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Making the Lion Gate Relief at Mycenae: Tool Marks and Foreign Influence

NICHOLAS G. BLACKWELL

Abstract

This article considers the stoneworking techniques and implements that were employed in the production of the Lion Gate relief at Mycenae, as deduced from tool marks preserved on the sculpture. Examination of these traces has revealed previously undetected details while highlighting the indispensable roles of tubular drills and saws—especially a large pendulum saw and a smaller convex blade—in the manufacturing process. A new illustration of the relief depicts the location of all discernible tool marks and other minute features, most of which are hidden to the on-ground viewer. The analytical conclusions from this investigation substantially advance our understanding of the monument's construction. The date of the relief and sequence of its production, as well as unexpected evidence for repair during the Bronze Age, are now clear. Moreover, evaluation of the extant tool marks suggests that the relief's composition should be reconstructed as heraldic lions turning their now-missing heads backward. Finally, this article argues that specific stonecutting methods evident on the relief have strong parallels in central Anatolia, so the prospect of Hittite and Mycenaean interaction, particularly on a technological level, is appraised.*

INTRODUCTION

The past 200 years have witnessed no shortage of interest and opinion about the Lion Gate relief at

Mycenae, yet earlier writings about the monument are surprisingly sparse, from both classical and early traveler accounts.¹ The grandeur of Mycenae's citadel entrance was ignored by all ancient writers except for Pausanias (2.16.5–6), who briefly mentions the city walls, the gate, the lion-adorned relief, the Graeco-Roman tradition of attributing the work to the Cyclopes, several treasure chambers (presumably tholoi), and certain graves belonging to Mycenae's heroic figures.² A short excerpt of that account is provided here:³

λείπεται δὲ ὅμως ἔτι καὶ ἄλλα τοῦ περιβόλου καὶ ἡ πύλη, λέοντες δὲ ἐφεστήκασιν αὐτῇ· Κυκλώπων δὲ καὶ ταῦτα ἔργα εἶναι λέγουσιν, οἱ Προίτῳ τὸ τεῖχος ἐποίησαν ἐν Τίρυνθι.

Other parts of the wall are still preserved as well as the gate over which lions stand. These also they say are the work of the Cyclopes who built the wall for Proetus at Tiryns.

It is perplexing that other classical sources fail to reference the gate or its relief, for the sculpture was most likely visible during the historical period at Mycenae. During the site's Hellenistic phase, a theater was built

*The Fourth Ephoreia of Prehistoric and Classical Antiquities in Nauplion, through the American School of Classical Studies at Athens (ASCSA), graciously issued me a permit to study the tool marks and surface details on the Lion Gate relief at Mycenae. I am extremely grateful to A. Papadimitriou for permitting me to undertake this study, as well as to the other staff of the Fourth Ephoreia for their help with the logistics of my research. This project could not have been completed without the encouragement and guidance of J. Wright, J. Davis, R. Bridges, and I. Damanaki at the ASCSA. G. Bianco was instrumental in the study, both for her exemplary and indispensable illustrations and for her keen observations, consistent feedback, and dedication. I thank G. Chronis, site guard at Mycenae, for his assistance, and K. Shelton for lending me her ladder. This fieldwork was performed over five days in November 2011 and was funded by the Harriet and Leon Pomerance Fellowship from the Archaeological Institute of America. Finally, I am grateful for the advice and suggestions offered by the *AJA* editors and anonymous reviewers; this article is improved immeasurably on account of their attention.

Any remaining errors are mine alone. Additional figures can be found under this article's abstract on the *AJA* website (www.ajaonline.org). Figures are my own unless otherwise noted.

¹For a thorough overview of the literature from 1810 to 1961, see Åström and Blomé 1964, 160–76. For later studies on the relief, see Mylonas 1966, 171–75; 1970, 423–25; 1983; Protonotariou-Deilaki 1967; Nojorkam 1968; Kardara 1970; Scoufopoulos 1971, 101; Hiller 1973; Younger 1978, 298; 1984; 1987a; Iakovidis 1983, 31; Shaw 1986; Boulotis 1990, 455–57; Bloedow 1996, 1159–63; Iakovidis and French 2003, 11.

²Iakovidis and French 2003, 11. Homer uses epithets when referring to Mycenae (e.g., “well built” [*Il.* 2.569], “rich in gold” [*Il.* 7.180, 11.46; *Od.* 3.305]) but fails to mention the gate (Wace 1962, 387). Diodorus Siculus (11.65.5) and Strabo (8.6.10, 8.6.19) claim that Mycenae, having been destroyed by the Argives in the fifth century B.C.E., was uninhabited during their lives, and so they do not describe the town or the entranceway.

³Translation by Wace 1949, 7. For discussion of Pausanias' Mycenae account, see Wace 1949, 7–8; 1962, 397–98.

into the Tomb of Clytemnestra; the Perseia Fountain House was constructed; and repairs were made to the temple on the citadel and the Cyclopean circuit walls.⁴ As for the earliest modern travelers to the Argolid, they did not identify Mycenae, and recorded visits to the site are unattested before 1500 C.E. Following Pausanias' *Description of Greece*, the Lion Gate appears again in travelogues only in 1700 C.E., when the Venetian Francesco Vandeyk visited Mycenae in search of worked stone for nearby Nauplion.⁵ The lacuna in the literature is surprising given the gate's prominent location, but vegetation probably covered much of the citadel and possibly the relief. Early 19th-century traveler sketches and descriptions indicate that soil and bushes filled the path leading up to the gate but that the relief itself was visible at that time.⁶ In 1801, Lord Elgin and his crew considered removing the relief but abandoned this thought on account of the stone's massive size and weight.⁷ Instead, they concentrated their Mycenae operations on the Treasury of Atreus.⁸ In 1841, Kyriakos Pittakis and the Archaeological Society at Athens cleared the earthen debris blocking the Lion Gate; since then, the sculpture and gateway have gained worldwide renown.⁹

Scholarship has rarely addressed the technology behind the facade's production, despite a lengthy bibliography on the relief. Wace's basic analysis of the monument and Casson's helpful study on early Greek sculpture are exceptions.¹⁰ Most studies have focused on the relief's symbolism, style, and composition, as well as the defensive arrangement of the gateway complex.¹¹ Physical details of the relief have been overlooked. This may be because of the difficulty of obtaining an optimal visual perspective. As one approaches the citadel up an inclined path, the vantage point of the relief is necessarily angled. The relief rests on a lintel more than 3 m above the ground, a considerable enough distance to hinder visual assessment (fig. 1). Consequently, several aspects of the relief went unconsidered in previous illustrations and analyses. Ubiquitous drill and saw cuttings and the techniques that produced them, for instance, are largely ignored in drawings and scholarly discussions.¹²

The aim of my project then, was to inspect, measure, and photograph the relief and its tool marks from the vantage of a ladder. As a result of this detailed work, numerous observations about the sculpture are presented here for the first time. This fresh data and attendant implications enrich our comprehension of this celebrated monument as well as our understanding of the tools and methods employed by its sculptors. Following an overview of the metal tools that were available on the Late Helladic (LH) mainland and a detailed discussion of the physical marks preserved on the Lion Gate relief, the article makes five primary points: (1) the relief belongs to the 13th century B.C.E., as evident in traces of pendulum saw marks, making it part of the extensive LH IIIB building program of the final palace and fortification system; (2) the production sequence of the sculpture can be deduced from the tool marks; (3) the relief incurred damage soon after it was finished, prompting several repairs; (4) the animals depicted in the relief were originally regardant lions; and (5) the use of two particular tools—the tubular drill and a short convex saw—recall Hittite stoneworking traditions suggestive of Anatolian influence if not the actual employment of Hittite artisans. The article concludes with a discussion of Mycenaean and Hittite connections and explores a possible mechanism for the transfer of technology and skilled craftsmanship during the 13th century B.C.E.

THE LION GATE RELIEF AND STONECUTTING IN MAINLAND GREECE

Four massive conglomerate blocks compose the Lion Gate's threshold, lintel, and posts, the first two components weighing more than 20 tons each.¹³ The relief sculpture adorns a single slab of hard limestone placed above the lintel within the so-called relieving triangle. The composition consists of two rampant lions, one on each of the incurved altars flanking a central column that supports an entablature of four beam ends. The relief measures between 3.5 and 3.6 m wide near its base and 1.13 m at its top. It is between 3.0 and 3.1 m high, and the maximum thickness of the block is approximately 0.7 m.¹⁴ Sculptors used

⁴Holland et al. 1953; Wace 1962, 390.

⁵Lavery and French 2003, 1–2; French 2010, 671.

⁶For references, see Åström and Blomé 1964, 159 n. 5.

⁷Hunt and Smith 1916, 200; Mylonas 1983, 79.

⁸Hunt and Smith 1916, 213–14.

⁹Iakovidis and French 2003, 11.

¹⁰Wace 1921–1923, 15–16; 1936, 408; 1949, 52–3; Casson 1933, 23–34; Åström and Blomé 1964, 179 n. 2; Adam 1966, 40–1.

¹¹Supra n. 1.

¹²Musculature lines are occasionally depicted on rough drawings (Ferri 1953, fig. 10; Nojorkam 1968, 234).

¹³Iakovidis and French 2003, 11.

¹⁴The relief, as a whole, was difficult to measure precisely from a ladder, yet my measurements coincide with those of Wace (1949, 52), who records the following dimensions: 3.6 (wdth.) x 3.0 (ht.) x 0.7 m (thickness). Mylonas (1957, 25; 1983, 79), however, reports the width as 3.9 m and the height as 3.3 m. For the top measurement, see Åström and Blomé 1964, 179.



Fig. 1. The Lion Gate relief at Mycenae as seen from below, at ground level.

drills, saws, chisels, punches, hammers/mallets, scoring implements, and polishing devices to fashion this massive relief. The type of stone, the size of the block, and the stoneworking practices in use at the time dictated this combination of tools. Questions about how the monument was made necessitate a chronological overview of the stonecutting tools and practices on the Greek mainland during the second millennium B.C.E. Such a summary is provided below to contextualize the tool marks on the relief, which are discussed in subsequent sections.

Masonry practices on the Greek mainland underwent significant developments during the second millennium B.C.E., especially over the course of the Late Helladic period. In contrast to Protopalatial sites on Crete, Middle Helladic sites offer scant evidence for metal stonecutting tools. A meager assemblage of about 20 implements (chisels, double axes, single axes, a saw, and a drill) is all that is known from the Middle Helladic mainland.¹⁵ Additional quantities must have been in circulation, but their scarcity in the archaeological record coincides with the absence of sophisticated Middle Helladic masonry. The advent of well-cut blocks on the Late Bronze Age mainland coincides with craft influence from Minoan Crete and a substantial rise (a 19-fold increase) in the quantity of

metal tools capable of cutting stone or wood.¹⁶ In the Late Helladic period as a whole, bronze chisels and double axes were the preeminent tools, followed by solid drills, saws, and single axes. Ambiguity persists as to whether these tools were for carpentry or masonry, or for both.¹⁷ Chisels—both narrow and wide types—were the preferred implement for cutting stone blocks. This assertion is postulated from the quantity of chisels (more than 125 examples) recovered at Late Helladic mainland sites and the abundance of chisel marks on masonry.¹⁸

The earliest cut blocks on the Greek mainland were fashioned with chisels and rasps, but there is no evidence for the use of saws and drills on masonry during the Early Mycenaean period.¹⁹ The sculpted Middle Helladic (MH) III/LH I Shaft Grave stelae, for instance, were made of soft limestone and were cut with punches, narrow chisels, and wide chisels.²⁰ Masons also used polishing stones, such as emery and whetstones, to smooth worked surfaces. Well-fashioned blocks appeared on the mainland by the LH I period at Pylos.²¹ In Laconia, two dressed limestone blocks were uncovered in Mansion 1 (LH IIB) at the Menelaion, but these appear to be in a secondary context, belonging originally to an earlier structure (possibly LH IIA).²² Indeed, it was not until LH II that ashlar blocks

¹⁵ Tripathi 1988; Blackwell 2011. The data set for Crete is substantially greater (Evely 1993).

¹⁶ Blackwell 2011, 430, fig. 3.26b.

¹⁷ Experimental work has demonstrated the effectiveness of these tools for carpentry and shipbuilding (Maragoudaki and Kavvouras 2012, 200–6, fig. 4). Shaw (2009, 53) interprets the functional Cretan double axe as a basic tool of Minoan carpenters.

¹⁸ For chisel marks on Mycenaean and Minoan architecture, see Wright 1978, 136; Dakouri-Hild 2001, 88; Nelson 2001, 52–5; Shaw 2009, 46, 52, figs. 62, 63, 86, 88.

¹⁹ Traces of rasp-like marks occur on Mycenaean architecture (Wright 1978, 136; Dakouri-Hild 2001, 88). Bronze files/rasps, however, are rare in the archaeological record. A LH IIB example comes from the Athens Acropolis hoard (Spyropoulos 1972, 74, no. 9, fig. 139). A rasp was also recovered at Late Minoan (LM) I Mochlos (Sole and Davaras 1996, 194–96, pl. 56c).

²⁰ Younger 1997, 232.

²¹ Nelson 2001, 114–17; Englehardt and Nagle 2011, 361–64; Fitzsimons 2011, 95, 98.

²² Wright 2006, 11; Catling 2009, 313–14, pl. 15a, b.

became more common throughout the Peloponnese, specifically within the early tholoi.²³ The spread of this masonry style occurred in Messenia (e.g., Peristeria Tholos I and Tragana Tholos I) and the Argolid (e.g., the Mycenae tholoi known as the Panagia, Lion, and Kato Phournos Tombs) around the same time.²⁴ Conglomerate blocks appear in Wace's second group of tholoi at Mycenae, dated to the 15th century B.C.E., but there is no indication that saws were employed on those stones.²⁵ The development of well-cut masonry during the Early Mycenaean period is likely a result of Cretan influence if not the presence of actual Minoan craftspeople on the mainland.²⁶

Drills with hollow bits are indicated by mortises in masonry, by traces of holes on the interior surfaces of stone vessels, and by the debris—cylindrical stone cores—produced during the drilling process. The device was regularly used in the manufacture of stone vessels in the Aegean and the Near East.²⁷ On Crete, the tubular drill existed during the third millennium B.C.E., but its introduction to Minoan architecture dates to the Protopalatial period with the Chrysolakos burial structure at Malia; the tool was also used on sealstones by the Middle Minoan II period.²⁸ On the mainland, the use of the drill by the Middle Helladic period is evident; drilled cores and stone axes with bored-out shaft holes appear at Ayios Stephanos, other Laconian sites, and Asine.²⁹ The tool's application to mainland architecture, however, is not demonstrated prior to the LH III period. Thus, despite the probable impact of Minoan craftsmanship on the evolution of mainland masonry, the connection and transfer of the Cretan tubular drill to Mycenaean architecture cannot be proved.

Over the course of the Mycenaean era, stoneworking techniques evolved beyond chiseling soft limestone. Stone hammers were employed to dress blocks, and hammer-faced facades are well documented in Mycenaean architecture.³⁰ Conglomerate blocks in

thresholds, gates, and tholoi at Mycenae and Tiryns, as well as the Cyclopean masonry in the walls of both sites, preserve traces of hammering.³¹ Other cuttings on Mycenaean architecture from the Palatial period indicate two important masonry implements that are primarily attested at Tiryns and Mycenae: the first is an impressive stonecutting device known as the pendulum saw, and the second is the aforementioned tubular drill bit.

Visible saw marks on anta blocks at Tiryns were initially thought to have been made by a sawing knife (*Messersäge*) because of their long, arching cuts (fig. 2).³² In an excellent study of Mycenaean architecture, Küpper examined the Tiryns marks meticulously and, following the earlier work of Schwandner, deduced the use of a massive machine whereby a large curved saw blade mounted on an apparatus was swung back and forth in a pendulum-like motion. The radii of the swinging blades—ascertained from the diameter of the arched cuttings—are as large as 7.5 m in some reconstructions.³³ For the blade to swing, it had to be suspended, probably from a wooden frame. This grandiose implement must have been impressive to behold, and though several reconstructions of the device exist, its exact form is unknown.³⁴ Wright understood the pendulum saw as “probably the most technologically advanced device used in architecture during the second millennium.”³⁵ The saw's cutting motion was aided by an abrasive, such as sand or emery. The advantages of the pendulum saw over handheld implements were the length of the saw cut as well as the consistently applied pressure created by the swinging motion of the blade. This force would have been enhanced with an attached weight.³⁶ The device produced clean, smooth cuts through hard materials such as conglomerate. Traces of pendulum saw operations have been identified on anta blocks, thresholds, posts, and lintels at Tiryns, Mycenae (within the citadel itself and the tholoi of Atreus and Clytemnestra), and Gla.³⁷

²³ Wace 1921–1923, 388–92; Wright 1978, 135; Fitzsimons 2011, 93–5.

²⁴ Wright 1978, 135; Fitzsimons 2011, table 5.8.

²⁵ Wace 1921–1923, 388–92.

²⁶ Wright 1978, 147, 272–73; Younger 1997; Nelson 2001, 187–91.

²⁷ Warren 1969, 161; Evely 1993, 77, 84; Bevan 2007, 50–1; Sparks 2007, 188–93; Karetsou and Evely 2012, 85, 94–5.

²⁸ Shaw 1973; Younger 1995, 338–39.

²⁹ Taylour and Janko 2008, 434–35, 567.

³⁰ For the use of stone hammers on Mycenaean architecture, see Wace 1949, 135–36; Mylonas 1966, 16–18; Wright 1978, 159, 189, 202, 217, 258 n. 307, figs. 88, 89, 92, 120; Iakovidis 1983, 6, 12, 29, 34; Loader 1998, 47.

³¹ On hammer dressing of Mycenae tholoi, see Wace 1949, 34, 36, 44, 135–36; Wright 2006, 17, fig. 1.4. On hammer dress-

ing on blocks within the citadels, see Mylonas 1966; Wright 1978; Loader 1998, 47.

³² Dörpfeld 1885, 263–64; Müller 1930, 183–85; Seeher 2007, 30–1.

³³ Schwandner 1991, 219–23; Küpper 1996, 16–25.

³⁴ Schwandner 1991, 220–21, figs. 6–8; Küpper 1996, 217, figs. 142, 286, pl. 12.2.

³⁵ Wright 2006, 34.

³⁶ Schwandner 1991, fig. 8.

³⁷ See Küpper (1996, 22–5) for a discussion of the evidence from Tiryns, Mycenae, and Gla. There is some uncertainty as to whether the cuts on the threshold blocks at Gla were made by a pendulum saw (Küpper 1996, 23; Thaler 2007, 295). Related to this question are pieces of conglomerate slabs from the melathron at Gla that appear to have been cut with a pendulum saw (Iakovidis 2001, pls. 75.168, 75.169).

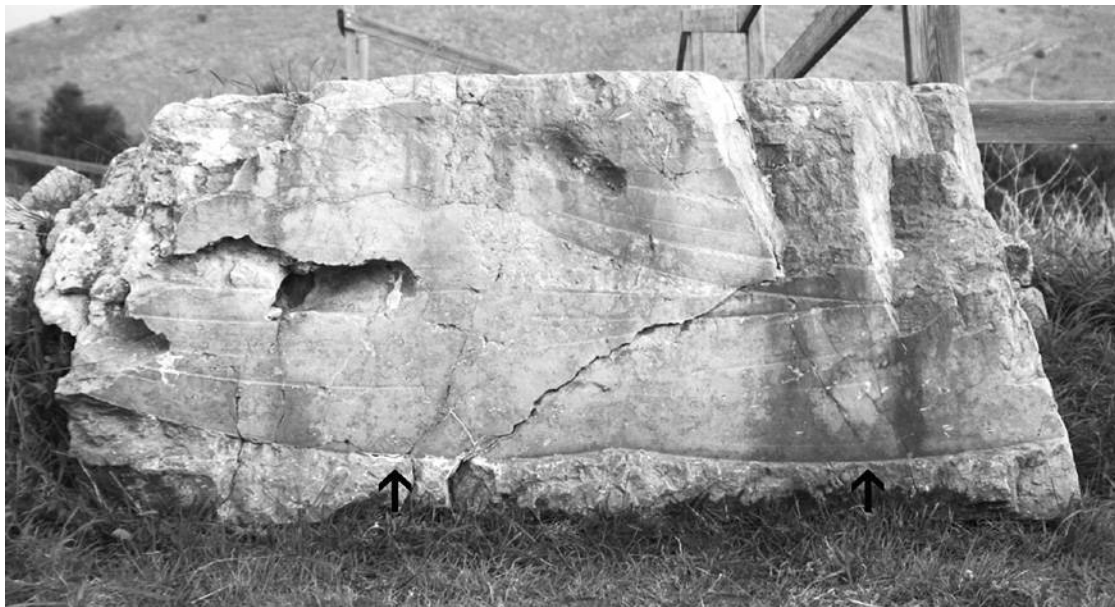


Fig. 2. Numerous pendulum saw cuts on the Great Propylon at Tiryns, southwest anta, south block, west side. The arrows indicate the final two cuts, which are comparable to the marks on the left side of the column on the Lion Gate relief.

Despite the tubular drill's long tradition in the Aegean, the terminus ante quem for its application in Mycenaean architecture is late, judging by the Tiryns throne base, which has been dated to the 14th century B.C.E. (LH IIIA1–A2).³⁸ The inspiration for employing this tool on such masonry need not be related to the much earlier use of the implement in Minoan architecture.³⁹ Furthermore, the Aegean tradition of tubular drill use in stone vessel workshops and lapidaries does not fully account for why or how the implement was transferred to mainland architecture. In light of the popularity of the tool in the contemporary Hittite world, it is worth considering whether the drilling technique evident on Mycenaean architecture stems from Anatolian inspiration; this question is addressed at the end of the article.

Regardless of its origin, the tubular drill—as a masonry implement—was restricted on the mainland, and traces of its use are documented only at Mycenae and Tiryns.⁴⁰ The tubular drill did not cut soft limestone, something Küpper stressed, and so circular

mortises are absent at sites that incorporated only ashlar masonry made of soft limestone.⁴¹ Worked blocks at the Palace of Nestor thus possess rectilinear dowel holes made by chisels instead of drilled mortises; Pylian masons took advantage of the soft limestone and sandstone available throughout Messenia.⁴² Küpper examined 128 drill holes from Mycenae and Tiryns; excluding the Lion Gate relief, which was not part of Küpper's study, the majority of the known examples are from Tiryns.⁴³ There, drilled holes are found in multiple locations: the great Steintor, the anta blocks of both the Great and Small Propylon, pier/pillar bases in the main courtyard, the Great Megaron, the Small Megaron, and the floor slab of the bathing room.⁴⁴ At Mycenae, the masons used the tubular drill in several areas, including the Treasury of Atreus (e.g., for joining the half-column segments to one another and to the column base, and for securing a large door within the stomion); the Lion Gate and North Gate entryways; the South House; the palace; and the House of the Columns.

³⁸Schulz 1988; Küpper 1996, 13–14; Wright 2006, 33.

³⁹Wright 2006, 33.

⁴⁰The House of Kadmos at Thebes has produced evidence (e.g., a vessel fragment, a drilled core, and other fragmentary stone pieces) for the use of the tubular drill in the manufacture of stone vessels and other workshop-related items (Dakouri-Hild 2005, 182, fig. 5.6; A. Dakouri-Hild, pers. comm. 2014). Yet it is questionable whether tubular drills

were employed on architecture there; some masonry cuttings may have been made by a drill, but the use of a tubular version is not certain (Dakouri-Hild [forthcoming]).

⁴¹Küpper 1996, 9–14.

⁴²Nelson 2001, 86.

⁴³Küpper 1996, 9–14.

⁴⁴Shaw 2012, 556–59.

Masons used the drill to cut circular mortises into resilient materials (e.g., conglomerate and hard limestone). After the drilling, the remnant stone core was broken and removed, and cylindrical dowels were then inserted into the holes to secure wooden or stone superstructures.⁴⁵ Rotation of the hollow drill bits was achieved by means of a bowstring. With the help of an abrasive agent (emery or sand) and a lubricant (water or oil), an organic material like reed, bamboo, or wood could cut circular mortises into stone.⁴⁶ Aegean emery comes primarily from Naxos; the material has turned up in archaeological contexts—either in block form or residue powder—at Knossos, Kommos, Malia, Pseira, and Akrotiri, as well as sites in the Near East.⁴⁷ An unresolved issue in the scholarship is whether the drill bit was organic or metal.⁴⁸ The absence of any tubular drills or fragments thereof supports the notion of an organic drill bit. Shaw argued for the use of a reed or bamboo drill based on the variety of mortise sizes in Minoan architecture, assuming that metallic drill bits would provide greater uniformity in the diameters.⁴⁹ The broad range of hole sizes on the Lion Gate relief thus may imply that a reed or bamboo drill bit was used on that monument.

Yet organic and metallic types were both likely available to artisans.⁵⁰ The relative effectiveness of organic vs. metal bits on hard stones (e.g., conglomerate, hard limestone, and basalt) remains unclear; further experimental work is needed to address this question.⁵¹ One argument for the existence of metal bits is the sheer size of drillings that exceed the diameter of any reed or bamboo. Massive holes are known in the west jamb of the Steintor of the Tiryns Oberburg (17 cm) and in the jambs of the Lion and Postern Gates at Mycenae (12.0–12.5 cm), and these mortises are thought to have been formed by large, hollow drill bits.⁵²

In addition to using it in architecture, Mycenaean artisans adopted the tubular drill as a sculpting implement. Traces of its use are distinct on the Lion Gate relief, the Tiryns throne base, the sculpted fragments and columns of the Treasury of Atreus, and possibly the decorated ceiling in the Treasury of Minyas at Orchomenos.⁵³

TOOLS USED ON THE LION GATE RELIEF

Nearly all the preserved tool marks appear on the relief's sculpted side, where cuttings from drills and saws are pervasive. Until now, Casson's 1933 discussion of the relief provided the most thorough study of its production. In his analysis, Casson focused on the relief's drill holes, while cursorily noting the existence of saw cuttings; Wace also observed traces of saw and drill use but did not describe the cuts in detail.⁵⁴ Casson registered that the circular holes, adjacent to one another, were formed by cylindrical, hollow drills, but he did not analyze the phenomenon further. Yet without systematically counting, measuring, and photographing the holes, the tubular drill's full impact on the production of the relief could not have been known. To rectify this situation, Giuliana Bianco and I have depicted all preserved tool mark locations in a new illustration of the relief (fig. 3).⁵⁵

The number of drill holes (N=340) on the relief stands out in comparison with the number on all other sculpture from the Bronze Age.⁵⁶ The drillings occur in series, the holes arranged in tight lines. Wace aptly describes these sequences: "[the holes] are so close together that they have the appearance of a honeycomb."⁵⁷ The result of this method was the creation of channels that enabled specific areas to be cut methodically and carefully, thereby preventing unwanted fracturing of the adjacent sections that were

⁴⁵For a metal dowel between two stone blocks at Boğazköy-Hattuša, see Seeher 2005, pl. 13.

⁴⁶Shaw 1973; 2009, 51; Evelyn 1993, 77–85. Blitzer (1995, 442), in her overview of the raw materials at Kommos, describes the benefits of emery: "Emery in the form of a rock containing hematite and corundum would have been employed in abrasive activities such as polishing, drilling, or grinding through the hardest rock materials."

⁴⁷Warren 1969, 160; Heimpel et al. 1988, 195 n. 1, 202–4; Betancourt 1990, 17; Blitzer 1995, 442, 447; Sparks 2007, 191.

⁴⁸An experiment by Gorelick and Gwinnett (1981) demonstrated how metal hollow drill bits were effective with additive emery, corundum, or diamond; see also Sparks 2007, 190–91.

⁴⁹Shaw 2009, 51 n. 292.

⁵⁰Evely (1993, 84) suggests that either metal or organic bits are possible.

⁵¹Gorelick and Gwinnett 1981.

⁵²Müller 1930, 70–1; Casson 1933, 210–11; Küpper 1996, 11 n. 113, pl. 1.3. For discussion about the size and use of tubular drills elsewhere, see Warren 1969, 161; 1978.

⁵³For the Tiryns throne base, see Schulz 1988, pls. 2, 3. Of the preserved Atreus fragments, there are 187 spiral centers on the decorated pieces; these spirals were formed by tubular drills with diameters between 1.7 and 2.3 cm (Pryce 1928, 21; Casson 1933, 24–34, 209–13, fig. 9; Wace 1949, figs. 49, 50; Hiller 2009). Casson (1933, 33) argued that the Orchomenos ceiling relief (Pelon 1976, pl. 136) was not made with tubular drills, but this conclusion should be reexamined in a future study. For other carved Mycenaean spirals, see Plommer 1965.

⁵⁴Supra n. 10.

⁵⁵The new illustration includes details from the cast of the Lion Gate relief in the Carnegie Museum of Art (Pittsburgh) that are no longer discernible on the original.

⁵⁶Nine drill holes appear on the Pittsburgh cast but not on the relief at Mycenae. The locations of the holes on the cast are designated by orange circles on fig. 3 but are not included in the total count reported in this article.

⁵⁷Wace 1921–1923, 16.

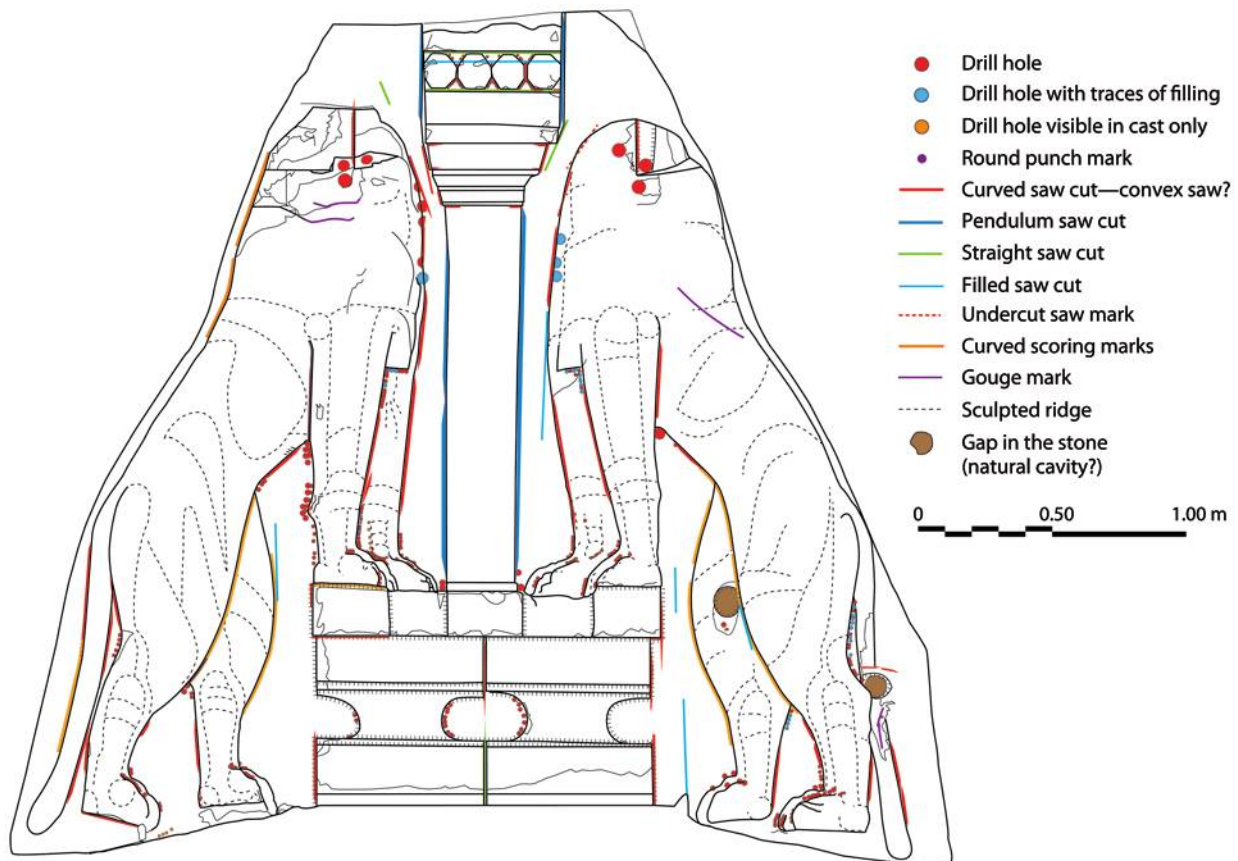


Fig. 3. Front of the Lion Gate relief at Mycenae, with tool mark locations (drawing by G. Bianco and N. Blackwell).

to be sculpted.⁵⁸ Saw cuts frequently appear before or after drill hole lines, indicating the importance of both implements in outlining the composition (see fig. 3).⁵⁹ There are 49 preserved saw cuts found along the edges of the animals, altars, column, capital, and entablature. Different blade types were used, judging from the depth of the saw cuts. Although evidence for a straight-edged saw exists, most saw grooves bear witness to a curved blade, of which there are two types: a long pendulum saw and a shorter saw with a convex—somewhat semicircular—blade. A more detailed discussion of the drill holes and saw cuts is presented in the next section of the article.

Despite the scarcity of other marks on the relief, it stands to reason that chisels, punches, hammers/mallets, polishing tools, and additional implements

were also employed.⁶⁰ Some incisions on the relief suggest that a scoring implement was used to delineate the curved edges on the lions' lower legs and tails. These scoring marks (see fig. 3 [orange lines]) may have been cut with several implements, including but not limited to chisels and knives. Regardless of its form, the incising tool outlined the animals effectively. Chisels and polishers (perhaps of emery) created a smooth surface for the relief while refining the musculature ridge lines.⁶¹ Punches could have enhanced details on the relief. A series of tiny depressions within a vertical saw groove (on the Left Lion, between the front legs and torso) raises the possibility that small punches deepened and widened already-made saw cuts. Additional punch marks occur in the crevice separating the Left Lion's hind legs. Finally, hammers and mallets

⁵⁸ The technique of drilling a line of holes, often to create folds in drapery or to undercut a feature, is known to have been used in the Archaic and Classical periods. At that time, a solid drill was used instead of the tubular one that was employed on the Lion Gate relief (Adam 1966, 46–61; Bluemel

1969, 30–2).

⁵⁹ Wace 1949, 52.

⁶⁰ Wace 1949, 52.

⁶¹ For discussion about emery pieces used as tools, see Casson 1933, 19–20; Blitzer 1995, 442.

facilitated chisel use and removed drilled cores from the relief.

Another type of mark warrants attention. Three gouge-like grooves appear on the upper bodies of the animals: a diagonal example on the Right Lion and two horizontal marks on the Left Lion (see fig. 3 [purple lines]). The irregular locations of these cuts make them difficult to date and understand—at least as part of the sculpting process. The gouges may have assisted in the attachment of the heads/manes or, conversely, may be scars of actions taken to remove the heads/manes from the relief. Currently, these marks are mysterious, but two shorter gouges on the broken tail of the Right Lion seem to be the result of repair work undertaken on that section. The evidence for modifications to the tail area is indicated from other cuttings, which are described later in detail.

A rectangular dowel hole (4 x 2 cm) on top of the limestone slab is the only cutting of its type on the relief.⁶² Given the prominence of the tubular drill in carving the relief, it is curious that a rectangular rather than a circular mortise was made. Yet Åström and Blomé argued that the mortise was contemporary with the relief and that it held an attachment, either birds or horns of consecration.⁶³ This argument relies primarily on iconographic comparisons, as the cutting could also have secured the joint between the relief and a superimposed block.

DESCRIPTION OF DRILL HOLES AND SAW CUTTINGS

Of the tool marks on the Lion Gate facade, drills and saws demand the most attention because of their ubiquity (figs. 4, 5). Sculptors relied on these implements more so than others, and the evidence for their application is described below.

Tubular Drill Holes

Hundreds of tubular drill perforations appear throughout the Lion Gate relief, including on the entablature, at the bottom of the column, along the curved edges of the altars, and on the bodies and borders of both lions (see figs. 3–5). Additional holes drilled during the carving process may have since disappeared, either through gradual weathering or through their intentional abrasion when the relief was smoothed. On the Left Lion, most holes are preserved on the chest, front legs, and feet. Fewer drill holes outline the hind legs, although the back feet have several drill hole sequences. While drill holes occur in similar

locations on the Right Lion, they do not mirror those on the left animal. Not as many holes are on the Right Lion's chest, front legs, and feet as are on its counterpart's. However, noticeably more drillings dot the hind legs, feet, and tail area of the Right Lion (see fig. 5) than of the Left Lion. Perhaps stonecutters followed general instructions in carving the relief but took liberties in how they worked each side.

The prevalence of these perforations, their range in size, and their locations on the relief demonstrate the tubular drill's multifunctional nature and value in the sculpting process. Artisans used the implement (1) to create sequences of holes delineating basic features of the composition while enhancing the depth and plasticity of the relief; (2) to extract unwanted stone from the relief in areas that were difficult to reach with the saw, while minimizing the amount of stone that had to be cut; and (3) to form mortises for securing attachments to the relief.

The typical cutting procedure resulted in sequences of holes arranged in vertical, horizontal, diagonal, or curving lines. Notable sequences appear between the octagonal disks (beam ends) above the capital (online fig. 1 on the AJA website),⁶⁴ near the top of each lion's front legs, along the outlines of their feet, and along the edges of their legs (see figs. 4–6; online fig. 2). Vertical and horizontal drill hole lines on the feet exemplify how the tool fashioned the crisp form of each paw in high relief. The depths reached by these drillings enhanced the relief's three-dimensionality. The primary features of the composition were thus framed by the drill. The tool also made guidelines for saw cuts, which are evident from the presence of holes on either side of the column base (online fig. 3). That these perforations were drilled before the column sides were sawed is indicated by the presence of a hole—located on the bottom right side of the column—that was bisected with a saw (see fig. 4). The successive use of drill holes was a cautious technique that prevented fracturing in the stone. Each drilling enabled the removal of a single stone core, making the tubular drill ideal for carving stone with precision in tight locations. This cutting process was time consuming yet effective.

Drill sizes on the relief are diverse, varying from 0.80 to 5.25 cm in diameter, but most fall between 0.8 and 1.6 cm, as illustrated in figure 7. Tables 1–3 record the position of the drill holes, the total number of perforations in each location, and the range of sizes within each area. These tables emphasize the variation within a sequence of holes, and this diversity

⁶² Åström and Blomé 1964, 179–83, figs. 6–9, 12.

⁶³ Åström and Blomé 1964, 183–86, figs. 16, 17 (recon-

struction).

⁶⁴ See www.ajaonline.org.

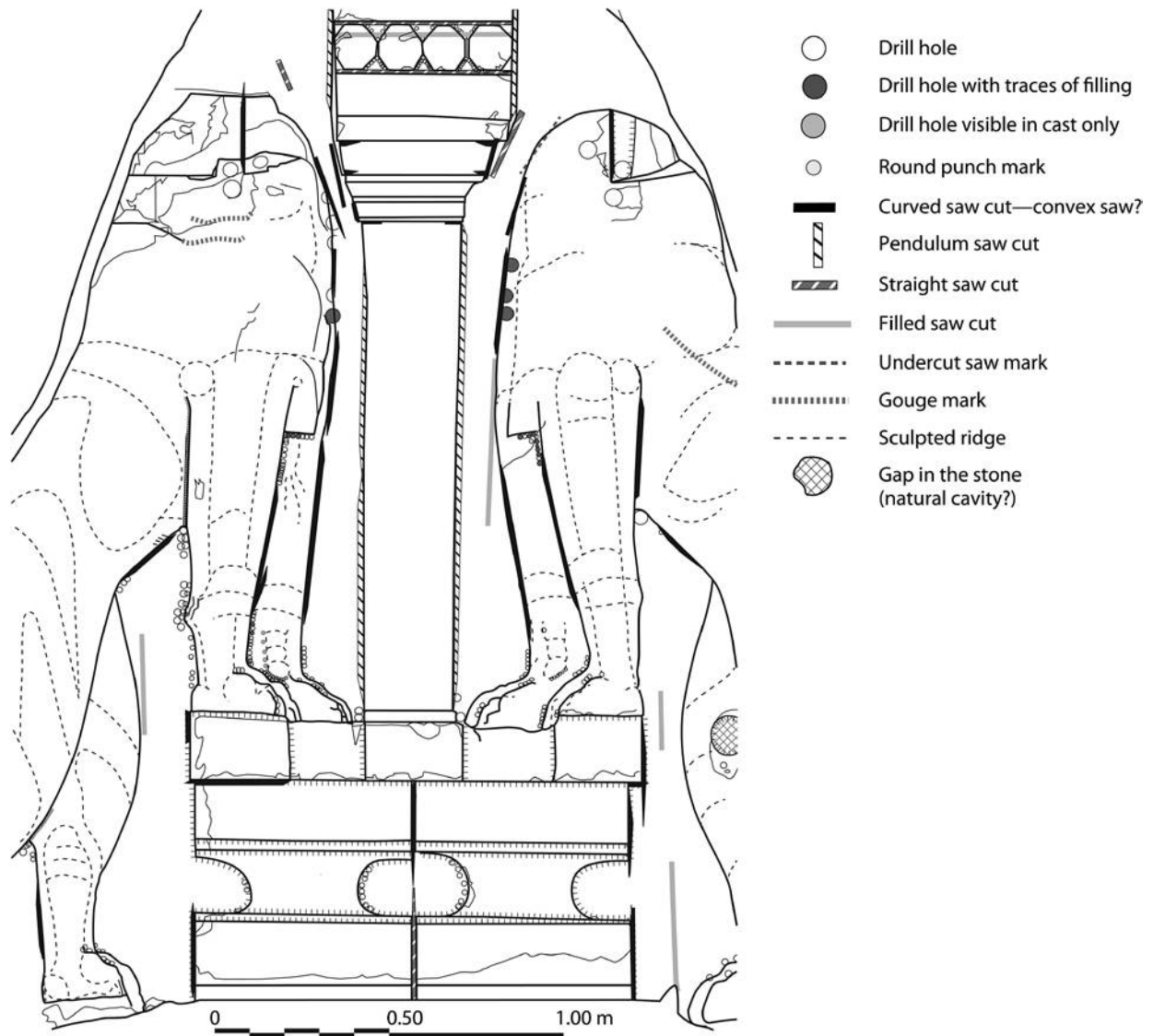


Fig. 4. Detail showing central features of the Lion Gate relief (drawing by G. Bianco and N. Blackwell).

reflects the necessity of switching drill bits on a regular basis. After a bit broke or eroded away, a replacement was used. Although the size of the new bit may have corresponded to previous holes, minor differences prevented homogeneity and suggest the use of organic drill bits. The smallest tubular drill holes border the beam ends in the entablature (see fig. 4; online fig. 1) and dot the lower ankles of each lion's front foot. At the other end of the spectrum, 3.6–4.4 cm drill holes, some partially cut by a saw, are visible on the front neck edge of both lions (fig. 8). The largest drill holes, located at the top center of the lions' bodies, measure between 5.00 and 5.25 cm; the latter drillings acted as mortises for attaching the heads.

Straight-Edged Saw Cuts

Only five of the saw cuts on the relief were made by a straight-edged saw, as the saw type was too cumbersome to be used in defining much of the relief. These cuts are characterized by marks whose depth is consistent throughout the length of the incision. Two horizontal cuts (lgth. 52 cm) border the top and bottom of the entablature disks (see fig. 4; online fig. 1); these grooves were made with a straight-edged saw blade. Just below the top horizontal cut, a parallel incision was made too low, resulting in the erroneous bisection of the beam ends. The groove is now filled with an unknown material, making it impossible to ascertain what kind of saw was employed. Two addi-

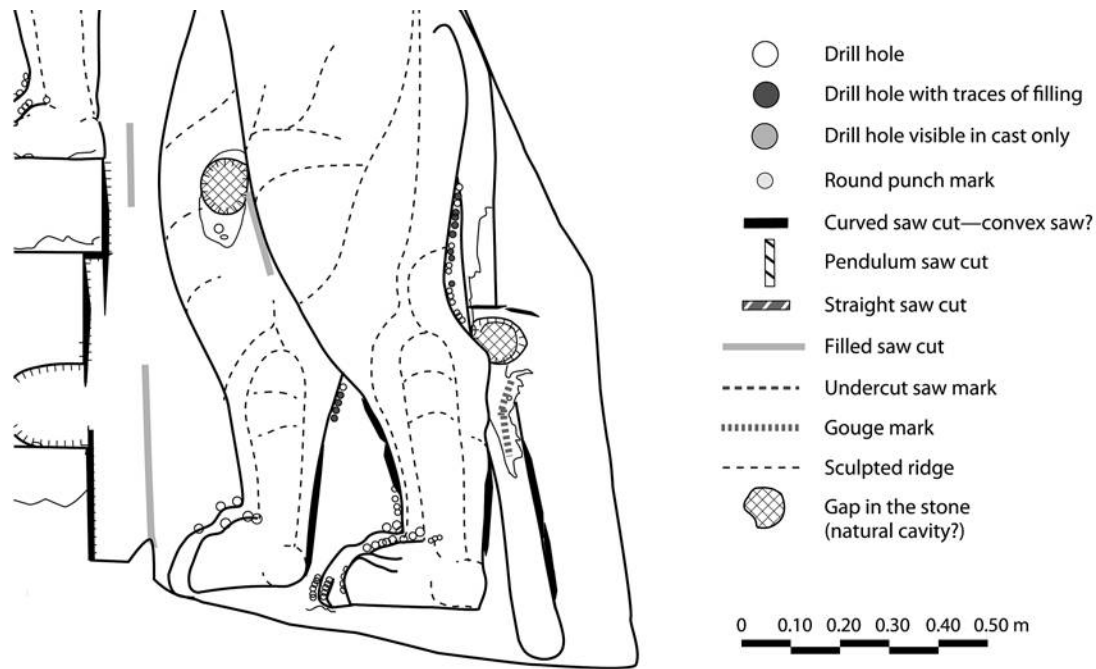


Fig. 5. Detail showing Right Lion's hind legs and tail (drawing by G. Bianco and N. Blackwell).

tional incisions on each side of the entablature were made by the straight saw, judging by the consistent depth of the cuts. At the bottom of the composition, artisans made a vertical incision (lgth. 20 cm) with this saw between the lower portions of the two altar bases. This blade type could be employed here because ample space existed for the tool to move back and forth.⁶⁵

Pendulum Saw Cuts

The pendulum saw made at least five elongated, curved grooves, which are unmistakable on the sides of the column and entablature. Identification of these marks as pendulum cuts has not been recognized previously. The left edge of the column has two curved incisions, both 68 cm in length (see figs. 4, 9). These successive concave marks resemble the pendulum-saw traces on an anta block from the Great Propylon at Tiryns (southwest anta, south block, west side [see fig. 2]).⁶⁶ A pendulum saw also fashioned the right side of the column, either in a single elongated cut or in two consecutive cuts as on the left side (fig. 10). The entablature sides exhibit distinct vertical cuttings (41 cm in length), which were sawed by a swinging blade (figs. 11, 12). Sculptors employed the pendulum saw for making long cuts, but it was cumbersome for fash-



Fig. 6. Detail of the front paws of the Left Lion.

ioning much of the composition. It is argued below that artisans used the pendulum saw during the early stages of construction, making the existence of other (unpreserved) preliminary cuts likely. An important

⁶⁵ A curved saw made the vertical division between the altars' top edges, for the straight saw would have been too un-

wieldy there.

⁶⁶ Küpper 1996, 17–21, fig. 135.

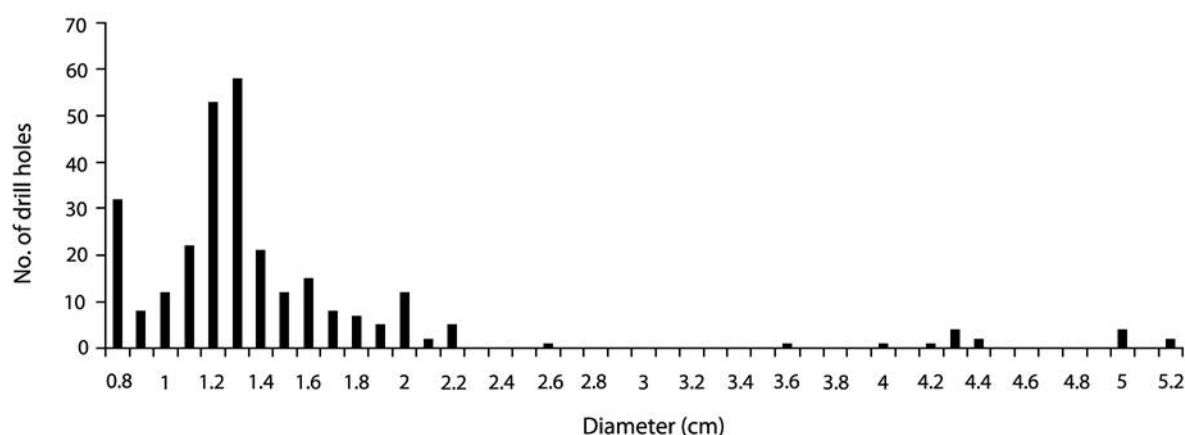


Fig. 7. Diameter of the measurable drill holes (N=288) on the Lion Gate relief at Mycenae.

Table 1. Drill Holes on the Left Lion (N=140).

Location	No. Drill Holes	Diameter Range (cm)
Top center of lion body	3	5.0
Neck (front edge)	5	3.60, 4.25–4.38
Top juncture of front legs	19	1.25–1.40
Underbelly and behind lion's front right leg	26	1.25–2.10
Front legs (shins, ankles, feet)	54	left shin/foot: 1.10–1.45, 1.50–1.70; right shin/foot: 0.80 (ankle), 1.15–1.35
Between tail and hind leg	5	1.25–1.35
Juncture of hind legs	5	1.2–1.3, 2.0
Hind legs (feet)	23	left foot: 1.20, 1.45–1.65; right foot: 1.20–1.25, 1.60

Table 2. Drill Holes on the Right Lion (N=126).

Location	No. Drill Holes	Diameter Range (cm)
Top center of lion body	3	5.00, 5.25
Neck (front edge)	3	4.30–4.40
Top juncture of front legs	12	1.25–1.45
Underbelly and behind lion's front left leg	2	1.30, 4.05
Front legs (shins, ankles, feet)	39	left foot/leg: 0.80 (ankle), 1.20–1.30; right foot/leg: 1.30–1.80
Lion's right hind leg, below cavity	2	1.45, 1.80
Between tail and hind leg	19	1.15–1.35
Broken tail section	2	1.35, 2.20
Juncture of hind legs	5	1.20–1.30
Hind legs (feet, shins)	39	left foot: 1.7–2.0; right foot/leg: 1.0 (ankle), 1.2–2.2

Table 3. Drill Holes on the Entablature, Column, Altars (N=74).

Location	No. Drill Holes	Diameter Range (cm)
Entablature (above octagonal disks)	16	0.85–1.10
Entablature (below octagonal disks)	35	0.80–1.15
Column base	4	2.2 (left side), 2.6 (right side)
Altar sides	19	1.3–2.2



Fig. 8. Lion Gate relief, detail of the column, the capital, and the necks of the lions.

distinction exists between the pendulum saw and the shorter convex blade. Pendulum cuts were made perpendicular to the relief's surface while the relief was lying on the ground, whereas many of the shorter, curved cuttings occur at angles. The short cuts could have been made when the relief was positioned horizontally or vertically.

Convex Saw Cuts

The typical saw cut on the relief, with 39 examples, is a curved incision incompatible with that of a large swinging blade (see fig. 3 [red lines]). A short, handheld, convex saw—akin to that employed in the stone-cutting experiments conducted by Seeher in central Turkey—was responsible for making these tool marks.⁶⁷

⁶⁷ Seeher 2007, 35–40.

The advantage of a handheld curved saw was its versatility in cutting stone within tight spaces and at angles. This saw type enabled the composition to be undercut, accentuating the three-dimensional appearance of the relief. Distinctive vertical and horizontal cuts from this curved blade are visible on the right side of the right altar (see figs. 4, 13). Well-preserved marks from the convex saw also appear on the Right Lion's tail area, at the top of the lions' bodies, and on their underbellies (see figs. 3–5; online fig. 4), for example. These saw cuts were usually made in conjunction with drilled holes—for instance, along the lions' legs and feet (fig. 14; online fig. 5). Although the convex saw blade is thought to have been short, its shape did not limit its use.⁶⁸ Artists could extend the length of a

⁶⁸ Seeher 2007, 35–40.



Fig. 9. Lion Gate relief, detail of the left side of column, cut by a pendulum saw. The arrows indicate two curved cuts made by the saw.



Fig. 10. Detail of the right side of column, cut by a pendulum saw.



Fig. 11. Side view of the Lion Gate relief, showing curved saw cuts on the left side of the entablature and the Left Lion.

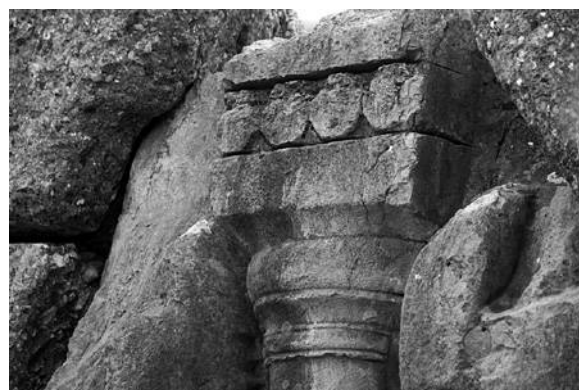


Fig. 12. Side view of the Lion Gate relief, showing curved saw cuts on the right side of the entablature and the Right Lion.

cut by dragging the saw instead of tilting it back and forth. Several short saw cuts are visible on the capital; the depths of these grooves are consistent, but their position on the relief implies the use of a convex saw,

as there is minimal space here for maneuvering unwieldy implements.

Curved saw blades are rare in the archaeological record of the Aegean Bronze Age. The front edges of



Fig. 13. Three short, curved saw cuts on the right side of the right altar.

some Minoan saws, as well as the LH II Euboean Andronianoi saw, possess slight curves, but these examples are incapable of cutting the type of short, curved incisions that appear on the relief.⁶⁹ Other tools with curved edges are attested on Late Minoan Crete (e.g., Mochlos and Zakros) but are better suited for making carpentry joins.⁷⁰ A notable tool from Mochlos is “an unusual rasp with a circular end with toothed edge.”⁷¹ It is unlikely that it or the Zakros objects—identified as scrapers by Evely—could saw through hard limestone in the manner seen on the Lion Gate relief. Moreover, these Minoan implements are neither attested on the mainland nor contemporary with the construction date of the relief, if it dates to the 13th century B.C.E., as this article argues. There is no good candidate in the repertoire of Aegean saws for making short, occasionally angled cuts, but use of such an implement is extensive on the relief. Currently, I am aware of only one comparable tool mark in the Mycenaean world. The Treasury of Minyas at Orchomenos bears a curved saw cut on the right post of its inner stomion,⁷² but a thorough examination of this groove has not been conducted.

⁶⁹ Minoan saws: Evely 1993, 26–36. Andronianoi saw: Paschalidis 2007, 434–35, pl. 107a, g.

⁷⁰ Zakros: Evely 1993, 33, nos. 52–6, fig. 13, pl. 11. Mochlos: Soles and Davaras 1996, 194–96, pl. 56c; Shaw 2009, 53, fig. 47.



Fig. 14. Front legs of the Left Lion, showing tubular drill holes and angled saw cuts.

Unknown Filling Material

Some drill holes and saw grooves contain traces of a filling that resembles a gritty mortar or cement-like substance. The filling material’s composition is presently unknown, and future scientific examination will be required to ascertain the material’s chemical and mineralogical nature. Six saw cuts preserve traces of this unknown material (see fig. 3 [light blue lines]), which hinders study of the cuts. At least 31 drill holes possess remnants of a similar filling (see figs. 3 [blue circles], 7, 15, 16). The filled-in saw cuts appear to be deep incisions that sculptors sought to conceal. The quantity of drill holes containing traces of this material raises the possibility that all perforations were hidden

⁷¹ Soles and Davaras 1996, 194–96, pl. 56c.

⁷² Personal observation of the tomb’s tool marks in July 2012.



Fig. 15. Unknown mortar-like filling in drill holes on the Right Lion's large neck holes.



Fig. 16. Series of drill holes with unknown mortar-like filling between the hind leg and tail of the Right Lion.

at one point. It is not possible with the evidence before us to prove a date, but a Mycenaean one is plausible based on the three horizontal saw cuts found in the entablature section. Two incisions frame the four octagons, while a third bisects the upper portion of the disks. This middle cut is an obvious mistake, and within it is a filling material that masks the error (see fig. 4; online fig. 1). Logic suggests that the erroneous cut was filled in antiquity, yet one cannot exclude the possibility that these fillings are much more recent, as plaster casts of the relief were manufactured during the 19th century.⁷³ Compositional analysis is necessary to resolve whether these materials are remnants of the

modern casting process or date to the Late Bronze Age. In the meantime, the existence of Mycenaean lime mortars and waterproof lime plasters—like those in the interstices of blocks within tholoi at Mycenae and Vapheio, in the cistern at Mycenae, and in the plaster floor in the Tiryns courtyard—might be fruitfully investigated.⁷⁴ Did Mycenaean artists use lime mortars and plasters for cosmetic purposes on the Lion Gate relief? Such treatment is intriguing in light of how craftspersons at Tiryns inlaid the kyanos frieze with blue glass.⁷⁵ If it proves to be ancient, the filling on the Lion Gate relief could have obscured particularly deep cuttings that could not have been hidden

⁷³There are plaster casts of the Lion Gate relief at the Carnegie Museum of Art in Pittsburgh, the Allard Pierson Museum in Amsterdam, the Ashmolean Museum Cast Gallery in Oxford, and the Gipsformerei of the Staatliche Museen zu

Berlin.

⁷⁴Chiotis et al. 2001, 329–31.

⁷⁵Moser von Filseck 1986.

through other means, such as polishing. Once again, the sculpture at Mycenae retains potentially surprising data that necessitates further study.

DATE OF CARVING AND THE RELIEF'S PRODUCTION SEQUENCE

The date of the Lion Gate relief has been a point of contention among scholars, and Stillman even suggested that the relief belonged to the Geometric or Archaic period.⁷⁶ Construction of the gateway took place in the mid 13th century B.C.E., as was verified by Mylonas' excavation underneath the gate's threshold, which yielded LH IIIB pottery.⁷⁷ Despite this evidence, ambiguity has persisted about when the relief was carved and whether the sculpture and the gateway were contemporaneous. Younger has championed the notion that the relief was older than the gateway by more than 200 years, basing his argument primarily on iconographic grounds.⁷⁸ An early date for the relief, however, contradicts the implications of the tool marks found on the sculpture. It is argued below that these marks date the construction of the relief to the 13th century B.C.E. and thus make it contemporary with the gateway.

Ferri dated the relief to 1500 B.C.E. and believed that it decorated the stomion of an Early Mycenaean tholos tomb before it was reused at the citadel entrance.⁷⁹ Nojorkam likewise argued that the relief predated the gateway and was Minoan in origin.⁸⁰ The question of when the relief came into existence is fueled by the use of different materials for the sculpture and the surrounding blocks. This point has been emphasized by Younger, who also questions whether the sculpted relief fits above the lintel: "the relief is of limestone, while the gate and surrounding enceinte is of conglomerate . . . the framing blocks do not fit snugly against the relief."⁸¹ Younger believed that the relief was transported from an alternate location to adorn the citadel's walls when its entrance was monumentalized. He postulated a 1475–1450 B.C.E. date for the relief and proposed that "the artist of the Mycenae Lion Gate Relief might have archaized, taking his inspiration directly from sealstones that were already heirlooms, perhaps in his possession."⁸² His view relies

on the representation of animals in Aegean iconography, which moves from richly modeled examples ca. 1500 B.C.E. to featureless ones by 1300 B.C.E.⁸³ The musculature of the lions on the relief bears certain characteristics (e.g., saphenous veins, shoulder bosses, and rings or "bracelets" on the wrists and ankles) that are attested on Aegean seals and frescoes much earlier than the LH IIIB period.⁸⁴ In fact, the style of the lions fits best with a series of sealstones in the Mycenae-Vapheio Lion Group of the late 16th and early 15th century B.C.E.⁸⁵ Similar to this group is a LH I–II seal from Chamber Tomb 8 at Mycenae that depicts bracelets on the front legs of two lions.⁸⁶ The bracelets on this seal and on the Lion Gate relief are rare in Aegean art, leading Younger to conclude that the relief appeared as if it "were an impression of a seal writ large."⁸⁷ The ivory sphinx plaque from the House of the Sphinxes at Mycenae, however, illustrates that some of the characteristics that are thought of as Early Mycenaean stylistic traits (e.g., the bracelets and leg veins) can date to the LH IIIA2–IIIB period.⁸⁸ Some artistic parallels thus point to an early date for the relief, yet the argument is not without holes. Furthermore, it is not unreasonable to harbor reservations about the direct influence of small works of art such as seals on a piece of sculpture as monumental as the Lion Gate relief.⁸⁹ Such doubts increase when one considers the stoneworking traits attested on the relief, which provide a drastically different picture than do stylistic traits.

Several technological features point to a late date for the relief. First of all, the use of gray microcrystalline limestone is hardly incongruous with the employment of conglomerate, as the ashlar external sidewall flanking the conglomerate Steintor at Tiryns documents.⁹⁰ Ferri's suggestion that the relief—which was fashioned with drills and saws—belonged to an early tholos tomb is incompatible with the lack of sophisticated stone-cutting evident in the initial tholoi, when rubble masonry predominated.⁹¹ Furthermore, a 15th-century relief would represent a substantial improvement in sculpting—both technological and stylistic—within a short period of time, judging by the incised Shaft Grave stelae.⁹² The use of the pendulum saw, tubular

⁷⁶ Stillman 1898, 183.

⁷⁷ Mylonas 1966, 15–35.

⁷⁸ Younger 1984, 62–4; 1987a, 63.

⁷⁹ Ferri 1953, 410–16.

⁸⁰ Nojorkam 1968, 232–34.

⁸¹ Younger 1987a, 63–4.

⁸² Younger 1987a, 68.

⁸³ Younger 1984, 1986, 1987b.

⁸⁴ Younger 1984, 62–4.

⁸⁵ Younger 1984, 63–4; 1987a, 64.

⁸⁶ CMS 1, no. 46.

⁸⁷ Younger 1995, 346–47.

⁸⁸ Tournavitou 1995, frontispiece, 171.

⁸⁹ Cf. Younger's (1995, 339–48) argument that seals greatly influenced monumental art, such as frescoes and relief sculpture.

⁹⁰ Müller 1930, 70–3.

⁹¹ Wace 1921–1923, 388.

⁹² Cf. Younger 1997, 233–34. Younger argues that the closest parallel to the sculpted stelae is the Lion Gate relief. He

drill, and convex saw in making the relief, however, is the strongest indication that an early construction date for the relief is untenable.

The identification of the pendulum saw on the monument (see figs. 9–12) has considerable ramifications, for the device is dated to the 13th century B.C.E. based on traces of its use on LH IIIB masonry at Tiryns and Mycenae. Its use at Mycenae—within the citadel and on the tholoi of Atreus and Clytemnestra—appears in conjunction with the great program of construction of the mid to late 13th century B.C.E.⁹³ Consequently, the pendulum saw traces on the Lion Gate relief strongly suggest that the sculpture was cut during the LH IIIB period.⁹⁴ There is scant evidence for the use of the convex saw and the tubular drill in Early Mycenaean stoneworking. As already argued, the application of the tubular drill to Mycenaean architecture and sculpture was a late development, despite its centuries-long existence in the Aegean. Therefore, several of the sculpting tools that are attested on the relief were not used on mainland architecture prior to the LH III era, a further indication of the synchronicity of the relief and entryway. Conceptualization of the relief thus belonged to Mycenae's elaborate project of strengthening its circuit walls, and the creation of the monument coincides with the flurry of architectural activity—both civic and funerary—that transpired in the LH IIIB era.⁹⁵

In addition to suggesting a firm date for the relief, the tool marks reveal the sequence of its production. The relief's manufacturing process can be reconstructed in nine stages, as illustrated in figure 17 and described below. Unfortunately, the cuttings fail to shed any light on how the relief was quarried. The limestone source for the slab is thought to be local, but the specific location remains unidentified.⁹⁶ Several possibilities exist in the vicinity of Mycenae (e.g., Asprokhoma, Batsourorachi), but then again stone quarries are notoriously difficult to date.⁹⁷ A survey of tool marks at these sources has never been performed, so it is impossible to match cutting methods from a quarry with those from the relief. Uncertainty also persists regarding which implements extracted the stone slab at the

source. Picks, wedges, chisels, mallets, and stakes are thought to have been used in prehistoric quarries, yet the type of stone would have dictated which implements were employed.⁹⁸ A recent study of the cuttings in a conglomerate (presumably prehistoric) quarry at Vapheio-Palaiopyrgi suggests that a combination of tool types was used.⁹⁹ Although drill and saw marks are extensive on the relief, their application within a quarry is uncertain.¹⁰⁰ Masons likely did a rough working of the slab at the quarry, while more refined carving took place near the citadel whereby the bold artistic endeavor could be supervised by the palace. Similarly massive blocks were cut and transported at this time, including the large bathing slab at Tiryns.¹⁰¹

After the monumental rock slab was transported from the quarry, the first step (phase 1; see fig. 17[1]) was the formation of the block into a roughly truncated pyramid, where the width of the top of the relief was roughly one-third that of the base. The details of this process remain vague, but saw marks are recognized on top of the relief and on the right edge of the back side.¹⁰² It is unclear what tools were used to saw these edges, but straight-sided and pendulum blades are both strong candidates. After this initial stage—and possibly during it—the relief slab rested flat on the ground. In this horizontal position, stonemasons proceeded with phases 2 and 3, using the pendulum saw to cut out the entablature and column before carving the rest of the relief.

The cutting of the relief required precise measurement, forethought, and careful execution, yet there are mistakes. Evidence of planning is apparent in the proportionality of the monument and in the saw cuttings attributed to phase 2 (see fig. 17[2]), when the relief was segmented into basic divisions. Two vertical cuts from a pendulum saw occur at the top of the relief, and these form the edges of the entablature. These cuts are imperfectly centered along the top edge of the relief. Two additional vertical saw cuts also reflect meticulous planning in how the relief was to be segmented. Remnants of these cuttings occur in the space between the altars and the hind legs of each lion (see figs. 3, 4, 17[2]). These incisions now

notes that the technique of incision is more sophisticated than commonly assumed and that the "stelai's reliefs are stark and powerful" (Younger 1997, 233).

⁹³ Küpper 1996, 22–5.

⁹⁴ This conclusion thus differs significantly from Younger's (1987a, 69–70) suggestion that monumental sculpture ended by the 14th century on the mainland.

⁹⁵ For the citadel wall phases at Mycenae, see Mylonas 1966, 19–33; Iakovidis 1983, 24–37.

⁹⁶ Wace 1949, 52.

⁹⁷ For quarries near Mycenae and photographs of Aspro-

khoma and Batsourorachi, see French 2003, 25, figs. 20, 21. For Minoan stone quarries, see Soles 1983; Dworakowska 1992, 56; Betancourt 2001, 90; Shaw 2009, 28–37.

⁹⁸ Loader 1998, 46–7; Shaw 2009, 30.

⁹⁹ Chapin et al. 2012; A. Chapin, pers. comm. 2012.

¹⁰⁰ For discussion about possible saw use at quarries, see Dworakowska 1992, 56–7; Shaw 2009, 35.

¹⁰¹ Shaw 2012, 555–57.

¹⁰² For the top saw cut, see Åström and Blomé 1964, 181, figs. 6–8.

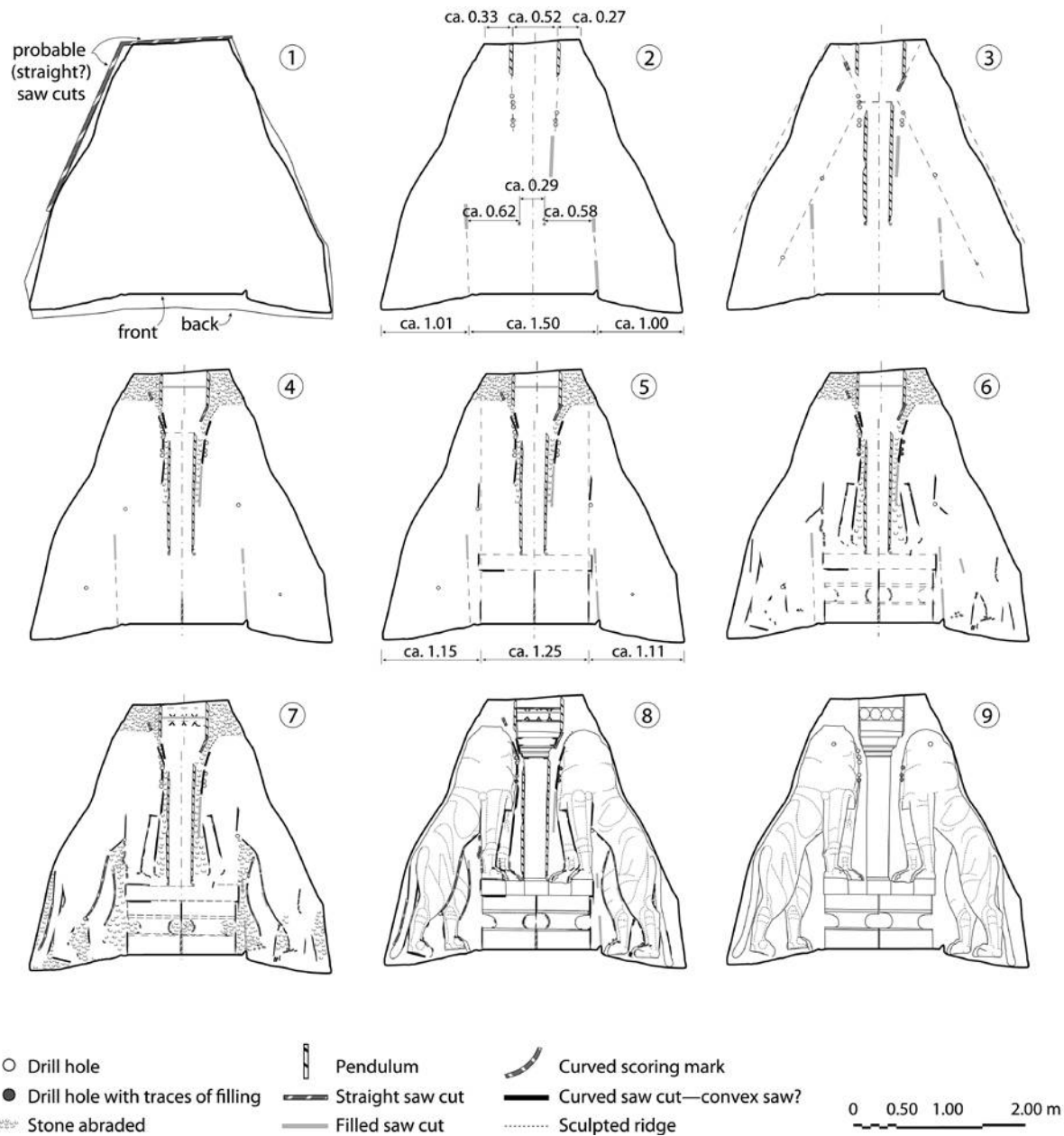


Fig. 17. Construction phases of the Lion Gate relief (drawing by G. Bianco and N. Blackwell).

contain an unknown, mortar-like material. The distance between these vertical cuttings and the outer edge of the slab is identical (ca. 1.0 m) on each side, suggesting that the relief was sectioned to ensure symmetry in later stages. The placement of several drill holes—which marked the lower, exterior boundaries of the column (see online fig. 3)—was measured off the aforementioned vertical cuts. These drillings provided a reference point for stoneworkers when they used the pendulum saw to fashion the column sides

in phase 3. With these drill holes, the column's axis was established, centered in relation to the bottom width of the relief. While the column was well aligned with the bottom edge, the entablature was imperfectly measured from the top. This difference resulted in a compositional error—namely, the column and capital were off-center underneath the entablature (see fig. 8). The large drill holes along the neck were probably cut at this time in the first attempt to outline parts of each lion. The series of holes align almost perfectly

with the entablature's pendulum saw cuts, and this arrangement was likely deliberate. Either the drill holes provided a visual marker in preparation for sawing the entablature (a technique confirmed for making the column) or the drilling spots were chosen along a line stemming from the entablature sides. Another nearly vertical cut (now filled) between the sides of the entablature and bottom of the column was made to designate the edge of the Right Lion's chest, and it represents an early attempt at shaping the border of the animal.

Further planning is evident in phase 3 (see fig. 17[3]). The tubular drill created holes at key locations on the lions' bodies, and these holes served as important reference points in the composition. In addition to those on the necks, holes were cut at the juncture of the underbelly and front legs and in the crevice between the hind legs. If connected by a diagonal line, these holes run parallel to the sides of the relief; this arrangement is denoted in figure 17[3] with dashed diagonal lines. The relief's sides thus served as guidelines when the artisans planned out the strategic junctures of the composition. Remnants of diagonal cuts are discernible on either side of the entablature; the lower ends of these incisions, which are no longer preserved, perhaps marked the top of the column. With the upper and lower extents of the column established, the pendulum saw cut the sides of the column between those boundaries. A conjectural reconstruction of this machine in action is illustrated in an isometric view and in a cross-section (fig. 18). The actual shape of the saw blade is unknown, so the proposal here is hypothetical, but a stone weight probably provided additional pressure to that created by the swinging mechanism. Small blocks may have been placed at the ends of the desired cut to prevent excessively long incisions (see fig. 18, right). In producing long, vertical cuts, the pendulum saw required considerable swaths of free surface area to operate. Following this stage, the device was no longer needed; the complexity of the composition, with its restricted spaces and nuanced lines, limited where such broad incisions could occur.

With the entablature, column, and portions of the upper lions formed, unwanted stone at the top of the composition was abraded (phase 4; see fig. 17[4]). The tool marks from this process were polished away in the final stages, yet chisels, mallets/hammers, axes, and drills would have been useful in removing stone. Further work on the entablature was performed at this stage: a horizontal groove was sawed, yet it serves no function in the final representation of the frieze. For this reason, the cut must have been made earlier than the rest of the entablature. Additional saw cuts—now from the shorter convex saw—appear on the sides of

the capital and along the front of the lions' necks and chests. The initial outlining of the altars occurred prior to completion of the lions, and the former is credited to phase 5 (see fig. 17[5]). The bases provided a central reference point from which one could carve the front legs of the animals effectively. The width of the lower altars is similar to that of the top of the relief. An imaginary vertical line (indicated by a dotted line on fig. 17[5]) shows this relationship; vertical saw cuts appear along this line (although they do not align perfectly) in the middle of the composition. The two saw cuts divide the front legs and thorax of the animals vertically; the stonecutters took their cue from the nearby drill holes and the aforementioned alignment between the exterior altar edges and the top of the relief.

In phase 6, most features of the composition were delineated, even if only superficially (see fig. 17[6]). The tubular drill and convex saw were employed extensively during this stage to give shape to the front legs and feet, underbelly, hind legs and feet, tail, and altars. The tubular drill provided a careful method of sculpting the features of the relief, but the agility of the convex saw proved equally useful in refining the figures. The drill and saw were used hand in hand throughout the relief's production, as previously noted (see fig. 14). In outlining the lions' anatomical frames, the tubular drill became the implement of choice for maneuvering in tight spots (e.g., the area between the back legs and tails) and for providing depth to the sculpture. Despite their pervasiveness, drill holes do not appear in a predictable or patterned manner and are not symmetrical from one side to the other. Different artists, or even teams, may have worked on the sculpture simultaneously, judging by the minor differences from one lion to the other and the ample space in which craftspersons could operate comfortably (see fig. 18, left).

The shape of the composition was fully articulated by phase 7, as the remaining edges of the animals were marked with a scoring implement and unwanted stone was abraded (see fig. 17[7]). With the relief now exposed, focus turned to the finer details. A minute tubular drill (diam. <1.0 cm) defined the lower and upper edges of the entablature's octagonal disks. In phase 8, further work occurred on the entablature, as two horizontal cuts framed the frieze (see fig. 17[8]). Artisans polished and refined the relief, abrading rough surfaces and creating ridge lines for the lions' muscles. Differences in the musculature, especially on the hind legs, suggest the work of multiple artists. Chisels must have been used on the relief for the details, yet traces of such work are absent, undoubtedly erased by a polishing tool. Scenes of sculptors polishing are known from Egyptian New Kingdom painting, and this simple

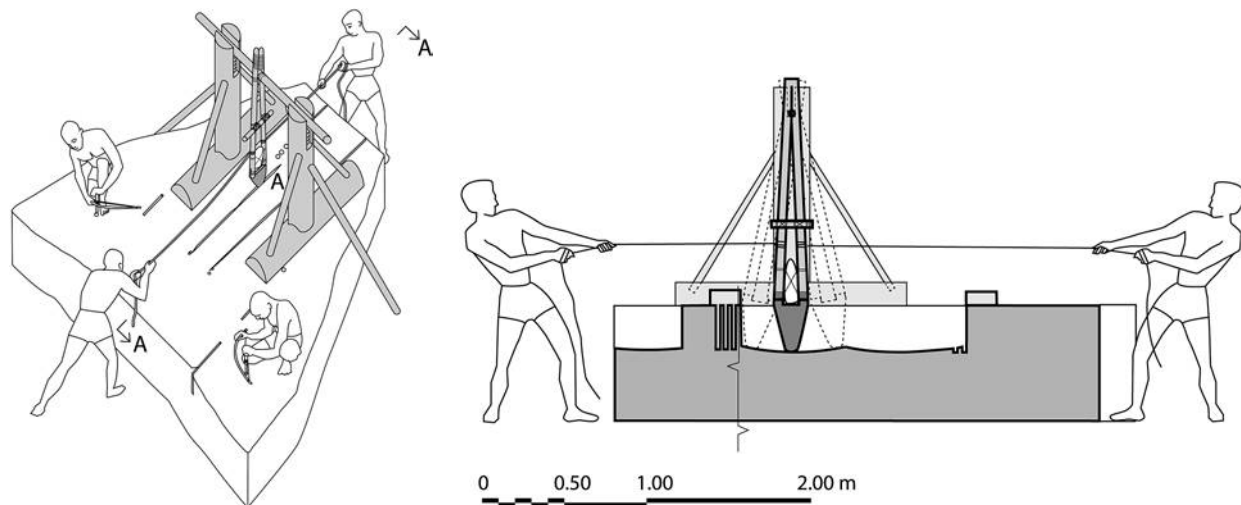


Fig. 18. Construction phase 3 of the Lion Gate relief, showing conjectural pendulum saw machine in action: *left*, isometric view; *right*, cross-section view of workers cutting through left side of column shaft (cross-section A-A) (drawing by G. Bianco and N. Blackwell).

yet effective practice was in all likelihood applied to the Lion Gate relief.¹⁰³ The remnants of numerous saw cuts, including the gaffe incision on the entablature as well as some drill holes, could have been filled with an unidentified material at this stage—if the composite filling proves to be Mycenaean in date (see figs. 15, 16).

After the relief was carved and polished, the lion heads were attached in phase 9, apparently with a single long dowel, the hole for which remains at the center of each upper body (see fig. 17[9]). Large holes also dot the neck lines (see figs. 4, 8), but these did not secure the heads on their own and, in any case, became unsuitable when their sides were cut by a saw.¹⁰⁴ Occurring in sequences, the neck holes seem to have outlined the front edges of each lion rather than providing structural support for an attachment. How the massive relief was erected above the lintel remains unknown. A combination of rollers, ropes, and a large earthen ramp is one solution. The proposed construction stages above demonstrate how the relief was fabricated, but several alterations to the monument have yet to be accounted for; these changes are explained below.

DAMAGE TO THE RELIEF AND SUBSEQUENT CHANGES

Inspection of the tool marks on the sculpture revealed evidence of damage to and subsequent modi-

fication of the relief in antiquity. The method of attaching the heads was altered so substantially that the change must have been a response to a failure in the original design of the relief recognized only after the fact. For this reason, it is argued here that repairs were made to the relief while it was already in place on the lintel and not while it was on the ground prior to its placement above the gateway. The best explanation for the damage to the relief is an earthquake; several are known to have struck Mycenae during the mid and late 13th century B.C.E.¹⁰⁵

The tubular drill and convex saw, prominent tools in the relief's initial production, were key factors in the repair work. The upper bodies of both lions bear signs of adaptation, as do the two cavities on the lower half of the Right Lion, which are discussed separately at the end of this section. Large circular dowel holes and a nearly horizontal ledge are evident on the Right Lion's upper body (see figs. 4, 19). A circular drill hole (diam. 5 cm; depth 9.5 cm) is visible at the left corner of this ledge. Directly to the left of this deep hole is a vertical saw cut clearly made by a curved blade—plausibly a convex saw (see fig. 12). Underneath the ledge and to the left are two additional drill holes (diam. 5.25 cm).¹⁰⁶ Collectively, the ledge, the vertical saw cut, and the latter two circular holes constitute evidence for a substantial alteration in how the head, now missing, was supported and attached to the relief.

¹⁰³ Consider the scene in the 18th Dynasty Tomb of Rekhmire that depicts Egyptian sculptors using rubbing stones to polish a statue (Davies 1973, pl. 60).

¹⁰⁴ Cf. Tsountas and Manatt 1897, 30; Wace 1949, 52.

¹⁰⁵ French 1996, 51, 54; 1998, 2–4; 2010. For additional earthquake evidence in the Argolid, see Åström and Demakopoulou 1996; Kilian 1996.

¹⁰⁶ These holes were filled by insect nests in November

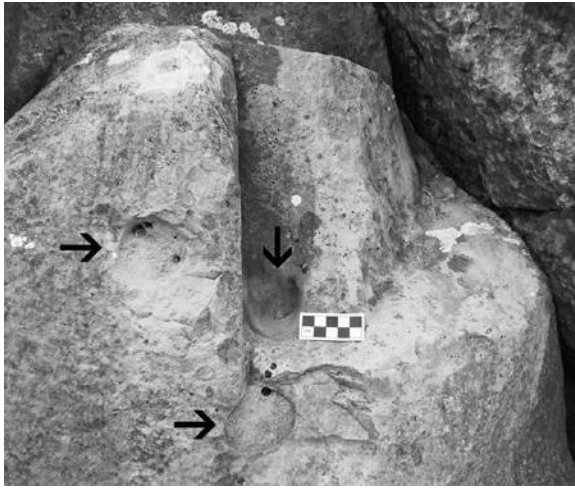


Fig. 19. Right Lion, showing the ledge and large drill holes. The arrows indicate the location of the drill holes.

The current proximity of three large dowel holes to one another was not part of the original design. Initially, a lone deep mortise—the one at the ledge's left corner—was used to fasten the head. This mortise was drilled prior to the creation of the ledge and neighboring drill holes. In its current state, the central hole is unable to hold a dowel; it became unusable when the vertical cut and the horizontal ledge were made. The considerable depth of this partial mortise indicates that a long dowel was used to support a weighty attachment. In all likelihood, the original dowel broke and needed to be removed. To loosen the lodged dowel and extract it, an artisan cut a vertical incision on the dowel's left side with a convex saw, thereby exposing the drill hole. With the original mortise now compromised, an alternative system for weight support was devised. The two larger holes were drilled on either side of the original mortise; these are slightly wider than the initial drilling but not as deep.¹⁰⁷ At this point, the sculptors made the horizontal ledge to bolster support for the head, providing extra care for the attachment since the original method had failed.

A partial ledge is also discernible on the upper section of the Left Lion, but it is not nearly as well preserved as the one on the Right Lion. At the right side of the Left Lion's ledge (fig. 20; online fig. 6) is a deep drill hole (diam. 5 cm; depth 6 cm), which is adjacent to a vertical convex saw cut (see fig. 11).

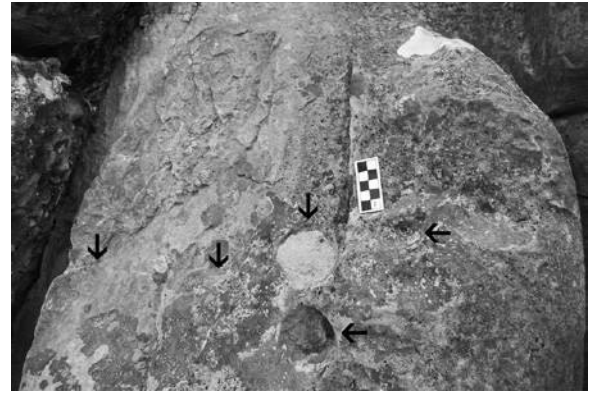


Fig. 20. Left Lion, showing the faint traces of a ledge and large drill holes. The arrows indicate the location of the ledge and drill holes.

The ledge area and central mortise of the Left Lion are also flanked by two circular perforations (diam. 5 cm; depth 4 cm) (see figs. 4, 20). Jointly, the obsolete mortise, ledge, and flanking drill holes on both lions confirm that craftspersons reattached the heads in a cautious, thorough manner. Each lion apparently underwent the same series of alterations. Tools identical to those used for the original carving—tubular drills and convex saws—were employed for the repairs. Since these implements are not attested during the Postpalatial period, one may deduce that the adjustments to the relief happened soon after it was initially completed. Since the construction of the relief dates to the 13th century B.C.E., the relief's partial damage and repair can be assigned to either the middle or the end of the LH IIIB period.

Further change is evident in two gaps on the Right Lion's lower body (see fig. 5). These large, perplexing cavities in the stone appear to be natural but perhaps were concealed in the finished relief.¹⁰⁸ Two tubular drill holes now exist on a broken edge underneath the gap in the hind leg; these mortises could have held a patch to cover the cavity. Likewise, the Right Lion's tail underwent repairs, alluding to the possibility that the tail had been damaged. Sculptors deliberately cut out part of the tail with the aid of a convex saw; this action is indicated by a curved cutting above the cavity (see figs. 5, 21). On the tail's broken surface, two drill holes exist and may be associated with an attempt to conceal the conspicuous opening. A lump of uniden-

2011, when the monument was studied.

¹⁰⁷ The depth of these holes was not measured, because they were filled by an insect's nest. Comparable drill holes surrounding the Left Lion's ledge have a preserved depth of

4.0–4.5 cm.

¹⁰⁸ Examples of large boulders with similar cavities occur at Mycenae, including two rocks near the entrance of the Archaeological Museum of Mycenae.



Fig. 21. Right Lion, hind leg and tail, showing tool marks and cavity. The arrows indicate the location of a convex saw cut, the natural gap, and a drill hole and gouge mark.

tified metal (lgth. ca. 5 cm) was found in a shallow groove within this natural cavity (online fig. 7). The purpose of this deposited metal is also unknown; the material may have aided repair work on the tail, but further study is required before a definitive answer can be reached.

Archaeological investigation on the citadel has uncovered an earthquake horizon dating to the LH

IIIB1–2 transition. French notes that the citadel's "damage was quickly repaired but much material (notably in the cult area) was left on floors and sealed away."¹⁰⁹ If the Lion Gate and its relief were finished prior to this earthquake, what was the fate of the sculpture during the catastrophe?¹¹⁰ Could the original lion heads have fallen off or have been weakened so significantly that immediate action was taken to stabilize the attachments?¹¹¹ If so, one can only speculate about the psychological effects this would have had on Mycenae's inhabitants. French notes that the response to the earthquake damage to the Cult Center "was dealt with in ways that indicate particular fear or awe."¹¹² The relief was altered with convex saws and tubular drills to repair the composition and to increase its stability. After these modifications, the heads would have been reattached in a more secure fashion. Though it is impossible to ascertain how the Lion Gate relief sustained its damage, a mid 13th-century earthquake is a viable option. Other parts of the Mycenae citadel were restored after this catastrophe, and it is reasonable to postulate that the repairs to the relief occurred in response to this event.¹¹³

CLASSIFICATION OF THE ANIMALS AND A PLAUSIBLE RECONSTRUCTION

Because of the absence of the original heads, two issues regarding the relief's composition have perplexed scholars: the classification of the animals and the direction in which the heads faced. Evidence presented below confirms that the animals are lions and that their heads were twisted backward.

Griffins, sphinxes, lionesses, and lions have all been proposed as possibilities for figures on the relief.¹¹⁴ One argument for griffins and sphinxes was that there was insufficient space for a feline head. Åström and Blomé's reconstruction of the composition with lions, however, demonstrated that this argument was untenable.¹¹⁵ Mylonas attributed the misperception about the space to an error in the 1950 restoration, in which two replacement blocks at the top right of the relief were positioned too far to the left.¹¹⁶ The restored blocks hid part of the relief's top right edge, making that area appear smaller than it actually was.

¹⁰⁹ French 1998, 3; see also French 2010, 676–77.

¹¹⁰ French (1996, 54) implies that the Lion Gate did not suffer any damage from this earthquake horizon: "The Lion Gate can be considered similarly sound, though it is thought to have been built immediately before the supposed calamity."

¹¹¹ Gouge marks on the Left Lion (see fig. 3 [purple lines]) suggest that a marred head could have been forcibly removed by humans. The date of the marks, however, is unknown, and

so the relation of the gouge marks to the construction and repair of the relief is unclear.

¹¹² French 1996, 54.

¹¹³ For comparison, Alexander (1986, 89, 115) speculates that sculptural repairs were made to the Hittite sanctuary of Yazılıkaya.

¹¹⁴ Åström and Blomé 1964, 177.

¹¹⁵ Åström and Blomé 1964, 179, figs. 16, 17.

¹¹⁶ Mylonas 1983, 79.

Similarities in Aegean art of antithetical griffins and/or sphinxes flanking a figure or object also have led to speculation that such creatures adorned the Lion Gate. A seal from Chamber Tomb 58 at Mycenae depicts a column and altar between two griffins;¹¹⁷ it is a well-known parallel for the Lion Gate relief and the strongest argument for the depiction of an animal other than lions/lionesses.¹¹⁸ Heraldic sphinxes also occur on Mycenaean seals, rings, ivory pieces, and frescoes, suggesting that the sculpted beasts were perhaps sphinxes.¹¹⁹ Despite these iconographic parallels, the notion that the animals decorating the relief are either griffins or sphinxes cannot be reconciled with the absence of cuttings for wings. Dowel holes—certainly a prerequisite for attaching wings—do not occur along the backs or centers of the animals. Mylonas emphasized the absence of such drill holes when arguing against the griffin/sphinx interpretation: “No evidence of dowel-holes that would prove the attachment of wings to the bodies is preserved and none exists. Wings in scale to the rest of the composition would have been large and heavy . . . and would have required very strong dowels to hold them in position.”¹²⁰ His point is confirmed by this study and reinforced by the new illustration showing the location of each tool mark (see fig. 3).

Although the feline nature of the animals seems certain in light of the preserved tool marks, their sex is more difficult to ascertain. The identification of the beasts as either lions or lionesses has been unresolved because of the absence of manes and heads. Younger argued that Pausanias’ (2.16.5) account (“ἡ πύλη, λέοντες δὲ ἐφεστήκασιν αὐτῇ”) fails to resolve the animals’ sex, which was likewise unclear to viewers in the second century C.E.¹²¹ Pausanias does not describe the heads, probably because they did not survive into the Roman period. The notion that the felines were lionesses was well received by scholars throughout the 19th and 20th centuries.¹²² Marinatos, however, refrained from making a decision about sex and simply referred to the animals as “lions or lionesses,” and Åström ar-

gued that it is “impossible to decide the sex of the animals on zoological grounds” but noted that lions are more common in Aegean iconography.¹²³ The lack of teats on the bodies led Mylonas to believe that the animals were lions and not lionesses, but scholars generally remain divided on this issue.¹²⁴

Despite these difficulties, two clues suggest that the animals are certainly lions. Sculpted ridges denote musculature on the bodies, yet the upper portions of both animals are relatively plain (see fig. 3). This undecorated area on the animal is the spot typically reserved for the depiction of a mane.¹²⁵ The lack of musculature definition would be accounted for if a mane had once covered the area, which is just below where the attached head would have been. It is also plausible that the manes were painted on the stone, yet no trace of paint has been observed.¹²⁶ The presence of manes is further suggested by a slight, outward protrusion of the upper chests (see fig. 1). Sculpted in higher relief, these areas are meant to resemble the bulging and dense nature of a mane. These simple observations, combined, point to the existence of manes and the identification of the animals as lions.

In his analysis of the Lion Gate relief, Schliemann claimed that the heads looked out toward the viewer, and this hypothesis, no doubt reinforced by Åström and Blomé’s 1964 reconstruction, has been widely accepted.¹²⁷ Aegean iconography has numerous instances of lion heads depicted en face, often when lions are shown as predators.¹²⁸ The aforementioned gem from Chamber Tomb 8 at Mycenae,¹²⁹ reminiscent of the Lion Gate relief composition, provides dual images in a single depiction of two antithetical lions placing their forepaws on an altar. They can be viewed as sharing a common face looking at the viewer and/or resting their heads in profile against one another nose to nose. Despite the use of en face lions on sealstones and the general acceptance of such a composition on the Lion Gate relief, Åström and Blomé admitted that the position “is not certain” and that “the heads of the lions in antithetic schemes on gems are usually

¹¹⁷ CMS 1, no. 98.

¹¹⁸ Protonotariou-Deilaki 1967, 11–25.

¹¹⁹ Evans 1901, 155, fig. 33; Kardara 1970, 245; Aravantinos and Fappas 2008, 144, fig. 83; Papazoglou-Manioudaki 2008, 138, fig. 77.

¹²⁰ Mylonas 1970, 423–24; 1983, 79.

¹²¹ Younger 1978, 298 n. 32; see also Åström and Blomé 1964, 178.

¹²² The contingent of scholars who believe the animals are lionesses are listed in Åström and Blomé 1964, 177 n. 2.

¹²³ Marinatos 1960, 86; Åström and Blomé 1964, 178.

¹²⁴ Mylonas 1970, 425.

¹²⁵ For discussion of the representation of lion manes on

Aegean seals, see Krzyszkowska 2005, 260.

¹²⁶ Åström and Blomé 1964, 178–79.

¹²⁷ Schliemann 1878, 33; Wace 1949, 52; Åström and Blomé 1964, 179, figs. 16, 17; Mylonas 1966, 173; Younger 1978, 298; Morgan 1995, 140–41; Bloedow 1996, 1159; Iakovidis and French 2003, 11.

¹²⁸ Younger 1988, 58–60; Morgan 1995, 138–41. Some examples of en face lions on seals from the chamber tombs at Mycenae include CMS 1, nos. 36 (Tomb 54), 54 (Tomb 11), 77 (Tomb 42), 84 (Tomb 48), 106 (Tomb 68), 115 (Tomb 81), 116 (Tomb 83).

¹²⁹ CMS 1, no. 46.

placed in a profile view.¹³⁰ Indeed, lions and other animals on Aegean seals are often shown in profile or are regardant.¹³¹

There are several examples of antithetical lions that flank a central object, often a column, and twist their heads back. The provenance of an Aegean yellow quartz lentoid gem in the British Museum is unknown, but the composition on the seal depicts a goddess seated between heraldic lions with turned-back heads.¹³² From Mycenae comes a gold signet ring with lions tethered to a central column and a seal with lions that flank a Taweret.¹³³ The griffin seal from Chamber Tomb 58 at Mycenae was previously mentioned;¹³⁴ it exhibits regardant griffins flanking a column. This seal further illustrates the Mycenaean preference for depictions of antithetical animals with turned-back heads.¹³⁵ This motif is not restricted to seals, as the Dendra tholos tomb yielded glass objects in the shape of lionesses that glance backward.¹³⁶ The motif of heraldic lions twisting their necks and heads also occurs on Crete. A lentoid seal from Crete depicts two regardant lions resting their forelegs on a central table or altar, exactly in the pose proposed below for the Lion Gate relief; the seal is dated stylistically to Late Minoan (LM) IIIA1, as it belongs to the Spectacle Eye Group.¹³⁷

Antithetical lions with turned heads also occur on two objects from Ialysos, Rhodes: an agate seal stone and an ivory plaque or handle for a bronze mirror. These items afford helpful parallels for reconstructing the appearance of the Lion Gate relief. The agate seal stone shows two stylized lions flanking a column and glancing backward (online fig. 8);¹³⁸ Younger places the piece within the LM IIIA1 period as part of the Spectacle Eye Group.¹³⁹ If the Lion Gate relief was carved in the 13th century B.C.E. as I have argued, then the seal predates it, but the ivory piece from Ialysos may be contemporary with the sculpture. Found in a votive deposit in the Sanctuary of Athena Polias on the Ialysos citadel and dated to LH IIIA2–B, the ivory plaque depicts backward-looking lions that rest their forepaws on an altar (fig. 22).¹⁴⁰ No column is depicted here, but the lions and altar stand on a feature that is reminiscent of a post-and-lintel gateway with a



Fig. 22. Ivory plaque from Ialysos (Rhodes), with heraldic lions looking backward. Rhodes, Archaeological Museum of Rhodes.

recessed doorway. This ivory piece provides the strongest parallel for the original appearance of the relief at Mycenae.¹⁴¹ The existence of the plaque suggests a Rhodian connection to the Argolid, a relationship also indicated by ceramic analysis.¹⁴²

The evidence for weight distribution on the relief challenges the notion that the heads faced outward toward the viewer. The positioning of the mortises and ledges on each lion demonstrates how the head weight was supported. Most of the load fell on the middle and back portions of each lion's upper body, or where the ledges were cut. For outward-facing heads, horizontal ledges centered in relation to the top of each lion would have been more effective in stabilizing an attachment. While the ledges provided support from the middle to the back edge of each

¹³⁰ Åström and Blomé 1964, 179.

¹³¹ Pini 1985; Younger 1988, 86–9, 91–3.

¹³² CMS 7, no. 118.

¹³³ For the signet ring, see CMS 6, no. 364. For the seal, see CMS 1, no. 172.

¹³⁴ CMS 1, no. 98.

¹³⁵ For other non-lion examples of this composition, see Krzyszkowska 2005, figs. 411 (from Knossos), 537 (from Kalapodi).

¹³⁶ Persson 1931, 59–60, pl. 26.

¹³⁷ CMS 11, no. 47; Younger 1986, 134; 1988, 91, fig. 52. For

another example of regardant lions on a seal from Crete, see CMS 6, no. 365.

¹³⁸ CMS 7, no. 154.

¹³⁹ Younger 1986, 133.

¹⁴⁰ Marketou 2008, 278, fig. 174.

¹⁴¹ Marketou 2008, 278. The possibility of the Ialysos seal reflecting the composition on the Lion Gate relief is suggested on the British Museum (2013, 1 November) website.

¹⁴² Jones and Mee 1978, 468–70; Karantzali and Ponting 2000, 235; Girella 2005, 135–36.

lion, there is little evidence for any part of the head being secured along the lions' necks (e.g., to either side of the column). The large holes along the necks provide no structural support; they are poorly suited for making an attachment, not least because the three holes on the Right Lion are incomplete, with one side exposed from a saw cut (see figs. 8, 15).¹⁴³ Likewise, several holes on the Left Lion's neck were bisected by a saw (see figs. 4, 8). It is also unlikely that the heads faced each other, for that arrangement does not fit well within the given space. Structurally, the position of the horizontal ledges and adjacent drill holes supports best a composition whereby the lions turned their heads backward, a configuration with compelling parallels in Aegean iconography.

Two reconstructions of the Lion Gate relief are presented here (fig. 23), which take into consideration the drilled dowel holes, the horizontal ledges, and iconographic parallels. The first option (see fig. 23, top) depicts a longer mane that wraps around the top of the front legs, thus corresponding to typical depictions of lions' manes in Aegean art.¹⁴⁴ The second option for restoration shows a shorter mane that falls short of the drilled mortises along the neckline, since extending the mane over them would have been redundant had the holes been filled at that time (see fig. 23, bottom). Figure 23 (bottom) also illustrates the restored heads as overlaid on the weight-support system. This support system applies to both reconstructions, though it is not illustrated in figure 23 (top) for the sake of allowing the reader to picture the composition as it would have appeared to the viewer. Presently, both restorations are plausible, but stronger iconographic parallels exist for figure 23 (top). The style of the heads and manes are based on a contemporary LH IIIB ivory lion statuette from Mycenae's Room with the Fresco.¹⁴⁵ In discussing this crouching ivory lion, Krzyszkowska noted: "One convention, which is more or less constant in all cases, is the feather-like treatment of the mane."¹⁴⁶ This ivory object is perhaps the best example of how artists of mid 13th-century B.C.E. Mycenae sculpted lions.

Unfortunately, the material of the missing heads and manes remains elusive. Visitors to the citadel in the 18th and 19th centuries believed that the heads

were sculpted from the stone slab and had broken off. Schliemann, however, noticed the mortises on the upper bodies and understood that the heads were fastened to the relief.¹⁴⁷ He also was "inclined to believe that they [the heads] were of bronze and gilded," though little evidence existed for such a claim.¹⁴⁸ Wace, and later Mylonas, asserted that the heads were made of a relatively heavy material—such as steatite—as indicated by the large, deep dowel holes.¹⁴⁹ Younger noted that intricately detailed steatite could have been gilded, an oft-cited notion that fits with the Homeric image of Mycenae as "πολυχρύσοιο Μυκῆνης" (Hom., *Il.* 7.180).¹⁵⁰ Indeed, the practice of gilding both steatite and ivory is familiar on objects from Minoan Crete.¹⁵¹ Judging by the damage and subsequent repairs to the relief, the heads, and possibly the manes, were likely heavy attachments made of stone and/or metal. Although it is reasonable to question whether the relief was richly adorned, the suggestion that the heads and manes were gilded is purely conjectural. How the manes were joined to the heads is equally ambiguous. Whether these attachments were steatite or limestone, gold or bronze, or some other material entirely is impossible to determine based on current evidence, yet at the very least the dowels and ledges indicate that the heads were heavy and not simply metal sheets.

One final comment about the reconstruction is necessary. The proposed composition deliberately avoids placing a crowning ornament on the sculpture. The rectangular depression (or dowel hole) on top of the relief slab does not permit a reconstruction of that space. Despite suggestions that birds, horns of consecration, or flowers surmounted the relief, it is equally possible that the hole connected the relief to an above block.¹⁵² Whether such a stone would have completed the apex of the triangular space is also ambiguous.

THE CASE FOR ANATOLIAN INFLUENCE IN THE PRODUCTION OF THE RELIEF AT MYCENAE

The degree of interaction between the Mycenaean and Hittite worlds, particularly on an architectural and technological level, is contested.¹⁵³ Architectural techniques and tool types have been cited regularly as evidence for links between these regions during the

¹⁴³ The holes also bear traces of an unknown filling, making them poor mortises. It is unclear, however, whether this material is ancient or modern.

¹⁴⁴ Examples of similar manes are depicted on two ivory heraldic lions from the LM IIIA–B chamber tomb cemetery at Chania (Preve 2009, 178, fig. 11).

¹⁴⁵ Krzyszkowska 2007, 21.

¹⁴⁶ Krzyszkowska 2007, 21.

¹⁴⁷ Schliemann 1878, 33.

¹⁴⁸ Schliemann 1878, 33.

¹⁴⁹ Wace 1949, 52; Mylonas 1983, 79.

¹⁵⁰ Younger 1978, 298 n. 32.

¹⁵¹ Younger 1978, 298 n. 32; Rehak 1995, 436–37, 447; Sackett 2006.

¹⁵² Marinatos 1960, 155; Åström and Blomé 1964, 179–83, figs. 6–9, 12.

¹⁵³ Scoufopoulos 1971, 100–6; Niemeier 1998, 19–25, 41–5; Maran 2004; Işık 2006; Wright 2006, 28–33; Thaler 2007; Seeher 2008; Beckman et al. 2011, 267–83; Maner 2012, 54; 2013, 419.

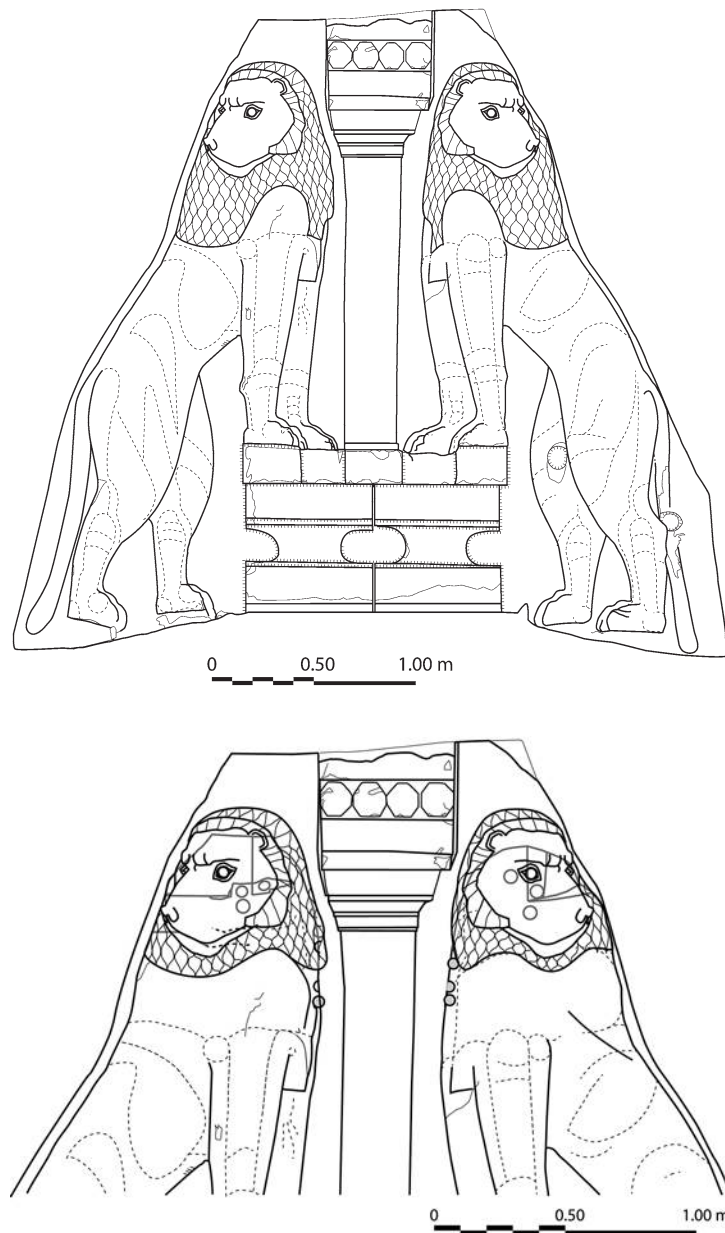


Fig. 23. Reconstructions of the Lion Gate relief: *top*, restoration A, with longer manes; *bottom*, restoration B, with shorter manes, also showing the modified weight support system (drawing by G. Bianco and N. Blackwell).

Late Bronze Age, yet Seeher doubts whether traces of stoneworking can demonstrate distant foreign relations. He argues that tool types, such as drills and saws, developed independently within each region and that similar cuttings do not necessarily indicate foreign influence one way or the other.¹⁵⁴ Seeher's analysis is important to bear in mind for the current assessment

of Mycenaean and Hittite relations. It is argued here, however, that Anatolian traits are indeed evident on the Lion Gate relief, judging by how the tubular drill and a short convex saw blade were used. The limited evidence for Mycenaean and Hittite contact is appraised below, and the potential Anatolian features on the relief at Mycenae are addressed in greater detail.

¹⁵⁴ Seeher 2008, 4–12.

Hittite texts repeatedly refer to the land of Ahhiyawa, and although the Ahhiyawa are understood geographically to have been located in the Aegean region, their actual identity and precise location are unknown.¹⁵⁵ The Argolid in general and Mycenae in particular are often suggested as possibilities, but Hittite contact with western Anatolia and perhaps the Dodecanese should not be disregarded. Hittite objects are exceedingly rare in the Aegean, as a mere “dozen objects in the Bronze Age Aegean are even potentially Hittite in origin, and these are scattered far and wide both in time and location.”¹⁵⁶ Scanty remnants of wall paintings have turned up at Boğazköy-Hattuša (e.g., in Temples 5 and 9 and on the Büyükkale) and have been cited as having iconographic and technological parallels with Mycenaean examples.¹⁵⁷ Because of the fragmentary nature of the Boğazköy-Hattuša material, it remains uncertain whether these wall paintings display foreign, specifically Aegean, characteristics.¹⁵⁸ Mycenaean material culture is rare in central Anatolia, yet limited quantities of Mycenaean pottery have turned up at Maşat Höyük, Boğazköy-Hattuša, and Kuşaklı.¹⁵⁹ Mycenaean goods are well documented on the fringe of the Hittite cultural sphere in southwestern Anatolia—at sites such as Miletus, Müskebi, Iasos, and Ephesus—as well as in the Dodecanese, particularly Rhodes and Kos.¹⁶⁰

Despite limited cultural overlap, the Mycenaeans and Hittites shared salient architectural features that suggest an exchange of craft ideas and technology.¹⁶¹ The corbeled vaulted galleries at Boğazköy-Hattuša and Tiryns are cited regularly, but similar use of timber frames to form wall sections in Anatolian architecture and some Mycenaean palaces cannot be overlooked. Nelson demonstrated that certain walls in the Palace of Nestor (e.g., the throne room) were made using removable timber frames, a process that he referred to as “pier-wall construction” but that is also known as timber formwork.¹⁶² Individual piers or pillars were built by pouring a mix of rubble and mortar inside a timber frame. After the mixture had set and dried, the timber was removed, leaving vertical gaps or chases in the wall. The chases left by the timber frames were

subsequently filled with lime mortar, except when the wood was unable to be removed. This technique, according to Wright, occurs at other Mycenaean centers (e.g., Tiryns and Mycenae) and may owe its origin to central Anatolia, where Middle Bronze Age and Late Bronze Age mudbrick monumental buildings utilized wooden chases (e.g., Beycesultan, Acemhöyük, Kültepe, Boğazköy-Hattuša, Tarsus, and Maşat Höyük).¹⁶³

With these potential connections in mind, it is not surprising that Anatolian stoneworking techniques may be present on the Mycenae Lion Gate relief. It is important to emphasize that the focus here is on the manufacturing methods and not the iconography. In other words, the relief at Mycenae shows evidence of Anatolian stonecutting techniques even though the final product does not resemble canonical Hittite imagery. The relief, as indicated by the tool marks themselves, is the product of a hybrid of Aegean and Anatolian practices.

The extensive use of the tubular drill and the convex saw on the relief at Mycenae finds its closest parallels with stonecutting in Anatolia, while that of the pendulum and straight-edged saws belongs exclusively to the Mycenaean tradition. Hittite masons and sculptors used diverse stonecutting techniques, and so the similarities documented on the relief at Mycenae are not found everywhere in Bronze Age Anatolia. The extant sculpture from that region indicates that rubbing stones and stone hammers were used in conjunction with—perhaps even instead of—metal tools.¹⁶⁴ Recent analysis of unfinished lion sculptures from Karakız Kasabası and Hapis Boğazı (Yozgat region), for instance, underlines the importance of stone hammers, at least at the quarry.¹⁶⁵ Summers and Özen found no evidence that metal tools such as “chisels, metal points, or saws” were applied to the unfinished lions.¹⁶⁶ Whether these implements were used during the finishing stages of the sculpting process is uncertain, but the tubular drill is well documented elsewhere.

Although Casson recognized traces of tubular drilling on the Lion Gate relief eight decades ago, the connection of this technique to Hittite stoneworking has not been explored adequately until now.¹⁶⁷ During

¹⁵⁵ Niemeier 1998, 43–5; Wiener 2009; Kelder 2010; Beckman et al. 2011, 1–6.

¹⁵⁶ Beckman et al. 2011, 268.

¹⁵⁷ Müller-Karpe 2003, 392–93, fig. 11; Özyar 2006, 131–32, fig. 4; Wiener 2007, 14; Seeher 2008, 12–13; Maner 2012, 62.

¹⁵⁸ Brysbaert 2008, 102, 108, 155.

¹⁵⁹ Genz 2004, 78–81. For discussion about a Minoan-type saw found on the Boğazköy-Hattuša citadel, see Neve 1989, 402–5.

¹⁶⁰ Yakar 1976, 125–28; Niemeier 1998, 25–45, fig. 6.

¹⁶¹ Işık 2006; Thaler 2007; Maner 2012, 61–2; 2013, 421–22.

¹⁶² Nelson 2001, 73–95, 154–69, 185, 207–12, fig. 84; Rutter 2005, 23–9.

¹⁶³ Wright 2006, 28–33. Nelson (2001, 168) also notes that the pier-wall technique was employed in the west wall of the palace bathroom at Tiryns.

¹⁶⁴ Alexander 1986, 27–31; Neve 1989, 399.

¹⁶⁵ Summers and Özen 2012, 509–14.

¹⁶⁶ Summers and Özen 2012, 514.

¹⁶⁷ Casson 1933, 24–8; cf. Maner 2012, 61.

the Late Bronze Age, the tubular drill was indisputably more common in Anatolian architecture and sculpture than in the Aegean. Moreover, the tubular drill was used on architecture and sculpture relatively late on the Greek mainland, although the tool itself had been known in the Aegean for centuries. The existence of the tubular drill within the third and early second millennia is not in dispute. How and when that technology was applied to masonry and sculpture on the Mycenaean mainland, however, is more tenuous; influence from Late Bronze Age Anatolia, in my opinion, is a strong possibility.¹⁶⁸ The tubular drill was also a prominent device in the eastern Mediterranean at sites such as Alalakh and Hazor, further solidifying the long tradition of the tool outside the Aegean. A cursory overview of the drill in Anatolia is presented below.

In central Anatolia, the tubular drill achieved its height of popularity in masonry and sculpture during the Hittite Empire period, or the 14th–13th centuries B.C.E. Tubular drill holes are prevalent in masonry at Boğazköy-Hattuša, particularly within the Great Temple and Unterstadt, where about 1,000 perforations are recorded on foundation blocks, thresholds, and doorsills.¹⁶⁹ These mortises received wooden or metal dowels to secure a superstructure of wood or stone with corresponding holes.¹⁷⁰ Traces of tubular drill use appear at other Hittite sites, such as Alaca Höyük, Kuşaklı-Sarissa, and Kayalıpınar.¹⁷¹ In addition to actual drill holes, numerous displaced stone cores from the cutting operation were recovered at Boğazköy-Hattuša (including an impressive cache of 600 stone cores found in the northern entrance of Yerkapı) and Kuşaklı-Sarissa.¹⁷²

In Hittite sculpture, the tubular drill served several purposes other than for making mortises. It was used to create perforations in fountains, to form eye sockets, and to abrade large sections of stone by means of a honeycomb technique. The bull relief fragment from Derbent has a drilled hole for a mouth, through which water flowed.¹⁷³ This hollow cavity, 4 cm in diameter,

was drilled from opposite ends all the way through the stone. Circular perforations, 3.5 cm in diameter, also appear on the skirts of three Hittite mountain deities at the bottom of the Eflatun Pınar facade.¹⁷⁴ These drill holes allowed water, emanating from behind the monument, to gush forth through the divinities' bodies and into the spring sanctuary's large water basin. Such functional capabilities complemented the decorative and practical purposes of drilling. Hollow drills were also ideal for carving the eyes of Hittite animal statues, as noted by Seeher.¹⁷⁵ The technique is unmistakable in the rendering of the eye sockets of the better preserved of the two lions at Boğazköy-Hattuša's southwestern gateway (fig. 24, left).¹⁷⁶ Sculptors used two different drill bits to fashion the eye sockets into a combined oval-like shape; a small exterior cavity measures 1.6–1.7 cm in diameter, while the interior one has a diameter of 3.3 cm. Drill holes were used in a similar fashion for other sculpted pieces from Boğazköy-Hattuša, including the lion fragments from Temples 2 and 3 and the fragmentary sphinx from the citadel's southern gate.¹⁷⁷

The drilling of deep-set eye sockets served an aesthetic purpose in Hittite sculpture, but the drill was also quite practical in removing sections of unwanted stone. The artisan who carved the Boğazköy-Hattuša lions used it as a cutting apparatus to eliminate extraneous material from the lions' mouths. Seeher documented traces of at least seven drillings—made by different tubular drills—within the mouth of the better-preserved beast from the Boğazköy-Hattuša Lion Gate (see fig. 24, right); the reconstructed diameters of these bits are 1.4–1.6 and 4.5 cm.¹⁷⁸ Similar traces of drilling are found in the mouth of the fragmentary lion from Temple 2.¹⁷⁹ The removal of large stone sections by means of the honeycomb method required numerous, successive drillings. After the cores—left by the tubular drills—were extracted, craftspersons easily knocked out the perforated, or honeycombed, sections of stone. An example of debris

¹⁶⁸ Cf. Seeher 2008, 2–3, 12.

¹⁶⁹ Naumann 1971, 111–14; Seeher 2005, 27–35; 2009, 139–41.

¹⁷⁰ In most cases, the mortise holes held wooden dowels and secured a wooden superstructure, but two bronze dowels (diam. 3.9 and 4.1 cm) remain in situ between different masonry courses of the King's Gate (Seeher 2005, 25, figs. 12, 13).

¹⁷¹ For Alaca Höyük, see Koşay and Akok 1966, pl. 82. For Kuşaklı-Sarissa, see Müller-Karpe 1995, fig. 15; Müller-Karpe et al. 1999, fig. 9. At Kayalıpınar, two drill holes (diam. 3.1 cm) appear on the top of an orthostate-like block, which depicts a seated divinity (Müller-Karpe 2006, 218–21, figs. 5, 6). Kayalıpınar is located near the Kızılırmak River, northwest

of Kuşaklı.

¹⁷² Neve 2001, pl. 10d; Seeher 2005, 30.

¹⁷³ Neve 1988, 263–64, figs. 2–4. Another example is the bull basin from Dokuz, where two bull heads seem to have drill holes serving as mouths (Güterbock 1969–1970, 93–5, pls. 13, 14).

¹⁷⁴ Bachmann and Özenir 2004, 96 n. 94, figs. 14, 15.

¹⁷⁵ Seeher 2005, 32–4, figs. 19–22.

¹⁷⁶ Bittel 1937, pl. 1a, b; Seeher 2005, figs. 21, 22.

¹⁷⁷ Bittel 1937, 7–10, pls. 4, 5; Neve 1987, 397, pl. 17; 2001, 56–7, 80, pls. 81, 102; Seeher 2005, 32–4.

¹⁷⁸ Seeher 2005, 34, figs. 23, 24.

¹⁷⁹ Neve 2001, 56–7, pl. 81; Seeher 2005, 34.



Fig. 24. Boğazköy-Hattuša Lion Gate: *left*, the better-preserved lion head (Seeher 2005, fig. 20); *right*, detail of the preserved mouth with traces of tubular drilling (Seeher 2005, fig. 23).

from this technique is provided by a gabbro fragment from Boğazköy-Hattuša's Büyükkale area (online fig. 9). The object—framed by four partial drill holes—testifies to the drilling of adjacent holes to remove larger chunks of stone. This efficient process decreased the surface area that the drill was required to cut, thereby enabling a faster method of stoneworking.¹⁸⁰ It is this honeycombing technique that was applied extensively to the relief at Mycenae.

Honeycomb drilling is in fact evident in the manufacture of Aegean stone vessels from as early as the second millennium B.C.E.¹⁸¹ A deposit of fragmentary stone vases came to light within the LH IIIB House of Shields at Mycenae; one of these vessels is made of Lapis Lacedaemonius, green basalt, and preserves distinct traces of honeycomb drilling on its interior.¹⁸² The application of this cutting technique in Aegean sculpture, however, is limited to the Lion Gate relief at Mycenae. Elsewhere, Mycenaean artists used the drills to form spiral centers on certain decorative pieces (e.g., the tholoi of Atreus and Orchomenos, the Tiryns throne base), but such aesthetic measures are absent on the

relief at Mycenae. The drilled spiral centers occur in shallow relief, and this practice may stem from a different stoneworking tradition from that exhibited on the monumental composition. The sequential drilling of holes—so vivid throughout the relief—afforded an effective means of removing stone in hard-to-cut spots while silhouetting the composition's major features. Does this sculpting procedure owe its origin to the traditions seen in stone-vessel manufacture, or should inspiration be sought elsewhere? That the drillings on the relief were inspired by the Hittites is suggested by the manner in which the tubular drill was used in Hittite and Mycenaean masonry and sculpture (table 4). It is argued here that the honeycomb method on the relief at Mycenae has its closest parallels in sculpture from central Anatolia and northern Syria. In the latter region, the Statue of Idrimi from Alalakh (as well as stone vessels from the site) exhibits such drill-hole sequences.¹⁸³ The proposal of Anatolian inspiration in the production of the relief at Mycenae is further strengthened by saw marks on the sculpture, which resemble those found in the Hittite capital city.

¹⁸⁰ Seeher 2005, 34–5, fig. 25.

¹⁸¹ From Protopalatial Crete, a stone kernos from Mount Juktas has a series of drill holes (Karetsou and Evely 2012, 95). A LM IA bucket jar from Akrotiri is perhaps the best example of the use of honeycombing in the production of stone vases (Warren 1978; Bevan 2007, 51).

¹⁸² Wace 1955, 182, pl. 23b. Similar honeycomb drilling evidence comes from a vessel fragment from the House of Kadmos in Thebes. I thank Anastasia Dakouri-Hild for alert-

ing me to the existence of this piece, which will be published in a new book about the House of Kadmos (Dakouri-Hild [forthcoming]).

¹⁸³ Statue of Idrimi: Woolley 1955, 240, pl. 47a. Stone vessels: Woolley 1955, 293–95 (AT/38/101, AT/39/280), pls. 79, 83; Sparks 2007, 181, fig. 64. Vessel AT/39/280 is considered a Minoan import, and a series of tubular drill holes within the vessel's inner basin indicates modification after it arrived in Alalakh (Warren 1969, 55–6).

Table 4. Tubular Drill Use in Hittite and Mycenaean Architecture and Sculpture.

Type of Drill Hole	Examples in Anatolia	Examples on Greek Mainland
Architecture: circular mortises on thresholds and socle foundations	Boğazköy-Hattuša, Alaca Höyük, Ortaköy, Kuşaklı-Sarissa, etc. ^a	key points within the Mycenae and Tiryns citadels
Architectural support: dowel holes on top of sculpted blocks	Boğazköy-Hattuša, Kayalıpınar	Tiryns (dowel holes on top of the decorated throne base)
Sculpture: honeycomb effect created by removing sections of stone	Boğazköy-Hattuša (open mouths of lion sculptures); Büyükkale (stone debris) ^b	Mycenae (Lion Gate relief) ^c
Sculpture: perforations made in sculpted fountains to facilitate water flow	Eflatun Pınar, Derbent, Dokuz	none
Sculpture: eye sockets of sculpted figures	Boğazköy-Hattuša (Lion Gate, Sphinx Gate, other fragmentary sculpted pieces)	none
Sculpture: center of spirals in low relief	none	Tiryns (throne base); Treasury of Atreus at Mycenae; Treasury of Minyas at Orchomenos?

^a This technique is ubiquitous in Hittite masonry. It is also evident in the Levant.

^b No proof exists, however, that this discarded piece stems from a sculpting operation.

^c This technique is also attested in Aegean stone-vessel production, including examples from the Greek mainland.

The short convex saw cuttings on the Lion Gate relief suggest foreign influence. Parallels for these saw marks are found in central Anatolia, on an adyton foundation from the Great Temple at Boğazköy-Hattuša (fig. 25). A series of cuts on this block was originally thought to have been made by a pendulum saw, but experimental work conducted by Seeher led him to propose that a short, handheld convex saw created these oft-cited curved markings.¹⁸⁴ The profile of the Boğazköy-Hattuša block reveals that saws sliced the stone at various angles, highlighting the maneuverability of the tool (fig. 26). The impressions of the shorter curved marks on the Mycenae Lion Gate relief thus resemble the convex blade cuts on the Boğazköy-Hattuša adyton block.

Further study of Hittite art is necessary to ascertain whether Anatolian craftspersons also used the convex saw in sculpture. A preliminary search for such cuts on Hittite sculpture turned up a few possibilities. On the King's Gate at Boğazköy-Hattuša, a curved tool mark is evident on the left side of the sculpted god's torso (opposite his left bicep).¹⁸⁵ This cut is a good candidate for evidence of convex saw use. Likewise, at Kayalıpınar, similar marks appear on an impressive limestone relief of a seated goddess, a sculpture recently uncovered

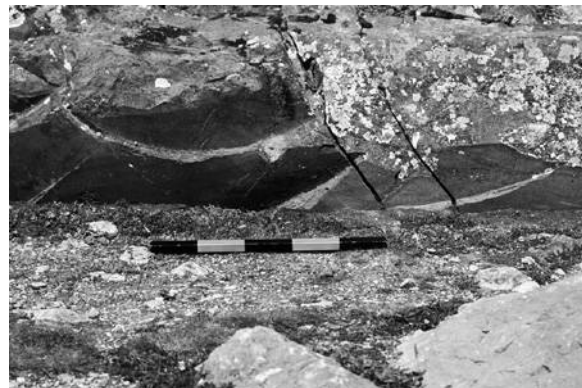


Fig. 25. Convex saw cut on the adyton block of the Great Temple at Boğazköy-Hattuša (Seeher 2007, fig. 7).

by Müller-Karpe. From published photographs, one can detect slightly curved cuts on the front edge of the goddess' dress and along one of the chair legs.¹⁸⁶ The curved markings on these two Hittite reliefs bear a resemblance to those from the Lion Gate relief at Mycenae. An imperial Hittite life-sized human torso in the round, sculpted in hard limestone, was found at Alaca Höyük; the sculpture bears traces of saw cuts,

¹⁸⁴ Seeher 2007, 35–40.

¹⁸⁵ Bittel 1937, pl. 3.

¹⁸⁶ Müller-Karpe 2006, 218–21, figs. 5, 6.

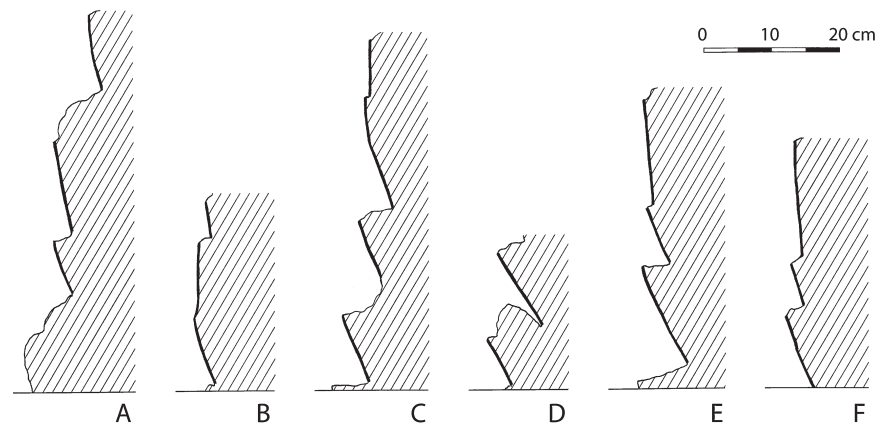


Fig. 26. Profile of the convex-saw cuttings on the northwest side of the adyton block of the Great Temple at Boğazköy-Hattuša (Seehr 2007, fig. 10).

yet it is unclear whether a convex type was employed.¹⁸⁷ The possible application of the convex saw on these pieces and on the remaining corpus of Hittite sculpture needs to be checked by future studies. It would not be surprising if the implement was used by sculptors as well as masons in central Anatolia.

In addition to the tool marks, circumstantial evidence bolsters the hypothesis of Hittite influence on the relief at Mycenae. Given the commonalities between Hittite and Mycenaean architecture,¹⁸⁸ the application of Anatolian techniques on a major—and importantly for this argument, unique—Mycenaean project is understandable. By placing the relief at the citadel's primary entrance, the Mycenaean *wanax* used architectural sculpture in conjunction with visually distinct masonry styles to propagate an image of imposing power and wealth.¹⁸⁹ The handiwork, or inspiration, of foreign craftsmen would only enhance this message, even more so if knowledgeable and cosmopolitan visitors understood—or learned via word of mouth—its debt and relationship to the monuments adorning the imperial Hittite capital.¹⁹⁰ Whether viewers could identify the Anatolian aspects of the relief is not as important as their ability to understand the monument as unique to the Aegean world. By using foreign artisans or techniques learned abroad, Mycenae advertised its ability to acquire specialists from another culture and, in so doing, created a spectacular monument within the

Aegean. The conspicuous display of this work contrasts with the other examples of Mycenaean relief sculpture. The ornamental features of the Treasury of Atreus and the decorative ceiling in the Treasury of Minyas at Orchomenos were not displayed as prominently.¹⁹¹ The visual impact would have been even less pronounced if the dromoi were filled following the funerary ritual and burial. Even the sculpted elements from Tiryns—the throne base and the kyanos frieze—were located within the megaron and thus remained out of sight from the general populace.¹⁹²

The massive Lion Gate relief and its placement above the entrance to the Mycenae citadel led Sandars to refer to the sculpture as possessing a “monumental Hittite style.”¹⁹³ Işık argued that the Lion Gate relief—along with the use of corbeled vaulting and Cyclopean masonry—reflects Hittite influence on Mycenaean architecture.¹⁹⁴ Scoufopoulos, and later Niemeier, went so far as to suggest that the motif of heraldic lions at the Mycenae gate was indicative of Anatolian inspiration.¹⁹⁵ Such a hypothesis is difficult to prove given the quantity of heraldic scenes in Aegean iconography, but the hunch of Scoufopoulos, Sandars, Niemeier, and Işık that the relief at Mycenae is somehow linked to Hittite traditions is not inconsistent with the evidence assembled here.

The singular nature of the large relief at Mycenae within the Aegean stands in stark contrast to the

¹⁸⁷ Koşay and Akok 1973, 78–9, no. Al.p 149, pls. 40, 41.

¹⁸⁸ Scoufopoulos 1971, 100–6; Niemeier 1998, 43; Wright 2006, 28–33; Thaler 2007, 293–95.

¹⁸⁹ Wright 1987, 176–82; Laffineur 1992, 105–7; Fitzsimons 2011, 109–11.

¹⁹⁰ Helms 1993, 32–43.

¹⁹¹ Pelon 1976, pls. 133–36.

¹⁹² Müller 1930, 139–47; Moser von Filseck 1986.

¹⁹³ Sandars 1978, 65.

¹⁹⁴ Işık 2006, 441.

¹⁹⁵ Scoufopoulos 1971, 101; Niemeier 1998, 43; cf. Maner 2012, 61.

number of examples—more than 30—of monumental sculpture throughout Anatolia.¹⁹⁶ It should be noted that the dimensions and material of the Tiryns Oberburg gateway are the same as those of the Lion Gate; moreover, the size of the massive rectangular bathing slab in Tiryns' Room XI matches the outside dimensions of the relief at Mycenae.¹⁹⁷ While the comparable dimensions of these massive blocks may have been deliberate, there is no definitive evidence to prove that a sculpted relief was made for the Tiryns gateway. The Lion Gate at Mycenae is thus unique as a monumentalized and sculpted entranceway in the Aegean world. In Anatolia, richly decorated entrance facades with high-relief guardian figures were a common feature of royal citadels throughout the Late Bronze Age as well as in the Early Iron Age. A product such as the Lion Gate relief would not have been rare in Hatti, for sculpted works adorned citadels, gateways, and remote rock faces in that region.

Hittite sculpture is generally rendered in low relief, but a "high plasticity" is also achieved in several pieces, as Özyar notes: "Often figures that are in relief are raised high above the background so that more than half of the entire face is depicted when seen from the side; this practice may also allude to familiarity and ease with sculpture in the round."¹⁹⁸ Indeed, the depth of the sculpted figure on the King's Gate at Boğazköy-Hattuša is comparable to that of the contemporary relief at Mycenae.¹⁹⁹ The three-dimensionality of the sculpted relief at Mycenae is without parallel in the Aegean world. This characteristic is all the more evident when the Right Lion is viewed from above (online fig. 10).

CONCLUSION: TOOL MARKS, TECHNOLOGICAL TRANSFER, AND CRAFT HYBRIDITY

This article has presented concrete evidence for the production and repair of the Lion Gate relief at Mycenae. While the use of the tubular drill and saw was noted by previous scholars, the importance of these tools was not adequately appreciated. In addition to documenting all tool marks on the relief, close inspection of the monument has enabled me to provide a date for when the sculpture was made; to suggest the process for how it was done; to recognize that re-

pairs and modifications were made to the relief, possibly after an earthquake; and to determine how the composition should be reconstructed. An intriguing observation from this study is the similarity between techniques used in making the Lion Gate relief and established stoneworking practices from Anatolia.

The mechanism for transferring Anatolian technology to the Argolid is uncertain, but Near Eastern textual records document the exchange of specialists between state powers.²⁰⁰ Whether Mycenae was perceived to be an international power is a matter of debate, but it is clear that Ahhiyawa was on the Hittite radar for much of the 14th and 13th centuries B.C.E. If one accepts the highly contested equation that Ahhiyawa is Mycenae, one must explore the possibility of communication between the two states.²⁰¹ Kelder argues that by the mid 13th century, the Hittite perception of Ahhiyawa and its "military might" developed so "the king of Ahhiyawa now belonged to that Club of Great Powers and was considered a Great King, at least as far as the Hittites were concerned."²⁰² The *wanax* at Mycenae may not have always been on par with the Hittite kings, but during the 13th century his power and reputation apparently were strong enough to facilitate distant relations with central Anatolia. This suggestion is supported by the Hittite Tawagalawa letter, in which a Hittite king, presumably Hattusili III, writes directly to the Ahhiyawa king and calls him "my brother."²⁰³ This oft-cited letter, which also mentions an Anatolian charioteer who had driven both the Hittite king and Tawagalawa, the brother of the Ahhiyawan king, reflects "personal and technical exchanges and visits" between Hittite and Mycenaean nobility.²⁰⁴

According to other Late Bronze Age Near Eastern correspondence records, the transfer of skilled persons between states was reciprocal, court mandated, and temporary; such individuals were "requested, refused, and dispatched like gifts."²⁰⁵ The Mari archives, for instance, document the palace-mandated movement of artisans in the early second millennium B.C.E.²⁰⁶ There are numerous cases for the transfer of desirable specialists—including craftspersons, musicians, doctors, and magicians—between Near Eastern powers, and the Hittite records are no exception.²⁰⁷ The Hittite acquisition of specialists from Babylonia

¹⁹⁶ Glatz and Plourde 2011, 44–56.

¹⁹⁷ Müller 1930, 70–3; Shaw 2012, 555–56.

¹⁹⁸ Özyar 2006, 133.

¹⁹⁹ Bittel 1937, pls. 2, 3.

²⁰⁰ Zaccagnini 1983; Moran 1992, xxiv–xxviii, 107–9, 315–16.

²⁰¹ Wiener 2009, 713–15.

²⁰² Kelder 2010, 30.

²⁰³ Güterbock 1983, 134–37; Mellink 1983, 140; Singer 1983, 209–13; Bryce 1998, 321–23, 344; Beckman et al. 2011,

101–22.

²⁰⁴ Mellink 1983, 140. See also Singer (1983, 213) for a discussion of this Hittite charioteer.

²⁰⁵ Zaccagnini 1983, 247, 253. See Helms (1993, 34) for ethnographic relations between elites and craftspersons.

²⁰⁶ Zaccagnini 1983, 247–48.

²⁰⁷ There are also historical and ethnographic records that document the acquisition of specialists as war booty (Zaccagnini 1983, 257; Helms 1993, 32).

and Egypt, and vice versa, is recorded in several texts. For example, Hattusili III and Ramses II made an agreement whereby Hittite masons or house builders went to Egypt after Hatti borrowed Egyptian physicians.²⁰⁸ In another text, a Hittite king demands a sculptor from the Babylonian court while pledging that the artist would be returned promptly.²⁰⁹ If this model of personal exchange was applied to the Aegean, one may speculate as to whether the Mycenaean *wanax* acquired master Hittite artisans to help manufacture the Lion Gate relief.²¹⁰

Specialized artisans were attached to the palace, and so their services had to be formally requested in state letters. Unfortunately, very few texts record state-level interaction between the Mycenaeans and Hittites.²¹¹ The Tawagalawa letter hints at the transfer of Anatolians into the Ahhiyawa territory.²¹² In the text, Tawagalawa was, according to Kelder, “operating in and around the Ahhiyawan dependency Millawanda [Miletus], recruiting Anatolians for labor in Ahhiyawa.”²¹³ Scholars have attempted to connect the acquisition of such Anatolian labor with new Mycenaean construction projects.²¹⁴ The textual evidence is too scanty to offer definitive proof of state-level transfer of specialists, such as sculptors and stoneworkers, between the Hittites and Mycenaeans. Such diplomatic relations, however, would reflect the same protocols by which Hittite kings interacted with Egypt and Babylonia. Thus, it is not unreasonable to question whether an Ahhiyawa king in the 13th century B.C.E., based at Mycenae, acted—in the eyes of the Hittites—in a similar diplomatic fashion as the other great powers of that period.

The prospect that the Mycenae Lion Gate relief was fashioned by Anatolian masons was alluded to by Sandars, who noted offhand that the high relief and monumentality of the Mycenae monument compares favorably with Hittite sculpture.²¹⁵ The present article has also raised this possibility by demonstrating that

comparable stoneworking methods were common in Anatolia and in the Argolid. How this similarity in Hittite and Mycenaean technology developed remains hypothetical, but formal diplomatic relations between Mycenae and Boğazköy-Hattuša provide one feasible explanation.²¹⁶

Despite Anatolian influence, the Mycenae Lion Gate relief is not a Hittite monument. The sculpted relief reflects an amalgam of craft traditions and iconographic traits from several areas. Hittite stoneworking methods supplemented Mycenaean technology and pan-Aegean iconography. The Mycenaean pendulum saw—the use of which is documented at Tiryns, Mycenae, and Gla—was used on key parts of the relief.²¹⁷ The heraldic composition of two animals flanking a central object is common in Aegean art, particularly on sealstones.²¹⁸ Minoan and Mycenaean artists frequently depicted lions in solitary and repetitive scenes, and so the relief’s heraldic lions fit comfortably within the corpus of Aegean art.²¹⁹ Finally, the incurved altars, the column, and the entablature’s beam ends on the Lion Gate relief have strong parallels in Minoan iconography and material culture, such as the four in situ altars at LM IB Archanes Tourkoyeitionia.²²⁰ Mycenaean artisans adopted these features into their visual repertoire as part of the indelible imprint of the Minoan past on the mainland. Indeed, the occurrence or adaptation of Minoan features is a characteristic of Mycenaean art and is especially noticeable among the Shaft Grave goods at Mycenae, of which many items have little to no precedent on the mainland.²²¹

Most interpretations of the Lion Gate relief focus on its symbolism and the meaning of the central column, altars, and lions.²²² Such studies have overlooked other important aspects of the relief. The combination of monumental display, foreign stoneworking techniques, and familiar iconography communicated Mycenae’s cultural and political reach and was meant

²⁰⁸ Zaccagnini 1983, 251–52; Maner 2012, 62.

²⁰⁹ Zaccagnini 1983, 253.

²¹⁰ In discussing the similarities of Hittite and Mycenaean corbeled vaulting and fortification architecture, Maran (2004, 270–74) and Maner (2012, 62; 2013, 422) have suggested state-sponsored transfers of Hittite craftsmen to the Aegean.

²¹¹ Nearly 30 Hittite texts refer to Ahhiyawa over the course of two centuries (1400–1220 B.C.E.), but the precise nature of relations between the Mycenaeans and Hittites remains elusive (Kelder 2010, 21; Beckman et al. 2011, 1–6).

²¹² Kelder 2010, 27–30; Beckman et al. 2011, 120.

²¹³ Kelder 2010, 27.

²¹⁴ Sandars 1978, 64–5; Bryce 2003, 203; Kelder 2010, 27–8.

²¹⁵ Sandars 1978, 64–5.

²¹⁶ Maran 2004, 270–74; Maner 2012, 61.

²¹⁷ Originally, scholars believed that the pendulum saw was used during the construction of the Great Temple at Boğazköy-Hattuša (Schwandner 1991; Neve 2002, 94). Seehar (2007), however, has shown that the curved saw cuttings at the Hittite capital were made by a convex—not a pendulum—saw.

²¹⁸ Evans 1901, 153–69; Nilsson 1950, 252–53; Younger 1988, 91–2, fig. 52; Krzyszkowska 2005, 211, 258–67.

²¹⁹ Wace 1965; Morgan 1988, 44–9; Bloedow 1992, 1996; Thomas 1999, 297; Krzyszkowska 2005, 259.

²²⁰ Shaw 1986, 108, 112–21; Bloedow 1996, 1159; Palyvou 2012, 18–21, figs. 14–16.

²²¹ Matthäus 1980, 39–42. For Minoan influence on Mycenaean architecture at Pylos, see Nelson 2001; Englehardt and Nagle 2011, 358–68.

²²² Åström and Blomé 1964, 160–76; Shaw 1986, 121–22; Boulotis 1990, 455–57; Bloedow 1996, 1159–62, 1166.

to impress commoners and dignitaries from the mainland and elsewhere. The conception and implementation of the Lion Gate relief should be seen as another testament to the interconnectivity of the Late Bronze Age Mediterranean and Near East. In conclusion, this study has uncovered previously unknown details and technical aspects of the relief's production and repair while raising intriguing possibilities about contact between two powerful states during the 13th century B.C.E.

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Works Cited

- Adam, S.A. 1966. *The Technique of Greek Sculpture in the Archaic and Classical Periods*. BSA Suppl. 3. London: Thames & Hudson.
- Alexander, R.L. 1986. *The Sculpture and Sculptors of Yazılıkaya*. Newark: University of Delaware Press.
- Aravantinos, V., and I. Fappas. 2008. "Pyxis with Sphinxes." In *Beyond Babylon: Art, Trade, and Diplomacy in the Second Millennium B.C.*, edited by J. Aruz, K. Benzel, and J.M. Evans, 144. New Haven: Yale University Press.
- Åström, P., and B. Blomé. 1964. "A Reconstruction of the Lion Relief at Mycenae." *OpAth* 5:159–91.
- Åström, P., and K. Demakopoulou. 1996. "Signs of an Earthquake at Midea?" In *Archaeoseismology*, edited by S. Stiros and R.E. Jones, 37–9. Fitch Laboratory Occasional Paper 7. Athens: Institute of Geology and Mineral Exploration, British School at Athens.
- Bachmann, M., and S. Özenir. 2004. "Das Quellheiligtum Eflatun Pınar." *AA* 85:122.
- Beckman, G., T. Bryce, and E. Cline. 2011. *The Ahhiyawa Texts*. Writings from the Ancient World 28. Atlanta: Society of Biblical Literature.
- Betancourt, P. 1990. "The Stone Vessels of Pseira." *Expedition* 32(3):15–21.
- . 2001. "A Minoan Stone Quarry from Pseira." In *Pseira V: The Architecture of Pseira*, edited by J.C. McEnroe, 89–91. University Museum Monograph 109. Philadelphia: University of Pennsylvania Museum of Archaeology and Anthropology.
- Bevan, A. 2007. *Stone Vessels and Values in the Bronze Age Mediterranean*. Cambridge: Cambridge University Press.
- Bittel, K. 1937. *Boğazköy: Die Kleinfunde der Grabungen, 1906–1912. I. Funde hethitischer Zeit*. Wissenschaftliche Veröffentlichung der Deutschen Orient-Gesellschaft 60. Leipzig: J.C. Hinrichs.
- Blackwell, N. 2011. "Middle and Late Bronze Age Metal Tools from the Aegean, Eastern Mediterranean, and Anatolia: Implications for Cultural/Regional Interaction and Craftsmanship." Ph.D. diss., Bryn Mawr College.
- Blitzer, H. 1995. "Minoan Implements and Industries." In *Kommos: An Excavation on the South Coast of Crete*, edited by J.W. Shaw and M.C. Shaw, 403–535. Princeton: Princeton University Press.
- Bloedow, E. 1992. "On Lions in Mycenaean and Minoan Culture." In *EIKON: Aegean Bronze Age Iconography. Shaping a Methodology. Proceedings of the 4th International Aegean Conference, University of Tasmania, Hobart, Australia, 6–9 April 1992*, edited by R. Laffineur and J.L. Crowley, 295–306. *Aegaeum* 8. Liège: Université de Liège.
- . 1996. "The Lions of the Lion Gate at Mycenae." In *Atti e memorie del secondo Congresso internazionale di micenologia, Roma-Napoli, 14–20 ottobre 1991*. Vol. 3, edited by E.D. Miro, L. Godart, and A. Sacconi, 1159–66. *Incunabula graeca* 98. Rome: Gruppo Editoriale Internazionale.
- Blumel, C. 1969. *Greek Sculptors at Work*. 2nd ed. Translated by L. Holland. London: Phaidon.
- Boulotis, C. 1990. "Villes et palais dans l'art égéen du IIe millénaire av. J.-C." In *L'habitat égéen préhistorique: Actes de la Table ronde internationale, Athènes, 23–25 juin 1987*, edited by P. Darcque and R. Treuil, 421–59. *BCH Suppl.* 19. Athens: École Française d'Athènes.
- British Museum. 2013, 1 November. "Banded Agate Seal-Stone." *British Museum*. www.britishmuseum.org/explore/highlights/highlight_objects/gr/b/banded_agate_seal-stone.aspx.
- Bryce, T. 1998. *The Kingdom of the Hittites*. Oxford: Oxford University Press.
- . 2003. *Letters of the Great Kings of the Ancient Near East: The Royal Correspondence of the Late Bronze Age*. London: Routledge.
- Brysbaert, A. 2008. *The Power of Technology in the Bronze Age Eastern Mediterranean: The Case of the Painted Plaster*. Monographs in Mediterranean Archaeology 12. London: Equinox Publishing.
- Casson, S. 1933. *The Technique of Early Greek Sculpture*. Oxford: Clarendon Press.
- Catling, H.W. 2009. *Sparta: Menelaion I. The Bronze Age*. BSA Suppl. 45. London: British School at Athens.
- Chapin, A., E. Banou, and L. Hitchcock. 2012. "The Conglomerate Quarry at Vapheio-Palaiopyrgi in Laconia, Greece." Paper read at the 2012 Annual Meeting of the Archaeological Institute of America, 5–8 January, Philadelphia.
- Chiotis, E., E. Dimou, G. Papadimitriou, and S. Tzoutzopoulos. 2001. "The Study of Some Ancient and Prehistoric Plasters and Watertight Coatings from Greece." In *Archaeometry Issues in Greek Prehistory and Antiquity*, edited by Y. Bassiakos, E. Aloupi, and Y. Facorellis, 327–42. Athens: Hellenic Society for Archaeometry and the Society of Messenean Archaeological Studies Athens.
- Dakouri-Hild, A. 2001. "The House of Kadmos in Mycenaean Thebes Reconsidered: Architecture, Chronology and Context." *BSA* 96:81–122.
- . 2005. "Something Old, Something New: Current Research on the 'Old Kadmeion' of Thebes." *BICS* 48:173–86.
- . Forthcoming. *The House of Kadmos at Thebes, Greece: The Excavations of Antonios D. Keramopoulos (1906–1929)*. Vol. 1, *Architecture, Stratigraphy and Finds*. Biblioteca di Pasiaphae, Collana di Filologia e Antichità Egizia 8. Rome and Pisa: Istituti Editoriali e Poligrafici Internazionali.
- Davies, N.G. 1973. *The Tomb of Rekh-mi-Re at Thebes*. Publications of the Metropolitan Museum of Art, Egyptian Expedition 11. New York: Arno Press.
- Dörpfeld, W. 1885. "Building Material and Construction—The Parastades (Pilasters)." In *Tiryns: The Prehistoric*

- Palace of the Kings of Tiryns. The Results of the Latest Excavations*, edited by H. Schliemann, 263–69. New York: C. Scribner's Sons.
- Dworakowska, A. 1992. "The Beginnings of Stone Quarrying on Crete: Some Reflections." In *Studia Aegaea et Balcanica in honorem Lodovicae Press*, edited by A. Lipska, E. Niezgodna, and M. Zakecka, 53–8. Warsaw: Wydawnictwa Uniwersytetu Warszawskiego.
- Englehardt, J., and D. Nagle. 2011. "Variations on a Theme: Dual-Processual Theory and the Foreign Impact on Mycenaean and Classical Maya Architecture." *AJA* 115 (3):355–82.
- Evans, A. 1901. "Mycenaean Tree and Pillar Cult and Its Mediterranean Relations." *JHS* 21:99–204.
- Evely, R.D.G. 1993. *Minoan Crafts: Tools and Techniques. An Introduction*. SIMA92 (1). Göteborg: Paul Åströms Förlag.
- Ferri, S. 1953. "La 'funzionalità' del monumento archeologico concepita come coefficiente di valutazione." *RendLinc* 8:391–416.
- Fitzsimons, R. 2011. "Monumental Architecture and the Construction of the Mycenaean State." In *State Formation in Italy and Greece: Questioning the Neoevolutionist Paradigm*, edited by N. Terrenato and D.C. Haggis, 75–118. Oxford: Oxbow.
- French, E. 1996. "Evidence for an Earthquake at Mycenae." In *Archaeoseismology*, edited by S. Stiros and R.E. Jones, 51–4. Fitch Laboratory Occasional Paper 7. Athens: Institute of Geology and Mineral Exploration, British School at Athens.
- . 1998. "The Ups and Downs of Mycenae: 1250–1150 BCE." In *Mediterranean Peoples in Transition: Thirteenth to Early Tenth Centuries BCE. In Honor of Professor Trude Dothan*, edited by S. Gitin, A. Mazar, and E. Stern, 2–5. Jerusalem: Israel Exploration Society.
- . 2003. "The Area Outside the Walls: Concordance of Notable Features." In *Archaeological Atlas of Mycenae*, edited by E. Andreadi and L. Braggiotti, 25. Archaeological Society at Athens Library 229. Athens: Archaeological Society of Athens.
- . 2010. "Mycenae." In *The Oxford Handbook of the Bronze Age Aegean (ca. 3000–1000 BC)*, edited by E. Cline, 671–79. Oxford: Oxford University Press.
- Genz, H. 2004. "Eine mykenische Scherbe aus Boğazköy." *AA*:77–84.
- Girella, L. 2005. "Ialysos: Foreign Relations in the Late Bronze Age. A Funerary Perspective." In *EMPORIA: Aegeans in the Central and Eastern Mediterranean. Proceedings of the 10th International Aegean Conference, Athens, Italian School of Archaeology, 14–18 April 2004*, edited by R. Laffineur and E. Greco, 129–39. *Aegaeum* 25. Liège and Austin: Université de Liège and University of Texas at Austin.
- Glatz, C., and A. Plourde. 2011. "Landscape Monuments and Political Competition in Late Bronze Age Anatolia: An Investigation of Costly Signaling Theory." *BASOR* 361:33–66.
- Gorelick, L., and A. Gwinnett. 1981. "The Origin and Development of the Ancient Near Eastern Cylinder Seal." *Expedition* 23(4):17–30.
- Güterbock, H. 1969–1970. "Das Stierbecken von Dokuz." *IstMitt* 19–20:93–5.
- . 1983. "The Hittites and the Aegean World: Part I. The Ahhiyawa Problem Reconsidered." *AJA* 87(2): 133–43.
- Heimpel, W., L. Gorelick, and A. Gwinnett. 1988. "Philological and Archaeological Evidence for the Use of Emery in the Bronze Age Near East." *JCS* 40:195–210.
- Helms, M.W. 1993. *Craft and the Kingly Ideal: Art, Trade and Power*. Austin: University of Texas Press.
- Hiller, S. 1973. "Das Lowentor von Mykene." *AntW* 4:21–30.
- . 2009. "The Facade of the So-Called 'Treasury of Atreus' at Mycenae: Reflections on the Iconography of the Ornamental and Figural Reliefs." In *Δώρον: Τιμητικός τομός για τον καθηγητή Σπύρο Ιακωβίδη*, edited by D. Daniilidou, 291–308. Σειρά Μονογραφιών 6. Athens: Academy of Athens.
- Holland, M., S.F. Hood, and A.G. Woodhead. 1953. "Mycenae, 1939–1952: Part II. The Perseia Fountain House." *BSA* 48:19–29.
- Hunt, P., and A.H. Smith. 1916. "Lord Elgin and His Collection." *JHS* 36:163–372.
- Iakovidis, S. 1983. *Late Helladic Citadels on Mainland Greece*. Monumenta Graeca et Romana 4. Leiden: E.J. Brill.
- . 2001. *Gla and the Kopais in the 13th Century B.C.* Library of the Archaeological Society at Athens 221. Athens: Archaeological Society at Athens.
- Iakovidis, S., and E. French. 2003. "The Citadel: The Excavated Areas." In *Archaeological Atlas of Mycenae*, edited by E. Andreadi and L. Braggiotti, 10–18. Archaeological Society at Athens Library 229. Athens: Archaeological Society at Athens.
- İşık, F. 2006. "Mimari'de Hitit Akha-İlişkileri." In *Hayat Erkanal'a Armağan: Kültürlerin Yansıması/Studies in Honor of Hayat Erkanal: Cultural Reflections*, edited by A. Erkanal-Otkü, 440–50. Istanbul: Homer Kitapevi.
- Jones, R., and C. Mee. 1978. "Spectrographic Analyses of Mycenaean Pottery from Ialysos on Rhodes: Results and Implications." *JFA* 5:461–70.
- Karantzali, E., and M. Ponting. 2000. "ICP-AES Analysis of Some Mycenaean Vases from the Cemetery at Pylona, Rhodes." *BSA* 95:219–38.
- Kardara, C. 1970. "Η Σημασία του Ανάγλυφου της Πύλης των Λεόντων/The Meaning of the Lion Gate Relief." *AAA* 3(2):238–46.
- Karetsoy, A., and R.D.G. Evely. 2012. "Two Stone Kernois from the Juktas Peak Sanctuary." In *Philistor: Studies in Honor of Costis Davaras*, edited by E. Mantzourani and P. Betancourt, 81–96. Prehistory Monographs 36. Philadelphia: INSTAP Academic Press.
- Kelder, J. 2010. *The Kingdom of Mycenae: A Great Kingdom in the Late Bronze Age Aegean*. Bethesda, Md.: CDL Press.
- Kilian, K. 1996. "Earthquakes and Archaeological Context at 13th Century BC Tiryns." In *Archaeoseismology*, edited by S. Stiros and R.E. Jones, 63–8. Fitch Laboratory Occasional Paper 7. Athens: Institute of Geology and Mineral Exploration, British School at Athens.
- Koşay, H., and M. Akok. 1966. *Türk Tarih Kurumu tarafından yapılan Alaca Höyük kazısı: 1940–1948 deki çalışmalara ve keşiflere ait ilk rapor/Ausgrabungen von Alaca Höyük: Vorbericht über die Forschungen und Entdeckungen von 1940–1948*. Türk Tarih Kurumu yayınlarından 6. Ankara: Türk Tarih Kurumu Basımevi.
- . 1973. *Alaca Höyük kazisi: 1963–1967 çalışmaları ve keşiflere ait ilk rapor/Alaca Höyük Excavations: Preliminary Report on Research and Discoveries, 1963–1967*. Türk Tarih Kurumu yayınlarından 28. Ankara: Türk Tarih Kurumu Basımevi.
- Krzyszowska, O. 2005. *Aegean Seals: An Introduction*. BICS Suppl. 85. London: Institute of Classical Studies, School of Advanced Study, University of London.

- . 2007. *Well Built Mycenae: The Helleno-British Excavations Within the Citadel at Mycenae, 1959–1969*. Vol. 24, *The Ivories and Objects of Bone, Antler and Boar's Tusk*, edited by W.D. Taylour, E. French, and K. Wardle. Oxford: Oxbow.
- Küpper, M. 1996. *Mykenische Architektur: Material, Bearbeitungstechnik, Konstruktion und Erscheinungsbild*. Internationale Archäologie 25. Espelkamp: Marie Leidorf.
- Laffineur, R. 1992. "Iconography as Evidence of Social and Political Status in Mycenaean Greece." In *EIKON: Aegean Bronze Age Iconography. Shaping a Methodology. Proceedings of the 4th International Aegean Conference, University of Tasmania, Hobart, Australia, 6–9 April 1992*, edited by R. Laffineur and J.L. Crowley, 105–12. *Aegaeum* 8. Liège: Université de Liège.
- Lavery, J., and E.B. French. 2003. "Early Accounts of Mycenae." In *Archaeological Atlas of Mycenae*, edited by E. Andreadi and L. Braggiotti, 1–5. Archaeological Society at Athens Library 229. Athens: Archaeological Society of Athens.
- Loader, N.C. 1998. *Building in Cyclopean Masonry: With Special Reference to the Mycenaean Fortifications on Mainland Greece*. *SIMA-PB* 148. Jonsered: Paul Åströms Förlag.
- Maner, C. 2012. "A Comparative Study of Hittite and Mycenaean Fortification Architecture." In *Athanasia: The Earthly, Celestial, and the Underworld in the Mediterranean from the Late Bronze Age and the Early Iron Age. International Archaeological Conference, Rhodes 2009*, edited by C. Stampedoulidis, A. Kanta, and A. Giannikouri, 56–66. Heraklion: University of Crete.
- . 2013. "Corbelled Vaults in Hittite and Mycenaean Fortification Architecture." In *SOMA 2012: Identity and Connectivity. Proceedings of the 16th Symposium on Mediterranean Archaeology, Florence, Italy, 1–3 March 2012*. Vol. 1, edited by L. Bombardieri, A. D'Agostino, G. Guarducci, V. Orsi, and S. Valentini, 419–26. *BAR-IS* 2581. Oxford: Archaeopress.
- Maragoudaki, E., and P.K. Kavvouras. 2012. "Mycenaean Shipwright Tool Kit: Its Reconstruction and Evaluation." *Archaeological and Anthropological Sciences* 4(3):199–208.
- Maran, J. 2004. "Architektonische Innovation im spämykenischen Tiryns: Lokale Bauprogramme und fremde Kultureinflüsse." In *Althellenische Technologie und Technik: Von der prähistorischen bis zur hellenistischen Zeit mit Schwerpunkt auf der prähistorischen Epoche. Tagung 21.–23.03.2003 in Ohlstadt/Obb. Deutschland*, edited by K. Apostolos, 261–93. Weilheim: Verein zur Förderung der Aufarbeitung der Hellenischen Geschichte.
- Marinatos, S. 1960. *Crete and Mycenae*. Translated by J. Boardman. London: Thames & Hudson.
- Marketou, T. 2008. "Plaque with Heraldic Lions." In *Beyond Babylon: Art, Trade, and Diplomacy in the Second Millennium B.C.*, edited by J. Aruz, K. Benzel, and J.M. Evans, 278–79. New Haven: Yale University Press.
- Matthäus, H. 1980. "Minoan Influence on the Greek Mainland During the Sixteenth Century B.C. and the Origins of Mycenaean Civilization." *TUAS* 5:37–44.
- Mellink, M.J. 1983. "The Hittites and the Aegean World: Part 2. Archaeological Comments on Ahhiyawa-Achaia in Western Anatolia." *AJA* 87(2):138–41.
- Moran, W.L., ed. 1992. *The Amarna Letters*. Baltimore: Johns Hopkins University Press.
- Morgan, L. 1988. *The Miniature Wall Paintings of Thera: A Study in Aegean Culture and Iconography*. Cambridge: Cambridge University Press.
- . 1995. "Frontal Face and the Symbolism of Death in Aegean Glyptic." In *Sceaux minoens et mycéniens: IVe symposium international 10–12 septembre 1992, Clermont-Ferrand*, edited by W. Müller, 135–49. *CMS Beiheft* 5. Berlin: Gebr. Mann.
- Moser von Filseck, K. 1986. "Der Alabasterfries von Tiryns." *AA*:1–32.
- Müller, K. 1930. *Die Architektur der Burg und des Palastes. Tiryns* 3. Augsburg: B. Filser.
- Müller-Karpe, A. 1995. "Untersuchungen in Kuşaklı 1992–1994." *MDOG* 127:5–36.
- . 2003. "Remarks on Central Anatolian Chronology of the Middle Hittite Period." In *The Synchronisation of Civilisations in the Eastern Mediterranean in the 2nd Millennium B.C. II: Proceedings of the SCIEEM 2000–EuroConference, Haindorf, 2–7 May 2001*, edited by M. Bietak, 383–94. Contributions to the Chronology of the Eastern Mediterranean 4. Vienna: Verlag der Österreichischen Akademie der Wissenschaften.
- . 2006. "Untersuchungen in Kayalıpınar 2005." *MDOG* 138:211–47.
- Müller-Karpe, A., V. Müller-Karpe, A. Schachner, T. Ökse, J. Miller, S. Lorra, H. Stümpel, and R. Pasternak. 1999. "Untersuchungen in Kuşaklı 1998." *MDOG* 131:57–113.
- Mylonas, G. 1957. *Ancient Mycenae: The Capital City of Agamemnon*. Princeton: Princeton University Press.
- . 1966. *Mycenae and the Mycenaean Age*. Princeton: Princeton University Press.
- . 1970. "The Lion in Mycenaean Times." *AAA* 3(2): 421–25.
- . 1983. *Mycenae: Rich in Gold*. Athens: Ekdotike Athenon S.A.
- Naumann, R. 1971. *Architektur Kleinasiens von ihren Anfängen bis zum Ende der hethitischen Zeit*. Tübingen: Wasmuth.
- Nelson, M.C. 2001. "The Architecture of Epiano Englianos, Greece." Ph.D. diss., University of Toronto.
- Neve, P. 1987. "Die Ausgrabungen in Boğazköy-Hattusha 1986." *AA*:381–412.
- . 1988. "Ein hethitisches Stierrelief aus Derbent bei Boğazköy." In *Documentum Asiae Minoris antiquae: Festschrift für Heinrich Otten zum 75. Geburtstag*, edited by E. Neu and C. Rüster, 263–72. Wiesbaden: O. Harrassowitz.
- . 1989. "Eine hethitische Bronzesäge aus Hattusha-Boğazköy." *IstMitt* 39:399–406.
- . 2001. *Boğazköy-Hattusha: Ergebnisse der Ausgrabungen des Deutschen Archäologischen Instituts und der Deutschen Orient-Gesellschaft in den Jahren 1931–1939*. Vol. 17, *Die Oberstadt von Hattusha: Die Bauwerke*. Pt. 2, *Die Bastion des Sphinxtores und die Tempelviertel am Königs- und Löwentor*. Mainz: Philipp von Zabern.
- . 2002. "The Great Temple in Boğazköy-Hattuşa." In *Across the Anatolian Plateau: Readings in the Archaeology of Ancient Turkey*, edited by D.C. Hopkins, 77–97. *AASOR* 57. Boston: American Schools of Oriental Research.
- Niemeier, W.-D. 1998. "The Mycenaeans in Western Anatolia and the Problem of the Origins of the Sea Peoples." In *Mediterranean Peoples in Transition: Thirteenth to Early Tenth Centuries BCE. In Honor of Professor Trude Dothan*, edited by S. Gitin, A. Mazar, and E. Stern, 17–65. Jerusalem: Israel Exploration Society.
- Nilsson, M.P. 1950. *The Minoan-Mycenaean Religion and Its Survival in Greek Religion*. Lund: C.W.K. Gleerup.
- Nojorkam. 1968. "Le bas-relief de la Porte des Lionnes n'est pas mycénien." In *Atti e memorie del 1° Congresso internazionale di micenologia, Roma 27 settembre–3 ottobre 1967*.

- Vol. 1, 232–37. Incunabula Graeca 25. Rome: Edizioni dell'Ateneo.
- Özyar, A. 2006. "A Prospectus of Hittite Art Based on the State of Our Knowledge at the Beginning of the 3rd Millennium AD." In *Strukturierung und Datierung in der hethitischen Archäologie: Voraussetzungen, Probleme, neue Ansätze/Structuring and Dating in Hittite Archaeology: Requirements, Problems, New Approaches. Internationaler Workshop, Istanbul, 26–27. November 2004*, edited by D.P. Mielke, U.-D. Schoop, and J. Seeher, 125–48. Byzas 4. Istanbul: Ege Yayınları and Deutsches Archäologisches Institut Abteilung Istanbul.
- Palyvou, C. 2012. "Wall Painting and Architecture in the Aegean Bronze Age: Connections Between Illusionary Space and Built Realities." In *Minoan Realities: Approaches to Images, Architecture, and Society in the Aegean Bronze Age*, edited by D. Panagiotopoulos and U. Güntel-Maschke, 9–26. Aegis 5. Leuven: Presses Universitaires de Louvain.
- Papazoglou-Manioudaki, L. 2008. "Ring with Griffins." In *Beyond Babylon: Art, Trade, and Diplomacy in the Second Millennium B.C.*, edited by J. Aruz, K. Benzel, and J.M. Evans, 138–39. New Haven: Yale University Press.
- Paschalidis, C. 2007. "Euboea at the Crossroads of the Metal Trade: The Aegean and the Black Sea in the Late Bronze Age." In *Between the Aegean and Baltic Seas: Prehistory Across Borders. Proceedings of the International Conference Bronze and Early Iron Age Interconnections and Contemporary Developments Between the Aegean and the Regions of the Balkan Peninsula, Central and Northern Europe, University of Zagreb, 11–14 April 2005*, edited by I. Galanaki, H. Thomas, Y. Galanakis, and R. Laffineur, 433–45. *Aegaeum* 27. Liège and Austin: Université de Liège and University of Texas at Austin.
- Pelon, O. 1976. *Tholoi, tumuli, et cercles funéraires: Recherches sur les monuments funéraires de plan circulaire dans l'égée de l'âge du bronze, IIIe et IIe millénaires av. J.-C.* Athens: École Française d'Athènes.
- Persson, A. 1931. *The Royal Tombs at Dendra near Midea*. Lund: Gleerup.
- Pini, I. 1985. "Das Motiv des Löwenüberfalls in der spätminoischen und mykenischen Glyptik." In *L'iconographie minoenne: Actes de la Table ronde d'Athènes (21–22 avril 1983)*, edited by P. Darcque and J.-C. Poursat, 153–66. *BCH Suppl.* 11. Athens: École Française d'Athènes.
- Plommer, H. 1965. "A Carved Block from the Megaron of Mycenae." *BSA* 60:207–11.
- Preve, S. 2009. "Rovithaki Excavation (11, Malinou St.)." In *Χανιά (Κυδωνία): Περιήγηση σε χώρους αρχαίας μνήμης/Khania (Kydonia): A Tour to Sites of Ancient Memory*, edited by M. Andreadaki-Vlasaki, 172–79. Athens: Υπουργείο Πολιτισμού και Τουρισμού and ΚΕ' Εφορεία Προϊστορικών και Κλασικών Αρχαιοτήτων.
- Protonotariou-Deilaki, E. 1967. "Περὶ τῆς πύλης τῶν Μυκηνῶν." *ArchEph*:7–26.
- Pryce, F.N. 1928. *Catalogue of Sculpture in the Department of Greek and Roman Antiquities of the British Museum: Prehellenic and Early Greek*. Vol. 1, pt. 1. London: British Museum.
- Rehak, P. 1995. "The Use and Destruction of Minoan Stone Bull's Head Rhyta." In *POLITEIA: Society and State in the Aegean Bronze Age. Proceedings of the 5th International Aegean Conference, University of Heidelberg, Archäologisches Institut, 10–13 April 1994*, edited by R. Laffineur and W.-D. Niemeier, 435–60. *Aegaeum* 12. Liège and Austin: Université de Liège and University of Texas at Austin.
- Rutter, J. B. 2005. "Southern Triangles Revisited: Lakonia, Messenia, and Crete in the 14th–12th Centuries BC." In *Ariadne's Threads: Connections Between Crete and the Greek Mainland in Late Minoan III (LM IIIA2 to LM IIIC). Proceedings of the International Workshop Held at Athens, Scuola Archeologica Italiana, 5–6 April 2003*, edited by A.L. D'Agata and J. Moody, 17–64. Tripodes 3. Athens: Scuola Archeologica Italiana di Atene.
- Sackett, L.H. 2006. *The Palaikastro Kouros: A Masterpiece of Minoan Sculpture in Ivory and Gold*. Athens: Hellenic Ministry of Culture, Archaeological Receipts Fund.
- Sandars, N.K. 1978. *The Sea Peoples: Warriors of the Ancient Mediterranean 1250–1150 BC*. Ancient Peoples and Places 89. London: Thames & Hudson.
- Schliemann, H. 1878. *Mycenae: A Narrative of Researches and Discoveries at Mycenae and Tiryns*. New York: Scribner, Armstrong & Company.
- Schulz, T. 1988. "Die Rekonstruktion des Thronpodestes im ersten großen Megaron von Tiryns." *AM* 103:11–23.
- Schwandner, E.L. 1991. "Der Schnitt im Stein: Beobachtungen zum Gebrauch der Steinsäge in der Antike." In *Bautechnik der Antike: Internationales Kolloquium in Berlin vom 15–17. Februar 1990*, edited by A. Hoffmann, E. Schwandner, W. Hoepfner, and G. Brandes, 215–23. Diskussionen zur archäologischen Bauforschung 5. Mainz: Philipp von Zabern.
- Scoufopoulos, N.C. 1971. *Mycenae Citadels*. SIMA 22. Göteborg: Paul Åströms Förlag.
- Seeher, J. 2005. "Bohren wie die Hethiter: Rekonstruktion von Bohrmaschinen der Spätbronzezeit und Beispiele ihrer Verwendung." *IstMitt* 55:17–35.
- . 2007. "Sägen wie die Hethiter: Rekonstruktion einer Steinschneidetechnik im Bronzezeitlichen Bauhandwerk." *IstMitt* 57:27–43.
- . 2008. "Innovation im Bauwesen als Indikator für Kulturkontakt—Hethiter und Mykenen als Fallbeispiel." In *Austausch und Inspiration: Kulturkontakt als Impuls architektonischer Innovation. Kolloquium vom 28.–30.4.2006 in Berlin anlässlich des 65. Geburtstages von Adolf Hoffmann*, edited by F. Pirson and U. Wulf-Rheidt, 1–15. Diskussionen zur archäologischen Bauforschung 9. Mainz: Philipp von Zabern.
- . 2009. "Die Techniken der Steinbearbeitung in der hethitischen Architektur des 2. Jahrtausends v. Chr." In *Bautechnik im antiken und vorantiken Kleinasien: Internationale Konferenz, 13.–16. Juni 2007 in Istanbul*, edited by M. Bachmann, 119–56. Byzas 9. Istanbul: Ege Yayınları.
- Shaw, J.W. 1973. "The Chrysolakkos Facades." In *Πεπραγμένα του Γ' Διεθνούς Κρητολογικού Συνεδρίου (Ρέθυμνον, 18–23 Σεπτεμβρίου 1971)*. Vol. 1, edited by G.I. Kourmoules and M.I. Manoussakas, 319–31. Athens: Υπουργείο Πολιτισμού και Επιστημών.
- . 2009. *Minoan Architecture: Materials and Techniques*. Studi Archeologia Cretese 7. Padua: Bottega d'Erasmio.
- . 2012. "Bathing at the Mycenaean Palace of Tiryns." *AJA* 116(4):555–71.
- Shaw, M.C. 1986. "The Lion Gate Relief of Mycenae Reconsidered." In *Φίλια ἔπη εἰς Γεώργιον Έ. Μυλωνῶν διὰ τὰ 60 ἔτη τοῦ ἀνασκαφικοῦ τοῦ ἔργου*. Vol. 1, 103–23. Η Βιβλιοθήκη της εν Αθήναις Αρχαιολογικῆς Εταιρείας 103 Athens: Αθήναις Αρχαιολογικῆς Ἐταιρείας.
- Singer, I. 1983. "Western Anatolia in the Thirteenth Century B.C. According to Hittite Texts." *AnatSt* 33:205–18.
- Soles, J.S. 1983. "A Bronze Age Quarry in Eastern Crete." *JfA* 10(1):33–46.
- Soles, J., and C. Davaras. 1996. "Excavations at Mochlos,

- 1992–1993.” *Hesperia* 65(2):175–230.
- Sparks, R.T. 2007. *Stone Vessels in the Levant*. The Palestine Exploration Fund Annual 8. Leeds: Maney Publishing.
- Spyropoulos, T. 1972. Υστερομυκηναϊκοί ελλαδικοί θησαυροί. Η Βιβλιοθήκη της εν Αθήναις Αρχαιολογικής Εταιρείας 72. Athens: Αθήναις Αρχαιολογικής Εταιρείας.
- Stillman, W.J. 1898. “The Arts at Mycenae.” *The Nation* 66:182–83.
- Summers, D., and E. Özen. 2012. “The Hittite Stone and Sculpture Quarry at Karakız Kasabası and Hapis Boğazi in the District of Sorgun, Yozgat, Central Anatolia.” *AJA* 116(3):507–19.
- Taylor, W., and R. Janko. 2008. *Ayios Stephanos: Excavations at a Bronze Age and Medieval Settlement in Southern Laconia*. BSA Suppl. 44. London: British School at Athens.
- Thaler, U. 2007. “Ahhiyawa and Hatti: Palatial Perspectives.” In *Mediterranean Crossroads*, edited by S. Antoniadou and A. Pace, 291–323. Oxford: Oxbow.
- Thomas, N.R. 1999. “The War Animal: Three Days in the Life of the Mycenaean Lion.” In *POLEMOS: Le contexte guerrier en Égée à l’âge du Bronze. Actes de la 7e Rencontre égéenne internationale Université de Liège, 14–17 avril 1998*, edited by R. Laffineur, 297–312. *Aegaeum* 19. Liège and Austin: University of Liège and University of Texas at Austin.
- Tournavitou, I. 1995. *The “Ivory Houses” at Mycenae*. BSA Suppl. 24. London: British School at Athens.
- Tripathi, D.N. 1988. *Bronzework of Mainland Greece from c. 2600 B.C. to c. 1450 B.C.* SIMA-PB 69. Göteborg: Paul Åströms Förlag.
- Tsountas, C., and J.I. Manatt. 1897. *The Mycenaean Age: A Study of the Monuments and Culture of Pre-Homeric Greece*. Boston: Houghton, Mifflin & Co.
- Wace, A. 1921–1923. “Excavations at Mycenae: The Lion Gate and Grave Circle Area.” *BSA* 25:9–146.
- . 1936. “Mycenae.” *Antiquity* 10:405–16.
- . 1949. *Mycenae: An Archaeological History and Guide*. Princeton: Princeton University Press.
- . 1955. “Preliminary Report of the Excavations of 1954.” *BSA* 50:175–89.
- . 1962. “The Principal Homeric Sites: Mycenae.” In *A Companion to Homer*, edited by A. Wace and F. Stubbings, 386–98. London: MacMillan.
- Wace, H. 1965. “Lions from Mycenae.” In *Studi in onore di Luisa Banti*, 337–44. Rome: L’Erma di Bretschneider.
- Warren, P. 1969. *Minoan Stone Vases*. London: Cambridge University Press.
- . 1978. “The Unfinished Red Marble Jar at Akrotiri.” In *Thera and the Aegean World*. Vol. 1, *Papers Presented at the Second International Scientific Congress, Santorini, Greece, August 1978*, edited by C. Doumas and H. Puchelt, 555–68. London: Thera and the Aegean World.
- Wiener, M.H. 2007. “Homer and History: Old Questions, New Evidence.” In *EPOS: Reconsidering Greek Epic and Aegean Bronze Age Archaeology. Proceedings of the 11th International Aegean Conference, Los Angeles, UCLA, the J. Paul Getty Villa, 20–23 April 2006*, edited by S.P. Morris and R. Laffineur, 3–33. *Aegaeum* 28. Liège and Austin: Université de Liège and University of Texas at Austin.
- . 2009. “Locating Ahhiyawa.” In *Δόρον: Τιμητικός τομός για τον καθηγητή Σπύρο Ιακωβίδη*, edited by D. Danielidou, 701–15. Σειρά Μονογραφιών 6. Athens: Academy of Athens.
- Woolley, L. 1955. *Alalakh: An Account of the Excavations at Tell Atchana in the Hatay, 1937–1949*. Reports of the Research Committee of the Society of Antiquaries of London 18. Oxford: Oxford University Press.
- Wright, J.C. 1978. “Mycenaean Masonry Practices and Elements of Construction.” Ph.D. diss., Bryn Mawr College.
- . 1987. “Death and Power at Mycenae: Changing Symbols in Mortuary Practice.” In *THANATOS: Les Coutumes Funéraires en Égée à l’âge du Bronze. Actes du Colloque de Liège (21–23 Avril 1986)*, edited by R. Laffineur, 171–84. *Aegaeum* 1. Liège: Université de l’Etat à Liège.
- . 2006. “The Formation of the Mycenaean Palace.” In *Ancient Greece: From the Mycenaean Palaces to the Age of Homer*, edited by S. Deger-Jalkotzy and I.S. Lemos, 7–52. Edinburgh Leventis Studies 3. Edinburgh: Edinburgh University Press.
- Yakar, J. 1976. “Hittite Involvement in Western Anatolia.” *AnatSt* 26:117–28.
- Younger, J.G. 1978. “The Mycenae-Vapheio Lion Group.” *AJA* 82(3):285–99.
- . 1984. “Aegean Seals of the Late Bronze Age: Masters and Workshops. III. The First Generation Mycenaean Masters.” *Kadmos* 23:38–64.
- . 1986. “Aegean Seals of the Late Bronze Age: Stylistic Groups, V. Minoan Groups Contemporary with LM III A1.” *Kadmos* 25:119–40.
- . 1987a. “The End of Mycenaean Art.” In *Forschungen zur Aegäischen Vorgeschichte das Ende der Mykenischen Welt: Akten des Internationalen Kolloquiums 7–8 Juli 1984 in Köln*, edited by T. Eberhard, 63–72. Berlin: Wasmuth.
- . 1987b. “Aegean Seals of the Late Bronze Age: Stylistic Groups, VI. Fourteenth Century Mainland and Later Fourteenth-Century Cretan Workshops.” *Kadmos* 26:44–73.
- . 1988. *The Iconography of Late Minoan and Mycenaean Sealstones and Finger Rings*. Bristol: Bristol Classical Press.
- . 1995. “Interactions Between Aegean Seals and Other Minoan-Mycenaean Art Forms.” In *Sceaux minoens et mycéniens: IVe symposium international 10–12 septembre 1992, Clermont-Ferrand*, edited by W. Müller, 331–48. CMS Beiheft 5. Berlin: Gebr. Mann.
- . 1997. “The Stelai of Mycenae Grave Circles A and B.” In *TEXNH: Craftsmen, Craftswomen and Craftsmanship in the Aegean Bronze Age. Proceedings of the 6th International Aegean Conference, Philadelphia, Temple University, 18–21 April 1996*, edited by R. Laffineur and P. Betancourt, 229–39. *Aegaeum* 16. Liège and Austin: Université de Liège and University of Texas at Austin.
- Zaccagnini, C. 1983. “Patterns of Mobility Among Ancient Near Eastern Craftsmen.” *JNES* 42:245–64.