BABESCH

Fifteenth BABESCH Byvanck Lecture

Tamar Hodos

Eggstraordinary Objects

Ostrich Eggs as Luxury Items in the Ancient Mediterranean

Tuesday December 7th 2021

in collaboration with the National Museum of Antiquities at Leiden

The BABESCH Foundation

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Tamar Hodos
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The BABESCH Foundation

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Colophon

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The rise of BABESCH to an established forum for international scholarly exchange has been due in no small part to the tireless efforts of the late dr. Lily Byvanck-Quarles van Ufford (1907-2002). Her passionate involvement continues through the substantial endowment she made to Leiden University in the form of the Byvanck Fund, with the BABESCH Foundation explicitly labelled as one of the beneficiaries. This has enabled the Foundation to develop, aside from its scholarly publishing duties, various other activities geared to a wider community, of which the Byvanck Lecture series is the best known. Another initiative perpetuating Lily's name is the Byvanck Award for the best contribution of a young, debutant scholar in the BABESCH journal. A fairly recent addition is the publication of the annual Byvanck Lecture in a booklet.

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Eggstraordinary Objects
Ostrich Eggs as Luxury Items in the Ancient Mediterranean

Decorated ostrich eggs were exchanged as luxury items from the Middle East to the western Mediterranean during the second and first millennia BCE. The eggs were engraved, painted, and occasionally embellished with ivory, precious metals and faience fittings. While archaeologists note their presence as unusual vessels in funerary and dedicatory contexts, little is known about how or from where they were sourced, decorated and traded. Researchers at Bristol University, Durham University, and the British Museum have established techniques to identify where the eggs originated and how they were decorated. This talk shares the results of our study, revealing the complexity of the production, trade, and economic and social values of luxury organic items between competing cultures of the ancient Mediterranean world.

Decorated ostrich eggs were luxury items in antiquity. They were used as jugs and cups, and they were engraved, painted, and sometimes embellished with ivory, precious metals and faience fittings (figs. 1 and 2). They have been found primarily in elite funerary contexts, and occasionally in dedicatory contexts, from Mesopotamia and the Levant to the wider Mediterranean throughout the region's Bronze and Iron Ages (c. 3rd–2nd millennium BCE; c. 1st millennium BCE). More explicitly, they were used by the Minoans, Mycenaeans, Cypriots, Egyptians, Babylonians, and Assyrians of the Bronze Age, and the Greeks, Etruscans, Phoenicians (at home and abroad), Cypriots, Egyptians, Assyrians, Achaemenids, and Babylonians of the Iron Age. Along with decorative ivory and shell objects, bronze and silver bowls, and gold jewellery, these eggs represent the shared values and status indicators of elites across the competing cultures of their respective ages.

Ostriches are not indigenous to Europe. Therefore, examples of decorated ostrich eggs found in Bronze and Iron Age archaeological contexts in regions such as Greece, Italy and Spain would have been imported from the Middle East and/or North Africa, where ostriches were indigenous during these time periods. With the exception of two Bronze Age sites in Egypt where ostrich eggshells were used to make beads, production centres have not been firmly identified to date. Therefore, determining where the eggs originated has relied upon analysis of their iconography and comparison with other worked media – primarily ivory – to ascertain who decorated them. Much of this work equates

Fig. 1 (top): Ostrich egg jar and cup from Ur, Iraq, with inlays of stone, shell, and mother-of-pearl in bitumen, c. 2600 BCE, British Museum.

Fig. 2 (bottom): Ostrich egg vessel from the Isis Tomb, Vulci, Italy, c. 625 BCE. It lacks the metal fittings that turned the egg into a pouring vessel, British Museum.

decorative style with cultural identity. This is tenuous at best, given how readily motifs can be copied or adapted, and it is especially challenging for periods in which artisans were reliant on royal/elite patronage and known to migrate (or be moved) between regions, such as during the Bronze and Iron Ages. A different approach has thus been needed.

The very first step in considering the production process of any object is origin of materials. In the case of ostrich eggs, the question is where was an egg laid? Determining this is a significant challenge, because there is a potential vast geographic area around the southern and eastern Mediterranean from where ostrich eggs could have been sourced. Ostriches are highly nomadic. They are also omnivorous. Their ancient natural Mediterranean habitats encompassed North Africa, the Levant and wider Middle East. Two sub-species may have existed: *Struthio camelus syriacus* in the Arabian peninsula and the Levant, which was hunted to extinction in the middle of last century, and the North African *S. c. camelus* across northern Africa. Genetic studies to date on their differences have produced ambiguous results.

Since ostriches breed well in captivity, it is possible they were reared in antiquity for their eggs, as well as feathers, perhaps oil, leather and meat, and for sport. Assyrian royal texts mention ostrich hunting. Ashurnasirpal II's (884–859 BCE) Banquet Stela from Nimrud (fig. 3) describes the king slaying 450 lions, 390 wild bulls and 200 ostriches while trapping a further 30 elephants, 50 bulls, 140 ostriches and 20 lions. The live, captive animals' purpose appears to have been for breeding to stock the palace pleasure gardens. Ostrich bones are rarely found in excavated archaeological contexts, so the birds do not seem to have been a significant food resource.

Ostriches were also viewed as dangerous, wild beasts. They were depicted on seals (fig. 4), terracottas, ivories and vessels lashing out or running at speed. Xenophon, in his *Anabasis* (5.3), written in the early fourth century BCE, noted, "But no ostrich was captured by anyone, and any horseman who chased one speedily desisted; for it would distance him at once in its flight, not merely plying its feet, but hoisting its wings and using them like a sail." The capture of an ostrich, therefore, was an achievement borne from stamina and bravery, for if the ostrich did not outrun its predator, it could kill its foe with a single kick. The Assyrians used such imagery to reinforce notions of royal might and emphasise the king as vanquisher of enemies.

Such iconography of animal conquest extended to lion hunts. The Assyrian king Ashurbanipal (669–631 BCE) had himself depicted on the palace walls at Nineveh slaying lions (figs. 5–7). His ninth century predecessor Ashurnasirpal II used similar imagery in his throne room at Nimrud. Both used these depictions to convey messages of Assyria's military strength, the king's symbolic conquest of foes, and elite prestige.

Fig. 3 (top): Ashurnasirpal II's Banquet Stela, c. 879 BCE, Mosul Museum.

Fig. 4 (bottom): Grey-brown chalcedony cylinder seal showing an Assyrian king fighting with an ostrich, late 8th– early 7th century BCE, British Museum.

Yet these lion hunts were staged, for other panels depict the lion being released into the hunt by an attendant (fig. 8). The king was never going to allow himself to be at risk from mauling by a lion for the sake of an undertaking reserved for the nobility, no matter how symbolic! These hunts were followed by the offering of libations over the slaughtered felines, which suggests that the hunt also served a more ritualised function in consolidating royal power. Nevertheless, there remains a practical question to consider: if the hunt was not a true hunt, but a ritualised activity engineered for safety in practice, what else was manipulated by the Assyrians in their projection of status?

This returns us to ostrich eggs. It would have been known that ostrich eggs were hard to acquire from the dangerous beast that is the ostrich, and this no doubt enhanced their luxury status: not only were they hard to acquire for a Minoan in Crete or an Etruscan in Italy because they came from far away, but they were also hard to acquire because of the physical risks in the first place. Yet we also know that ostriches take very well to captivity. Therefore, could the Assyrians have been manipulating the idea of ostrich eggs as luxuries that were difficult to acquire, and thus exploiting presumptions of their value? This is akin to our notion today of the worth of pearls. The biological process to produce a natural or cultured pearl is the same. It starts with an irritant such as a parasite or food particle being caught inside the bivalve. The mollusc protects itself by encasing the offending speck in layers of the mineral aragonite and the protein conchiolin. As a composite material, this is called nacre, which we know more commonly as mother-of-pearl. Chemically-speaking, natural and cultured pearls are indistinguishable. Their only difference is that in the case of the former, the irritant enters naturally, whereas in the case of the latter, human intervention introduces the irritant. From a fungible perspective, however, natural and cultured pearls have very different values, with the former far more expensive than the latter. To return to ostrich eggs, therefore, an Etruscan king would not have known if the egg he had acquired for interment purposes had been retrieved as part of a risky sourcing expedition or obtained from a managed environment.

To understand the true nature of this wider ancient Mediterranean luxury market, therefore, we must begin with establishing for its products their full *chaîne opératoire*, the technical and social processes of step-by-step production and distribution. Only by this means can we understand the full extent of how economic and social values travelled across cultures.

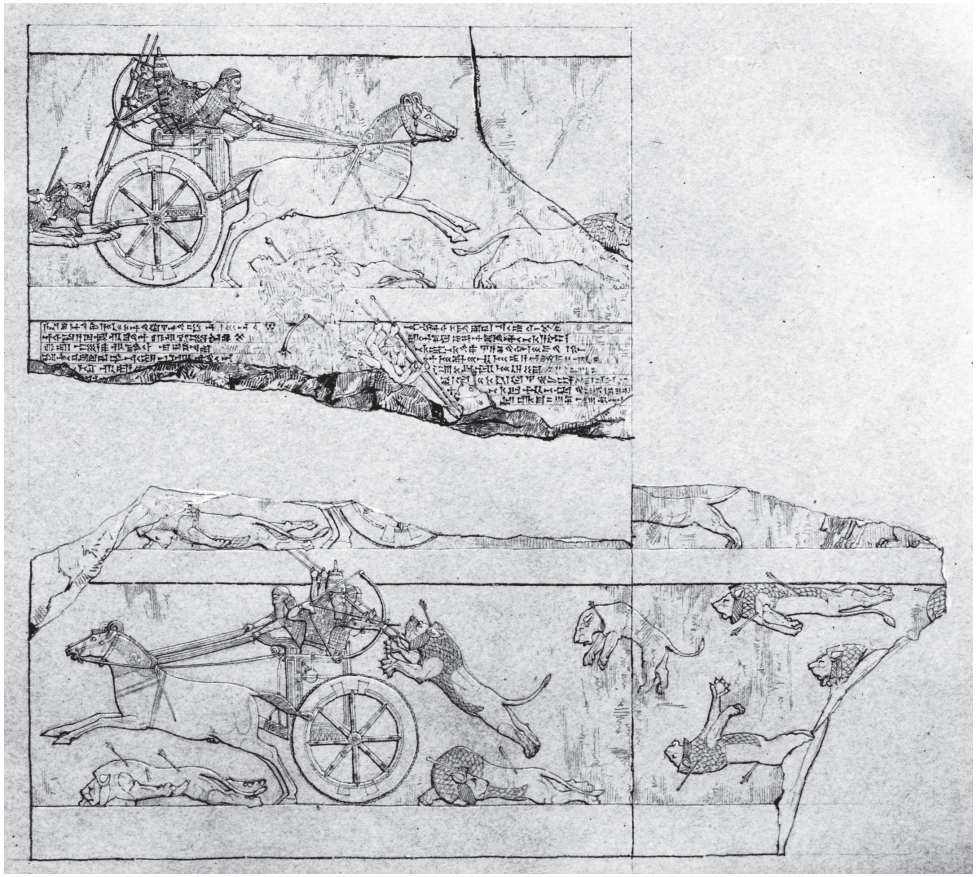

Fig. 5 (top left): Gypsum wall relief panel of a royal lion hunt, from the North Palace, Nineveh, c. 645-640 BCE, British Museum.

Fig. 6 (bottom left): Gypsum wall relief panel of a royal lion hunt, from the North Palace, Nineveh, c. 645-640 BCE, British Museum.

Fig. 7 (right): Pencil drawing by William Boutcher showing a fragmented Assyrian royal lion hunt, used in the original publications of the excavation by Layard, mid-19th century CE, British Museum.

Fig. 8: Detail of a gypsum wall panel relief showing a lion being released from a cage, from the North Palace, Nineveh, 645-640 BCE, British Museum.

EGGSTRAORDINARY OBJECTS

In this regard, the crux of our study has been five complete ostrich eggs in the British Museum. They are associated with the Isis Tomb of the Etruscan site of Vulci (Italy); the tomb is dated to between the late seventh century and first half of the sixth century BCE. Four of the eggs were incised and painted; one was just painted (figs. 9–13). Motifs include animals, flora, geometric patterns, soldiers and chariots. All were fashioned into vessels with metal attachments, although none of the metallic fittings themselves survive.

The tomb itself was discovered in 1839 on the estate of Napoleon Bonaparte's brother, Lucien Bonaparte, Prince of Canino, who had been granted his land to the north-west of Rome by the Pope. The tomb is known as the Isis Tomb because of a bronze statue found in the tomb that was originally thought to be of Isis but is now regarded as a local work of an Etruscan deity (fig. 14). Additional Egyptian paraphernalia associated with the burial includes several faience flasks, over half a dozen scarabs, and approximately 33,000 faience beads that have been chemically identified as Egyptian in origin; they were likely strung together as a shroud. A gold diadem, a number of bronze utensils and vessels, bucchero pottery, two gold foil-covered terracotta statuettes, and a half life-size gypsum statuette form the rest of the assemblage.

Whether this assemblage represents the contents of the grave is uncertain, for no formal catalogue was made at the time of excavation, and the objects were displayed by Lucien Bonaparte for many years in a cabinet of Egyptian antiquities at his villa near Vulci that may have included material acquired directly from Egypt. Nevertheless, the fusing of some of the Egyptian faience beads to bronzework of Etruscan manufacture does suggest that at least some of what came to the British Museum in 1850 as a tomb group was likely recovered from an Italian context.

Given the mix of objects from Etruria and Egypt, the origin of the ostrich eggs has been the subject of much discussion, which until very recently had focused only upon their iconographic style. The motifs and working methods of these eggs have been compared with Iron Age Levantine and Mesopotamian ivory working, whereas skilled ostrich egg decorating during the seventh and

Fig. 9: Decorated ostrich egg from the Isis Tomb, Vulci, c. 625 BCE, British Museum.

Fig. 10: Decorated ostrich egg from the Isis Tomb, Vulci, c. 625 BCE, British Museum.

Fig. 11 (top): Decorated ostrich egg from the Isis Tomb, Vulci, c. 625 BCE, British Museum.

Fig. 12 (bottom): Decorated ostrich egg from the Isis Tomb, Vulci, c. 625 BCE, British Museum.

Fig. 13: Painted ostrich egg from the Isis Tomb, Vulci, c. 625 BCE, British Museum.

Fig. 14: Bust of riveted sheet bronze from the Isis Tomb, Vulci, c. 600-575 BCE. Originally thought to be the Egyptian goddess Isis, but now regarded as representing an Italic deity, British Museum.

sixth centuries BCE is associated with both North Africa and the Levant. Thus, some scholars have argued that these objects were decorated imports; others have suggested they were worked by migrant Phoenician craftsmen in Etruria; still others believe they were made by local Etruscan craftsmen who were familiar with eastern Mediterranean styles and techniques.

The geographic origins of the eggs themselves prior to working remain obscure. Yet this is central to the question of who 'made' a decorated egg, for acquisition of materials is the first step of the entire *chaîne opératoire*. Since ostriches are not indigenous to Italy, the eggs represent imported objects in one capacity or another, i.e. as finished products or for the raw (egg-shell-as-) material. Furthermore, the Levantine features of their iconography – regardless of whether they were decorated by Phoenicians or other artisans – distinguishes them from the rest of the Isis Tomb assemblage, which otherwise consists of Italic and Egyptian artefacts. Therefore, their geographic origins are fundamental to the question of who made them.

A CRACKING CONUNDRUM

To determine their origins, we assessed three main aspects of their production biography: whether we could successfully assign an ostrich egg to a geographic/climatic region; whether the ovulating bird was wild or captive; and how, exactly, were the eggs decorated in terms of techniques and tools? This combined approach allowed us to move beyond iconography to ascertain the eggs' origins.

To address our questions, we used high-resolution digital microscopy, scanning electron microscopy, and isotopic analyses. The microscopy was undertaken to examine working techniques to evaluate tools and determine working methods, an assessment not previously conducted on these types of decorated eggs. Isotopic indicators are an established means to assess past geo-ecological origins of various types of organic remains; they have been used successfully with the ostrich eggs of South African species not only to establish regional origin but also to distinguish wild from captive mothers. Prior to our study, however, these isotopic methodologies had not been applied to eggs from Mediterranean contexts, and never in conjunction with assessment of working and decorating techniques.

Not only did we look at the five complete eggs from the Isis Tomb, but also we compared them with an additional 39 ostrich eggshell sherds from the British Museum that dated to between the fifth millennium and first millennium BCE. We regarded the earlier eggs as representative of periods when materials were very unlikely to have moved long distances. We also used modern eggs from Egypt, Israel, Jordan, and Turkey to provide comparative data from known latitudes and as baseline indicators for farmed birds with restricted diets.

Our purpose was not only to answer questions about the mechanisms and routes of luxury production and trade in the ancient world, but also to inform our understanding of the extent to which luxuries impact today's globalised world, both between cultural groups and beyond their elite consumers.

WORKING OUT THE WORKING

In the British Museum's Department of Scientific Research, ten ancient decorated examples were assessed for tool marks and working techniques with a stereomicroscope at various magnifications. Five of these were also examined in a variable pressure scanning electron microscope (VP-SEM), with inorganic pigments analysed via energy-dispersive X-ray spectroscopy (SEM-EDX). Modern reference ostrich eggshell and some experimentally-modified modern ostrich eggshell fragments were also examined using VP-SEM. For the experimental fragments, which derived from a modern ostrich egg we had purchased from Fortnum & Mason, an upmarket department store in central London, we used steel tools, flint, bone, and antler to make incision marks. We buffed, smoothed, and abraded using pumice and cuttlefish bone to replicate as closely as we could the kinds of tools we believed the ancient craftsmen may have used.

We were able to characterise several different working methods to produce carved images and the use of pigments. Techniques included polishing; smooth scraping; scratching and pecking; picking (fig. 15); abrading; and shaving (fig. 16). Macroscopically visible pigment colours were predominantly red and black that derived from red ochre and carbon respectively; other pigment traces were also visible.

Fig. 15: Cuneiform letter produced by picking. Iron Age Nineveh, British Museum.

We were able to replicate only some of the methods that were macro- and microscopically visible with our own experimental efforts. Our superficial incisions in the outer surface of modern ostrich eggshell pieces exhibited a similar V-shaped profile to those seen in the ancient examples, while deeper incisions that penetrated the palisade layer had a U-shaped profile also seen in the antique specimens. Additionally, we were able to recreate scuffing or judder marks observed on the

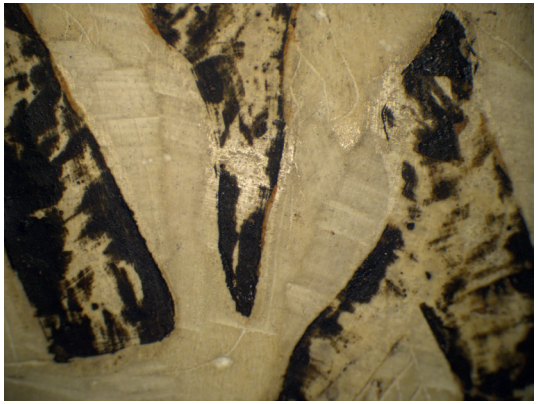

Fig. 16: Leg details produced by shaving. Isis Tomb, Vulci, c. 625 BCE, British Museum.

archaeological eggs. But we were unable to replicate the range of technical skill displayed in the decorated archaeological examples, and in some cases we could not determine how they were polished or what tools were used to decorate them. There was a surprising number of different techniques in all aspects of the production process, and we could not correlate these conclusively with egg findspots. No doubt, this is because our dataset was small.

Our inability to reproduce the range of fashioning methods seen in the ancient examples may also pertain to our own lack of knowledge about egg carving in principle at the time we undertook our experimental activities. In an interview I conducted subsequently with the President of the Egg Crafters Guild of Great Britain, I learned that an ostrich egg, once emptied, must be left to dry for at least six months and ideally up to two years before it is suitable for carving. This is to allow any water molecules in the matrix of the eggshell, which is gas-permeable, to evaporate. The drying process cannot be accelerated by artificial methods, such as putting the egg in the sun or keeping it in a warm oven. Our eggshell had been emptied of its 1.2 kg of yolk and albumen, the equivalent to two dozen chicken eggs, only eighteen hours before we commenced our decorative experiments on it.

Nevertheless, the diversity and variability of egg carving techniques of the ancient examples, and our experimental efforts, demonstrate how highly skilled the ancient craftworkers were. More data are required to ascertain if certain techniques can, indeed, be associated with eggs from particular findspots. Comparison of any such patterns with isotopically-determined egg origins may help unpick questions such as where or when an egg was decorated within the trade process.

WHERE WAS AN EGG LAID?

This leads us to the question of egg origin. We used strontium, carbon, and oxygen isotope analyses to establish whether the ancient eggs had isotope ratios matching the region in which they were found, with our modern eggs providing geographic and dietary reference. An ostrich egg is comprised of ~95% inorganic calcite ($CaCO_3$) formed from the food and water ingested by the female bird during ovulation. Ostrich eggs therefore have the potential to act as a palaeoenvironmental proxy. Specifically, they provide evidence of the residential habitat of the adult female bird through combined analyses of strontium ($^{87}Sr/^{86}Sr$), oxygen ($\delta^{18}O$) and carbon ($\delta^{13}C$) isotope ratios in the eggshell. Nitrogen isotopes are also a potentially useful dietary proxy in ostrich eggs but required too great a mass (c. 50 mg) to be removed from what are museum objects.

Strontium isotopes in ostrich eggs derive from the underlying geology, via water, grit and vegetation consumed. Oxygen isotopes vary geographically in precipitation and groundwaters with climate, latitude, altitude, and distance from the coast. Wild ostriches are non-obligate drinkers, tolerant of high aridity, and can raise their body temperature to conserve water. As a consequence, they may hydrate through plant-leaf water. Therefore, the oxygen isotope ratio of ostrich eggshell will reflect that of the plants consumed by the female whilst ovulating, rather than local water sources. The plant-leaf water oxygen isotope and plant carbon isotope ratios are positively correlated with temperature and aridity, however, and are thus regarded as proxies for climate change over time or movement between different climatic zones. Carbon isotope ratios of animal tissues will also record the differential consumption of C_3 and C_4 plants (which relates to how different types of plants photosynthesise). Both types grow in the study region. As a result, ostrich eggshell carbon isotope ratios reflect both diet and environment. Used together, at a range of sites, these isotope systems offer the potential to investigate individual variation in ostrich eggs, and to characterise possible origins based on diet, geology and climate.

Much of the study region's underlying geology consists of limestone, calcareous sandstone, and basalt. In many areas, however, the bedrock is overlain by aeolian sediments, which remove the connection between the bedrock geology and biosphere strontium. Therefore, despite different bedrock at the sites from which ostrich eggs were recovered, we have a small range of strontium isotopes that are consistent with sediments derived from limestones and calcareous sandstones. These strontium isotope ratios correlate with previous studies of plants, animals and humans.

One egg from Amara West (Sudan) had a significantly higher strontium isotope ratio than other eggs excavated at the site, whereas one egg from Ur (Iraq) had a particularly low ratio comparatively. This suggests that these two eggs were laid by birds living in different geological and hence geographical environments than for the other eggs at the same sites.

The carbon and oxygen isotope data vary widely, but with the eggs clustering into two groups. Group 1 is characterised by dry and semi-arid environments with predominantly C_3 plant consumption. Group 2 is characterised by arid and hyper-arid environments and C_4 plant consumption. There appears to

be a dividing geographical line at 30°N latitude that distinguishes the cooler/wetter from the hotter/drier zones. For sites with multiple samples, outliers were again identified (Ur in Iraq; A'Ali in Bahrain; Naukratis in Egypt), suggesting the female was elsewhere during egg laying. This was unexpected and adds a potential new level of complexity to our understanding of the movement of luxury materials in their production biographies.

But what about our eggs from regions where ostriches are not indigenous, like those found at Vulci in Etruria? In fact, we had two examples in our study from areas where ostriches are not indigenous: one egg from Vulci that was suitable for sampling (fig. 17), and an eggshell sherd from Salamis on Cyprus. These two eggs group with examples deriving from sites in cooler semi-arid environments. Unfortunately, this does not help us distinguish between the Nile Delta, the Phoenician homeland, or Mesopotamia.

While there is clearly more work to do to determine where the Isis Tomb eggs originated from, this was not our only question about ancient decorated ostrich eggs.

WERE THE EGGS GATHERED FROM CAPTIVE OR WILD BIRDS?

We hoped to address whether the ancient birds laying these eggs were wild or captive through carbon and oxygen isotope evidence relating to diet. We hypothesised that highly divergent data could indicate the eggs were taken from the wild. There was much less variation in our modern eggs than the archaeological ones, which may be a function of the geographically and climatically limited range from which the farmed eggs were obtained, and possibly the long-distance transport of modern feedstuffs. For the ancient examples, it was impossible to ascertain a definite pattern owing to small sample numbers from each site.

Whilst there is a clear correlation in the ancient eggs between location, aridity and temperature, this does not extend to local precipitation values. The data could not be directly correlated with precipitation due to ostrich body-water being primarily obtained from ingested plants. If we had to take a guess, however, we would err on the side that the high oxygen isotope ratios of the archaeological eggs suggest that our ancient birds were not supplied with drinking water and therefore were wild.

In a study on respiratory pores in ostrich eggshells undertaken by another team, the authors noted that pronounced ridging and grooving of egg surfaces from wild birds may be due to the need for stronger shells and effects of environmental stresses; the surface of farmed eggs is mostly smooth by comparison. On our examples, viewed via the SEM, fine, randomly-oriented intersecting lines were seen that appeared unrelated to decorative motifs or smoothing methods, which were identified separately. Such pronounced lines were not observed on the modern, farmed eggs we examined. We would tentatively suggest that our ancient examples therefore are more likely to have come from wild birds than captive ones. This has implications for determining the relative value of ostrich eggs in the ancient world and thus returns us to the balance between technical and social processes that underpin the *chaîne opératoire*.

Fig. 17: The only ostrich egg from Vulci sampled for isotopic analysis, which is a destructive methodology, British Museum.

THE BIOGRAPHY OF A LUXURY

Let us think about the biography of these decorated eggs from a practical perspective. It begins with individuals who had to track the animals to their nest sites and then try to steal the eggs from their nests, whether by stealth or killing the parents. Either way, acquiring eggs entailed risk to the tracker. Firstly, it could take days to find nest sites, since a male ostrich's territory may extend up to 20 km^2, and nest locations seem to have no relation to nest sites from previous seasons within a territory. Secondly, while the ostrich was recognised as a dangerous animal – we know that they can kill with a single kick – other predators equally dangerous to humans inhabited the same ancient landscapes as ostriches, such as lions and elephants. Therefore, even if the tracker chose to kill an ostrich to acquire its eggs rather than merely steal the eggs, the bird itself was not the only threat. To acquire fresh ostrich eggs in antiquity was no easy feat, yet the quantity of decorated ostrich eggs that we find in the Mediterranean, particularly during the Iron Age, suggests that there was a reasonably plentiful supply.

Furthermore, our results have revealed that just because someone could source an ostrich egg locally it does not mean they necessarily always did. The fact that egg sources may have fluctuated between relatively local and more distant locations in both the Bronze and Iron Ages implies that trade networks in eggs was more flexible, opportunistic and extensive than has been considered previously (if considered at all). This suggests that there were a range of middlemen who had to acquire the eggs and then bring them to sell or somehow exchange them in areas where ostrich eggs could be procured. Did eggs from different areas have different perceived values? Who conducted these exchanges? What arguments would an individual have used to persuade someone to acquire their 'foreign' eggs when eggs could be acquired more regionally? Is it purely a social understanding, like our own perception regarding brown and white chicken eggs? There is no nutritional difference between a brown or white hen egg. Eggshell colour is a genetic trait and correlates with the colour of the hen's earlobes (yes, hens have earlobes!). Yet in areas where brown eggs predominate, white eggs are more expensive, and vice versa. It is a completely down to our own social values. Was it a similar circumstance for the ostrich eggs in antiquity?

Our study has also demonstrated that the production stage is more complex than we had realised because of previously unrecognised storage needs. We know from modern egg crafters that an egg is not ready for carving for at least six months and ideally is best left for two years. This implies there were individuals responsible for the eggs' safe storage for an extended period of time. This step

may have added to the eggs' luxury status, since it represents a long-term investment before a return can be realised. Who took this hit in the supply chain?

Only once the eggs were suitably dried could highly skilled craftsmen proceed to undertake their decoration. This introduces questions about the iconographic decisions. Who determined the imagery – craftsman or patron? Traders were then required to transport the eggs from workshops and arrange for their distribution around the Mediterranean by sea and then land. There were then other middlemen at the destinations to take possession of these objects and sell them on to local elites through local networks. In short, many hands were involved in the biographies of these luxury objects.

LUXURIES PAST AND PRESENT

Despite our deeper understanding now of the scale and complexity of the production and distribution of decorated ostrich eggs around the ancient Mediterranean world, there is still much we do not understand. Additional experimental work, more comparative data and further study of decorating techniques are necessary to investigate discernible patterns regarding not just egg decoration, and their potential geographic origins, but also the origins and production methods of their components, like pigments, and the individuals involved in those aspects of procurement, production and distribution.

Nevertheless, this project already has revealed that the mechanisms of creation, production and trade in exotic organic materials in antiquity are of unexpected complexity that necessitate further study to understand the true extent of the role luxury objects played within and between the societies in the wider Mediterranean past. Luxury material culture had significant impacts upon individuals and groups beyond just their final, wealthy consumers. This point has resonance in our lives today. We face continued substantial uncertainty as the world still addresses the impact of Covid-19, and many of us are practicing economic restraint even though our circumstances may now be more secure. Nevertheless, I invite you to indulge in a luxury acquisition this holiday season and to not feel guilty or anxious about it. Your purchase will be supporting the livelihoods of more individuals around the world than you might imagine, for what may seem like an extravagance to you will mean someone else, somewhere else, gets to eat. May this empower your decision.

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REFERENCES:

Albenda, P. 2005, *Ornamental Wall Painting in the Art of the Assyrian Empire*, Leiden.

Albenda, P. 2008, Assyrian Royal Hunts: Antlered and Horned Animals from Distant Lands, *Bulletin of the American Schools of Oriental Research* 349, 61–78.

Appadurai, A. 1986, Introduction: Commodities and the Politics of Value, in A. Appadurai (ed.), *The Social Life of Things*, Cambridge, 3–63.

Aruz, J. *et al.* (eds.) 2014, *Assyria to Iberia at the Dawn of the Classical Age*, New York.

Barnett, R.D. 1982, *Ancient Ivories in the Middle East*, Jerusalem.

Bertram, B.C.R. 1992, *The Ostrich Communal Nesting System*, Princeton.

Brown, L.H. *et al.* 1982, *The Birds of Africa, Volume* 1, London.

Brysbaert, A. 2013, 'The Chicken or the Egg?' Interregional Contacts Viewed through a Technological Lens at Late Bronze Age Tiryns, Greece, *Oxford Journal of Archaeology* 32(3), 233–256.

Collon, D. 1977, Ivory, *Iraq* 39, 219–222.

Collon, D. 1998, First Catch your Ostrich, *Iranica Antiqua*, 25–42.

Conkey, M.W. and C.A. Hastorf (eds.) 1993, *The Uses of Style in Archaeology*, Cambridge.

Evely, D. 1993, *Minoan Crafts*, Gothenburg.

Feldman, M.H. 2014, *Communities of Style*, Chicago.

Freitag, S. and T.J. Robinson, 1993, Phylogeographic Patterns in Mitochondrial DNA of the Ostrich (*Struthio camelus*), *The Auk* 110(3), 614–622.

Gosden, C. 2005, What do Objects Want? *Journal of Archaeological Method and Theory* 12(3), 193–211.

Graeber, D. 2001, *Toward an Anthropological Theory of Value*, Basingstoke.

Gunter, A. 2009, *Greek Art and the Orient*, Cambridge.

Haynes, S. 1977, The Isis-Tomb, do its Contents form a Consistent Group?, in A. Neppi Modona (ed.), *La civiltà arcaica di Vulci e la sua espansione. Atti del X Convegno di Studi Etruschi e Italici*, Florence, 17–29.

Haynes, S. 2000, *Etruscan Civilization*, London.

Hermann, G. 2000, Ivory Carving of the First Millennium: Workshops, Traditions and Diffusion, in C. Uehlinger (ed.), *Images as Media*, Fribourg, 267–287.

Hodos, T. 2018, Luxuries during the Mediterranean's Iron Age Period, in A. Fletcher (ed.), *An Age of Luxury: the Assyrians to Alexander*, Hong Kong, 10–23.

Hodos, T. 2020, Eggstraordinary Artefacts: Decorated Ostrich Eggs in the Ancient Mediterranean World, *Humanities and Social Sciences Communications* 7, article 45: <https://www.nature.com/articles/s41599-020-00541-8> (last accessed 25 October 2021).

Hodos, T. 2020, *The Archaeology of the Mediterranean Iron Age*, Cambridge.

Hodos, T. *et al.* 2020, Origins of Decorated Ostrich Eggs in the Ancient Mediterranean and Middle East, *Antiquity* 94(374), 1–20.

Johnson, B.J. *et al.* 1998, Stable Isotopes in Modern Ostrich Eggshell: a Calibration for Paleoenvironmental Applications in Semi-Arid Regions of Southern Africa, *Geochimica et Cosmochimica Acta* 62(14), 2451–2461.

Joy, J. 2009, Reinvigorating Object Biography: Reproducing the Drama of Object Lives, *World Archaeology* 41(1), 540–556.

Kandel, A.W. 2004, Modification of Ostrich Eggs by Carnivores and its Bearing on the Interpretation of Archaeological and Paleontological Finds, *Journal of Archaeological Science* 31, 377–391.

Karlsson, M. 2016, *Relations of Power in Early Neo-Assyrian State Ideology*, Berlin.

Koyama, T. and A.J.D. Tennyson, 2016, Respiratory Pores on Ostrich *Struthio camelus* (Aves: Struthionidae) Eggshells, *Advances in Experimental Medicine and Biology* 923, 51–55.

Kopytoff, I. 1986, The Cultural Biography of Things: Commoditization as Process, in A. Appadurai (ed.), *The Social Life of Things. Commodities in Cultural Perspective*, Cambridge, 64–91.

Le Meaux, H. 2013, Des ivoires et des œufs, *Mélanges de la Casa de Velázquez* 43(1), 85–110.

Markoe, G.E. 1992, In Pursuit of Metal: Phoenicians and Greeks in Italy, in G. Kopcke and I. Tokumaru (eds.), *Greece between East and West, 10th–8th Centuries BC*, Mainz, 61–84.

Marshall, Y. and C. Gosden (eds.) 1999, The Cultural Biography of Objects, *World Archaeology* 31(2), 169–320.

Middleton, A.P. 2009, Beads beyond Number: Faience from the 'Isis Tomb' at Vulci, Italy, in A.J. Shortland *et al.* (eds.) *From Mine to Microscope: Advances in the Study of Ancient Technology*, Oxford, 69-78.

Napolitano, F. 2004, Considerations on the Making and Use of Colours in Etruria during the Middle Orientalising Period, *Etruscan Studies* 10, 11-26.

Onnis, F. 2013, The Influence of the Physical Medium on the Decoration of a Work of Art: a Case Study of the 'Phoenician' Bowls, in B.A. Brown and M. Feldman (eds.), *Critical Approaches to Ancient Near Eastern Art*, Boston, 159–84.

Papadopoulos, J. and G. Urton, 2012, Introduction: the Construction of Value in the Ancient World, in J. Papadopoulos and G. Urton (eds.), *The Construction of Value in the Ancient World*, Los Angeles, 1–50.

Phillips, J. 2000, Ostrich Eggshells, in P.T. Nicholson and I. Shaw (eds.), *Ancient Egyptian Materials and Technology*, Cambridge, 332–333.

Poplin, F. 1995, Sur le polissage des œufs d'autruche en archéologie, in H. Buitenhuis and H.-P. Uerpmann (eds.), *Archaeozoology of the Near East, Volume* 2, Leiden, 126–139.

Porter, J. 2012, The Value of Aesthetic Value, in J. Papadopoulos and G. Urton (eds.), *The Construction of Value in the Ancient World*, Los Angeles, 336–353.

Rathje, A. 1986, Five Ostrich Eggs from Vulci, in J. Swaddling (ed.), *Italian Iron Age Artefacts in the British Museum*, London, 397–404.

Renfrew, C. 2012, Systems of Value among Material Things: the Nexus of Fungibility and Measure, in J. Papadopoulos and G. Urton (eds.), *The Construction of Value in the Ancient World*, Los Angeles, 249–260.

Robinson T.J. and C.A. Matthee (1999), Molecular genetic relationships of the extinct ostrich, *Struthio camelus syriacus*: consequences for ostrich introductions into Saudi Arabia, *Animal Conservation* 2(3), 165–171.

Savio, G. 2004, *Le Uova di Struzzo Dipinte nella Cultura Punica*, Madrid.

Torelli, M. 1965, Un uovo di struzzo dipinto conservato nel Museo di Tarquinia, *Studi Etruschi* 33, 329-365.

Walsh. J. 2013, *Consumerism in the Ancient World: Imports and Identity Construction*, New York.

Winter, I. 1976, Carved Ivory Furniture Panels from Nimrud: a Coherent Subgroup of the North Syrian Style, *Metropolitan Museum Journal* 11, 25–54.

Winter, I. 1976, Phoenician and North Syrian Ivory Carving in Historical Context: Questions of Style and Distribution, *Iraq* 38, 1–22.

Winter, I. 1982, Is there a South Syrian Style of Ivory Carving in the Early First Millennium BC?, *Iraq* 43, 101–130.

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