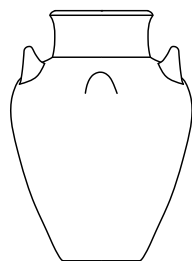


Göltepe Excavations

Tin Production at an Early Bronze Age Mining Town
in the Central Taurus Mountains, Turkey



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by

Kutlu Aslıhan Yener

with contributions by

Müge Bulu, Talisha Chaput, Mahmut G. Drahor, Alexandra Fletcher,
Patience Ann Freeman, Allan S. Gilbert, Haskel J. Greenfield, Tina L. Greenfield,
Abdullah Hacı, Jennifer E. Jones, Ergun Kaptan,[†] Arlene M. Rosen,
Michael L. Wayman, and Kutlu Aslıhan Yener



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A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die and a new generation grows up that is familiar with it.

Max Planck (1949, 33–34)

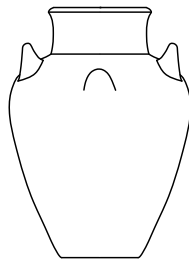


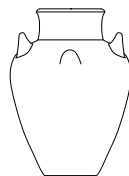


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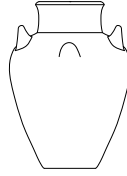
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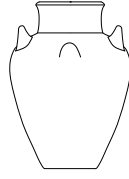
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Preface

The long span of time between the end of the field excavations at Göltepe in 1993 and this publication was unfortunate but unavoidable. Several other excavation and survey commitments took precedence, including the Amuq Valley Regional Projects, Tell Kurdu, and Alalakh, all of which intervened to delay the publication of this unique, special-function site. Each university and research institution in which the author worked required attention to specific research agendas and had differing support structures. Accordingly, the various arms of the archaeometallurgy research project began in Boğaziçi University in Istanbul, Turkey. A series of fellowships at the Smithsonian Institution followed, and finally positions at the Oriental Institute of the University of Chicago and Koç University in Istanbul. Given that working in some of these institutions required cross-Atlantic moves, time was lost in the processing of the archaeological finds. Regardless, an impressive amount of articles and books from these investigations have been published in a timely manner, making public the analytical aspects of the finds from both the Kestel tin mine and the Göltepe miners' village. Nevertheless, the specifics of Göltepe's Early Bronze Age (EBA) archaeology remained largely unknown until this publication.

Further slowing the publication of this excavation was the enormous expenditure of effort required to address the adverse reactions by some scholars to finding a tin resource in Turkey. While most paradigm-changing discoveries are met with skeptics, the magnitude of opposing opinions resulted in time taken from publishing the archaeological finds and contexts for the production technologies. This book addresses this need and also updates the implications of two decades of archaeometallurgical research by other scholars.

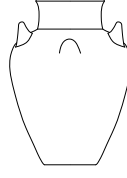
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Team Members of the Taurus Mountains Archaeometallurgical Surveys and Excavations at Kestel Mine and Göltepe:

K. Aslıhan Yener, director, Taurus Mountains Archaeometallurgical Surveys (1981–1996); director, Göltepe and Kestel tin mine excavations (1987–1996)
 Açıkgöz, Fazıl, ministry representative (1984, 1987, 1990), conservation (1991, 1993, 1996)
 Adriaens, Annemie, instrumental analysis (1993–1996)
 Aksoy, Behin, ceramics specialist, Kestel tin mine and Göltepe (1987, 1988, 1990, 1991, 1993, 1996)
 Akyol, A. Levent, remote sensing (1990)
 Andrews, Phillip, trench supervisor, Kestel tin mine (1991, 1996) and Göltepe (1993)
 Arıcan, Haluk, Taurus-Bolkardağ survey (1983)
 Aydın, Duran, guide, Taurus-Bolkardağ survey (1983, 1984)
 Barnes, I. Lynus, instrumental analysis (1987–1993)
 Bayrı, Özkan, remote sensing (1991)
 Bezmen, Cemil, Taurus-Bolkardağ survey (1983, 1984, 1987)
 Bottema, Sitze, palaeobotany (1992)
 Burgess, Robin, geoarchaeology and palaeoecology (1990)
 Chadderdon, Thomas, trench supervisor and field director (1991, 1993)
 Craddock, Brenda, illustration, Kestel tin mine and Göltepe (1991–1993, 1996)
 Craddock, Paul, mining specialist, Kestel tin mine (1991)
 Deniz, Engin, remote sensing (1991)
 Dickey, Keith, Kestel tin mine and Göltepe surveys (1988)
 Drahor, Mahmut, remote sensing (1990, 1991)
 Duprés, Sylvestre, ceramics specialist (1990, 1991, 1993, 1996)
 Earl, Bryan, archaeometallurgy specialist (1992, 1993)
 Eren, Ayda, Taurus-Bolkardağ survey (1984)
 Feldman, Marion, trench supervisor (1991)
 Gale, David, trench supervisor, Kestel tin mine (1991)
 Gilbert, Allan, faunal analysis (1990–1993)
 Goodway, Martha, instrumental analysis, Kestel tin mine and Göltepe surveys (1988)
 Frey, Rosa, trench supervisor (1990)
 Hard, Robert, trench supervisor, lithics (1990–1992)
 Jean, Eric, trench supervisor (1993)
 Joel, Emile, instrumental analysis (1987–1996)
 Jones, Jennifer, trench supervisor (1991)
 Kane, Lois, illustration (1991)
 Kaptan, Ergun, archaeometallurgy (1984–1996)
 Karaören, Fatma, Taurus-Bolkardağ survey (1984)
 Karaören, Mehmet, Taurus-Bolkardağ survey (1984)
 Kaya, Vahap, camp management, ministry representative (1988, 1991)
 Kerkütlü, Nihat, remote sensing (1990)
 Klucas, Eric, trench supervisor (1991, 1993)
 Knudstad, James, field director (1990, 1991)
 Koob, Stephen, conservation (1993)
 Kosub, Lynden, lithics (1992)
 Kuniholm, Peter, dendrochronology (1991)
 Mizrahi, Daryo, Kestel tin mine and Göltepe surveys (1988)
 Monroe, Christopher, trench supervisor (1993)
 Nesbitt, Mark, palaeobotany (1991)

- Ott, Cindy, illustration (1991)
Ozaner, F. Sancar, geomorphology (1991)
Özbal, Can, trench supervisor (1992)
Özbal, Hadi, instrumental analysis and survey (1983–1996)
Özbal, Rana, trench supervisor (1992)
Özkan, Ayşe, illustration (1993, 1996)
Özyar, Aslı, trench supervisor, Kestel tin mine, Göltepe surveys (1988, 1990)
Pikin, John, trench supervisor, Kestel tin mine (1996)
Peele, John, trench supervisor, Kestel tin mine (1991, 1992)
Pehlivan, Necip, geology, Kestel tin mine (1987–1996)
Peterson, Jane, trench supervisor (1991)
Ponat, Ertuğrul, remote sensing (1991)
Pulhan, Gül, archaeologist (1987, 1988, 1991)
Rosen, Arlene M., palaeobotany (1992)
Şahin, Işın, illustration (1992)
Şakar, Bekir, remote sensing (1990)
Sayre, Edward V., instrumental analysis (1987–1996)
Sebüktekin, Ufuk, Taurus-Bolkardağ survey (1983)
Soysal, Gün, Taurus-Bolkardağ survey (1984)
Steele, Ian, instrumental analysis (1993–1996)
Timberlake, Simon, trench supervisor, Kestel tin mine (1996)
Uyar, Orhan, remote sensing (1991)
Vandiver, Pamela, instrumental analysis (1991–1993)
Wilkinson, Tony J., Kestel tin mine (1994)
Willies, Lynn, trench supervisor, Kestel tin mine (1991, 1992, 1996)
Willies, Sheelagh, trench supervisor, Kestel tin mine (1991, 1992, 1996)
Woldring, Hendrik, archaeobotany (1992)

Kutlu Aslıhan Yener
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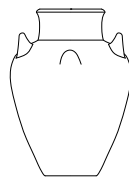
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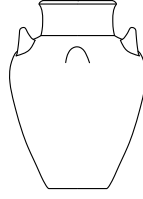
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List of Abbreviations

ARIT	American Research Institute in Turkey	LC	Late Chalcolithic
B	bone (cataloged)	m	meter(s)
BA	Bronze Age	M	metal object (cataloged)
BT	profile trench (backhoe)	m asl	meter(s) above sea level
C	clay object (cataloged)	max.	maximum
cal.	calibrated	MBA	Middle Bronze Age
cm	centimeter(s)	MC	Middle Chalcolithic
dia.	diameter	mm	millimeter(s)
EB	Early Bronze	μ	micron(s)
EBA	Early Bronze Age	μm	micrometer(s)
EDS	energy dispersive spectrometry	MRN	Main Registration Number
FCN	Fine Context Number	MTA	Maden Tetkik ve Arama Genel Müdürlüğü (General Directorate of Mineral Research and Exploration)
g	gram(s)	NAA	neutron activation analysis
ha	hectare(s)	ND	no date
HMS	Historical Metallurgy Society	NISP	number of identified specimens
ht.	height	NIST	National Institute of Standards and Technology
ICP-MS	inductively coupled plasma mass spectrometry	no.	number
kg	kilogram(s)	NW	northwest
km	kilometer(s)	P	pottery (cataloged)
L	liter(s)	ppm	parts per million
L	lithic object (cataloged)		
L.	length		

S	stone object (cataloged)	VES	vertical electrical sounding
SL	slag (cataloged)	w.	width
SP	ore (cataloged)	wt.	weight
SEM	scanning electron microscopy	XRD	X-ray diffraction
SEM-EDA	scanning electron microscopy- energy dispersive analysis	XRF	X-ray fluorescence
SPT	stratigraphic profile trench	Ω .m	ohms per meter
T	test pit		
th.	thickness		
TÜBİTAK	Türkiye Bilimsel ve Teknolojik Araştırma Kurumu (Scientific and Technological Research Council of Turkey)		



1

Background

by

K. Ashhan Yener

The publication of this volume brings to completion over 15 years (1981–1996) of archaeometallurgical surveys in a number of regions in Turkey (in the Pontic Black Sea mining regions, the Ergani Maden mine, and including the Taurus Mountains Archaeometallurgical Surveys), and more specifically the excavations of an Early Bronze Age (EBA) tin mine, Kestel, and its associated miners' village, Göltepe (Figs. 1, 2). Before the discoveries of the Kestel tin mine and Göltepe miners' village, the initial archaeometallurgical surveys were part of a research project aimed at identifying sources of silver in Turkey used in antiquity (Yener 1982, 1983). The survey design was developed on the hypothesis that the complex networks of interregional Middle Bronze Age (MBA) trade between major Central Anatolian kingdoms, such as Kanesh and Assur in northern Iraq, had precursors in the third millennium B.C. (Özgüç 1986, 33–46).

While the lack of written documents is a disadvantage of working within the parameters of Early Bronze Age Anatolia, this circumstance presents a valuable challenge that enables the formulation of

alternative methodologies. At times, ancient texts reflect only select topics of interest to Assyrian merchants, which often constrain efforts toward defining social, political, and economic dynamics and present only a partial view of the complexities of the rich canvas of intra-Anatolian interactions (Adams 1978; Dercksen 2005; Yener 2009; Yener et al. 2015). My preliminary research seeking to clarify third-millennium exchange systems without written documents at first produced a dissertation that left many questions unanswered (Yener 1980). Be that as it may, the identification of exotic materials and products has always been among the functions to which archaeology is best suited. If only as the necessary link between production and consumption of commodities, the fact of trade and the centrality of exchange in many social conditions demanded that it retain explanatory significance as a social force, especially in the nascent centers of Anatolia. Hence, in 1981 a multidisciplinary, multi-institutional research design linking the extraction of raw materials to urban centers of the third millennium B.C. was formulated utilizing newly developed

instrumental analysis in conjunction with fieldwork (Yener 1982, 1983).

Researching metal trade in the third millennium B.C. could be viewed as nothing more than an acknowledgment of details that others (including myself) have already suggested—perhaps frequently, but in a less-coherent form. As George Orwell once noted, “To see what is in front of one’s nose requires a constant struggle” (1946). Testing the widening of cultural communication or change in the intensity of economic contact from its earlier precursors in the Neolithic period onward demanded complex forms of data. The problem of metal trade therefore needed to be approached from another perspective—that is, an analytical viewpoint. A series of instrumental breakthroughs in the 1970s and 1980s provided the catalyst for the Taurus Archaeometallurgical Surveys and augmented the tools necessary to generate relevant data.

History of the Project

The key to the project framework was the idea of fingerprinting sources through trace element analyses, which were first formalized for Anatolian obsidian by Colin Renfrew and his colleagues and remain ongoing (Renfrew and Dixon 1976 [with references]; Chataigner, Poidevin, and Arnaud 1998). The logic behind this approach is that volcanoes producing obsidian can be characterized by compositional analysis, the results of which then can be compared to obsidian artifacts tested in the same manner. Just as a sequence of sourcing information and consumption patterns can be quantified to model obsidian trade, the notion that likewise similar techniques could be applied to metals was the next logical step. The intended approach incorporated two constructs of trade, source and consumption, which would be coupled through technical analyses. From the data obtained through instrumental techniques, the traffic of metal artifacts and raw materials between loci and their patterns of distribution, both regional and interregional, would be inferred. To that end, while the author was teaching at Boğaziçi University in Istanbul during the early 1980s, Hadi Özbal of the Department of Chemistry was approached to help design a program of field surveying and analysis for the sourcing of ore

for silver artifacts dating to the Early Bronze Age. Subsequently, the Archaeometry Unit of TÜBİTAK (Türkiye Bilimsel ve Teknolojik Araştırma Kurumu [Scientific and Technological Research Council of Turkey]) incorporated the project into its aims, thus enhancing its funding potential. The initial objective was the utilization of intensive compositional analysis to reconstruct the technological and compositional variability of artifacts utilizing atomic absorption spectrometry. Indeed, the success in obtaining silver, copper, and lead artifact samples from third and second millennium B.C. Anatolian, Syrian, and Mesopotamian excavations was the first achievement of the project (Yener et al. 1998).

A second discernible development that impacted the formulation of the archaeometallurgical project were the compelling results of lead isotope source characterization studies conducted on Aegean, Mesopotamian, and Cypriot samples that even more convincingly matched ores to artifacts. The successful use of lead isotope ratios for sourcing Near Eastern metals and glass was first published by Robert Brill and colleagues at the Corning Museum and the National Institute of Standards and Technology (NIST), followed by teams from Mainz, Heidelberg, and Oxford utilizing new developments in mass spectrometry (Brill and Wampler 1967; Wagner et al. 1986). While the compositional analysis of metal artifacts was less secure in pinpointing sources due to elemental changes from ore to finished product, measurements with a mass spectrometer were detected on an isotopic level and theoretically did not change, even with oxidation. The next step therefore was to build partnerships with researchers who had access to instruments capable of generating lead isotope ratios for source characterization analyses. In collaboration with the Smithsonian Institution and together with Edward Sayre, Emile Joel, Robert Brill, and Lynus Barnes, a second phase of research, the lead isotope analyses of Turkish ores and artifacts, was initiated in 1982 (Yener 1982, 1983).

The early studies of compositional analysis carried out at Boğaziçi University, and the necessity of more precise characterization afforded by lead isotope research, spurred a separate arm of the archaeometallurgical initiative—that is, obtaining ore and slag samples from various mining districts in Turkey. On all counts, the analytical programs needed to be accompanied by a parallel set of

archaeometallurgical and archaeological surveys. Accordingly, a series of surveys into the mining regions of Turkey began in 1981. Because the selection and processing of ores would be directly reflected in lead isotope ratios, this consideration formed the basis for the first targeted region, the central Taurus mountain range. The central Taurus mountain range (Bolkardağ) was selected both for archaeometallurgy surveys and lead isotope sampling of the ores because it was known as the legendary “silver mountains” of antiquity. Artifact samples were selected from excavated silver, lead, and copper-based objects dating to the third and second millennia B.C. Both the Taurus mountain range and the artifact samples bear relevance to Syro-Mesopotamian and Anatolian trade networks.

While an initial spurt of interest in the ancient mining and metallurgy centers of ancient Anatolia had occurred in the early 20th century (see, e.g., Przeworski 1939), it was short-lived and superseded by the study of the finished products: metal artifacts and their typologies, chronologies, and compositions. As a result, archaeometallurgical explorations in the highest, metalliferous-rich altitudes in Turkey languished until the 1960s, when Theodore Wertime and colleagues conducted short reconnaissance forays following insights provided by Christopher Ryan (Ryan 1960; Wertime 1964, 1967, 1973, 1978, 1980; Wertime and Muhly, eds., 1980; Muhly 1993). The solid foundations for the future study of the archaeology of mining and metal technologies was not established, however, until Ergun Kaptan of the General Directorate of Mineral Research and Exploration (Maden Tetkik ve Arama Genel Müdürlüğü [MTA]) in Ankara partnered with Prentiss de Jesus (former Director of the American Research Institute in Turkey [ARIT], Ankara) and, through a series of pioneering projects, they explored the extraordinary mineralogical wealth of Turkey (de Jesus 1980; Kaptan 1983).

Following clues set by these initial series of surveys, three major zones pertinent to the elucidation of trade with Syro-Mesopotamia were selected by our archaeometallurgical project: the Taurus Mountains, the Pontic (Black Sea) Mountains, and the eastern highlands of Turkey. Substantial evidence existed that the Pontic range in general had both copper and silver deposits, while the Keban mines near Elazığ in the eastern highlands were a rich region for silver (Yener 1982, 1983, with references).

Doubtless, however, the most well-known potential source was the Taurus Mountains, which run east-west parallel to the Mediterranean coast, extending to the border of Iraq; again, this mountain range had readily been identified as the so-called silver mountains (Yener 1983; Yener, Özbal, Minzoni-Deroche et al. 1989; Yener, Geçkinli, and Özbal 1996).

The MTA made available to me its otherwise inaccessible internal archives of valuable geological reports, its historical documents, and a wealth of analytical information about the Taurus sources. A small team from Boğaziçi University—consisting of three professors of physics and chemistry, one president of the student mountaineering club, and myself—was put together to survey the mining districts of the Taurus Mountains. The Bolkardağ valley was chosen as the focus of our investigation, because it was considered to have the richest silver deposits in the central Taurus range. Notwithstanding the initial naiveté of assuming that these sources could be sampled in two weeks in 1981, it became readily apparent that this area was not just one source but rather a multiplicity of mining regions within close proximity to each other, situated in a zone rich in polymetallic ores including silver, gold, antimony, copper, iron, lead, and, later, tin. The MTA then provided expertise in the form of geologists who were experts on the Taurus Mountains, while Etibank, the state mining authority, provided logistical support. The Ministry of Culture and Tourism, realizing that an entire facet of Turkey, the highlands, had not been surveyed for sites, also provided funding and legitimized the research as relevant to archaeology with an archaeological survey permit. During the first year (1981), 37 sites were identified in the valley and surrounding mountain slopes. Within a 15 km² radius of Bolkardağ alone, MTA geologists had already identified 850 silver mine shafts, which were plotted on their maps of Turkey archived in Ankara. Only a fraction of these mine galleries were accessible, and many potential Bronze Age (BA) mines had been gutted for gold and silver production during the Ottoman period (Yener and Özbal 1986a, 1986b; Aksoy 1991, 1998). The scope of the project expanded to revisit Bolkardağ and other valleys in the central Taurus yearly until 1987.

The analysis of samples collected from the 37 identified sites became a multinational effort taking place over the last two decades, an undertaking

that has carried out the many characterization studies resulting in the present corpus of lead isotope ratios of known ore bodies in Turkey. Currently, over 300 ore samples from these sites have been published and used to characterize known bodies of metal ore, and over 3,000 analyses are archived in my database as well as in others (Brill and Wampler 1967; Barnes et al. 1973; Kouvo 1976; Wagner et al. 1984, 1986, 1989, 2003; Gale, Stos-Gale, and Gilmore 1985; Pernicka 1990, 2014; Yener et al. 1991; Sayre et al. 1992, 2001; Hirao, Enomoto, and Tachikawa 1995; Allègre 2008; Villa 2009). In addition, archaeometallurgy has become the topic of international symposia and conferences in an attempt to resolve issues involving overlapping data fields due to the complex geology of the Near East (for summaries, see Roberts and Thornton, eds., 2014; Yalçın, ed., 2000, 2002, 2005, 2008). Because Anatolian ores overlap to a high degree, however, important regional distinctions were attempted by statistically categorizing lead isotope ratio data sets with bivariate or multivariate statistics or Hotelling's T-squared distribution tests (Sayre, Yener, and Joel 1992, 1993, 1995; Sayre et al. 1992; Scaife et al. 1999).

Discovery of the Kestel Tin Mine

During the process of analyzing the hundreds of ore and slag samples from the central Taurus range, the first evidence of tin-containing ores (stannite) was found in the Bolkardağ valley (Figs. 1, 2; Okay 2008). The Taurus (Bolkardağ valley) source contained 0.3% tin (Özbal and Yener 1984; Yener and Özbal 1987), higher than any analyzed source reported at the time in other regions including Afghanistan (Franklin, Olin, and Wertime, eds., 1978; Cleuziou and Berthoud 1982; Stech and Pigott 1986). An even richer source of tin oxide (cassiterite) was discovered by MTA prospecting geology teams seeking gold near Çamardı, situated 40 km north of Bolkardağ through the Kırk Geçit passes. While stannite occurs in Bolkardağ as a minor accessory mineral in lead ore, and smelting this ore would produce lead and possibly silver with tin as a minor element, the point nevertheless is that these ores occur in the same metal-rich geographical zone, the Taurus Mountains. The fact that these

sources, located in close proximity to each other, were accessible to the makers of the Late Chalcolithic (LC)/Early Bronze (EB) I tin bronzes at Tell Judaidah (Phase G, ca. 3000 B.C.: Braidwood, Burke, and Nachtrieb 1951; for crucible bronze residues with 37% tin, see Adriaens et al. 2002b), and also to metalworkers at Amuq sites ringing the northeastern bend of the Mediterranean Sea, became even more important when lead isotope analysis linked the bronzes from these Amuq sites with the Taurus sources (Lehner and Yener 2014).

Through intensive panning in local stream beds below the Niğde Massif, an unexploded volcanic dome located on the north-facing slopes of the Taurus Mountains near the Cilician Gates (Pl. 1A), the MTA was able to demonstrate that tin oxide (cassiterite) was present in major quantities. Establishing the presence of cassiterite involved sifting through 80 tons of alluvial stream sediments during the course of a major five-year research project investigating the sources of heavy minerals in the central Taurus range in the early 1980s (Pehlivan and Alban 1986; Çağatay and Pehlivan 1988; Çağatay and Arman 1989; Çopuroğlu and Yalçın 2000). Mines used as animal shelters by the villagers of nearby Cellaller (Pl. 1B), situated near the town of Çamardı, were located on the southern slope of the Niğde Massif, which was strewn with collapsed entrances, only one of which provided access to the underground workings now called the Kestel tin mine (Yener 2000, figs. 7, 9). Outcropping bedrock limestone platforms situated above mine entrances, some of which measured 4 x 3 m in size, were used as anvils where ore was dressed (S113, S115–S118; see also this vol., Ch. 6, p. 114), some having hundreds of percussion hollows (S114; Pl. 1C; Yener 2000, fig. 11). Cellaller was settled following World War I by Türkmen villagers, formerly nomads across the border in Syria, who continued to practice transhumance at this time in upper altitudes (up to 2,500 m asl), even though their village was at 1,700 m asl. Herding their sheep and goats, which even today provide staple dairy products and meat, the villagers also used wool for carpet and textile production (Pl. 2A).

The Kestel tin mine, with ca. 4 km of galleries (Fig. 3), is located 200 m above the Kuruçay stream (Yener, Özbal, Kaptan et al. 1989, fig. 2; Yener 1997b). This 4 km estimate is based on MTA surveys and resulting sketch plans in the MTA

archives and is confirmed by specialists with the United Kingdom Historical Metallurgy Society (HMS). (For multiple elevations and sketches of interconnected galleries starting from the Kuruçay stream and extending to the top of the massif, see Yener 2000, figs. 7, 9. Collapsed mine entrances also can be identified through the location of the multi-hollowed beneficiation anvils mentioned above.) The galleries, which were carved out of limestone, are very small and round, some only 60 cm in diameter (Pl. 2B). Skeletons of subadults found in the mine suggest that it was worked by children (see this vol., Ch. 8).

The limestone into which the galleries of the Kestel tin mine were cut appears to have been originally part of a Triassic sequence of dolomitic limestone (Willies 1990, 1991, 1995). Iron in the form of hematite, magnetite, and limonite is visible in and around the entrance of the mine (Pl. 3A), and the cassiterite tin ore most likely was derived from granite intrusion. Cassiterite was identified in one of the mine soundings at the Smithsonian Institution with a single-crystal Gandolfi X-ray camera, X-ray diffraction (XRD), and scanning electron microscopy (SEM; Yener, Özbal, Minzoni et al. 1989, fig. 3; Yener 2000, pl. 5b). Early Bronze Age fire-setting methods of extraction, battering rams, and antler tools also were identified at the tin mine by ancient mining experts from the United Kingdom and the HMS (Pl. 3B; P.T. Craddock 1989, 1992, 1995; B. Craddock 1990; Andrews 1994; Weisgerber and Willies 2000; Yener 2000, pl. 7; see also this vol., Ch. 6). The archaeological stratigraphic sequences for the Kestel mine were obtained by excavation and radiocarbon dating (Yener 2000, 172–173), and the continuity of the exploitation of this important source of tin was determined to date from the end of the fourth millennium to the end of the third millennium B.C. (Willies 1992, 1993). Several reused chambers of the Kestel mine were also reached that contained Early Bronze Age burials (Fig. 4; Yener 1997a), and there were signs of post-Bronze Age ore extraction and the use of the mine as a shelter during the Byzantine and later periods.

Tin, used in the production of bronze, was until now not known to have existed in the Near East in close proximity to major complex societies in Anatolia, Syria, Mesopotamia, and the Levant. Access to these regions and the Mediterranean coast was provided through the Cilician Gates mountain

pass in the Central Taurus Mountains. Considering the contemporaneity of the Kestel tin mine with the irrefutable mass production of tin in processing quarters at Göltepe (see below), the archaeological importance of these sites is manifest. Late Chalcolithic and Early Bronze Age sherds (ca. 3500–2000 B.C.) as well as charcoal, bones, and ground stone tools were recorded from areas inside and outside of the mine, and habitation debris was found in a sounding in a workshop located on the slope of the mine (Pls. 1A, 1C; Yener 2000, figs. 9, 11). If the prospects for a view of industrial and urban organization in a highland metalliferous zone during the period of the greatest florescence of metal use seemed bright, the possibility of obtaining a diachronic view of at least the third millennium was only slightly less so.

The presence of tin in the Kestel mine is not self-evident, because only sub-economic material was left in situ (Yener and Goodway 1992; Sharp and Mittwede 1994, 1995). Fires had been extensively used in the mine where smooth continuous walls typical of this process could be seen (Craddock 1992, fig. 1). The following is quoted from a report submitted and subsequently published by Lynn Willies of HMS (1990, 93; see also Willies 1991, 1992, 1993, 1994, 1995):

Samples taken from mineralized pockets in the mine have yielded up to 0.6% tin, and since this was neglected, though in an obviously mineralized position, a working presumption might be that an ancient cut-off grade of around 1% is reasonable.

In 1991, MTA geologists estimated that 100,000 tons of ore had been extracted from the Kestel tin mine. If the ore as published contained at least 1% tin, then a total of 1,000 tons of tin were extracted in the 600 years of the mine's existence—that is, 1.7 tons per year (Özbal 1993, 310). The discovery of tin at Kestel and the publication of these analyses prompted vigorous and spirited discussions about the amount of tin accessible there in antiquity. But finding the original alluvial deposit or a vein that had not been exploited in antiquity eluded the research team. Nevertheless, it was important not to underestimate the competence of ancient miners or to be satisfied with oversimplified explanations, such as the belief sustained by a majority of traditional scholars that equates tin with only one

source, Afghanistan. As such, our archaeometallurgical team was challenged to find the smelting furnaces, slag deposits, and workshops of the tin-production industry at Kestel. Thus, an intensive site survey was launched in the hinterland of the Kestel tin mine to seek these special function production sites (Yener 2000).

After 15 years of survey and excavation, the Early Bronze Age Anatolian highland production model of tin was formulated (Yener 2000, 2008). This dynamic model involves the two-tiered production of metal artifacts and the use of a diverse resource base. The first tier encompassed mining and smelting operations in the regions where rich ore deposits and forests were located, usually in the mountains. The second tier comprised lowland urban centers where the processed ores, in the form of either metal ingots or semi-processed materials, were refined, remelted, alloyed, and cast into various idiosyncratic metal assemblages. A great many new surveys and excavations have been carried out in other areas potentially supplying tin to a variety of other regions (for recent assessments of other sources, see Weeks 1999, 2003; Weisgerber and Cierny 2002; Nezafati, Pernicka, and Momenzadeh 2008, 2009; Chirikure, Heimann, Killick 2010; Killick and Fenn 2012). Especially important are the Bronze Age central Asian sources that yielded mines and equipment very similar to those of the Kestel mine (Garner 2014, 2015, with references).

Discovery of the Göltepe Tin Miners' Village

While excavations were continuing at the Kestel tin mine, preliminary survey work near Çamardı, carried out in order to delineate overall “man-mine” relationships, was ongoing. Three archaeological surveys near the tin source had been completed in 1987, 1988, and 1991 (Yener 1989, 1990, 1992, 1993, 2000). The sampling strategy of these surveys stressed the key underlying environmental and technological factors that may condition site locations, and it relied heavily on local informants, geological consultants, and traditional survey methodologies. Thirty-seven sites were located during the Çamardı surveys, which were based on 1:25,000 maps obtained from MTA (no. M33ba,

Kozan) and also on local ethnographic information. The main locus of settlement in this locality appeared to have been on the tops of hills overlooking the mountain passes, although some mounds were located 3 km due east of Göltepe in the Ecemiş fault line leading to the Kırk Geçit passes farther to the south (see Fig. 2). Located on a natural hillside 2 km southeast of the Kestel tin mine, the contemporary site of Göltepe (“lake hill”; Çamardı survey no. Ç13) was discovered and initially surveyed in the last two weeks of the 1988 field season (Yener 1995a, 1995b, 1995c, 1995d, 1996, 1997c, 1997d, 1997e). This fortified Early Bronze Age miners' village was visible from the Kestel mine.

The site of Göltepe sits strategically at the crossroads of two major routes: (1) the well-known Silk Road from Cilicia that transverses north through the Taurus passes, up the Ecemiş fault directly to Kayseri; and (2) the turnoff of the Silk Road to the northwest where it forks to Niğde. Located on top of a large, natural hill, cultural deposition could be discerned throughout the entire extent of the surface of the site. Additionally, surveys conducted by Tony Wilkinson in the nearby area notably identified patterns of land-use and evidence of terraced agricultural practices (unpublished report provided by Wilkinson). The Early Bronze Age miners' village is located at 1,767 m asl, approximately the same altitude as the Kestel tin mine. Its natural hill measured close to 60 ha in size (650 x 1,000 m; 150 m high), and it was settled in a sparsely scattered plan of habitation throughout its entire extent, but with a concentration at the summit surrounded by a circuit wall. Apart from its location and time span, the relatively unique morphology of Göltepe was a contributing factor to the selection of the site for excavation.

Presentation of the Material

This volume is intended to be the complete, final publication of the Göltepe excavations. While some of the material finds and instrumental analyses were published previously, herein is the full presentation of the architecture, stratigraphy, and material remains from the site. Many participants unfortunately have passed away in the intervening

years since the inception of the project, and their reports submitted to the excavations have been paraphrased.

Chapter 2 presents the pre-excavation sampling strategies and methodology behind the intensive surface surveys, test pit operations, and stratigraphic profile trenches (SPTs) at the site. These methods were all initiated in an attempt to determine where to locate excavation trenches, given the unusual topography of the natural hill and the subterranean nature of the dwellings. A description of the contexts of the SPTs is also provided.

The architecture and phasing of the structures are examined in greater detail in Chapter 3, which explains the results of the larger program of excavation. It is organized stratigraphically from the earliest structures in Period 4 (LC/early EB I, pit houses and basal pits, 4400–2900 B.C.), Period 3 (EB II, pit houses, 2900–2400 B.C.), and Period 2 (EB III, above-surface buildings, 2400–1900 B.C.) to the top strata buildings in Period 1 (Iron Age, pit houses and buildings, 10th–8th centuries B.C.). Each locus number is followed by descriptions of the finds found in that context and identified with Main Registration Numbers (MRNs) and figure numbers. Cataloged finds, which were divided in the field into bags of ceramics, bone, stone, and artifacts, each bag with a distinct MRN, are included for each locus organized by related contexts (see also the list in App. D), while specific objects given unique MRNs also appear in other chapters as well as in full in Appendix E. Excavation methods are given in more detail in Appendix A.

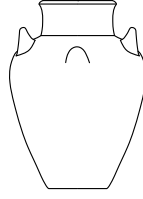
Returning to the main body of the volume, Chapter 4 deals with the pottery analysis and includes discussions of methodology, fabrics, shapes, motifs, and parallels; basic statistics are included, primarily in chart form (for the catalog, see this vol., App. C). Thin-section petrography and instrumental analysis of the different wares are also discussed, along with a brief consideration of the dates of the pottery within Chalcolithic, EB I, EB II, EB III, and Iron Age Anatolia. The small finds, including stone, metal, bone, and clay objects, are discussed in Chapter 5. Ground stone tools (heavy lithics)

are presented in Chapter 6, and select ground stone tools from the Göltepe surface survey are presented in catalog form. The results from grinding experiments on both ores and grains are included. Basic statistics are discussed for both Kestel surface surveys as well as intrasite differences between Kestel and Göltepe. Selected ground stones from excavated in situ contexts are presented as a catalog. Previously unpublished analyses of iron implements and the thin-section analysis of crucible/bowl furnace samples are discussed in Appendix B. Palaeozoological observations constitute the analysis of the faunal corpus in Chapter 7. Because a cemetery for Göltepe was never located, the skeletal finds from Kestel tin mine are especially relevant and are discussed in Chapter 8. Botanical finds are presented in Chapter 9, and remote sensing results focused on determining subsurface features in Chapter 10, representing one of the earliest such applications in Turkey. Finally, Chapter 11 includes summary overviews and general conclusions about the special function site, Göltepe.

Catalogs

Materials in this volume are designated by **B** for bone objects, **C** for clay objects, **M** for metal objects, **P** for pottery, **S** for stone objects, **SL** for slag, and **SP** for ore. Non-tool animal bones were not given specific catalog numbers, and they will be referred to in the text with their initial MRN, which typically refer to an entire bag of bone rather than to individual specimens. In most cases, special analyses of the individual bones from a bag with a MRN have been given specimen numbers. For pottery and other objects, the excavation MRN, locus number, and figure/plate number are provided. The catalog entries are presented as follows:

Catalog number of the object in this volume (excavation catalog number [MRN]; locus findspot; Figure; Plate). Identification of the object. Preservation. Measurements. Weight. Description. Decoration. Details of shape. Date.



2

Sampling Strategies at Göltepe

by

K. Aslıhan Yener

All excavation areas at Göltepe were selected on the basis of four sampling strategies: intensive surface survey, remote sensing, and the excavation of test pits (T) and SPTs (Figs. 5–7; see also this vol., Ch. 10, App. A). The sampling procedures for each strategy were predicated upon the morphological distinctions of the terrain noted below. Special attention was given to areas already exposed by villager trenching, and the results of the 1988 intensive surface survey were taken into consideration.

Intensive Surface Survey of 1988

Once the site of Göltepe had been identified, the first step was to initiate an intensive surface survey in 1988. The link between the Kestel tin mine and the miners' village at Göltepe was demonstrated by their contemporaneity as well as the presence of similar ore dressing equipment and ceramics. In fact, the villagers from Celaller who worked on

the excavation of the Kestel mine drew attention to the hillside on which the site is located when they pointed out the presence of large quantities of ground stone tools, which they had observed while grazing cattle there. The survey was intended to provide a look at the chronological relationship among operations in the Kestel mine, its workshop units situated on the Niğde Massif/Kestel slope, and a possibly related industry at Göltepe. The 1988 survey program included a 1 km area of the surface of the large Göltepe hilltop, which was strewn with cultural deposition.

The location of Göltepe, situated only 2 km from the Kestel tin mine, indicated that it was functionally connected to mining or smelting activities, although no traditional slag lumps or dumps were apparent on the site surface, thus leading some to erroneously reject the idea of a smelting location there altogether (Hall and Steadman 1991; Sharp and Mittwede 1994). In order to identify tin mining and tin smelting operations in the field, I visited excavations at the medieval Crift Farm in Cornwall and helped experts vanning in streams. Hand-sized

chunks of tin slag were collected in order to identify similar objects in Turkey (Buckley and Earl 1990). The observation of the obsidian-like, glassy slag residue samples from Crift Farm allowed for the realization that no amount of surveying near the Kestel mine would reveal such products, since the technology of smelting was different: the medieval smelting was accomplished in furnaces, while that of the Early Bronze Age occurred in crucibles/bowl furnaces (for a comparative analysis of slag from Göltepe and Crift, see Adriaens 1996). In fact, the smelted, vitrified metallurgical residues from Göltepe, the ore chunks from the Kestel mine, and even the scrapings of crucibles/bowl furnaces were ground down during the processing of tin metal and resmelted. Thus, no so-called slag heaps in the traditional sense are present at Göltepe, but rather they became part of the soil accumulation. This observation was recently confirmed by more recent assessments of the soil chemistry wherein analyzed surface soil was found to contain high amounts of tin (Hanilçi et al. 2010).

The unique morphology of the hill of Göltepe in addition to the time span represented by surface finds were contributive factors in the selection of the site for survey. Indeed, the site was distinguished by its large size, and, furthermore, there appeared to be a terrace-like feature on the northern spur of the hill. Before survey commenced, the expectation was to find deep cultural deposits in what appeared to be a mound-like accumulation on top of a natural hill; this expectation was only partially borne out, as is apparent below. The ceramics from Göltepe identified during the survey and test pit/profile trench operations (e.g., Anatolian Metallic Ware and burnished wares; see this vol., Ch. 4) were identical to those found in the Kestel tin mine, and they date the site to the late 4th–3rd millennium B.C. Although some ceramics were thought to be Iron Age and Byzantine in date, these were small in number. Additionally, quick reconnaissance indicated that the great quantities of ground stone tools lying on the surface of Göltepe were typologically similar to the ones found on the Kestel slope. The fact that there would not be an overburden of later strata at the site, thus giving easy access to Early Bronze Age levels, coupled with the extraordinary richness of ore dressing equipment on the surface were further advantages of the selection of this site for excavation.

The immediate aim of the surface survey was to provide information about the lateral spread and density distributions of material evident on the surface for eventual excavation trench locations, the excavation of which took place in 1990, 1991, and 1993. Six main sectors of the site were visually distinguishable. These distinctions were presumed to reflect different erosional patterns and thus varied depths of deposit. The morphological features were also strongly suggestive of functional variations within the settlement—that is, differential habitation quarters of the Early Bronze Age site.

The Göltepe survey design differed from the Kestel intensive surface survey in terms of time spent and method (for the Kestel survey, see Yener 2000). The survey units were mapped at intervals of 50 m north, east, and west from Datum A, a concrete Turkish government mapping elevation post at 1,767 m asl (Fig. 7; Yener 2000, fig. 17). On the northern terrace spur, an area of 300 m was mapped in each direction, with a total of six circular sampling units per axis radiating out from the datum point. Three more axes were placed every 22.5° between the north and west axes, and the same procedure was repeated between the north and east axes. Thus, the gentle undulating spur or terrace at the northern end of Göltepe was covered with nine axes, with each sample unit numbered consecutively downslope (A–O). The farthest extent of collection to the south was 700 m from Datum A at the summit. Finally, six more transect lines were placed running east–west, diverging from the north–south axis and extending downslope 150 m. In the four directions—north, south, east, and west—a total of 77 large (625 m², radius of 14.10 m) and small (100 m², radius of 5.45 m) circular sample units were generated in this manner.

Within the circular sampling units, each surveyor tied a rope around their waist defining a pre-selected size radius, usually 5 m in diameter and situated 50 m apart. All collection was done inside these circles. At first, all the circles were measured so that each would have a radius of 14.10 m, totaling 625 m² or the area of one triangle in a grid at Kestel (see Yener 2000). This approach was chosen so that the densities and distributions of finds could be compared to the Kestel survey. After 18 circles had been sampled, it became logistically impossible to carry the large amounts of collected material back to the dig house. The presence of

large diabase ground stone tools (some weighing 100 kg) and a general lack of time forced a reduction of the sample size to circles with radii of 5.45 m (100 m²). In the end, the ground stone tools were counted and left on the site surface.

Results of the 1988 Survey

Clear-cut data about the areas of density for eventual excavation derived from a surface distribution of artifacts on difficult sloping terrain. The single most abundant surface find, other than the coarse ceramics, was ground stone tools. Based on survey results, it was estimated that over 60,000 ground stone tools were distributed on the site surface. Other artifacts ranged from obsidian tools, ore, crucible/bowl furnace fragments, ceramics, molds, stamp seals, to vitrified materials. Registered surface survey finds include the following: **C43, C63, C164, L13–L20, S20, S21, S24–S29, S57, S58, SL9, SL16, SP1–SP6, SP194**, MRNs 47, 75, 100, 352, 1454, 1740, 4731.

When the collection areas were superimposed on the topographic map, it became obvious that the greatest concentrations (>51 finds) were situated within 100 m of the spine of the hill summit (Yener 2000, fig. 17). While deeper deposits under normal circumstances would have been indicated by greater densities of artifacts, this was not the case at Göltepe. Generally, the graywacke outcroppings on the summit were anomalously correlating with artifact densities. The initial interpretation of the densities nearer the outcrops was that the quantities of finds indicated the mound was eroding faster on the summit due to harsh mountain climate conditions. Along with this factor, the entire slope had been plowed up until recent times, and, in fact, modern villagers quarried the stones there for building material; indeed, many ground stone tools were located in wall foundations in nearby Celaller. These disappointing indications of an eroded site almost deterred excavation, but the location and surface finds were too attractive to not proceed.

Many of the sherds collected on the surface were coarse ware, found in large quantities at the site and resembling cooking pot wares or third-millennium B.C. baking trays. Twenty-five samples of these as-yet unknown coarse wares from the 1990 excavations were taken to the Smithsonian Institution's

Museum Conservation Institute for X-ray fluorescence (XRF) analysis (Yener 2000). The decision to export the sherds was predicated by results from observation with a simple hand lens. Revealed on the surfaces was a glassy black accretion resembling in small scale what turned out to be tin-rich slag, ultimately leading to the sherds' identification as crucible/bowl furnace fragments with heavily vitrified interior surfaces. Each crucible/bowl furnace also had a smooth, gray interior surface, which was tested and found to contain up to 30% tin (see this vol., Ch. 5). Instrumental analyses (XRF, microprobe, atomic absorption, secondary ion mass spectrometry) clarified that the bulk of the ceramic finds on the surface during the Taurus surveys of 1987 and Göltepe in 1988 were functionally smelting-related (Yener 2000, 2008, 2009, with references).

Other coarse ware sherds were later recognized as Early Bronze Age ceramics with eroded surfaces—that is, the burnished surfaces of the ceramics were not preserved on a majority of the surface finds and only the very coarse grit and straw temper was visible. Consequently, they were described as coarse cooking pot wares and/or relegated to the Byzantine period. This overall impression was reinforced by a more than usual number of Byzantine sites identified through survey throughout the Taurus Mountains, albeit based on firmer ceramic criteria (Yener, Özbal, Minzoni-Deroche et al. 1989; Yener and Toydemir 1993; Aksoy 1991, 1998). Recognition of these highland assemblages without local stratified sequences, however, hampered both the dating of the site and publication of this pottery.

On the basis of visual observations and surface survey, six main sectors of the site were selected for further testing, their morphological areas reflecting either different erosional patterns and thus variegated depths, or differential quarters of the Early Bronze Age site. The summit was completely denuded with ubiquitous outcrops of bedrock, and trenching by modern villagers revealed a 40 cm deposit on the western slope and deposits of at least 2 m on the other slopes. Aerial photographs also indicated the site was surrounded by concentric structural features suggestive of circuit walls on the summit. Local informants also noted that pits they themselves had dug into the site yielded several meters of deposit above bedrock. With this evidence in mind, subsequent selection of excavation trenches in the first season of excavation in 1990 avoided

these bedrock outcrops as much as possible. That the bedrock had been intentionally trenched was realized when semi-subterranean pit houses were found that had been cut into underlying basal clays using outcroppings as walls—that is, the cultural deposition consisted of the accumulation of strata all cut into underlying geologic sediments. Excavation revealed that ca. 100 m below and south of the summit on the western slope, the remains of the latest phase of the third millennium B.C. occupation were still preserved immediately beneath a 10–25 cm plow zone.

Particularly on the western and eastern slopes of the mound, ancient foundations and floor levels were located only a few centimeters beneath the surface. On the assumption that the observed morphological sectors were indeed significant, functionally differentiated zones, the planned areas of excavation encompassed a high-yield surface area of ca. 3.6 ha, broken up into six arbitrary, localized grids: Areas A–E (Fig. 7). The sectors included the following:

- (1) The flat-topped summit of the hill with its outcropping bedrock (excavation Areas A–C, D)
- (2) The gentle undulating spurs on the northern slope (test pits and profile trenches)
- (3) The gradual, step-like southern slope descending onto the summits of the neighboring hills (test pits and profile trenches)
- (4) The sharp drop on the western slope (excavation Areas A, B, and E, test pits, and profile trenches)
- (5) The gentler descent on the eastern slope (test pits and profile trenches)
- (6) The lower terraces near the stream at the foot of the hill below the southern slope (test pits and profile trenches)

Test Pit Operations

The excavation of shallow test pits (T-1 to T-46) was initiated during the first season in 1990 in order to determine whether any in-situ stratigraphy could be found in what appeared to be a much denuded site (Fig. 7). The test pits, as suggested by

field director James Knudsted, were situated in areas exhibiting the greatest concentrations of cultural material as revealed by the surface survey, avoiding flysch or graywacke outcrops of bedrock as much as possible. Predicting the slant and direction of the bedrock was possible because of the ubiquitous southerly 20° tilt of the underlying rocks. The excavation of these superficial windows into layers under topsoil avoided these bedrock outcrops in the search for the depth of the site deposit and determined future areas of excavation. As noted above, after excavations and remote-sensing resistivity results (see this vol., Ch. 10), it was realized that the bedrock had been dug in antiquity to accommodate neighborhoods of subterranean pit houses and production facilities.

Because of the size and lack of great depth at the site, the planned system of test-pit sampling was combined with a search for important architectural units and other features that might otherwise be missed by the surface survey. Accordingly, the remaining test pits were chosen in order to illuminate the nature of the over 600-m lateral spread of cultural material on the surface of the site. A wide part of the natural hill was subjected to test pits, with soil samples taken from each loci for ecofactual information and, most importantly, to detect aerosols or spherules formed as a result of smelting operations. The size of the intramural settlement on the summit was estimated to be between 8 and 10 ha, and, combined with the Kestel tin mine production areas on its slope, it yielded a substantial man-mine system, indicating an interactive socio-political and economic network connecting the mine to the special function site, Göltepe.

Test Pits T-2, T-5 to T-9, T-16, T-17, T-23, and T-24 were located on the flat-topped summit of the hill with its outcropping bedrock. Test Pit T-2 yielded crucible/bowl furnace fragments (C355). Test Pits T-5 to T-8, where trenching by modern villagers exposed a cross-section indicating stratified deposits, yielded fallen or dumped stones in a pit and ore (SP12). Test Pit T-8 and the surfaces surrounding T-5 to T-9 yielded ground stone tools (S121, MRN 73; see this vol., Ch. 6), stone molds (S20, S21, S24–S29; see this vol., Ch. 5), ceramics (MRN 70), and burned structural clay (MRN 71), and bone (MRN 72) and charcoal (MRN 75) from a looters' pit. Three phases could be distinguished in T-24, which was situated by Area B Pit

House 1 (see this vol., Ch. 3). A tumbled stone scatter was discovered on dense medium-brown soil with ground stone tools (MRNs 161, 1565, 1701), ceramics (**P25**, MRNs 162, 163, 1564, 1568b), charcoal (MRN 1567), and ore (**SP49**). This assemblage, which represented the first two phases, was overlaid by a dense, dark soil level with a floor surface on which partly crushed pots (**P24**), a ceramic object (MRN 1569), and bone (MRN 1570) were found. When the floor was discovered, T-24 was excavated to a depth of 90 cm and subsequently abandoned for wider excavation in the future. Test Pit T-9, situated north of the exposures of Area C-D, yielded a possible stone wall set in loose basal clay, burned structural clay (MRNs 915, 918), and cultural material such as ground stone tools (MRN 932), ceramics (**P14**, **P15**), ceramic objects (MRNs 917, 1562), obsidian (**L7**; see this vol., Ch. 5), and bone (MRN 1563), following an initial 20 cm of topsoil that yielded two stamp seals (**C354**, **S127**; see this vol., Ch. 5) and molded architectural fragments (**C43**, **C63**; see this vol., Ch. 5); soil samples (MRNs 919, 1600) were taken. Test Pit T-9 was excavated to a depth of 55 cm, and work stopped when sterile levels of firm basal clay were reached. Test Pits T-2, T-16, T-17, and T-23 reached basal clay following a thin layer of cultural debris.

The greatest concentration of test pits was placed on the sharp drop on the western slope. Test Pits T-31 and T-32, discussed below, were merged into Area B when a major north-south circuit or terrace wall emerged. Test Pits T-25 and T-26 were placed on the western extension of the east-west axis in order to research the westernmost extent of the mound. Test Pits T-37 to T-43 were placed on the southwestern spur and yielded slag (**SL11**). Test Pit T-36, yielding greater than usual depth, was excavated to 1 m when basal clay emerged. Three phases could be distinguished after the removal of 25 cm of topsoil. Tumbled heavy stones emerged in denser brown subsoil, but no signs of a structure in situ or stratified soil deposits were encountered. The cluster of test pits in the southwestern spur indicated cultural deposits were rich in this sector. Three phases, one with massive stones, a hard, irregular earthen surface, signs of burning, and rich cultural material (**S61**, MRN 1441; see this vol., Ch. 6) emerged in T-37, and the test pit was enlarged to 2 x 1 m as a result of the rich material finds. Excavation in Test Pit T-38, the farthest set

on the southwest knoll located ca. 400 m from the summit Datum A, as well as that in T-41 and T-42, reached bedrock underneath shallow deposits of cultural material situated immediately under topsoil. Test Pit T-38 yielded ceramics (MRN 491) and ground stone (MRN 492); a soil sample was collected (MRN 493). Shallow Test Pits T-25, T-39, T-40, and T-43 yielded cultural material after topsoil, and excavation was stopped for future exploration. Test Pit T-26, measuring 2 x 1 m, yielded unusual material. A small, scrappy wall of one to two courses made of medium-sized stones and set on bedrock emerged, and dark-stained stone chips with dark-stained, dense soil covered the irregular bedrock. No signs of burning could be identified, however, and the dark staining may have been transported from elsewhere on site.

Test Pits T-1, T-27 to T-30, and T-44 were placed on the gentle undulating spurs of the northern slope. In Test Pits T-1 and T-27, bedrock was reached after 25 cm of topsoil and slight cultural debris. Test Pits T-28 to T-30 were placed 350 m below the summit on the north-south axis in order to test the northernmost extent of Göltepe. Test Pit T-30 was excavated to 30 cm, and it revealed slight cultural debris in a dense, light olive-green soil underlying the topsoil. Test Pit T-44 was opened on the basis of resistivity results, which indicated a positive anomaly (see this vol., Ch. 11). After the removal of about 25 cm of topsoil in the area of these test pits, 90 cm of cultural debris including ground stone tools (MRNs 1276, 1581, 1583, 1704-1706), ceramics (MRNs 1277, 1572, 1702, 1703), ore (**SP43**, **SP51**), slag (**SL5**, **SL6**), an iron artifact (**M6**; see this vol., Ch. 5), a hematite weight (**S6**; see this vol., Ch. 5), and a stone object (MRN 1580) were found within a tightly packed stone collapse; a soil sample also was taken (MRN 1559). This deposit continued to a depth of 2 m and excavation stopped at this point. This test pit subsequently became part of Period 3 Terraced Building 2 (see this vol., Ch. 3).

Test Pits T-3, T-4, T-10 to T-15, T-18, and T-19, placed on the southern summit, were later integrated into the trenches of Area A. All revealed cultural material below an initial topsoil overlay of 20 cm, while some test pits had a dense compact layer of soil with sherds and ground stone tools and ore (**SP26**, **SP27**, **SP30**, **SP31**) with signs of burning. Excavation of some of the test pits was halted after reaching cultural deposits 25 cm below the surface

to allow future investigation. Test Pit T-3 was integrated into Trench A06, T-19 was expanded as Trench A28, T-11 was expanded as Trenches A02 and A03, and T-4 was extended as Trenches A23 and A24. All are discussed below within the context of the pit houses (see this vol., Ch. 3). Test Pits T-12 and T-20 to T-22 were placed on the north-south axis extending down the southern slope 500 m from the summit. The last three test pits located at this southern extremis of the hill reached bedrock after 25 cm. Only one phase, represented by a dense layer of soil with ground stone tools and other cultural material such as a roundel (C32), slag (SL4), ore (SP7), and a weight (S150), was intact following a thin layer of topsoil.

Test Pits T-33 to T-35, T-45, and T-46 were placed on the eastern slope of Göltepe. In Test Pit T-33, an initial light brown topsoil level with tumbled small stones, sherds, and ground stone tools overlaid a more dense brown soil with cultural material. Underlying this was a dense layer consisting of a mass of small- to medium-sized stones in a dense matrix of basal clay and more cultural material. Test Pits T-34, T-35, T-45, and T-46 all reached bedrock at its usual strike and angle after a depth of ca. 30 cm and yielded material such as ore (SP46, SP47). Although resistivity sampling indicated anomalies in this region, and Test Pits T-45 and T-46 were specifically executed to investigate these anomalies, most of the results indicated the presence of talus rather than deep deposits. Aerial photographs as well as morphological features identified by the staff geomorphologist seemed to point to an anomaly akin to either a projecting terrace or a circuit wall in this sector.

A few conclusions were drawn from the results of the test pits and survey prior to excavation. First, a circuit wall surrounded the site, although an alternative interpretation was a terrace wall. Secondly, the perimeter of the site was now in line with a believable, actual site size: the density of population in the walled-in summit measured 5 ha; a less dense, scattered, extramural settlement extended between 8 and 10 ha. This estimate is conservative, and it is still possible that pit houses were dug all over the landscape between the site and the mine, because the mine slope also had pit structures. Although the spread of cultural material over the surface of the natural hill measures 60 ha, however, it is believed that some of this was due to

erosion. These estimates of size of course do not include the Kestel tin mine or its 1 km slope area, where evidence of structures and contemporary pottery was also found (Yener 2000). Thus, linked together as a man-mine system, the total of 60 ha is probably closer to reality.

Profile Trenches

This section is based on unpublished field notes by Thomas Chadderdon.

In 1991, a SPT measuring 1 x 10 m was placed cutting across a portion of the site in an east-west direction, in order to determine the formative processes of the site and to explore the possibility of deeper deposits, as indicated by test pits excavated during the 1990 season (SPT 1; Fig. 5; see also this vol., Ch. 3). The trench was designed to obtain information on the cultural morphology of the western slope of the hill. To this end, the length of SPT 1 was extended 60 m from the summit downslope to the circuit wall. Within this distance it was apparent that there has been a tremendous amount of modification to the slope.

There were several areas of occupation evident over the 60 m of the western slope as revealed by SPT 1. One of these areas was at the summit, where the extent of occupation was at least 10 m in length (and very likely more), continuing to the east in unexcavated areas. Here there was evidence of bedrock cuttings, but the surface was flat enough that no extensive leveling took place in antiquity. Downslope to the west there was a strip of unmodified bedrock about 5 m long, before reaching an 18 m stretch of modified bedrock. Modification included cutting the bedrock to about 2 m deep and leveling it off for another 17 m to the west. Within that 17 m, there was at least one or perhaps two bedrock structures and three pits.

The long stretch of modified bedrock was followed by another 6 m of unmodified bedrock before coming to a cut in the bedrock about 3.50 m deep. This cut may well have been a modification of a natural escarpment. A leveling of the bedrock 12.5 m long followed. This area included a prepared clay floor about 3.75 m long and probably also a wall, the evidence of which was primarily in the form of a modern villager's trench that presumably

was used to rob stone for construction. An additional north-south stratigraphic unit (1 x 10 m; SPT 2; see below and this vol., Ch. 3) excavated here as a 4 m northward extension of SPT 1 revealed that occupation continued to the north. The modification here was less extreme; rather than cutting bedrock to level it, it appears that it was filled in and then capped by a floor. Continuing downslope, there was a 5 m stretch of unmodified bedrock. At the end of this stretch was the circuit wall. It was certainly possible that there was additional modification and occupation downslope.

During the excavation of SPT 1, units were labeled with locus designations of both 000 and 999 (for more information on methods of excavation and recording procedures, see App. A). The latter was used earlier in the 1990 season to reserve 000 for topsoil and also to indicate that the unit was being excavated in an uncontrolled and un-screened manner in order to obtain a subsurface profile. Collections were made, but only on the basis of sight-screening. Ground stone was recorded but not collected.

Following excavation, the cross-section of SPT 1 was inspected, and locus numbers were assigned to individual lenses. There were also two controlled excavations in Strips B05-09 and B06-02. Both measuring 1 x 2 m, these units were designed to provide controlled samples for comparative purposes. The location of these strips was initially determined by the results of the 1990 magnetic resistivity tests (see this vol., Ch. 10), which indicated the presence of a deep anomaly that was investigated more fully with the excavation of units B05-0700-000, B05-0800-000, and B06-0100-000 (see this vol., Ch. 3, pp. 45-52). The remaining units were extensions of B05-0700-000.

Two buildings were revealed in SPT 1 and SPT 2, Terraced Building 1 and Terraced Building 2 (see this vol., Ch. 3). It is entirely conceivable that these structures are contemporary buildings constructed at different levels, a situation observable today in the houses of the modern village of Celaller, which are built on the slope of the Niğde Massif adjacent to the Kestel tin mine. The different levels thus are attributable to different floor-leveling procedures. In fact, the controlled excavation in Strip B06-02 indicated that irregularities in the bedrock were filled with trash and then capped by a floor to create a level surface. These irregularities are up to 1

m or more in depth, approximately the difference between the elevations of the two structures. The higher-elevation Terraced Building 2 collapsed, and there are collapse deposits on the floor.

Admittedly, our understanding of site structure at Göltepe was poor, limited to only a few excavated contexts and lacking chronological control. Magnetic resistivity investigations conducted during previous field seasons, however, indicated that additional and extensive archaeological features were present across the summit as well as on the slope (see Ch. 10). Presumably these features would prove to be similar to those already excavated. Overall, our impression of occupation at Göltepe going into the 1991 field season was that it had been rather modest in terms of the style and size of structures.

That impression changed over the course of the 1991 season when excavations in Area A were expanded and excavations in Area B began. Area A indeed contained pit houses, but the occupation there proved to be complex in ways that defied a characterization of "scrappy." The work in Area B started with the excavation of Trench B05, centered on one of two large resistivity anomalies on the northwestern slope of the hill. Each of the anomalies was manifest on the ground surface as a change in the gradient of the slope. In Trench B05, located lowest on the slope and having the greatest change in gradient, a jumble of large rocks immediately below the ground surface was uncovered, which was only the beginning of a massive quantity of what appeared to be structural rubble. Because of the potential frustration of removing tons of rubble to an unknown end—that is, there may have been no cultural deposits at the base of the rubble—the investigation strategy in Area B shifted to the excavation of a 1-m wide stratigraphic trench along the southern side of Trench B05 and parallel to the slope. This trench was designed to more quickly determine the profile of the resistivity anomaly and more effectively plan for its excavation.

What was found in the stratigraphic profile trench (SPT 1) was a terrace that had been hand-cut into the slope of the hill. The upslope wall of the terrace was cut ca. 3.5 m below the original ground surface and to within 30° of vertical. The level base of the terrace was ca. 6 m long, and it extended west to the original sloping ground surface. At the base of the cut terrace was a prepared floor that evidently leveled and filled in irregularities of

the bedrock. Multiple layers of plaster suggested the floor may have been re-plastered several times. The entire terrace from the base to the present ground surface was filled with rubble, presumably debris from the collapse of the walls of a structure that had been built on the terrace. Most of the stones were large and tabular with faces up to 50 cm long and most likely quarried from the bedrock that was removed to make the terrace. Very few artifacts were recovered from within the wall fall and no domestic or industrial features were identified in the profile.

The stratigraphic trench was eventually extended 10 m downslope to the circuit wall and 40 m upslope to the summit. Ultimately, the trench revealed a second terrace with three subfloor pits in the upslope resistivity anomaly and at least one more pit just off the level summit. The second terrace was much shallower and logistically easier to excavate in the time remaining in the field season. Trench B11 was opened over the area and evidence of a pit house structure was found.

Excavations in Area B showed that immense effort had gone into creating habitable terraces on the steep slope of Göltepe. Certainly the occupation there was appearing less and less scrappy, but what we knew of that occupation was based on limited excavation at the southern end of the summit and in SPT 1 on the slope 150 m to the north.

Göltepe appeared to be a natural feature, and the contours of the hill were assumed to be the natural result of the same geologic and geomorphologic processes that created the contours of the surrounding hills and mountains. The only obvious cultural feature on the slope of Göltepe was the circuit wall, traceable on the northwestern slope in part because of a trench where stone had been quarried from the circuit wall by modern villagers to build homes in the village of Celaller. Knowing that there were cut terraces on the northwestern slope, however, suddenly gave a new perspective on the morphology of the slope around the entire circumference of the hill. Irregularities such as abrupt changes in gradient over short distances on the slope south of the stratigraphic trench seemed to align with the cut terraces found in the trench, indicating that those terraces either extended to the south or there were additional terraces to the south that were discontinuous with those in the stratigraphic trench. Around the northern

end of the hill were what appeared to be agricultural terraces associated with modern building and land use. But at the same time, several features that appeared to be rock outcrops seemed to be in an alignment with the circuit wall. The eastern slope of the hill has a steeper aspect, probably due to the dip and strike of the bedrock that composes the hill. Changes in gradient on the eastern slope could also indicate cut terraces. The southern end of the hill is a broad, level expanse beyond the excavation units in Area A that eventually turns into a ridge. Yet even across the broad flat were several drops of 1 m or less, and excavations indicated that these were also cultural in origin.

Profile Trenches BT-1 to BT-36

Considerable area on Göltepe was excavated with profile trenches (BT), but an even larger area remained untouched. In total, 36 profile trenches around and on the summit were excavated. The trenches averaged 9 m in length and 1 m in width, for a total of ca. 324 m² of small profile trenches.

The excavation of profile trenches took place in the later part of the 1993 field season (Table 2.1; Figs. 6, 7); these trenches were initiated with the occasional help of a backhoe, which was utilized only on the natural hill to clear topsoil. Göltepe and its immediate surrounding naturally divides into six areas: the eastern slope, a long, flat area to the south, a small, flat area to the southwest, the western slope, the northern slope, and the flat top of the hill. Each area was sampled with profile trenches to greater or lesser degrees in order to determine if cultural modifications of the natural hillside similar to those on the western slope were present. On the western slope, profile trenches were used to explore the nature of apparent cultural features between Areas B and E.

Excavation in Areas A and C provided a good sample of the top of the hill, so only a single trench, BT-35, was placed there to investigate a feature of uncertain origin. No excavation took place on the eastern slope of the hill, except for a single strip, C26, situated far downslope. Profile Trenches BT-1 to BT-3 were located on the northeastern part of the eastern slope. They were situated in a line that continued the 60 m length of STP 1, which was

BT	Location	Length (m)	Deposits	Features
1	Northeast slope	6.08	Slope wash with cultural debris	Cut bedrock pit
2	Northeast slope	10.08	Slope wash with cultural debris and structure collapse	Cut bedrock terrace, possible wall, prepared floor
3	Northeast slope	8.40	Natural and cultural	Possible feature at east end
4	East-central slope	9.20	Structure collapse	Cut bedrock terrace, possible structure
5	East-central slope	8.40	Slope wash with some cultural debris	None
6	East-central slope	9.20	Slope wash with some cultural debris	None
7	Southeast slope	9.60	Slope wash with some cultural debris	None
8	Southeast slope	10.20	Jumble of small- and medium-sized rocks with some cultural debris	Possible building stone quarry
9	Southeast slope	8.30	Jumble of small- and medium-sized rocks with some cultural debris	Possible building stone quarry
10	South flat	10.18	Mixed cultural debris	Natural bedrock outcrop with rubble dumped over
11	South flat	8.56	Natural	None
12	South flat	8.90	Natural	None
13	South flat	8.50	Natural	None
14	South flat	10.70	Natural	None
15	South flat	8.60	Natural	None
16	Southwest flat	9.50	Natural with some cultural debris	None, possible occupation upslope
17	Southwest slope	11.20	Natural and cultural	Pit with several partial pots
18	Southwest slope	9.26	Natural	None
19	Southwest slope	8.70	Slope wash with some cultural debris	None
20	Southwest slope	9.58	Natural and cultural	Possible pit, occupation upslope
21	Southwest slope	19.60	Structural collapse	Two cut bedrock terraces and wall
22	Southwest slope	7.66	Natural	None
23	West-central slope	13.90	Possible structural collapse	Cut bedrock terrace, possible floor
24	West-central slope	7.60	Structural collapse	Cut bedrock terrace, wall, possible floor
25	West-central slope	10.66	Slope wash and cultural debris	Cut bedrock and bedrock pit
26	West-central slope	8.10	Slope wash with some cultural debris	None
27	West-central slope	7.30	Natural	None
28	Northwest slope	10.40	Possible structural collapse	Cut bedrock
29	Northwest slope	5.24	Natural	None
30	North slope	12.04	Cultural	Two cut bedrock pits, one with rock platform or wall foundation
31	North slope	7.10	Slope wash with some cultural debris	None
32	North slope	7.26	Natural with some cultural debris	None
33	North slope	8.90	Wall collapse	Circuit wall in cut bedrock
34	North slope	10.80	Slope wash with some cultural debris	None
35	Central flat	7.60	Cultural	Two pits, whole pot
36	West-central slope	10.78	Structural collapse	Cut bedrock, wall, possible floor, whole pot

Table 2.1. Summary of profile trenches (BT).

excavated in 1991, through Trench C01-02 on the summit (Fig. 7). In effect, this line created a discontinuous stratigraphic trench some 170 m long, bisecting the northern end of the hill. Trenches BT-4 to BT-6 were situated so as to provide a discontinuous 50 m profile of the central part of the eastern slope. Profile Trenches BT-7 to BT-9 were placed in a large, sweeping hollow on the southeastern slope below excavation Area A.

South of excavation Area A, the hill of Göltepe becomes a long broad, flat area. Artifacts were present on the surface, but in a much lower density than on the crest and slope of the hill. Profile Trenches BT-10 to BT-15 were staggered across this southern flat to about 200 m south of Area A (Fig. 6). Off the southwestern corner of the hill is a second prominent flat area, almost a secondary summit of the hill. A single profile trench, BT-16, was placed on that flat. Profile Trench BT-17 was located between BT-16 and excavation Area E.

Regular excavations in Areas B and E had demonstrated the nature and scale of occupation on the west slope (for results of the 1990, 1991, and 1992 excavation seasons, see this vol., Ch. 3). Profile trenching on the western slope therefore could focus on filling in the gap between the two excavation areas and exploring specific topographic features thought to be cultural in origin. Profile Trenches BT-18 through BT-20 were lined up immediately below the westernmost limit of excavation in Area E (Fig. 6). Area E itself constituted a 40 m section of the hill, and the profile trenches discontinuously extended that section west for an additional 60 m to the edge of a very steep drop in the slope.

The slope between excavation Areas A and E had many ridges and was covered with rock piles, both of which suggested the presence of subsurface features. Profile Trenches BT-21 to BT-27 and BT-36 were laid there to investigate those surface features (Figs. 6, 7). Profile Trench BT-21, the longest single profile trench dug at the site, cut through two ridges and bisected a rock pile. Profile Trench BT-22 was dug between two rock piles. Profile Trenches BT-23 to BT-26 were placed in the middle part of the slope, while BT-27 enabled the investigation of an area far downslope to the west. Profile Trench BT-36 was placed at the top of the slope.

Profile Trenches BT-28 and BT-29 were located on the northwestern slope, in the northwest section of Area B, in order to further investigate the circuit

wall (Figs. 6, 7). The northern slope is a long, narrow nose that descends across several terraces and/or rock outcrops. Profile Trenches BT-30 through BT-35 were placed there in order to investigate the features. The most distant trench on the northern slope was BT-29, ca. 120 m from the edge of the hilltop (Fig. 6).

Once the location of a trench was selected, its ends were marked with pinflags. In all cases, the trenches were laid out parallel to the slope of the hill. With the exception of BT-21, all profile trenches initially were laid out to be 10 m long, but in many cases the final length of the trench was either over or under 10 m. When it became apparent that a trench would reveal no cultural deposits it was terminated short of 10 m. There were also instances where a trench was lengthened when it was exceptionally interesting, for example BT-2, which was considered important enough to extend by hand.

EASTERN SLOPE, BT-1 TO BT-9

Profile Trenches BT-1–BT-3 were situated in a line on the northeastern part of the eastern slope (Figs. 6, 7). They also roughly lined up with SPT 1 in Area B and excavation in Area C in 1993, thus helping create a discontinuous profile across the top of the hill. Profile Trench BT-1 was just off the flat of the hill, cutting through a slight ridge that runs the length of the eastern side. There was no cut bedrock terracing in the trench, but there was a bedrock pit, essentially the same as the many bedrock pits found in SPT 1. The pit was bell shaped, about 1.15 m deep and 1.20 m wide at the bottom. The fill consisted of mixed cultural debris that did not appear to be trash. It is likely that the pit was intentionally filled in a single episode.

Profile Trench BT-2 was only ca. 10 m downslope of BT-1, but its excavation revealed the presence of a cut bedrock terrace and a possible wall (Figs. 6, 7). A layer of red clay on the bedrock appeared to be a floor, and the deposits above consisted of large and small rubble typical of structural collapse. Profile Trench BT-3 was situated ca. 20 m below BT-2, well down the eastern slope. Most of the trench was sterile, but the final 2.40 m downslope showed a layer of mixed cultural debris about 50 cm thick.

Profile trenches BT-4 to BT-6 were in an east-west line in the central part of the eastern slope (Figs. 6, 7). Profile Trench BT-4 was just off the

eastern edge of the hill, very near the A02 excavation area. It exposed a cut bedrock terrace some 2.40 m deep, structural stone rubble in the southern wall of the trench, and cut bedrock in the northern wall. There was a possible stone wall against the western cut, and the structure the stone wall belonged to lies to the south of this trench. Profile Trench BT-5 was located 10 m below BT-4. It revealed no features and only shallow deposits consisting of slope wash with some cultural debris. Identical deposits were found in BT-6, situated 10 m downslope from BT-5.

Profile trench BT-7 was located in the southern portion of Area F near large exposures of bedrock (Figs. 6, 7). No features were revealed, and the deposits were slope wash with some cultural debris probably derived from occupation in Area A. Profile Trenches BT-8 and BT-9 were located well below the southernmost excavation in Area A, in a large, sweeping hollow on a very steep section of the eastern slope. No features were identified in the trenches, but the deposits were unique, consisting of a very thick layer of large and small angular debris derived from bedrock. This layer is debris but is very loosely packed and mixed with ground stone and other cultural debris (P60). It is possible that this part of the hill was a quarry where stones for construction were obtained, or a natural feature of the hill used to dispose of rubble that included discarded cultural material.

SOUTHERN FLAT, BT-10 TO BT-15

Profile Trench BT-10 was situated ca. 40 m south of the southernmost excavations in Area A (Fig. 6). It cut through a low ridge that marks a drop of about 1 m in the elevation of this flat area at the southern end of the hill. The ridge itself seemed to constitute a feature formed with mixed cultural debris, which appeared to be mainly structural rubble that was dumped over a somewhat less-pronounced natural ridge created by a bedrock outcrop. This dump may have been intentional leveling of the bedrock ridge. Although no other, more definable features were exposed, the ridge continues for some distance southwest and northeast of the trench, and it is possible that there are occupational features elsewhere along the ridge.

Profile Trenches BT-11 and BT-12 bisected a similar ridge-like feature, but they did not reveal

evidence of a cultural origin. Profile Trenches BT-13 to BT-15 were dug at regular intervals to ca. 200 m south of Area A (Fig. 6). While there was sparse artifactual debris on the surface throughout the area, all of these trenches were very shallow and showed only natural deposits.

SOUTHWEST FLAT AND SLOPE, BT-16 AND BT-17

Profile Trench BT-16 was in a prominent, flat area to the southwest of the summit, ca. 30 m below its highest elevation (Fig. 6). There was sparse cultural debris on the surface, but only a very small amount of cultural debris subsurface. Because of the steep slope of the hill, it is likely that this part of the site has been greatly affected by erosion. The deposits were complex and probably the result of slope wash. The cultural material thus could have been derived from a considerable distance upslope.

Profile Trench BT-17 was on the southwestern slope between BT-16 and the excavations in Area E (Fig. 6). This trench contained a thick deposit of yellow decayed bedrock that was nearly sandy in texture, quite unlike deposits discovered anywhere else on the site. A pit had been dug into the deposit, and at the bottom of the pit the better part of at least three ceramic vessels (P61, MRN 2359) was found.

WESTERN SLOPE, BT 18 TO BT 29 AND BT-36

Profile Trenches BT-18 to BT-20 were placed so as to continue the profile of Area E as far as possible downslope to the west (Figs. 6, 7). Profile Trench BT-18 was placed 10 m below the westernmost excavation in Area E. Notwithstanding the considerable features found only 10 m upslope (i.e., Terraced Buildings 1 and 2; see this vol., Ch. 3), this trench was shallow and devoid of cultural deposits. Profile Trench BT-19, located 10 m downslope from BT-18, lacked cultural features but did exhibit slope wash deposits containing some cultural debris. Profile Trench BT-20 was ca. 15 m below BT-19 and situated at the very edge of a precipitous drop that would have been a natural limit to occupation on this part of the hill. While the lower part of the trench showed nothing but shallow deposits lacking cultural debris, the 3 m of the trench upslope exposed cultural deposits ca. 1.60 m deep. The depth of these deposits suggests that there may be areas of occupation between BT-19 and BT-20.