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Stepping Stones: Stepped Urban Terraces of Sardis in the Late 7th and Early 6th Centuries BCE

[BASAMAK TAŞLARI: MÖ GEÇ 7. VE ERKEN 6. YÜZYILLARDA SARDİS'İN KADEMELİ KENTSEL TERASLARI]

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ÖZET

Lidya başkenti Sardis'in hareketli topografyasında düzenin sağlanmasında kentsel terasların önemli bir rolü vardır. MÖ 6. yüzyılda Kral Kroisos'un hükümdarlığı döneminde inşa edilen anıtsal teraslar, şehre yukarıdan bakan saray podyumları yaratmıştır. Söz konusu teraslar, kent merkezindeki tepeleri bütünüyle bir podyuma dönüştüren yüksek platform tipi yapılar olarak karakterize edilmektedir, ki bu mimari model Lidya teraslarını simgeler hale gelmiştir. Ancak, Sardis'te süregelen saha araştırmaları, anıtsal teraslama faaliyetlerinin Erken Tunç Çağı'na kadar uzanan kapsamlı tarihini açığa çıkarmaya devam ederken, terasların inşa yöntemlerinin bu süreç içerisindeki çeşitliliğini göstermektedir. Bu makalede, Sardis'te MÖ geç 7. ve erken 6. yüzyıllarda kademeli olarak inşa edilmiş kentsel terasların araştırmasına odaklanılmıştır. Bu kademeli terasların mekânsal, mimari ve stilistik açıdan ortak özellikleri ortaya konularak, Sardis'te Kral Alyattes'in hükümdarlığı esnasında gelişmiş bir kentsel teraslama sisteminin varlığına işaret ettikleri öne sürülmektedir. Mekânsal düzeni açısından eşsiz bu kademeli teras sistemi, Alyattes'in döneminde Lidya'nın genişleyen etkileşim çevresini yansıtırken, bir nesil sonra inşa edilen yüksek platform tipi terasların teknik gelişiminde önemli bir basamak taşı oluşturmuş gibi görünmektedir.

Anahtar Kelimeler

Lidya, Sardis, Alyattes, Arkaik Dönem, Demir Çağı, kentsel teras.

ABSTRACT

Urban terraces played a crucial role in organizing the vibrant topography of the Lydian capital Sardis. The monumental urban terraces built in the 6th century BCE during the reign of King Croesus created palatial podiums overlooking the lower city. These terraces are characterized as high-rising platform structures that transformed entire hills into standalone cubical podiums, an architectural model that has become emblematic of Lydian terraces. However, ongoing field research in Sardis continues to reveal an extensive history of monumental terracing dating back to the Early Bronze Age, showcasing varied construction practices over time. In this article, I focus on urban terraces constructed as shorter stepped platforms during the late 7th and early 6th centuries BCE. By identifying their shared spatial, architectural, and stylistic characteristics, I argue that these stepped terraces represent a sophisticated system that can be attributed to the reign of King Alyattes in Sardis. This spatially unique stepped terrace system reflects Lydia's expanding horizons of communication during the time of Alyattes and appears to have served as a significant step in the technical development of the high-rising platform-type terraces built a generation later.

Keywords

Lydia, Sardis, Alyattes, Archaic Period, Iron Age, urban terrace.

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Introduction

Sardis was the capital of the Lydian polity, ruled by three succeeding dynasties according to Herodotus: the Atyads, the Heraclids, and the Mermnads. While the Atyads are considered mythical, the Heraclid Dynasty reigned 22 generations over a period of 505 years, roughly from the dissolution of Late Bronze Age administrative systems around 1200 BCE until the rise of the first Mermnad King Gyges, who assumed the Lydian throne "ca." 680 BCE.[1] The succeeding Mermnad kings, especially Alyattes and Croesus, transformed Lydia from a kingdom into an empire during the late 7th and the first half of the 6th centuries BCE. During this imperial phase, Lydia emerged as a major political force in Anatolia, subjugating neighboring polities, actively participating in international politics, and engaging in military conflicts with prominent Near Eastern empires.[2]

The expanding power of Lydian kings has been supported by archaeological findings at Sardis, as the city underwent significant monumentalization through ambitious urban projects during the late 7th and the first half of the 6th centuries BCE.[3] Sardis was encircled by monumental mudbrick fortifications stretching 3.5 km around the city. These fortifications did not delineate the city's boundaries; residential, industrial, and ritual spaces extended outward for at least 2.5 km beyond the walls. Within the fortified area lay a lower city comprised of prosperous domestic neighborhoods, some elevated by artificial terrace fills.[4] At the center of this fortified zone, overlooking the residential lower city, the Acropolis and two of its naturally elevated hill spurs—ByzFort and Field 49—formed the city's elite core. These central and dominant hills were monumentalized through large-scale urban terrace constructions that encircled and regularized their rugged topography. The magnitude of investment in these hills, evident in the immense scale of land transformation, the monumental nature of the architecture, and the significant number of luxurious objects discovered, indicates that this prominent locale housed the Lydian palace.[5] Thus, these monumental terrace constructions served the purpose of creating a special locale for the residence of the Lydian kings.[6]

The urban terraces built during Croesus' reign in the second quarter of the 6th century BCE enveloped the hillsides of ByzFort and Field 49, forming a single integrated palatial complex. These terraces were high-rising platform-type structures that transformed the hills in their entirety into cubical and flat-top podiums, as illustrated in the iconic reconstruction (Fig. 1).[7] Their construction was achieved by filling the steep hillslopes with large amounts of earth and rubble, which were then retained by tall facades of massive limestone ashlars, skillfully crafted by Lydian masons. This high-rising podium-type construction of the 6th century BCE has become recognized as the canonical model of Lydian terrace architecture.

Our field research at Field 49 over the past decade has shown that this podium-type terrace model did not appear abruptly; it represents the latest development in a long sequence of terrace constructions that feature varied construction practices, along with continuities, in the same elite complex. Here, the long history of urban terracing operations reaching back to the Early Bronze Age, attested by significant terrace fills dating to the late 3rd millennium BCE and extensive Late Bronze Age occupation over these fills.[8] The subsequent Iron Age layers of to the 9th century BCE reveal the occupation of the complex by monumental semi-subterranean mudbrick buildings, sunk into different levels of the natural hillslopes, resembling terraced residences.[9] In the 8th century BCE, these mudbrick structures were replaced by the first monumental Iron Age examples of urban terrace architecture, characterized by polygonal boulder constructions that transformed the lower slopes of Field 49 into short terrace platforms,[10] and they were followed by successive phases of polygonal and ashlar terraces throughout the 7th century BCE.[11]

1 Roosevelt 2012; Högeman, Oettinger 2018.

2 Greenewalt 2010; Roosevelt 2009.

3 Cahill 2010; Greenewalt 2011.

4 Greenewalt 2007: 745-746.

5 Cahill 2023; Cahil et al. 2025.

6 Eren 2022.

7 Ratté 2011.

8 Cahill 2019a; Pavúk et al. forthcoming.

9 Eren forthcoming.

10 Eren in press.

11 Cahill et al. 2025; Cahill in press.

In this article, I focused on a series of urban terraces built as shorter stepped platforms in the late 7th and earlier 6th centuries BCE, a generation earlier than the iconic high-rising platform terraces. To identify the common characteristics of these terrace constructions across various sectors of Sardis, I examined their spatial configurations, architectural features, and masonry techniques, considering the diachronic context in Sardis, as well as comparative examples from the wider cultural spheres of the Near East, Anatolia, and the Aegean. To refine their dating, I evaluated material assemblages from associated contexts and identified the latest datable material in primary construction deposits, which consisted mainly of masonry debris deposited in front of the terraces during the processing of blocks.[12] The results of these investigations highlighted the spatial, architectural, and technical commonalities in the creation of Lydian stepped terraces, demonstrating the presence of a well-developed stepped terrace system in Sardis during the time of Alyattes in the late 7th and early 6th centuries BCE. This spatial system appears to be unique in its broader regional context, yet it shows external influences in masonry construction.

Stepped Urban Terraces of Sardis in the Late 7th and Early 6th Centuries BCE

Urban terraces built in the form of stepped terraces are distributed across Sardis, including the palatial hills of ByzFort and Field 49, the north slopes of the Acropolis, and an extramural sector, Kagirlik Tepe (Fig. 2). All built during the late 7th and early 6th centuries BCE, the stepped terraces outside the palatial core of the city remained in use until the Persian capture of Sardis in 547/6 BCE; yet in the palatial sector, they were partly replaced in (perhaps the second quarter of) the first half of the 6th century BCE by high-rising podium-type terraces. This palatial sector, along with its monumental terraces, was sacked and burnt during the Persian capture of Sardis.[13] Following this destructive event, the entire urban zone within the fortifications was abandoned, and the remaining architecture in the palatial complex was systematically destroyed through spoliation.[14]

1. ByzFort

The transformation of the palatial hills' spatial design from shorter stepped terraces to a high-rising podium-type platforms is most clearly documented at the ByzFort sector by the discovery of both architectural phases with implemented changes at the center of the east flank of the hill. In the earlier phase, three major walls extending in the same alignment terraced the hillslope. When the hill was being converted into a high podium in the later phase, earlier walls were partially removed and rebuilt in a new orientation to realign them with the tall north facade of the hill within the larger spatial framework (Fig. 3). In this process, the center of the east slope was filled with an extensive rubble deposit to serve as the core packing of the high-rising platform.Three parallel terrace walls of the earlier phase were built onto different tiers of the slope, forming short and stepped platforms (Fig. 4). The lowest-tier wall was uncovered with two visible frontal courses, with a limestone packing behind the facade (Fig. 5).[15] This packing continues beneath a 7-meter-high rubble-boulder

12 The stoney character of these construction deposits and their limited nature—depending partly on the terraces' special construction within bedrock shelves without terrace fills (detailed below) and partly on having already been removed in older excavations—prevented us from applying more advanced scientific analyses, such Optically Stimulated Luminescence (OSL) dating that has been increasingly used successfully in the studies of agricultural terraces (see Turner et al. 2021 with extensive bibliography).

13 Cahill et al. 2025; Cahill 2023.

14 Cahill 2019b.

15 This lowest-tier Lydian terrace was exposed in 1984 in Trench SEBF 84.7 supervised by Neel Smith, and it was labeled as Lot 2. The limestone facade was found to be extensively robbed in post-Lydian times (Greenewalt et al. 1988: 34). A lime kiln, inserted into the core rubble construction of the later-phase Lydian terrace, could be held responsible for the robbing of the Lydian facade. However, several photos in an album currently housed at the Suna ve Inan Kıraç Research Center (AKMED), the existence of which was communicated to the Sardis Expedition by Peter Kuniholm, and which were then kindly made available to the team by the Institute Director Kayhan Dörtlük, show the spoliation of Lydian limestone blocks from Sardis for the construction of the Izmir railway (specifically the route between Turgutlu and Alaşehir) between 1872 and 1875. One of these photos specifically displays ByzFort with piles of back-dirt from the spoliation.

Terrace wall	Platform width (m)	Preserved platform height (m)	Reconstructed platform height (m)	Course setback (cm)	Course height (m)	Frontal ashlar dimensions (m)
ByzFort, earlier phase stepped terraces						
Lot 2	2 + (?)	1	?	2	0,5	L: 0.75-0.95 W: 0.5-0.75
Lot 9	2	0,8	2,5	1.5-2	0,4	L: 0.5-0.85 (majority 0.7-0.75) W: 0.4-0.85 (majority 0.55-0.6)
Lot 11	2	0,4	4	?	0,4	L: 0.5-0.85 (majority 0.7-0.75) W: 0.4-0.85 (majority 0.55-0.6)
ByzFort, later phase platform terrace						
Lot 10	2	1,8	2,8	3-5	0,4	L: 0.45-0.85 (majority 0.6) W: 0.35-0.65 (majority 0.45-0.55)
Field 49 North						
Lot 100 limestone	5	1	3-5	1.5-2	0.3-0.4	L:0.35-0.45 W: 0.25-0.35
Lot 101 sandstone	2 + (?)	1,6	1,6	1.5-2	0,35	L: 0.35-0.6 W: 0.25-0.5
Acropolis North						
Wall 1	3	3,3	4,5	1.5-2	0,4	L: 0.7-1.8 (majority 0.9-1.0) W: 0.3-0.6 (majority 0.4)
Wall 2	2	2,8	3	-	0.25-0.4	L/W: 0.5-1.6
Wall 3	3	2	4,5	1.5-2	0,4	L: 0.65-1.8 (majority 0.9-1.0) W: 0.3-0.75 (majority 0.5)
Kagirlik Tepe						
Monumental wall	3-4	1.3 + 1 (?)	4,2	2	0,25	L: 0.45-0.75 (majority 0.45-0.5) W: 0.3-0.55 (majority 0.35-0.4)
Lower-tier wall	2	0,15	?	?	0,15	L: 0.22-0.38 W: 0.25-0.35

Table 1. Dimensions of stepped terraces in Sardis.

construction,[16] which represents the packing of the later-phase platform (Fig. 5a).

The two consecutive upper-tier terraces near the hilltop were also short platforms built entirely of limestone blocks.[17]

They were placed within shelves that were carved out of alternating layers of clay and conglomerate bedrock, and the backs of the terraces were set against the vertical cuts of these shelves (Fig. 6-7). The current level of this bedrock cut and the height of the Late Roman retaining wall built against the face of the lower-tier terrace suggest that the terraces originally stood higher than what survives on the ground today (Fig. 7). The face blocks of the upper-tier terraces are of various sizes (Table 1) and feature fine hammer dressing. They were fastened using butterfly-type lead clamps, some of which have been found in situ.[18] The core blocks of the terraces, on the other hand, were only roughly worked to produce relatively even surfaces to receive the next course.

Both upper-tier terraces extend to a butt-end towards the south, where a dip in the topography indicates the presence of an opening here.[19] Overall, these three parallel terrace walls suggest that the east slope of ByzFort was organized into a stepped terrace system that provided the hill with a morphology akin to a stepped pyramid, which staggeringly rose about 12 meters from the bottom to the top of the hill, pierced by an opening to allow access to the hilltop.[20]

The construction of the later phase high-rising terrace platform involved significant modifications of earlier structures at the center of the east slope. Many of the limestone blocks from the upper-tier terraces were reused to build a new terrace (henceforth, the spolia wall), constructed at the same level as the highest-tier terrace of the earlier phase, but oriented at a 160-degree angle compared to the former terraces (Fig. 4).[21]

Several archaeological observations of earthen deposits and masonry evince that this differently oriented wall was built through the spoliation and modification of earlier terraces. The clearest evidence for this comes from a Lydian robber's trench. This silty deposit covered the preserved top of the lower-tier terrace with a depth equivalent to the height of three courses, while cutting its masonry debris in line with the ghost face of the terrace. Thus, it demonstrates the intentional removal of the lower-tier terrace's blocks. Furthermore, the back of the spolia wall was built up against a silty earthen deposit with occasional mudbricks. This deposit packed a triangular area between the back of the new terrace platform and the old line of the vertical bedrock cut of the highest-tier terrace's shelf (Fig. 6, dashed lines). This area had become unoccupied due to the change in the terrace's new orientation, and its intentional filling stands out as clear evidence that the earlier-phase terrace previously extended further north and was removed entirely beyond the point where it currently intersects with the spolia wall. To apply this new orientation, the spolia terrace was also constructed on uneven bedrock, filling in a depression created by the removed blocks of the lower-tier terrace, with further limestone courses.

The limestone masonry of the spolia terrace shows further signs of reuse. The first and most significant indication of spoliation is the clamp cuttings on its blocks that are non-sequential and occasionally found on false surfaces (Fig. 4). Many of these cuttings do not find a match in the neighboring block, making the use of clamps for

16 Smith 1984: 16.

17 These terraces were investigated by the author in 2011 in trench ByzFort 11.1 and labeled as the highest-tier terrace (Lot 9) and the lower-tier terrace (Lot 11).

18 See also Cahill 2013: 147.

19 Fieldwork in 1991 in a trench about 15 m to the south of this complex located a 5-meter-wide Roman street (Greenewalt et al. 1995: 23), but it did not expose any Lydian foundations for it.

20 This dimension of 12 m reflects the elevation difference between the natural top of the hill and the bottom of the exposed blocks of the lowest tier terrace; yet it could have been higher, since we do not know how far down the lowest-tier terrace goes given the Late Roman constructions abutting the facade of the Lydian terrace (Greenewalt et al. 1988: 34).

21 In front of these highest-tier terraces, a sloping rubble deposit was preserved. This deposit rests on the masonry debris of Lot 9 and extends over the top of Lot 11 (Fig. 8); however, it does not extend in front of the spolia terrace, as some of its blocks were partially robbed in the Late Roman period. Whether this rubble deposit is associated with the earlier or later phase of construction remains inconclusive. Nevertheless, the most likely interpretation is to see this deposit as a continuation of the rubble-boulder construction that filled the center of the slope and formed the core of the expanded later-phase platform, which may have buried the earlier-phase terraces.

attachment impossible. This situation indicates that clamps were not utilized in the later-phase construction; however, earlier clamp cuttings, some of which appear close to the bottom surfaces, might have been repurposed for moving blocks around.

Secondly, the ashlar sizes of the spolia terrace were considerably smaller than those of the earlier-phase walls (Table 1). This difference suggests a reduction in size due to the reprocessing of blocks during rebuilding. Specifically, the course heights reduced from an earlier 0.4 m to a later 0.3 m, resulting in the spolia wall that is not level, diverging significantly from the horizontal plane (Fig. 7). As a result, the front face of the spolia terrace, particularly close to the intersection of the phases, features additional shims to level its ashlar courses.

Finally, the masonry techniques deployed in the construction of the spolia terrace are generally similar to those of the earlier phase (Fig. 8). Its frontal ashlar blocks were fully hammer-dressed and lacked rustication.[22] Yet, they were finely squared to create a tighter fit compared to the earlier-phase frontal blocks that were fastened with clamps. Additionally, the spolia terrace's platform packing was not built exclusively from limestone masonry, and it included mica schist, quartz, and sandstone blocks, which were absent from the core construction of the earlier-phase terrace platforms.

The material from the earth deposits is used to date the terraces and their modification. The only deposits associated with the construction of the earlier-phase higher-tier stepped terraces were the masonry debris produced during the dressing of their ashlar blocks. Running up to the faces of both terraces, these two deposits comprised limestone chips embedded in soft, limey fills. The pottery assemblage from both masonry debris includes a rim of a Corinthian cup and local Lydian shapes and decorative conventions typical of the late 7th and early 6th centuries BCE (Fig. 9a),[23] while lacking diagnostics of the later 6th century BCE.

The reconstruction of the later-phase spolia terrace itself created a masonry debris deposited against its front face.[24] Consisting primarily of limestone chips, this deposit produced a large collection of jasper/chalcedony fragments,[25] as well as Lydian pottery. The pottery assemblage from the masonry debris and the robbers' trench commonly includes fragments of Lydian vessels with shapes and decorative styles dated to the first half of the 6th century BCE, such as a lydion, column kraters, and other vessels featuring marbling, streaky glaze, or white band decorations,[26] together with sporadic Lydian sherds predating the 6th century BCE (Fig. 9b). A more precise date for the construction is provided by an Attic or Ionian black-figure cup,[27] dated by specialist Kathleen Lynch to the period between 550 and 525 BCE (Fig. 9c).

2. Field 49

Another area characterized by a series of monumental urban terraces arranged on successive levels is the north slope of Field 49, known locally as Derviş'in Tepe (Fig. 10). In 1982, two monumental walls were uncovered here. A polygonal boulder terrace was revealed in short segments extending 40 meters, with another wall at the base of this terrace, identified as its glacis. Consequently, these structures were interpreted as part of the same construction dated to the 7th century BCE.[28] Ongoing excavation work[29] uncovered these terraces in full, discovered two additional Lydian terraces on the slope, and further explored their phases and dating.

22 This stands in contrast to the brand new constructions in the north of ByzFort, see Fig. 1.

23 Lydian plate: Sardis inventory no. P11.101.

24 This deposit was partly laid over the Lydian robber's trench of the lower-tier terrace and partly filled the spolia wall's own foundation trench that was cut into the robber's trench.

25 A large collection of jasper fragments was found not only in this deposit, but also generally from excavations at ByzFort. The use of this semi-precious stone for luxurious vessel productions is known from a plate found in the Ikiztepe Tumulus of the Persian period (Özgen, Öztürk 1996: 130), dated to the second half of the 6th or early 5th century BCE. While this plate is similar to others found in the Treasury of Persepolis (Özgen 2010: 316-317), the discovery of large numbers of jasper chips at ByzFort might indicate their earlier production in this sector.

26 White banded Lydian plate: Sardis inventory no. P11.110; skyphos: Sardis inventory no. P11.112.

27 Black-figure cup: Sardis inventory no. P11.109.

28 These two terraces were initially excavated by Chris Simon in SEBF 1982 Trenches 1-5; see Greenewalt et al. 1985: 64-67.

29 This work has been supervised by the author since 2012.

Of these four Lydian terraces discovered on the north slope of Field 49, the most prominent is the polygonal boulder terrace (Lot 1/140) situated on the highest tier. The boulder terrace extends approximately 47 m along the hill's brow. The central section of this terrace is considered to have been constructed around the late 8th century BCE,[30] encircling the entire hill with a corresponding counterpart recently discovered on the western slope of Field 49 (Fig. 11).[31]

When the boulder terrace of the 8th century BCE was still in use,[32] two further terrace walls were constructed at its foot in a stepped configuration. The terrace at the central tier of the slope was faced with limestone ashlars (Lot 100, Fig. 10-12a). It was placed within a shelf carved out of conglomerate-clay bedrock. The back of this terrace was laid up against the deep vertical cut of the shelf for most of its length, except near the junction with the boulder terrace. Given the height of these bedrock cuts, the original facade of the terrace must have risen much higher, up to at least 5 m. However, the terrace's limestone blocks were spoliated in the Achaemenid period,[33] during when the city center was gradually emptied after the Persian sack of Sardis.[34] This spoliation left a huge deposit of waste rubble in place of the limestone terrace (Fig. 11), allowing us to reconstruct the terrace's original course with a 160-degree turn close to the center of the slope.

Another monumental wall built of roughly squared sandstone blocks (Lot 101) was constructed at a lower tier (Fig. 10-12b). The facade of this terrace was partly exposed, with the deepest two courses set into a shallow foundation trench cut into the bedrock (Fig. 13b). The core construction of the terrace, which comprised mainly unworked quartz, sandstone, and schist boulders, extended beneath the preserved facade of the limestone terrace (Fig 12a). Thus, the sandstone wall not only provided a solid foundation but also created a further stepped terrace system.

Near the eastern side of the hillslope, where the hill naturally curves, these two terraces were constructed at a slightly different orientation. At this point, the course of the sandstone terrace is notably shifted, with some of its blocks toppled.[35] Nevertheless, the general alignment of the sandstone terrace with a 165-degree turn near the center of the slope can be reconstructed from its in situ blocks and a specially dressed block that indicates this specific rotation angle. This demonstrates that, at least at the center of the slope, both of these terraces followed the same orientation, similar to the stepped central terraces at ByzFort.

The dating of these terraces is based on two significant contexts, neither of which provided closely datable materials. The first context is the bedrock cut behind the limestone terrace, where the lower courses of the terrace's rear blocks were embedded and subsequently filled with a small rubble deposit (Fig. 13a). The second context is the foundation trench of the sandstone terrace, which was filled with masonry debris (Fig. 13b). The material from both contexts included non-diagnostic sherds of exclusively Lydian pottery, such as waveline amphorae, oinochoe, skyphos, and bichrome vessel fragments (Fig. 13c- d). These sherds exhibit conventions common in Lydian I assemblages dating from the late 7th century BCE onward; however, none needs to be dated specifically to the later 6th century.

3. Acropolis

The sharp topography of the Acropolis was also regularized with terraces located at the northern promontory, known as Acropolis North. This sloping spur, surrounded by sheer cliffs to its north, has restricted access.[36] To facilitate ascent

30 Eren forthcoming, Eren in press.

31 This was explored in the 2024 and 2025 seasons by Dr. William Bruce and Okan Güney; reports can soon be found in Cahill in press, Cahill forthcoming.

32 This boulder terrace underwent significant reconstruction during the later first half of the 6th century BCE and remained intact for centuries until it collapsed in the Early Roman period, most likely as a result of the earthquake in 17 AD that destroyed Sardis (Eren forthcoming; Eren in press; Cahill 2025: 39).

33 Eren 2022: 86-88.

34 Cahill 2019b.

35 This destruction is most likely a result of the earthquake that razed Sardis to the ground in the early 7th century CE. The collapse debris of this terrace, comprised of stones embedded in a fine gravel fill, included Late Roman pottery and two coins. These coins were both dated to the late 5th century CE and were still in circulation until the early 7th century CE, see Cahill in press.

36 This spur would have been inaccessible from the palace if not for the Lydian tunnels connecting them (Cahill 2023: 16-17).

to the top of the Acropolis via this spur, Lydian builders established a stepped platform system that arranged three parallel terrace walls on the steep slope in a single construction phase (Fig. 14). Built of limestone and sandstone blocks, these terraces formed two consecutive tiers that reach a height of about 9 meters (Fig. 15).[37] Further down the slope of this complex, an additional L-shaped limestone block and a relatively flat shelf cut into bedrock (Fig. 14)[38] hint at the presence of yet another lower tier of terracing; however, no architectural remains have been uncovered in situ at this location.Two monumental walls, labeled Wall 1 and Wall 2, make up the lower tier, with a recess at their intersection. This platform leads up to a higher-tier platform retained by Wall 3.[39] The terrace walls were built onto sharply sloping conglomerate bedrock (Fig. 15). Their backs were partly laid up against cuts opened into this bedrock and partly packed with earth and rubble to maintain a uniform orientation. The facade of Wall 1 was built of limestone blocks with chisel-drafted margins and point-stippled centers, while roughly squared sandstones were used for Wall 2. Thus, similar to the case of Field 49, the simultaneous use of sandstone and limestone in the same construction is observed here.

Wall 1 features the use of isodomic techniquewith ashlar blocks regularly set back at every course (Table 1). In contrast, the courses of Wall 2 are more irregular, particularly at its base, which steps up on sloping bedrock. The staggered positioning of the foundation blocks that include special cuttings allows for the reconstruction of stairs along the faces of Walls 1 and 2.[40] Wall 3 was built of limestone blocks that lack the delicate masonry work of the lower-tier platform, leading Ratté to suggest that Wall 3 may have been left unfinished.[41]

37 These terraces were explored by the Harvard-Cornell Expedition in 1960 and 1971-1975 and were later examined by Ratté as part of his study of ashlar masonry in Sardis (Ratté 2011: 99-102 and figures 164-174).

38 Greenewalt et al. 1977: 50.

39 The structures located on top of this platform date from the Byzantine and Islamic Periods (Ramage 1972: 19-20), but the terraces themselves belong to the Lydian period, suggesting that the Lydian terraces must have stayed intact and remained in use for more than a millennium.

40 Ramage 1972: 19; c.f. Ratté 2011: 100-101.

41 Ratté 2011: 12.

The dating of this terrace complex relied primarily on stylistic considerations rather than material from associated construction deposits. In front of Wall 3, a layer of masonry debris created during the dressing of its ashlar blocks was preserved.[42] Ratté's re-examination of the pottery assemblage from this deposit identified a small number of sherds that belong to the Lydian I period.[43] In conjunction with this pottery, Ratté's comparative analysis of ashlar masonry styles and techniques suggested a construction date for these stepped terraces in the middle of the first half of the 6th century BCE.[44]

4. Kagirlik Tepe

Urban terrace platforms at Sardis were not limited to the Acropolis and the city's elite core. The Lydians organized their uneven topography with terraces, also outside the fortifications.[45] One notable sector is Kagirlik Tepe, a low-lying spur of the Acropolis that overlooks the Hellenistic Temple of Artemis. Two terrace walls have been uncovered in this area (Fig. 16).[46] The first, a monumental wall (Lot 1), was constructed as a short platform measuring 3 to 4 meters wide, positioned closer to the hilltop. The second wall, narrower and located at the base of the monumental terrace (Lot 6), likely represents another terrace, albeit on a much smaller scale.

The monumental terrace extends along the west side of the hillside and makes a 163-degree turn toward the east following the hill's original topography.[47] This terrace was built into a sloping shelf carved out of clay bedrock. The back of the terrace was positioned against the cut into bedrock, while the lower frontal courses rest in a shallow foundation trench. The western stretch of the terrace's front face features courses built

42 The lower-tier walls presumably had similar construction debris that was cleared away once the construction of the steps was completed.

43 For the re-evaluation of former excavation results (Hanfmann 1961: 38-39) that initially dated the structure to the Hellenistic period, see Ratté 2011: 102, 220, fig. 174.

44 Ratté 2011: 102.

45 Greenewalt et al. 1983: 20; Greenewalt 2007.

46 These were uncovered in trench KG 05.1 by Felipe Rojas in 2005.

47 The western stretch of this wall is straight for a length of 9.5 m, and it continues for another 4.7 m to the east after the turn.

of hammer-dressed schist and quartz blocks, with occasional limestone and sandstone. As preserved, the stepping courses of the platform toward the hilltop suggest a significant height to the terrace facade (Table 1).

The lower-tier wall aligns with the western stretch of the monumental terrace. Only the top preserved course of this wall is intermittently exposed, level with the bottommost subterranean blocks of the monumental terrace.[48] Between the front faces of these two walls lies a layer of rubble, which can be interpreted as packing material. Stretching along the same alignment, these two walls suggest a minor stepped terrace program designed to retain the hillside of Kagirlik Tepe. I have proposed earlier that this terrace complex, distinct from the palatial terraces, may have potentially surrounded a sacred space for the Lydians, based on the site's proximity to the Artemis shrine, the discovery of a large number of painted architectural terracottas, and the absence of any post-Lydian deposits in the area.[49]

Currently, a precise dating for the construction of these extramural terraces is not available, yet other material and stylistic considerations suggest a date from the late 7th century BCE onwards. Small-scale sondages excavated in front of the monumental terrace to explore its foundation trenches yielded no cultural artifacts, only masonry debris associated with the dressing of terrace blocks. Most of the material used to approximate the date comes from unclosed contexts. The pottery collected from the earth above the monumental terrace is exclusively Lydian.[50] This pottery assemblage includes sherds of marbled and streaky-glazed vessels as well as red-bichrome wave-line amphorae, representing the latest identifiable material. This suggests that the terraces were in use until at least the mid-6th century BCE. The presence of earlier Lydian diagnostics, such as grayware vessels and a Lydian II-type dish, indicates an earlier date for the construction of terraces, perhaps during the late 7th century BCE.

Characteristics of Stepped Terraces in Context

This brief survey highlights several common traits of Lydian terraces from the late 7th and early 6th centuries BCE, regarding their spatial configuration, construction techniques, and masonry styles.

A distinctive characteristic of Lydian stepped terraces is their mode of multi-level topographic manipulation that serves to openly demarcate special zones within the urbanscape. As introduced above, the stepped terraces in different sectors of Sardis modified the existing topography of hills in a multi-tiered layout, transforming them into cubically regularized monumental steps. Notably, in the palatial complex, this building practice altered the natural contours of hillslopes entirely, giving these central hills the appearance of truncated stepped pyramids, on which palatial buildings could be seen from anywhere in the city. This practice has a deeper history in the palatial complex that can be traced back to the construction of terraced residences and polygonal terraces in the 9th and 8th centuries BCE.[51] It was also pursued in the 6th century phase of terracing, albeit with a change in architectural style from stepped terraces to standalone, high-rising platforms, as clearly illustrated at ByzFort.

This spatial organization, achieved through stepped urban terraces, appears to be uniquely Lydian within its regional context. Although terrace constructions were also used for organizing monumental spaces in the Near East and the Aegean, their forms and functions differ from those of Lydian stepped terraces. In western Anatolia, monumental terraces were often built in sacred spaces of the 7th and 6th centuries BCE.[52] These terraces typically served as platform-type features that elevated temple buildings within the cityscape, such as the podiums of the Temples of Athena at Smyrna and Phocaea, and the Temple of Artemis at Ephesus.[53] They were also constructed supplementary to sacred perimeter walls (temenos) on hilltops where temple buildings were located, such as the Temple of Athena at Emporio on Chios, Temple of Artemis Kithone at Kalabaktepe-Miletus,

48 Discovered close to the end of the excavation season, this lower-tier wall was not properly investigated.

49 Eren 2024.

50 Greenewalt 2007.

51 Eren forthcoming.

52 Eren 2015.

53 Smyrna: Cook et al. 1998; Phocaea: Özyiğit 2003: 112.

and the Archaic Acropolis of Teos.[54] While these terrace constructions rarely took the form of stepped architecture, their purpose of visible demarcation is most comparable to the role of Lydian stepped terraces that openly delineated the elite and possibly sacred zones of Sardis. In the Near Eastern and Anatolian worlds, monumental terraces were built as part of palatial and defensive architecture. Within Neo-Assyrian, Syro-Anatolian, and Phrygian citadels, monumental terraces sometimes elevated palaces themselves in the complex, such as Sargon's Royal Palace at Khorsabad.[55] More commonly, they served as retaining features for extensive fills that created levelled platforms along the edges of citadels, as seen in the Northwest Palace at Nimrud/Kalhu and the citadel complex at Gordion, and sometimes these platforms created open spaces in front of public buildings to allow performative interactions, such as at Carchemish and Zincirli.[56] These retaining features were usually adorned with socially-communicative media, such as orthostats prominent in Syro-Anatolian and Assyrian citadels.[57] Ratté suggested (2011: 53-55) that Assyrian platform constructions formed a "typological forerunner" of Lydian terraces based on their observed parallels with the high-rising platform terraces of the 6th century in Sardis; however, unlike the case of the 7th century terraces in Sardis, these Near Eastern palatial terraces rarely took the form of stepped terraces. Stepped constructions, on the other hand, are observed as a glacis feature designed to enhance the defensive systems around citadels, as exemplified in Gordion and Zincirli.[58] In Gordion's case, the substantial stepped glacis of the YHSS5 palatial complex was built to retain extensive earth fills that elevated the citadel, and it did not feature wide platforms,[59] contrasting with the Lydian stepped platforms that were carved into the natural terrain with no earthen fills to support.

The stepped terraces are also distinguished by their unique construction: placement within a bedrock-carved shelf. The wide bases of these stepped terraces were positioned on relatively mild slopes, within shelves carved out of bedrock (and occasionally older Lydian deposits). Their backs were laid up against the vertical cut of the shelves, while the fronts were usually set in shallow foundation trenches. This technique incorporated the natural topography into construction and eliminated the need for terrace fills. In contrast, the tall platform-type terraces of the later 6th century BCE employed a different construction technique. Their narrow stone facades were positioned on the lower parts of sheer slopes. This placement necessitated deeper foundation trenches to stabilize the narrow frontal courses and involved significant filling operations (as opposed to removal of substrata) on the slopes, resulting in tall, podium-like platforms.[60]

To the best of my knowledge, there are no comparative examples of stepped terraces constructed by sinking them into bedrock-carved shelves.[61] Yet, in terms of building technology, I find the transition from stepped terraces to the high podium design in the Lydian palace complex akin to the development of Egyptian pyramids. Before the construction of the grand pyramids at Giza, builders first created stepped pyramids (e.g., Pyramid of Netjerikhet), then experimented with building full pyramids—initially filling in the sides of stepped pyramids, which resulted in failures (e.g., the Meidum Pyramid), then starting anew but miscalculating angles (e.g., the Bent Pyramid), until finally achieving the first "true" Red Pyramid at Dashur.[62] In this sense, the stepped Lydian terraces can be considered an intermediate technological step leading to the high-rising platform-type terraces of the 6th century BCE.

54 Emporio: Boardman 1967; Kalabaktepe/Miletus: Kerschner 1995; Greaves 2009: 106; Teos: Kadıoğlu 2021.

55 Kertai 2015: 85-87.

56 Nineveh-Kalhu: Kertai 2015: 92-95; Gordion: Rose 2021: 38-40; Voigt 2013: 208-210; Carchemish and Zincirli: Pucci 2006, 2008; Gilibert 2011.

57 Harmanşah 2018; Osborne 2020.

58 Gordion: Voigt 2013: 200-210; Zincirli: Luschan et al. 1898; Schloen, Fink 2009: 212.

59 Rose 2012: 5-7.

60 For instance, the terrace in the north of ByzFort rose approximately 12 to 13 meters high with packing fills measuring 7 to 8 meters wide from the front of the terrace to the top of the hill, Eren 2022: 61-64.

61 Ayanis may be a possible exception, as its 7th-century BCE citadel foundations were extensively modified to incorporate natural rock into the architecture (Harmanşah 2009: 193-194).

62 Smith 2004: 44-46.

Another notable feature of the stepped terraces is their strict axial alignment. They were constructed to follow specific orientations over extended distances, despite being multi-tiered on rugged slopes. Architectural studies have shown that these alignments, some inherited from earlier phases of terrace constructions, established the basis for the major orientations of both Lydian and post-Lydian structures in Sardis.[63] However, the specific orientations used during the Lydian period do not appear to be chronologically determinative. This is evident from their simultaneous implementation in different construction phases, as seen at ByzFort and Field 49 (Fig. 4; Fig. 10). Furthermore, these terrace orientations had to be adjusted occasionally, particularly when topographical constraints required it, such as at substantial natural turns in the hills. In my analysis of these turning points in all the Lydian terraces,[64] I discovered that the rotation angles consistently fell within a specific range between 160 and 165 degrees (Fig. 17). These angles were either acute or obtuse, depending on whether the terraces were built with an inward or outward curve. Such consistent use of specific alignments and angle ranges reflects top-down decisions imposed by a central authority, as well as the Lydians' skilled management of their landscape.[65] Moreover, this consistency indicates the proficiency in angle measurement; however, the methods or devices the Lydians used for this measurement remain unknown. Different types of measurement tools, such as levels and plumbs, are known from this period,[66] but protractors specifically designed for measuring angles are unrecognized.[67]

The stepped terraces are also notable for their consistent masonry walling, characterized by isodomic construction of equal-height courses, measuring 0.3 to 0.4 m high and featuring hammer-dressed frontal blocks that were regularly set back by 1-3 cm (Table 1). Their face blocks were finely crafted using a scabbling hammer or pick. This technique is prevalent in ashlar masonry of the late 7th and early 6th centuries BCE in Sardis, and it was further refined in later Lydian terraces, incorporating claw-chiseled margins and point-stippled centers,[68] as observed in the Acropolis terraces, which are slightly later than the rest of the stepped terraces presented above. Yet, the use of limestone for ashlar production appears to be an innovation in the later 7th century BCE Lydian terraces, as earlier terracing in Sardis utilized only boulder-sized, roughly-worked schist blocks.[69] When considering the finely crafted megalithic limestone ashlars of the 6th-century BCE Lydian terraces, Ratté (2011: 61) noted that "the sudden appearance of new masonry techniques in early sixth-century Lydia and throughout the Greek world [indicates] that these techniques were adopted or adapted from some external source." He proposed that the "typological forerunners" of Lydian terrace constructions can be traced back to Assyria, and following the adoption of megalithic architecture—likely through the Greek contacts with Egypt and Phoenicia and/or Lydia's own interactions with the Assyrian world—ashlar masonry techniques were further developed in the Eastern Greek/Aegean world.[70]

In support of Ratté's points, the limestone ashlar masonry of the stepped terraces in Sardis, which exhibits fine pick marks without margins or additional finishing treatments, shows closer technical parallels to the ashlar work in the Assyrian world, including the capping constructions of defensive towers at Assur, Nimrud, and Nineveh. Comparatively, this Lydian masonry seems less developed than the ashlar masonry found in Greek sanctuaries that predate the Lydian stepped terraces, such as the well-smoothed and claw-chiseled masonry of Naos 1 and 2 at the Temple of Artemis at Ephesus.[71] Still, the closest parallels to the masonry of the Lydian stepped terraces are found in Ionia, including the temple terrace of Athena (IIIA) in Smyrna and

63 Cahill 2008: 121-124; Eren forthcoming.

64 These turns are observed not only in the stepped terraces but also in other terrace locations, such as the areas north and south of the ByzFort sector and the Wall 46 sector.

65 Smith 2007; May, Steinert 2014.

66 Coulton 1977; White 1984.

67 Only a recent study of a peculiar wooden object discovered in the tomb of an Egyptian architect suggests that it may have served as a protractor (Sparavigna 2011).

68 Ratté 2011: 23-25; see also Ratté 1993, and for comparisons to Hellenistic ashlar masonry see also Gençer, Hamamcıoğlu-Turan 2022.

69 Eren 2022; Eren forthcoming.

70 Ratté 2011: 61. Yet Ratté does not rule out the possibility of independent developments.

71 Kerschner 2017: 35-45.

the Archaic walls of Teos.[72] Additionally, the use of roughly squared hammer-dressed masonry in the construction of the stepped terraces resembles the megalithic masonry of the 8th-century BCE Middle Phrygian gate and defensive circuit, although those structures utilized a diverse range of polychromatic stones instead of limestone.[73]

Finally, the stepped terrace masonry commonly features a specific setback of 1-3 cm for the frontal courses, which creates platforms that are narrower at the top than at the base.[74] This technique of slanting construction can also be observed in earlier polygonal terraces from the 8th century BCE,[75] in the facade of the 7th-century BCE mudbrick fortifications,[76] and later in the taller masonry structures, such as the north facade of the ByzFort platform terraces in Sardis.[77] This application of slightly staggering the front blocks likely enhanced the stability and durability of the terrace structures,[78] a technique that has deeper historical roots dating back to the Late Bronze Age in defensive constructions. Notable examples include the Bronze Age citadel wall of Troy VI[79] and the Early Phrygian citadel gate at Gordion.[80]

Conclusion

The widely recognized image of a monumental Lydian terrace has been shaped by prior research on terraces dating from the time of Croesus in the first half of the 6th century BCE, which is generally portrayed as a high-rise platform-type terrace. In this article, I presented an earlier series of terraces built during the late 7th and early 6th centuries BCE as shorter stepped platforms that leveled hillslopes into cubical monumental steps. The analysis of spatial organization, architectural features, and masonry styles reveals several common characteristics of these stepped terraces. They include a multi-tier manipulation of the landscape to demarcate special areas within the urban environment, construction in bedrock-carved shelves with shallow foundation trenches, an axial construction that adheres to certain orientations, the application of specific rotation angles between 160 and 165 degrees, and isodomic walling that features a specific 1-2 cm setback of frontal ashlar courses, built of expertly hammer-dressed limestone and sandstone blocks. These shared traits suggest the presence of a cohesive spatial and architectural terracing system that organized the palatial sector and potentially a sacred area in Sardis during the late 7th and early 6th century BCE. Since some of these characteristics were adopted by the succeeding high-rise terrace platforms, this earlier generation of stepped terraces serves as a technical stepping-stone in the development of the canonical Lydian terraces of the later first half of the 6th century BCE. In light of these findings, this stepped-terrace system can be attributed to the reign of the Lydian king Alyattes. Further comparative analysis in the broader regional context highlights the uniqueness of Alyattes' terracing program for its organization of urban space, while emphasizes significant influence of masonry techniques from both the Assyrian and western Anatolian cultural spheres, reflecting the broadening horizons of Lydia's communication during his reign.

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72 Smyrna: Cook et al 1998, plates 13-15; and the Archaic walls of Teos (Kadıoğlu 2021).

73 Rose 2021: 43, figures 14-15.

74 For instance, if the facade of the Acropolis terraces is extrapolated to their original height of 4.5 m, the difference between the top and base of the platform would be approximately 1 m.

75 Eren in press.

76 Greenewalt, Rautman 1998: 474.

77 Ratté 2011: 9-10.

78 Ratté 2011: 35

79 Fields et al. 2004: 20-21; Aslan, Rose 2013: 7-8.

80 Gönen et al. 2018.

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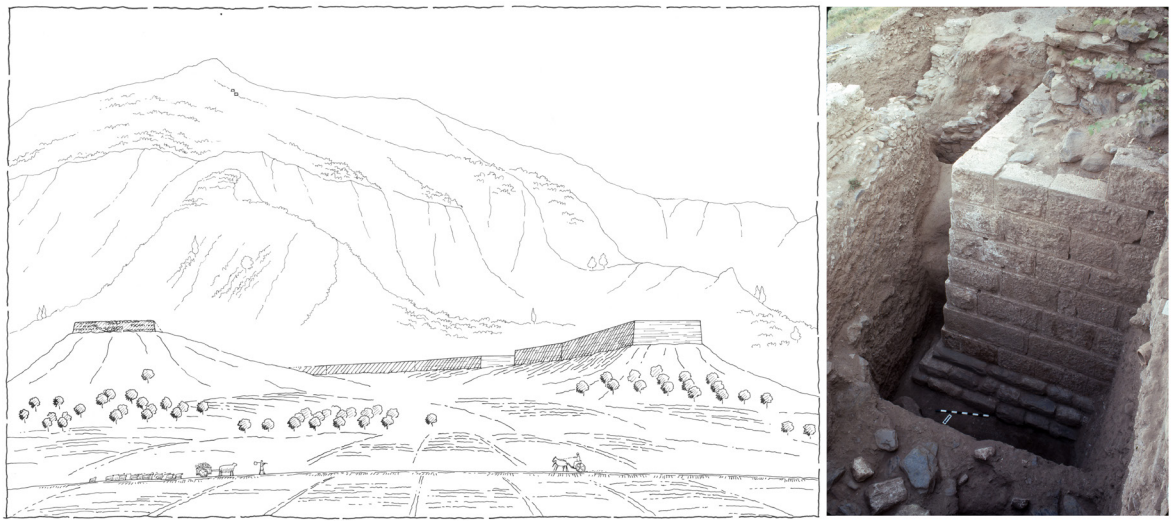

Fig. 1. Reconstruction of high-rise platform terraces (left) with preserved remains in the northwest corner of ByzFort (right). © Archaeological Exploration of Sardis/President and Fellows of Harvard College

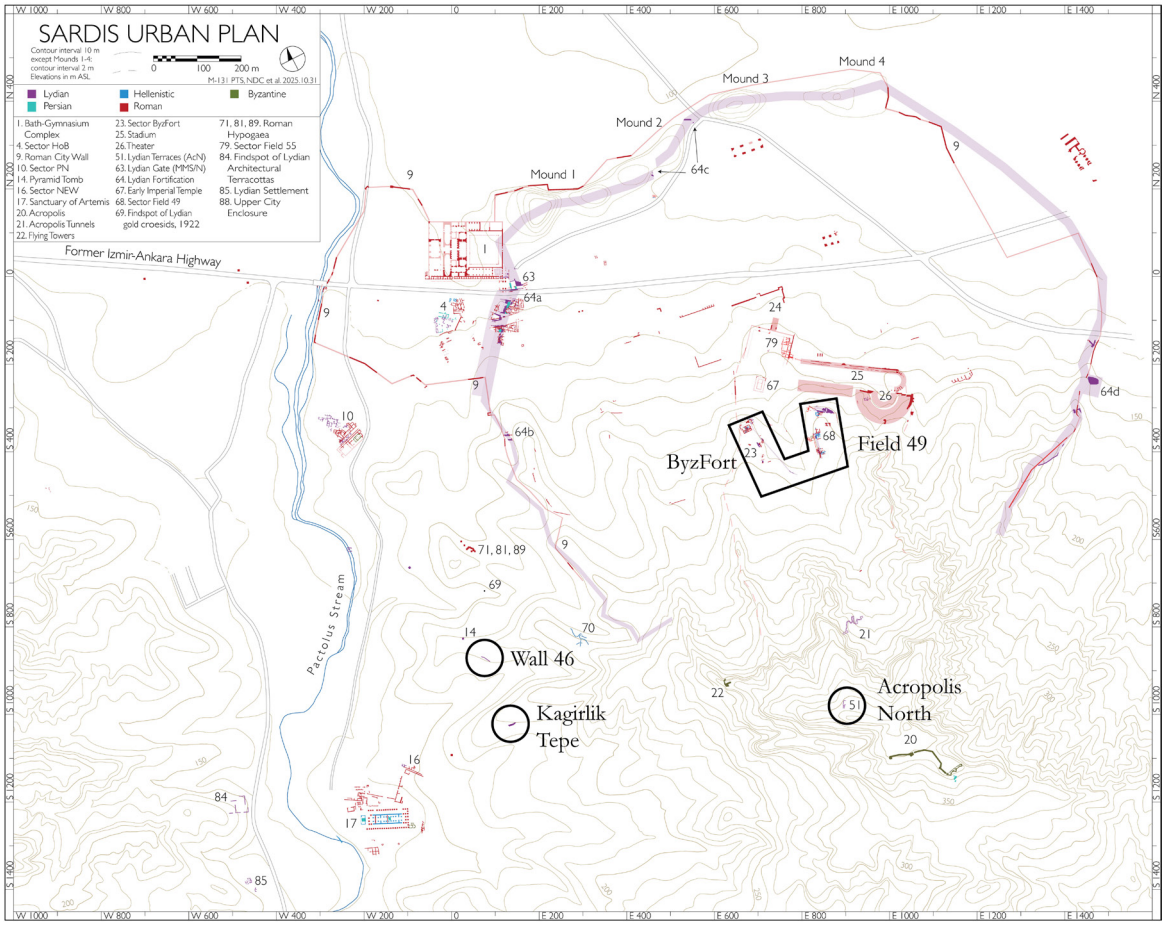

Fig. 2. Urban plan of Sardis, showing sectors of terraces mentioned in the text.
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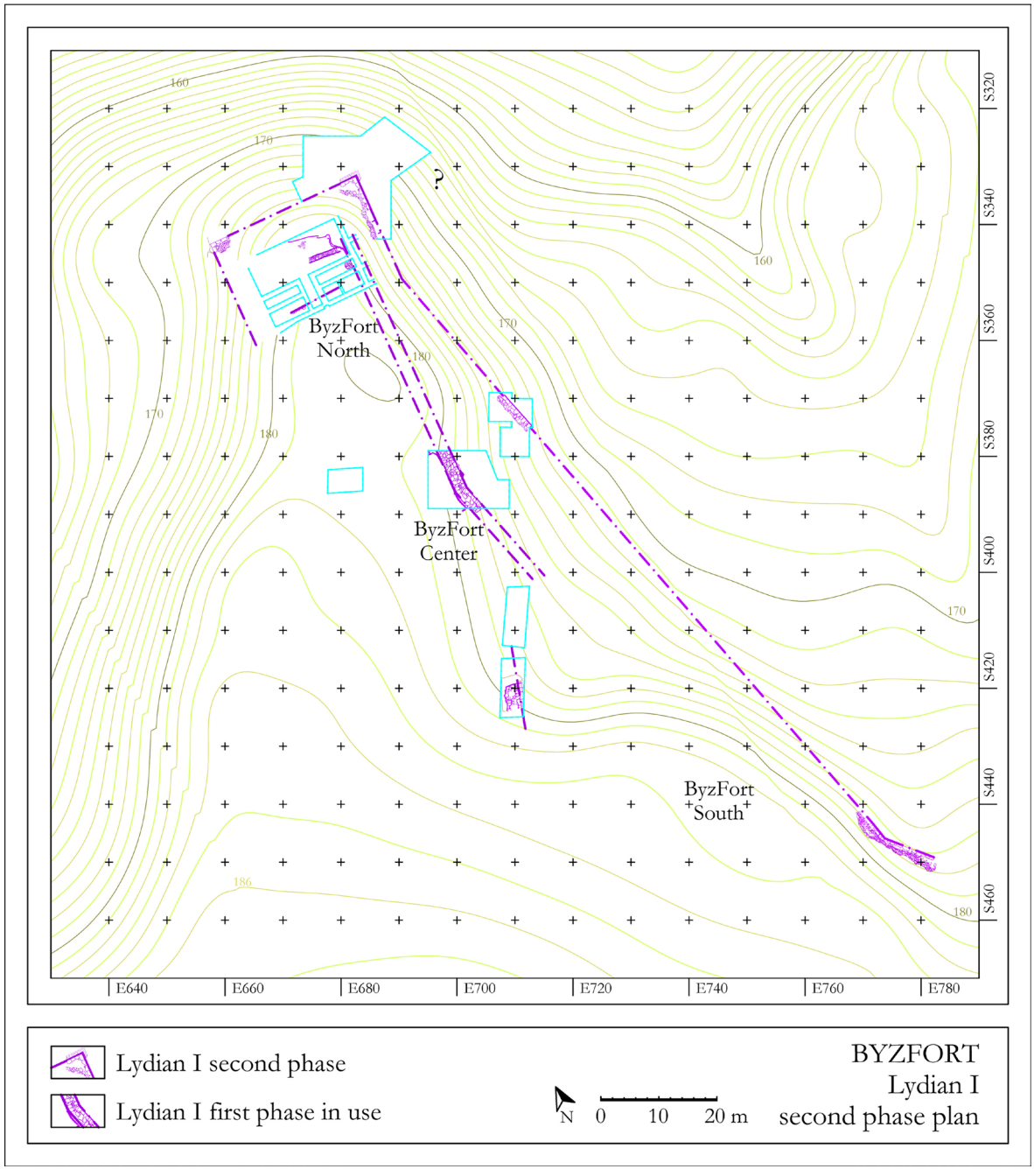

Fig. 3. Plan of Lydian terraces at ByzFort.

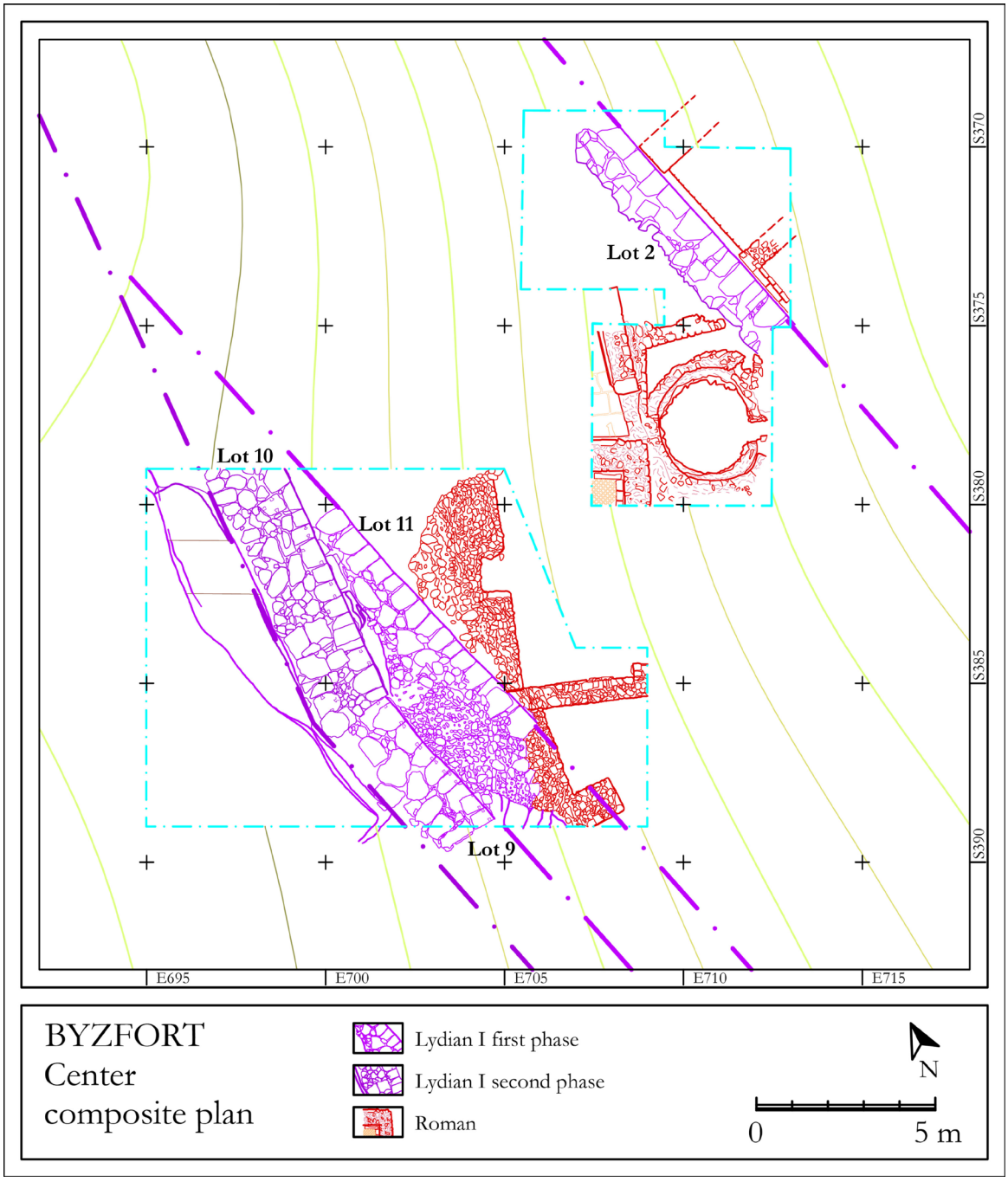

Fig. 4. Plan of Lydian terraces on the east slope of ByzFort center.

Fig. 5. View of the lowest-tier terrace on the east slope of ByzFort center: (a) side view of limestone platform under rubble packing, (b) top view.

Fig. 6. Aerial view of the higher-tier terraces at the center of ByzFort.

Fig. 7. View of the higher-tier terraces at the center of ByzFort.

Fig. 8. Masonry of higher-tier terraces at the center of ByzFort.

Fig. 9. Pottery found in construction deposits of terraces at ByzFort center: (a) from masonry debris of earlier phase Lot 9 terrace, (b-c) from masonry debris of later phase spolia terrace.

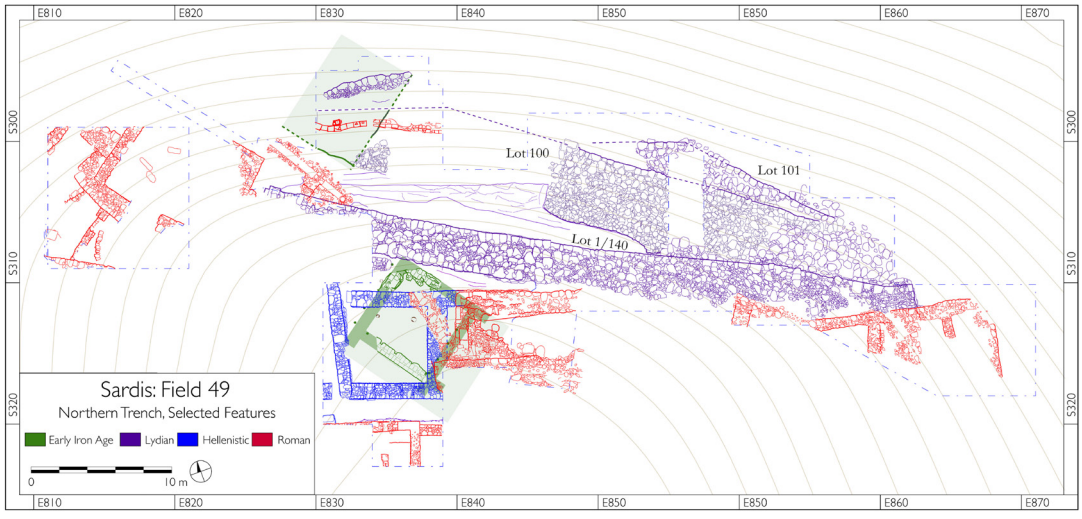

Fig. 10. Plan of Lydian terraces in the north of Field 49 sector.

Fig.11. Aerial view of Lydian terraces in the north of Field 49 sector.
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Fig 12. Stepped terraces in the north of Field 49: (a) the face of limestone terrace resting on the packing of sandstone terrace, (b) the face of sandstone terrace.
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Fig. 13. Ceramic material from foundation trenches of Lydian terraces at Field 49: (a-c) from Lot 100 limestone terrace, (b-d) from Lot 101 sandstone terrace.

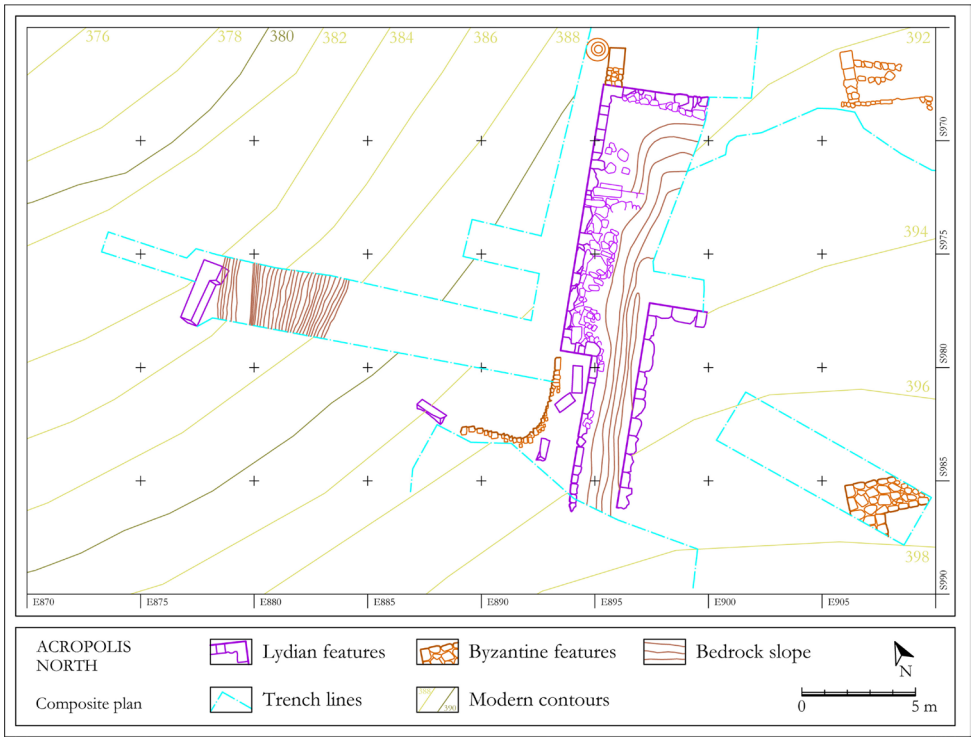

Fig. 14. Plan of terrace at Acropolis North. (author's digitization of drawing courtesy of Archaeological Exploration of Sardis / President and Fellows of Harvard College)

Fig. 15. View of stepped terraces at Acropolis North.
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Fig. 16. View of Lydian terraces at Kagirlik Tepe.

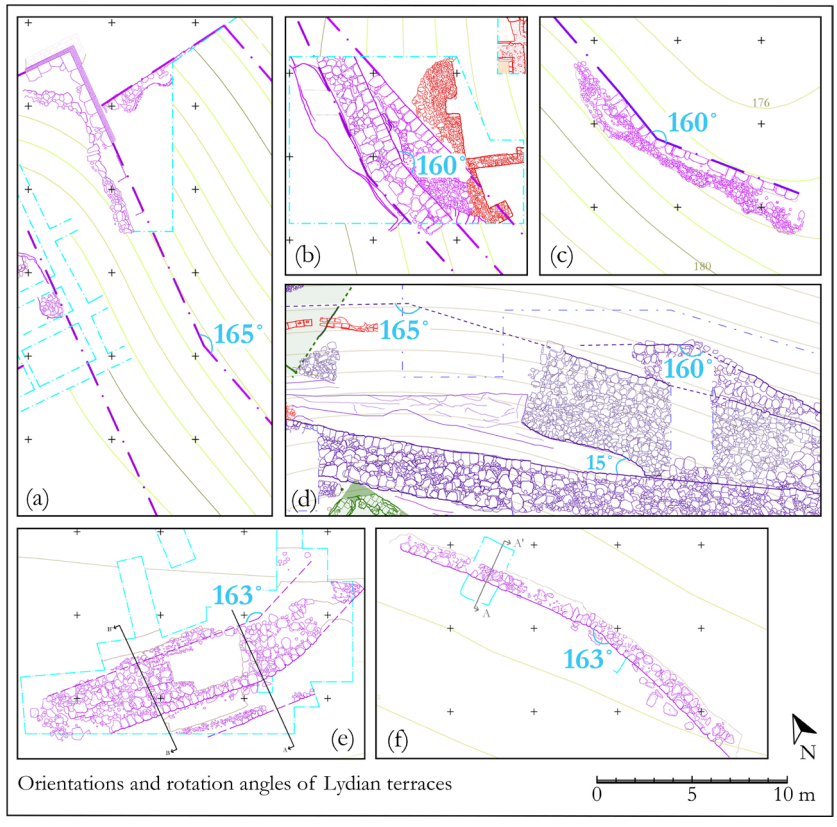

Fig. 17. Orientations and specific rotation angles of Lydian terraces at (a) ByzFort North, (b) ByzFort Center, (c) ByzFort South, (d) Field 49, (e) Kagirlik Tepe, (f) Wall 49.