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METALWORKING IN 12TH CENTURY BC GREECE: FOCUSING ON THE SMALL-SCALE

Changes in metal supply and technology have often been cited as some of the defining factors of Late Bronze to Early Iron Age changes in Aegean material culture.[1] It has been stressed that the required materials for metalworking constituted one of the prime movers of interregional exchange networks.[2] However, focusing only on an economic explanation for Eastern Mediterranean contacts falls short of explaining the multiplicity of different motivations and expectations, modes of contact, and variations in impact which past people experienced, and how these, in turn, shaped their perceptions and practices. Metalworking has long been considered as a craft in which knowledge, skills, and technology transfer social status onto those involved with it. The image of an impoverished material culture during the last centuries of the Late Bronze Age[3] has sometimes led to a neglect of the ingenuity of past people in maintaining or developing new forms of contacts and networks in the wider Eastern Mediterranean during the 12th century BC.

We deem an assessment of different or converging developments in Mycenaean metallurgy[4] at the close of the Late Bronze Age only feasible after contextualized studies of evidence for metallurgical activities on a site-to-site basis, i. e., after stressing the small-scale and the idiosyncratic. Instead of focusing on larger networks and pan-Eastern Mediterranean developments in metalworking, this paper aims specifically to reconstruct interlinked activities on one site. Evidence for metalworking from the mid-13th century to the beginning of the 11th century is presented, but the main focus lies on the period from the end of the 13th to the first half of the 12th century BC. The analyses deal with very diverse, and often fragmentary material remains, and aim to provide some answers to the following questions: How was small-scale metalworking integrated into the social web of other activities? And how did metalworking influence or reflect the social identity of such artisans?

This paper presents case studies that stem from the project »Cross-craft interaction in the cross-cultural context of the late Bronze Age Eastern Mediterranean«,[5] which is part of the larger Leverhulme funded program »Tracing Networks: Craft Traditions in the Ancient Mediterranean and Beyond«.[6] Based on the intra-site evidence from Tiryns in the Argolid, Greece (**fig. 1**), a survey of metallurgical activities in the Lower Citadel over the course of the late Palatial and earlier part of the Postpalatial period,[7] demonstrates that the intensity and locations of such evidence varied considerably over time.

THE METHODOLOGICAL AND THEORETICAL FRAMEWORK: CHAÎNE OPÉRATOIRE AND CROSS-CRAFT INTERACTION

One of the main concerns of our project is the actual identification of metalworking, i. e., activity areas and workshops in Tiryns. Methodologically, we employ a bottom-up approach: we analyze the composition,

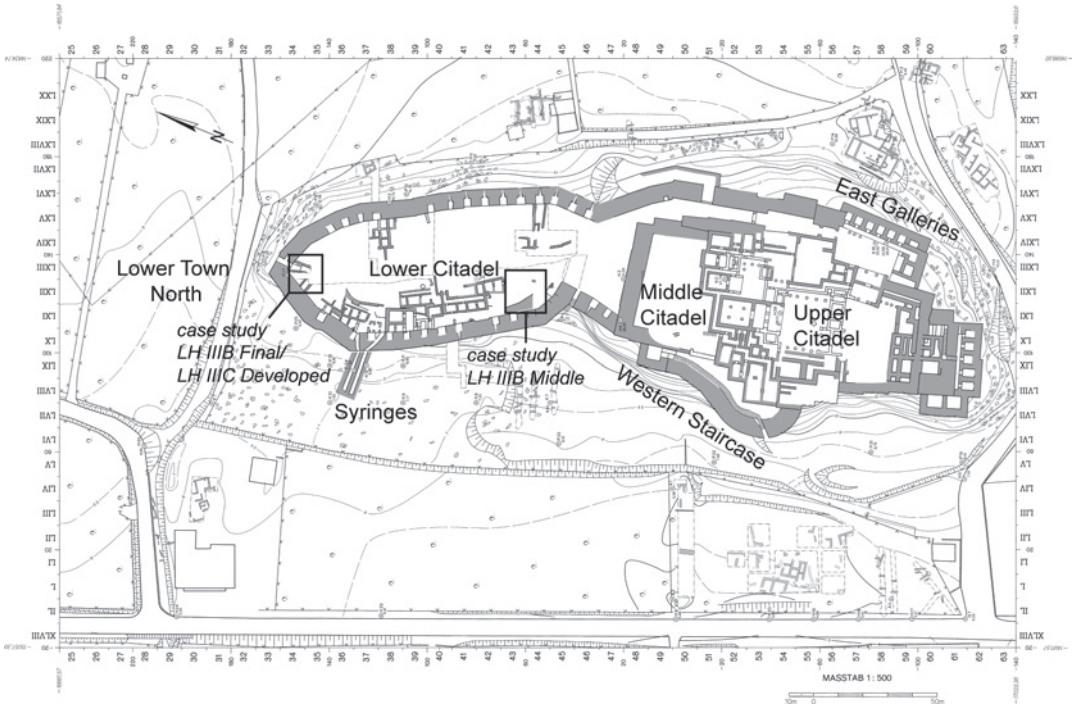

Fig. 1 Map of Tiryns with case study areas indicated. – (Based on map in the Tiryns archive of the German Archaeological Institute at Athens, with kind permission of J. Maran).

stratigraphy, chronology, and distribution of material that, due to the settlement context, comprises mostly of refuse. Herein lies perhaps the most confounding factor for assessing the actual metal consumption on a specific site: since metals are especially prone to be recycled, absence of evidence definitely cannot be taken as evidence of absence. We hope that a detailed reconstruction of refuse behavior and abandonment modes on the basis of depositional histories, and the extent of preservation and spatial distributions may alleviate the problem of mostly »invisible« metal consumption in settlement contexts.

Integrated into a traditional material and stratigraphic study are the methodological and theoretical concepts of multiple *chaînes opératoires*, and cross-craft interaction to focus on human-object interactions, individual practices and the social networks, into which they are embedded.[8] A *chaîne opératoire* encompasses all technological and social elements, from raw material to final deposition, as well as the material and social networks a specific commodity was part of. Focusing, moreover, on cross-craft interactions, i. e., links between multiple *chaînes opératoires* of different technologies, techniques and practices, helps to build a framework of hypotheses regarding the material and social webs an object was potentially involved in during its life history, and to test these in contextualized studies. Based on the analysis of all small finds, features, and architecture in each case study, our project aims to contextualize the local and interregional networks metallurgical activities were implicated in, and to assess local practices involving non-local materials.

Estimates of metal circulation in the 13th-12th centuries Aegean

In order to frame the data from Tiryns presented below, evidence for metal acquisition and circulation before the 12th century is shortly, and by no means exhaustively, reviewed.[9] The best evidence for metal trade comes from shipwrecks: the metal cargo of the late 14th/early 13th century Uluburun shipwreck consisted of

ten tons of copper and one ton of tin, in the shape of oxhide and bun ingots.[10] In contrast to the Uluburun cargo, the Cape Gelidonya shipwreck,[11] which dates to the very end of the Palatial or the early Postpalatial period, comprised only one ton of copper coming mostly from Cyprus, but also from Laurion and even from Sardinia, according to isotope analyses. The cargo also contained disintegrated tin bars, as well as a collection of scrap metal comprising mainly Cypriot types and several tools that may have constituted the tool-kit of a tinker.[12] The terms of metal acquisition by the Mycenaean palaces remain elusive, because any hints to international trade are missing in epigraphic sources.[13] The distribution of metals by the palaces is attested in the Linear B tablets, but it is still controversial whether the palaces were actually involved in all metal trade and production. The Jn–series of the Pylos tablets[14] document 600 units [ca. 600 kg] of copper or bronze which was redistributed to bronze smiths, with each individual being allotted 1.5-12 kg. The tablet Pylos Jn 829 explicitly mentions that the metal which is distributed to various smiths is earmarked for the production of javelins points – *pa-ta-ja* [*παλταια]. The summary tablet of the Jn-series, PY Ja 749, records an annual total of copper or bronze for the whole Pylian kingdom: 1046 units, or slightly more than a ton. Kilian suggests on the basis of the Pylian Linear B tablets that ca. 4 kg of copper or bronze were annually distributed to the bronze smiths by the palace.[15] The documented amount of metals is rather small compared to the cargo of the Uluburun shipwreck, but probably constituted the norm in the Palatial period. More than 400 bronze smiths are known from the Pylos tablets, indicating that these cannot have been employed by the palace full-time.[16] Evidence from the tablets furthermore reveals that some bronze smiths were landholders and of rather high status.

Since no contemporary written sources exist for the Postpalatial period on the Greek mainland, one can only estimate the amount of metal circulation by the archaeological remains in various contexts. The overall circulation and deposition of metals during the Late Helladic IIIC (henceforth: LH) period is probably best evidenced in hoards and burials. A wealth of metal artifacts in the later Postpalatial periods is exemplified, first, in the so-called Tiryns Treasure consisting of two golden signet rings, two swords, one large and one small cauldron, four bowls, two drinking vessels, one bronze sickle, one bronze tripod stand, one iron knife, two fire dogs, and one rectangular copper or bronze ingot, as well as copper oxhide ingots.[17] Second, the so-called Tomb of the Tripods in Mycenae contained two tripods, twenty double axes, and one socketed chisel.[18] Nevertheless, it is impossible at present to compare the total bulk of metals deposited in tombs during the LHIIIC Early phase with, for instance, the metal cargo of the Cape Gelidonya shipwreck, because an overview of metal finds in Postpalatial funerary contexts is still lacking.[19]

METALWORKING IN CONTEXT: DATA FROM 13TH/12TH CENTURY BC TIRYNS

Tiryns represents a major Palatial site and is surpassed only by Mycenae in importance during the Palatial period.[20] It also formed one of the most extensively occupied settlements of the Postpalatial period (at least in the 12th century) on the Greek mainland, and provided an uninterrupted settlement stratigraphy in the Lower Citadel until the end of the Late Bronze Age. The LHIIIB settlement layers of the 13th century in Tiryns, i. e., the later Palatial period, are divided into stratigraphic horizons on the basis of architectural events and changes and, to a lesser degree, the development of fine-ware decorated pottery. The phases that concern us here are LHIIIB Middle[21] and LHIIIB Final for the Palatial period.[22] The succeeding Postpalatial period is divided into four major phases, LHIIIC Early, Developed, Advanced and Late.[23]

The best evidence for metallurgical activity stems from a LHIIIB Middle building in the southwestern Lower Citadel that witnessed two occupation phases without major architectural changes during its life time (**fig. 1**, case study 1). The building was abandoned after a destruction in the mid-13th century, and the set-

tlement layout of the Lower Citadel changed markedly afterwards. The combined assemblages from both occupation phases of the LHIIIB Middle Building feature a furnace, crucibles, slag, a large rectangular ingot, bronze and lead scrap metal, and evidence of bronze melting and casting.[24] Some circumstantial evidence points to the types of metal artifacts casted in the LHIIIB Middle complex. One mold fragment[25] for casting javelin heads in the lost wax-technique that was found close to a fire place in Room 214 during the first occupation phase indicates that weaponry was produced in this building (**fig. 2**). This is reminiscent of the Pylos tablet Jn 829 mentioned above, where the palace allots certain amounts of bronze to various bronze smiths for the production of javelin heads. A small lump of Egyptian blue[26] may have been connected to metallurgical activities as well, since bronze scraps were added as the metal phase to the glass paste to obtain a blue hue.[27] This find was encountered close to the fire place with the mold. The find features an intriguing example of cross-craft interaction between metalworking and the manufacture of Egyptian blue pigment, although a complete *chaîne opératoire* for the production of this specific lump is not extant in the LHIIIB Middle context.[28] A glimpse into the minimal amount of metal available may be derived from a rectangular bronze ingot which was found hidden in the south wall of Room 215, probably at the end of the first occupation phase[29]: it weighs almost 20 kg. The reasons underlying the deposition of this ingot are still open to discussion; however, its occurrence in a metalworking context indicates that its hiding may have been based on practical rather than ritual motives. In the second occupation phase (**fig. 3**), the building featured a box furnace in Room 210.[30] The furnace was surrounded by a large pile of ash in which a crucible was found.[31] Additionally, three fragments of burnt painted plaster were excavated within the furnace (TN[32] 795, TN 797, TN 798). This lime plaster was initially thought to be recycled and used as lining for crucibles and this was confirmed by the strong presence of Ca in the LIBS analyses. However, in discussions with Myrto Georgakopoulou (2013; pers. comm.) it seems that Ca is one of the components of bone ash which would have been inserted as fuel inside the crucible together with the metal charge or melt. This aspect is under study at the moment by M. Georgakopoulou. Thus, both occupation phases may provide evidence for a range of interlinked pyrotechnological activities and cross-craft interaction on the basis of partial *chaînes opératoires* reconstructed from archaeological remains.

The second case study area is located in the north-western Lower Citadel (**fig. 4**): the LHIIIB Final workshop(s) in Building XI have already been published as an example for an artisanal context, which runs counter to previous assumptions of a decrease and impoverishment in Eastern contacts at the end of the Palatial period.[33] Room 78a of Building XI featured a fire place with bronze spills, faience vessel fragments, an amber and a relief glass bead, a vitreous spherule, a knob-shaped half-baked terracotta object with a scrap of gold foil stuck to it, two well preserved wall brackets, and an ivory rod with cuneiform signs scattered in and around it.[34]A better preserved example of a faience vessel identical to the sherds in Room 78a was found on the passageway east of Building XI.[35] Room 78a represents an assemblage that can be best explained as a small workshop for the gilding of faience vessels which were produced elsewhere. Scraps of gold foil found in the neighboring Room 78b, the vitreous spherule, the knob-shaped terracotta object, and the bronze spills, as well as a crucible fragment with a metallic or vitreous stain on the rim in the northernmost Room 1/02,[36] attest to the final embellishment of the faience vessels with inlaid eyes and the gilding of the surface. Kostoula and Maran argue that the two fragmentary vessels found in Building XI and on the passageway belong to rhyta in the shape of an ape, or the Near Eastern demon Humbaba.[37] Such vessels which often have eyes inlaid with glass or precious stones and are occasionally gilded with gold foil, occur usually in Near Eastern elite contexts. Those examples, however, differ from the Tiryns vessels in an important aspect: they are cups not rhyta, and as such, the modelling of a second aperture in the Tiryns examples demonstrates a transformation of such Near Eastern prototypes into a distinctly Mycenaean vessel. Within Building XI, the artifact distributions (**fig. 4**) suggest that a small lapidary workshop may have been located in Room 4/02.[38]

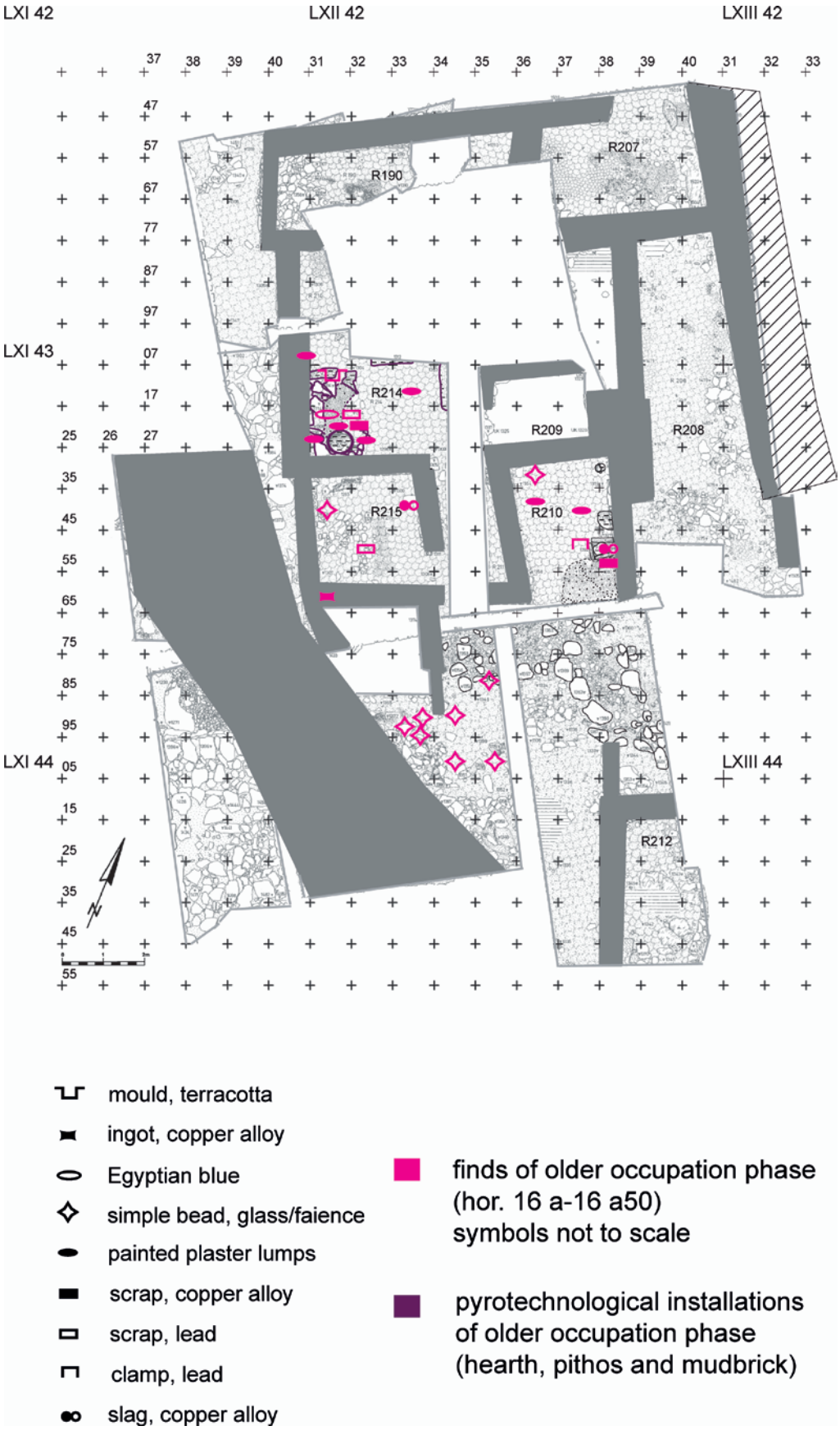

Fig. 2 Lower Citadel Southwest, LHIIIB Middle Building Complex with find distribution, first occupation phase. – (Map A. Brysbaert / M. Vetters; based on maps in the Tiryns archive of the German Archaeological Institute at Athens).

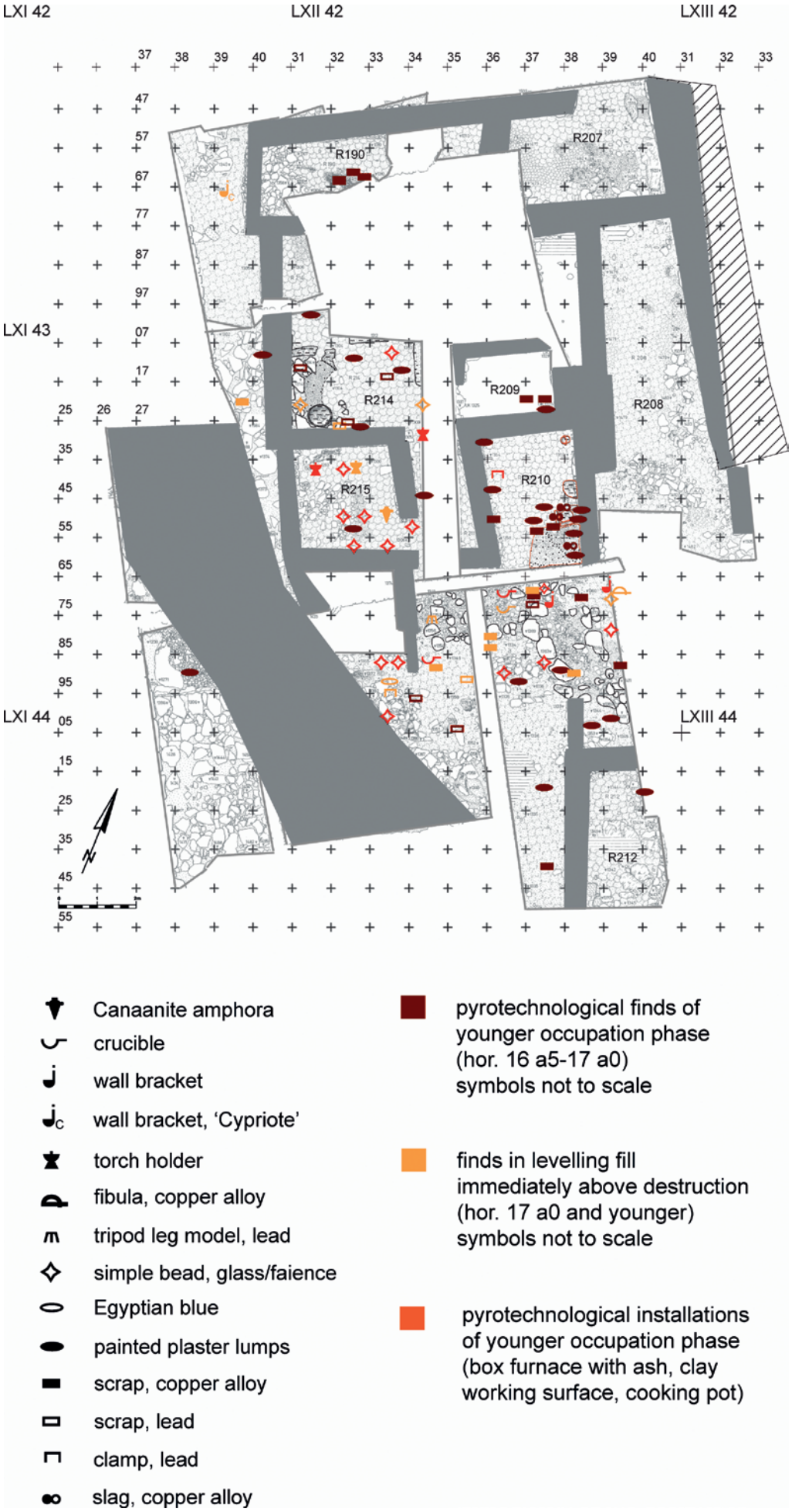

Fig. 3 Lower Citadel Southwest, LHIIIB Middle Building Complex with find distribution, second occupation phase. – (Map A. Brysbaert / M. Vetters; based on maps in the Tiryns archive of the German Archaeological Institute at Athens).

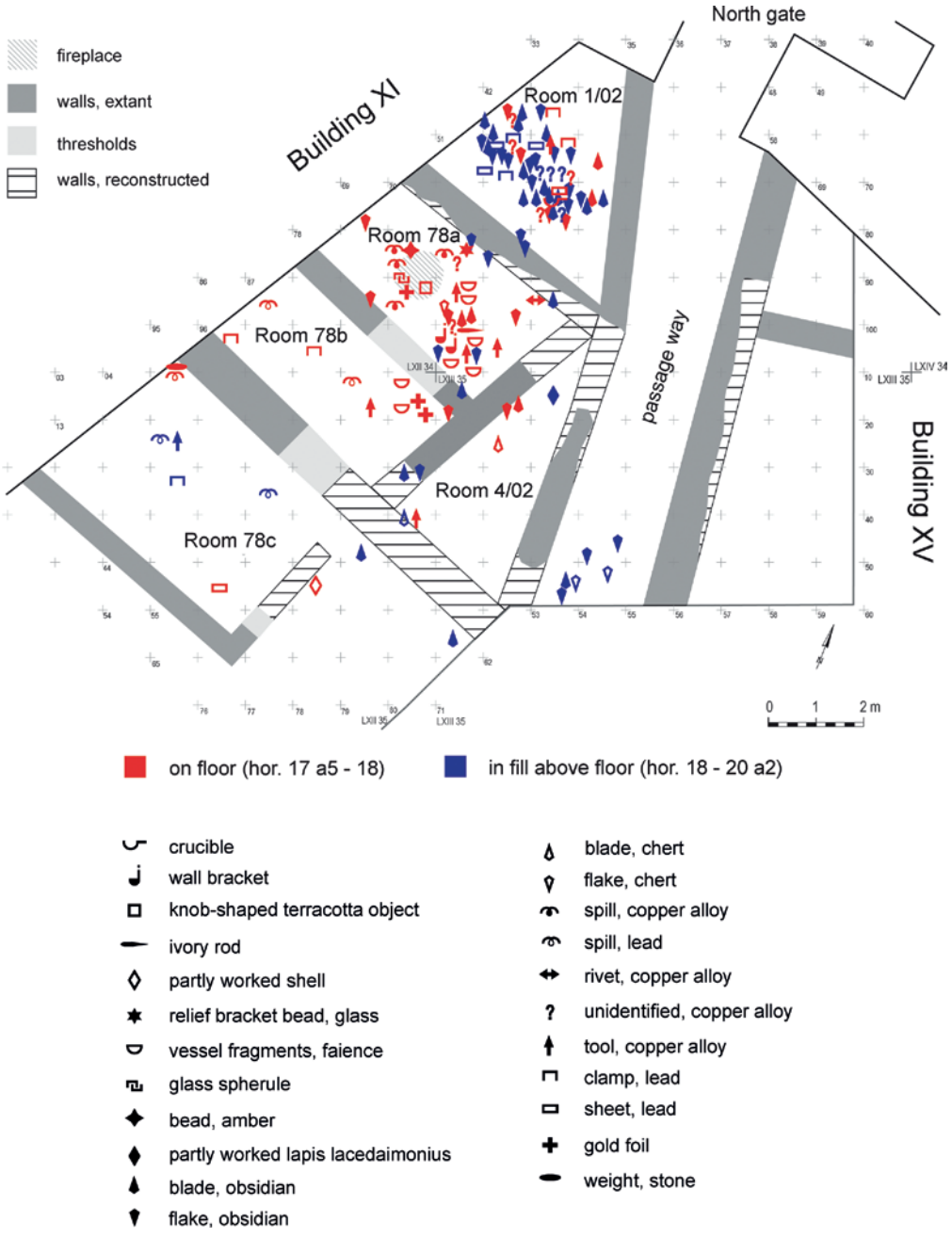

Fig. 4 Lower Citadel North, LHIIIB Final Building XI with find distribution. – (Map A. Brysbaert / M. Vetters; based on map by M. Kostoula, with kind permission of J. Maran).

Finally, Room 1/02 contained concentrations of obsidian in the form of decortification flakes, an exhausted core fragment, and flakes, as well as blade blanks which represent all steps in the knapping process.[39] Building XI was destroyed at the end of the Palatial period and most finds remained in their place of use or had been discarded close to activity areas.

Metallurgical crafts admittedly left fewer traces in the Postpalatial contexts: during the LHIIIC Early phase no crystal-clear indications of metalworking are attested in the Lower Citadel of Tiryns. During LHIIIC Developed (ca. 1170-1140 BC), the area of the former Building XI was re-occupied and the architecture was modified into a suite of two rooms flanking a courtyard (**fig. 5**). An unbaked clay bin and perhaps some clay installations were excavated in the area of the former Rooms 78b and 78a.[40] At least three mud brick ovens cluster in the north and east of the courtyard.[41] While oven no. 79/02 is slightly older than oven

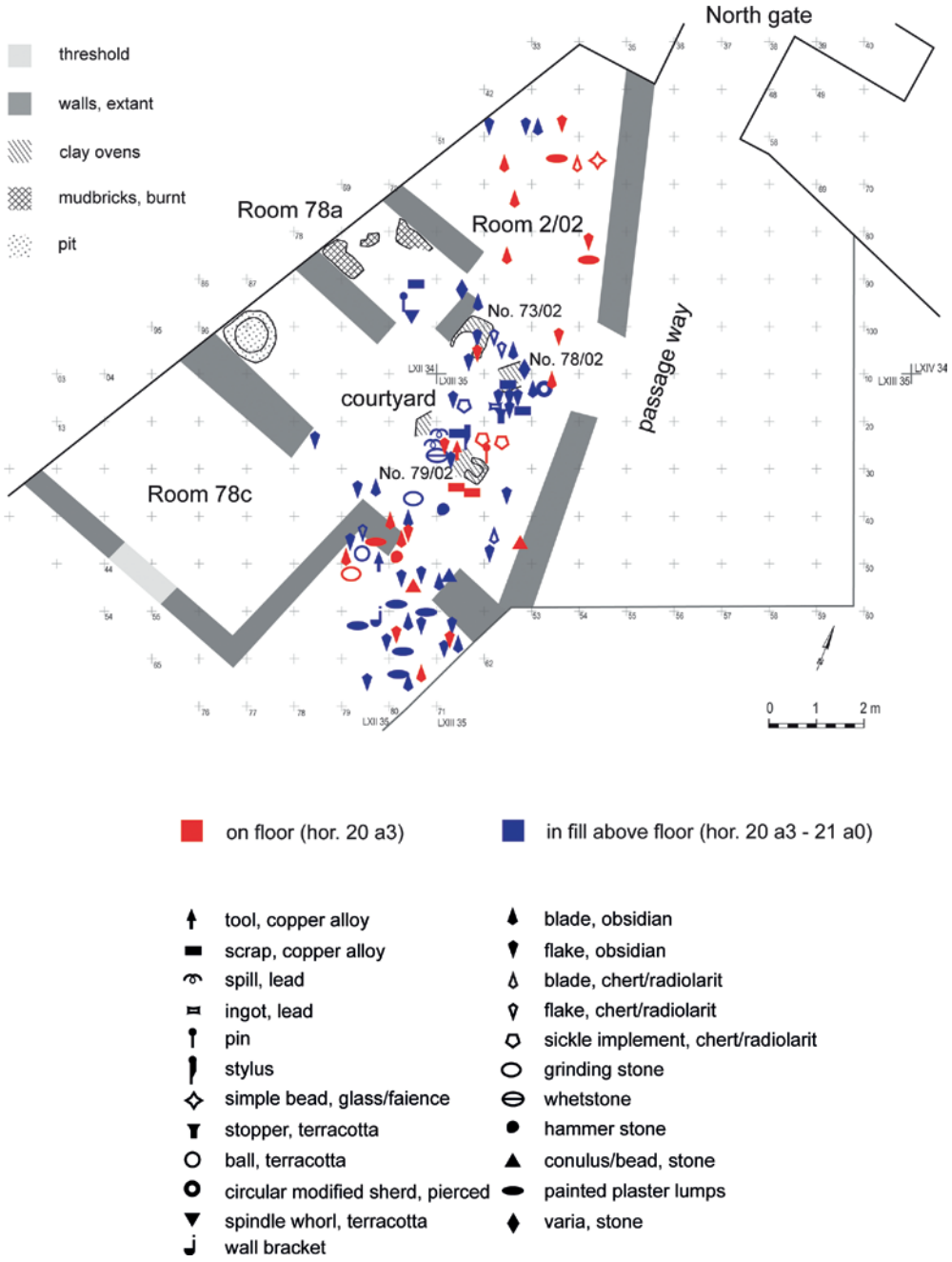

Fig. 5 Lower Citadel North, LHIIIC Developed courtyard with find distribution. – (Map A. Brysbaert / M. Vetters; based on map by M. Kostoula, with kind permission of J. Maran).

no. 78/02, according to Joseph Maran, this concentration of installations and a fragmentary assemblage connected to the ovens are not paralleled elsewhere in Tiryns. Finds were either concentrated around the ovens, or scattered in the area of the southern entrance to the courtyard (**fig. 5**). They mainly comprise of obsidian flakes and blades, but two lead spills just northwest of oven no. 79/02, and a piece of lead slag in the passage way east of the oven indicate small-scale lead working. Moreover, metal finds are confined to the area around the oven. The obsidian artifacts are rather fragmented, and it could be argued that they derive from inclusions in disintegrated mud bricks.[42] This may be the case in a few instances, but definitely cannot account for all obsidian finds. The thin obsidian blades snap easily, and this equally explains their

fragmentary state. Moreover, complete or broken obsidian blades or flakes may inhibit the manual kneading of the clay necessary in the process of making the raw clay bricks since it carries the risk of severe cutting of the hands. The rather frequent occurrence of lime plaster fragments just south of the courtyard may be due to an intentional collection of such pieces, and can perhaps be set into a local technological tradition. The collection of lime plaster for recycling in metallurgical contexts, where they were initially understood to be used as lining for crucibles, is best attested by burnt fragments found *in situ* – and associated with a crucible – in the LHIIIB Middle furnace in Room 210, but we may have to revise this hypothesis in light of ongoing discussions and new analyses. The LHIIIC Developed occupation is a typical abandonment context: there are no signs of destruction at the end of the phase, most finds are highly fragmented, and comprise of refuse that was not considered valuable for recycling. The evidence collected only supports the working of lead in the Postpalatial contexts, although bronze scrap was found close to the ovens in the LHIIIC Developed courtyard. However, bronze slag and crucible fragments are missing. Since the latter may still have been intact, thus useful and valuable assets for smiths, they may have been curated at the time of abandonment and reused or recycled elsewhere.[43]

A comparison of the 11 metal items from the Postpalatial context at the northern tip of the Lower Citadel, with 33 recorded metals from LHIIIC Early to Late strata in the Lower Town Northeast,[44] is illuminating, because it demonstrates that metal remains in the LHIIIC Developed settlement context are actually quite numerous with a view to the spatial extent of the area and the shorter occupation span. The majority of the metals from phases 2-5 in the Lower Town Northeast consist of miniscule scraps. Exceptions are a miniature chisel (TN 502), a bird fixture or appliqué (TN 500[45]) and a single Near Eastern-type cuirass scale (TN 498[46]). This cuirass scale demonstrates a very different deposition practice from the other metal objects; its ritual burying beneath the clay layer of a LHIIIC Advanced hearth, made out of a sherd bedding and covered by a clay layer, has been extensively discussed. Maran traces such practice to Cypriot and Near Eastern rituals in settlement, burial, and temple contexts, where single cuirass scales functioned as *pars pro toto* and apparently acted as apotropaic items.[47]

Considering the total amount of metals in the Postpalatial settlement, metal as a material remains scarce, but this scarcity is probably not only due to declining contacts to supply routes, but is also majorly influenced by abandonment modes and continuous recycling on site. The same phenomenon is attested elsewhere, if one compares the data from Tiryns with evidence for metalworking in the Postpalatial settlement of Lefkandi on Euboea. Bronze or even iron working is not directly attested there either, but two out-of-context mold fragments point to highly developed casting techniques.[48] A destruction context without later scavenging, however, demonstrates that metal tools were widely used in agricultural and domestic contexts: the LHIIIC Developed hilltop settlement of Aigeira in western Achaia,[49] which was extensively destroyed by fire at the end of phase 1b, presents a fairly well preserved amount of bronze objects, especially two sickles.[50]

INTERPRETING FIND DISTRIBUTIONS: ACTIVITY AREAS VERSUS REFUSE BEHAVIOR

The following, more detailed analysis of assemblages and activities in the LHIIIB Final and LHIIIC Developed contexts aims to investigate continuity and change in practices at the northern tip of the Lower Citadel: the most numerous artifacts in Building XI are the lithics (**fig. 4**) with a clear concentration in Room 1/02. Also, lead clamps and sheets are more frequent in this room than elsewhere. In general, 35 metal artifacts and fragments constitute the second largest group, although evidence for lead working surpasses that of bronze. The obsidian production waste and tools attest to a typical blade and bladelet industry. Cross-craft interaction between obsidian knapping, and the application of gold foil to gild faience vessels, as well as

the distinctive artifact concentrations and their implications for a work group of diverse artisans has been discussed elsewhere.[51] Overall, the bone, ceramic and ground stone tools as well as the fine metal tools are all local in style. However, embedded in this local material culture are the wall brackets, which are made of a local fabric and feature a local decor, but have a Cypriot and Near Eastern pedigree and are, furthermore, very uncommon on the Mycenaean mainland.[52] A local appropriation of »foreign« objects – and thereby practices – may also pertain to the exceptional ivory rod with cuneiform signs.[53] If the new reading of the signs and the interpretation of the rod as a rhabdomantic device, as recently suggested by Dietrich and Loretz is correct,[54] then the appeal to an oracle in a workshop context would constitute a distinctly non-Mycenaean ritual. However, oracular implements known from the Near East are usually not found in workshops. Again, as in the case of the faience rhyta, this would demonstrate a modification of practices, whereby these adapted artifacts were brought closer to local expectations, experiences and customs. The materials worked in Building XI indirectly point to Palatial control at least for the final embellishment of the faience vessels, and it may be suggested that the curious mixture of foreign and local material cultures stems from the close interaction of one or more foreign artisans with local crafts persons. The Linear B tablets list foreigners in the workforces by their *ethnikon*,[55] and the international exchange of highly specialized artisans in the course of diplomatic elite contacts between Near Eastern societies is documented in the Amarna tablets.[56]

If one examines the spatial data of the subsequent LHIIIC Developed occupation in the area of Building XI (**fig. 5**), the find distribution indicates two clear activity areas – one between the ovens, and another one around the southern entrance to the courtyard. The latter may in part represent cleaning activities where refuse was swept out of the courtyard.[57] The lithics (**fig. 6**) can be considered a »local« industry, despite the fact that the obsidian in all probability derives from the Cycladic island of Melos, but chert and radiolarite slightly increase in the Postpalatial period in comparison to the fragmentary obsidian tools. They constitute mostly sickle implements, suggesting perhaps threshing activities in the courtyard. A significant difference between obsidian and chert industries has already been noted in Lefkandi[58]: whereas obsidian tools mostly comprise blade blanks, the chert artifacts are mainly retouched to form specialized tool types. The material remains of the LHIIIC Developed courtyard all seem rather inconspicuous at first glance. However, the assemblage also contained a small clay ball marked with three Cypro-Minoan signs, that was found just at the southern entrance to the LHIIIC Developed workshop area.[59] The clay ball that measures 1.7 cm in diameter was well stratified: It was found above the LHIIIC Developed floor, and below a LHIIIC Advanced pavement, thus clearly sealed off from the Palatial period in this area. The clay ball with its Cypro-Minoan inscription is unique on the Mycenaean mainland, and the LHIIIC Developed settlement so far features the only material evidence for external contacts with Cyprus that would have been on a very direct, personal level. The implications of this find are manifold: if on Cyprus, as seems probable, individuals of elite status were intricately linked to literacy and metallurgy, then this may have created exactly the kind of interpersonal relationship with emerging elites on the Greek mainland that eventually brought the inscribed clay ball to Tiryns. Yet the hypothesis of intricate contacts with Cyprus and of an awareness of Cypriot practices rises and falls with the assumption that the clay ball does not represent an earlier kick-up from the Palatial period, an association that of course remains tenuous. Other practices are less disputable. We argued that the re-occupation of the same area as the former Building XI in the Postpalatial period may have been an intentional link to past practices[60] as memories of the past were actively reinforced by returning and using the same space. However, this was not a static process, since the former Building XI of LHIIIB Final was opened up in the Postpalatial period into a more accessible courtyard for easier access and communication.[61] Thus, a notion of tradition and at the same time an adaptation to contemporary needs both manifest themselves in, and are reinforced by, the architecture.

artefacts	on floor (hor. 20 a3)	in fill above floor (hor. 20 a3 – 21 a0)	finds in total LH IIIC Dev.
lithics			
obsidian blade	8	10	**18**
obsidian flake	8	22	**30**
chert/radiolarit flake		3	**3**
chert/radiolarit sickle implements	2	1	**3**
chert/radiolarit blade	1	1	**2**
ground stone tools			
grinding stone	1	1	**2**
hammer stone	1	1	**2**
whetstone		1	**1**
sandstone drill core		1	**1**
bone/antler			
bone pin	1	1	**2**
antler stylus		1	**1**
flux agents?			
lime plaster fragment	3	5	**8**
metals			
copper alloy scrap	2	4	**6**
copper alloy awl	1		**1**
copper alloy arrow bolt		1	**1**
lead spill	1	2	**3**
lead ingot (?)		1	**1**
beads and whorls (?)			
serpentine conulus	2		**2**
serpentine bead		1	**1**
glass bead	1		**1**
clay artefacts			
clay stopper		1	**1**
circular modified sherd		1	**1**
earlier kick-ups?			
rock crystal fragment		1	**1**
wall bracket fragment		1	**1**
'exoticum'			
clay ball with CM-signs		1	**1**
			94

Fig. 6 Finds from Lower Citadel North, LHIIIC Developed context. – (Table A. Brysbaert / M. Vetters).

METALWORKING IN TIRYNS: SOME CONCLUDING THOUGHTS

Metal wealth in the Postpalatial Argolid is mostly evident in hoards and burials.[62] However, actual metallurgical activities in settlements offer more insight into the practices that constitute the nodes of foreign exchange and knowledge networks, despite the scarcity of such metal workshops so far. Judging by the architectural features, the installations and the composition of assemblages, metalworking, foreign knowledge and practices in Postpalatial Tiryns appear more integrated into the domestic economy than during the final Palatial phases. Perhaps because of the integration of the metalworking craft in domestic contexts at this stage, its practice offered potential for the individual artisan to acquire social prestige. Such prestige was based on individual accomplishments and dexterity, as well as via the participation in interregional networks

– in which obsidian, metals (in raw or recycled form) and probably other, less visible goods were circulated. Moreover, it was exactly the opportune behavior of those artisans with the prerequisite skills and knowledge, who, by their performance in metallurgical contexts, not only interacted with their material surroundings but also created new social connotations to such places. As such, these artisans not only established but perpetuated social differentiation, uninterruptedly, from the final Palatial into the Postpalatial period, despite changing socio-political and economic conditions. The materials and objects involved in this process of social distinction were anything but passive either, they afforded such practices and, once established, continuously reinforced the social gap between those who possessed knowledge of metallurgical processes and skills in such pyrotechnological practices, and those who did not. In that respect, Tiryns probably mirrors social processes elsewhere in the Mediterranean.

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Notes

1) Dickinson 2006, 120. 144-146.
2) See papers in Betancourt 2011 for recent approaches to Aegean metallurgy.
3) Iakovidis 1982, 227.
4) See Iakovidis 1982 for a typological overview.
5) See www.tracingnetworks.org/content/web/cross_craft_interaction.jsp (16.12.2014).
6) Foxhall et al. in print.
7) For absolute dates of the Mycenaean Palatial and Postpalatial period, see Shelmerdine 2001, 331-333 tab. 1; Jung 2010, 172 tab. 13, 1.
8) Brysbaert 2007; 2008, 45-51; 2011.
9) For a general overview on metal consumption, see Kayafa 2008, esp. 215 diagram 12; 219 for the Argolid.
10) Bass et al. 1989. – Pulak 2010, 865-866.
11) Bass 1967.
12) Bass 2010, 800.
13) Bendall 2007, 270-274.
14) Hiller/Panagl 1976, 175-182. – Smith 1992-1993.
15) Kilian 1984, 55.
16) Gillis 1997.
17) Karo 1930. – Maran 2006; 2012.
18) Onassoglou 1995, 25-28. 32-55. 141 pls 8. 10-15.
19) For a general overview on Postpalatial funerary rituals and finds, only hinting at metal deposition and the difficulties in studying this material, see Dickinson 2006, 174-195 with further references.
20) For a general overview of the site, see Maran 2010; Papadimitriou 2001.
21) Kilian 1988, 132 fig. 27. The LHIIIB Middle phase has been redefined as LHIIIB:2 Early by French/Stockhammer 2008, 183 tab. 4 based on a new analysis of the fine-ware, decorated pottery. However, the term »LHIIIB Middle phase« is retained here, because changes in the architectural layout of the Lower Citadel afterwards (Maran 2009, 248-255) indicate a profound difference between the stratigraphic horizons of LHIIIB Middle (horizon 16) and LHIIIB Developed and Final (horizon 17) apparently not evidenced in the pottery.
22) See Rahmstorf 2008, 14 for a general overview of phases and stratigraphic horizons.
23) Mühlenbruch 2007.
24) Kilian 1988, 130. 133-137 fig. 36.

25) Kilian 1988, 137. 140 fig. 37, 1. – Rahmstorf 2008, 81 cat. no. 1791 pls 35, 3; 90, 9.

26) Rahmstorf 2008, cat. no. 2053 pls 94, 6d; 133.

27) First discussed in Philippakis/Perdikatsis/Paradellis 1976; Cameron/Jones/Philippakis 1977; Dandrau 1999. For Tell el-Dab'a, see Seeber 2000, 102; Brysbaert 2003, 171. For summaries for the Aegean and East Mediterranean sites to date, see Brysbaert 2008, 135-137.

28) For further discussion, see Brysbaert/Vetters 2013.

29) Kilian 1988, 130 note 153; 140 fig. 37, 4.

30) Kilian 1988, 126. 135 fig. 31.

31) Kilian 1988, 126. 135 fig. 32. – Rahmstorf 2008, 84-85 cat. no. 1809 pls 37, 5; 91, 1.

32) TN stands for »tracing networks«, followed by the number that refers to the individual database number of the finds in the project's database.

33) Brysbaert/Vetters 2010, 29-31. – Kostoula/Maran 2012. – Maran 2008, 50-54.

34) Brysbaert/Vetters 2010, 29-30 with further references.

35) Kostoula/Maran 2012, 195-199 cat. no 1a-c.

36) Brysbaert/Vetters 2010, 30. 41 tab. 1, 3 TN 191.

37) Kostoula/Maran 2012, 208. 218.

38) Maran 2008, 53. 90.

39) Brysbaert/Vetters 2010, 41-42 tab. 2.

40) Kilian 1988, fig. 9.

41) Maran 2008, 67-68 figs 56-57.

42) Andreas Tillmann 2011, pers. comm.

43) For the potential recycling of crucibles as grog in refractory pottery see Karageorghis/Kassianidou 1999, 181-182.

44) For architecture and stratigraphy, see Maran/Papadimitriou 2006, esp. 106 figs 5, 112; 15, 115; 20, 119; 27. For pottery, see Stockhammer 2008.

45) Vetters 2011, 30.

46) Maran 2004, 21 fig. 14. – Maran/Papadimitriou 2006, 117-118 fig. 26.

47) Maran 2004, 18-26.

48) Evely 2006, 288-289 fig. 5, 11. 1-2 pl. 91, 1-2.

49) For metal finds, see Alram-Stern 2006, 105-111. For stone mold, see 134-135 pls 32; XXXI, 128. For metal production on site and social prestige connected with metallurgy, see 156-157.

50) Alram-Stern 2006, 107-108 cat. nos 9-10 tab. 18a pls 23, 9-10; IX 9-10; inset 20.

51) Brysbaert/Vetters 2010, 33-34.

52) Maran 2004, 12-16. – Rahmstorf 2008, 91-111 esp. 103-104.

53) Cohen/Maran/Vetters 2010.

54) Dietrich/Loretz 2011.

55) Hiller/Panagl 1976, 113-114. 323-324. – Bartoněk 2003, 400. 427-428.

56) Moran 1992; see also Zaccagnini 1983.

57) Vetters 2011, 22. 43 tab. 4.

58) Evely 2006, 279.

59) Vetters 2011.

60) Brysbaert/Vetters 2010, 32 fig. 4, 35-36.

61) Brysbaert/Vetters 2010, 32 fig. 4.

62) However, see Dickinson 2006 for arguments surrounding the difficulties in studying burial contexts and their content for this period.

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