Understanding the role of metal within the Late Bronze Age community at Mycenae: challenges and potential approaches

Abstract: It has been widely argued that metal played a decisive role in the development of Mycenae, which became one of the foremost centers on the Late Bronze Age Greek mainland. Yet, little is understood as to how metals were integrated into the lives of the inhabitants. Most scholarship has concentrated on the relationship between the ruling class and metal artifacts, drawing much of their evidence from the Linear B archives and top-down models of trade, society and internal redistribution that are increasingly considered untenable within the study of other aspects of Mycenaean life. This paper introduces a new project designed to investigate this issue by using a practice-orientated approach based around object biographies to study the use of metal across the entire social spectrum of the Late Bronze Age community at Mycenae (approximately 1700–1050 BC). The decision to take such an approach is justified through the presentation of a case study, based upon hitherto unpublished previous research, that examines the unexpected rarity of gold vessels in the Palatial-period archaeological record from the perspective of social practice; its purpose is to demonstrate how the holistic use of evidence from multiple sources, as envisaged in this new project, can help overcome the difficulties inherent in the study of the use of metal in past societies.

Keywords: metal, Mycenae, Late Bronze Age, social practice, object biography

Stephanie Jane Aulsebrook

University of Warsaw, Faculty of Archaeology

Polish Archaeology in the Mediterranean 29/2
Aulsebrook 2020: 237–264
https://doi.org/10.31338/uw.2083-537X.pam29.2.10

Acknowledgments

The project "Forging society at Late Bronze Age Mycenae: the relationships between people and metals" is funded by the National Science Center, Poland (NCN), through the SONATA 14 scheme, grant number 2018/31/D/HS3/02231, and is based at the University of Warsaw. The research undertaken for the case study was funded by the AHRC and a Leslie Wilson scholarship from Magdalene College, Cambridge. I would like to thank Dr. Nicholas Soderberg and two anonymous reviewers for their exceedingly helpful comments on an earlier draft of this paper. Blame for any remaining mistakes and omissions lies with the author.

It is unsurprising, given the quality and quantity of metalwork unearthed at Late Bronze Age Mycenae (approximately 1700–1050 BC), that metal has long been considered to have played a crucial role in the distinctive sociopolitical trajectory of Mycenaean societies, especially at Mycenae itself (Davis 1983; Rutter 2001; Parkinson and Galaty 2007; Kelder 2016). How metal artifacts were integrated into the communities in which they were used is still poorly understood despite extensive research into Mycenaean metalwork. Indeed the two most recent attempts at a comprehensive study of Mycenaean metalwork date back almost 40 and 20 years respectively (Iakovides 1982; Kayafa 1999), but these broad-brush overviews did not seek to address wider issues concerning the social role of metals in these societies.

The early discovery of Grave Circle A at Mycenae in 1876, marking the beginning of Aegean Prehistory as a scholarly discipline, the lower frequency of hoards in the Aegean compared to the rest of mainland Europe, and the fact that most Mycenaean metalwork comes from mortuary contexts seem to have directed scholarly attention towards the role of metal within the political economy. This has been reinforced by the nature of the information derived from contemporary textual sources. However, an extraordinarily wide range of metal artifacts, such as weaponry, cookware, jewelry, tools, architectural elements and personal grooming accessories, has been recovered from multiple types of contexts implying that metal objects were used in a diverse selection of social practices extending well beyond the immediate concerns of the political economy. Thus the importance of metal objects can only really be truly appreciated through a close examination of their relevance to the entire social spectrum of a Late Bronze Age Greek mainland community.

The project "Forging society at Late Bronze Age Mycenae: the relationships between people and metals" is designed to tackle these issues. Deliberately taking the unusual approach of focusing on a single community enables the project to provide a much deeper analysis than could be achieved by superficial comparison across a multitude of sites, which also particularly facilitates the investigation of temporal change. Mycenae has been specifically chosen for this study due to its long history of excavation and the diversity of its domestic, mortuary, religious and civic contexts, as well as our in-depth understanding of its chronology and sociopolitical trajectory and the availability of detailed evidence from the Mycenae Excavations Archive. The project's methodology combines distribution and contextual analyses of metal objects with contemporary textual and iconographic evidence. It will consider metal artifacts from Mycenae holistically from the perspective of social practice. Social practices comprise the discursive and non-discursive activities that take place within each society, and their precise expression is influenced by many factors such as social structure, emic cosmology, available material resources, and the surrounding environment. A practice-orientated approach seeks to understand the function and meaning of objects by examining how they are embedded within the set of social practices specific to a certain society. As the social practices within which

metal artifacts are embedded encompass their manufacture, use and deposition, this approach will be informed by investigating their object biographies. This project will determine:

1) which social practices metal was and was not involved in;
2) the culturally defined criteria, along with any associated processes of adaptation, exclusion and resistance, that governed access to metals at Mycenae;
3) the typical object biographies for metalwork, which artifacts deviated from these and why.

This paper first presents the relationship of the project to previous scholarship by discussing the difficulties specific to the study of metals and their impact on earlier research, especially the use of evidence from Linear B documents to support one particular model of palatial control over metal. The next section then examines the advantages of a practice-orientated approach, with a short illustrative case study based upon unpublished research derived from the author's doctoral thesis. This case study demonstrates how a practice-orientated approach can be used, in conjunction with multiple sources of evidence, to explain otherwise unexpected patterns in the archaeological record. The nature of the latter creates distinct challenges for archaeologists studying metal artifacts in particular, which must be acknowledged and integrated into our interpretations. Therefore, the paper ends by explaining how this new project will avoid some of the pitfalls encountered by previous scholars with regard to the appearance of metal in the archaeological record and its relationship to past practices of metal deposition.

DIFFICULTIES SPECIFIC TO THE STUDY OF METALS

The archaeological record is well understood to be a partial and imperfect source of evidence for the investigation of past societies, and this is especially the case for the study of metals. There are several factors that disproportionately affect the preservation of metals in comparison to other materials, generating challenges that may have deterred holistic investigations in the past. The most prominent of these is the convertibility of all metals, both precious and non-precious (Sherratt 1994: 62). Thus a metal artifact can be recycled by heating it until the metal becomes liquid, resetting its structure and removing all traces of its former shape and previous object biography (Aulsebrook 2017: 10). This possibility both discourages the deposition of metal and encourages its removal from the archaeological record through legitimate or illegitimate cycling (Taylor 1999: 26), which may have been exacerbated during the Mycenaean period due to the frequent reuse of tombs (Boyd 2015). Durable items also tend to enter the archaeological record less frequently (Hurcombe 2007: 545).

The majority of metal artifacts from the Late Bronze Age Greek mainland, particularly those dated to the Prepalatial period (1700/1600–1420/1390),[1] were recovered from mortuary contexts. The process of

1 Absolute dates are based on Manning 2010: 23 and Warren 2010: 393.

organizing an assemblage of goods to accompany the dead was, through necessity, one of selection. It was driven by myriad concerns that can be summarized as a combination of regard for the social status of the deceased, and perhaps also elements of their individuality, as well as the wider values held about material culture and its role in this situation. One notable example of artifact selection is the absence of lead vessels from graves after LH I, despite their appearance in settlement contexts (see Mossman 1993). Indeed, current evidence would suggest that they only ever appeared in two tombs (shaft graves IV and V in Circle A at Mycenae) out of the many hundreds known from the Greek mainland, and these were a special variant with a distinct foot and bronze clad rim (Karo 1930: 109, 160, Figs 78-79, Pl. CII). Although this selection process can provide us with interesting insights into various aspects of Late Bronze Age societies on the Greek mainland, it creates preservation biases that can obscure the significance of certain types of metalwork routinely underrepresented in mortuary contexts, such as tools (Kilian-Dirlmeier 2009: 385); the quantity found at Mycenae thus far does not in the least resemble that required for the basic functioning of a complex Late Bronze Age settlement.[2] Indeed, analysis of tool marks on the Lion Gate itself has highlighted the gap between the range of tools known to have been used at Mycenae and the archaeological record (Blackwell 2014).

The same problem also applies to another major source of metal artifacts from Late Bronze Age Mycenae: hoards. The five known examples from Mycenae, which contain a range of tools, weapons, other implements and ingots, together total more than 200 objects (Schliemann 1878; Spyropoulos 1972). Blackwell (2018a) has emphasized that these are not random assortments of material but structured deposits, which may be linked to tool kits and the organization of bronze production, and therefore once again create preservation biases that must be taken into account when assessing the role of metal at Late Bronze Age Mycenae.

EARLIER SCHOLARSHIP: ELITES AND MYCENAEAN METALS

Most earlier scholarship concerning Mycenaean metalwork has concentrated on establishing typologies (see below), analyzing ore sources to reconstruct trade networks (such as Stos-Gale and Gale 1982; Gale 2011), assessing single artifacts from an art-historical viewpoint (for example, Marinatos 1954; Davis 1974) and the reconstruction of metalworking practices, sometimes with the assistance of composition analyses (such as Demakopoulou et al. 1995; Clarke 2013; Becker 2015). This has provided a great deal of important information upon which this project is founded, but the structuring of these studies has had an impact on our thinking about metalwork and its role in Mycenaean societies as well as narrowing the range of the types of research questions pursued.

2 In his catalog of tools, Blackwell (2011: 581–585) lists 214 examples from Late Bronze Age Mycenae (and another three of unknown date) which, given that he defines this as a period of six centuries (2011: xxiii), approximately represents one tool per three years.

In particular, the focus on typology has led to Mycenaean metalwork being predominantly studied in a compartmentalized fashion, as a series of separate classes of artifacts that have often been further fragmented by the type of metal used; examples include precious metal vessels (Davis 1977), copper and bronze vessels (Matthäus 1980), spears (Avila 1983), swords (Kilian-Dirlmeier 1993) and daggers (Papadopoulos 1998) [*Fig. 1*]. This compartmentalizing approach has meant that only limited research has been carried out into the simultaneous use of multiple artifact types within social practices, mainly within the context of burial assemblages (such as Kilian-Dirlmeier 1988). Integrated studies that combine inquiries into both the various types of context and the metal objects they contain, using the latter as more than just tools for assessing dating, are relatively rare (but see Blackwell 2018a) except in the case of mortuary assemblages, which are primarily studied in terms of assessing the wealth and social status of the deceased. Indeed, metalwork is often expected to act as an index for wealth (Gillis 1999: 291) and objects manufactured from gold and silver in particular have been repeatedly interpreted as belonging to elite or wealthy individuals with little consideration of their overall context. The result includes some rather simplistic assumptions and modeling (see,

Fig. 1. Selection of metalwork object categories from Mycenae (Photos S.J. Aulsebrook & N. Soderberg, processing S.J. Aulsebrook)

for example, Graziadio 1991), reflected in and exacerbated by the frequent division of Mycenaean metalwork into elite (or non-functional) and non-elite (or utilitarian) objects, perhaps encouraged by the compartmentalization approach described above.

It is clear that metals were of great importance to the competing yet complementary demands that emanated from both the political economy and the efficient and effective functioning of the wider economy upon which the ruling elite relied; indeed it is possible that the mismanagement of this difficult balance, perhaps only fully appreciated with hindsight, led to the collapse of the political system of the Late Bronze Age Eastern Mediterranean (Sherratt and Sherratt 1991). Differential access to metals across the social spectrum at Mycenae was a key element of this community's social structure, and this observation seems applicable to most of the Late Bronze Age Greek mainland. It is indicated by, among other trends, variation in the inclusion of metal artifacts in grave assemblages, the frequent use of metal in the production of objects suited to the demands of the political economy, the enhancement of everyday artifacts with metals especially in the funerary sphere, and the emulation of metal artifacts in other materials. However, who was able to access metals and how this was actually controlled has not been investigated.

Specialists studying other forms of Mycenaean material culture, such as ceramics, have already made considerable advances in our understanding of their wider role across society (examples include Tournavitou 1992; Bendall 2004; Hruby 2017). In other areas of Mycenaean scholarship previous assumptions regarding the central role of elites, especially during the period of the palatial bureaucracies, have been challenged. Recent study into topics such as the functioning of autonomous market environments (Parkinson, Nakassis, and Galaty 2013; Pullen 2013) have continued to demonstrate that the complexity of Mycenaean life cannot be explained by simplistic models of elite-controlled redistribution. These are just two of the latest contributions to an ongoing trend that has been evident now for more than two decades (see, for example, Halstead 1992: 72–73). Yet this model of elite-controlled redistribution is still habitually applied to metals, which are considered to be a special case because of their vital importance to both the practical and symbolic aspects of elite control (see, for example, Tournavitou 1997: 31), and the fact that they have to be imported (Nosch 2006). Nosch suggested that this idea of a state monopoly on metals is particularly prevalent among philologists and historians (2006: 171); indeed, it is the case that almost all of these models rely upon a single set of Linear B texts from Pylos, the Jn series, as a fundamental source of supporting evidence. However, the limitations of these texts do need to be acknowledged especially, given that they only deal with bronze-working, in terms of their lacunae and their wider applicability to all metals and the rest of the Greek mainland. In light of the importance of this specific Linear B series within this particular strand of previous scholarship, the following section discusses their limitations in greater detail.

THE LIMITATIONS OF THE JN SERIES

The preserved documents of the Jn series suggest a decentralized structure, with the bronzesmiths in question located away from the palace (Shelmerdine 2007: 43) and some form of intermediary in place (Killen 2001: 174). The work commissioned in these tablets was undertaken within the ta-ra-si-ja system (Killen 1987: 68; Gregersen 1997a: 47), which was a mechanism through which the palace issued small quantities of raw materials that were weighed and recorded upon release to ensure the return of an appropriate quantity of finished goods (Killen 1987: 68; 2001; Smith 1993: 179; Nakassis 2015: 583).[3] It may also refer to a consignment of work (Smith 1993: 179). Certain bronze-workers received tax exemptions and grants of land, in contrast to lower status workers who were provided with rations as payment in kind (Gregersen 1997b: 401–402), although some bronzesmiths did receive foodstuffs (Nakassis 2015: 599); bronzesmiths could also own slaves (Gregersen 1997a: 49; Nakassis 2008: 558). However, Killen argues that the large number of bronze-workers listed (approximately 400) cautions against the idea that they were all particularly elevated in status (2001: 173). Nakassis (2008: 557–558; 2015: 587) has suggested that at least some named individuals on the Jn tablets were members of the elite with multiple administrative supervisory functions and thus did not carry out the work themselves; overall he believes that the social status of bronzesmiths may have been quite diverse (Nakassis 2015: 592). Tablet Jn 832 indicates the existence of specialists, in this case finishers (Smith 1993: 179). Another specialist, the ka-si-ko-no (Gregersen 1997a: 47), who may have manufactured weapons, received payment in kind (Gregersen 1997b: 401). Some bronzesmiths were apparently associated with Potnia, an important religious deity, but the nature of this relationship is still not well understood (Killen 1987: 67; Gregersen 1997a: 46; Shelmerdine 2007: 44).

There are several important caveats and limitations that must be borne in mind. The given titles only reveal the relevance of these people to the palace; it is possible that they were not full-time specialists or they may have also worked for other clients beyond the palatial sphere (Gregersen 1997a: 43; Tournavitou 1997: 37). Indeed the entire organizational structure may be based on an anterior system (Gregersen 1997a: 48; Naskassis 2015; Palaima 2015: 621), since metalworking predated the arrival of the palaces by a considerable margin, and it has been argued that this indicates that bronzesmiths, as a group, retained some level of independence and power (Gillis 1997: 511, although this is partly based on a reinterpretation of ta-ra-si-ja as a tax that, as discussed above, is not widely accepted; see Nosch 2006:

3 Halstead (1981: 333) suggested that the allocated bronze was intended to repair tools, not produce finished objects. This would be required for iron tools because it is easier to patch than reforge them (Ehrenreich 1991: 78), but makes little sense in the context of cast bronze tools unless the metal was used to produce replacements. This practice would not fit the structure of ta-ra-si-ja, the basic operation of which is well understood from textile crafts as well (Killen 2001; Nosch 2006).

175). That the tablets show a fixed quantity was allocated to each geographical unit, regardless of the number of smiths (Uchitel 1990: 199), again indicates there are certain aspects to this system which we do not yet fully understand. Other tablets make it clear that there were additional mechanisms in place for distributing metal to palace-based workshops and apparently repairing metal objects (Smith 1993: 214). Furthermore, the information in the Jn series only applies to bronzeworking. Goldsmiths are also mentioned in the Pylian archive, but not within the Jn series (Tournavitou 1997: 37; Hruby 2013: 424). Thus the extent to which this system was relevant to other metals is simply not known and it may have been difficult to apply to the manufacture of composite objects, for which gold was commonly used.

As with all Linear B evidence, it is uncertain how applicable this information is to Prepalatial and non-palatial Mycenaean societies, or even to other contemporary palatial societies; although metals are mentioned on tablets from Knossos (Landenius Enegren 2000: 34–35), comparable information about the organization of metalworking is not. Killen (1987: 61) argues that similarities between the documents recovered from different palatial centers means it is safe to assume that information from one site is applicable to all the others. However, this type of approach creates a self-fulfilling prophecy; the current lack of overlap between sites cannot be presumed as solely due to an accident of preservation, although this surely does play some role. The Jn tablets were written just before the collapse of the palatial system at Pylos; thus it is not possible to be certain as to their typicality, but neither is it necessary to interpret their contents as symptomatic of an emergency (Palaima 1995). The small quantities of metal allocated to certain bronzesmiths, and the absence of an allocation for approximately one third of the bronze-workers listed, have been used to argue for a shortage, connected to problems that immediately preceded the fall of the palaces (such as Chadwick 1973: 510; Blackwell 2018a),[4] which would undermine its use as an example of the typical functioning of the bronze-working industry at a Mycenaean palace. It has also been argued, based on analogous texts from Ur concerning silversmiths, that the failure to allot metal to all the Pylian bronzesmiths listed on these tablets was due to seasonal fluctuations in their expected work schedule (Uchitel 1990: 202). Having an excess number of smiths 'on the books' would give greater flexibility to the palatial authorities (Nakassis 2015: 591). Smith (1993: 189–190) also notes that two tablets in the Jn series (Jn 601.7 and Jn 389.7) record metal that is leftover or yet to be allotted, which seems inconsistent with the notion of a shortage. The issuing of small quantities may have been a deliberate policy to facilitate logistics and discourage theft (Montecchi 2012: 189). Thus, it remains unclear whether the Jn series provides information concerning the normal functioning of the bronzesmithing industry at Pylos or an atypical situation.

4 Ta-ra-si-ja allocations appear to be annual but it is possible that the Jn series covered only a short administrative period (Nakassis 2015: 591).

The preservation of this textual material through accidental firing means that the Pylian palace may have also interacted with metalworking industries in a variety of other ways, and this evidence has now been lost.[5] The description of certain metal artifacts as "of Cretan manufacture" (Matthäus 1980: 114) implies that the import of finished metal goods also took place and demonstrates that there were multiple methods through which the Pylian palace obtained finished metal objects.[6] The fact that the majority of the Jn tablets do not specify what artifacts this metal was intended to be used for (Smith 1993: 181) is another clear sign that we are missing significant information. Only on Jn 829 is this made explicit, and this document does not belong to the ta-ra-si-ja system but is instead an order for metal from 16 centers/districts, which was intended to be made into spear and javelin points (Palaima 2004a: 290). No information is provided as to where the production of these weapons would take place nor who was involved. Given that this is the only example of its type, it is not certain if Jn 829 represents an unusual or typical process (Palaima 2004a: 292). Killen (1987: 63, 69–70) argues that tablet K(1) 875 from Knossos, a list of metal vessels, represents a later stage in the same ta-ra-si-ja system and thus that such lists would have also existed at Pylos although, given the lack of both forms of record at a single site, it is still not clear how (or indeed if) a Mycenaean palace ordered a specific form of object. Bronze-working is exceedingly complicated with very different techniques and forms of working that occupy distinct conceptual frameworks. It cannot be assumed that each of the listed smiths possessed the same skill-set and were all capable of producing every type of required object. The fact that all the artifacts listed on K(1) 875 were vessels may imply some type of specialization for each organizational unit. However, it has also been argued that the metal listed in the Jn series was specifically intended for weapon production (Montecchi 2012: 186). This is eminently plausible, as the scribes often presumed a certain level of knowledge on the part of the reader and did not provide exhaustive information (Palaima 2015: 620).

It is probable that the scribes who wrote these documents were administrative specialists, not craft specialists (Smith 1993: 176, Note 20), and were the primary consumers, as well as producers, of the information stored on these tablets (Palaima 2015: 619–620). This underlines the point that ultimately what most of these tablets provide is a snapshot (Smith 1993: 216) of a single mechanism through which metal was distributed to bronze-

5 Killen (2001: 173) notes that the specified total of bronze for the Jn series exceeds that obtained by adding up the individual records, which may indicate that the series is incomplete. This is disputed (Smith 1993: 172), although it is possible that this series was still a work in progress (Smith 1993: 194–197).

6 This reasoning is still applicable even if some of these Cretan artifacts were heirlooms (as argued by Palaima 2003); they may have reached the palace stores through gift exchange or taxation, as booty or they may have already been in the possession of one of the lineages that went on to form the palatial authorities.

smiths from the logistical point of view of the palatial accounting authorities. Returning to the use of this series as a fundamental source of evidence to support the existence of a state monopoly on the redistribution of metals, in reality we have little idea as to how important the ta-ra-si-ja allocations were to the bronzesmiths themselves, nor what proportion they represent of the total metal in circulation in Messenia. If the ta-ra-si-ja system is a form of corvée labour (Montecchi 2012) then, far from being grateful recipients of a diminishing resource that enabled them to continue working, the bronzesmiths may have seen these obligations as an unwanted distraction from their main work; hence the need for the palaces to supply rewards in the form of tax exemptions and land grants. Currently, it is not even possible to be certain that the ta-ra-si-ja process described in the Jn series was the primary way in which the Pylian palace interacted with the bronzeworking industries; it is simply the one for which we have the most evidence. Moreover, although further information about bronze and other metals can be gleaned from inventories (Chadwick 1973: 335–338; Palaima 2004b: 113), descriptions of rituals (Chadwick 1973: 284–287; Godart 2009; Weilhartner 2012: 222–223) and other types of texts (Killen 2007: 117) preserved in the Pylian archive, there is no mention of the production or disbursement of utilitarian metal tools (Palaima 2015: 629). It has simply been assumed that the palace must have played a role in the redistribution of such objects because of the existence of an entirely different mechanism through which the palatial authorities collected and allocated raw material.[7] Finally, as stated above, the applicability of the Jn series to other forms of metalworking is completely unknown and this has serious implications for the use of the Jn series as evidence for a model of palatial control over the redistribution of all metals. Even when palatial authorities may have exerted a significant degree of control over redistribution, such as for types of metalwork essential within Mycenaean political economies, it cannot be assumed that the specific system embodied by the Jn series was used.

ADVANTAGES OF A PRACTICE-ORIENTED APPROACH

It is perhaps understandable, given the problems inherent in studying the use of metals in past societies, that scholars have principally turned to other sources of evidence such as the Linear B records. As I have just demonstrated, although informative, too much interpretative weight has been placed upon them, particularly the Jn series, and instead of being accepted as a small window into the world of

7 In this respect I disagree with the argument recently put forward by Blackwell (2018a) which does exactly that, supported by what I believe is a problematic interpretation of Late Bronze Age Greek mainland hoards as representing 'palatial stock' within a redistribution system that seems to be mainly based on a single tablet, Jn 829, the typicality of which is deemed uncertain, as noted above.

bronze-working at Pylos, they have instead been used as the foundation for an entire palatial redistribution system for all metals. The model this has imposed, the assumptions it has begot and the constraints on interpretation that it has created have acted as a straitjacket on our investigation of the role of metals in Mycenaean societies. Disregarding the information these documents contain would, however, be counterproductive; it is essential that such evidence, with due concern for its limitations, is carefully integrated into a wider examination of material from the archaeological record.

As discussed above, the use of archaeological material to interpret the role of metal objects in a society is not a straightforward task. It can be difficult to judge whether a specific unexpected or problematic pattern in the archaeological record is solely an outcome of preservation bias, and is therefore unrelated to past realities. Moreover a naive reading, without due regard for such biases, can generate misleading interpretations. In such circumstances, a practice-orientated approach, as defined above, can prove much more fruitful.

This type of approach places social practice at the heart of analysis. Understanding the actual forms of interaction between people and metalwork at Mycenae enables us to piece together the role that metal played in the community and moves the debate from abstract assumptions to concrete examples. The evidence for a practice-orientated approach can be accrued by establishing the typical life cycle or biography of a given artifact (Kopytoff 1988); that is to say the full narrative of an object from its conception and production to its removal from the human and material world (recently re-termed by some scholars as itinerary) (Joyce and Gillespie 2015; Bauer 2019). Of course, this ideal is impossible to achieve for prehistoric objects. However it is still possible to investigate the social history of things (Appadurai 1988: 34), which can provide plentiful information regarding social norms and the expected relations between people and objects (Joy 2009) that would otherwise remain inaccessible [*Fig. 2*]. Once a standard expected biography has been recognized this can be compared to the range of actual object biographies, enabling the uncovering of narratives that deviated from the usual path, for example extension of use life through a repair. These "discrepancies" can highlight occasions when atypical values or social practices were put into action.

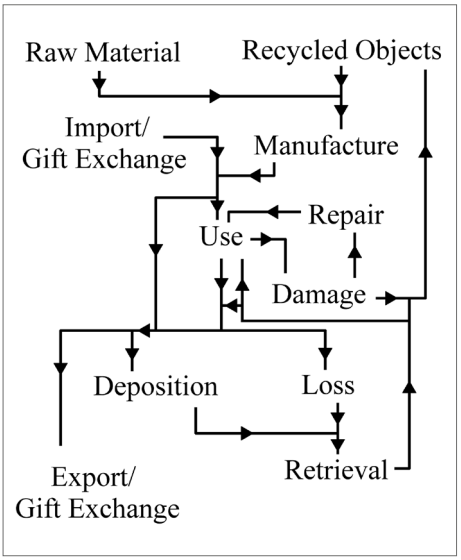

Fig. 2. Flow chart showing potential object biographies of metal artifacts in general (S.J. Aulsebrook)

The investigation of each stage of this object biography can reveal different types of information. Production can tell us about the expected functions, visibility and durability of an artifact. Repairs (Aulsebrook 2017) and usewear traces, which may range from minor scratches on the working edges of tools and weapons (Kristiansen 2002; Quilliec 2008; Molloy et al. 2016) to significant alterations that enabled a change in function (Aulsebrook 2017), allow us to compare the intended use of an object against its actual use, understand how an item was used and assess the decisions made once an artifact became worn or obsolete. How an object left the human world, for example as a grave offering, through accidental loss or deliberate discard, can also provide evidence concerning the values placed upon that particular artifact, including the curation of heirlooms

Metals open up new social practices because they can be used to manufacture objects that cannot be made in any other material. A good example of this is the sword, the impact of which has been explored in considerable detail (Peatfield 1999; Kristiansen 2002; Molloy 2008; 2010). Other examples include artifacts such as mirrors and tweezers, the social impact of which has generally received

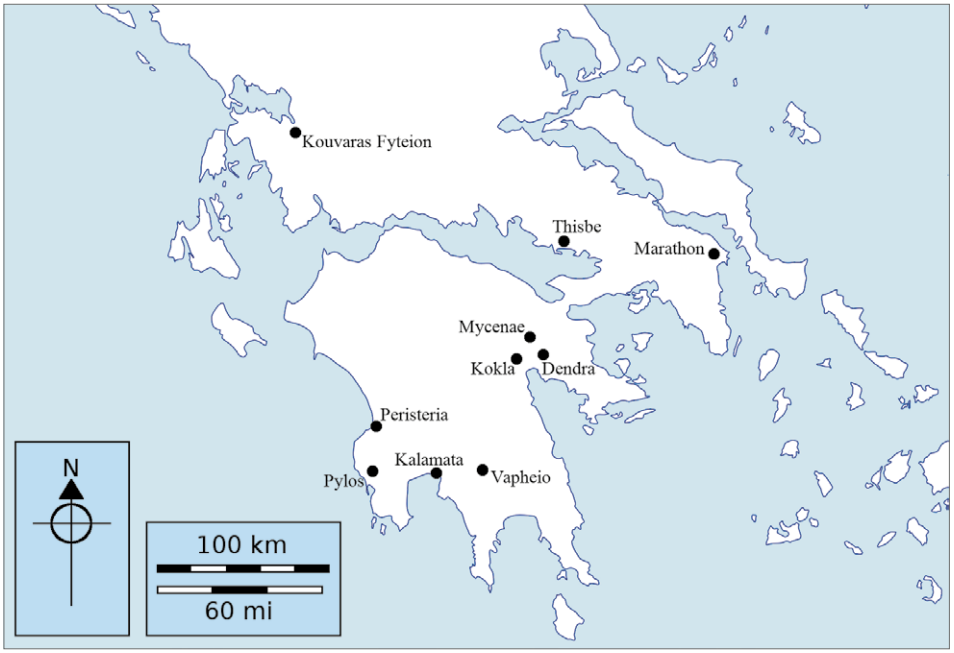

Fig. 3. Distribution map showing the Greek mainland locations from which Mycenaean-period gold vessels have been reported. The Thisbe vessel, a miniature gold box (Evans 1925: 2 Fig. 1c), was purportedly found with other objects that are regarded as forgeries (Betts 1981: 32), although Mycenaean remains are known from this area (Heurtley 1923–1925: 41). 39 of these vessels came from Mycenae and of those 33 came from just four contexts: Graves III, IV and V in Circle A (Karo 1930) and the Acropolis Treasure (Thomas 1938–1939). The gold vessels from Pylos come from the Griffin Warrior tomb, the publication of which will revise the total upwards.

less attention (but see Treherne 1995). Although recent research has begun to reverse this trend, branching out into different types of metal artifacts such as tools (Blackwell 2018b), it is the actual use phase of metal objects that has received the least scholarly consideration. Indeed, someone otherwise unfamiliar with the functioning of a Bronze Age society might be forgiven for thinking that the primary purpose of Mycenaean metalwork was its deposition as a form of wealth display in the mortuary sphere; this is an unfortunate reflection of the context within which most Mycenaean metalwork has been recovered and the conceptual framework within which most scholars have operated.

Conversely, although many different types of Mycenaean metal objects have been discovered, which demonstrates their use within a variety of spheres of human action, they form just a subset of the total range of material culture found at Late Bronze Age Mycenae. This may imply that metal artifacts were absent from many social practices. For example, the known corpus of ceramic vessel shapes (Furumark 1972; Mountjoy 1986; 1993) is significantly larger than the metal equivalent (Davis 1977; Matthäus 1980; Mossman 1993). The use or absence of metalwork within the context of a particular social practice has been generally presumed to relate to the accessibility of metal and the "wealth" status of the individuals involved. Other possibilities have not been investigated, presumably because it has been assumed, based perhaps on deep-rooted ideas within the archaeological literature concerning the technological superiority of metal artifacts (Fontijn 2002: 4), that metals would have been enthusiastically employed for any relevant purpose whenever possible. Consequently, processes of resistance and adaptation have been downplayed or neglected with little thought given as to why and how new forms of metalwork were adopted by the inhabitants of Mycenae during this period.

To demonstrate the possibilities of this practice-orientated approach, I would therefore like to present a case study where the consideration of social practice, in conjunction with evidence from the Linear B archives, can be used to help clarify and contextualize an unexpected pattern in the archaeological record of the Mycenaean Palatial period. This case study is not a product of the project discussed here but results from previous unpublished research related to my doctoral thesis. Although its scope extends beyond Mycenae, the decision to include this case study was taken due to its ability to act as a practical demonstration of the potential of the project.

THE RIDDLE OF THE MISSING GOLD VESSELS

Of the 55 or so gold vessels presently known from the Greek mainland [*Fig. 3*], only one, a shallow cup decorated with a marine scene from the tholos tomb at Dendra (ANM 7341, Persson 1931: 31–32, No. 3; Davis 1977: 276–280, No. 116, Figs 224–227) [*Fig. 4*], can be securely dated to the Palatial period (LH IIIA–B;

1420/1390–1200/1185 BC). The Palatial period is widely considered to be the florescence of Mycenaean culture across many different spheres (for a general overview, see Shelmerdine 2001; Mee 2008; Shelmerdine and Bennet 2008), and therefore this apparent lack of gold vessels seems rather puzzling. It cannot be explained as the result of an overall shift in mortuary depositional practices,[8] as approximately 25 silver vessels[9] have been recovered from secure Palatial period contexts (Aulsebrook 2012: 465–467, Table B4)[10] and gold continues to appear in other forms, such as jewelry, dress ornaments and wire, in the contemporary archaeological record, and beyond into the Post-Palatial period as well (Kayafa 1999: 248).

This finding of a single solitary Palatial period gold cup has been taken at face value by some scholars, especially those who wish to argue that the standard of crafting in the Aegean fell considerably as a result of the end of the Neopalatial period on Crete; it has been suggested that every precious metal vessel deposited after this point was an heirloom, with the knowledge of their production all but lost along with the LM IB Cretan palaces (Rehak 1995: 118; 1997). Yet, Linear B texts provide strong evidence to the contrary, and even appear to place gold vessels at the core of religious activities linked to the palaces. Tablet Tn 316, from the Pylian archive, reports the offering of gold and silver cups to deities from the palace, through the medium of a sanctuary (Shelmerdine 2001: 355; Godart 2009; Lupack 2011: 208; Weilhartner 2012). A second tablet from Knossos documents a similar arrangement, with gold vessels given to different deities as laid down in a set timetable (Chadwick 1973: 284, 287), thus demonstrating that such practices were not confined to Pylos alone.[11] The use of gold vessels in such a context

Fig. 4. Gold octopus cup from the Dendra tholos (photo and processing S.J. Aulsebrook)

8 All gold vessels found in securely dated contexts came from the mortuary sphere (at least 82% of the total).

9 Silver vessels are often recovered in a highly fragmented state; some fragments in the same context may have belonged to one or more vessels, hence the quantity presented here is approximate. The majority of these came from Dendra (11 examples) and Mycenae (8 examples). Please note that these figures do not include the Griffin Warrior Tomb, which is currently awaiting publication.

10 The total given in this table is incorrect and should read 22/25.

11 It is exceedingly unlikely that these objects were anything other than solid gold vessels; in other words they were not tinned ceramics that had been subjected to the "gilding" process described by Gillis (1991–1992: 28) or any other type of gilded vessel. Composite objects are listed in the Linear B archives and the description of their various materials is highly detailed and comprehensive (Shelmerdine 2012: 688).

underscores their significance in Mycenaean material culture within the palatial sphere, even though not a single gold vessel has been found within the Palace of Nestor itself.

How can this contradiction be resolved? Given the survival of Palatial-period silver vessels and other gold objects, it is not enough to point to general issues with the entry of metals into the archaeological record. The possibility that this absence of gold vessels from the remainder of the mortuary sphere is to be attributed to purely economic concerns can, I think, be safely discounted. The weight of the gold vessels from the shaft graves varies enormously, from 9.95 g to 1004 g, but the difference between the median (98.725 g) and the mean (189.43 g) weights indicates that these graves contained many lighter gold vessels weighing less than 100 g with a few exceptional heavier examples (Karo 1930: 166–168). This does not compare too unfavorably with the quantity of gold found in rich Palatial period mortuary contexts such as Chamber Tomb 515 at Mycenae; only small items, like rosettes and other foil ornaments, were present but in great number (207 in total) (Wace 1932: 52–63). Although these have not been weighed, an estimate can be obtained using as a basis a form of circular foil from the shaft graves (ANM 315, Karo 1930: 167), which was about half the diameter of the most common example in Tomb 515. This would suggest that the approximate total gold in Tomb 515 was just over 100 g;[12] in comparison, the lightest cup in the shaft graves (ANM 220) weighed 26.55 g (Karo 1930: 167). Thus the absence of gold cups cannot be linked to a general inability to access gold.

The gold vessel heirloom theory is also implausible. Not only does this hypothesis fail to address why, given the extensive trading networks within which Mycenaean Greece was embedded at this time (Mee 2008), alternative sources of gold vessels in the East Mediterranean were not sought, it is also contradicted by evidence from the precious metal vessel corpus. Clear evolution in techniques over time can be distinguished in the manufacture of silver vessels including into the Palatial period (Aulsebrook 2012: 253–258) which, due to the similar working properties of the two metals, would have been applicable to gold vessels as well (as seen in Davis 1977), and temporal change in form is also visible (Aulsebrook 2018).

It has been argued that the failure to find a precious metal artifact in the archaeological record was not because it was non-existent, but because of the way in which it was retained in circulation and mobilized when necessary (Sherratt and Sherratt 1991: 360; Michailidou 2001: 85–86). Although I broadly agree with this tenet, I suggest that in this specific set of circumstances, the apparent absence of the gold cups could be best explained through a combination of sumptuary practices and changes to the elite mortuary landscape. At Mycenae, the use of the grave circles ended in LH II, when a building sequence of large tholos tombs

12 The size of the most common Tomb 515 circular foil in terms of area was four times larger than that of ANM 315, which weighed 0.15 g.

was put in motion that continued into LH III (Wace 1921–1923: 393–396; Wace 1949: 16; Galanakis 2014). Similar large grand tholoi, ranging in date from LH II–III, appear at a number of sites including Analipsis, Dendra, Galatas, Kokla, Malthi, Marathon, Menidi, Nichoria, Orchomenos, Pylos,[13] Routsi, Thorikos and Tiryns (Voutsaki 1995: 59; Cavanagh and Mee 1998: 56, 77–78; Cavanagh 2008: 334–335; Galanakis 2014: 243).

The effort required to construct these edifices was significant and clearly associates them with the uppermost echelons of Mycenaean societies; the construction of the Treasury of Atreus at Mycenae required the demolition of existing buildings, the removal of thousands of tons of rubble and rock, and the quarrying, transportation and raising of large stone blocks (Cavanagh 2008: 337). The sociopolitical significance of tholoi has been discussed by several scholars. Their construction seems to have been used as a form of political influence, for instance at Nichoria (Bennet 1995: 599; Cavanagh and Mee 1998: 78), and it has been posited, based on strong similarities to the Treasury of Atreus, that the Treasury of Minyas at Orchomenos was an elite gift (Cavanagh and Mee 1999: 101). In the Argolid, the number of tholoi in use decreases during LH IIIA until by LH IIIB they are only in use at palatial centers; this has been interpreted as a strategy of centralization (Voutsaki 1995: 59). It is unlikely that they were restricted to royalty alone (Cavanagh and Mee 1998: 56; Shelmerdine 2001: 352), but were probably associated with the leading lineages at each of the most prominent settlements (Wright 2008: 246).

Unfortunately, despite the precautions taken by those who sealed them, the majority of these tombs were looted. Their high visibility made their mortuary assemblages far more vulnerable. The looting of large tholoi across the mainland over many centuries may have effectively creamed off the very highest-status Mycenaean material culture (Reeves 2003: 190–191), of which, as suggested by the Linear B evidence, gold vessels appeared to have been a part. This is supported by the fact that the only Palatial period gold vessel found thus far came from a large grand tholos. However, this cannot be the entire story. Plenty of Palatial period prestige goods have been recovered from the archaeological record, including silver vessels. That these were in use at the very highest levels of society is demonstrated by the appearance of a broken inlaid silver vessel just outside the main megaron of the palace at Pylos (Blegen and Rawson 1966: 57–58; Davis 1977: 308–310, No. 136, Fig. 251). A very similar example was discovered in Chamber Tomb 24 at Mycenae (Davis 1977: 297–300, No. 130; Xenaki-Sakellariou 1985: 84, No. A 2489, Pl. 15). This, I believe, highlights the main difference between the treatment of gold and silver vessels; the capability and right to deposit silver vessels in the mortuary sphere extended beyond the ruling elite, despite their use by the latter. The same also applied to other gold objects but not, apparently, gold vessels.

13 But see Murphy et al. 2020, which re-dates the construction of one of the most developed tholos tombs at Pylos, Tholos IV, to MH III.

As discussed above, purely economic concerns are unlikely to have been the cause. The fact that between LH II–IIIB only one gold vessel is known to have been deposited in a chamber tomb across the entire Greek mainland[14] strengthens the likelihood that gold vessels were actively prevented from entering the mortuary sphere outside of the large grand tholoi. Whether gold vessels were also withheld from the use of the living community beyond those entitled to be buried in a large tholos is impossible to say. Their existence outside of this innermost sphere of elite material culture may well have been so rare that their loss to the mortuary sphere could have been unthinkable, especially if their acquisition governed access to special arenas of social importance, such as feasting activities. However, sumptuary laws that encompassed the realms of both the living and the dead would probably have been the easiest way to guarantee this distinction for gold vessels. This may have been reinforced through direct control over the producers of gold vessels and also perhaps silver vessels, with the latter allowed to circulate beyond the very highest echelons of society as gifts and rewards for services rendered.

The likely association of gold vessels with large tholoi is highly significant when attempting to piece together how metal vessels fitted into the political landscape of the Mycenaean mainland. If a concerted effort was sustained to keep gold vessels within a small clique of individuals, it suggests that they had an important symbolic link to leadership. Gold seems to have been the most highly valued metal used for vessels (Aulsebrook 2012: 137–139) and its indestructibility and immutability have been suggested to convey notions of immortality (Whittaker 2008: 94), an idea that may have been used to stress the continuity and legitimacy of Mycenaean leaders. However, it is not necessarily the case that all the large grand tholoi contained gold vessels. The appearance of gold vessels in the LH I mortuary sphere at locations such as Peristeria, which did not become a palatial center, implies that those individuals who deposited them envisaged retaining future access to gold vessels. Yet the almost complete absence of gold vessels from rich chamber tombs during LH II indicates that restrictions on the ability to deposit them were in place before geographical restrictions on the use of large grand tholoi were imposed. The limitations on gold vessel deposition in chamber tombs during LH II may have been enforced locally by those individuals who were being buried in tholoi. If so, it is probable that, as the distribution of the large grand tholoi in use contracted over time, so also did the distribution of individuals who were entitled to deposit gold vessels in the mortuary sphere. This interpretation of the available evidence would suggest that gold vessels were probably deposited in all the large grand tholoi constructed and used by local elites who had more autonomy; in the cases

14 In Chamber Tomb 10 at Dendra (Persson 1942: 74–75, No. 19; Davis 1977: 267–269, No. 110, Figs 214–216), and this probably occurred before the large tholos there was constructed in LH IIIA (Wright 2008: 246).

of Nichoria and Orchomenos, for example, where, as discussed above, the involvement of other polities in the construction of their tholoi has been hypothesized, it cannot be assumed that the right to be buried with gold vessels was also granted alongside the right to be buried in a large grand tholos. Such patterns indicate that the increasingly centralizing palatial authorities were able to impose their sumptuary rules on other settlements within their area of influence, although exactly how this was achieved requires further investigation.

Therefore, the appearance of only a single gold vessel in the Palatial-period archaeological record is not evidence that these objects simply no longer existed, but is connected to their specific role in Mycenaean societies and limits placed on the type of social practices in which they could be used. By treating gold vessel mortuary deposition as a form of social practice, regulated by a set of culturally specific rules, it has been possible to form an alternative hypothesis that better fits the available evidence. Separating out different forms of mortuary deposition, in this case by tomb, metal and object type, and considering each of these as distinct but related social practices has revealed a small part of the complexity embedded in this sphere of human action. That this has been achieved despite the focus of the case study upon only one part of these objects' biographies indicates the richness of interpretation that is potentially accessible when more aspects of an object's biography are analyzed.

DISCUSSION: METAL DEPOSITION AS SOCIAL PRACTICE

This case study has provided a demonstration of how an approach based on social practice can provide a more plausible interpretation for an unexpected pattern in the archaeological record, working within the limitations of the latter and using additional sources of evidence, in this instance textual, when possible. This method is valuable for the analysis of all patterning of evidence concerning past societies, because it ensures that human action is at the forefront of interpretation. It is this type of study that the wider project on metalwork at Mycenae has been designed to achieve, by maximizing the range of social practices and potential actors that can be investigated, through its holistic approach.

One further danger that is evident in some similarly wide-ranging analyses of metal use is a tacit assumption that the deliberate deposition of metal objects provides an index of the total metal circulation in a society (Taylor 1999: 25). In fact, deliberate metal deposition is primarily rooted in culturally determined ideas concerning correct social practice, as firmly demonstrated by the above case study. Durability is one factor that can make the issue of deliberate deposition of metals much more complex than for other materials. Metal tools, for example, may be gifted from generation to generation rather than being buried with a deceased craftsperson, regardless of their "wealth" status, because they retain their usefulness. The categorization of metals

as inter-generational may also influence decisions made about their deliberate deposition, as it could be expected that older members of a family effectively hold them in trust for future descendants.

To avoid this issue and overcome other problems commonly found in the interpretation of metal use in past societies, the project will employ the use of six general, fluid, analytical categories when considering metal deposition. These consider ownership status, social and/or economic restrictions on metal depositional practices and the opportunity for interaction between people and metalwork; they are summarized as follows:

1) Possessors of metalwork that have the capacity, right and/or desire to deliberately deposit all metal objects and may, through their interaction with metals, also accidentally deposit them;

2) Possessors of metalwork that have the capacity, right and/or desire to deliberately deposit certain types of metal objects and may, through their interaction with metals, also accidentally deposit them;

3) Possessors of metalwork that do not have the capacity, right and/or desire to deliberately deposit metal objects yet may, through their interaction with metals, accidentally deposit them;

4) Non-possessors of metalwork that nevertheless have frequent contact with metal objects during their day-to-day lives and may, through their interaction with metals, accidentally deposit them;

5) Non-possessors of metalwork that have little or no contact with metal objects except in exceptional circumstances;

6) Possessors or non-possessors of metalwork that contravene accepted social norms regarding the capacity, right and/or desire to deliberately deposit metal objects as well as those who gain unauthorized access to metalwork and may, through their interaction with metals, accidentally deposit them.

These categories are not intended to neatly map onto the social structure of the community at Mycenae, but instead provide a tool to think through how different agents may have interacted with metal objects and the impact this has on social practices and the preservation of metalwork in the archaeological record. For example, sumptuary laws, such as those discussed in the case study, could differentiate between the visibility of Group 1 and Group 2 in the archaeological record, even though in terms of their "wealth" there was in fact no difference between them. This scheme covers all the possibilities through which metal could enter the archaeological record. A destruction horizon, for instance, could be associated with any group except Group 5; a mortuary gift would be associated with Group 1 or 2. Group 6 is most likely to be linked with atypical object biographies. Identifying the involvement of each group with the various social practices that will be uncovered as part of this project will form the first step towards contextualizing the relationships between people and metals at Mycenae.

Although the "Forging society at Late Bronze Age Mycenae" project is still in its early stages, this paper has demonstrated the need for such a study, the strengths and potential of its approach and highlighted some of the precautions being taken to avoid the pitfalls encountered by previous scholars.

Dr. Stephanie Jane Aulsebrook
https://orcid.org/0000-0002-0534-270X
University of Warsaw, Faculty of Archaeology
s.aulsebrook@gmx.com

How to cite this article: Aulsebrook, S.J. (2020). Understanding the role of metal within the Late Bronze Age community at Mycenae: challenges and potential approaches. *Polish Archaeology in the Mediterranean* 29/2) (pp. 237–264). https://doi.org/10.31338/uw.2083-537X.pam29.2.10

References

Appadurai, A. (1988). Introduction: Commodities and the politics of value. In A. Appadurai (ed.), *The social life of things: Commodities in cultural perspective* (pp. 3–63). Cambridge: Cambridge University Press

Aulsebrook, S.J. (2012). *Political strategies and metal vessels in Mycenaean societies: Deconstructing prestige objects through an analysis of value* (unpubl. Ph.D. diss.). University of Cambridge

Aulsebrook, S.J. (2017). Repair, recycle or modify? The response to damage and/or obsolescence in Mycenaean metal vessels and its implications for understanding metal recycling. *Studi Micenei ed Egeo-Anatolici*, 3, 7–26

Aulsebrook, S.J. (2018). Rethinking standardization: The social meanings of Mycenaean metal cups. *Oxford Journal of Archaeology*, 37(2), 147–163

Avila, R.A.J. (1983). *Bronzene Lanzen- und Pfeilspitzen der griechischen Spätbronzezeit* (=*Prähistorische Bronzefunde* 5.1). Munich: Beck

Bauer, A.A. (2019). Itinerant objects. *Annual Review of Anthropology*, 48, 335–352

Becker, N. (2015). Attribution studies of golden signet rings: New efforts in tracing Aegean goldsmiths and their workshops. *Aegean Archaeology*, 11, 73–88

Bendall, L. (2004). Fit for a king? Hierarchy, exclusion, aspiration and desire in the social structure of Mycenaean banqueting. In P. Halstead and J.C. Barrett (eds), *Food, cuisine and society in prehistoric Greece* (=*Sheffield Studies in Aegean Archaeology* 5) (pp. 105–135). Sheffield: Sheffield Academic Press

Bennet, J. (1995). Space through time: Diachronic perspectives on the spatial organization of the Pylian state. In R. Laffineur and W.-D. Niemeier (eds), *Politeia: Society and state in the Aegean Bronze Age. Proceedings of the 5th International Aegean Conference / 5e Rencontre égéenne internationale, University of Heidelberg, Archäologisches Institut, 10–13 April 1994* (=*Aegaeum* 12) (pp. 587–602). Liège–Austin, TX: Université de Liège, Histoire de l'art et archéologie de la Grèce antique; University of Texas at Austin, Program in Aegean Scripts and Prehistory

Betts, J.H. (1981). Some early forgeries: The Sangiorgi group. In W.-D. Niemeier (ed.), *Studien zur minoischen und helladischen Glyptik*. (=*CMS Beiheft* 1) (pp. 17–36). Berlin: Gebr. Mann Verlag

Blackwell, N.G. (2011). Middle and Late Bronze Age metal tools from the Aegean, Eastern Mediterranean, and Anatolia: Implications for cultural/regional interaction and craftsmanship (unpubl. Ph.D diss.). Bryn Mawr College

Blackwell, N.G. (2014). Making the Lion Gate relief at Mycenae: Tool marks and foreign influence. *AJA*, 118, 451–488

Blackwell, N.G. (2018a). Contextualizing Mycenaean hoards: Metal control on the Greek mainland at the end of the Bronze Age. *AJA*, 122(4), 509–539

Blackwell, N.G. (2018b). Experimental stone-cutting with the Mycenaean pendulum saw. *Antiquity*, 92(361), 217–232

Blegen, C.W. and Rawson, M. (1966). *The Palace of Nestor at Pylos in western Messenia I. The buildings and their contents*. Princeton, NJ: Princeton University Press

Boyd, M.J. (2015). Destruction and other material acts of transformation in Mycenaean funerary practice. In K. Harrell and J. Driessen (eds), *Thravsma: Contextualising the intentional destruction of objects in the Bronze Age Aegean and Cyprus* (=*Aegis* 9) (pp. 155–165). Louvain-la-Neuve: Presses Universitaires de Louvain

Cavanagh, W. (2008). Burial customs and religion: Death and the Mycenaeans. In C.W. Shelmerdine (ed.), *The Cambridge companion to the Aegean Bronze Age* (pp. 327–341). Cambridge: Cambridge University Press

Cavanagh, W. and Mee, C. (1998). *A private place: Death in prehistoric Greece* (=*Studies in Mediterranean Archaeology* 125). Jonsered: Paul Åströms Förlag

Cavanagh, W. and Mee, C. (1999). Building the Treasury of Atreus. In P.P. Betancourt, V. Karageorghis, R. Laffineur, and W.-D. Niemeier (eds), *Meletemata: Studies in Aegean archaeology presented to Malcolm H. Wiener as he enters his 65th year* (=*Aegaeum* 20) (pp. 93–102). Liège–Austin, TX: Université de Liège, Histoire de l'art et archéologie de la Grèce antique; University of Texas at Austin, Program in Aegean Scripts and Prehistory

Chadwick, J. (1973). *Documents in Mycenaean Greek* (2nd ed.). Cambridge: Cambridge University Press

Clarke, C.F. (2013). *The manufacture of Minoan metal vessels: Theory and practice*. Uppsala: Åströms Förlag

Davis, E.N. (1974). The Vapheio cups: One Minoan and one Mycenaean? *The Art Bulletin*, 56(4), 472–487

Davis, E.N. (1977). *The Vapheio cups and Aegean gold and silver ware*. New York: Garland

Davis, E.N. (1983). The gold of the Shaft Graves: The Transylvanian connection. In P.P. Betancourt (ed.), *Gold in the Aegean Bronze Age* (=*TUAS* 8) (pp. 32–38). Philadelphia: Department of Art History, Temple University

Demakopoulou, K., Mangou, E., Jones, R.E., and Photos-Jones, E. (1995). Mycenaean black inlaid metalware in the National Archaeological Museum, Athens: A technical examination. *Annual of the British School at Athens*, 90, 137–153

Ehrenreich, R.M. (1991). Metalworking in Iron Age Britain: Hierarchy or heterarchy? In R.M. Ehrenreich (ed.), *Metals in society: Theory beyond analysis* (pp. 69–80). Philadelphia: MASCA, The University Museum of Archaeology and Anthropology

Evans, A.J. (1925). 'The Ring of Nestor': A glimpse into the Minoan after-world and a sepulchral treasure of gold signet-rings and bead-seals from Thisbê, Boeotia. *JHS* 45, 1–75

Fontijn, D.R. (2002). *Sacrificial landscapes: Cultural biographies of persons, objects and "natural" places in the Bronze Age of the southern Netherlands, c. 2300–600 BC* (=*Analecta praehistorica Leidensia* 33/34). Leiden: University of Leiden

Furumark, A. (1972). *Mycenaean pottery* I. *Analysis and classification*. Stockholm: Svenska Institutet i Athen

Galanakis, Y. (2014). Arthur Evans and the quest for the "origin of Mycenaean culture. In Y. Galanakis, T. Wilkinson and J. Bennet (eds), **ΑΘΥΡΜΑΤΑ**. *Critical essays on the archaeology of the Eastern Mediterranean in honour of E. Susan Sherratt* (pp. 85–98). Oxford: Archaeopress

Gale, N.H. (2011). Copper oxhide ingots and lead isotope provenancing. In P.P. Betancourt and S.C. Ferrence (eds), *Metallurgy: Understanding how, learning why. Studies in honor of James D. Muhly* (pp. 213–220). Philadelphia: INSTAP Academic Press

Gillis, C. (1991–1992). All that glitters is not gold. *Medelhavsmuseet. Bulletin*, 26–27, 24–32

Gillis, C. (1997). The smith in the Late Bronze Age—state employee, independent artisan, or both? In R. Laffineur and P.P. Betancourt (eds), *Techne: Craftsmen, craftswomen and craftsmanship in the Aegean Bronze Age. Proceedings of the 6th International Aegean Conference, Philadelphia, Temple University, 18–21 April 1996* (=*Aegaeum* 16) (pp. 505–513). Liège–Austin, TX: Université de Liège, Histoire de l'art et archéologie de la Grèce antique; University of Texas at Austin, Program in Aegean Scripts and Prehistory

Gillis, C. (1999). The significance of color for metals in the Aegean Bronze Age. In P.P. Betancourt, V. Karageorghis, R. Laffineur, and W.-D. Niemeier (eds), *Meletemata: Studies in Aegean archaeology presented to Malcolm H. Wiener as he enters his 65th year* (=*Aegaeum* 20) (pp. 289–298). Liège–Austin, TX: Université de Liège, Histoire de l'art et archéologie de la Grèce antique; University of Texas at Austin, Program in Aegean Scripts and Prehistory

Godart, L. (2009). I due scribi della tavoletta Tn 316. *Pasiphae. Rivista di filologia e antichità egee*, 3, 99–115

Graziadio, G. (1991). The process of social stratification at Mycenae in the Shaft Grave period: A comparative examination of the evidence. *AJA*, 95(3), 403–440

Gregersen, M.-L.B. (1997a). Craftsmen in the Linear B archives. In C. Gillis, C. Risberg, and B. Sjöberg (eds), *Trade and production in premonetary Greece: Production and the craftsman. Proceedings of the 4th and 5th International Workshops, Athens 1994 and 1995* (pp. 43–55). Jonsered: Åström

Gregersen, M.-L.B. (1997b). Pylian craftsmen: Payment in kind/rations or land? In R. Laffineur and P.P. Betancourt (eds), *Techne: Craftsmen, craftswomen and craftsmanship in the Aegean Bronze Age. Proceedings of the 6th International Aegean Conference, Philadelphia, Temple University, 18–21 April 1996* (=*Aegaeum* 16) (pp. 397–405). Liège–Austin, TX: Université de Liège, Histoire de l'art et archéologie de la Grèce antique; University of Texas at Austin, Program in Aegean Scripts and Prehistory

Halstead, P. (1981). Counting sheep in Neolithic and Bronze Age Greece. In I. Hodder, G.L. Isaac, and N. Hammond (eds), *Pattern of the past: Studies in honour of David Clarke* (pp. 307–339). Cambridge: Cambridge University Press

Halstead, P. (1992). The Mycenaean palatial economy: Making the most of the gaps in the evidence. *Proceedings of the Cambridge Philological Society*, 38, 57–86

Heurtley, W.A. (1923–1925). Notes on the harbours of S. Boeotia, and sea-trade between Boeotia and Corinth in prehistoric times. *BSA*, 26, 38–45

Hruby, J. (2013). The Palace of Nestor, craft production, and mechanisms for the transfer of goods. *AJA*, 117(3), 423–427

Hruby, J. (2017). Finding haute cuisine: Identifying shifts in food styles from cooking vessels. In J. Hruby and D. Trusty (eds), F*rom cooking vessels to cultural practices in the Late Bronze Age Aegean* (pp. 15–26). Oxford–Philadelphia: Oxbow Books

Hurcombe, L. (2007). A sense of materials and sensory perception in concepts of materiality. *World Archaeology*, 39(4), 532–545

Iakovides, S. (1982). The Mycenaean bronze industry. In J.D. Muhly, R. Maddin, and V. Karageorghis (eds), *Early metallurgy in Cyprus, 4000–500 B.C.* (pp. 213–229). Nicosia: Pierides Foundation

Joy, J. (2009). Reinvigorating object biography: Reproducing the drama of object lives. *World Archaeology*, 41(4), 540–556

Joyce, R.A. and Gillespie, S.D. (2015). Making things out of objects that move. In R.A. Joyce and S.D. Gillespie (eds), *Things in motion: Object itineraries in anthropological practice* (pp. 3–19). Santa Fe: School for Advanced Research Press

Karo, G.H. (1930). *Die Schachtgräber von Mykenai*. Munich: Verlag F. Bruckmann

Kayafa, M. (1999). *Bronze Age metallurgy in the Peloponnese, Greece*. (unpubl. Ph.D. diss.). University of Birmingham

Kelder, J.M. (2016). Mycenae, rich in silver. In K. Kleber and R. Pirngruber (eds), *Silver, money and credit: A tribute to Robartus J. van der Spek on the occasion of his 65th birthday* (=*Uitgaven van het Nederlands Instituut voor het Nabije Oosten te Leiden* 128) (pp. 307–317). Leiden: Nederlands Instituut voor het Nabije Oosten

Kilian-Dirlmeier, I. (1988). Jewellery in Mycenaean and Minoan "warrior graves." In E.B. French and K.A. Wardle (eds), *Problems in Greek prehistory: Papers presented at the centenary conference of the British School of Archaeology at Athens, Manchester April 1986* (pp. 161–171). Bristol: Bristol Classical Press

Kilian-Dirlmeier, I. (1993). *Die Schwerter in Griechenland (ausserhalb der Peloponnes), Bulgarien und Albanien*. Stuttgart: F. Steiner

Kilian-Dirlmeier, I. (2009). Burials with tools: Evidence for Aegean craftspeople? In D. Daniēlidou (ed.), *Dōron: timētikos tomos gia ton kathēgētē Spyro Iakōbidē* (pp. 383–390). Athens: Akadēmia Athēnōn, Kentron Ereunēs tēs Archaiotētos

Killen, J.T. (1987). Bronzeworking at Knossos and Pylos. *Hermathena*, 143, 61–72

Killen, J.T. (2001). Some thoughts on ta-ra-si-ja. In S. Voutsaki and J.T. Killen (eds), *Economy and politics in the Mycenaean palace states: Proceedings of a conference held on 1–3 July 1999 in the Faculty of Classics, Cambridge* (=*Cambridge Philological Society Supplementary Volume* 27) (pp. 161–180). Cambridge: Cambridge Philological Society

Killen, J.T. (2007) Critique: A view from the tablets. In M.L. Galaty and W.A. Parkinson (eds). *Rethinking Mycenaean palaces* II (=*Cotsen Institute of Archaeology at UCLA Monograph* 60) (rev. and exp. 2nd ed., pp. 114–117). Los Angeles: Cotsen Institute of Archaeology, University of California

Kopytoff, I. (1988). The cultural biography of things: Commoditisation as process. In A. Appadurai (ed.), *The social life of things: Commodities in cultural perspective* (pp. 64–91). Cambridge: Cambridge University Press

Kristiansen, K. (2002). The tale of the sword — swords and swordfighters in Bronze Age Europe. *Oxford Journal of Archaeology*, 21(4), 319–332

Landenius Enegren, H. (2000). Craft production at Knossos: Raw materials and finished goods. The Linear B evidence. In C. Gillis, C. Risberg, and B. Sjöberg (eds), *Trade and production in premonetary Greece: Acquisition and distribution of raw materials and finished products. Proceedings of the 6th International Workshop, Athens, 1996* (pp. 29–42). Jonsered: Paul Åströms

Lupack, S. (2011). A view from outside the palace: The sanctuary and the damos in Mycenaean economy and society. *AJA*, 115(2), 207–217

Manning, S.W. (2010). Chronology and terminology. In E.H. Cline (ed.), *The Oxford handbook of the Bronze Age Aegean (ca. 3000–1000 BC)* (pp. 11–28). Oxford: Oxford University Press

Marinatos, S. (1954). Der "Nestorbechers" aus dem IV. Schachtgrab von Mykene. In R. Lullies and W. Schadewaldt (eds), *Neue Beiträge zur klassischen Altertumswissenschaft. Festschrift zum 60. Geburtstag von Bernhard Schweitzer* (pp. 11–18). Stuttgart: W. Kohlhammer

Matthäus, H. (1980). *Die Bronzegefässe der kretisch-mykenischen Kultur*. Munich: C.H. Beck

Mee, C. (2008). Mycenaean Greece, the Aegean and beyond. In C.W. Shelmerdine (ed.), *The Cambridge companion to the Aegean Bronze Age* (pp. 362–386). Cambridge: Cambridge University Press

Michailidou, A. (2001). Recording quantities of metal in Bronze Age societies in the Aegean and the Near East. In A. Michailidou (ed.), *Manufacture and measurement: Counting, measuring and recording craft items in early Aegean societies* (pp. 85–111). Athens: Research Centre for Greek and Roman Antiquity

Molloy, B. (2008). Martial arts and materiality: A combat archaeology perspective on Aegean swords of the fifteenth and fourteenth centuries BC. *World Archaeology*, 40(1), 116–134

Molloy, B. (2010). Swords and swordsmanship in the Aegean Bronze Age. *AJA*, 114(3), 403–428

Molloy, B., Wiśniewski, M., Lynam, F., O'Neill, B., O'Sullivan, A., and Peatfield, A. (2016). Tracing edges: A consideration of the applications of 3D modelling for metalwork wear analysis on Bronze Age bladed artefacts. *Journal of Archaeological Science*, 76, 79–87

Montecchi, B. (2012). Wool-spinning, bronze-working and the peculiarities of Mycenaean ta-ra-si-ja. *Pasiphae. Rivista di filologia e antichità egee*, 6, 185–194

Mossman, S.T.I. (1993). *Mycenaean lead: Archaeology and technology* (unpubl. Ph.D. diss.). University of Birmingham

Mountjoy, P.A. (1986). *Mycenaean decorated pottery: A guide to identification* (=*Studies in Mediterranean Archaeology* 73). Göteborg: P. Åström

Mountjoy, P.A. (1993). *Mycenaean pottery: An introduction*. Oxford: Oxford University Committee for Archaeology

Murphy, J.M.A., Stocker, R., Davis, J.L. and Schepartz, A. (2020). Late Bronze Age tombs at the Palace of Nestor, Pylos. In J.M.A. Murphy (ed.), *Death in Late Bronze Age Greece: Variations on a theme* (pp. 26–44). Oxford: Oxford University Press

Nakassis, D. (2008). Named individuals and the Mycenaean state at Pylos. In A. Sacconi, M. del Freo, L. Godart and M. Negri (eds), *Colloquium Romanum*, *Atti del XII colloquio internazionale di Micenologia, Roma, 20–25 febbraio 2006* (pp. 549–561). Rome: Fabrizio Serra.

Nakassis, D. (2015). Labor and individuals in Late Bronze Age Pylos. In P. Steinkeller and M. Hudson (eds), *Labor in the Ancient World* (pp. 583–615). Dresden: ISLET-Verlag

Nosch, M.-L.B. (2006). More thoughts on the Mycenaean *ta-ra-si-ja* system. In M. Perna (ed.), *Fiscality in Mycenaean and Near Eastern archives: Proceedings of the conference held at Soprintendenza Archivistica per la Campania, Naples, 21–23 October 2004* (pp. 161–182). Paris: De Boccard

Palaima, T.G. (1995). The last days of the Pylos polity. In R. Laffineur and W.-D. Niemeier (eds), *Politeia: Society and state in the Aegean Bronze Age. Proceedings of the 5th International Aegean Conference / 5e Rencontre égéenne internationale, University of Heidelberg, Archäologisches Institut, 10–13 April 1994* (=*Aegaeum* 12) (pp. 623–633). Liège–Austin, TX: Université de Liège, Histoire de l'art et archéologie de la Grèce antique; University of Texas, Program in Aegean Scripts and Prehistory

Palaima, T. G. (2003). The inscribed bronze "Kessel" from Shaft Grave IV and Cretan heirlooms of the Bronze artist named "Aigeus" vel sim in the Mycenaean Palatial period. In Y. Duhoux (ed.), *Briciaka: A tribute to W.C. Brice* (pp. 187–201). Amsterdam: Hakkert

Palaima, T.G. (2004a). Mycenaean accounting methods and systems and their place within Mycenaean palatial civilization. In M. Hudson and C. Wunsch (eds), *Creating economic order: Record-keeping, standardization, and the development of accounting in the ancient Near East* (pp. 269–301). Bethesda, MD: CDL Press

Palaima, T.G. (2004b). Sacrificial feasting in the Linear B documents. In J.C. Wright (ed.), *The Mycenaean Feast* (=*Hesperia* 73.2) (pp. 97–126). Princeton, NJ: The American School of Classical Studies at Athens

Palaima, T.G. (2015). The Mycenaean mobilization of labor in agriculture and building projects: Institutions, individuals, compensation and status in the Linear B tablets. In P. Steinkeller and M. Hudson (eds), *Labor in the ancient world* (pp. 617–648). Dresden: ISLET-Verlag

Papadopoulos, T.J. (1998). *The Late Bronze Age daggers of the Aegean* I. *The Greek mainland*. Stuttgart: F. Steiner

Parkinson, W.A. and Galaty, M.L. (2007). Secondary states in perspective: An integrated approach to state formation in the prehistoric Aegean. *American Anthropologist*, 109(1), 113–129

Parkinson, W.A., Nakassis, D., and Galaty, M.L. (2013). Crafts, specialists, and markets in Mycenaean Greece: Introduction. *AJA*, 117(3), 413–422

Peatfield, A. (1999). The paradox of violence: Weaponry and martial art in Minoan Crete. In R. Laffineur (ed.), *Polemos: Le contexte guerrier en Égée à l'âge du bronze. Actes de la 7e Rencontre égéenne internationale, Université de Liège, 14–17 avril 1998* (=*Aegaeum* 19) (pp. 67–74). Liège–Austin, TX: Université de Liège, Histoire de l'art et archéologie de la Grèce antique; University of Texas at Austin, Program in Aegean Scripts and Prehistory

Persson, A.W. (1931). *The royal tombs at Dendra near Midea* (=*Skrifter utgivna av Kungliga Humanistiska Vetenskapssamfundet i Lund* 15). Lund: Gleerup

Persson, A.W. (1942). *New tombs at Dendra near Midea* (=*Skrifter utgivna av Kungliga Humanistiska Vetenskapssamfundet i Lund* 34). Lund: Gleerup

Pullen, D.J. (2013). Exchanging the Mycenaean economy. *AJA*, 117(3), 437–445

Quilliec, B.T. (2008). Use, wear and damage: Treatment of bronze swords before deposition. In C. Hamon and B. Quilliec (eds), *Hoards from the Neolithic to the metal ages: Technical and codified practices. Session of the XIth Annual Meeting of the European Association of Archaeologists* (=*BAR IS* 1758) (pp. 67–78). Oxford: Archaeopress.

Reeves, L.C. (2003). *Aegean and Anatolian Bronze Age metal vessels: A social perspective* (unpubl. Ph.D. diss.). University of London

Rehak, P. (1995). Enthroned figures in Aegean art and the function of the Mycenaean megaron. In P. Rehak (ed.), *The role of the ruler in the prehistoric Aegean: Proceedings of a panel discussion presented at the Annual Meeting of the Archaeological Institute of America, New Orleans, Louisiana, 28 December 1992* (=*Aegaeum* 11) (pp. 95–118). Liège–Austin, TX: Université de Liège, Histoire de l'art et archéologie de la Grèce antique; University of Texas at Austin, Program in Aegean Scripts and Prehistory

Rehak, P. (1997). Aegean art before and after the LM IB Cretan destructions. In R. Laffineur and P.P. Betancourt (eds), *Techne: Craftsmen, craftswomen and craftsmanship in the Aegean Bronze Age. Proceedings of the 6th International Aegean Conference, Philadelphia, Temple University, 18–21 April 1996* (=*Aegaeum* 16) (pp. 51–66). Liège–Austin, TX: Université de Liège, Histoire de l'art et archéologie de la Grèce antique; University of Texas at Austin, Program in Aegean Scripts and Prehistory

Rutter, J.B. (2001). Review of Aegean Prehistory II: The prepalatial Bronze Age of the southern and central Greek mainland. In T. Cullen (ed.), *Aegean prehistory: A review* (=*AJA Supplement* 1) (pp. 95–147). Boston: Archaeological Institute of America

Schliemann, H. (1878). *Mycenae: A narrative of researches and discoveries at Mycenae and Tiryns*. New York: Scribner, Armstrong & Co

Shelmerdine, C.W. (2001). Review of Aegean prehistory VI: The palatial Bronze Age of the southern and central Greek mainland. In T. Cullen (ed.), *Aegean prehistory: A review* (=*AJA Supplement* 1) (pp. 329–377). Boston: Archaeological Institute of America

Shelmerdine, C.W. (2007). Administration in the Mycenaean palaces: Where's the chief? In M.L. Galaty and W.A. Parkinson (eds), *Rethinking Mycenaean palaces* II (=*Cotsen Institute of Archaeology at UCLA Monograph* 60) (rev. and exp. 2nd ed., pp. 40–46). Los Angeles: Cotsen Institute of Archaeology, University of California

Shelmerdine, C.W. (2012). Mycenaean furniture and vessels: Text and image. In M.-L. Nosch and R. Laffineur (eds), *Kosmos: Jewellery, adornment and textiles in the Aegean Bronze Age* (=*Aegaeum* 33) (pp. 685–695). Leuven: Peeters

Shelmerdine, C.W. and Bennet, J. (2008). Mycenaean states. 12A: economy and administration. In C.W. Shelmerdine (ed.), *The Cambridge companion to the Aegean Bronze Age* (pp. 289–309). Cambridge: Cambridge University Press

Sherratt, A.G. and Sherratt, E.S. (1991). From luxuries to commodities: The nature of Mediterranean Bronze Age trading system. In N.H. Gale (ed.), *Bronze Age trade in the Mediterranean* (=*Studies in Mediterranean Archaeology* 90) (pp. 351–386). Jonsered: P. Åströms Förlag

Sherratt, S. (1994). Commerce, iron and ideology: Metallurgical innovation in 12th–11th century Cyprus. In V. Karageorghis (ed.), *Cyprus in the 11th century B.C.: Proceedings of the international symposium* (pp. 59–106). Nicosia: A.G. Leventis Foundation; University of Cyprus

Smith, J.S. (1993). The Pylos Jn series. *Minos. Revista de filología egea*, 27–28, 167–259

Spyropoulos, T.G. (1972). *Ysteromykīnaïkoí elladikoí thīsauroí* (Late Mycenaean Greek treasures). Athens: Archaiologikī Etaireía (in Greek)

Stos-Gale, Z.A. and Gale, N.H. (1982). The sources of Mycenaean silver and lead. *Journal of Field Archaeology*, 9(4), 467–485

Taylor, T. (1999). Envaluing metal: Theorizing the Eneolithic 'hiatus.' In S.M.M. Young, A.M. Pollard, P. Budd, and R.A. Ixer (eds), *Metals in antiquity* (=*BAR IS* 792) (pp. 22–32). Oxford: Archaeopress

Thomas, H. (1938-1939). The Acropolis Treasure from Mycenae. *BSA*, 65–87

Tournavitou, I. (1992). Practical use and social function: A neglected aspect of Mycenaean pottery. *Annual of the British School at Athens*, 87, 181–210

Tournavitou, I. (1997). The social and economic position of artisans in the Mycenaean world. In C. Gillis, C. Risberg, and B. Sjöberg (eds), *Trade and production in premonetary Greece: Production and the craftsman. Proceedings of the 4th and 5th International Workshops, Athens 1994 and 1995* (pp. 29–41). Jonsered: Åström

Treherne, P. (1995). The warrior's beauty: The masculine body and self-identity in Bronze-Age Europe. *Journal of European Archaeology*, 3(1), 105–144

Uchitel, A. (1990). Bronze-smiths of Pylos and silver-smiths of Ur. *Minos. Revista de filología egea*, 25, 195–202

Voutsaki, S. (1995). Social and political processes in the Mycenaean Argolid: The evidence from the mortuary practices. In R. Laffineur and W.-D. Niemeier (eds), *Politeia: Society and state in the Aegean Bronze Age. Proceedings of the 5th International Aegean Conference / 5e Rencontre égéenne internationale, University of Heidelberg, Archäologisches Institut, 10–13 April 1994* (=*Aegaeum* 12) (pp. 55–66). Liège–Austin, TX: Université de Liège, Histoire de l'art et archéologie de la Grèce antique; University of Texas at Austin, Program in Aegean Scripts and Prehistory

Wace, A.J.B. (1921–1923). Excavations at Mycenae IX: The tholos tombs. *Annual of the British School at Athens*, 25, 283–402

Wace, A.J.B. (1932). *Chamber tombs at Mycenae*. Oxford: Society of Antiquaries

Wace, A.J.B. (1949). *Mycenae, an archaeological history and guide*. Princeton: Princeton University Press

Warren, P. (2010). The absolute chronology of the Aegean circa 2000 B.C.–1400 B.C. A summary. In W. Müller (ed.), *Die Bedeutung der minoischen und mykenischen Glyptik:* VI. *Internationales Siegel-Symposium aus Anlass des 50 jährigen Bestehens des CMS, Marburg, 9.–12. Oktober 2008* (pp. 383–394). Mainz am Rhein: Philipp von Zabern

Weilhartner, J. (2012). Religious offerings in the Linear B tablets: An attempt at their classification and some thoughts about their possible purpose. In C. Varias (ed.), *Actas del Simposio Internacional: 55 Años de Micenología (1952–2007)* (=*Faventia Supplementa* 1) (pp. 207–231). Bellaterra: Universitat Autònoma de Barcelona, Servei de Publicacions

Whittaker, H. (2008). The role of drinking in religious ritual in the Mycenaean period. In L. Hitchcock, R. Laffineur, and J.L. Crowley (eds), *Dais: The Aegean feast. Proceedings of the 12th International Aegean Conference, University of Melbourne, Centre for Classics and Archaeology, 25–29 March 2008* (=*Aegaeum* 29) (pp. 89–96). Liège–Austin, TX: Université de Liège, Histoire de l'art et archéologie de la Grèce antique; University of Texas at Austin, Program in Aegean Scripts and Prehistory

Wright, J.C. (2008). Early Mycenaean Greece. In C.W. Shelmerdine (ed.), *The Cambridge companion to the Aegean Bronze Age* (pp. 230–257). Cambridge: Cambridge University Press

Xenaki-Sakellariou, A. (1985). *Oi thalamōtoi taphoi tōn Mykēnōn: Anaskaphēs Chr. Tsounta (1887–1898) / Tombes à chambre de Mycènes: fouilles de Chr. Tsountas (1887–1898)*. Paris: Diffusion de Boccard