

WHY SO SERIOUS? AN EXTRAORDINARY CONE SHELL GROUP FROM MYCENAE AND THE PROBLEM OF IDENTIFYING MYCENAEAN BOARD GAMING MATERIAL

Vassiliki Pliatsika
Athens, National Archaeological Museum
vpliatsika@culture.gr

with an appendix by Jacqueline S. Meier
Department of Sociology, Anthropology and Social Work, University of North Florida
Jacksonville, FL USA
jacqueline.meier@unf.edu

Abstract. In 1974 in Room Θ3 of House Θ in the Southwest Quarter of the Mycenae citadel, an extraordinary find came to light: 545 *conus mediterraneus ventricosus* shells were found together with 12 small objects in a crevice of the bedrock. 353 cones were intentionally pierced and ground, and 9 of them were filled with lead. This assemblage includes the largest collection of cone shells known from the Late Bronze Age Aegean, and it is now possible to attempt an interpretation of its use, after the publication of the Southwest Quarter excavation. The find is examined in detail, in comparison to other large cone shell groups from Mycenaean contexts. The facts suggest that the Θ3 assemblage artefacts could have been markers for a kind of game, for which games of strategy, skill and chance known in the Eastern Mediterranean, are suggested as possible candidates. Under this hypothesis, context finds from the Room Θ3 deposit are also examined.

©2022 Vassiliki Pliatsika. This is an open access article licensed under the Creative Commons Attribution-NonCommercial-NoDerivs License (<https://creativecommons.org/licenses/by-nc-nd/4.0/>).

Published with the support of the European Research Council (ERC) in the framework of the ERC Advanced project *Locus Ludi. The Cultural Fabric of Play and Games in Classical Antiquity* based at the University of Fribourg (CH) under the European Union's Horizon 2020 research and innovation programme (grant agreement No 741520).

This study highlights the difficulty in identifying the material remains of board games, as well as the need to include the game – being a basic human activity- in the potential interpretations of archaeological records from the Mycenaean period.

Cone shells, board games, gaming pieces, Mycenaean, Late Bronze Age

Περίληψη. Το 1974 στο Δωμάτιο Θ3 της Οικίας Θ στην Νοτιοδυτική Συνοικία της ακρόπολης των Μυκηνών, ένα εκπληκτικό εύρημα ήρθε στο φως: 545 όστρεα *conus mediterraneus ventricosus* βρέθηκαν μαζί με 12 μικρά αντικείμενα σε μια σχισμή του βράχου. 353 κώνοι έφεραν σκοπίμως οπή και είχαν λειανθεί, ενώ 9 εξ αυτών βρέθηκαν γεμισμένοι με μόλυβδο. Το σύνολο αυτό περιλαμβάνει τη μεγαλύτερη συλλογή κώνων που είναι γνωστή από την Ύστερη Εποχή του Χαλκού στο Αιγαίο, και είναι πλέον δυνατόν να επιχειρηθεί η ερμηνεία της χρήσης του, μετά τη δημοσίευση της ανασκαφής της Νοτιοδυτικής Συνοικίας. Το εύρημα παρουσιάζεται λεπτομερώς σε σύγκριση με άλλες μεγάλες ομάδες κώνων από μυκηναϊκά σύνολα. Τα δεδομένα υποδεικνύουν ότι τα μικρά αντικείμενα του Δωματίου Θ3 θα μπορούσαν να είναι πεσσοί κάποιου είδους παιχνιδιού, για το οποίο ως πιθανοί υποψήφιοι προτείνονται παιχνίδια στρατηγικής, δεξιάτητας και τύχης γνωστά στην Ανατολική Μεσόγειο. Υπό το πρίσμα αυτής της υπόθεσης, εξετάζονται επίσης τα συνευρήματα του Δωματίου Θ3. Η μελέτη αυτή υπογραμμίζει την δυσκολία της ταύτισης των υλικών καταλοίπων των επιτραπέζιων παιχνιδιών, καθώς και την ανάγκη να συμπεριληφθεί το παιχνίδι -ως βασική ανθρώπινη δραστηριότητα- στις πιθανές ερμηνείες των αρχαιολογικών ευρημάτων της μυκηναϊκής περιόδου.

Κώνοι, επιτραπέζια παιχνίδια, πεσσοί, μυκηναϊκό, Ύστερη Εποχή του Χαλκού

Riassunto. Nel 1974, nel Vano Θ3 della Casa Θ, nel Quartiere Sud-ovest della cittadella di Micene, fu effettuato un ritrovamento straordinario: 545 conchiglie della specie *conus mediterraneus ventricosus* furono scoperte insieme a 12 piccoli oggetti in una fessura della roccia. 353 conchiglie erano state intenzionalmente forate e lisciate e 9 di esse erano state riempite di piombo. Questo deposito costituisce la più grande raccolta conosciuta di conchiglie della specie *conus* provenienti dall'Egeo della tarda Età del bronzo e, a seguito della pubblicazione dello scavo del quartiere sud-ovest, è ora possibile tentare un'interpretazione della sua funzione. Il complesso di reperti viene esaminato in dettaglio ed in confronto con altri grandi lotti di conchiglie

della stessa specie provenienti da contesti micenei. I dati suggeriscono che i manufatti del Vano Θ3 potrebbero essere interpretati come strumenti di qualche gioco da tavolo, tra i quali i giochi di strategia, abilità e fortuna conosciuti nel Mediterraneo orientale sono suggeriti come possibili candidati. Alla luce di questa ipotesi, vengono esaminati anche gli altri reperti rinvenuti nel contesto del Vano Θ3. Questo studio evidenzia la difficoltà di identificare i resti materiali dei giochi da tavolo, così come la necessità di includere il gioco – tra le primarie attività umane – nelle potenziali interpretazioni dei documenti archeologici del periodo miceneo.

Conchiglie a cono, giochi da tavolo, strumenti di gioco, periodo miceneo, tarda Età del Bronzo

1. The cone shell group

From 1951 up to his death in 1988, George E. Mylonas directed a major excavation and restoration program inside the citadel of Mycenae and in the surrounding area.¹ Previous excavations in the late 19th century by Heinrich Schliemann, Panagiotis Stamatakis² and Christos Tsountas,³ were poorly documented in publications, thus G.E. Mylonas' main research goal was to recount the archaeological history of this legendary site and clarify several issues which remained unresolved.

I would like to thank Alkestis Papadimitriou and my colleague Vassiliki Papadimitropoulou at the Ephorate of Antiquities of Argolis and Konstantinos Nikolentzos at the National Archaeological Museum (henceforth NAM) for permission to study and facilitating my research. I am grateful to Jacqueline S. Meier for identifying the fossil astragalus and her contribution in this paper. Warm thanks are due to David S. Reese for generously sharing his knowledge on ancient shells and Konstantinos Syrgiannis for elucidating questions on gaming. Special thanks are due to the organisers of the Board Game Conference in Athens and especially to the editors of this volume Barbara Carè, Véronique Dasen and Ulrich Schädler for their most helpful comments.

¹ ΜΥΛΩΝΑΣ 1983; ΙΑΚΩΒΙΔΗΣ 1989; ΙΑΚΩΒΙΔΗΣ 2013.

² Though H. Schliemann only worked for a period of four months in Mycenae, he excavated extensively, both inside the Mycenae citadel (focusing on the Grace Circle A) and outside, in the Clytemnestra tholos tomb, employing a large number of workmen. SCHLIEHMANN 1878. P. Stamatakis continued work at Mycenae in Grave Circle A and the Atreus tholos tomb. For a recount of the excavations at Mycenae from 1870 to 1878, see ΒΑΣΙΛΙΚΟΥ 2011, esp. 80-188.

³ C. Tsountas began work at Mycenae in 1886, excavating extensively inside the citadel, in tholos tombs and chamber tomb cemeteries in the surrounding hills. SHELTON 2006.

In 1966 G.E. Mylonas began the excavation of the Southwest Quarter of the Mycenae citadel. This large quarter extended in the south part of the west slope of the Mycenae hill, covering an area of 2,200 square meters, densely built in the mid-13th century BC, after the construction of the west leg of the Cyclopean wall in this area. It comprised eleven buildings and complexes of essentially residential use, communicating with each other through a system of corridors and stairways.⁴

In 1974 he focused excavation work on Building Θ, consisting of seven rooms preserved in the basement level with high walls (Fig. 1).⁵ The central basement room of the building was Θ3, a small square room of 13.5 square meters, communicating towards the west with a side corridor, through a small staircase ascending from the floor level. The floor surface was uneven with a difference of 78 cm slanting from east to west, because of the protruding natural bedrock, which had not been evened out. The room had no special architectural features, but for a kind of bench formed in the southwest corner by covering the bedrock with lime plaster.⁶ Θ3 was previously unexcavated by C. Tsountas who had worked in the area, thus G.E. Mylonas had the rare opportunity to unearth its original deposit consisting of a large quantity of pottery sherds and a variety of small finds.⁷ I will comment briefly on the nature of the deposit, as soon as I stress here that its general character was typical for this residential area of the Mycenae citadel. This practically means that no obvious specific use could be attributed to Room Θ3 or to the whole Building Θ for that matter, for example cult or secular ritual activities, industrial, storage, cooking etc.

Three distinct levels could be discerned in the deposit: a level with very few building remains, dating after the abandonment of the room, a level of the collapse of the roof and the upper floor including burnt earth and bricks, and the fill of the room extending to the floor. What is most interesting is the fact that no major changes are diagnosed in the pottery of the three levels, all dating from the mid to the late 13th century BC. This speaks for the short-lived use of the building, which is true for all of the Southwest Quarter, attributed to the effect of a major destruction event which took place at Mycenae in the late 13th century (Late Helladic IIIB2 late),

⁴ ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 1-6.

⁵ ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 302-389.

⁶ ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 330-331

⁷ ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 331-389.

evidenced in various areas of the Mycenae citadel. The room fill included an array of vessel shapes, with tableware predominating, the most popular being the kylikes, shallow cups, angular bowls, deep bowls, stirrup jars and jugs.

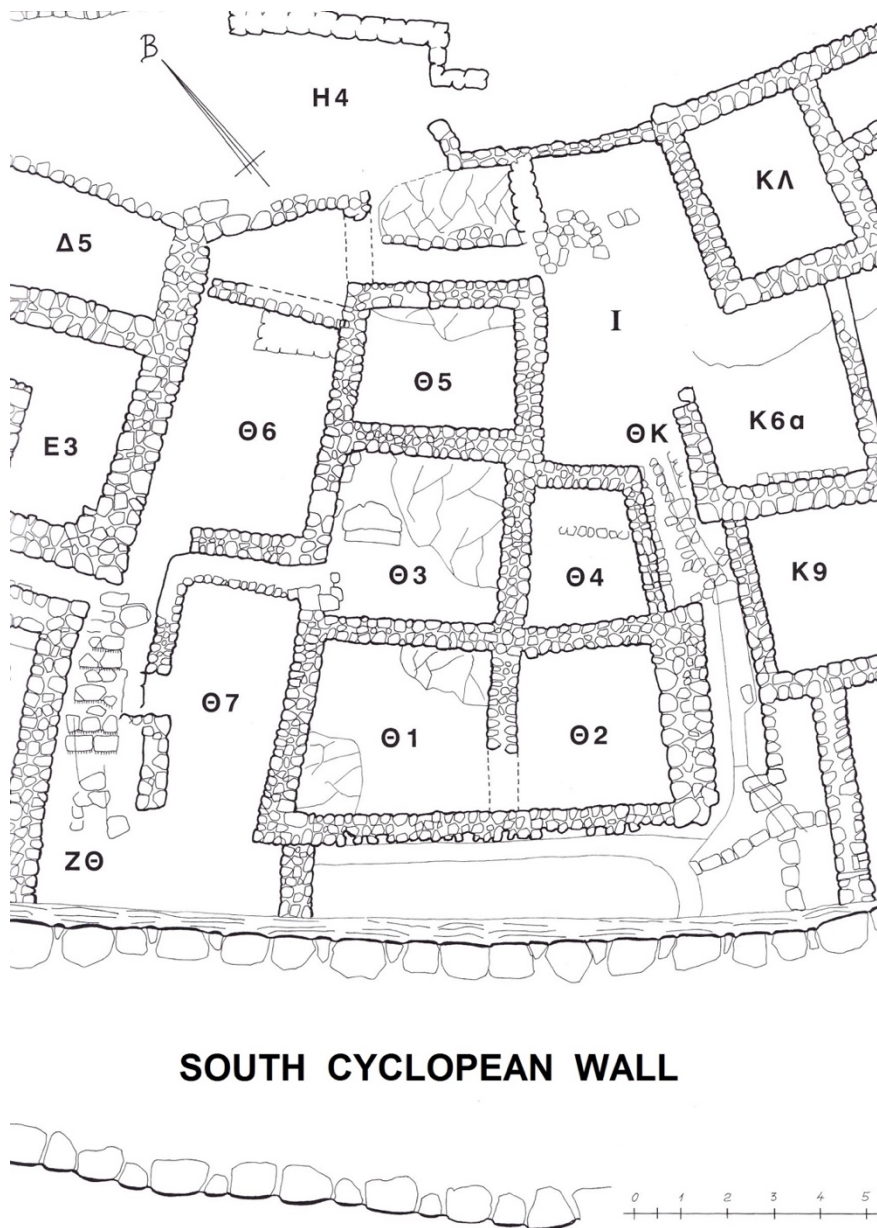


Figure 1: Plan from the S of the basement level of Rooms Θ1 and Θ3 in House Θ, at the Southwest Quarter of the Mycenae citadel. After ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 303, plan 7.

The most extraordinary find in Θ3, lying *in situ* in a crevice of the bedrock in the centre of the room, was an assemblage of 545 *Conus ventricosus mediterraneus* shells (Fig. 2),⁸ found together with 12 small lead objects (Figs. 4-5). The shells and lead objects were evidently stored in an organic container, probably a cloth or leather bag, as they were all found packed together and not scattered about the deposit as per usual in such contexts.⁹ Out of the total of 545 shells, 192 were left unmodified, in their natural state, while the remaining 353 had a flat surface and a hole on the labial side, next to their aperture.¹⁰ Out of these 353 ground and pierced shells, 9 were filled with lead and there was evidence that some of the rest had been filled with red clay, which is now practically worn out¹¹ (Table 1). The cone shells ranged from 1.7 to 4.9 cm in length, were light pink to light beige in colour and were preserved in fairly good condition.

Careful examination revealed that the modification of the shells was a time-consuming task, demanding precision, performed even in the smallest shells measuring 1 or 2 cm long, and may be described as follows: the shell was ground on its labial side, against a rough, probably stone surface. Once a small hole was formed, a pointed, probably metal tool was used to broaden the hole, sometimes forming a carefully made square opening. Subsequently the spine within the shell was crushed and removed, so the body was left hollow. Hollowing the shell was evidently the goal and not just creating a flat surface, as has been previously assumed.

⁸ Mycenae Museum (henceforth MM) inv. no. 14267. Found on August 8, 1974, at a depth of 1,65 m. from the surface of the slope. MYLONAS 1974, 89-90, REESE 1982, 126-128, REESE 1983, 354-357, IAKOVIDIS *et alii* 2013, 372-374, REESE in IAKOVIDIS *et alii* 2013, 478, 489-493. The total number differs in all cases where the shells were studied. G.E. Mylonas mentions 550 in 1974, D.S. Reese in 1982 and 1983 mentions 542, S. Iakovidis in 2013 mentions 545, D.S. Reese in the same volume mentions 537. I personally studied the material in 2001 and again in 2018 counting 545 cone shells. IAKOVIDIS *et alii* 2013, 374, fn. 735, comments on this discrepancy attributing it to the movement of the material from the excavation at Mycenae to Nafplion Museum for storing and then back to the Mycenae Museum, where it is currently stored. This small discrepancy does not affect the validity of the views expressed by all scholars who studied the material.

⁹ Perhaps even a wicker basket or a wooden box. It was noted that no soil was found among the shells, so they must have been stored tight together. IAKOVIDIS *et alii* 2013, 372.

¹⁰ Out of the 353, 4 were ground, but without a hole.

¹¹ The 2001 study mentioned specifically 102 shells filled with clay, but consistent study in 2018 revealed that only few traces of clay could be discerned in a handful of shells and some red clay was present in the bag of shells.



Figure 2: Group of *Conus ventricosus mediterraneus* shells from Room Θ3.



Figure 3: Lead-filled cone shells from Room Θ3.

The nine lead-filled cones range in size (Fig. 3), from the smallest being 1.8 cm long to the largest of 4.4 cm, and accordingly in corresponding weight, from 5 to 63 grams (Table 2). The lead-filled cones are not always heavier than the hollow ones (as one would assume), they may even be lighter. This practically means that the lead-filled cones do not form a special category where they were overall differentiated by weight in relation to the hollow shells. The lead was poured through the intentionally formed hole and spread to fill the hollow shell, in one case overflowing through the labial opening. Red clay was used to seal the hole. In one case the shell is completely broken away and lost, so only the lead filling is preserved, having taken the inner form of the cone.

The *Conus ventricosus mediterraneus* shell is a subspecies of *Conus ventricosus* indigenous to the Mediterranean Sea, found in rocky bottoms on stones and slates, reaching a maximum of 6.5 cm in length.¹² The shell is glossy pink to light beige in colour with occasional striations, making it attractive and popular with collectors even today. It hosts an inedible venomous snail, which is why it must be handled with caution, as stinging or consumption may cause neurological paralysis or even death;¹³ thus, it could not have been used for dietary reasons or as fish bait in antiquity. The gastropod is also carnivorous, feeding on other molluscs by penetrating their shells. This explains the small holes detected on many cone shells, which at times look deceptively man-made and should not confuse scholars looking for man-made traits to identify modified shells.¹⁴

Cones appear in the Neolithic and Bronze Age Aegean archaeological records in domestic and occasionally in ritual contexts, but more commonly

¹² A gastropod mollusc of the Conidae Family. GMELIN 1791, 3397 (*ventricosus*); HWASS in BRUGUIÈRE 1792, 701-702 (*mediterraneus*); DELAMOTTE – VARDALA – THEODOROU 2001, 136, 237.

¹³ NICOL 1964, 373; DELAMOTTE – VARDALA – THEODOROU 2001, 236-237; HADDAD JR 2009; ΒΕΡΟΠΟΥΛΑΙΟΥ 2011, 41. Current biochemical research focuses on the exploitation of cone venom (Conotoxins or *conopeptidae*) in pharmacology and medical applications. RAYBAUDI MASSILIA *et alii* 2001; ROMEO *et alii* 2008; LEWIS *et alii* 2012.

¹⁴ Holes on the top of the shells may also be caused by breaking and wear. DELAMOTTE – VARDALA – THEODOROU 2001, 50-51; ΒΕΡΟΠΟΥΛΑΙΟΥ 2011, 47-49; THEODOROPOULOU 2014, 84; RIDOUT – SHARPE 2017.

as grave offerings,¹⁵ in some cases associated with child burials.¹⁶ Depending on the context, they have been variously interpreted as gaming markers¹⁷ or toys, personal ornaments, amulets or fishing weights, or even as symbols of the sea or childhood.¹⁸

2. Comparative evidence

As a rule, the cone shells appear in Mycenaean contexts, in very small numbers, even with a single specimen. The 545 Mycenae Building Θ cones form a unique case,¹⁹ constituting the largest, by far, collection ever found in any Bronze Age Aegean site. Such an exceptional number of an uncommon inedible species indicates special care in procuring them for a specific function.

The only comparable group of cone shells deriving also from a Late Bronze Age archaeological context, was found beyond the Aegean, at Hala Sultan Tekke in Cyprus. 540 cone shells came from Area 8 of the settlement, from a 12th century BC layer, but unfortunately more information on their use is lacking.²⁰ Their number is strikingly similar to the Mycenae Theta 3 (Θ3) group, however at Hala Sultan Tekke only two of the shells were modified (they were just grounded, but not pierced), therefore one cannot be certain whether both these large shell groups had a similar function.

Groups of numerous cone shells collected from a single context mainly derive from palatial and post-palatial burials in Mycenaean chamber tombs

¹⁵ For a full list of cone shells found in Bronze Age contexts in the Aegean, Cyprus and Israel, see REESE in EVELY 2006, CD 25-28.

¹⁶ ΠΟΛΥΧΡΟΝΑΚΟΥ – ΣΓΟΥΡΙΤΣΑ 1987, 22, 24; ΒΛΑΧΟΠΟΥΛΟΣ 2006, 330-331; ΒΛΑΧΟΠΟΥΛΟΣ 2012, 58. See also ΙΑΚΩΒΙΔΗΣ 1969-1970, vol. B, 364-366.

¹⁷ In this paper I follow HILLBOM 2005, 62, on the terminology of small gaming implements. “Markers” and “counters” are small low pieces, natural or man-made, marking spots on a board game, “pieces” are man-made, standing up objects (height > width) that move or may be knocked over on a board game, “tiles” are flat objects, having special features and a more active role, a “die” may be any kind of random generator object.

¹⁸ ΙΑΚΩΒΙΔΗΣ 1969-1970, vol. B, 365-366; REESE 1982, 125, 129; REESE 1983, 353, 356; ΒΛΑΧΟΠΟΥΛΟΣ 2006, 330-331. EVELY in POPHAM *et alii* 1984, 246-247, and 296: fn 166.

¹⁹ One or two ground (and sometimes pierced) cone shells appear sporadically in various areas inside the citadel of Mycenae. REESE in ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 478-479; D.S. REESE pers. comm.

²⁰ Excavated in 1979, they were found in the Late Cypriot IIIA1 (12th century BC) Layer 4 F 1350A (from bench F 1350). Excavation data for Area 8 have not been published. REESE – LERNAU 2018, 493, 537.

from Mycenae and Prosymna in the Argolid, and Perati in Attica. These groups form the closest Mycenaean parallels to the Building Θ cone assemblage, so I examined all of them, as well as most of the singular lead-filled specimens, looking for analogies, differences and traits which could illuminate the interpretation of the unique Building Θ find from Mycenae.²¹

The association of cone shells with children and gaming was established through the Perati cemetery finds, where the excavator, Spyridon Iakovidis, detected a pattern in furnishing child burials with cone shells.²² He believed that the cone shells were used in a children's game, played with an unlimited number of counters. He thought they were intentionally flattened on one side, to land on it when rolled or thrown, and that the lead-filled examples were made to be more stable and harder to roll. Though more specific rules could not be deduced, S. Iakovidis imagined a game recalling the one played with astragali in ancient Greece or modern-day marbles.²³

This was indeed an intriguing interpretation and most importantly a rare case of identifying gaming material in the Mycenaean world. S. Iakovidis' suggestion of the existence of such a game is used here as a working hypothesis, further investigated with a comparative analysis of the available evidence. As we have already seen in the Mycenae Θ3 cone shell group, the goal in the modification process was not merely to create a flat surface, but rather to create a pierced and hollow shell, which would evidently differentiate it from the natural unmodified pieces and the lead-filled ones. So, this hypothetical game could ultimately involve three categories of counters: the natural shells, the hollow ones and the lead-filled ones.

Coming back to Perati in Attica, it was observed that in the total of the 217 tombs, there were 26 tombs with 28 burials, where ca. 400 shells were used as offerings (the vast majority being cone shells) –²⁴ an indication that this was not a common custom, but rather a specialized one. Out of the 28 burials with shells, 14 certainly belonged to children, and possibly 4 more, and only one could safely be attributed to an adult person, the others belonging to unidentified individuals.

²¹ The groups of cone shells from Mycenae, Prosymna and Perati studied and presented here are stored in the NAM.

²² ΙΑΚΩΒΙΔΗΣ 1969-1970, vol. B, 364.

²³ ΙΑΚΩΒΙΔΗΣ 1969-1970, vol. B, 365.

²⁴ ΙΑΚΩΒΙΔΗΣ 1969-1970, vol. B, 364: at least 338 *conus mediterraneus*, 8 *cypraea*, 3 *cardium*, 1 *pectunculus (axinea) violacescens*, 1 *haliotis tuberculata*, 1 *murex*, 1 *melania*.

In most burials in Perati, where cones were found as grave offerings, there are single specimens, or up to 6 cones per tomb.²⁵ But there are seven exceptional contexts, where a notably large group of cones was offered and five of these were certainly associated with child burials – perhaps even a sixth, with the seventh being unidentified.²⁶ These burials were placed either in a small niche in the dromos wall, or in a pit in the chamber tomb floor. The cones were found in various positions in relation to the skeleton, either forming a layer under the bones, or spread over them, or gathered at the feet together with other finds. In one case, an impressive total of 160 cones were used to cover the bones inside a pit burial by the southeast corner of the chamber.²⁷

The study of the Perati cone shell groups asserted that the treatment of the modified shells was similar to that from Mycenae, as in grinding, forming a hole and hollowing the shell, while there are also very few lead-filled examples. All the cone shells found in Perati were worn, fragile, and some of them broken and bearing post-mortem mollusc holes, all evidence that these shells were collected on the beach.²⁸ By comparison, the Mycenae Θ3 shells were visibly in a much better state, though a lot of them – if not all – must have been beach-collected too.

At Prosymna, a small settlement close to Mycenae, 58 cones were placed as offerings in eight tombs.²⁹ One case stands out, in chamber tomb XXVI,

²⁵ ΙΑΚΩΒΙΔΗΣ 1969-1970, vol. A, 123-127, pl. 38b [tomb 149: 1 cone (Δ210)], 175-178 (tomb Σ3: 6 cones), 197-199, pl. 60a [tomb 100: 2 lead-filled cones (Δ139)], 269-270, pl. 78b [tomb 46a: 3 cones (Δ93)], 304-314, pl. 94b [tomb 12: 3 cones (Δ30)], 324, pl. 99d [tomb 37: 4 cones (Δ91)], 331-336 [tomb 21: 5 cones (Δ60)], 337-339 (tomb 25: few cones), 368-370, pl. 110b [tomb Σ24: 6 cones (Δ102)], 380 (tomb 7: 2-3 cones), 380-382, pl. 113e [tomb 104: 4 cones (Δ141)], 385-386, pl. 114d [tomb 109: 1 cone (Δ150)], 409-411, pl. 122b [tomb 113: 3 cones (Δ153)], 447-448 (tomb Σ57a: 1 cone).

²⁶ Associated with child burials, ΙΑΚΩΒΙΔΗΣ 1969-1970, vol. A, 189-191, pl. 56b [tomb 56: 25 cones (Δ96) - NAM inv. no. 8238], 364-366, pl. 109b-c [tomb Σ23a: 38 cones (Δ101) - NAM inv. no. 8249], 379-380, pl. 113a [tomb 54: 61 cones (Δ137) - NAM inv. no. 8722] (60 found in NAM), 416-418, pl. 124a [tomb 119: 11 cones (Δ161) - NAM inv. no. 8780], 451-455, pl. 135a [tomb 131: 162 cones (Δ172) - NAM inv. no. 8797] (160 found in NAM). Probably associated with child burial, ΙΑΚΩΒΙΔΗΣ 275-279, pl. 80b [tomb 36: 13 cones (Δ89) - NAM inv. no. 8222]. Unidentified burial, ΙΑΚΩΒΙΔΗΣ 457-458, pl. 136b [tomb 133: 11 cones (Δ175) - NAM inv. no. 8834].

²⁷ ΙΑΚΩΒΙΔΗΣ 1969-1970, vol. A, 451-455, pl. 135a (tomb 131). 162 cone shells are mentioned in the publication (Δ172), but 160 were found in the NAM (inv. no. 8797).

²⁸ ΒΕΡΟΠΟΥΛΙΑΟΥ 2011, 49-50; THEODOROPOULOU 2014, 77-78; RIDOUT-SHARPE 2017.

²⁹ BLEGEN 1937, 465.

where a group of 40 cones was found in a heap against the east wall of the chamber, not readily associated with other finds or specific burials in the tomb.³⁰ Out of those 40, 16 were unmodified, while the rest were pierced, either at their spiral end, or on the labial side. No lead-filled examples were found in Prosymna.

At Mycenae in chamber tomb 3 of the Asprochoma/Agriosykia cemetery, a group of 52 cones was found under the stones of the drywall blocking the entrance to the chamber, 36 of them ground and pierced.³¹ They must have been placed there as a burial offering, though they cannot be associated with a particular burial. Sadly, no indication about the age or sex of the deceased in the tomb survives, since the finds were not well documented during the tomb's excavation in the late 19th century by C. Tsountas.

When comparing all data, an interesting picture emerges (Table 3):

- All the large cone shell groups include natural unmodified examples together with ground and pierced shells, in all cases modified according to the process already described.
- Lead-filled cones are actually very rare. In fact I have located only 16 examples from the Mycenaean world:³² 9 from the Mycenae Θ3 assemblage (out of 545), 2 from two chamber tombs in Mycenae,³³ 4 from the Perati cemetery (out of 338 in all)³⁴ and 1 lead filling of a

³⁰ BLEGEN 1937, 93-98, plan 15, fig. 212. On p. 94, 38 cones are mentioned, whereas on p. 465, 40 specimens. One specimen was located at the NAM (inv. no. 6651).

³¹ ΞΕΝΑΚΗ-ΣΑΚΕΛΛΑΠΙΟΥ 1985, 57-58, pl. 3 (NAM inv. no. 2358). It is interesting and worth commenting that 33 of the modified shells were found stored in the National Archaeological Museum in Athens hanging on a string, as a suggestion for their use in a necklace or for safer storage. Interpreting the modified shells as beads is not plausible, as it does not adequately explain the large hole, the broken spine, the occasional lead filling or their co-existence with unmodified specimens.

³² A lead filled cone shell is also reported from Temple 2 at Kition in Cyprus, REESE 1985, 342, 347, 353, pl. A:1a, its lead (if not the object itself) probably imported from the Aegean. It was interpreted as some sort of weight, or as a counter used in game or divination, because of its association with the Temple.

³³ Both from the Kalkani cemetery: one found by C. Tsountas in tomb 86: ΣΑΚΕΛΛΑΠΙΟΥ 1985, 242-243, NAM inv. no. 3152, the other by A.J.B Wace in tomb 529: WACE 1932, 224, NAM inv. no. 6554.

³⁴ ΙΑΚΩΒΙΔΗΣ 1969-1970, vol. A, 197-199, pl. 60a [tomb 100: 2 lead-filled cones (Δ139) - NAM inv. no. 8727], 364-366, pl. 109b-c [tomb Σ23a: 1 lead filled cone out of 38 (Δ101) - NAM inv. no. 8249]. One more ground and pierced cone shell is filled with lead from tomb 56, not mentioned in the publication. REESE 1985, 346. NAM inv. no. 8238, personal examination.

now lost shell from a chamber tomb in Thebes.³⁵ Lead-filling makes the shells much heavier, especially when compared to the hollow ones, but evidently it was not important to attain a specific weight, since at the Mycenae Θ3 assemblage the size and weight of the lead-filled examples vary considerably (Table 2).³⁶

- At Perati the modified shells were always less than the unmodified ones, seemingly not in any persistent analogy, with percentages ranging between 3% and 28% of the total. By contrast, in the Argolid, in the two burial groups from Mycenae and Prosymna and in the domestic Mycenae Θ3 group, the modified shells are more than the unmodified ones, with a very interesting fixed ratio: the percentage of modified shells ranges consistently between 60 to 70% of the total.³⁷

There is also a notable difference in the deposition of the shells: at Perati the cone shells were spread to form a layer over or below the body, while in the Argolid the shells were evidently placed in a group as a single offering – a fact which may be explained by local burial customs or individual choice.

Through the prism of the working hypothesis of a game involving groups of cone shells, we note that: a. at Perati an association of cone shell groups with children is established, and b. in the Argolid the cone shell groups display a specific analogy of two modified shells to an unmodified one, a trait which could be construed in the context of a game.

Besides the examples of cone shell groups from tombs in Attica and Argolis, there is another important assemblage of cones from a domestic context: at Lefkandi in Euboea, in the fill of Room 3 of the East House, a Mycenaean handmade *askos* with a broken handle was found, containing 25 cone shells.³⁸ It is unclear whether the find belonged with the equipment of the room, which was a kitchen, or fell there from the upper storey. The shells have not yet been published in detail, so information on the analogy

³⁵ ΚΕΡΑΜΟΠΟΙΥΛΟΣ 1917, 183; REESE 1985, 347; ΙΑΚΩΒΙΔΗΣ 1969-1970, vol. B, 365, fn 9, thought that it was made from a cut and folded lead sheet.

³⁶ The Θ3 lead-filled cone shells range in weight from 5 to 63 g. By comparison, an empty shell about 4 cm long, weighs 10-14 g.

³⁷ It should be noted that a certain variation in numbers should be attributed to the fragility of the material and the small size of the shells which may be overlooked in excavation.

³⁸ DAUX 1966, 900-901, fig. 9; EVELY 2006, 26-28, 147, 207, pl. 21.5; REESE in EVELY 2006, CD 20 (not examined, not catalogued).

of modified to unmodified cones is lacking and cannot be used more purposely as a *comparandum* to the Θ3 assemblage. It should be noted though, that “some” ground and pierced cones are mentioned in the publication.³⁹ Furthermore, the shells were all carefully stored in a small clay vase, much like the Mycenae Θ3 shells were tightly packed in an organic container. This recalls the later Greek *phormiskos*, a pear-shaped pouch made of cloth or leather, identified in vase-painting and imitated in clay. The *phormiskos* was used for carrying around astragali for gaming and divination.⁴⁰ The Lefkandi *askos* may have had a similar function. In this respect, a find from Mycenaean Naxos becomes significant in combining a cone shell group in a clay container associated with a child burial. In chamber tomb C in the Kamini cemetery a deep bowl was found containing nine cone shells, while 15 more cones were found spread in the tomb.⁴¹

3. The context

To further illuminate the interpretation of the Room Θ3 assemblage and investigate the presence of related objects and possible gaming equipment, not initially identified, a careful re-examination of the context finds was required. The room contained a large amount of pottery sherds and several large fragments of vases, including deep bowls, jugs and small stirrup jars. The only complete vase was a large transport stirrup jar, measuring 47.5 cm in height. In the centre of the room, next to the shell and lead objects assemblage, there was an almost complete unpainted angular bowl, which could have been used in collecting small items, such as the shells, though it would not have sufficed to contain all of them.⁴²

The pottery collected in the crevice of the rock together with the enigmatic assemblage included, among others, grey Minyan and matt-painted sherds, part of a LH IIB-III A1 goblet with a spiral, a LH III A2 rhyton fragment with octopus tentacles, a fragment of a LH III A-B1 mug, a fragment of a LH III A piriform jar with scale pattern, and part of a type

³⁹ REESE in EVELY 2006, CD 20. In the illustrated photograph (DAUX 1966, fig. 9 = EVELY 2006, pl. 21.5), one ground and pierced shell is visible.

⁴⁰ NEILS 1992; HATZIVASSILIOU 2001; KEFALIDOU 2004.

⁴¹ ΒΑΛΧΟΠΟΥΛΟΣ 2006, 330, 388, 398-399, 403, pls. 50, 56.

⁴² MM inv. no. 14488, H. 5.2 cm, base diam. 5 cm. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 372. Cf. the deep bowl containing nine cone shells in a chamber tomb in Naxos, ΒΑΛΧΟΠΟΥΛΟΣ 2006, 330, 388, 398-399, pl. 50: 1769; also, the *askos* from the East House at Lefkandi containing 25 cone shells, EVELY 2006, 26-28, 147, 207, pl. 21.5.

Phi figurine. The pottery reveals that the area was inhabited much earlier than the building of the wall in this part of the citadel, a fact which is verified by other finds in the Southwest Quarter.

As noted, packed together with the shells in a rock crevice in the middle of the room, there was a group of 12 very small lead artefacts: seven pellets (Fig. 4), three conical objects and two discoid ones (Fig. 5),⁴³ all ranging from 1.1 to 2.2 cm in diameter. Intriguingly, the seven pellets increase gradually in size and weight, and they should be considered a set, though its specific use is hard to pinpoint. Objects of similar shape, same hard material and different size are usually considered a set of weights. In this case the differences in weight are minimal and thus they would be useful only in weighing minimum quantities in a precision scale. They range from 7 to 43 grams, while the three smallest weigh practically the same.⁴⁴ Their use is interlinked with the shells', so their involvement in gaming should be considered, especially since such small pellets found in Late Minoan and Cypriot contexts have been associated with gaming.⁴⁵ The lead pellets look remarkably like a set of marbles, being in fact so small that a child's hands would be more suitable to handle them. In this respect, the remaining three conical⁴⁶ and two discoid⁴⁷ objects could be interpreted as gaming markers as well, the different shapes perhaps indicating different values.

All these lead objects could have provided the lead for filling some shells and they were thus interpreted by their excavator, G.E. Mylonas, in his excavation notebook. Together combined they equal 273 grams of lead. Taking into account that about 35 grams are needed to fill a 4 cm long *Conus* shell, this quantity would suffice to fill about 7 such shells. However, since the seven pellets (at least) are so painstakingly constructed, it seems unlikely they were destined for melting.

⁴³ MM inv. no. 12295. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 373.

⁴⁴ MM inv. no. 12295.1: diam. 1.1 cm, W. 7 g; MM inv. no. 12295.2: diam. 1.2 cm, W. 7 g; MM inv. no. 12295.3: diam. 1.3 cm, W. 8 g; MM inv. no. 12295.4: diam. 1.7 cm, W. 19 g; MM inv. no. 12295.5: diam. 1.8 cm, W. 24 g; MM inv. no. 12295.6: diam. 1.9 cm, W. 33 g; MM inv. no. 12295.7: diam. 2 cm, W. 43 g.

⁴⁵ HILLBOM 2005, 65-68. See also CRIST 2016, 218, for Cypriot clay balls.

⁴⁶ MM inv. no. 12295.8: H. 1.3 cm, diam. 2.1 cm, W. 23 g; MM inv. no. 12295.9: H. 2 cm, diam. 2.1 cm, W. 41 g; MM inv. no. 12295.10: H. 1.85 cm, diam. 2.2 cm, W. 41 g.

⁴⁷ MM inv. no. 12295.11: H. 0.9 cm, diam. 1.4 cm, W. 6 g; MM inv. no. 12295.12: H. 1.2 cm, diam. 1.9 cm, W. 21 g.



Figure 4: Lead pellets from Room Θ3.



Figure 5: Lead conical and discoid objects from Room Θ3.

In the room deposit a large lead disc was also collected, with a diameter of 5 cm, bearing a deep hole on one side and a shallow circle near its periphery, weighing 214 grams (Fig. 6:1).⁴⁸ This could have been a balance weight or a small ingot for providing the lead to fill the shells, given also that part of the disc on one side was already missing.

The destruction deposit filling Room Θ3 also included: 31 fragments of coloured frescoes,⁴⁹ as well as a small mass of blue colour pigment⁵⁰ and two masses of white colour,⁵¹ 2 glass paste beads,⁵² a very thin ivory disk inlay with a hole near its periphery,⁵³ one flint flake⁵⁴ and three obsidian flakes,⁵⁵ few traces of a bronze object⁵⁶ and 37 fragments of the usual Mycenaean clay human and animal figurine types.⁵⁷ A trachyte spouted mortar lay on the floor of the room and it might have provided the rough surface needed to grind the shells.⁵⁸

Most importantly the Room Θ3 destruction deposit also included an interesting array of 33 objects made of colourful stones in a variety of shapes. These objects have not been associated with the shell and lead objects assemblage in the publication of Building Θ, but I believe their presence in the context of Room Θ3 should be considered in more detail, under the possibility of their use in gaming activities.

A most notable find was the fragment of a large, flat and thin, rectangular whetstone (Fig. 6:2), made of grey sandstone,⁵⁹ which may well have been the one used to grind the shells on, to create a flat surface and

⁴⁸ MM inv. no. 14242.1: H. 1.2 cm, diam. 5-5.1 cm, hole diam. 0.65 cm, hole depth 0.7 cm, W. 214 g. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 371, pl. 86:18.

⁴⁹ MM inv. no. 12296, 12300, 12305, 12318, 12319. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 351, 371.

⁵⁰ MM inv. no. 12302. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 371.

⁵¹ MM inv. no. 12309. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 371.

⁵² MM inv. no. 12306, 12312. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 351, 371.

⁵³ MM inv. no. 12310. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 361.

⁵⁴ ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 351.

⁵⁵ MM inv. no. 14402, 14242. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 361, 371.

⁵⁶ MM inv. no. 12308. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 371.

⁵⁷ ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 350-351, 360-361, 369-370, pls. 79b:10, 81b:6, 83:18, 84b:10, 85b:4, 85b:5, 87:8, 87:9. Large numbers of figurine fragments are common in the Mycenae citadel deposits.

⁵⁸ Not located in the Mycenae Museum for study: ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 372. A “tubular bone object, burnished outside, with finished edges, 3,4 cm long” described in ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 371, is a misidentification for a horizontal tubular handle of a gray burnished vase (MM inv. no. 14479).

⁵⁹ MM inv. no. 14243: L. 10.1 cm, thickness 0.8 cm, pres. width 4.1 cm. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 351.

hole. In relation to the large and heavy mortar just mentioned, this is a more practical, easily portable object.

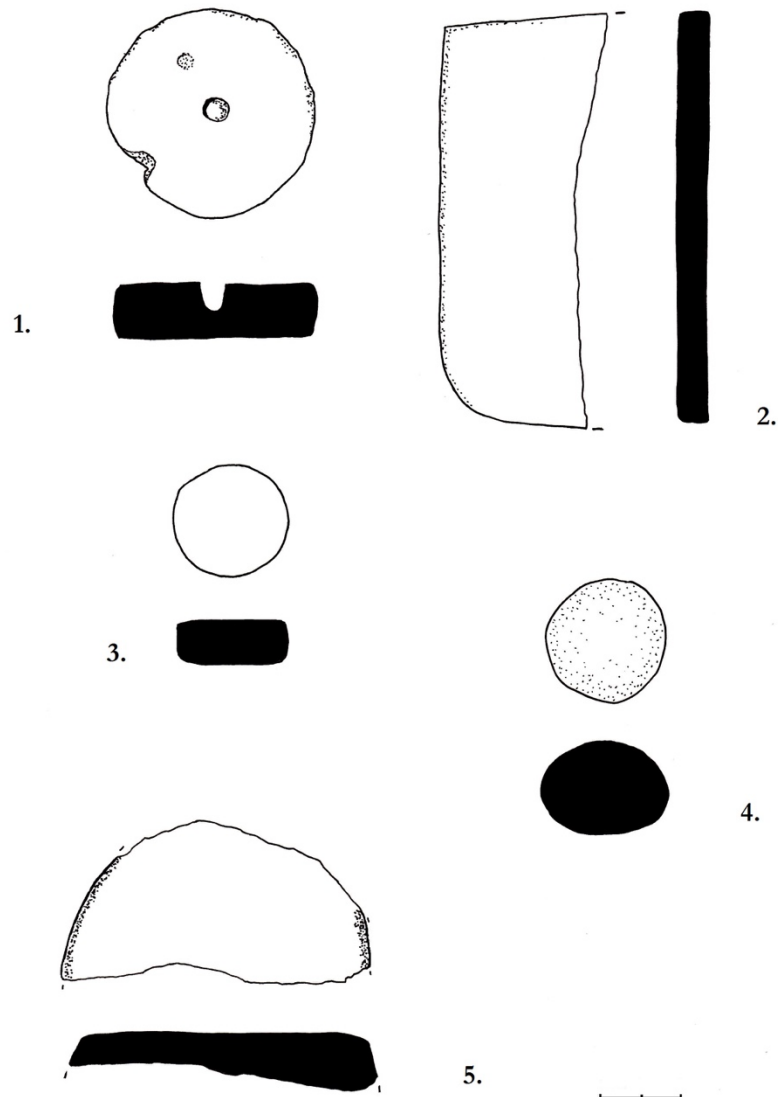


Figure 6: Lead disc and stone objects from the deposit in Room Θ3.

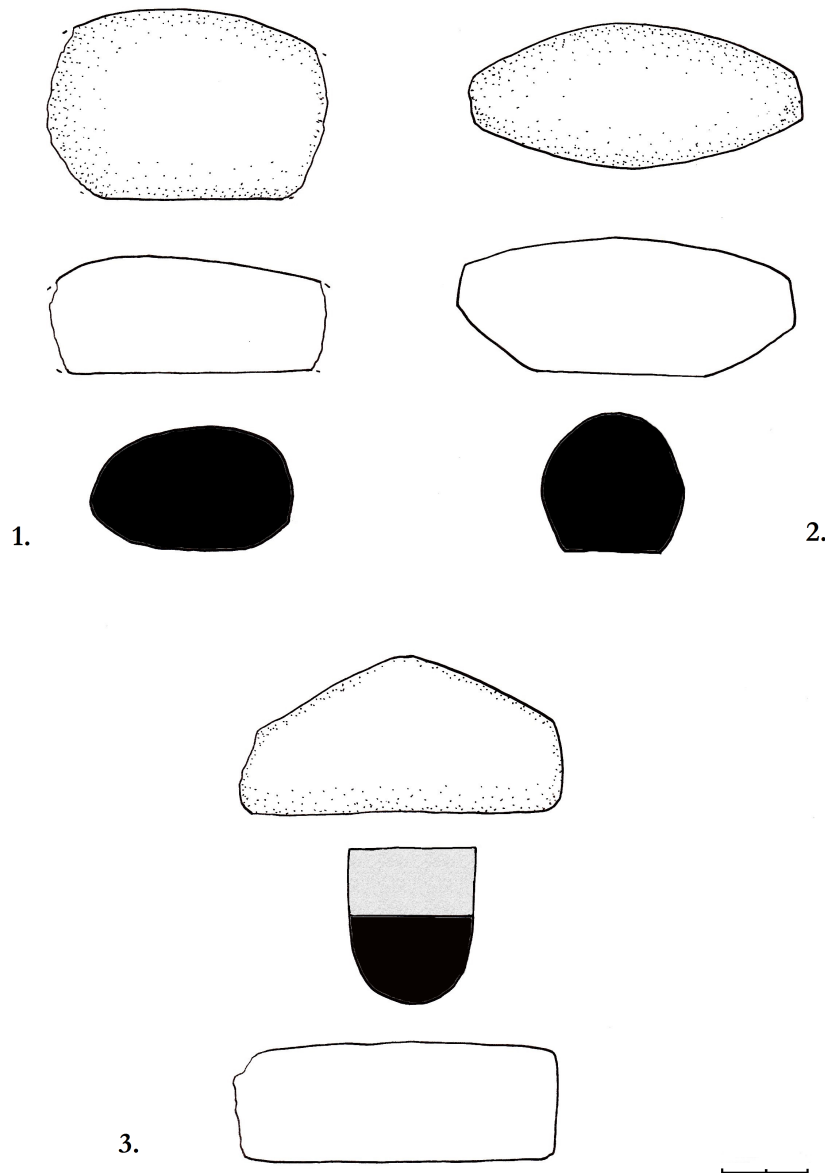


Figure 7: Stone objects from the deposit in Room Θ3.

There was also a group of small stone discoid objects which could have been used as markers. Most remarkable among them is a small disc looking

very much like a checker piece (Fig. 6:3), made of black diorite with white specks, well-polished on all surfaces.⁶⁰ A second object, a small compressed spherical pebble of greenish andesite (Fig. 6:4), could also have been a checker piece.⁶¹ There were also: the fragment of a large black steatite disc (Fig. 6:5),⁶² a discoid pebble of pinkish stone⁶³ and a flat pebble of green stone with black spots, well-polished on the surface, but for the narrow sides (Fig. 7:1).⁶⁴ A pair of spherical pebbles, of similar size, forming slightly smooth, almost flat sides, could have been used as weights, polishers or rolling counters (with flat surfaces useful for landing). One is made of green andesite,⁶⁵ the other of a brown stone with whitish specks.⁶⁶

The deposit included also three more remarkable stone finds. One is a peculiarly shaped object (Fig. 7:3) made of grey veined marble, flattened, triangular, with one rounded edge, which could stand on either of its flat sides, or on one of its narrow converging surfaces, but not on the widest lateral side.⁶⁷ It stands out because of its unusual shape, the effort and precision of its construction, but it has no obvious function or parallel, therefore its use as an elaborate gaming piece is at least a possibility to be considered.

The second is a sphendonoid object with a flat base (Fig. 7:2), made of black diorite with white specks.⁶⁸ It belongs to a type of stone balance weights well-known in Eastern Mediterranean contexts,⁶⁹ though there is no reason to preclude other uses. In fact, there is at least one instance where such objects were associated with gaming equipment. At the Katsambas cemetery near Knossos, five sphendonoid objects made of stones of different

⁶⁰ MM inv. no. 12315: H. 1.1 cm, diam. 2.85 cm, W. 19 g. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 361. HILLBOM 2005, 68-69 for Minoan parallels.

⁶¹ MM inv. no. 14487: H. 2.35 cm, diam. 3.1 cm. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 371. HILLBOM 2005, 63-64, on pebbles as gaming counters.

⁶² MM inv. no. 14242.2: Diam. 7 cm, pres. H. 1.2 cm, pres. width 3.7 cm. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 371.

⁶³ MM inv. no. 14242.3: Diam. 5 cm, H. 2 cm, W. 77 g. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 371.

⁶⁴ MM inv. no. 14249.2: L. 6.4 cm, width 4.5 cm, H. 2.7 cm, W. 150 g. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 354.

⁶⁵ MM inv. no. 14479.1: Diam. 5.2-5.7 cm, W. 266 g. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 371.

⁶⁶ MM inv. no. 14479.2: Diam. 5.6-5.9 cm, W. 295 g. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 371.

⁶⁷ MM inv. no. 14220: L. 7.3 cm, H. 3.7 cm, thickness 3 cm, W. 142 g. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 361.

⁶⁸ MM inv. no. 14249.1: L. 7.8 cm., H. 3.2 cm, thickness 3.4 cm, W. 118 g. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 354.

⁶⁹ PETRUSO 1992, 3; ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 354, fn 690.

colours were found in tomb H in a Late Minoan context which included conical gaming pieces and an astragalus die marked on its four sides with one, two, three and four holes.⁷⁰

The most remarkable stone object from the Θ3 deposit is a unique paleontological find, the oldest object to have ever been found at Mycenae. It is a large fossil astragalus (talus) belonging to a rhinoceros species, dating as far back as the Pliocene or the Pleistocene (Fig. 8).⁷¹ Its original provenance is unknown, as well as how and why it was collected and ended up in a Late Helladic context at Mycenae. It is not easy to assess the full meaning such an object might have had for the Mycenaeans, or whether they realized its immense antiquity, but we may surmise that they identified the shape of an astragalus of a large mammal – they may even have attributed it to a supernatural being.

In respect to the hypothesis of a gaming context, this large, very heavy astragalus finds an interesting parallel in Late Bronze Age Ugarit, where Claude F.-A. Schaeffer collected a bovine astragalus filled with lead, weighing 280 grams. His workmen in the excavation informed him that bovine astragali were still used for a game in the villages of Syria.⁷² The heavy astragalus was rolled with the purpose of knocking over the maximum number of smaller lighter bones. Should we imagine its involvement in a gaming activity, the Θ3 fossil astragalus might have had a similar use in knocking over the shells, or even functioning as a large die, as in the late-Babylonian rules for the game of 20 squares.⁷³

⁷⁰ ΑΛΕΞΙΟΥ 1967, 39-40, 57-58, pl. 28a. At the Perati cemetery a small sphendonoid object made of hematite was found in a tomb together with two lead-filled cone shells. ΙΑΚΩΒΙΔΗΣ 1969-1970, vol. A, 197-199 (A208), pl. 60a.

⁷¹ MM inv. no. 14242.4: 10 cm x 8.2 x 5.9 cm., W. 501 g. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 371, pl. 86:19. The fossil was overlooked in the publication of the Southwest Quarter and was first identified by Jacqueline S. Meier, who contributes more on the object in an appendix to this paper. A detailed study of the object by J.S. Meier and the author is underway.

⁷² The game was called “mourasasse” or “sakka” in Syrian, and the bovine astragalus was called a “ka’b”, SCHAEFFER 1962, 103-105, fig. 64; GILMOUR 1997, 167-168. In South America the gauchos play a tossing game with bovine astragali (tabas): LOPES NETO 1912, 167-175. Two lead-filled bovine astragali are also reported from Cyprus: one from a tomb at Kouklia (Palaepaphos)-*Teratsoudhia*, KARAGEORGHIS 1990, 45:92, pl. XXXVII: B.92; REESE 1990, 144, 149: pl. A:4, the other, weighing 64.84 g, from the floor of a sacred courtyard area at Kition, REESE 1985, 382, pl. B:5. Note also CARÈ 2013 who calls for caution in attributing preconceived values in different types of astragali without adequate evidence.

⁷³ FINKEL 2007, 21.



Figure 8: Fossil astragalus from the deposit in Room Θ3.

The fact that it weighs 501 grams, i.e., exactly 1 *mina*, which is the large unit of weight in Late Bronze Age Aegean, means that it might also be interpreted as a rare zoomorphic balance weight.⁷⁴

Scattered about the room deposit there were also 22 small *conuli*⁷⁵ of olive green, dark purple and black steatite, a common find in the Mycenae citadel. But for one biconical, the rest belong to the more common conical

⁷⁴ Very few examples are known from the Aegean, resembling an oxhead or a reclining ox, the type being of Near Eastern inspiration. PETRUSO 1992, 3-4.

⁷⁵ MM inv. no. 12299, 12311, 14257. ΙΑΚΩΒΙΔΗΣ *et alii* 2013, 351, 361, 371.

and discoid varieties, their height ranging from 0.7 to 1.4 cm. An interesting feature of this group was that these *conuli* were all shorter than the average *conulus* which measures 1.5 cm, therefore, size-wise they are comparable to the small lead objects found together with the shells. *Conuli* have been variously interpreted as spindle-whorls, buttons, beads or decorative dress elements hanging from the hem, sleeve or bands around the waist.⁷⁶ They should probably be viewed as multi-functional objects, their use depending on needs and contexts, since they are present in domestic, ritual and burial contexts with no evident pattern of use. The Room Θ3 context with its gaming connotations could offer an insight on the use of *conuli* in gaming. They could easily be placed on a board game surface as gaming markers, moved around (even with a small stick in their vertical holes), and are easy to carry.⁷⁷ D. S. Reese has suggested that *conuli* may appear in large numbers in burial contexts alternately to cone shells⁷⁸ and Naya Polychronakou-Sgouritsa rightly points out that their presence as grave offerings in child burials is better explained as gaming equipment, rather than any other suggested use.⁷⁹

4. Evaluation of possible interpretations

Most of the small finds from lead and stone in the Θ3 deposit would habitually be interpreted as balance weights, and this possibility has indeed been considered. Karl M. Petruso's catalogue of balance weights from all Aegean sites includes an extremely wide range of values, all referable to units of ca. 10.60 and 500 grams (1 *mina*) which were used in the Aegean.⁸⁰ Indeed, one may refer all the weight values of the lead and stone objects in Θ3 as multiples or fractions of these units, given also that a fluctuating proximity of 5%-7% to any unit is allowed, mainly because of some loss of material over time. Recent metrological studies proved that the proportionate association to a unit does not suffice as a sole criterion to identify balance weights. Lorenz Rahmstorf has convincingly demonstrated that practically any stone or lead object may refer to one of the Late Bronze Age metric systems current in the Eastern Mediterranean, often to more

⁷⁶ ΙΑΚΟΒΙΔΗΣ 1977, 114-115, 118-119; RAHMSTORF 2008, 134-138; ΑΝΔΡΙΚΟΥ 2019, 167, 178.

⁷⁷ *Conuli* are also ideal as toy spinning tops.

⁷⁸ REESE 1983, 356.

⁷⁹ ΠΟΛΥΧΡΟΝΑΚΟΥ-ΣΓΟΥΡΙΤΣΑ 1987, 23-24.

⁸⁰ PETRUSO 1992, 78-82; PAKKANEN 2011.

than one, and advised caution in identification, suggesting a set of criteria.⁸¹ The point to be stressed here is that the mentality of habitually attributing most Mycenaean stone and lead objects to weighing systems impedes the identification of gaming implements.

As already noted, at least some of the stone objects may have been used in one or more gaming activities in association with the shells. They have various shapes, generally small size, most forming a flat surface that would facilitate standing on a board, while others are more rounded (so they could have been rolled or placed in a board with depressions), and they are made of different colourful materials – an important parameter in identifying gaming implements.⁸²

The cone shell group in Room Θ3 cannot be associated with balance weighing, if anything because of the shells' fragile character, unless they themselves constituted at some point a commodity that required weighing. One should consider the shells' use in a metrological context as pieces in a counting system. This does not actually differ significantly from the hypothesis of their use in gaming, in that the different categories would suggest different values. The association of cone shells with children would make sense either way, as game or counting implements, but the fragile material and the large number of the Θ3 cone shells seems more justified in gaming. Most importantly the use of shells as counting devices has no contemporary parallels in the Eastern Mediterranean.

Though there was no evidence for the practice of cultic ritual in Room Θ3 or in any of the other rooms of Building Θ, one should not exclude the practice of divination, that is the attempt to foresee the future by reading logic into fortuitous signs and believing in divine intervention in human affairs.⁸³ Divination and games were closely interconnected throughout antiquity, it is thus difficult to discern one from the other activity in the archaeological record.⁸⁴ Both involved gaming implements which generate

⁸¹ RAHMSTORF 2006, 9-12. See also MICHAILIDOU 2006, 248-252.

⁸² The statistician F.N. David 1962, 6, perceptively remarks: "The conjunction of the coloured pebbles and astragali on the prehistoric sites and of the coloured counters and astragali in the early board games is suggestive (and tantalising), but there will probably never be enough evidence to link the two".

⁸³ VON FRANZ 1980, 38-50; AHERN 1982.

⁸⁴ MURRAY 1952, 233-235; BEERDEN 2013, 37-40.

luck, like cubic or polyhedral dice, binary lots and astragali.⁸⁵ In cleromancy these implements offer simple yes-or-no answers, or a more complex message through numbers, images or patterns formed. The shells and small lead objects of Θ3 could have been thrown on the ground to form chance patterns. The fossil astragalus, undoubtedly appreciated by the Mycenaeans as a unique object, perhaps attributed to a supernatural being, may have been associated with the occult and thus may have played a key role in any divination, magical or mystical practice.

Focusing on the hypothesis of the existence of gaming implements in the Room Θ3 deposit, one may note the following: The three categories of shells (unmodified, ground-and-pierced and lead-filled) may have been markers of different function or value in a game, with the small lead objects also constituting a variant category. Some of the stone objects in the room deposit might also have been involved in gaming activities, like the whetstone for grinding the shells, the small discoid objects as markers, and the fossil astragalus as a heavy rolling piece or die.

5. Gaming parallels

The assemblage of the shells and small lead objects could have been used in games known during the Late Bronze Age in the Eastern Mediterranean. They could be gaming implements either for games without a specific board (like some games with astragali) or for those requiring a specific game frame on stable, portable or temporary surfaces of various materials: wood, stone, ivory, faience, etc., or even on the ground.

The large number of the Θ3 shell assemblage is comparable to the groups of numerous astragali collected and associated with gaming or ritual depositions from the Early Bronze Age onwards in Greece, Cyprus, Anatolia and the Near East. These groups recall the modification treatment of the Θ3 shells, including worked (ground, polished, perforated, drilled) specimens and specimens filled with lead, iron or bronze, as well as imitations in other materials (bronze, glass, faience, stone, etc.).⁸⁶ While there is insufficient evidence for the Bronze Age, in ancient Greece astragali were used in gaming in several ways, and were still popular throughout the

⁸⁵ DAVID 1962, 13-19; GRAF 2005. In Late Bronze Age Kition cone shells and a lead-filled cattle astragalus have been associated with divination practices, REESE 1985, 388-389.

⁸⁶ REESE 1985, 387-388; GILMOUR 1997; POMADÈRE 2018, 11.

centuries,⁸⁷ enjoyed and played both by children and adults.⁸⁸ S. Iakovidis suggested that the Mycenaeans must have developed a game with heavier cone shells used for scattering lighter ones, similar to a modern game with astragali. This should not sound strange, since Julius Pollux in the 2nd century AD mentions in his *Onomasticon* that besides astragali, people used to play the game with broad beans, walnuts and almonds. The contextual data in Θ3 indicate that some of the stone objects in the room deposit might have been used for scattering the shells. If indeed such a game with shells existed in Mycenaean times, we may assume that the shells were later replaced with astragali, which were more durable and easier to collect.

The most popular board games in the Late Bronze Age Eastern Mediterranean were race games like the Egyptian *senet* and *mehen*, the game of 20 Squares (of which the most famous example is the Royal Game of Ur) and the game of 58 Holes, known also as ‘Hound and Jackals’. All these games had a broad dissemination and a lot of variations.⁸⁹ They all required a game board with specific places and a small set of counters and pieces.

In Late Bronze Age Crete, Cyprus and the Near East numerous gaming stones or slabs with depressions have been found, at least some of which interpreted as boards for *senet* and *mehen*.⁹⁰ They have irregular shapes, cavities in rows, and were sometimes used on both sides. The cavities are shallow and would therefore require small and round gaming pieces, like pellets, seeds, nuts, pebbles and shells.⁹¹ The Θ3 group of cones and small lead objects would have been suitable for such a game, however there is no evidence in the Mycenaean world for such portable or fixed stone slabs. The only exception to this rule is found at Dimini in Thessaly, where a large limestone slab, measuring 160 by 75 cm, was found on the floor next to a

⁸⁷ Classical and Byzantine literature sources comment negatively on the excessive occupation of adults with these games and morally condemn gambling. The Church Fathers spoke fiercely against dice games, there were penalties and prohibitions, but in practice not even priests, nor beggars or royalty could avoid succumbing to the guilty pleasure of dice games. Niketas Choniates, a 12th century Byzantine historian, reprimands Alexios, son of Isaac Komnenos, for playing dice all day with his friends. ΚΟΥΚΟΥΛΕΣ 1948, 167-172, 182, 215-217.

⁸⁸ On these different games, see Poll., *Onom.*, 9.99-103, and the commented edition of COSTANZA 2019; DAVID 1962, 2-12; SCHÄDLER 1996.

⁸⁹ ROTHÖHLER 1999; SEBBANE 2001; FINKEL 2007; FINKEL 2008; DE VOOGT *et alii* 2013; CRIST *et alii* 2016a.

⁹⁰ SWINY 1980; WHITTAKER 2002; HILLBOM 2003; CUCUZZA 2010; CRIST 2016.

⁹¹ CRIST 2016, 215-219.

side entrance to Megaron B.⁹² It had two rows of shallow cavities placed at a right angle to each other. Close to it there were objects which the excavator interpreted as offerings in a cult ritual: a sealstone, a unique kylix sherd with a Linear B inscription, 15 fragments of clay figurines and fragments of bronze objects and vases. Though stone slabs with cavities are practically missing in Mycenaean sites, we should consider the possibility that wooden boards, which are lighter and easily portable, were preferred, like in Egypt, or that the game might have been played directly on the ground.⁹³

An interesting parallel worth mentioning exists in the game of Mancala where the use of shells is very common. This is a game of expertise and calculation, extremely popular in Africa, the Near and the Middle East, but not attested before late Antiquity.⁹⁴ It is usually played in wooden boards with deep cup-like depressions or on the ground, and requires a significant number of pieces, without differentiated markers.

6. *Why so serious? Gaming and the Mycenaeans*

The ambiguity in safely identifying board game material is a wider problem in Mycenaean archaeological records.⁹⁵ The reasons for the lack of evidence on Mycenaean board gaming are plenty: the complete disintegration of perishable organic materials, objects in secondary use which are hard to identify as gaming pieces (e.g., fragments of figurines or sherds), objects to which a different function is habitually appointed (e.g. animal figurines or stone *conuli*), the disturbance of Mycenaean settlement layers and the lack of relevant textual and iconographic sources.⁹⁶ There is also an inherent difficulty in distinguishing between ritual and gaming behaviour,⁹⁷ with archaeologists tending to identify the former over the latter.

Indeed, until now, there has been no specialised study on the subject of Mycenaean board gaming. Only sporadic and tentative identifications of

⁹² ΑΔΡΥΜΗ-ΣΙΣΜΑΝΗ 2001, 92, fig. 16; ΑΔΡΥΜΗ-ΣΙΣΜΑΝΗ 2004, 42, 44, fig. 29.

⁹³ Cf. the case of the grid floor in a building from Thebes, mentioned below, ΑΡΑΒΑΝΤΙΝΟΣ - ΦΑΙΗΛΑΣ 2012, 930, figs. 2, 3.1.

⁹⁴ DE VOOGT 1996; SCHÄDLER 1998; DE VOOGT 1999; VOJT 2012.

⁹⁵ POMADÈRE 2018. Observed for Minoan contexts as well, HILLBOM 2005.

⁹⁶ See two notable exceptions in Minoan art with people playing board games on a fresco and a seal, HILLBOM 2005, 86-87, figs. 21, 23.

⁹⁷ RENFREW 2018, 14-15; KYRIAKIDIS 2018; MALAFOURIS 2018, 309-315.

board gaming implements appear in relevant scholarship. The most frequently quoted example of a board game in a Mycenaean context still belongs with a late 19th century discovery of an object believed to be of Minoan origin. In the excavation of Tomb IV in Grave Circle A at Mycenae in 1876, H. Schliemann collected several pieces of faience and rock crystal plaques which could be combined as inlays of a large wooden game board. This board was interpreted as an imported luxury, as many of the Grave Circle A finds are, a gift for the Mycenaean elite,⁹⁸ probably originating in Crete or Egypt. It has been compared to the splendid game board later found at Knossos by Sir Arthur Evans,⁹⁹ made of rock crystal, ivory, silver, gold and glass paste.¹⁰⁰ The Knossos game board is one of the largest of its kind surviving from antiquity, reaching almost 1 meter long and including at least four large conical ivory pieces.

No definite evidence exists for any other similar portable game boards from the Mycenaean palatial or post-palatial times. Ivory inlays for wooden furniture and small boxes are relatively common, but they are rarely associated with the decoration of gaming boards or gaming boxes, despite the existence of similar contemporary finds in Cyprus, Egypt and the Near East.¹⁰¹ Some of the ivory plaques coming to light in Mycenaean sites, with elaborate pictorial representations could have decorated wooden board games, while some of the ivory plaques which do not have traces of inlaying and bear engraved signs may be gaming pieces or even binary lots.¹⁰²

As already noted, there are no stones with depressions, common in the Eastern Mediterranean, but for the single example from Dimini.

A recent rescue excavation in Thebes brought to light an extremely interesting and rare find: part of a large, engraved grid was uncovered on the floor of a palace building in the Kadmeia citadel. It was made up of square unbaked bricks with pebbles stuck in the corners. Among other finds on the floor, there was a clay cuboid object with images painted on its sides, which recalls other similar ones from Mycenae, Thebes, Perati and Glyka

⁹⁸ EVANS 1921, 482-485, figs. 346-348; KARO 1930-1933, 115-116, 243-244, nos. 555, 556, 568, 574, taf. CLI-CLIII; FOSTER 1979, 141-143, fig. 92; HILLBOM 2004, 58-59.

⁹⁹ EVANS 1921, 472-482, figs. 337-340, 342, 344, pl. V; BRUMBAUGH 1975; HILLBOM 2004.

¹⁰⁰ HILLBOM 2004, 61-68.

¹⁰¹ CRIST *et alii* 2016a, figs. 4.2, 4.5, 5.2.

¹⁰² HILLBOM 2005, 77-81, 85-86.

Nera.¹⁰³ The excavators assume the existence of a large board, set on the floor, and interpret the cuboids as gaming pieces (pawns). Polyhedral objects in antiquity have functioned as dice and polyhedral Mycenaean examples certainly deserve an analytical study.¹⁰⁴

Gaming counters, the simplest pieces which do not have any special properties or values in a game, are notoriously hard to identify. Small objects are habitually interpreted as useful implements in various industries or weighing or are left without an interpretation, when they are not easily attributed to any productive activity. There are only a few instances where some so-called ‘enigmatic’ objects tend to be considered as board game counters, pieces, tiles or dice – as if usefulness should always come before pleasure. This mentality is bound to change with the study of contemporary evidence from neighbouring areas, since games tend to ‘travel’.¹⁰⁵ After all, throughout the ages, board gaming is the commonest way for merchants and soldiers to pass their time pleasantly.

Through most of the scholarship produced in almost 150 years of Mycenaean archaeology, a picture emerges where the Mycenaeans do not engage in playing, gaming, gambling or any such leisurely pastimes. Researchers have dealt with the practice of sports and athletic contests, suggesting, under the influence of the Homeric narrative, that Mycenaeans engaged in chariot racing, foot racing, boxing and bull-leaping.¹⁰⁶ Hunting, a seemingly omnipresent activity in Mycenaean culture, may also be regarded as a leisure activity – and there are people who even consider hunting a sport. Mycenaean iconography suggests that the aristocrats organized hunting expeditions with a formal character involving several assistants, dogs and chariots – much like fox hunting was organized in 15th century England. But hunting was much more than simply entertaining: it was a meat-procuring method, a rite of passage, a field of displaying bravery and a symbolic action of man prevailing over nature.

All in all, the Mycenaeans appear rather solemn and official in every aspect of their social life. This is a perception which stands in complete

¹⁰³ APABANTINOS – ΦΑΙΛΙΑΣ 2012, 930, 933-935, figs. 2, 3.1, 9, 10.

¹⁰⁴ DAVID 1962, 18; HILLBOM 2005, 82-85; PLATZ-HORSTER 2017.

¹⁰⁵ BIELINSKI – TARACHA 1992; CRIST *et alii* 2016b.

¹⁰⁶ RYSTEDT 1986; RYSTEDT 1988; RENFREW 1988; MOURATIDIS 1989, 55-63. These activities are always depicted in an official secular or religious ritual setting, but there is little actual evidence that they were practiced in real life: RUTTER 2014, 43-48.

contrast to basic human behavioural patterns, which demonstrate the necessity and need to play. This could not have been an ‘all work and no play’ civilization and gaming must have had an important role in the life of children and adults alike – if anything else for educational reasons. Hopefully further systematic research will illuminate more thoroughly this neglected subject.

Appendix: A description of the stone object by Jacqueline S. Meier

In 2019, further examination was made of the unique stone object from the Θ3 deposit House Θ in the Southwest Quarter of the Mycenae citadel. This was previously identified from photos as a large stone model of a bovine (*Bos taurus*) or possibly bear (*Ursus sp.*) astragalus. However, closer inspection of the object in person revealed that it was an astragalus (talus) specimen of fossilized bone. The mineralized astragalus specimen is from the left side of the body of an individual in the rhinoceros taxonomic family. In this appendix, I provide a basic description of the find.

Observations of the morphology of the specimen support a general taxonomic identification of either *Dicerorhinus* or *Stephanorhinus sp.* The trochleae are divided by a deep depression and are not much wider than the head portion of the specimen. On the anterior side, the medial trochlea has a nearly continuous boundary with the neck and head. The orientation of the axis of the trochlea is slightly oblique and more so towards the lateral side. Although worn, the articular facets for the cuboid and navicular bones appear similar in anterior-posterior length. The dorsal edge of the proximal calcaneal facet is also somewhat worn.

Overall, the fossil from House Θ is of considerable size, spanning a maximum height of 81.2 mm and a maximum breadth of 83.0 mm. Although it represents a large animal, the astragalus fossil is smaller than the average size maximum height for other fossilized talus specimens from the local and wider region that were identified as *Coelodonta sp.*,¹⁰⁷ or as *Dihoplus megarhinus*.¹⁰⁸ Based on the available information, the fossil from Mycenae most likely represents a *Dicerorhinus* or *Stephanorhinus sp.* individual.

Given the fact that this fossil was found removed from the paleontological context and some of the surface features are worn down, the

¹⁰⁷ TSOUKALA – GUÉRIN 2016.

¹⁰⁸ PANDOLFI 2013.

identification of the type of prehistoric rhinoceros species remains a tentative one.

It is estimated to be from a *Dicerorhinus hemitoechus* or *Stephanorhinus etruscus* individual based on the size and morphology of the specimen. Other fossilized remains of astragali of these taxa have been found in the Aegean that are comparable in size and shape.¹⁰⁹ Still, the rhinoceros astragalus specimen may have originated from a more distant location than the context at Mycenae where it was ultimately found. In all, the rhinoceros astragalus represents an interesting example of fossil collecting in the past at Mycenae.

Ø3 CONE SHELLS			
TOTAL	UNMODIFIED	MODIFIED	
545	192	353	
100%	35.2%	64.8%	
		<i>Ground and pierced</i>	<i>Lead-filled</i>
		344	9
100%	35.2%	63.1%	1.7%

Table 1

¹⁰⁹ TSOUKALA – GUÉRIN 2016.

Θ3 Cone Shells filled with lead			
	Length (in cm)	Weight (in grams)	Description comments
1.	4.4	63	Broken in half of apex, sealed with clay
2.	3.4	53	Shell broken and lost
3.	4.1	36	
4.	3.85	34	Holes on apex and body, sealed with clay, not completely full of lead
5.	3.6	42	Lead mass overflowing labial aperture
6.	3.4	30	Sealed with clay
7.	3	22	
8.	2.4	5	
9.	1.8	5	

Table 2

CONE SHELL GROUPS FROM MYCENAEAN CHAMBER TOMBS							
NAM	Site	Tomb	Burial	Cone shells TOTAL	Unmodified	Ground and pierced	Lead-filled
8797	Perati	Tomb 131	child	160	148 92.5%	12 7.5%	-
8722	Perati	Tomb 54	child	60	58 96.7%	2 3.3%	-
8249	Perati	Tomb Σ23α	child	38	32 84.21%	5 13.15%	1 2.63%
8238	Perati	Tomb 56	child	25	17 68%	7 28%	1 4%
8222	Perati	Tomb 36	child?	13	11 84.6%	2 15.4%	-
8834	Perati	Tomb 133	unidentified	11	8 72.72%	3 27.3%	-
8780	Perati	Tomb 119	child	11	11 100%	-	-
2358	Mycenae	Tomb 3	unidentified	52	16 30.8%	36 69.2%	-
6651	Prosymna	Tomb XXVI	unidentified	40	16 40%	24 60%	-
CONE SHELL ASSEMBLAGE FROM ROOM Θ3, MYCENAE							
NAM	Site	Building	Room	Cone shells TOTAL	Unmodified	Ground and Pierced	Lead-filled
14267	Mycenaea citadel	Θ	Θ3	545	192 35.2%	344 63.1%	9 1.7%

Table 3

Bibliography

- Αδρόμη-Σισμάνη Β. 2001. “Μυκηναϊκή Ιωλκός”, *AAA* 32-34, 71-100.
- Adrymi-Sismani V. 2004. “Le palais de Iolkos et sa destruction”, *BCH* 128-129, 1-54.
- Ahern E.M. 1982. “Rules in oracles and games”, *Man* n.s. 17:2, 302-312.
- Αλεξίου Σ. 1967. *Υστερομινωικοί τάφοι Λιμένος Κνωσού (Κατσαμπά)*, ΒΑΕ αρ. 56, Αθήναι.
- Ανδρικού Ε. 2019. “Σχετικά με τους μυκηναϊκούς κωνίσκους (conuli)”, Ν. Πολυχρονάκου-Σγουρίτσα (ed.), *Πρακτικά Ημερίδας στη Μνήμη του Καθηγητή Σπύρου Ιακωβίδη (6 Μαΐου 2015)*, Αθήνα, 167-181.
- Αραβαντινός Α. – Φάππας Ι. 2012. “Νέο Μυκηναϊκό Ανακτορικό Κτήριο στην Ακρόπολη των Θηβών (Καδμεία)”, Α. Μαζαράκης Αινιάν (ed.), *Αρχαιολογικό Έργο Θεσσαλίας και Στερεάς Ελλάδας 3, Πρακτικά επιστημονικής συνάντησης, Βόλος 12.3 – 15.3.2009*, Τόμος II: Στερεά Ελλάδα, Βόλος, 929-943.
- Beerden K. 2013. *Worlds Full of Signs. Ancient Greek Divination in Context*, Religions in the Graeco-Roman World 176, Leiden-Boston.
- Bielinski R. – Taracha P. 1992. “Board games in the Eastern Mediterranean: Some aspects of cultural interrelations”, A. Lipska – E. Niezgodna – M. Zabecka (eds), *Studia Aegaea Balcanica in Honorem Lodovicae Press*, Warsaw, 41-52.
- Blegen C.W. 1937. *Prosymna. The Helladic Settlement Preceding the Argive Heraeum*, Cambridge.
- Brumbaugh R. 1975. “The Knossos game board”, *AJA* 79, 135-137.
- Bruguière J.G. 1792. *Encyclopédie méthodique. Histoire naturelle des vers*, Tome premier (Abe-Con), Paris.

- Carè B. 2013. “Knucklebones from the Greek Necropolis of Locri Epizefiri, Southern Italy (VIth-IIIrd century BC). Typological and functional analysis”, F. Lang (ed.), *The Sound of Bones*, ARCHAEOPlus. Schriften zur Archäologie und Archäometrie an der Paris Lodron-Universität Salzburg 5, Salzburg, 87-99.
- Costanza S. 2019. *Giulio Polluce, Onomasticon: excerpta de ludis. Materiali per la storia del gioco nel mondo greco-romano*, Hellenica 81, Alessandria.
- Crist W. 2016. *Games of Thrones: Board Games and Social Complexity in Bronze Age Cyprus*, PhD thesis, Arizona.
- Crist W. – Dunn-Vaturi A.-E. – De Voogt A. 2016a. *Ancient Egyptians at Play. Board Games Across Borders*, Bloomsbury.
- Crist W. – De Voogt A. – Dunn-Vaturi A.-E. 2016b. “Facilitating interaction: Board games as social lubricants in the ancient Near East”, *OJA* 35.2, 179-196.
- Cucuzza N. 2010. “Game boards or offering tables? Some remarks on the Minoan ‘pierres à cupules’”, *Kernos* 23, 133-144.
- Daux G. 1966. “Chronique des fouilles et découvertes archéologiques en Grèce en 1965”, *BCH* 90, 715-1019.
- David F.N. 1962. *Games, Gods, and Gambling: A History of Probability and Statistical Ideas*, New York.
- Delamotte M. – Vardala-Theodorou E. 2001. *Shells from the Greek Seas*, Kifissia.
- de Voogt A.J. 1996. “Changing objects: Aesthetic qualities of mancala boards”, *Museum Anthropology* 20(3), 150-155.
- de Voogt A.J. 1999. “Distribution of mancala board games: a methodological inquiry”, *Board Game Studies* 2, 104-114.

- de Voogt A. – Dunn-Vaturi A.-E. – Eerkens J.W. 2013. “Cultural transmission in the ancient Near East: Twenty squares and fifty-eight holes”, *JAS* 40, 1715-1730.
- Evans A. 1921. *The Palace of Minos at Knossos*, vol. I, London.
- Evely D. 1984. “The other finds of stone, clay, ivory, faience, lead etc”, M.R. Popham – J.H. Betts – M. Cameron – H.W. Catling – E.A. Catling – D. Evely – R.A. Higgins – D. Smyth, *The Minoan Unexplored Mansion*, BSA Suppl. 17, Oxford, 223-259.
- Evely D. (ed.) 2006. *Lefkandi IV. The Bronze Age: The Late Helladic IIIc Settlement at Xeropolis*, BSA Suppl. 39, London.
- Finkel I.L. (ed.) 2007. *Ancient Board Games in Perspective: Papers from the 1990 British Museum Colloquium, with Additional Contributions*, London.
- Finkel I.L. 2008. “Board games”, J. Aruz – K. Benzel – J. Evans (eds), *Beyond Babylon. Art, Trade, and Diplomacy in the Second Millennium B.C.*, New York, 151–154.
- Foster K.P. 1979. *Aegean Faience of the Bronze Age*, New Haven.
- Gilmour G.H. 1997. “The nature and function of astragalus bones from archaeological contexts in the Levant and Eastern Mediterranean”, *OJA* 16, 167-175.
- Gmelin J.F. 1791. *Caroli a Linné. Systema naturae*, I, Pars VI, Lipsiae.
- Graf F. 2005. “Rolling the dice for an answer”, S.I. Johnston – P.T. Struck (eds), *Mantikê, Studies in Ancient Divination* (RGRW 155), Leiden – Boston, 51-97.
- Haddad Jr V. – Coltro M. – Simone L.R.L. 2009. “Report of a human accident caused by *Conus regius* (Gastropoda, Conidae)”, *Revista da Sociedade Brasileira de Medicina Tropical* 42(4), 446-448.

- Hatzivassiliou E. 2001. "The attic *phormiskos*: Problems of origin and function", *BICS* 45, 113-148.
- Hwass C.H. 1792. "Conus mediterraneus", J.G. Bruguière (ed.), *Encyclopédie méthodique. Histoire naturelle des vers, Tome premier (Abe-Con)*, Paris, 701-702.
- Hillbom N. 2003. *For Games or for Gods? An Investigation of Minoan Cup-Holes*, SIMA 132, Sävedalen.
- Hillbom N. 2004. "The Knossos game board", *OpAth* 29, 39-71.
- Hillbom N. 2005. "Minoan game markers, pieces and dice. Small, archaeological finds that could have belonged to games and gaming", *OpAth* 30, 61-98.
- Ιακωβίδης Σ.Ε. 1969-1970. *Περατή. Το Νεκροταφείον*, ΒΑΕ αρ. 67, Αθήναι.
- Iakovidis S. 1977. On the use of Mycenaean 'buttons' ", *BSA* 72, 113-119.
- Ιακωβίδης Σ. 1989. Ο Γεώργιος Μυλωνάς και η ανασκαφή των Μυκηνών, *Γεώργιος Ε. Μυλωνάς, Ο Βίος και το Έργο του (1898-1988)*, ΒΑΕ αρ. 100, Αθήναι, 47-62.
- Ιακωβίδης Σ. 2013. Ο Γεώργιος Μυλωνάς στις Μυκήνες, *Γεώργιος Εμμ. Μυλωνάς, Βίος και Έργο (1898-1988)*, ΒΑΕ αρ. 290, Αθήναι, 19-26.
- Ιακωβίδης Σ. – Shelton-Δημοπούλου Κ. – Δανιηλίδου Δ. – Μαγγίδης Χ. – Μπολώτη Τ. – Πλιάτσικα Β. – Τουρναβίτου Ι. – Reese D. 2013. *Ανασκαφές Μυκηνών ΙΙΙ. Η Νοτιοδυτική Συνοικία*, ΒΑΕ αρ. 278, Αθήναι.
- Karageorghis V. 1990. "Catalogue of finds", V. Karageorghis (ed.), *Tombs at Palaepaphos: 1. Teratsoudhia, II, Eliomylia*, Nicosia, 25-53.
- Karo G. 1930-1933. *Die Schachtgräber von Mykenai*, München.
- Kefalidou E. 2004. "On *Phormiskoi* again", *BICS* 47, 23-44.
- Κεραμόπουλλος Α.Δ. 1917. *Θηβαϊκά*, *ArchDelt* 3, Αθήναι.

- Κουκουλές Φ. 1948. *Βυζαντινών Βίος και Πολιτισμός. Τόμος Α': Σχολεία, Παιδών Ανατροφή, Παίγνια*, Αθήναι.
- Kyriakidis E. 2018. "Rituals, games and learning", C. Renfrew – I. Morley – M. Boyd (eds), *Ritual, Play and Belief in Evolution and Early Human Societies*, Cambridge, 302-308.
- Lewis R.J. – Dutertre S. – Vetter I. – Christie M.J. 2012. "Conus Venom Peptide Pharmacology", *Pharmacological Reviews* 64, 259–298.
- Lopes Neto J.S. 1912. "Jogo do osso", *Contos Gauchescos, Pelotas*, 167-175.
- Malafouris L. 2018. "Play and ritual: Some thoughts from a material-culture perspective", C. Renfrew – I. Morley – M. Boyd (eds), *Ritual, Play and Belief in Evolution and Early Human Societies*, Cambridge, 309-315.
- Michailidou A. 2006. "Stone balance weights? The evidence from Akrotiri on Thera", M.E. Alberti – E. Ascalone – L. Peyronel (eds), *Weights in Context, Bronze Age Weighing Systems of Eastern Mediterranean, Chronology, Typology, Material and Archaeological Contexts* (Proceedings of the International Colloquium, Rome 22-24 November 2004), Roma, 233-263.
- Mouratidis J. 1989. "Are there Minoan influences on Mycenaean sports, games and dances?", *Nikephoros* 2, 43-64.
- Murray H.J.R. 1952. *A History of Board-Games other than Chess*, Oxford.
- Μυλωνάς Γ.Ε. 1974. "Ανασκαφή Μυκηνών", *ΙΑΕ*, 89-92.
- Μυλωνάς Γ.Ε. 1983. *Πολύχρυσοι Μυκῆναι*, Αθήναι.
- Neils J. 1992. "The Morgantina *phormiskos*", *AJA* 96, 225-235.
- Nicol J.A.C. 1964. "Special effectors: Luminous organs, chromatophores, pigments, and poison glands", K.M. Wilbur – C.M. Yonge (eds), *Physiology of Mollusca*, I, London, 353-381.

- Pakkanen J. 2011. “Aegean Bronze Age weights, *chaînes opératoires* and the detecting of patterns through statistical analyses”, A. Brysbaert (ed.), *Tracing Prehistoric Social Networks through Technology: A Diachronic Perspective on the Aegean*, London–New York, 143–166.
- Petruso K.M. 1992. *Keos VIII. Ayia Irini: The Balance Weights*, Mainz on Rhine.
- Platz-Horster G. 2017. “Antike Polyeder. Vom Spiel mit Form und Zahl im Ptolemäischen Ägypten zum Kleinod im römischen Europa”, *JDI* 132, 107-184.
- Πολυχρονάκου-Σγουρίτσα N. 1987. “Παιδικές Ταφές στη Μυκηναϊκή Ελλάδα”, *ArchDelt* 42, Μέρος Α' (Μελέτες), 8-29.
- Pomadère M. 2018. “Ambiguïté des jeux et jouets dans la culture matérielle du monde égéen aux âges du bronze moyen et récent”, V. Dasen – Th. Haziza (eds), *Dossier Jeux et jouets, Kentron. Revue pluridisciplinaire du monde antique*, *Kentron* 34, 61-86.
- Popham M.R. – Betts J.H. – Cameron M. – Catling H.W. – Catling E.A. – Evely D. – Higgins R.A. – Smyth D. 1984. *The Minoan Unexplored Mansion*, BSA Suppl. 17, Oxford.
- Rahmstorf L. 2006. “In search of the earliest balance weights, scales and weighing systems from the East Mediterranean, the Near and Middle East”, M.E. Alberti – E. Ascalone – L. Peyronel (eds), *Weights in Context, Bronze Age Weighing Systems of Eastern Mediterranean, Chronology, Typology, Material and Archaeological Contexts* (Proceedings of the International Colloquium, Rome 22-24 November 2004), Roma, 9-45.
- Rahmstorf L. 2008. *Kleinfunde aus Tiryns*, Tiryns XVI, Wiesbaden.
- Raybaudi Massilia G. – Schininà M.E. – Ascenzi P. – Polticelli F. 2001. “Contryphan-Vn: A novel peptide from the venom of the Mediterranean snail *Conus ventricosus*”, *Biochemical and Biophysical Research Communications* 288, 908–913.

- Reese D.S. 1982. "The use of cone shells in Neolithic and Bronze Age Greece", *AAA* 15:1, 125-129.
- Reese D.S. 1983. "The use of cone shells in Neolithic and Bronze Age Greece", *BSA* 78, 353-357.
- Reese D.S. 1985. "Shells, ostrich eggshells and other exotic faunal remains from Kition", V. Karageorghis – M. Demas (eds), *Excavations at Kition V, part II*, Nicosia, 340-415.
- Reese D.S. 1990. "Appendix VI: Astragali, shells and ostrich eggshells from Palaepaphos-Teratsoudhia (Cyprus)", V. Karageorghis (ed.), *Tombs at Palaepaphos: 1. Teratsoudhia, 2. Eliomylia*, Nicosia, 144-149.
- Reese D.S. 2006. "The LH IIIC marine invertebrates from Lefkandi", D. Evelyn (ed.), *Lefkandi IV. The Bronze Age: The Late Helladic IIIC Settlement at Xeropolis*, BSA Suppl. 39, London, CD-20-29.
- Reese D.S. 2013. "Appendix: Organic remains from the southwest quarter, Mycenae", Σ. Ιακωβίδης, Κ. Shelton-Δημοπούλου, Δ. Δανιηλίδου, Χ. Μαγγίδης, Τ. Μπολώτη, Β. Πλιάτσικα, Ι. Τουρναβίτου, D.S. Reese, *Ανασκαφές Μυκηνών III. Η Νοτιοδυτική Συνοικία*, BAE αρ. 278, Αθήναι, 475-494.
- Reese D.S. – Lernau O. 2018. "Faunal evidence: catalogues, worked bones, ivory, horn, shells and fish", P.M. Fischer – T. Bürge (eds), *Two Late Cypriot City Quarters at Hala Sultan Tekke. The Söderberg Expedition 2010-2017*, SIMA CXLVII, Uppsala.
- Renfrew C. 1988. "The Minoan-Mycenaean origins of the panhellenic games", W. Raschke (ed.), *The Archaeology of the Olympics. The Olympics and other Festivals in Antiquity*, Madison, 13-25.
- Renfrew C. 2018. "Introduction: Play as a precursor of ritual in early human societies", C. Renfrew – I. Morley – M. Boyd (eds), *Ritual, Play and Belief in Evolution and Early Human Societies*, Cambridge, 9-19.

- Ridout-Sharpe J. 2017. "Shell ornaments, icons and other artefacts from the eastern Mediterranean and Levant", M.J. Allen (ed.), *Molluscs in Archaeology. Methods, Approaches and Applications*, Oxford, 290-307.
- Rothöhler B. 1999. "Mehen, god of the boardgames", *Board Game Studies* 2, 10-23.
- Romeo C. – Di Francesco L. – Oliverio M. – Palazzo P. – Raybaudi Massilia G. – Ascenzi P. – Polticelli F. – Schininà M.E. 2008. "Conus ventricosus venom peptides profiling by HPLC-MS: A new insight in the intraspecific variation", *Journal of Separation Science* 31, 488 – 498.
- Rutter J. 2014. "Sport in the Aegean Bronze Age", P. Christesen – D.G. Kyle (eds), *A Companion to Sport and Spectacle in Greek and Roman Antiquity*, Chichester, 36-52.
- Rystedt E. 1986. "The foot-race and other athletic contests in the Mycenaean world. The evidence of the pictorial vases", *OpAth* 16, 103-116.
- Rystedt E. 1988. "Mycenaean runners - Including Apobatai", E.B. French – 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*, Bristol, 437-442.
- Schädler U. 1996. "Spielen mit Astragalen", *AA*, 61-73.
- Schädler U. 1998. "Mancala in Roman Asia Minor?", *Board Game Studies* 1, 10-25.
- Schaeffer C.F.-A. 1962. "Fouilles et découvertes des XVIII^e et XIX^e campagnes, 1954-1955", C.F.-A. Schaeffer (ed.), *Ugaritica IV*, Paris, 1-150.
- Schliemann H. 1878. *Mykenae: Bericht über meine Forschungen und Entdeckungen in Mykenae und Tiryns*, Leipzig.

- Sebbane M. 2001. "Board games from Canaan in the early and intermediate Bronze Ages and the origin of the Egyptian senet game", *Tel Aviv* 28.2, 213-230.
- Shelton K. 2006. "The long lasting effect of Tsountas on the study of Mycenae", P. Darcque – M. Fotiadis – O. Polychronopoulou (ed.), *Mythos : La préhistoire égéenne de XIXe au XXIe siècle après J.-C. Actes de la table ronde internationale d'Athènes* (21-23 novembre 2002), BCH Suppl. 46, Athens, 159-164.
- Swiny S. 1980. "Bronze Age gaming stones from Cyprus", *RDAC*, 54-78.
- Theodoropoulou T. 2014. "Dead from the sea: Worn shells in Aegean prehistory", K. Szabó – C. Dupont – V. Dimitrijević – L. Gómez Gastélum – N. Serrand (eds), *Archaeomalacology: Shells in the Archaeological Record*, BAR IS 2666, Oxford, 77-90.
- Βασιλικού Ν. 2011. *Το Χρονικό της Ανασκαφής των Μυκηνών*, ΒΑΕ αρ. 274, Αθήναι.
- Βεροπουλίδου Ρ. 2011. *Όστρεα από τους οικισμούς του Θερμαϊκού κόλπου. Ανασυνθέτοντας την κατανάλωση των μαλακίων στη Νεολιθική και την Εποχή του Χαλκού*, Διδακτορική διατριβή Α.Π.Θ., Θεσσαλονίκη.
- Βλαχόπουλος Α.Γ 2006. *Η Υστεροελλαδική ΙΙΙΓ περίοδος στη Νάξο: Τα ταφικά σύνολα και οι συσχετισμοί τους με το Αιγαίο*, Τόμος Α, *Αρχαιογνωσία* αρ. 4, Αθήνα.
- Βλαχόπουλος Α.Γ 2012. *Η Υστεροελλαδική ΙΙΙΓ περίοδος στη Νάξο: Τα ταφικά σύνολα και οι συσχετισμοί τους με το Αιγαίο. Τόμος Β: Η Νάξος και ο Μυκηναϊκός Κόσμος της Μετανακτορικής περιόδου*, *Αρχαιογνωσία* αρ. 10, Αθήνα.
- Vojt I. 2012. *Mancala, Game of Thought*, Exhibition catalogue, Belgrade.
- Von Franz M.-L. 1980. *On Divination and Synchronicity: The Psychology of Meaningful Chance*, Toronto.
- Wace A.J.B. 1932. *Chamber Tombs at Mycenae*, Oxford.

- Whittaker H. 2002. “Minoan board games: The function and meaning of stones with depressions (so-called *kernoi*) from Bronze Age Crete”, *Aegean Archaeology* 6, 73-87.
- Ξενάκη-Σακελλαρίου Α. 1985. *Οι Θαλαμωτοί Τάφοι των Μυκηνών ανασκαφής Χρ. Τσούντα (1887-1898)*, Παρίσι.

Appendix

- Pandolfi L. 2013. New and revised occurrences of *Dihoplus megarhinus* (Mammalia, Rhinocerotidae) in the Pliocene of Italy, *Swiss Journal of Palaeontology* 132.2, 239-255.
- Tsoukala E. - Guérin C. 2016. The Rhinocerotidae and Suidae of the Middle Pleistocene from Petralona Cave (Macedonia, Greece), *Acta Zool. Bulgarica* 68, 243-264.