The Sardis Campaigns of 1994 and 1995

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Abstract

Excavation at Sardis in 1994 and 1995 further exposed a Late Roman suburb, with houses and colonnaded streets of the fourth–seventh centuries A.D., and a massive defense wall of the seventh–sixth centuries B.C., together with destruction debris of the latter and associated weapons that evidently belong to the Persian attack of the 540s B.C. Foundations for a crepis wall that curbed one of the largest tumuli in the Bin Tepe cemetery were also found. Geophysical resistivity and magnetic surveys were conducted over a total of 2.4 ha of the city site and at Bin Tepe, and results were checked by excavation in two locations. Ancient quarries in the environs of Sardis were sampled in an attempt to identify sources of limestone and marble used in buildings of the seventh and sixth centuries B.C. at Sardis and Bin Tepe. Drilling/coring inside a large tumulus at Bin Tepe indicated that anomalies previously detected in a ground-penetrating radar survey do not represent a burial chamber.*

INTRODUCTION

This report presents results of excavation and archaeological exploration in 1994 and 1995 at the city site of Sardis (fig. 1), which is located on the south side of the Hermus River plain, around the nucleus of a 300-m-high acropolis, and in the tumulus cemetery at Bin Tepe, which lies 8 km away, on the north

* The Archaeological Exploration of Sardis, or Sardis Expedition, is cosponsored by the Harvard University Art Museums and Cornell University, and has conducted summer field campaigns every year since 1958. The Expedition is financially supported by many corporate and individual donors. The conservation program is supported by a grant from the Samuel H. Kress Foundation. Study projects connected with publication of the results of fieldwork before 1977 have been supported by the National Endowment for the Humanities.

Fieldwork in 1994 and 1995 was authorized by the General Directorate of Monuments and Museums, a division of the Ministry of Culture of the Republic of Turkey. It is a pleasure to acknowledge permissions, encouragement, and support of General Directorate officers, notably Director General Engin Özgen, Deputy Director General Kenan Yurttagül, Excavations Department Chief Kudret Ata, and the Excavations Branch Director, the late Osman Özbek; also of officers of the Archaeological and Ethnographical Museum in Manisa, notably Director Hasan Dedeoğlu, Deputy Directors Ü. Fatma Bilgin and Mustafa Tümer, and curators Ilhami Bilgin and Mehmet Önder. Ministry of Culture Representatives were Bilgin (1994) and Önder (1995); their sound and apt advice, generous support, and unstinting assistance greatly facilitated Expedition programs.

Staff members for 1994 and 1995 were the following (for both seasons where no year is given): C.H. Greenewalt, Jr. (field director); Teoman Yalçınkaya (administrative officer and agent); A. Ramage (associate director and specialist for antiquities from sectors HoB and PN); L.M. Gadbery (associate director and head of the Sardis Office in Cambridge, Mass.); K.J. Frazer (camp manager); C.J. Wright (camp manager, 1995); K.J. Severson (supervising conservator, 1994); S.J. Koob (supervising conservator, 1995); G. Dikilitaş, M.J. Dilisio, S. Hornbeck, A.B. Sigel, D. Smith, and M.E. Thumm (conservators; Dikilitaş, Dilisio, Thumm in 1994; Hornbeck, Sigel in 1995); P.T. Stinson (senior architect); K.M. Bergman, J. Chang, and K.A. Courteau (architects; Bergman, Chang in 1995; Courteau in 1994); C.S. Alexander and J. Ogden (draftsmen; Ogden in 1995); E. Proctor (photographer); R.E. Leader (recorder); C. Chabot (assistant recorder, 1994, and excavator); N.D. Cahill, E.R. McIntosh, and M.L. Rautman (senior excavators); F. Heinz, A. Prieto, and C.H. Roosevelt (excavators; Heinz, Roosevelt in 1995); L.E. Somers (geophysicist, 1995); D.J. Goldsmith and S. Moore (geophysical surveyors, 1995); F.K. Yegül (specialist for graphic recording of the Artemis temple); P. Herrmann (epigraphist, 1995); D.J. Pullen (specialist for prehistoric material, 1995); T.D. Thompson (specialist for protective and display shelter design, 1995); M.H. Ramage (specialist for limestone and marble source study); S.I. Rotroff (specialist for Hellenistic and Roman pottery, 1994); Gül Gürtekin (specialist for Lydian pottery); Gökhan Özagaçlı (specialist for terracotta conduit pipes); M.R. Glendinning (specialist for Anatolian architectural terracottas, 1994); and M. Kerschner (specialist for East Greek Orientalizing pottery, 1995). T. Güngör (geologist, 1994) was an unofficial and invaluable staff member. The considerable clerical work required by regulations of the Ministry of Labor, the Social Security Commission, and the Tax Office was done efficiently and cheerfully by Celâlettin Şentürk. To all of these for hard work, high professional standards, patience, and team spirit, heartfelt thanks.

The section on Roman occupational material in sectors MMS/N and MMS/S was written by Rautman, the rest by Greenewalt.

The following abbreviations are used:

Greenewalt et al. 1994 — C.H. Greenewalt, Jr., C. Ratté, and M.L. Rautman, "The Sardis Campaigns of 1990 and 1991," *AASOR* 52 (1994) 1–36.

Greenewalt et al. 1995 — C.H. Greenewalt, Jr., C. Ratté, and M.L. Rautman, "The Sardis Campaigns of 1992 and 1993," *AASOR* 53 (1995) 1–36.

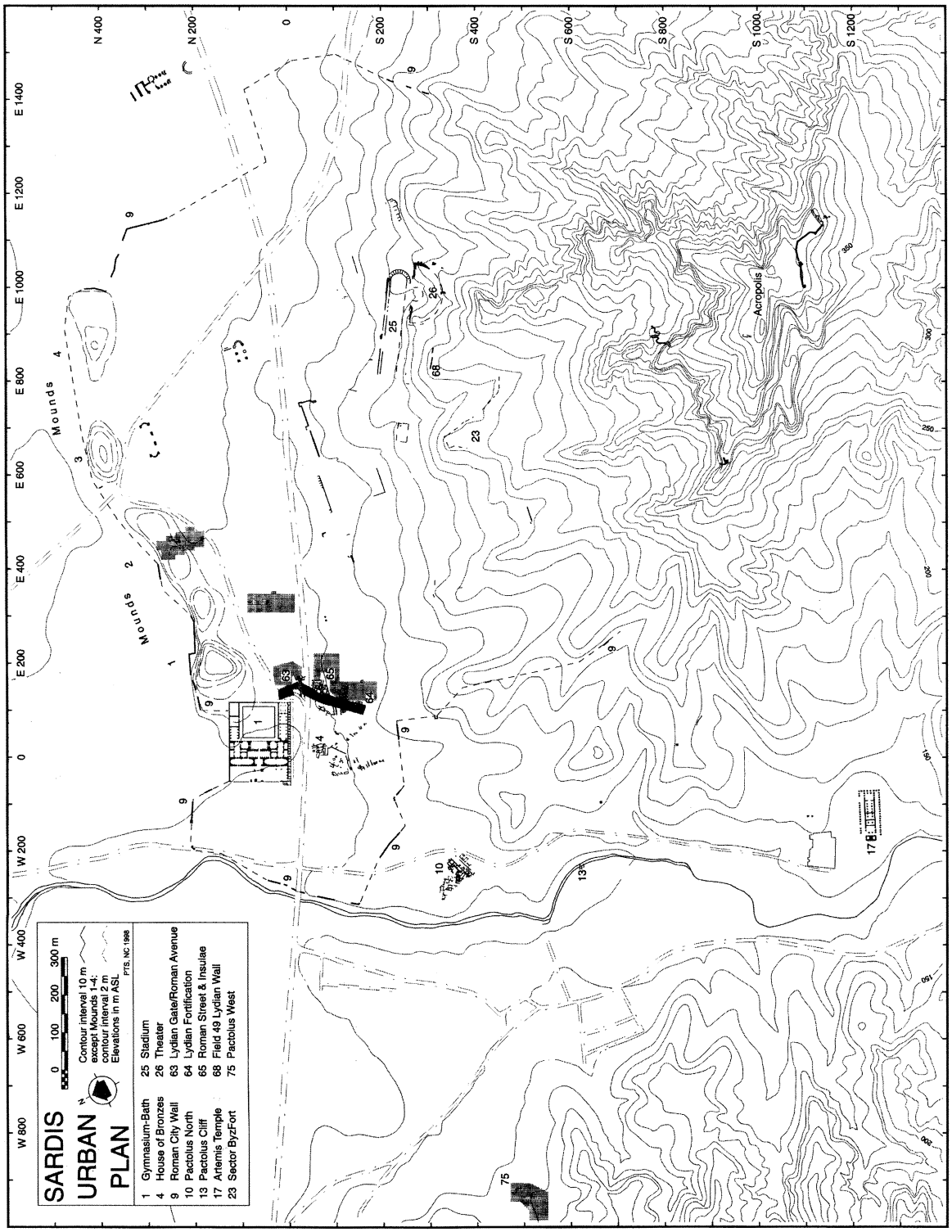

Fig. 1. Sardis, general site plan. Shading marks locations of geophysical survey (1995). Not indicated: modern village houses of Sart (mostly located near the Pactolus stream).

side of the river plain.[1] Archaeological exploration included geophysical resistivity and magnetic surveys at Sardis, in five separate locations of 0.24–0.76 ha each, and at Bin Tepe on the largest tumulus (Koca Mutaf Tepe; the Tomb of Alyattes); a survey at Bin Tepe and in the environs of Sardis to identify sources of limestone and marble used in seventh–sixth century B.C. construction at Sardis and Bin Tepe; and a limited program of drilling/coring inside a tumulus at Bin Tepe (Karnıyarık Tepe; formerly considered the Tomb of Gyges) to check the results of a ground-penetrating radar survey carried out in 1993. Other projects included conservation, study of monuments and antiquities discovered in previous seasons, and planning for touristic site improvement.[2]

EXCAVATION

Since 1977, the main goal of excavation has been to clarify urban topography and monuments of the seventh–early fifth centuries B.C., the eras of the Lydian kingdom and of early Achaemenid Persian rule. Monuments of this time period are called Archaic. Excavation in 1994 and 1995 took place in the city site at the group of sectors MMS/N, MMS, and MMS/S (fig. 1: 63–65) and at three other localities (1995) to check the results of the geophysical survey (fig. 1, shaded areas); and at Bin Tepe (1995), at the foot of Kır Mutaf Tepe, the second-largest tumulus of the cemetery.

Sectors MMS/N, MMS, and MMS/S

The excavation sector group of MMS/N, MMS, and MMS/S (fig. 2) is located at the foot of the Acropolis, south of the Late Roman Synagogue, and on either side of the modern Ankara–Izmir highway (sector MMS/N immediately north of the highway, sector MMS immediately south of it, and sector MMS/S immediately south of sector MMS). Since 1977, excavation there has been continuous, driven by the attraction of a well-preserved fortification wall (fig. 1: 64) and houses of the first half of the sixth century B.C. and their sudden destruction, which may be dated to the mid-sixth century and which is reasonably identified with the siege, capture, and partial sack of Sardis by the Persians in the 540s, when the Lydian king Croesus's "mighty empire" was destroyed and western Anatolia became part of the Persian Empire. For *AJA* readers who have not followed annual and biennial reports in *BASOR*, *BASOR* Supplements, and *AASOR*, a brief description of the wall and the destruction layer is provided in the following paragraphs.

In the 150-m-long stretch where excavation has concentrated, the truncated stump of the wall stands

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[1] See G.M.A. Hanfmann, *Sardis from Prehistoric to Roman Times: Results of the Archaeological Exploration of Sardis, 1958–1975* (Cambridge, Mass. 1983) fig. 2. The most recent field season report is Greenewalt et al. 1995. Reports on the results of earlier campaigns (through 1993) have appeared in *BASOR*, *BASOR* Supplements, and *AASOR*.

Locations are recorded in grid coordinates, which are given for some but not all features in this report. For the grid system, which uses compass directions from a zero point on the Roman Bath-Gymnasium complex (fig. 1: 1), formerly called building B, hence the "B" grid, see S.L. Carter, in G.M.A. Hanfmann and J.C. Waldbaum, *A Survey of Sardis and the Monuments outside the City Walls* (*SardisRep* 1, Cambridge, Mass. 1975) 9–10. Excavation levels refer to an arbitrary elevation datum of 100, which has been calculated as 115.11 masl; Carter (supra) 10–11. Contour elevations in fig. 1, however, are recorded in meters above sea level.

[2] Conservation projects included (in addition to routine conservation, repair, and monitoring efforts) cleaning and treatment of two painted marble supports for an Archaic funeral *kline*, recovered from a tumulus tomb chamber at Bin Tepe by the Manisa Museum in 1993–1994 (1994; the supports, inventoried as NoEx 94.4, were painted in red and black/blue with conventional kline-leg palmettes); preparation of plaster casts of eight stone inscriptions from the Synagogue for an exhibit at the Yeshiva University Museum, New York (1995; see S. Fine ed., *Sacred Realm: The Emergence of the Synagogue in the Ancient World*, New York 1996); and services to the Manisa Museum in connection with the lifting of mosaic paintings from a Byzantine ecclesiastical building at Çağlayan village near Julia Gordos/Gördes (1995). Study projects included graphic recording of the Artemis temple by F.K. Yegül (which resulted in the discovery in 1994 of three modern Greek graffiti on the top drum of the northeast corner column of the peripteros; the drum, not in its original position, may have been placed there by the H.C. Butler Expedition); study of Neolithic and Early Bronze Age artifacts from the south shore of the Gygaean Lake and Bin Tepe, by D.J. Pullen assisted by J. Ogden (1994); of Lydian pottery, by G. Gürtekin; of Archaic roof and revetment tiles, by M. Glendinning (1994); of Hellenistic pottery, by S.I. Rotroff (1994); and of Hellenistic and Roman water pipes, by G. Özağaçlı (1994). Site enhancement planning primarily involved the redesigning of a permanent shelter for Lydian and Late Roman residential spaces in sector MMS, by T.D. Thompson, and preliminary discussions concerning construction of the shelter with the firm TEKNO, A.Ş., Izmir (1995).

Purchase of 12 acres of land at Sardis (23,444 m² at sector MMS/N; 15,850 m² at sectors MMS and MMS/S; and 10,260 m² at mound 2, where a large Archaic building had been located during excavation in 1985) in the name of the Turkish Treasury, for future excavation and site enhancement (e.g., planting, visitor walkways) was greatly facilitated by the efforts of Teoman Yalçınkaya, Hasan Dedeoğlu, and Celâlettin Şentürk and was made possible by a grant from the Hyacinth Foundation.

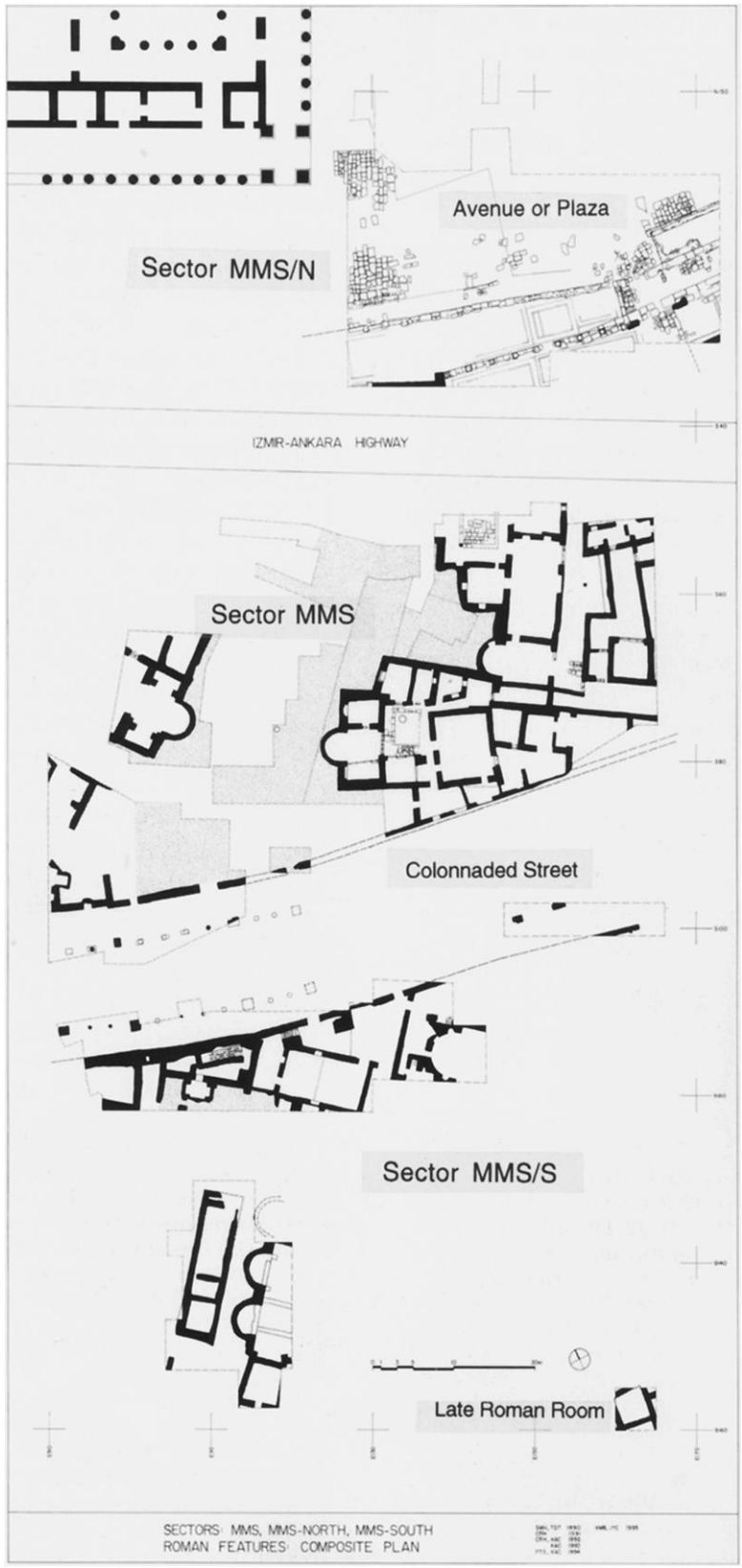

Fig. 2. Sectors MMS/N, MMS, and MMM/S, Roman levels, plan

up to 8 m high and is 20 m thick. Since few ancient fortification walls approach that thickness, the identification of the Sardis building as a fortification was doubted in its early excavation seasons (hence the names "monumental mudbrick structure" and "colossal Lydian structure," which continue to be used in their acronyms, MMS and CLS); but in spite of other puzzling features (notably the large recesses on either side of the building; see below, fig. 14), its narrow proportions, solid construction, and steep sides, which are incompatible with other standard ancient building types, are persuasive evidence that the structure was a fortification wall. Consistent with that function are its materials and techniques of construction; the massive earthwork built against the west side of the structure, which is intelligible as a glacis or *agger*; the skeleton of a young man likely to have been a soldier, who had been unceremoniously dumped and buried in demolished ruins of the wall; and armament and weapons resting in or directly under those ruins. At the north end of sector MMS, the wall has sloped faces built mostly of coursed mudbrick and with a relatively low socle of stone; to the south, faces are vertical and built of stone to their preserved height, in roughly coursed or polygonal masonry with neatly squared quoins at salient corners. In sector MMS/N, the wall is much less well preserved and includes a blocked gate (discussed below, "Sector MMS/N: Archaic levels"). A date of construction in the second half of the seventh century B.C. is indicated by pottery recovered underneath the stone socle.[3]

Whether the wall protected settlement to the east or west remains an embarrassing question. Lydian occupation existed on either side of the wall, and excavation has not established intramural and extramural identity; the earthwork might be an exterior glacis or an interior agger. A long chain of four artificial mounds to the northeast, evidently at the north edge of the settlement site (fig. 1), may mark a continuation of the Archaic wall, like mounds that marked the wall segment in sectors MMS and MMS/S before excavation;[4] and a large Archaic building that could belong to a defense work was exposed in limited excavation on one of those mounds (in 1985). If the mound chain represents a continuation of the Archaic defense line, the wall segment in sectors MMS/N, MMS, and MMS/S would have protected settlement to the east. In that case, occupational zones to the west, which yielded rich ceramic material (sectors HoB, PN, PC; fig. 1: 4, 10, 13) and refining installations for precious metal (sector PN), would have been extramural, as would also the Pactolus stream, which according to Herodotos (5.101) bisected the agora in a well-populated residential part of the city at the time of the Ionian Revolt in 499 B.C. If the mound chain is unrelated to the line of defense and the wall segment protected settlement to the west, Archaic houses in sector MMS and Archaic terraces and related occupation at "ByzFort" and "field 49" would have been extramural (the terraces, fig. 1: 23, 68, may have been associated with the "upper city" Acropolis—although their altitude is relatively low—rather than with the lower city).[5]

Resting against the truncated stump of the wall on either side and standing as high as the stump are demolished ruins of the wall (which acted as a preservative matrix for the stump and account for its considerable surviving height). The demolished ruins consist mostly of brick (with much smaller

[3] The fortification wall and related features have been discussed in season summaries in *BASOR*, *BASOR* Supplements, and *AASOR* since 1979, the most recent of those being Greenewalt et al. 1995, 11–12. There is no up-to-date summary. For the date of construction and materials and techniques of construction, see C.H. Greenewalt, Jr., E.L. Sterud, and D.F. Belknap, "The Sardis Campaign of 1978," *BASOR* 245 (1982) 18–24; and Greenewalt et al., "The Sardis Campaigns of 1979 and 1980," *BASOR* 249 (1983) 1–15. For the earthwork glacis or agger, see Greenewalt et al., "The Sardis Campaign of 1986," *BASOR* Suppl. 26 (1990) 141–43. For the "soldier" casualty and armament (with brief information on the architectural context), see Greenewalt, "When a Mighty Empire Was Destroyed: The Common Man at the Fall of Sardis, ca. 546 B.C.," *ProcPhilSoc* 136 (1992) 247–71; and Greenewalt, "Arms and Weapons at Sardis in the Mid Sixth Century B.C.," *Arkeoloji ve Sanat* 79 (1997) 2–20.

[4] The absence of connecting mounds in the modern landscape between sector MMS and the west end of the mound chain (a distance of ca. 100 m) may be attributed to post-Archaic construction activity that leveled the Archaic fortification ruins, as is demonstrably the case at sector MMS/N (further, below) and at the location of the modern highway between sectors MMS/N and MMS.

[5] For excavation in the mound chain, see C.H. Greenewalt, Jr., M.L. Rautman, and N.D. Cahill, "The Sardis Campaign of 1985," *BASOR* Suppl. 25 (1987) 80–84. For Archaic occupational material in sectors HoB, PC, and PN, see A. Ramage, S.M. Goldstein, and W.E. Mierse, in Hanfmann (supra n. 1) 26–42. The ancient channel of the Pactolus stream must have had approximately the same location as the modern channel where the stream is flanked by the Acropolis and Necropolis massifs. Whether it had the same location north of those massifs or veered to the east and passed through or near sector HoB (fig. 1: 4) has not been determined. For speculation on an easterly course, see G.F. Swift, Jr., in G.M.A. Hanfmann, "The Eighth Campaign at Sardis (1965)," *BASOR* 182 (1966) 8.

amounts of roughly worked or unworked stone and carbonized wood) and have been called "Brick Fall." The brick ranges from small grains to whole bricks; most of the bricks are either unfired or semibaked, with a small number that are blackened and partly vitrified from intense heat. The haphazard orientations of bricks and other components and their inclined fall lines extending down and out from the sides of the truncated stump demonstrate that the demolished ruins come from atop the stump; and the similarity in size and shapes of bricks in the ruins to bricks in the stump construction establish that the ruins are the destroyed upper part of the wall (which may originally have stood another 4–8 m high).

The homogeneity of materials and the absence of significant stratification suggest that demolition and dumping occurred within a short period of time, presumably days. Diagnostic pottery that rested in or directly underneath the demolition heaps includes parts or all of six Attic black-figure pots, as well as of Corinthian, Laconian, and Eastern Greek (Ionian, Fikellura) pottery. All the Attic pottery is datable, according to conventional chronological reckoning, to the second quarter and middle years of the sixth century B.C. The Corinthian, Laconian, and Eastern Greek items are consistent with that date; a ^{14}C date for grain that rested directly underneath the debris (570 ± 50 radiocarbon years B.C.) and a dendrochronological date for wood that may be associated with the destruction are also compatible. The chronological evidence, the extent and violence of destruction, its association with a major urban defense work, and evidence for contemporaneous pillaging and destruction of nearby houses are all consistent with the historical record of Persian capture in the 540s.[6]

In a way still poorly understood, the demolished ruins of the wall are a combination of wreckage and renovation: the debris deposit is not merely dump; it was also partly shaped, to support a new defense work, which may have been begun within a half century after the destruction. Much less well preserved than its predecessor, it included a wall ca. 5.20 m thick (stone footing preserved; indicated in fig. 14, below, "post-destruction walls") and appears to have had another earthwork on the west side. Occupational remains of the fifth and fourth centuries B.C. and the Hellenistic era have been recovered for the most part in isolated pockets. The next major occupational phase is Roman, and the most conspicuous part of it is a Late Roman–Early Byzantine suburb of *insula* residences and streets belonging to the fourth–seventh centuries A.D. The following presentation is organized chronologically, from latest to earliest, and topographically (within discrete chronological phases), from north to south.

Sector MMS/N: "Ottoman road." Road metaling of the 15th century or later was uncovered in a previously unexcavated, ca. 10 × 10 m "tongue" of land on the north side of the sector MMS/N trench, directly north of the Archaic fortification gate passage (1994; fig. 2 approximately at "plaza"). The metaling presumably had extended further east, west, and south, but in previous excavation of the immediately surrounding locale, its extension had not been recognized, or at least not recorded; it probably belongs to the "Ottoman road" of which a part was uncovered in 1961, 150 m to the west. The metaling excavated in 1994 consisted of broken stone (including one Roman sculpture fragment, showing the bridled muzzle of a horse in white marble). An iron horseshoe rested on the metaling. From beneath the metaling was recovered a bronze coin of Ottoman Sultan Murat II, minted at Bursa in 1433. The metaling rested 0.60–0.70 m above the level of the Late Roman avenue/plaza paving (see below) and belongs to the sequence of east–west thoroughfares that include several Archaic surfaces (see below, fig. 15), a 15-m-wide marble-paved Roman avenue, a Byzantine cobbled surface, and the modern Ankara–Izmir highway.[7]

Sectors MMS/N and MMS/S: Roman levels. Sector

[6] For evidence that semibaked brick in "Brick Fall" had been baked in a kiln, rather than baked in a destruction fire, see N.D. Cahill in C.H. Greenewalt, Jr., N.D. Cahill, and M.L. Rautman, "The Sardis Campaign of 1984," *BASOR* Suppl. 25 (1987) 22–24. The most diagnostic pottery from destruction contexts is Attic, Corinthian, Laconian, and Fikellura; see J.S. Schaeffer, N.H. Ramage, and C.H. Greenewalt, Jr., *The Corinthian, Attic, and Lakonian Pottery from Sardis* (*SardisMon* 10, Cambridge, Mass. 1997) nos. Att 1, 46, 85 (possibly 88), Cor 123, 124, Lak 5; also N.H. Ramage, "Two New Attic Cups and the Siege of Sardis," *AJA* 90 (1986) 419–24; Greenewalt et al. 1995, 18; and for one Fikellura item, G.P. Schaus, "Two Fikellura Vase Painters," *BSA* 81 (1986) 255 no. 34. For ^{14}C evidence, see Cahill, in Greenewalt et al. 1987 (supra) 29. Houses are reported by Cahill (supra) 26–30; Greenewalt et al. (supra n. 5) 62–70; Greenewalt et al. 1990 (supra n. 3) 143–55; Cahill, "Lydian Houses, Domestic Assemblages, and Household Size," *BiblArch*, forthcoming; and Greenewalt et al. 1995, 13–19. For looting evidence, see Greenewalt et al. 1995, 13, 15–16 (burning and scattering of pottery); and Hdt. 1.88.

[7] The "Ottoman road" segment was located at E 148–60/S 11–20 on the "B" grid. The sculpture fragment showing the horse muzzle is S95.7: 10193. The coin of Murat II, C94.15/1994.189, was identified by Ü.F. Bilgin. For Archaic road surfaces, see Greenewalt et al. 1995, 12–13, fig.

MMS/N lies southeast of the Bath-Gymnasium and Synagogue complexes. In previous seasons part of a broad avenue or plaza-like area was identified lying east of the Marble Road and Byzantine Shops (fig. 3).[8] Along the south edge of the paved expanse stood a monumental colonnade with large column bases placed 2.4–2.6 m apart along a continuous stylobate. A well-built wall formed the back of the west part of this portico, while behind the east part stood a second, inner colonnade with nine columns or piers that at one time rested on Ionic bases or inverted capitals at intervals of 2.8–3.0 m. Paved with geometric mosaics and covered by a timber roof in the early fifth century, this monumental portico remained in use until the early seventh century. Excavation in 1994 concentrated on the area east of this double portico area.

The east end of the double portico can be identified at approximately E 162 on the "B" grid, where the inner stylobate turns north to join the main colonnade.[9] The upper mosaics of the outer sidewalk end at this point, as do also the mosaics of the inner aisle (fig. 3). Two large piers rising from the two stylobates indicate a change in the portico's superstructure as well. Immediately to the east a narrow alley or walkway enters the avenue or plaza at an oblique angle from the southeast (fig. 4). Although extensively robbed out, the surviving stone paving indicates that the walkway was originally 3.5–4.0 m wide. The surface was paved with carefully fitted and mortared slabs of marble apparently stepped downward from the level of the inner portico to the surface of the avenue or plaza. A central spine of large blocks was flanked by smaller slabs of gray-veined marble extending to both sides. A deep, well-mortared channel containing a terracotta pipe lies beneath the walkway and slopes gently from south to north to join the complex network of waterworks underlying the plaza-like area. Repairs to the waterworks may account for some of the disturbance of the paving, which in its final state included a fragmentary draped marble statue, apparently male, with an unfinished back surface (S94.9: 10197).

On the opposite side of the walkway another portico with two aisles extends east beyond the present limit of excavation. Both the walkway and this east portico derive their orientation from a massive earlier foundation that was reused as the inner stylobate of the east portico. The 1.5-m-wide foundation consists of large marble blocks with lewis holes that were originally clamped in place and supported one side of a structure that extended to the south. The foundation continues about 6 m under the west inner portico, where it was trimmed to fit the divergent orientation of the later feature.

The east portico apparently also consisted of two colonnades and a back wall, and had a total depth of 10.0 m. The colonnades are known by their stylobates and foundations, although the bases were removed in antiquity. The north or outer colonnade seemingly rested on a mortared rubble foundation capped by marble blocks, of which two remain in place. The south or inner colonnade apparently rose directly from the earlier marble foundation. Excavation between the two foundations recovered several fragments of brecciated white and dark red marble column shaft, 0.50 m in diameter and with a height of at least 3.5 m, which may have formed part of the inner colonnade. The 3.0-m-wide sidewalk area between the two colonnades was paved with irregularly laid marble blocks. The back wall of the east portico stands about 6 m farther back. The wall was built of mortared rubble and includes a 1.2-m-wide doorway with threshold, which was blocked at a later time. A low apron or curb immediately to the north reinforced this part of the portico. Isolated patches of a black-and-white mosaic floor with interlacing patterns and interlocking circles lie between the inner stylobate and the back wall.

Related to the east portico is a parallel wall lying 4 m in front of the main colonnade at the level of the paved avenue or plaza. The wall consists of a curb or foundation of marble slabs with a rising screen of mortared rubble construction that continues east beyond the limit of excavation. A row of marble roof cover tiles, only fragmentarily preserved, was mortared along the base of the wall to serve as dressing for its north face. At the west end of this foundation, a rubble wall extends south to join the main colonnade at the point of intersection with the walkway

3, "cobble paving." For Roman, Byzantine, and "Ottoman" road surfaces, see G.M.A. Hanfmann, "The Fourth Campaign at Sardis (1961)," *BASOR* 166 (1962) 45–46, figs. 33–35; J.S. Crawford, *The Byzantine Shops at Sardis* (*SardisMon* 9, Cambridge, Mass. 1990) 3 fig. 6. For an 18th-century east–west road located considerably further to the north, as recorded by G.B. Borra, the artist who accompanied R. Wood to Sardis in 1750, see R.L. Vann, *The Unexcavated Buildings of Sardis* (*BAR-IS* 538, Oxford 1989) 99 fig. 6. Sardis Expedition foreman Ibrahim Akyar (born ca. 1926) remembers a functioning east–west main road that was located "over the Byzantine shops," just north of the Roman avenue, i.e., essentially the same location as the "Ottoman road."

[8] Greenewalt et al. 1995, 4–6.

[9] Greenewalt et al. 1995, 5.

Fig. 3. Sector MMS/N, Late Roman portico and walkway area, plan

Fig. 4. Sector MMS/N, Late Roman portico and walkway area, looking east

from the south. The oblong area enclosed by the wall and the facing main colonnade was apparently filled with rubble and earth to the height of the outer stylobate; this arrangement seems to have formed a low platform projecting north from the portico into the avenue or plaza. A mid-fourth century coin (Constantius II, Gallus [?], or Julian Caesar, ca. 346–361, 1994.106) recovered from the packing suggests that the structure was built no earlier than the mid-fourth century.

Like the previously excavated portico area to the west, the area of the east portico was covered by a heavy layer of bricks and roof tiles from the collapsed superstructure. No architectural features or vaulting forms were evident in the tile fall but the extent of roof tiles suggests that both the portico area and the intersecting walkway were covered. Figure 5 provides a conjectural reconstruction of the portico and walkway area, and assumes that the columns and brick piers supported a timber superstructure. Most of the coins recovered from the level of the portico floor date to the fourth to sixth centuries. Two issues of Heraclius (612–613, 1994.41, 45) found in the layer of packed earth immediately above the outer portico's floor bedding confirm that the paving had been partially robbed out before the superstructure collapsed in the early seventh century. The date coincides with evidence recovered from the west portico area, and suggests that both structures collapsed at the same time.[10]

Excavation of the plaza-like area to the north confirmed the extensive robbing of its marble paving in antiquity. A 7 × 2.5 m section of paving preserved along the north face of the projecting platform includes many irregularly shaped blocks and architectural spoils, several of which carry incised letters or mason's marks. Elsewhere the original surface survives only in a layer of marble-chip bedding for the robbed flagging. Of 43 identified coins recovered from atop this bedding, 85% date to the fourth and fifth centuries, when the paving was apparently installed and repaired. Excavation below this level farther west identified more of the extensive system of waterworks, mostly terracotta pipes, that ran beneath the paved surface. Five coins of the mid- and late sixth century document later activities in the vicinity, probably including the robbing of marble paving blocks.

[10] C.H. Greenewalt, Jr., C. Ratté, and M.L. Rautman, "The Sardis Campaigns of 1988 and 1989," *AASOR* 51 (1993) 6, 39 n. 6.

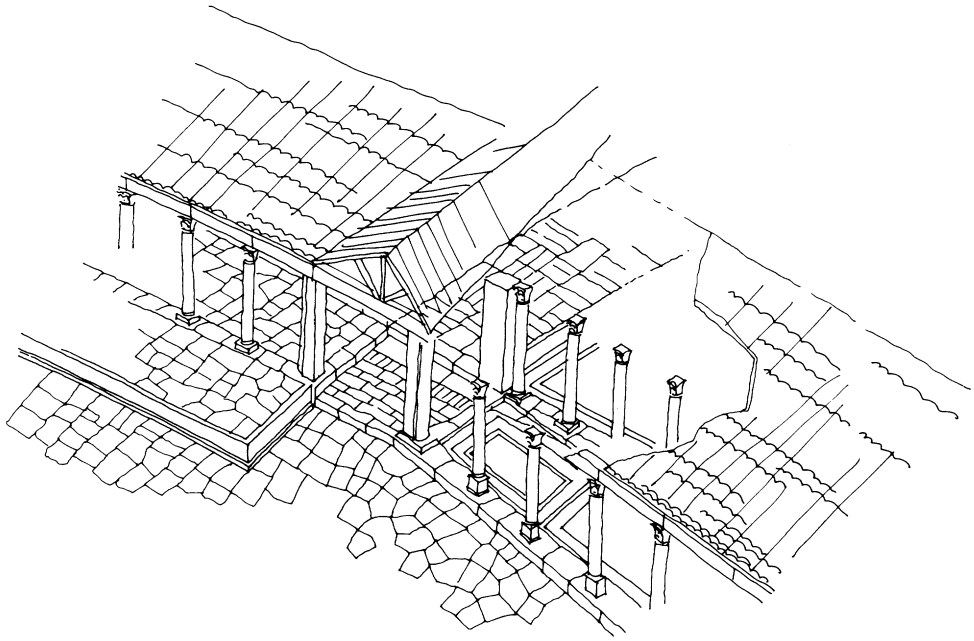

Fig. 5. Sector MMS/N, conjectural reconstruction of Late Roman portico and walkway area, looking southeast. (P.T. Stinson)

South of sector MMS/N and the present Ankara–Izmir highway lies sector MMS, where previous excavations have explored a residential insula defined by the Roman avenue and plaza-like area on the north and a broad colonnaded street to the south.[11] Sector MMS/S includes the area lying immediately south of this street (fig. 2). To the west is a low ridge, where remains of the Archaic fortification underlie buildings of Roman and Late Roman date; the rest of the sector comprises an open field. Work focused on the southern part of the sector in 1994 and on areas closer to the colonnaded street in 1995.

Previous excavation along the east edge of the ridge identified a Roman terrace wall with at least two broad apses or exedrae set into the hillside (fig. 6). The south apse, the space onto which it faced, and an adjacent room to the south were explored in 1992 and 1993.[12] Excavation in 1994 turned to the second apse of this large structure.

Like its counterpart to the south, the second apse was set into the stone core of the Archaic fortification with flanking walls founded directly upon its east face. The apse is semicircular in plan with an interior diameter of 4.0 m, slightly wider than the 3.8-m-wide south apse. The apse wall was carefully built of mortared brick and rubble and carried a brick semidome (fig. 7). A tile floor originally covered the enclosed area. In the late fifth century a wall was constructed across the front of the apse to create a separate space that was accessible by a narrow doorway at its north end.

The original shape and function of the apsidal building remain uncertain. At one point both apses faced onto the same large space. At this time the south boundary appears to have been located beyond the south apse while the facing wall stood some 14 m to the north, a little beyond the second apse; the east limit of the space remains unknown.[13] Excavation in 1994 recovered additional evidence dating these walls to the early fifth century. Several fragmentary piers and walls as well as subfloor pipes and drains suggest a complex sequence of changes that were made during the later fifth and sixth centuries. Ash and other evidence of burning found in the second

[11] For a recent overview of the residential buildings, see M.L. Rautman, "A Late Roman Townhouse at Sardis," in E. Schwartheim ed., *Forschungen in Lydien* (Asia Minor Studien 17, Bonn 1995) 49–66; for the street, see Greenewalt et al. 1987 (supra n. 6) 18–20.

[12] Greenewalt et al. 1995, 8–10.

[13] A similar, if more elaborate, arrangement of paired apses apparently served as a fountain house or nymphaeum in the second-century A.D. stoa at Sparta; see G.B. Waywell and J.J. Wilkes, "Excavations at Sparta: The Roman Stoa, 1988–91. Part 2," *BSA* 89 (1994) 385–89.

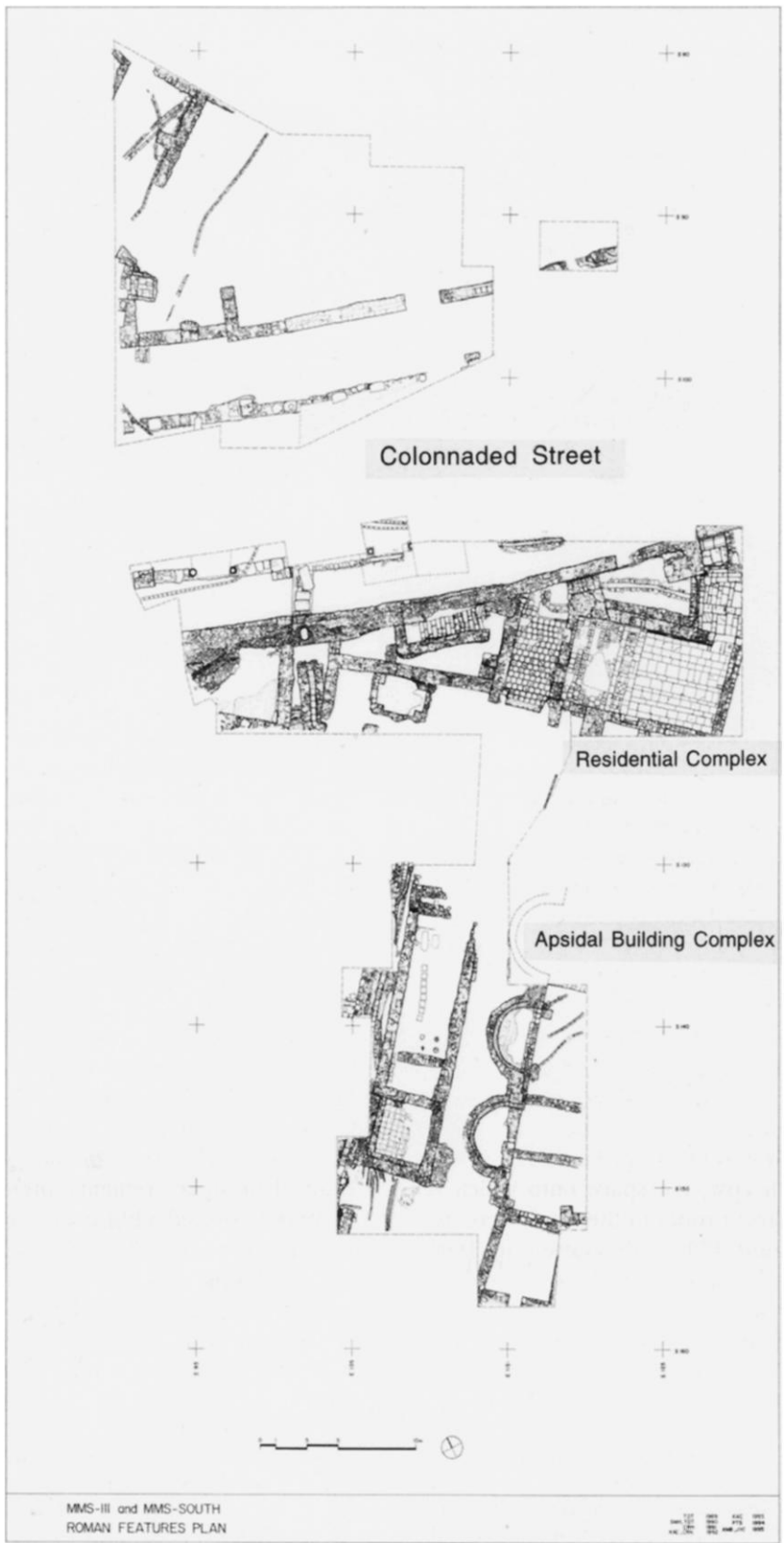

Fig. 6. Sector MMS/S, Late Roman apsidal building and residential complex, plan

Fig. 7. Sector MMS/S, Late Roman apsidal building, looking northwest

Fig. 8. Sector MMS/S, Late Roman room, looking west

apse may be contemporary with the circular oven that was built in the south apse in the later sixth century.[14] A heavy layer of rubble and tiles found above this level indicates that the second apse and adjacent area were roofed at the time the nearby oven was in use.

The main north–south terrace wall apparently was built atop the east face of the Archaic fortification during several Roman building campaigns and the apses or exedrae were added only around the early fifth century. (For an intermediate phase of activity between Roman and Archaic times, see below, "Sector MMS/S: Hellenistic, Classical, and Late Archaic levels"). A short section of the south part of the terrace wall was dismantled in 1994, together with the abutting east–west wall that separated the apsidal space from a small trapezoidal room to the south. The latter wall was found to have been built in three phases beginning in the late fourth or early fifth century. Mud mortar that included green-glaze ceramic fragments of apparent Middle Byzantine date was used in the third phase. No material previously recovered from the room was recognized as dating later than the sixth or early seventh century.[15]

Excavation in 1994 also explored the southeast part of sector MMS/S at a location approximately 50 m east of the terrace wall and apsidal building complex (fig. 2). A 5 × 5 m trench identified well-preserved Late Roman walls defining a small room of squarish proportions (fig. 8). The four walls were constructed of mortared brick, stone, and rubble in multiple phases and rise from sturdy foundations to a preserved height of approximately 2 m. The west wall, a heavily mortared rubble feature of uncertain thickness that lacks a clear lower face, may be the earliest of the four walls. The 0.75-m-thick north wall projects somewhat obliquely to the east. By contrast, the bonded south and east walls were carefully built of brick and rubble and form a right angle. Two doorways originally opened through the east wall onto adjacent spaces and a third doorway was located near the middle of the north wall. In an early phase the room had a floor of terracotta tiles. The north half of the floor consisted mostly of square tiles 0.34 m on a side, while the south half had three carefully laid rows of square tiles 0.40 m on a side. Running from east to west through the middle of the room was a 0.45-m-deep brick-lined trough, which abuts the east and west wall foundations and lacks any evident outlet. Similar subfloor channels in nearby residential contexts may have been not conventional drains but features intended to reduce the rising ground moisture or to serve as sinks from internal drainage.[16]

Excavation of the floor and bedding recovered pottery and coins (including seven issues of Arcadius or Honorius, 395–408) that suggest a construction date in the early fifth century. Both doorways in the east wall were blocked during a late period of use when the room was accessible only by the north doorway. The room's intended purpose in the fifth and sixth centuries remains uncertain. The latest clear evidence for its use dates from the late sixth century (coin of Tiberius II, 578–582, 1994.127). Excavation below the Roman foundations encountered a 0.6-m-thick layer of Hellenistic fill and a fragmentary stone wall. Commonly represented ceramics include echinus bowls, fish plates, moldmade and painted fine wares, cooking vessels, lamps, and loomweights. Identified coins date to the mid-third and mid-second centuries B.C. (1994.225, 226). For other items, see below, "Sector MMS/S: Hellenistic, Classical, and Late Archaic levels." Archaic contexts were noted at a lower level.

The area immediately south of the colonnaded street was a particular focus of interest in 1995 (figs. 2, 9). Previous work at the north end of the MMS/S ridge identified structures that were built atop the remains of the Archaic fortification in Early Roman times but were demolished or reorganized in the early fifth century when the colonnaded street was built through the area. One of the best-preserved spaces is room A, an oblong space with tiled floor and painted walls, which was explored in 1979 and 1991.[17] Excavations east of this space in 1995 revealed that room A belonged to an extensive and well-preserved residential complex lying behind the south street wall. Two additional rooms (D and F) and part of a third space (E) were excavated to floor level in 1995 and the walls of several additional spaces were identified farther east (fig. 9).

Room F appears to have been a tall, irregularly shaped space formed by the roughly perpendicular walls of room D and space E and the obliquely oriented south street wall (figs. 9–10). The room has a maximum length of 6.0 m and its width varies be-

[14] Greenewalt et al. 1995, 10 fig. 9.

[15] Greenewalt et al. 1995, 9.

[16] For a similar example in a nearby residential context, see C.H. Greenewalt, Jr., "The Sardis Campaign of 1987," *BASOR* Suppl. 27 (1990) 6; cf. below.

[17] Greenewalt et al. 1983 (supra n. 3) 8; Greenewalt et al. 1994, 11–13, figs. 12–13.

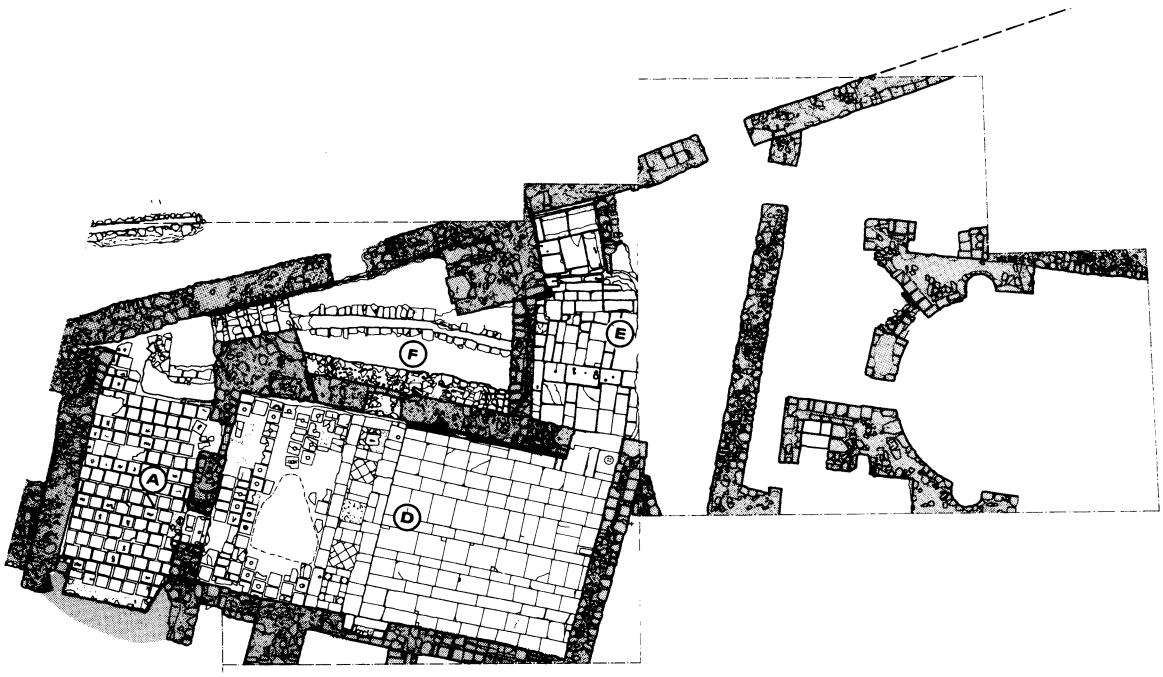

Fig. 9. Sector MMS/S, Late Roman residential complex, rooms D and F, and space E, plan

tween 2.2 and 4.0 m, owing to the presence of two massively built piers of mortared brick and stone at the southwest and northeast corners. Both piers, as well as north and south walls, stand to a height of over 3 m and attest to the tall, narrow proportions of the space. A 1.5-m-wide doorway near the middle of the north wall opened onto the south portico of the street. The room had a packed earthen floor that apparently lay close to street level. A 0.3-m-deep tile-lined channel that runs the length of the room but remains confined within it may reflect an attempt to deal with ground moisture at this depth. A bench or wall abutment, 0.6–0.7 m deep and built against the south wall, apparently incorporates schist and sandstone blocks from the Archaic fortification, which lies immediately beneath the room's floor. At the west end of room F, a 0.9-m-wide staircase built against the street wall rises 2.0 m from a cobbled landing to room A. At least six stone-built treads once led to the level of one or two L-shaped brick steps contained within the small recess at the north end of the upper room. The street-level location, awkward design, and sparse furnishing of room F suggest that it was intended primarily as a utilitarian space, perhaps offering a service entrance to the residence.

Space E stands immediately to the east of room F at a much higher elevation (fig. 10). Only the western part of the space was cleared to floor level but shallow excavation farther east revealed a trapezoidal plan measuring about 5.0 m wide by 6–8 m long. To the north stands the obliquely oriented street wall with a 1.2-m-wide doorway at the northeast corner of the space. The relatively high elevation of the floor suggests that this entrance stood well above the street surface and may have had an exterior staircase and landing.[18] A 1.1-m-wide doorway in the north end of the east wall joins space E with other parts of the complex. A doorway to room D and a narrow corridor open to the south. The arrangement suggests that space E may have served as both entryway and organizing court for the residence.

The west side of space E was originally defined by a wall extending 3.2 m south from the massive street wall pier. For most of its height the wall formed the east wall of room F, which lies 1.9 m below the floor of space E. The wall's uppermost part is 0.67 m thick and consists of two abutting vertical screens built of mortared brick and stone. Little of the wall survives above the floor level of space E. Fragments of marble revetment, a half-column, and wall-painting details suggest that it rose only part of the room's height and formed a protective parapet overlooking room F. Above the wall stood a brick arch, whose springing point is preserved by a schist slab mortared

[18] Greenewalt et al. 1987 (supra n. 6) 16–17.

Fig. 10. Sector MMS/S, rooms D and F, and space E, looking west

into the south wall at a height of 1.48 m; a hemispherical arch between this wall and the facing pier would have reached over 3 m in height.

The excavated western part of space E was paved with a well-preserved marble floor incorporating architectural spoils. About 1.7 m before the south wall the floor steps up slightly to reach the doorway to room D. The central part of the floor consists of carefully fitted rectangular slabs of white and gray marble. A large water tank set into the northwest corner of the space empties into a shallow overfloor channel sloping gently to the east. The lower walls of the space were faced with marble revetment.

The water tank stands in the northwest corner of space E, next to the street wall between the large street pier and a projecting spur. The tank measures 1.66 × 1.75 m in plan and was originally lined to a height of about 1.0 m with marble blocks, most if not all reused in this context. The tank floor lies 0.41 m below the floor of space E. A hole (0.04–0.05 m) in the front of the tank presumably was intended for water overflow, which emptied into the recessed floor channel. A similar hole at the bottom of the east side preserved a bronze collar that once was closed by a pivoting cover. A deep channel on the top surface of the front marble slab was worn by frequent drawing of water from the tank or similar activity during an earlier use of the block.

Many fragments of painted plaster were recovered from floor level and survived on sections of the brick arch that spanned the west side of space E. One reconstructed section from the lower east face of the arch near its south springing measures approximately 0.35 × 1.0 m and depicts a paneled background with the upper torso of a draped female figure (fig. 11)—the first known example at Sardis of a human figure in monumental painting.[19] Features are strongly outlined and carefully modeled in yellow ocher, olive green, and maroon with white highlights; traces of a red underpaint appear beneath

[19] For other wall paintings from sector MMS, see especially C.H. Greenewalt et al. "The Sardis Campaigns of 1981 and 1982," *BASOR* Suppl. 23 (1985) 68–73. For a list of painted tombs, see Hanfmann (supra n. 1) 207–209. Cf. in general V.M. Strocka, *Die Wandmalerei der Hanghäuser in Ephesos* (*Ephesos* VIII.1, Vienna 1977).

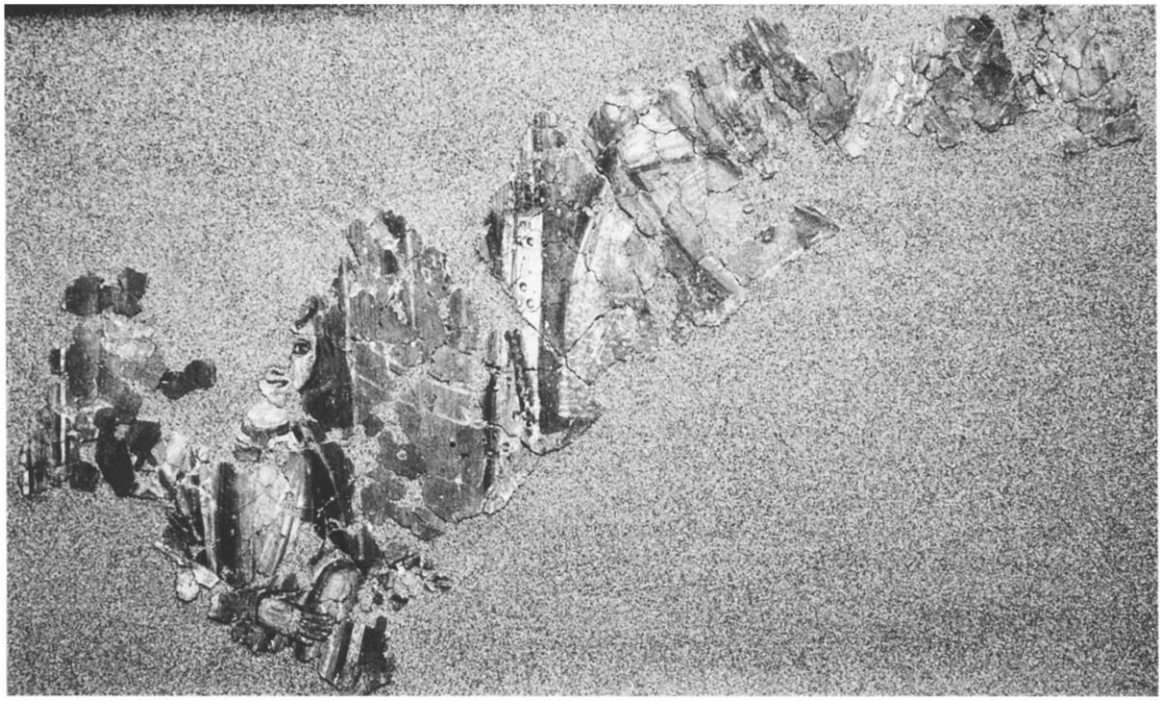

Fig. 11. Sector MMS/S, space E, west wall painting with draped female figure, detail

the worn and flaking surface. The figure faces the viewer or turns slightly to the right, gesturing with raised hands toward the open archway. To the right of the figure is a zone filled with indefinite polychrome patterns that may represent curtains. Other fragments recovered from the space depict a diaper pattern of circles and floral elements.

From space E one passed south through a 1.3-m-wide doorway, now lacking a threshold, into room D (figs. 10, 12). Four walls built of mortared brick and rubble and standing over 2 m in height define the room's rectangular plan, which measures 5.25 m wide by 10.0 m long. Two doorways in the west wall originally led to room A, the northern doorway later blocked by a brick screen, the southern one preserving a marble threshold. At least one doorway near the room's west end once opened to the south but was blocked in a later phase. Near the midpoint of the room a 1.02-m-wide niche is recessed in the north wall 1.03 m above floor level; across the room and slightly to the east, a 1.20-m-wide niche stands 0.47 m above the floor. A 1.24-m-long marble window mullion and a matching chamfered base or impost capital found near floor level at the room's east end apparently fell from a nearby window.

The importance of room D is underscored by its floor, which combines marble slabs, opus sectile paving, and terracotta tiles on two levels. The lower level, occupying the eastern 5.55 m of the room, is paved with carefully cut and closely fitted slabs of white and gray marble bedded in mortar. The paving was neatly laid in rows of similarly sized slabs, apparently beginning near the midpoint of the south wall and working from west to east and from south to north. The entire surface slopes gently toward a 0.25-m circular floor drain located in the doorway at the room's northeast corner. West of the marble paving, a step rises 0.12 m and a 1.43-m-wide band of opus sectile extends across the room. Five squarish panels with colored geometric ornament are set within a framework of white and light gray marble slabs and rest on a thick mortar bedding. The western 3.0 m of room D originally was paved with terracotta tiles, of which about half were found in situ. The square tiles measure ca. 0.33 m on a side and were laid in eight north–south rows directly atop an earthen surface. Several of the tiles were replaced by marble slabs in a late phase of use. At least 23 of the surviving tiles were pierced by a round central hole, about 0.07 m in diameter, which would have allowed additional drainage when the floor was washed.[20]

The walls of room D were plastered and covered with painted decoration during several phases. A sim-

[20] For similar pierced tiles, see K. Barker, in C.S. Lightfoot et al., "Amorium Excavations 1994: The Seventh Preliminary Report," *AnatSt* 45 (1995) 131.

Fig. 12. Sector MMS/S, room D, looking east

ple masonry-style plaster treatment was found on the lower south wall, similar to decoration found in the adjacent room A. In a later phase the room was decorated with a tripartite scheme known from in situ details and fragments recovered from the floor: a low 0.40-m-high dado course with painted rectangles simulating colored stone; a tall orthostat zone presenting large rectangular panels imitating brecciated and veined colored marbles separated by broad dark bands; and an upper zone with variegated floral and other vegetal decoration.[21] At a later date, marble baseboard was added to the north wall above the marble paving.

The furnishings of room D included a marble sigma table that was found resting directly on the tile floor in the northwest part of the room. The tabletop had been broken into 10 pieces, probably by the collapse of the upper walls and roof, which also seriously damaged the tile floor surface. The table (S95.4: 10295) was carved of light gray marble with dark gray veining. It is 1.28 m wide and measures 1.35 m from the squared foot to the rounded head. The 0.055-m-high stepped border has a raised rim with a broad inner ledge surrounding the central surface; the border is interrupted at the midpoint of the foot to allow for cleaning.[22] The table apparently stood supported by wooden legs on the tiled floor near the edge of the opus sectile band, its foot facing the marble paved part of the room. A long circular cushion, or *stibadium*, supported on a wooden frame would have gathered diners around the table.[23] Food may have been brought from room A, behind the dining area, from space E, or from other rooms farther east.

Context finds indicate that room D and space E remained in use into the early seventh century. A coin of Phocas (602–610, 1995.31) recovered 0.3 m above floor level in space E corresponds with three contemporary issues previously found in room A.[24] Ceramics from floor level and lower fill in room D include fine wares that reinforce the late date of activities in the complex.[25] As elsewhere in the sector,

[21] Cf. Greenewalt et al. (supra n. 19) 68, figs. 16–17.

[22] For the type, see E. Chalkia, *Le mense paleocristiane: Tipologia e funzioni delle mense secondarie nel culto paleocristiano* (Studi di antichità cristiana 47, Vatican City 1991) 45–47.

[23] K.M.D. Dunbabin, "Triclinium and Stibadium," in W.J. Slater ed., *Dining in a Classical Context* (Ann Arbor 1991) 128–36.

[24] Greenewalt et al. 1994, 11.

[25] E.g., two African Red Slip bowls, J.W. Hayes, *Late Roman Pottery* (London 1972) variant form 103 or 104 (P95.64: 10292), and form 105 (P95.106: 10421); one Late Roman C/Phocaean Red Slip bowl, Hayes form 10C (P95.66: 10296). Cf. a contemporary deposit in M.L. Rautman, "Two Late Roman Wells at Sardis," *AASOR* 53 (1995) 70–79.

Fig. 13. Sector MMS/S, terracotta ampulla (P95.46: 10267) from room D. Ht. 0.073 m.

the upper fill of these spaces consisted primarily of loose earth mixed with fieldstone, bricks, roof tiles, and other building debris that gradually accumulated following the abandonment of the residence.

An intact terracotta ampulla (fig. 13; P95.46: 10267 = IN95.4) was recovered from lower fill in the southwest part of room D, about 0.6 m above floor level. The moldmade vessel measures 0.073 m high and 0.045 m wide at the handles, and was made in a micaceous, light red fabric and covered with a thin red slip. The lentoid body rises to a high neck and plain rim, flanked by two pinched, pierced handles. On the front is a half-length image of the Virgin and Child, set within a border with impressed dots and surrounded by the inscription ΒΟΕΙΘΕ Τ(Ο)ΥC ΞΕΝ(Ο)ΥC, an invocation probably referring to pilgrims. The back presents a full-length image of a standing male figure, John the Baptist, draped and bearded, flanked by paired columns and joined by a crude arch, surrounded by the text ΑΓΗΙΕ ΙΟΑΝΝΗ ΒΑ(ΠΤΙCΤΑ). The vessel is an example of the Asia Minor type of *eulogia* ampulla best known by examples from Ephesos, although the iconography and texts are usual.[26] Ampullae of the general type are not infrequently found in Late Roman contexts at Sardis[27] and many may have been made locally.

An area of 148 m² east of the excavated part of room E was explored to an approximate depth of 1.0 m to verify remote-sensing data from the vicinity (figs. 2, 9). An earlier, limited magnetometer survey suggested the eastward continuation of both street walls and the presence of other structures to the south. A more extensive survey using magnetic and resistivity methods was carried out in 1995 and detected multiple data anomalies that suggested the presence of extensive building debris across the MMS/S field.[28] The wall tops exposed in 1995 sketch the apparent configuration of several additional spaces and clearly indicate the impressive scale of the residential complex. The street wall continues along its northeasterly course at an oblique angle to most other building lines. A doorway near the street wall leads from space E to an irregularly shaped area lying behind the curved wall of an apse. A staircase with marble steps stands behind the apse wall

[26] C. Metzger, "Les ampoules à eulogie du Musée du Louvre," *Notes et documents des Musées de France* 3 (Paris 1981) 17–18. My thanks to Metzger and Jean-Pierre Sodini for their comments on this piece.

[27] G.M.A. Hanfmann, "The Donkey and the King," *HThR* 78 (1985) 422–23.

[28] Greenewalt et al. (supra n. 5) 62. For the aims and methods of the 1995 survey, see below.

and the rising tile treads of a second staircase were identified immediately north of it. The apse itself has an internal diameter of approximately 5.5 m and was built of mortared brick and stone. It is articulated by two lateral semicircular niches and two asymmetrically arranged doorways or windows, one of which was blocked at a later date. The north wall of the facing room lies immediately north of the apse and extends beyond the limit of excavation. The exposed features suggest the presence of a large room for dining or reception, similar to those noted across the street to the north.[29]

Sector MMS/S: Hellenistic, Classical, and Late Archaic levels. Occupational deposits chronologically intermediate between the first century A.D. and the mid-sixth century B.C. were uncovered at the south end of sector MMS/S, 3–5 m east of the line of the Archaic fortification wall, near the rectangular recess in that wall (1994; fig. 14): 1) a pit containing about 100 fragments of molded bowls, molds for molded bowls (six fragments, five inventoried P95.3: 10210–P95.7: 10214), West Slope-type wares, rouletted bowls and dishes, plain cooking wares, and one illegible Hellenistic coin; 2) on a floor extending into the east trench scarp, several discrete vessel assemblages, including most of a Wavy-Line amphora, which is evidently a Hellenistic version of the Archaic type;[30] and 3) a deposit of roof tiles (one cover tile and at least five pan tiles, all partly covered by sand).[31] South of the recess were deposits of the fourth or fifth century B.C., which contained water-laid sand and silt and bones of a young equid. The age of the animal was estimated at about two years by excavator E.R. McIntosh. The skeletal assemblage was neither complete nor articulated (skull, shoulder and leg bones, pelvis, ribs, and three hooves were recovered); McIntosh concluded that it probably had been dumped after decomposition of soft parts. Nearby, a fieldstone wall, which was exposed for a length of nearly 4 m in the east trench scarp (and is not shown in fig. 14), evidently rests on "Brick Fall" destruction debris of the mid-sixth century B.C. and is likely to date from later in the same century or early in the fifth.

Sector MMS/N: Archaic levels. The Archaic fortification wall is much less well preserved in sector MMS/N than in sectors MMS and MMS/S: in the northerly sector only foundations and bottom courses survive; upper parts were leveled after the Archaic era, perhaps when the Roman avenue/plaza was created. Roman avenue/plaza features graze Archaic fortification wall remains and intrude upon some deposits. Because of the complexity and cultural significance of Roman features (for example, a sequence of two mosaic paving surfaces in the south portico of the avenue/plaza and pre-portico Roman features beneath), removal of them to explore lower Archaic features has been slow and in places was deemed unwarranted by the slightness of potential gains in information.

In sector MMS/N the fortification wall contained a gateway, which had a "gate court" to the west and a gate passage, ca. 5 m wide, to the east (figs. 14–15). The sides of those gate components above their foundations had been faced with ashlar masonry, of which one or more courses survive in places: limestone on the south and east sides of the gate court and north side of the gate passage, and sandstone on the north side of the gate court. The southeast end of the gate passage has not been located; the northeast end is abutted by stone construction of rectilinear form and undetermined significance (at far right in figs. 14–15). Near the southwest exposed end of the gate court space is an obliquely angled southwest salient corner, the west side of which is aligned with the west face of the fortification wall in sector MMS to the south; that corner represents a fundamental juncture of west face and gate. The south side of the gate court continues further west, however, as defined by a line of masonry that abuts the southwest corner (fig. 15, lower left).[32] That line of masonry is provisionally interpreted as a retaining wall of the earthwork glacis or agger, which rests against the west face of the fortification wall in sector MMS and which terminates in a retaining wall at the large recess near the south side of sector MMS (figs. 14 and 15, C).

A small segment of masonry exposed north of the gate court may belong to a retaining wall for an earthwork further to the north (figs. 14 and 15, D). In the gate court and passage are segments of stratified pebble-cobble pavings, contemporaneous with and earlier than the gate; most of them are likely to be road surfaces. The gate court contains two massive

[29] Rautman (supra n. 11) 61.

[30] From the same deposit with the Wavy-Line vessel (P95.1: 10278) were recovered five plain two-handled cups (P94.42: 10203; P94.43: 10204; P95.17: 10229–P95.19: 10231) and one plain one-handled mug (P94.44: 10205).

[31] The tiles were left as found and covered with earth, so that if excavation is extended further east in the future, the entire deposit could be studied together.

[32] Greenewalt et al. 1994, 13–18.

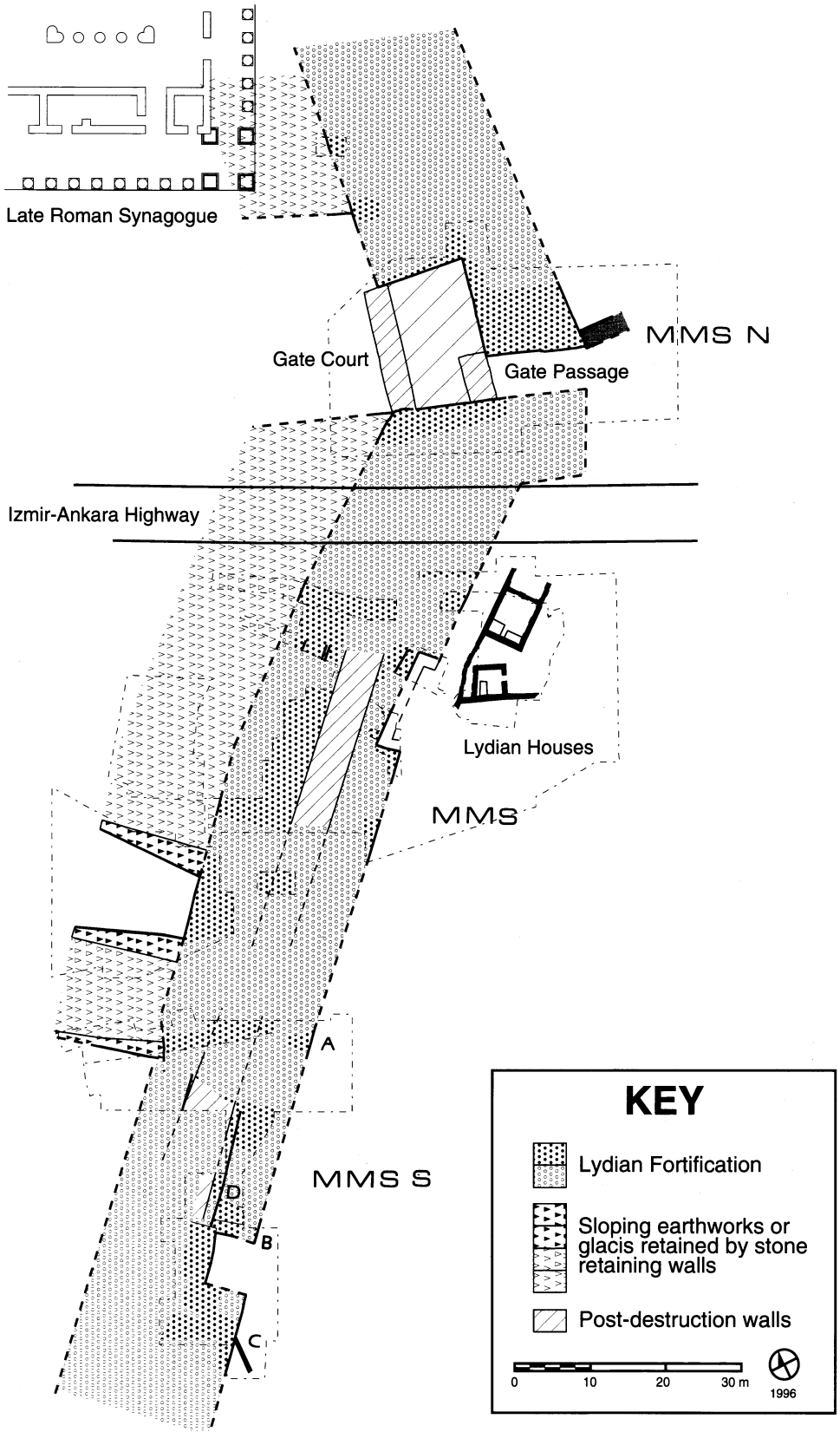

Fig. 14. Sectors MMS/N, MMS, and MMS/S, Archaic levels. Schematic interpretive plan of Archaic fortifications and houses. A, B, and C mark exposures of the east face of the fortification wall in 1994 and 1995. D marks an inner east face of mudbrick. (N.D. Cahill and P.T. Stinson)

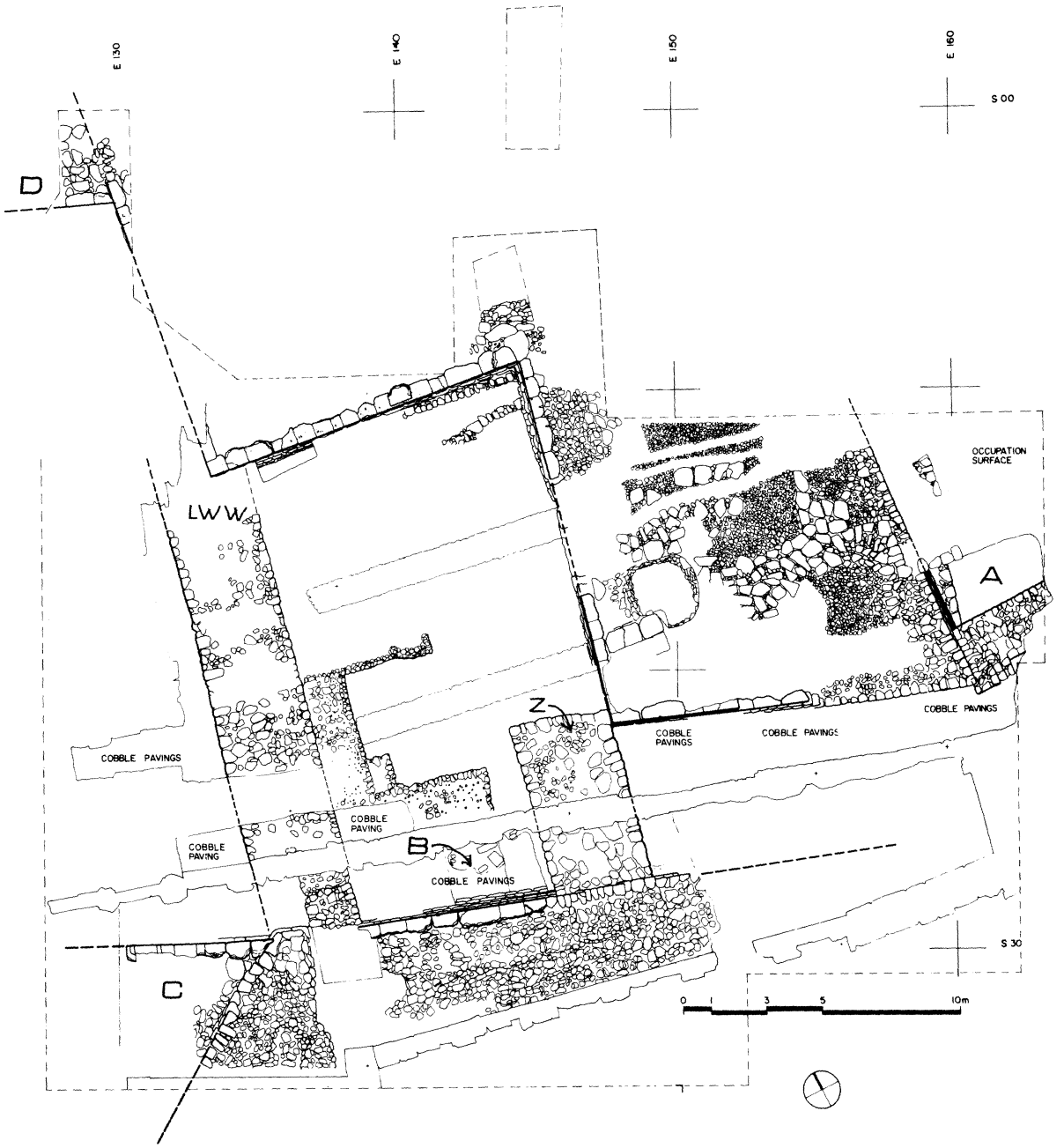

Fig. 15. Sector MMS/N, Archaic levels, plan. Roman features appear in outline. A marks 1993 test trench. B marks 1994 test trench. C and D mark what may be inner corners of earthwork glacis or aggers.

walls: wall LWW ("Lydian West Wall"), which extends across the west end of the gate court, and wall Z, which blocks the gate passage at the east end of the court. Correspondence between those walls—parallel orientation, identical thickness (3.5 m), parallel construction with large, closely fitted stones on "outer" faces and small, loosely fitted stones on "inner" faces—and remains of Archaic gravel deposits between them suggest that the two walls belong to a casemate construction comprised of shell walls and gravel core. That construction blocked or eliminated the gateway.[33] When first excavated the casemate

[33] Why wall LWW appears to have met the northwest corner of the gate court in an irregular juncture, with the thickness of wall LWW distributed to either side of the corner (fig. 15), was not determined. Roman intrusive construction has removed the north end of wall LWW.

wall was understood to postdate the destruction of the mid-sixth century B.C. (because "Brick Fall" destruction debris was thought to rest against wall LWW). Later (1991) it was understood to antedate that destruction (because "Brick Fall" debris was recognized underneath walls LWW and Z).

Excavation in 1994 and 1995 clarified the eastern limit of the fortification and the construction north of the gate passage (1995); uncovered part of a destruction deposit outside the gate passage (to the northeast), which contained arrowheads and which may be dated to the middle of the sixth century B.C. (1995); clarified occupational deposits in the gate court (1994); and uncovered there part of another cobble surface, which probably belongs to a road and which antedates fortification construction on the south side of the gate court (1994).

In the fortification north of the gate passage, the extent of Roman disturbance to the top of surviving Archaic features was not always clear; but all stones shown in figure 15 and belonging to architectural features discussed below appear to be undisturbed. The east face was traced another few meters to the north, to a point 10 m beyond the northeast corner of the gate passage. Internal construction consisted of a dense packing of large unshaped or crudely shaped stones of schist and sandstone, and of small, fist-sized fieldstones. In some places the large and small stones seem to have been laid in alternating layers, while in others they occupied the same layer, with larger stones curbing smaller fieldstone assemblages. (Missing parts, questions of redeposit, and the presence of Roman drains—not shown in figure 15—obscured the construction system.)

Of undetermined significance are two short lines of four to five stones, located east of the east face: one line is oriented at right angles to the face (and is located immediately north of a 1993 test trench, fig. 15, A); the other is parallel to and 1.5–1.7 m east of the east face. The stones are untrimmed and slightly larger than those of the east face; and they rest on earth at the same level as the top preserved stones of the east face, except for the westernmost stone of the line at right angles to the east face, which rests partly on the east face (where it appears bisected by the dashed line of the east face in fig. 15).

Northeast of the gate passage, at approximately the same level as the uppermost preserved stones of the east face of the fortification, is an occupational surface covered by destruction debris. The destruction debris extended over an area about 4–5 m on a side in the northeast corner of the excavation zone (fig. 15, "occupation surface"; at ca. E 159–162/S 11–16 on the "B" grid); the main concentration was located 1.5–2.0 m east of the fortification's east face (and ends with the line of four to five stones parallel to the east face, noted above) but parts extended further west, as far as the east face and even some 0.50 m west of that face.[34] Much of those parts may have been disturbed and redeposited after their original deposition; but some parts, notably a thin burnt earthy layer that meets the east face and rests on the bearing surface of a few top surviving stones of the east face, look identical to the bottom layer of debris in the main concentration further east.

The main concentration of destruction deposit (fig. 15, "occupation surface") consisted of merging layers in the following sequence, from top to bottom: orange-red layers of semibaked and finely crushed mudbrick or clay, ca. 0.15 m thick; a darker red-brown layer of partly burnt earth, ca. 0.15 m thick; a darker red-brown layer of partly burnt earth, ca. 0.25 m thick; an ashy layer with charcoal fragments, up to 3–4 cm thick; and a hard layer of burnt earth containing small bits of green and reddish brick, which is partly an occupational surface. Fragments of Roman pottery scattered in the top layer indicate contamination of that layer. The lower layers contained no evidence of contamination, apart from two clearly defined places where the debris had been removed to accommodate Roman water pipes.

The debris included many large unworked stones, fragments of at least 30–40 pottery vessels, many of them 30% or more complete, and small metal items of bronze and iron. The stones were about the size of watermelons, and appeared to rest in the ashy layer, in no apparent orientation or order (some with angular sides pointed upward, others tilted at an angle); they had evidently fallen or been dumped. The pottery included a large variety of Lydian fine and coarse wares, mostly of standard shape and decorative types, and a few small fragments of an Attic band cup.[35] Metal items included about 25 complete and 109 fragmentary iron nails (the fragments suggest-

[34] To the east the debris extended to 1995 excavation limits (the dashed line in fig. 15; at E 163 on the "B" grid). To the south it evidently extended into the locale of the 1993 test trench (fig. 15, A), but may have been minimal there, since it was not recorded. To the north it may have extended as far as excavation limits (the dashed line in fig. 15; at S 11 on the "B" grid).

[35] Noteworthy pottery items included the following: gray ware neck amphora (neck fragments); two or more Wavy-Line hydrias/amphoras (one with a nontextual graffito on the shoulder); two column craters with dark glaze and white linear decoration (one P96.108: 10423); Lydian bichrome skyphos-crater (rim only); hydria with simple Orientalizing decoration (neck and rim; P95.62: 10290); three trefoil-

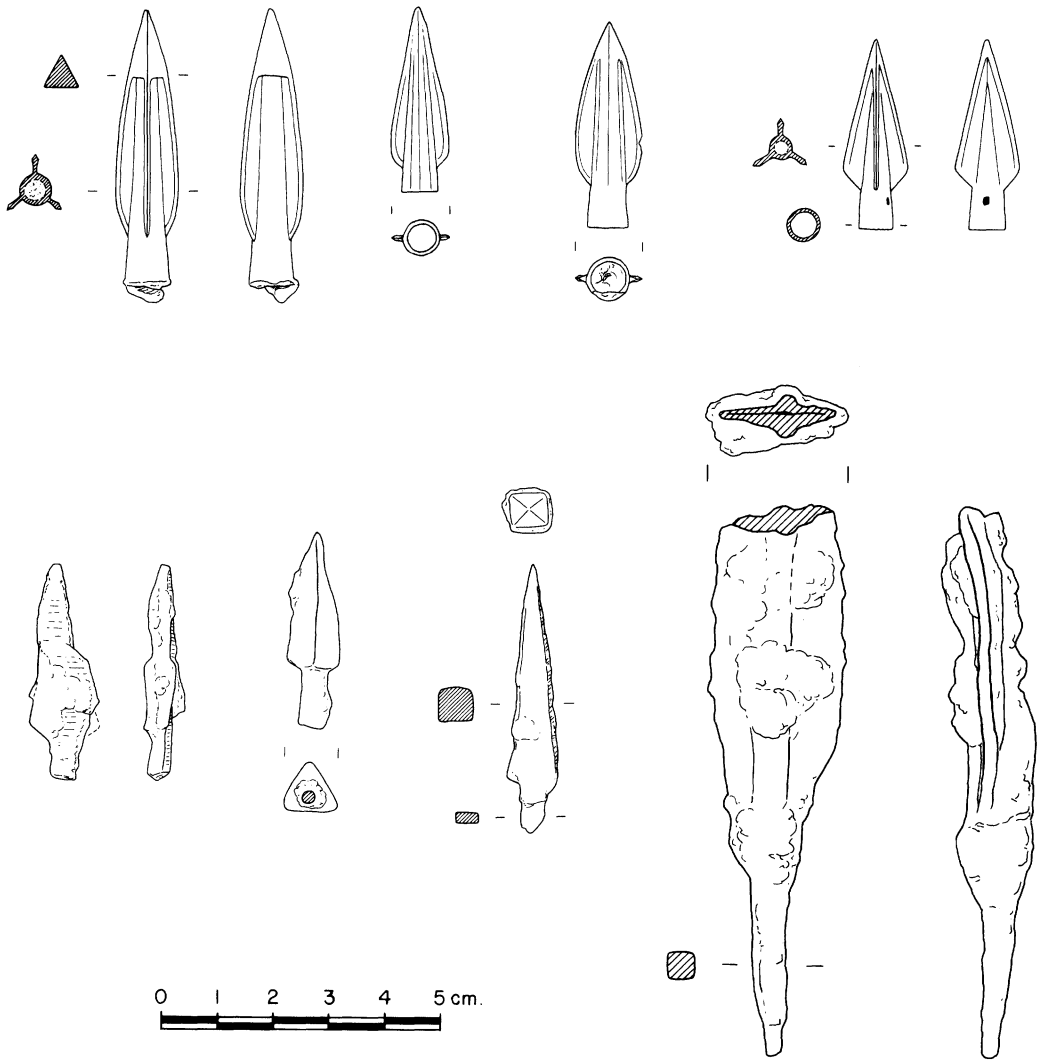

Fig. 16. Arrowheads (and spearhead?) from Archaic destruction debris, sector MMS/N. Upper row, bronze (M95.8: 10298–M95.10: 10300, M95.15: 10305, the first and last in two views); lower row, iron (M95.11: 10301–M95.14: 10304, the first and last in two views).

ing to the excavator, A. Prieto, a total of about 70 nails), an iron "strap," folded at one end to make two halves of almost equal length (3.5 cm wide, 23 cm long as folded), and 135 bronze and iron arrowheads, perhaps including two spearheads (of which eight representative examples were inventoried; fig. 16).

Iron arrowheads outnumber bronze ones by nearly four to one. Five shape types were identified: leaf-

mouth oinochoai (two with streaky glaze, one with glaze and white dots); oinochoe with strainer at bottom of neck (P97.117: 10689); trefoil-mouth oinochoe with double-reeded handle and gritty, cooking-ware fabric (P95.63: 10291); lekythos of Lydian-Samian type, with streaky-glaze decoration (P96.101: 10407); three lydions, one with horizontal facets on body and another unusually small (P96.102: 10408; P96.103: 10409; uninventoried); unpainted canteen, with canted spout, slightly flattened underside, incised concentric circles on upper side (P95.61: 10280); askos, missing mouth, neck, handle (P95.61: 10289); three plain bowls of lopsided form and unsmoothed exterior (one P95.60: 10288); several dishes with ring feet, one with black-on-red decoration, another in gray ware (the latter P96.104: 10410); stemmed dish, with simple Orientalizing decoration (P95.52: 10279); stemmed dish (foot fragment; with graffito IKITAN on underside; P95.54: 10282); many skyphoi, mostly with streaky glaze and white linear decoration, some with marbled glaze decoration, one with dot rosettes in white-on-dark ground (the latter P97.116: 10688); cup with offset rim (rim only), rim decorated with spoked dot rosettes between border bands; Ionian cup (small fragments); cup with merrythought handles (rim and handle fragments; P97.118: 10697); Attic band cup (three small fragments; P95.65: 10294); one or two chytrae (rim, body fragments); cooking stand (top of rim fragment); and a "bread tray" (small fragment).

shaped with central rib (24, bronze), trilobate (5, bronze), three-sided (2, iron), four-sided (81, iron; M95.13: 10303), and flat (without central rib; 1, iron; M95.11: 10301). The shape type of 22 arrowheads (1 bronze, 21 iron) is unclear because of poor preservation. Bronze arrowheads have sockets for shafts, while iron ones have tangs (many tangs show traces or pseudomorphs of wood). Bronze leaf-shaped arrowheads are of two kinds, with tapering shoulder (20 examples, e.g., M95.10: 10300) and with high shoulder (4 examples, e.g., M95.9: 10299), and are approximately the same length. The bronze trilobate arrowheads range in length between 3.4 cm (M95.15: 10305) and 5.2 cm (M95.8: 10298). The difference in size among iron examples is no more than 1 cm. An extra-large iron arrowhead or small spearhead (M95.14: 10304) is flanged on both sides, has a tang, is missing its tip, and measures 9.8 cm in length. Another large iron arrowhead or spearhead was recovered, presumably from the same deposit, in 1993 (from 1993 test pit, fig. 15, A).

The destruction deposit appears to date to the middle of the sixth century B.C. The evidence of burning (heat reddened and blackened material, carbonized wood, ash deposit) is as conspicuous and pervasive as in the "Brick Fall" of the mid-sixth century at sectors MMS and MMS/S, the shapes and decoration of the local pottery are matched by those of pottery sealed under the "Brick Fall" in those sectors, and the Attic band cup is a mid-sixth century type. There is slight evidence for a later date. A small rim fragment of an Attic Floral Band cup, which should be later than the middle of the sixth century, was recovered in the orange-red layer west of the main concentration of debris; and from the same layer in this general location was recovered a trefoil-mouth oinochoe, which in degree of preservation, shape, and decoration resembles pottery from the main concentration of debris.[36] Furthermore, if the burnt earthy layer that rests on stones of the fortification's east face (cited above) was deposited at the same time as the main concentration of debris, that part of the east face would have to have been dismantled to contemporaneous ground level at the time of debris deposition (unless the stones on which the burnt earthy debris rested belonged to a projecting ledge at the foot of the east face—which has seemed unlikely). In sectors MMS and MMS/S, however, the faces of the fortification wall stood to a considerable height at the time of the mid-sixth century destruction.

At least for the main concentration of destruction debris, the evidence for a mid-sixth century date seems more compelling than the evidence for a later date. The Floral Band cup fragment could be intrusive, given the disturbed layer in which it was recovered (and there are no other items of recognizably post-550 date, such as Achaemenid bowls, which appear in sectors MMS and MMS/S by the end of the sixth century B.C.).[37] The slight amount of the burnt earthy layer on the fortification wall stones makes the significance of the layer there difficult to assess; and partial dismantling of the wall near the gate passage prior to deposit of the destruction debris is not inconceivable.[38]

A mid-sixth century date and a major destruction (attested by the tumble of large stones, artifact scatter, and burning) suggest that the deposit is contemporaneous with the "Brick Fall" and related destruction deposits in sectors MMS and MMS/S, and that, like those deposits, it may be identified with the capture and sack of Sardis by the Persians in the 540s B.C. The arrowheads (and spearheads?) may therefore be identified as weapons employed in that historic event. They closely resemble arrowheads from deposits associated with conflict involving Lydians or Persians between ca. 600 and 480 B.C.[39] None

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[36] For Floral Band cups, see R.M. Cook, *Greek Painted Pottery* (London 1960) 80; N.H. Ramage, in Schaeffer et al. (supra n. 6) 89–91. The oinochoe is P95.67: 10297.

[37] E.R.M. Dusinberre, "Satrapal Sardis: Achaemenid Bowls in an Achaemenid Capital," *AJA* 103, forthcoming.

[38] A terminus post quem of 585 B.C. for the destruction deposit is indicated by results of dendrochronological analysis of a carbonized oak segment, which rested between the ashy and hard burnt earth layers and which was excavated in fragments. The fragments showed a 94-year sequence of annual growth rings, and the outermost identified ring was tentatively dated to 585 B.C. by P.I. Kuniholm and C.H. Roosevelt of the Malcolm and Carolyn Wiener Laboratory for Aegean and Near Eastern Dendrochronology, Cornell University (Kuniholm, personal communication, 1996). Indeterminable is the amount of time that elapsed between the growth of that ring, the cutting of the tree, and the destruction that buried the oak segment.

[39] Sites include the Küçük Höyük fortification at Gordion: R.S. Young, "Making History at Gordion," *Archaeology* 6 (1953) 159–66; "Alyattes's destruction" debris and associated strata at Old Smyrna: R.V. Nicholls, "Old Smyrna: The Iron Age Fortifications and Associated Remains on the City Perimeter," *BSA* 53–54 (1958–1959) 131–34; Old Paphos: E. Erdmann, *Nordosttor und persische Belagerungsrampe in Alt-Paphos* I: *Waffen und Kleinfunde* (Ausgrabungen in Alt-Paphos auf Cypern I, Constanz 1977) 4–25, 31–52; Marathon, Thermopylae, and the slope of the Athenian Acropolis: E. Forsdyke, "Some Arrow-Heads from the Battlefield of Marathon," *ProcBritAc* 32 (1919–1920) 146–58; and T. Sulimirski, "Scythian Antiquities in Western Asia," *Artibus Asiae* 17 (1954) 303–304.

may be specifically associated with the besieged or besiegers, however, although the trilobate type at Old Smyrna was associated by R.V. Nicholls, on the grounds of provenience, with Lydian attackers of ca. 600 B.C., nor may they be identified with a specific form of bow (self bow, composite bow).[40]

Reexamination (1994) of crushed semibaked brick deposits and disintegrated mudbrick deposits and their relationship to the "casemate wall" (formed of walls LWW and Z and intermediate gravel deposits), which filled the gate court and blocked the gate passage, led to the conclusion that the semibaked brick debris is intrinsically and chronologically the same as "Brick Fall" of the mid-sixth century B.C. in sectors MMS and MMS/S, and that its deposit antedated construction of the casemate wall.[41] Excavation (1994) of a small test trench at the south side of the gate court in the 2-m-wide space between the fortification and foundations for the outer colonnade of the Late Roman portico (fig. 15, B) aimed to clarify the building history of the gate and revealed a complex sequence of surfaces and fills, cuts and intrusions (several of which had been exposed in excavation of the same general locale in previous seasons; figs. 17–18). Several features remain to be explained. A layer of limestone chips may mark a working surface where limestone ashlar blocks of the gate had been trimmed. Below that layer, what was identified as a narrow foundation trench cut through fills that contained painted pottery of styles compatible with the last third of the seventh century B.C. Below the foundation trench are two pebble-cobble surfaces, 0.30–0.40 m apart; the upper and later of the two (which had been exposed in 1992) passes directly underneath the fortification foundations (figs. 17–18). Both surfaces must antedate the south side of the gate structure; both are presumed to be road surfaces.[42]

Sandy and gravelly fill between the two pebble-cobble surfaces contained part of an ivory ornament carved in relief with the head and antler of a deer

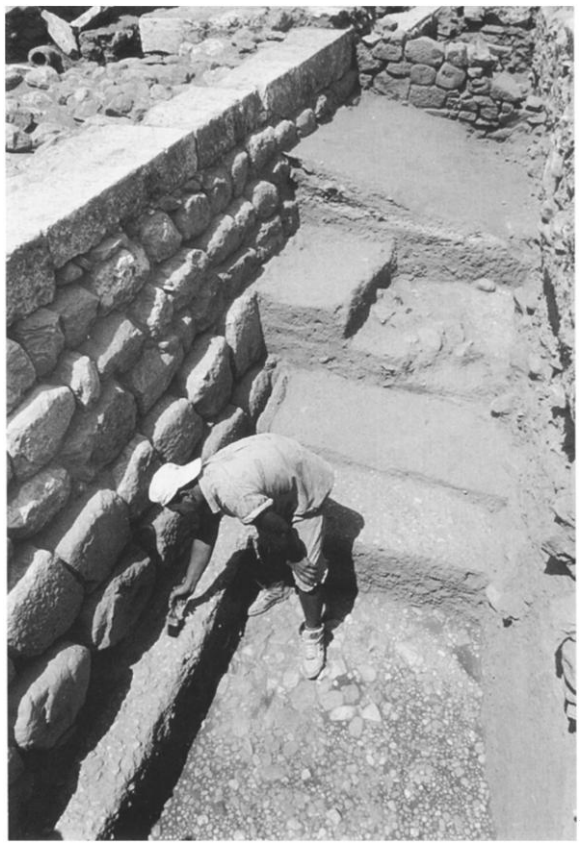

Fig. 17. Sector MMS/N, Archaic fortification wall gate court, south side, looking west. Just visible at far right, foundations for outer colonnade of Late Roman portico. At left, Archaic fortification foundations. At lowest levels, two consecutive pebble-cobble surfaces that antedate the fortification (the later surface is immediately behind the workman and under his brush; the earlier one is under his feet).

(fig. 19). The object may have been part of a bridle attachment that secured strap crossings (*Riemenkreuzung*), although the cuttings on the back (two narrow vertical grooves at either end, a large semiconical socket underneath) appear unrelated to the usual intersecting passages and could be for attachment to a separate part. The form of the antler branches

[40] A. Snodgrass, *Early Greek Armour and Weapons from the End of the Bronze Age to 600 B.C.* (Edinburgh 1964) 154; Greenewalt 1997 (supra n. 3) 2–8. In the latter, numbers and types of arrowheads from sector MMS/N are incorrectly reported, e.g., the three-sided iron type is not mentioned. Numbers and types are corrected in the text here.

[41] For this issue, see Greenewalt et al. 1995, 11–12.

[42] Excavator N.D. Cahill suggested that the limestone masonry belonged to a remodeling of the gate, and that an extensive layer of unbaked mudbrick debris (also noted in previous seasons) might be residue from original gate construction. Several large sandstone blocks on the south side of the gate court (three exposed in 1994, at least one in 1992; located about 0.75–1.00 m north of the south side of the gate court; one shown in fig. 18), too deeply buried to be associated with the putative limestone remodeling, remain to be explained. Fills apparently cut by the foundation trench contained fragments of an East Greek trefoil oinochoe (guilloche on neck, incised scale pattern on upper shoulder; P94.34: 10185) and of a Wild Goat-style closed vessel (showing goat in outline and reserve to right, with head turned back; P94.29: 10175) and chips of both limestone and marble, all of which would be consistent with a date in the later seventh or early sixth century B.C. for the fortification.

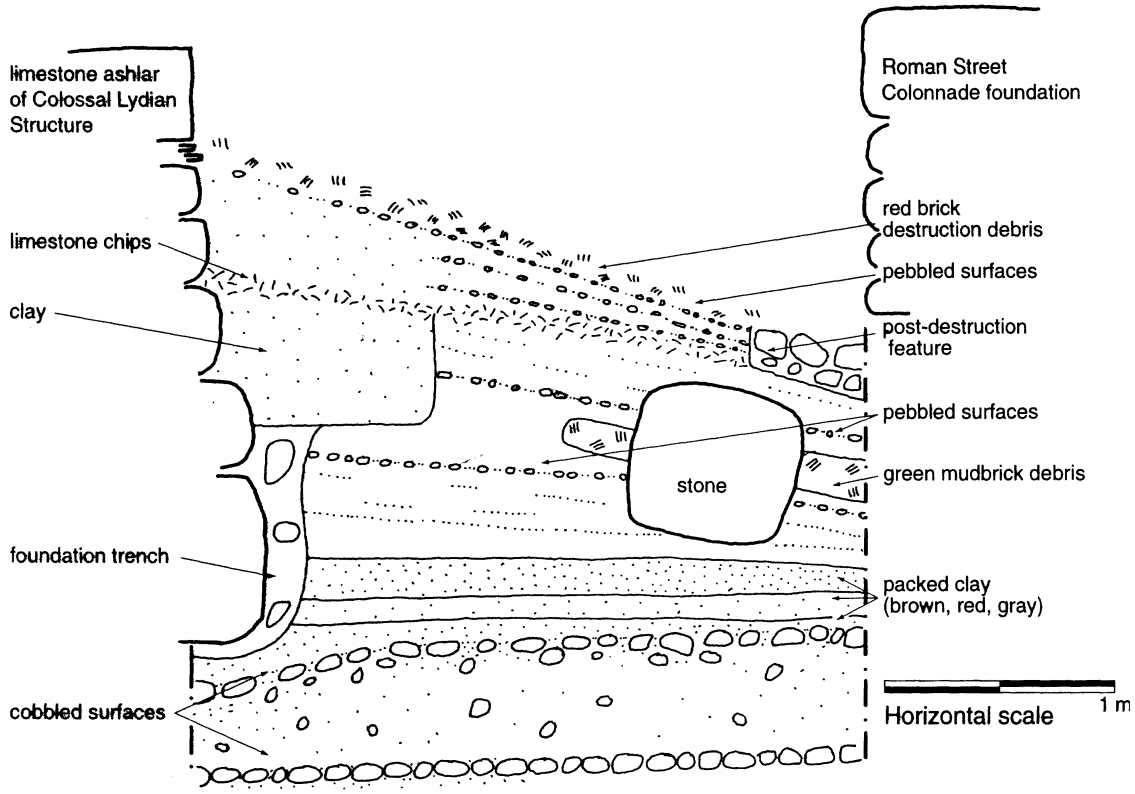

Fig. 18. Sector MMS/N, Archaic fortification wall gate court. Schematic composite section between fortification foundations (left) and foundations for outer colonnade of Late Roman portico (right), looking west at E 140.6–145.6.

(with their curve away from the head, abrupt taper, sub-branches, and disklike, perforated terminals) and their perforated lozenge-shaped "fillers" are unlike antler compositions in nomadic and Near Eastern art.[43]

Sector MMS: Archaic levels, test trench. To clarify the building history of the large recess in the west side of the fortification wall (fig. 14), a 3 × 3 m test trench was excavated (1995) in the southeast corner of the recess, from the occupational surface that had been covered by "Brick Fall" destruction debris of the mid-sixth century B.C. (excavated in 1989) to a depth of ca. 2.6 m (fig. 20). Features critical for building chronology were not fully excavated (for lack of time in the season): the bottom of the back wall of the recess was not reached and associated deposits not adequately defined. The south wall of the recess is clearly a secondary addition, as is the north wall (which retained the earthwork glacis or agger, itself a secondary feature).

Below the mid-sixth-century occupational surface, the back wall of the recess has a stepped construction of seven exposed courses, which are built of stones that are generally smaller than the stones of the vertical face above (fig. 20). The stepped construction resembles that of the stone socle of the west face of the fortification wall further to the north, where the socle supported a sloped face of coursed mudbrick (both eventually covered by the earthwork glacis/agger). The resemblance and the illogical construction of larger stones above smaller ones suggest that the stepped courses of the back wall of the recess originally may also have been a socle for a sloped mudbrick face, which was replaced with a vertical stone face when the north and south walls were added to create the recess. East Greek and Corinthian

[43] Inventoried BI94.3: 10187. Pres. L. 0.05 m, th. 0.01 m. The front of the antler is missing. Dissimilar antler compositions appear on Scythian goldwork from Kostromskaya and Kelermes in South Russia: L.L. Barkova et al., *Gold der Skythen aus der Leningrader Eremitage* (Munich 1984) 46–49; on ivories from Nimrud: R.D. Barnett, *A Catalogue of the Nimrud Ivories with Other Examples of Ancient Near Eastern Ivories in the British Museum*[2] (London 1975) pls. II, CXXXVII; and on a Phrygian wood figure from Gordion: R.S. Young, *Three Great Early Tumuli* (University Museum Monograph 43, Gordion Excavations Final Reports I, Philadelphia 1981) pl. 24G.

Fig. 19. Ivory deer appliqué (B194.3: 10187), from fill between pebble-cobble surfaces of Archaic fortification gate court, sector MMS/N. L. 0.05 m.

pottery fragments may help to clarify building chronology if their stratified contexts can be related to fortification architecture. The most helpful is likely to be an East Greek oinochoe fragment recovered in a stratum that, according to excavator E.R. McIntosh, antedates the fortification wall; it is decorated in a style identified by M. Kerschner as Middle Wild Goat I and assigned by him to the second third of the seventh century B.C.[44]

Sector MMS/S: Archaic levels outside the east face of the fortification wall. Excavation of trenches immediately east of the fortification wall exposed three more segments of the east face (fig. 14, A–C),[45] which clarified its form. The alignment of those with previously exposed segments in sector MMS/S and with previously exposed southerly east-face segments in sector MMS suggests that the east face in those sectors formed a continuous straight line 85 m long except where the face is interrupted by the rectilinear recess in sector MMS/S. The exposure of the northeast salient corner of that recess (1995; at fig. 14, B—the last corner of the recess to be located) established its rectangular form and dimensions: 6.2 m wide and 5.2 m deep. The best preserved of the east-face segments exposed in sector MMS/S is at the northeast corner of the recess (fig. 21), where the east face stands 10 courses high and is built of sandstone and limestone. The masonry is fundamentally polygonal[46] except at the corner, which has ashlar quoins (as does the less well preserved southeast corner). The courses are slightly stepped, more on the recess face (of which little was exposed) than on the east face; and limestone is featured in five contiguous quoins.

The occupational surface of the mid-sixth century B.C. in front of the east face was exposed (1995) within the 3.0–4.5-m-wide trench for stretches of 2.5 and 7 m, respectively, at the north salient corner of the recess and from approximately 4 m south of the south salient corner to the south excavation limit (fig. 14, near C). At the north salient corner, the occupational surface was covered by an 8-cm-thick layer of fallen brick debris, evidently "Brick Fall." It was partly the mixture of red-to-purple semibaked brick and green-

[44] The East Greek oinochoe fragment is P95.50: 10274. An East Greek cup fragment, P95.49: 10273, was recovered below a layer of stone chips that McIntosh associated with the second phase of the back wall of the recess and was decorated in a Wild Goat style of Mixed Technique that Kerschner assigned to the first half of the sixth century. A small, worn Corinthian alabastron fragment was recovered between pebbles of a paving (visible in fig. 20) that McIntosh considered to be at ground level when the fortification wall was built; its style was not identified. A fragmentary architectural terracotta (not inventoried), with molded guilloche and attachment hole, was recovered below the mid-sixth-century occupational surface; it is noteworthy because of the contextual evidence for its date in the middle or first half of the sixth century B.C. and because it can be identified (from the attachment hole) as a revetment plaque, which is a much less common decorative architectural terracotta form at Sardis than the sima.

[45] Three segments of the east face were exposed from north to south as follows: a 3-m-long segment below Late Roman room F (1995; fig. 14, A; cf. figs. 2, 9); a 2.3-m-long segment north of the north salient corner of the recess (1995; fig. 14, B); and a segment south of the south salient corner of the recess, which, with other segments exposed there in 1992 and 1993, makes a 10-m-long segment (1994; fig. 14, C).

[46] This masonry is similar to that of the east–west segment on the west side of the fortification wall, at the north end of sector MMS/S (opposite A in fig. 14); see C.H. Greenewalt, Jr., M.L. Rautman, and R. Meriç, "The Sardis Campaign of 1983," *BASOR* Suppl. 24 (1986) 9 fig. 11; but it is unlike the roughly finished and jointed masonry in the vertical east and west faces of the fortification wall in sectors MMS (e.g., shown in fig. 20).

Fig. 20. Sector MMS, recess in west side of Archaic fortifications. Southeast corner, showing test trench below mid-sixth-century B.C. occupational surface.

Fig. 21. Sector MMS/S, east face of Archaic fortification wall, with (at left) north salient corner of recess in east face

gray and brown unbaked brick characteristic of "Brick Fall," and partly a uniform brown-colored mass; the latter, McIntosh suggested, might have fallen from the core of the fortification wall, where it had escaped exposure to destruction heat.

Directly under the fallen brick debris and resting on the occupational surface was much burnt organic debris, including carbonized wood (pine and oak),[47] something resembling rush matting, and a silicated white powder; also a small amount of scattered pottery fragments from different vessels and many complete or near-complete iron objects, which included ca. 150 nails of two or three sizes (embedded in the white powder), a rectangular clamp (perhaps a felloe clamp from the wheel of a vehicle), a ring handle with disk plate and small nails for attachment to a wooden host,[48] and a saber (fig. 22).

The saber is 0.65 m long and had handle plates of another material or materials, which were secured

[47] Pine (*Pinus brutia*) and oak were identified in the Malcolm and Carolyn Wiener Laboratory for Aegean and Near Eastern Dendrochronology at Cornell University by P.I. Kuniholm and C.H. Roosevelt (Kuniholm, personal communication).

[48] Clamp and ring handle are respectively inventoried as M95.5: 10275 and M95.6: 10276.

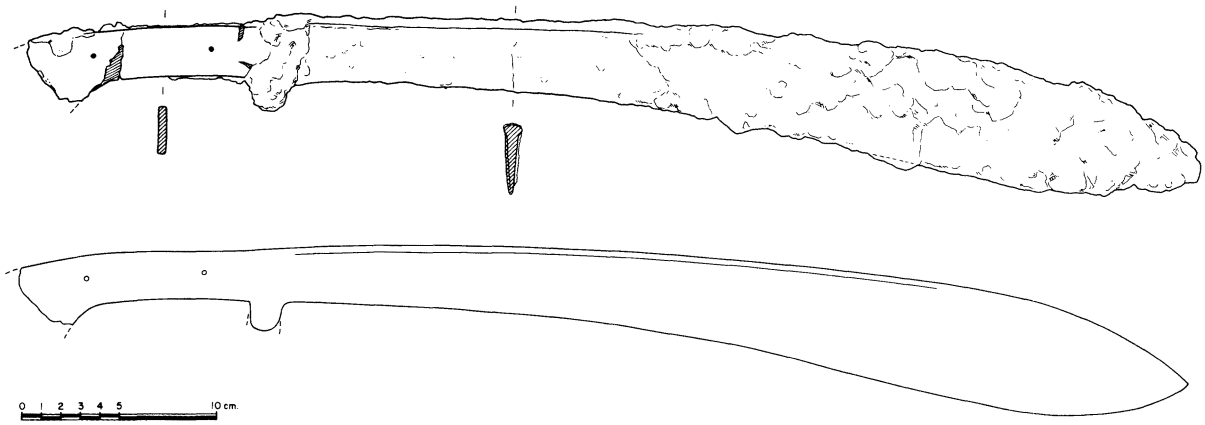

Fig. 22. Iron saber (M95.7: 10277), from sector MMS/S Archaic levels. (C.S. Alexander)

by rivets. Its relatively short length suggests, according to J.K. Anderson (personal communication), that it was an infantry saber, like those used by Greek and Asiatic combatants in Attic red-figure vase painting of the late sixth and early fifth centuries B.C. and by Harmodios in the Tyrannicides group. It is one of the few examples that have been recovered east of Italy, and one of two that have been recovered in Asia Minor (the other, also a short iron example, is from Old Smyrna and may also have a Lydian connection). Its context associates it with the capture of Sardis by the Persians in the 540s B.C.[49]

At the south end of sector MMS/S, excavation in 1992 had exposed a 3-m-long (N–S) stretch of occupational surface of the mid-sixth century B.C., together with a scatter of over 300 iron artifacts, which rested on or just above the surface, and a segment of narrow wall, which emerged from the south excavation scarp and is oriented diagonally to the fortification face (fig. 14, C). "Brick Fall" was present east of the narrow wall but almost entirely absent between it and the east face of the fortification wall, where it had probably been washed away by water flow. A stratified sequence of water-laid sand and silt deposits appears in section in the south excavation scarp and was carefully excavated (1994) 3 m north of the 1992 excavations in a 3.5-m-long stretch; the deposits rested against the east face of the fortification wall, just above the mid-sixth century occupational surface, and may be dated from pottery fragments in the sand and silt to the fourth and fifth centuries B.C. (see above, "Sector MMS/S: Hellenistic, Classical, and Late Archaic levels"). The deposits attest to a drainage route, which evidently followed the south-to-north downward incline of the ancient terrain. Excavation (1994) also uncovered the north end of the narrow wall, which abuts the east face of the fortification wall (fig. 14, C), fragments of six to eight local pottery vessels, and some 50 more iron artifacts, which all rested on or slightly above the occupational surface between the narrow wall and the fortification wall. The iron objects included a rectangular strainer or sieve, a sickle that might be a war weapon, and 17–25 items identified by H. Kökten as hardware from a wheeled vehicle, possibly a chariot.[50]

[49] The saber is inventoried as M95.7: 10277; see Greenewalt 1997 (supra n. 3) 8–10. The example from Old Smyrna, ca. 0.58 m long, was recovered from a grave together with pottery identified as Lydian and of the mid-sixth century B.C.: J.M. Cook, "Old Smyrna, 1948–1951," *BSA* 53–54 (1958–1959) 31 n. 87; and E. Akurgal, "The Early Period and the Golden Age of Ionia," *AJA* 66 (1962) 374. For bronze and iron sabers from Epiros and Thrace, see H. Sandars, "The Weapons of the Iberians," *Archaeologia* 64 (1912–1913) 236, 245, and figs. 17, 26; and B.D. Filow, *Die Grabhügelnekropole bei Duvanlij in Südbulgarien* (Sofia 1934) 73, 117, 224, and figs. 140–41. For bronze sabers of the sixth and fifth centuries B.C. from Etruria and of the fourth century and Hellenistic era from Spain, see P.F. Stary, "Foreign Elements in Etruscan Arms and Armour: 8th to 3rd Centuries B.C.," *PPS* 45 (1979) 188–89, 192; and Sandars (supra) 231–58.

[50] The narrow wall is exposed for a total length of 6 m; an occupational surface to the west is retained by it, while the occupational surface to the east and north inclines down and away from it. The wall has a fieldstone socle capped by mudbrick or pisé, which survives to a height of two or three mudbrick courses at the south end. The socle contains a 15-cm-wide opening, presumably for drainage. Against the west face were holes, evidently for posts (remains of wood were recovered from one and near an-

Sector MMS/S: Archaic levels, core of the fortification wall behind its east face. Excavation in the core of the fortification wall, behind its east face, aimed to clarify the history and functional role of an inner east face of coursed mudbrick that is approximately parallel to the proper east face and is aligned with the back wall of the recess (fig. 14, D). A 2.6 × 3 m trench was excavated (1995) in front of the inner east face and immediately north of the recess (the east side of the trench was delimited at a point 2–3 m short of the proper east face by overlying Late Roman construction, the multi-apse building, which appears at the bottom of fig. 2).

The inner east face stands 1.6 m and 14 mudbrick courses high; the bottom course is 4.9–5.1 m above the bottom of the proper east face at ancient ground level. The inner face rests on mudbrick construction that extends in front and meets a deposit of fieldstones; the latter is probably packing behind the proper east face (fig. 23).[51] Above that mudbrick construction and fieldstone packing rested a series of earthy layers (13 counted by excavator McIntosh), which sloped down from west to east. One of the layers contained a crude "wall," which was oriented at right angles to the inner and proper east faces. Layers and "wall" are paralleled in the earthwork glacis or agger on the west side of the fortification wall in sector MMS and on the east side of the fortification wall, some 11 m north of the 1995 trench in sector MMS/S, where they also appear 4–5 m behind the proper east face.[52] Earthy layers and "walls" are understood to be a form of construction, in which

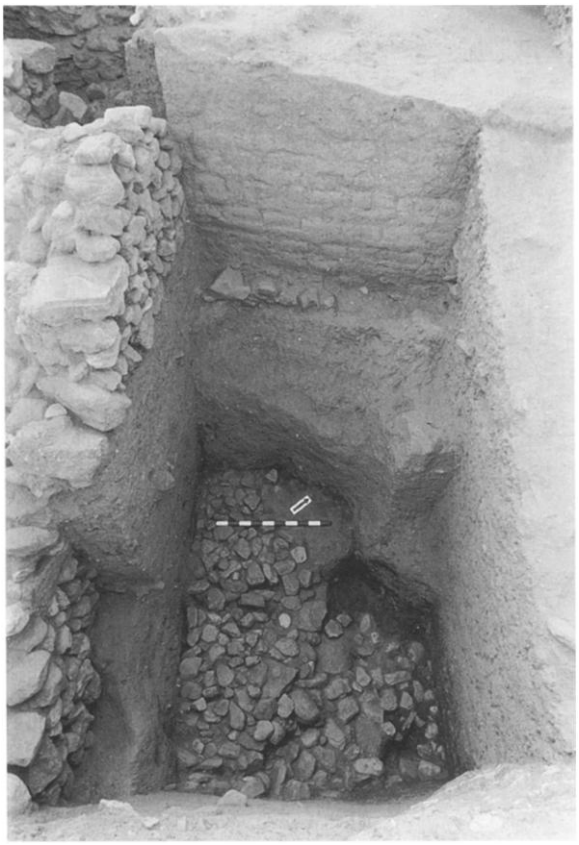

Fig. 23. Sector MMS/S, excavation in the core of the Archaic fortification wall, looking west. At top, inner east face of mudbrick. At left, stone packing behind north wall of recess. At bottom, fieldstone deposit, which is probably packing behind the proper east face. At right, unexcavated earthy layers.

other), ca. 10 cm in diameter, 6 and 9 cm apart. A small amount of "Brick Fall" that rested on socle stones at the north end suggested that the wall had fallen into disrepair by the mid-sixth century.

Pottery vessels included a dipped-glaze trefoil jug, virtually complete (P94.40: 10199); an amphora decorated with bands and tongues in glaze and small accents in white, about two-thirds complete; a small fragment of a closed vessel with bichrome decoration (multiple compass-drawn pendent hooks); and a plain ovoid storage jar with wide mouth, about one-third complete (P95.47: 10271). Plain storage jars are uncommon in the repertory of Lydian vessels recovered and recorded at Sardis. This example had a flat base, ovoid body, and low neck; est. ht. 0.345 m, max. body diam. 0.275 m, mouth diam. 0.16 m. The strainer sieve (M94.12: 10200) is flat, has a low raised border, and measures 0.14 × 0.18 m. The sickle (M94.13: 10201) has a blade 0.22 m long and a "wrap-around" handle socket 0.05 m long. For war sickles, see N. Sekunda, "The Rhomphaia, a Thracian Weapon of the Hellenistic Period," in A.G. Poulter ed., *Ancient Bulgaria* (Nottingham 1983) 275–88; Sekunda, "Anatolian War-Sickles and the Coinage of Etenna," in R. Ashton ed., *Studies in Ancient Coinage from Turkey* (London 1996) 9–17; A. Ribera i Lacomba, "La primera evidencia arqueológica de la destrucción de Valentia por Pompeyo," *JRA* 8 (1995) 33–34, 38–39, and fig. 34; Greenewalt 1997 (supra n. 3) 10–12. Functionally identifiable wheeled vehicle parts include three felloe clamps, a nave band, and three rein rings. Complete nails in one of the felloe clamps (M96.12: 10503) indicate a wheel rim thickness of 0.002 m, which, according to Kökten, is more appropriate for a chariot than for a cart. Remains of vehicle wheels from tombs at Bin Tepe and near Balıkesir are presented by H. Kökten, *Anadolu'da ele geçen Akhaemenid dönemi Araba Buluntuları* (Diss. Aegean Univ., Izmir 1994); the same wheel remains are briefly described and illustrated in H. Dedeoğlu, "Lydia'da Bir Tümülüs Kazısı," *I. Müze Kurtarma Kazıları Semineri* (Ankara 1991) 119–49 (Bin Tepe) and S. Kütük, "Balıkesir Üçpinar Tümülüstü," *Arkeoloji ve Sanat* 69 (1995) 17–22 (Balıkesir); for Urartian wheel parts, see R. Merhav ed., *Urartu, a Metalworking Center in the First Millennium B.C.E.* (Jerusalem 1991) 53–77.

[51] For similar fieldstone packing behind the (proper) east face of the fortification wall at the south end of sector MMS/S, see Greenewalt et al. 1994, 19; Greenewalt et al. 1995, 20 (the former reference for the packing, at "MMS/S, C"; the latter reference for the face in front of the packing).

[52] Greenewalt et al. 1990 (supra n. 3) 141–43; Greenewalt et al. 1994, 19.

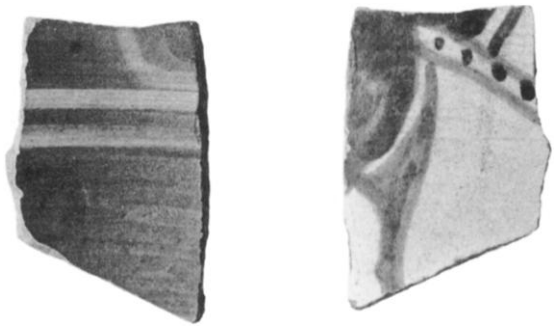

Fig. 24. Chiot chalice fragment (P95.48: 10272), from excavation in the core of the Archaic fortification wall, sector MMS/S

the "walls" may have served a temporary retaining function for layers being piled in segments by several work crews. One of the layers (the fifth from the top) contained a fragment of a Chiot chalice (fig. 24), the decoration of which is consistent with a date in the first half to middle years of the sixth century B.C.[53]

The chronology of layers, faces, and recess remains to be determined. The layers are not patently part of a renovation; but the Chiot chalice fragment indicates that at least the top layers were deposited after ca. 600 B.C., which is somewhat later than the date for the construction of the wall that is indicated by other ceramic evidence. Whatever the chronological relationship between inner and proper faces, there is no evidence that one replaced the other. Did they coexist in a double-trace arrangement? That arrangement is also suggested by inner and outer faces at respectively higher and lower levels in sector MMS, on the west side of the fortification wall. Can the wall have had a "triple trace," with a high platform flanked on one side or the other, or on both sides in some places, by lower platforms?[54]

Bin Tepe: Kır Mutaf Tepe

Kır Mutaf Tepe is the most westerly of the three largest tumuli at Bin Tepe.[55] Its base diameter of approximately 300 m is smaller by 55–60 m than that of the largest and the most easterly of the three, the Tumulus of Alyattes. In contrast to the earth surfaces of most tumuli at Bin Tepe, the surface of Kır Mutaf Tepe consists substantially of stone (fist-size and slightly larger hunks of limestone). In the late 1950s or early 1960s, widening of the Akhisar–Salihli road, which passes to the south of Kır Mutaf Tepe, had exposed several large limestone blocks: four or five of them were displaced to the south embankment of the road, and one remained partly exposed at the foot of the tumulus. Limited excavation (1995) was undertaken to determine whether the blocks belonged to a curb wall, or *crepis*; and, if so, to gain information about crepis size, design, and construction.

A 3 × 6 m trench in the south side of the tumulus uncovered the partly exposed limestone block and eight others, which are roughly aligned and extend 6.5 m to the east (fig. 25). The first block is not in its original position (probably as a result of the road widening), but the other eight are in situ. The blocks have different sizes and shapes[56] and were roughly trimmed with a hammer or pick. They were not

[53] Chiot chalice fragment (P95.48: 10272). Pres. ht. 0.024 m; pres. width 0.017 m; thickness 0.002 m. Inside: white bands and part of a lotus in white and red over a dark ground. Outside: lower body and upper hind leg of animal (grazing goat?) to right; body partly in reserve, dotted belly. The light-on-dark bands and lotus of the interior and the absence of filling ornament in the space under the body identify the chalice with either Lemos's Animal Chiot Style or her Chalice Style, respectively assigned by her to the first quarter and to the second quarter and middle decades of the sixth century; A.A. Lemos, *Archaic Pottery of Chios: The Decorated Styles* (Oxford 1991) 119, 184, 185.

[54] For the double trace in Greek fortifications, see F.E. Winter, *Greek Fortifications* (*Phoenix* Suppl. 9, Toronto 1971) 120–21. The double trace is commonly associated with artillery, which can hardly be as early as the fortification wall at Sardis (whatever the significance of stone shot from Old Paphos on Cyprus and Phocaea; Erdmann [supra n. 39] 80–82; P. Briant, "À propos du Boulet de Phocée," *REA* 96 [1994] 111–14). In sector MMS, the east side of the fortification wall directly opposite the two staggered west faces did not have two faces; and in sector MMS/S, the width of the fortification wall and the location and form of the west side opposite the recess in the east side are unknown.

Archaic painted pottery fragments of individual interest from chronologically mixed deposits in sector MMS/S (1994) included the following: Orientalizing closed vessel with confronted sphinxes, P94.35: 10189; "Early Fikellura" skyphos with bird and animal, P94.38: 10198; lebes or crater (?) with grazing goat, P94.15: 10153; Ionian cup with leaf pattern on inside of lip, P94.16: 10154; Fikellura amphora(s?) with crescents and guilloche (saved, not inventoried); Chiot chalice (saved, not inventoried); Attic black-figure cup with addorsed feet in the tondo, P94.37: 10196; Attic Little Master cup with carnivore feet, P94.17: 10156.

[55] Kır Mutaf Tepe means "gray goathair sack" hill (*kır*, gray; *mutaf*, goathair sack), gray referring to the gray stones that predominate on the mound surface, goathair sack to the mound shape. The local name for the Tumulus of Alyattes is Koca Mutaf Tepe, "big goathair sack" hill. Cf. Greek *pyramides*, "cakes," for Egyptian pyramids.

[56] The heights of the blocks range between 0.37 and 0.60 m; their widths between 0.54 and 1.27 m; their depths between 0.84 and 1.16 m. For three unbroken displaced blocks on the other side of the Akhisar–Salihli road, heights range between 0.30 and 0.34 m; widths between 0.65 and 0.90 m; and depths between 0.99 and 1.48 m.

Fig. 25. Bin Tepe, tumulus called Kır Mutaf Tepe. Crepis foundation stones, looking east.

closely fitted—several are separated by a narrow space. The outer profiles of some are approximately vertical, of others convex. Their top surfaces were flattened (pick-dressed) to a depth of 0.57 m from the front, and the flattened surfaces are level to within 2 cm. The front sides of two blocks were cut with a rectilinear U (6 × 8 cm; 7 × 9 cm).

The blocks presumably are foundations for a crepis. The roughness of their shapes and placement would be tolerable in a foundation; and, although their alignment appears to be straight, a 6.5-m-long stretch of foundation for a crepis with a circumference of 950 m might not show curvature. The blocks were covered with earth after recording.

GEOPHYSICAL SURVEY AND RELATED EXCAVATION

To test the potential of remote sensing geophysical techniques for identifying subsurface architectural features at Sardis, limited survey with a magnetic field gradiometer, a multi-depth twin electrode resistance meter, and computer software that quickly processes data into maplike images was conducted by GeoScan Research U.S.A. The work took place in three weeks in 1995 over a total of 2.4 ha (six acres) in six locations, five of them in or near the city site, and one at Bin Tepe: sector MMS/N 0.24 ha; sectors MMS, MMS/S 0.76 ha; mound 2 0.36 ha; locale MD1/S 0.40 ha; sector PW 0.48 ha; and Bin Tepe 0.16 ha.

The first three survey locations are adjacent to excavated features. Mound 2 is one of the four artificial mounds in the chain that apparently marks the northern limits of the city site (fig. 1); it contains a large Archaic building that had been partly excavated (and reburied) in 1985.[57] Sector MD1/S (mound 1 south) is located south of another of the four mounds, the most westerly of the four, and is part of a large, flattish, unexcavated zone delimited on the west, north, and south respectively by sector MMS/N, mounds 1–3, and the modern Ankara–Izmir highway; survey by magnetic gradiometer only was conducted in a 90 × 10 m harvested field (fig. 1). Locale PW (Pactolus West) is a small valley west of the Pactolus stream, where ceramic material of occupational nature (roof tiles) and Archaic date (pottery) had been collected in a surface survey in 1978,[58] and constituted potential archaeological evidence that Archaic Sardis was partly located on the west side of the Pactolus (as is implied for the early fifth century B.C. in Hdt. 5.101);[59] geophysical survey was conducted at the west end of the valley, ca. 450–500 m west of the Pactolus stream (fig. 1, far left). At Bin Tepe, geophysical survey was conducted on the sides of the tumulus of Alyattes, to determine whether or not the south side of the tumulus had a large crepis wall of limestone masonry, as was reported in the 19th century.[60]

[57] Greenewalt et al. (supra n. 5) 55–92.

[58] Greenewalt et al. 1982 (supra n. 3) 3, 5, fig. 3.

[59] Apart from walls and foundations of uncertain function and date, which were uncovered in 1922 opposite the Artemis temple, the only known structures west of the Pactolus belong to graves. For the walls and foundations, see T.L. Shear, *Sardis* X: *Terra-cottas*, Pt. 1: *Architectural Terra-cottas* (Cambridge 1926) 1–2; A. Ramage, *Lydian Houses and Architectural Terracottas* (*SardisMon* 5, Cambridge, Mass. 1978) 40.

[60] Resistivity and magnetic surveys were conducted in transects up and down the lower half of the tumulus. More transects on the south side, where the crepis reportedly had the greatest number of courses, might have been informative. The investigation was frustrated by inherent difficulty in distinguishing subsurface limestone bedrock from subsurface limestone masonry, and by the uncertain level of the reported crepis on the south side of the tumulus. For 19th-century references to the crepis, see J.F.M. von Olfers, "Über die lydischen Königsgräber und den Grabhügel des Alyattes nach dem Bericht des K. General-Consuls Spiegelthal zu Smyrna," *AbhBerl* 1858, 544–45 and pl. II; *Fisher's Illustrations of Constantinople and Its Environs* I (London; before 1839) 93–94; and A. Prokesch von Osten, *Denkwürdigkeiten und Erinnerungen aus dem Orient* (Stuttgart 1837) 50. The crepis had a sloped face and stood 18 m high, according to L.P. Spiegelthal in von Olfers's account; and it was "capped with a cut stone cornice," according to Spiegelthal as reported by F.H. Bacon in an unpublished letter to W.R. Ware. Is this construction a reality, or did 19th-century visitors mistake outcroppings of bedrock and stone rubble deposits for the crepis reported by Herodotos (1.93)?

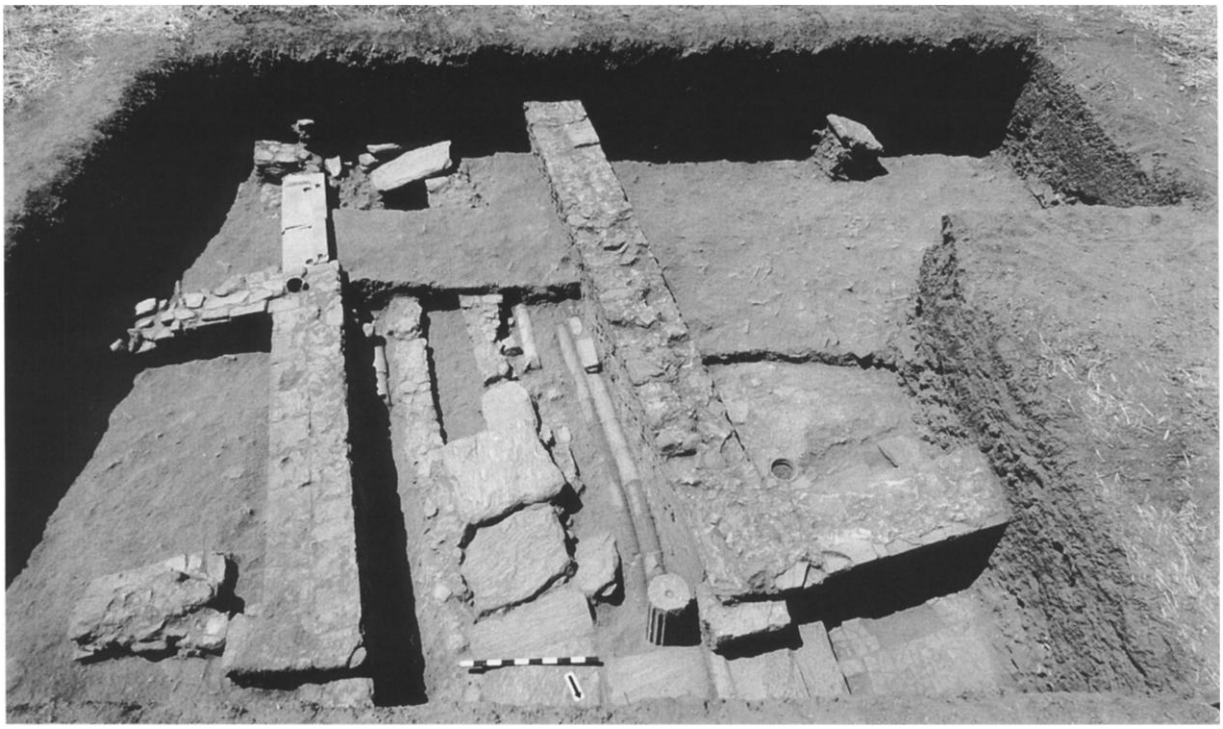

Fig. 26. Geophysical survey location MD1/S. Late Roman street and flanking buildings in trench excavated to check results of geophysical survey, looking south.

Interpretation of the survey data was frustrated by the complexity of site topography and subsurface features, by interpreters' unfamiliarity with the history and nature of occupation in unexcavated parts of the site, and perhaps by the limited size of individual survey zones, which may have been too small to show the broad patterns that geophysical techniques are effective in revealing. The data were checked by excavation in three locations: sectors MMS/S, MD1/S, and locale PW.

For Late Roman wall tops exposed in two shallow trenches in sector MMS/S, see above, "Sectors MMS/N and MMS/S: Roman levels."

In sector MD1/S, a stubby L-shaped, approximately 7 × 10 m trench (at E 324–334/N 41–48 on the "B" grid) was opened where computer-generated survey images seemed to show a semicircular feature with a diameter of 80 m (!). Excavation uncovered Roman urban features of rectilinear design: part of a street, oriented north–south and flanked by buildings with street doorways and with dividing walls oriented at right angles to street walls and street (preserved wall tops rested 0.65–0.70 m below modern ground surface, occupational surfaces 0.55–0.65 m further below; fig. 26). The dimensions and materials of construction are substantial but relatively modest. The street is 2.3 m wide, surfaced with hard-packed earth, and the walls are ca. 0.65 m thick, built of mortared rubble and tile, with marble threshold blocks (cut for doors that could be bolted from inside). That the structures had been in use for some time is indicated by an abandoned street drain (the tamped-earth street surface covered a drain segment where drain cover slabs are missing), possibly replaced by flanking terracotta pipe conduits, and by a worn mosaic paving (showing interlocking circles that create quatrefoils in diagonal lines of red and blue, against a white ground) covered with a thin layer of lime that appeared to be a resurfacing. Of three identifiable coins the latest is an issue of Anastasius I (A.D. 491–518). The trench was backfilled after recording.

Three small test trenches were opened in locale PW where magnetic and resistivity survey images showed what resembled a wall, 35 m long (within survey limits) and oriented north–south, with an apsidal adjunct, about 8 m in diameter, at the north end; structures were exposed that correspond to image features (fig. 27). Only their preserved tops were uncovered; mortared rubble and tile construction indicate a Roman date. Artifacts from adjacent surface fill included a small quantity of ceramic fragments from Archaic and Classical eras (e.g., lydion, skyphos, column crater, and "Achaemenid bowl" shapes, and lamps). They could come from a lower, earlier occupational stratum, but they looked more like surface "flotsam and jetsam," perhaps the remains of grave offerings that had been discarded (as

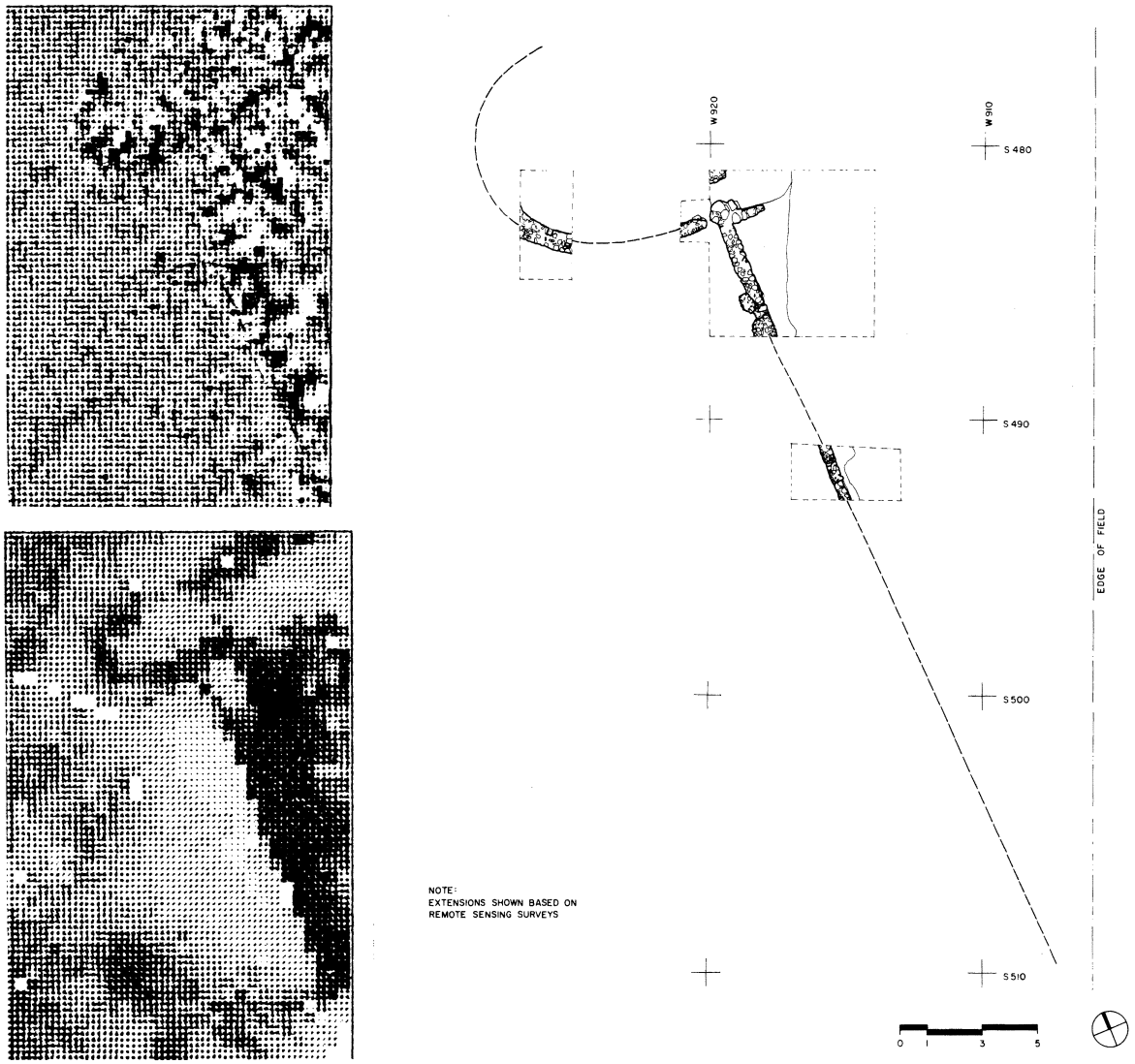

Fig. 27. Geophysical survey location PW. Wall and apsidal feature in images of geophysical survey results (left; above from magnetic survey, below from resistivity survey) and in trenches excavated to check results of geophysical survey (right).

was common practice when graves were reused)[61] and had been washed down from surrounding hills, where graves have been identified. The trenches were backfilled after recording.

LIMESTONE AND MARBLE SOURCES PROJECT

M.H. Ramage undertook a project (1994, 1995) to identify sources of limestone and marble used in buildings of the Archaic period at Sardis. Limestone and marble deposits and quarries in the environs of Sardis, Bin Tepe, and further afield were visited by Ramage and T. Güngör.[62]

Limestone and Marble Quarry Sites

Five ancient limestone quarry sites were identified at Bin Tepe: one near each of the three largest tumu-

[61] H.C. Butler, *Sardis* I: *The Excavations*, Pt. 1: *1910–1914* (Leiden 1922) 78, 159.

[62] The project was undertaken (1994) for an undergraduate honors thesis at Carleton College (M.H. Ramage, "The Provenience of Lydian Masonry at Sardis," Department of Geology, 1995) and was continued (1995) to check results and additional marble sources. In 1994, T. Güngör was a Ph.D. candidate in geology, Ninth of September University, Izmir. The use of marble in Lydian Archaic architecture is attested at Bin Tepe by the walls of the tomb chamber in the Tumulus of Alyattes and by a worked block recovered from one of the Roman (?) "robbers' tunnels" in Kar-

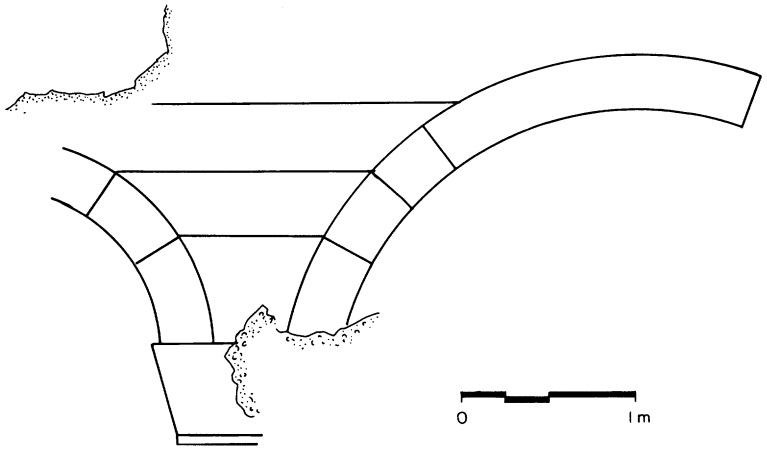

Fig. 28. Gölmarmara, northwest of Sardis. Elevation of an arcade incised on ancient quarry face. Roughly measured sketch.

li (Kır Mutaf Tepe, Karnıyarık Tepe, Tumulus of Alyattes); one at the southeast end of the Bin Tepe ridge (ca. 2.6 km southwest of the Tumulus of Alyattes, 2.2 km north of Kerayakcı köyü, 0.6 m north of the major irrigation canal); and one on a natural limestone hill about 2.1 km north of the Tumulus of Alyattes.

At the hill, quarry cutting is widespread on a gradual north slope. At the top and toward the east end of that side, several roughly hewn blocks rested on modern ground surface. Location and topography make the hill an appropriate site for the ruins identified by 19th-century visitors as the Temple of Artemis of Koloe, but no trace of such ruins was recognized in the 1994 survey.[63]

Eight marble quarries were visited: one immediately south of Sardis (Mağara deresi); two in the region of Gölmarmara (9 km northwest of Bin Tepe; one of the two on the hill above Gölmarmara town, the other ca. 700 m southeast of Değnekler village, which is located west/southwest of Gölmarmara town); two near Akhisar (one at Buknus village); one near Turgutlu/Kassaba in the Hermus River valley (at Karaköy village); one near Alaşehir (at Badince village); and one near Ephesos (Kuşini). All had been worked in antiquity except a quarry near Akhisar (at Buknus, where Ramage saw no evidence for ancient quarrying). Noteworthy features that are chiseled into the vertically trimmed faces of two quarries and that were previously unknown to Sardis Expedition members are an inscription in Greek, OPOC, i.e., "boundary" at Mağara deresi[64] and an incised drawing of an arcade, with voussoir blocks and an impost capital in the quarry above Gölmarmara (fig. 28).

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nıyarık Tepe; at Sardis by blocks of a plinth and by reused blocks in two Archaic walls, one of the walls datable to the late seventh–early sixth centuries B.C., all structures in sector ByzFort; see Ratté, in Greenewalt et al. 1994, 27. For limestone and marble masonry in Archaic buildings at Bin Tepe and Sardis, see C. Ratté, *Lydian Masonry and Monumental Architecture at Sardis* (Diss. Univ. of California at Berkeley 1989).

[63] The location of the hill corresponds to that of the hill marked with ruins of the temple on the map published by von Olfers (supra n. 60) pl. I. On the surface at the summit, a few artifacts were noticed (1994), none of them obviously related to a sanctuary (stone quern, stone gutter or spout, pottery fragments). Much of the summit and upper south side has been removed by recent bulldozing. Ancient remains reported in the 19th century and associated with the Temple of Artemis of Koloe (walls of basalt masonry, three Doric columns formed of "colossal" drums of weathered marble that stand 6′ high; sculptured fragments of an archer with pointed cap, lion's head) are not reported to have been seen in the 20th century. For the remains, see E. Curtius, "Artemis Gygaia und die lydischen Fürstengräber," *AZ* 11 (1853) 152. H.C. Butler briefly thought he had located the ruins in 1922 (unpublished letter from Butler to E. Capps, 20 May 1922, unpublished report on 1922 season by E.R. Stoever; both in Princeton University archives), and D.G. Mitten of the Harvard-Cornell Expedition searched for the temple in the 1960s. The only ancient evidence for the location of the temple near the Gygaean Lake/Lake Koloe is Strabo 13.4.5/626. Artemis of Koloe is invoked in Lydian grave epitaphs (nos. 1 and 2 in the Lydian Corpus; R. Gusmani, *Lydisches Wörterbuch: Mit grammatischer Skizze und Inschriftensammlung*, Heidelberg 1964).

[64] The inscription is wrongly transcribed XOROΣ in M.H. Gates, "Archaeology in Turkey," *AJA* 100 (1996) 322. For relief sculpture, now almost entirely lost because of vandalism, in another part of the same quarry, see G.M.A. Hanfmann and N.H. Ramage, *Sculpture from Sardis: The Finds through 1975* (*SardisRep* 2, Cambridge, Mass. 1978) no. 156.

Sampling, Analysis, and Interpretation

Samples were taken from quarry sites and Archaic buildings at Sardis and Bin Tepe. Limestone building samples included crepis blocks from Kır Mutaf Tepe (see above) and Karnıyarık Tepe, and material from the Tumulus of Alyattes tomb chamber ceiling, the Pyramid Tomb, terrace walls on the north side of the Acropolis summit, and the fortification gate in sector MMS/N. Marble samples included tomb chamber walls in the Tumulus of Alyattes, a worked marble fragment from a Roman "robber" tunnel in Karnıyarık Tepe, a kline from a Bin Tepe tumulus, and a stylobate and another structure in sector ByzFort.

The limestone was analyzed (by Ramage at Carleton College) in 107 thin sections with a petrographic microscope in plane and cross-polarized light. A combination of features, notably texture, quartz content, dissolution, and recrystallization, suggested to Ramage 1) a distinctive limestone character for each of the three quarries near the three largest tumuli at Bin Tepe; 2) a general correlation between limestone used in Archaic buildings at Sardis and the Bin Tepe limestone sources (no limestone sources at Sardis are known); 3) specific correlations between (a) limestone used in each of the three largest tumuli and limestone of the respective tumulus quarry site, (b) limestone from the Pyramid Tomb at Sardis and the Kır Mutaf Tepe quarry site, and (c) limestone from the sector MMS/N fortification gate at Sardis and the Karnıyarık Tepe quarry site.

The marble was analyzed (by Ramage and R. Tykot at the Harvard University Archaeometry Laboratory) with a VG II Isogas mass spectrometer and with samples that had been dissolved in 100% phosphoric acid. Analysis established isotope "signatures" for the samples, based on their isotope ratios of carbon and oxygen. Isotope signatures of marble from all Lydian Archaic buildings are similar; they are dissimilar to the isotopic field of visually similar white marble from quarries at Mağara deresi and Gölmarmara, but similar to the isotopic field of marble from quarries at Kuşini near Ephesos and Dokymeion in Phrygia. The grain size of marble from Lydian Archaic buildings is similar to that of marble from the Kuşini quarries. Ramage tentatively concluded that the marble of Archaic construction at Sardis and Bin Tepe came from Ephesos, with which Sardis had political and cultural ties in the Archaic period.[65]

DRILLING/CORING AT KARNIYARIK TEPE

Karnıyarık Tepe is one of the three largest tumuli at Bin Tepe (base diameter ca. 200 m, height ca. 50 m), located between the other two (Kır Mutaf Tepe, Tumulus of Alyattes), and has the highest elevation of the three. It was extensively tunneled by the Sardis Expedition in 1964–1966, and the tunnels were surveyed with ground-penetrating radar equipment in 1992.[66] The radar survey detected two major anomalies located 5 m apart, about 20–25 m east of the mound center, 1.5–2.0 m above the (pretumulus) ground surface, and 1.0–1.5 m beyond the tunnel walls.[67] To explain the anomalies and determine whether they represented a burial chamber, a nine-day program of drilling/coring was undertaken with two or three engineers and equipment of KAROTEK Inşaat Sanayi ve Ticaret A.Ş., a firm in Izmir that specializes in coring concrete.[68] Seven

[65] For Lydian-Ephesian connections, see Hdt. 1.26, 93; Ael. *VH* 3.26; Polyaenus 6.50; and Paus. 7.2.7–8; for pottery evidence for such connections, see C.H. Greenewalt, Jr., "Ephesian Ware," *CSCA* 6 (1973) 91–122. Ancient overland routes between Ephesos and Sardis that have been postulated in modern times are about 100 km long. The one with the simplest topography includes a 450-m-high pass (Karabel). For those routes, see J.K. Anderson, "The Battle of Sardis in 395 B.C." *CSCA* 7 (1974) 27–53; C.H. Greenewalt, Jr., "Sardis in the Age of Xenophon," in P. Briant ed., *Dans les pas des dix-mille* (*Pallas* 43, Toulouse 1995) 125–26. Whether all or an appreciable extent of the Hermus River between the Aegean Sea and Sardis was navigable for transport of stone blocks is not known; if it was, sea transport between Ephesos and the mouth of the Hermus would have involved circumnavigation of the Karaburun peninsula.

[66] The tunnels (directed by miners from the lignite mines at Soma) resembled in section a truncated triangle, 2 m wide at the floor, 2 m high, and 1.5 m wide at the ceiling; they were shored with timbers that included a log frame every meter. By the 1990s the shoring had either been removed or had decayed. The ceilings remained stable (except for a very few places where they exposed loose material in the tumulus fill), but the sides in most places had fallen in. For the radar survey, see C. Ratté in Greenewalt et al. 1995, 26–32.

[67] At A in Greenewalt et al. 1995, 27 fig. 28.

[68] "The equipment consisted of a large electric drill, a platform on which the drill was mounted, a core barrel that cut a core 10 cm in diameter and approximately 40 cm long through the tumulus material, and a series of extensions that allowed the core barrel to drill up to 2–3 m into the tumulus. We used two different types of drills, starting with a 'B & B Tec 130' model, which could be mounted at an angle to drill obliquely downward into the tunnel wall. This drill was not powerful enough to penetrate some of the loose rock layers, however, and after breaking a number of them we switched to a more powerful drill, which could only be drilled horizontally or at a slight incline. The core barrel was lubricated and cooled by water, supplied by gravity through the drill and extensions; this water was collected as far as possible as it ran out of the hole.

cores 0.10 m in diameter and ranging between 2 and 3 m in length were cored from the tunnel walls at different levels, some of them horizontally oriented, others inclined downward, in the anomaly locations. The seven cores consisted either of tumulus fill or limestone bedrock, both of which are visually distinctive materials. The coring program indicated that the anomaly locations do not coincide with a burial chamber but did not suggest an identification for the anomalies.[69]

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The platform was wedged from floor to ceiling of the tunnels to hold the drill firmly. Power for the drill and lights was supplied by a generator, located outside the tunnels, via a 120-m cable. The areas in which we worked were shored up temporarily with iron railroad track and ties to provide security" (quoted, with slight adjustments, from the 1995 field report by N.D. Cahill).

[69] "They may have been caused by the transition from rubble to clay, which was noticed in about the right place in some cores, but this transition occurs in many places in the mound that did not produce such radar anomalies" (quoted, with minor changes, from the field report of N.D. Cahill).