AMUQ VALLEY REGIONAL PROJECT

K. Aslıhan Yener and Tony J. Wilkinson

In 1997 a short one month season (12 September to 12 October) continued the ongoing regional program of geoarchaeology and archaeological survey in the Amuq Valley. Directed by Tony J. Wilkinson, the initial aim was to reconstruct the palaeoenvironment of the Amuq. During this first phase of our investigations several new sites were discovered in the drained Lake Antioch basin and unsurveyed sectors of the Amuq Valley, bringing the total to 203 sites. Preliminary topographical maps and settlement pattern distributions were completed. Our intent in the future is to assess long-term changes in the region's population and ecology and to place the Amuq into a broader regional context by examining areas of potential metal extraction within the Amanus Mountains. By finding and recording gold and copper sources and by determining their dates of extraction from the mines we hope to describe the archaeological diversity of the Amuq. Tell Kurdu, a major Chalcolithic period site dating to ca. 4500 BC, is targeted for large scale excavations in 1998.

The 1997 season was conducted under the auspices of the Turkish Ministry of Culture, Directorate General of Monuments and Museums. The 1997 team consisted of K. Aslıhan Yener, Tony J. Wilkinson, Eleanor Barbanes, Simrit Dhesi, Kubra

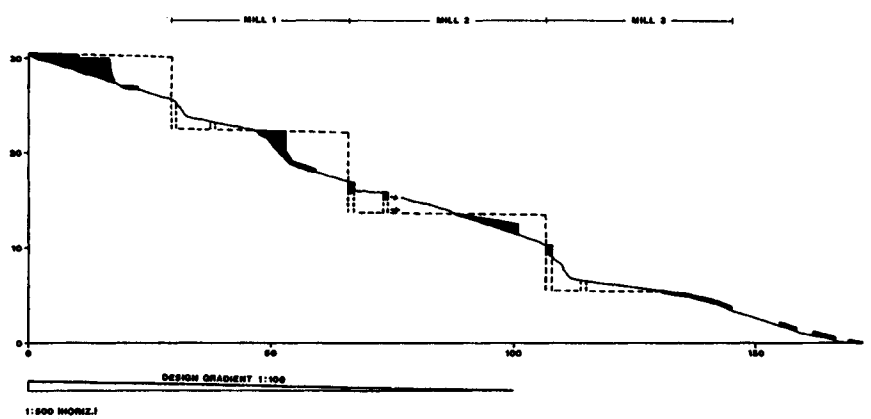

Figure 1. Reconstruction of flight of three Roman/Byzantine water mills west of Yenişehir, mapped by Eleanor Barbanes and Simrit Dhesi. Millstones, located in milling chambers below penstocks (shaded and dotted), were turned by water emitted under pressure from vertical pressure pipe

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Preliminary archaeological survey has charted the dynamics of human settlement and has shown that there has been significant change in settlement locations over the past seven or eight thousand years. The discovery of the small site of Dutlu Höyük (AS 200) considerably enhances our knowledge of the Neolithic of the plain. Half of this site was removed by earthmoving machinery a number of years ago, with the result that masses of pottery are strewn over the ground. Being mainly of Amuq Phases A and B date, this is one of the rare examples of a single-period ceramic Neolithic site in the Amuq. During the Chalcolithic period through the beginning of the Early Bronze Age, ca. 3000 BC, the largest sites in the Amuq appear to

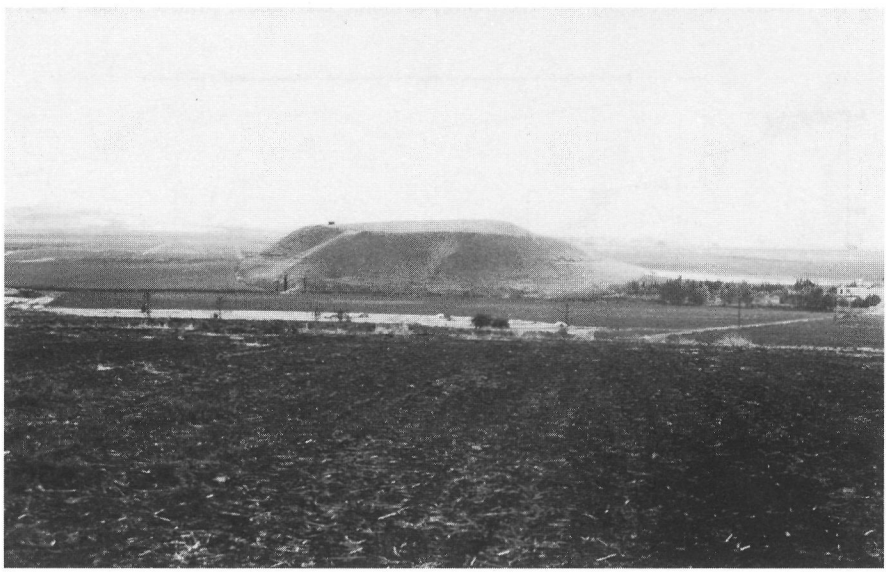

Figure 2. View of Daudpaşar on Afrin River, originally discovered by Robert Braidwood

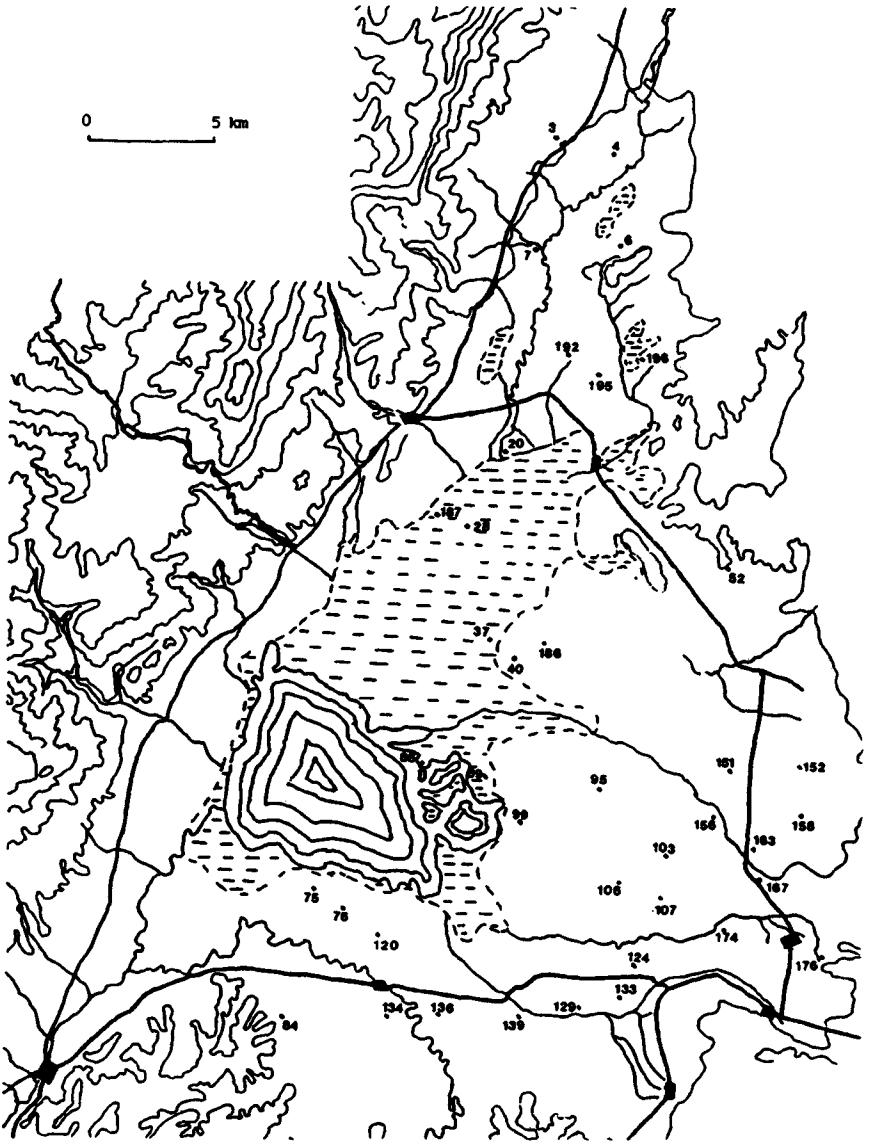

Figure 3. Distribution of Late Bronze Age sites in Amuq Plain. Drawing by J. Verstraete

have been Tell Kurdu (Amuq Phases C–E) and neighboring Tell 'Imar (Amuq Phases E–G) located near the center of the valley. After a hiatus of perhaps a few centuries, the main settlement of the plain shifted towards the southern fringes of the plain where Tells Ta'yinat and Atchana (Alalakh) grew up nearer to the main east-west route linking the Aleppo region with the Mediterranean coast. The alternating nature of occupation between these twin urban center sites may result from periodic environmental events or socio-economic factors. Finally, with the integration of the area into the Seleucid Empire, the capital appears to have shifted west, first to Antigonia, and then to Antioch. During the Roman period, the pre-eminent

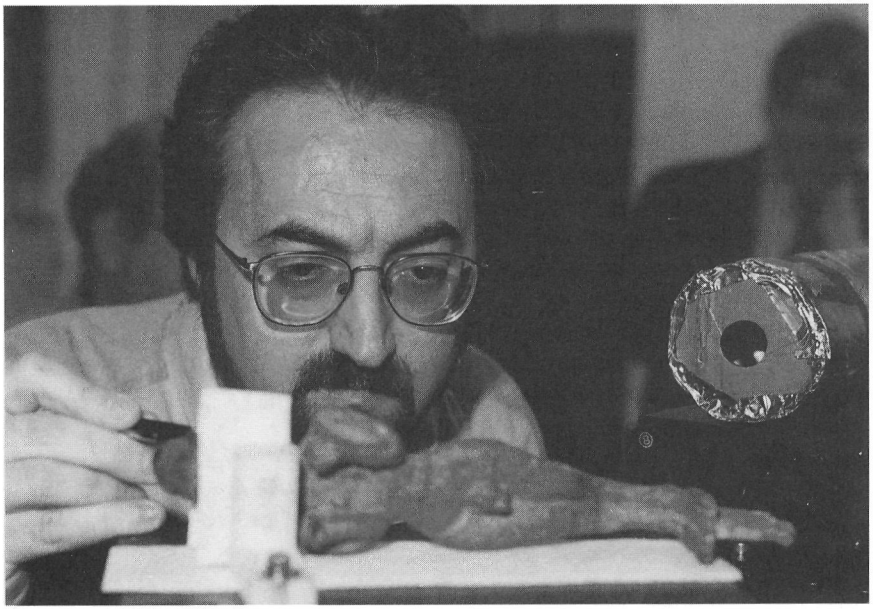

Figure 4. Ercan Alp oversees analysis of Judaidah figurine at Argonne National Laboratory's Advanced Photon Source

site within the plain was Imma, located at modern Yenişehir in the southeast sector of the Amuq Plain. In this sector of the plain we find that the landscape of the limestone uplands intersects with that of the plain, and at Khirbet al-Tahun we were able to record a full flight of Roman/Byzantine water mills that must have operated just outside town of Imma (fig. 1). Further processing of survey data will help isolate whether factors such as the growth of Lake Antioch, riverine flooding, or economic changes were influential in such shifts of settlement. One testable hypothesis is that there was a change in the valley economy from farming of major staple crops and pastoralism to that of "wealth finance" or trade-based systems. The wealth economy would have been based, we think, on metal production centered on the nearby Amanus or Taurus Mountains. A relocation of settlements towards major routes of access is one such indication of a shift in the economy towards increased trade and exchange of economic products.

As part of the Amuq Project, a new project, directed by Jan Verstraete of the University of Cincinnati, was established in 1996 to document the relationship between the Aegean (including Cyprus) and the local cultures of the plain. During the 1997 season 31 known sites were visited, located by Global Positioning System (GPS), described, measured, drawn, photographed, and sampled, and 7 new sites were discovered and recorded. In total over the 1996 and 1997 field seasons 116 sites were visited, of which 94 are previously known from the original Braidwood survey and 22 are new discoveries (fig. 2).

Jan Verstraete reports the following results: Sixty-one sites could be dated to the Middle Bronze to early Iron Age. Preliminary conclusions drawn from the data suggest that during the Middle Bronze Age (Amuq Phase L) the Amuq was densely occupied, with sites evenly spread over the plain. During the next phase, the Late

Bronze Age (Amuq Phase M), sites were concentrated at the eastern and southern sides of the Amuq, mainly along the Orontes and Afrin Rivers (fig. 3). At the beginning of the Iron Age (Amuq Phase N) there was a marked increase in the number of settlements (forty-two sites) especially at the eastern and western edges of the plain.

Aegean or "Aegeanizing" pottery was found on twenty-three sites, but only four of these sites had definite Bronze Age sherds. The sites with Aegean pottery are concentrated in the northern part of the plain, along the Kara Su River, and at the southern and eastern edges, along the Orontes and Afrin Rivers. During 1997, a more intensive survey was conducted on two sites, Baytarli-Toprakli (AS 40) and Ta'yinat (AS 126). Comparisons were sought respectively between the small, unexcavated site AS 40, which was occupied during the Middle Bronze and Late Bronze Ages, and the larger site of Ta'yinat, excavated during the original campaigns of the Oriental Institute during the 1930s.

While fieldwork was progressing, ongoing programs of instrumental analysis generated a great deal of interest in the press. A Collaborative Seed Grant between the University of Chicago and Argonne National Laboratory was renewed for a second year with exciting results. A source of brilliant non-destructive X-rays, the Advanced Photon Source (APS), was made available to us for high precision compositional identification. Predicted to provide compositions to parts per billion, the APS has the distinct advantage of not damaging artifacts. The beamlines at APS/SRI and ChemMatCARS (the University of Chicago facility) include a capability, synchrotron radiation X-ray fluorescence (SR-XRF), that measures the spectra emitted from

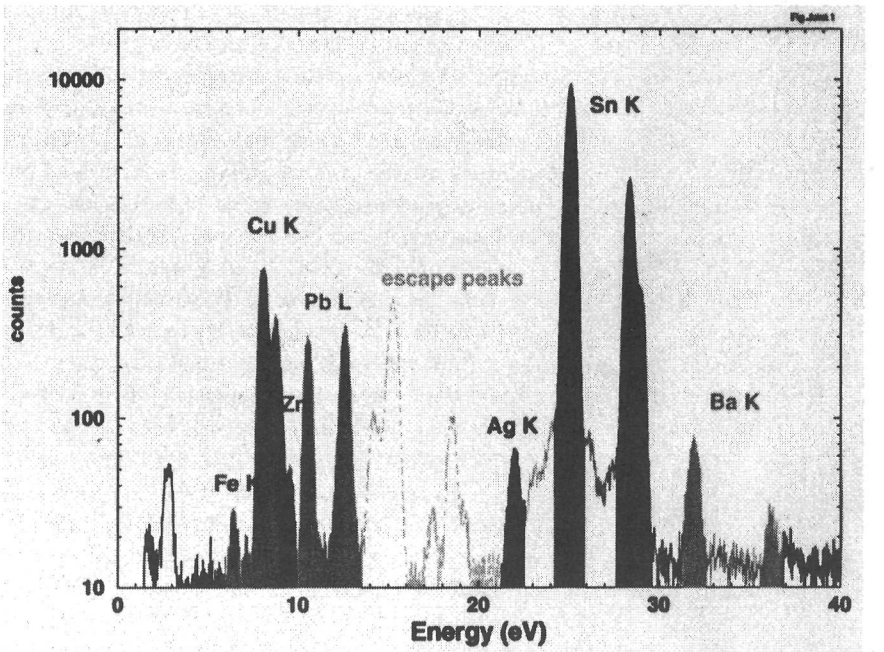

Figure 5. Elemental analysis of Judaidah figurine showing peaks corresponding to tin (Sn), copper (Cu), and lead (Pb). By Ercan Alp, Liz Friedman, and colleagues at Argonne National Laboratory

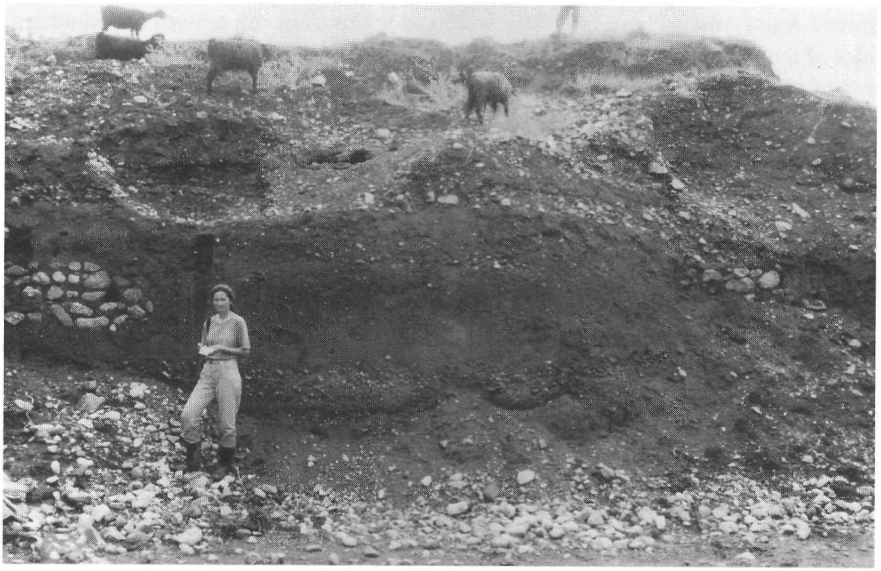

Figure 6. Hellenistic/Roman wall in Arpali quarries near Kirikhan, buried under ca. 3 m of alluvial fan deposits

the object. Each chemical element has its own recognizable spectrum, and with the aid of a sophisticated software package, these emissions can then be converted into chemical compositions. The brilliance of the X-ray source also enabled the detection of niobium, an exotic element not easily analyzed with other methods. The niobium may eventually prove useful in the identification of metal sources.

The APS beamline is also targeted for tomographic imaging and CAT scans of objects from the Oriental Institute and Field Museum collections. These imaging techniques use high-energy X-rays and phase contrasting which gives us a peek into the internal macro- and microstructure of artifacts without having to cut them. Consequently, information that was previously impossible to obtain from museum quality artifacts, such as methods of manufacture, kiln or furnace temperatures, alloying techniques and processes such as casting, annealing and welding, can now be gathered. The Amuq figurine from Judaidah Phase G (fig. 4; ca. 3000 BC) and a Japanese Samurai sword from the Field Museum were brought to Argonne and scanned. Analysis of the figurine revealed signs of breakage at the knees and ancient welding with lead. Made of bronze with high amounts of tin, the figurine (fig. 5) had silver/gold decorations on its belt and chest and a silver helmet. The high peaks for barium suggest the use of flux. Even X-ray diffraction patterns were obtained that suggest the next step, the internal structure of the metals, may indeed be within our reach next winter. Near Eastern Languages and Civilizations graduate student Liz Friedman is now an intern in training at the APS working towards actualizing this.

Another relic from the past, in the form of a crucible excavated in 1936 from Tell Judaidah (Phase G), was re-examined using a Secondary Ion Mass Spectrometer (SIMS). Analysis by Mieke Aedriaens of the University of Antwerp demonstrated that the crucible residue is a result of alloying of copper and tin, and that the alloying procedures were actually done at the site. Point analyses within the slag en-

crustation and prills (globules and droplets of metal) show that they were of bronze varying in tin concentration between 35% and 75%. This is quite substantial and suggests that the smiths were dealing with high levels of tin during the formative periods of tin bronze metallurgy, and that they had easy access to the tin sources of the Taurus Mountains and Kestel Mine are very relevant. We will continue to explore the Amuq and its technological role within the region.

Geoarchaeological work continues to show that whereas parts of the plain have experienced little sedimentation, elsewhere the plain is blanketed in deep accumulations of sediment. Deep accumulations are particularly apparent to the northwest of Lake Antioch, where buildings of the Hellenistic/Roman period are buried beneath some 3 m of gravel and loam washed from the adjacent Amanus Mountains (fig. 6). Such evidence suggests that along this part of the plain, the apparent lack of sites may partly result from the burial of former settlements beneath deep sedimentary accumulations.

Another effort, again in collaboration with the APS, was to recognize signals of environmental change resulting from human agencies or natural factors. Thanks to Liz Friedman, as well as Ercan Alp and colleagues at Argonne, we now have preliminary results from cores taken through Lake Gölbaşi located to the north of the Lake Antioch basin. These analyses show changes in the quantity of trace elements through time in the ancient lake sediments. Of all the trace elements analyzed the most useful so far have been potassium, calcium, and chromium. Potassium, being associated with clay minerals, appears to relate to clay deposition within early lakes, while calcium might have accumulated as a result of the drying up of the lakes and the consequent formation of soils on the lake bed. Finally, chromium (and associated nickel) is probably a result of the erosion of the Amanus Mountains, the component rocks of which are rich in these minerals. We can now tentatively suggest that Lake Gölbaşi was at its greatest extent in the Chalcolithic period and was then dry during the Bronze and Iron Ages, when soils formed. Finally there appears to have been a second growth of lakes around the Hellenistic and Roman periods. This late development of a lake appears to have been roughly in phase with the growth of Lake Antioch which, as we have shown in the *1996/97 Annual Report*, grew at some time in the first millennium BC.