niece (chapter 14) presents a comprehensive study on niello (manufacture methods, source of the raw material). Craddock and Cowell (chapter 19) have identified Neolithic flint from Grimes Graves (England) away from the site itself and also conclude that flint from this mine (of the Floorstone formation) was readily available in the Late Neolithic at least in East Anglia. Hall and Photos-Jones (chapter 18) delve into the processing techniques of alum and the interpretation of Pliny's account regarding this substance, and the paper by Photos-Jones et al. (chapter 20) investigates sugar processing by materials analyses of waste from a Mamluk (13–15 c. CE) sugar mill in Jordan.

This book is a 'classic' reader for the type of audience of the *Journal of Archaeological Science* with new data and old debates. Although printing considerations are understandable, the black-and-white version is problematic as many figures require color for proper presentation (e.g., Fig. 2 in chapter 7 showing 'four colors' of faience beads or Fig. 7 in chapter 8 about Egyptian blue; Unfortunately, the only color photos on the cover do not have any identification). A solution may be in the format of a supplementary on-line companion that would include relevant figures. Moving to on-line publication may also answer the concerns raised by Pollard (p. 183) and others about the availability of databases, as analytical data can be thoroughly published and hopefully be available for scrutiny and further usage by other scholars (a common format in many fields of the Natural Sciences, see e.g., <http://earthref.org>). The implication of the ample analytical datasets produced in 'archaeological science' is sometimes vague (as is evident from the long debate regarding the role of 'archaeological science' in archaeological studies), and making them easily accessible would enable further interpretations and wider discussions. The book 'From Mine to Microscope' is above all a great demonstration of the variety and scope of archaeological problems that can be tackled by the application of analytical techniques and the interpretation of the ever-growing analytical datasets.

References

- Boaretto, E., Wu, X., Yuan, J., Bar-Yosef, O., Chu, V., Pan, Y., Liu, K., Cohen, D., Jiao, T., Li, S., Gu, H., Goldberg, P., Weiner, S., 2009. Radiocarbon dating of charcoal and bone collagen associated with early pottery at Yuchanyan Cave, Hunan Province, China. *Proceedings of the National Academy of Sciences* 106, 9595–9600.
- Budd, P., Haggerty, S.E., Pollard, A.M., Scaife, B., Thomas, R.G., 1996. Rethinking the quest for provenance. *Antiquity* 70, 168–174.
- Gale, N., 2001. Archaeology, science-based archaeology and the Mediterranean Bronze Age metals trade: a contribution to the debate. *European Journal of Archaeology* 4 (1), 113–130.
- Knapp, A.B., 2000. Archaeology, science-based archaeology, and the mediterranean bronze age metals trade. *European Journal of Archaeology* 3, 31–56.
- Pollard, A.M., 2004. Putting infinity up on trial: a consideration of the role of scientific thinking in future archaeologies. In: Bintliff, J. (Ed.), *A Companion to Archaeology*. Blackwell, Oxford, pp. 380–396.

Erez Ben-Yosef
Department of Anthropology,
University of California,
San Diego La Jolla, California, USA
E-mail address: ebenyose@ucsd.edu