KERKENES DAĞ PROJECT

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http://www.kerkenes.metu.edu.tr/

Study seasons usually provide many fewer surprises than a season of active digging. That was certainly not the case during the 2006 season at Kerkenes Dağ in central Turkey. The bulk of the season was devoted to the continued study and conservation of the incredible stonework uncovered in the monumental entryway to the Palatial Complex over the past four years. However, several weeks in May were dedicated primarily to the ongoing geophysical survey that proved to yield very exciting results. Conservation and survey work on-site also continued throughout June and July, as did the activities of the parallel Kerkenes Eco-Center project focused on environmental sustainability and rural development initiatives within the village of Şahmuratlı.

Geophysical Investigations

Over three weeks during the month of May the resistivity survey, which uses electrical pulses to map walls and features buried under the surface of the ground, continued to reveal impressive details of the plan of the late Iron Age city at Kerkenes Dağ (fig. 1). From its start in 2001 to 2005 the resistivity survey had focused primarily on the central portion of the lower city. This portion of the city is found at its lowest elevations and therefore possesses more natural moisture within the soil which is a key necessity for attaining successful readings with the resistivity meter. The results achieved over the past years provided an excellent map of the buried buildings and urban blocks in this limited area of the much larger city. It was unknown though how well the resistivity survey would work elsewhere within the one square mile area contained by the city walls.

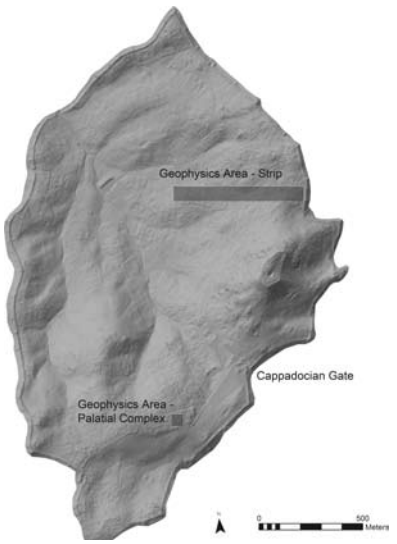

Figure 1. Locations of the resistivity survey at Kerkenes Dağ in 2006

The focus then of this year's survey was to expand the use of the resistivity meter across a wide range of the often dryer slopes and higher areas in the city. To accomplish this task two areas of work were selected. The first was a lengthy 60 m × 660 m strip running from the eastern city wall all the way down the slopes along that side and into the center of the city (fig. 2). The second was a 4,000 sq m test area in the Palatial Complex itself,

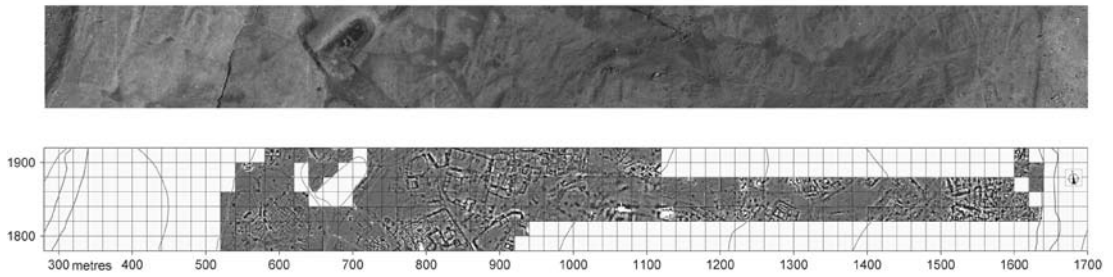

Figure 2. The results of the resistivity survey along the 60 m wide strip from the eastern city wall down into the lower city can be seen in the lower half of this figure. Portions of over a hundred buried buildings are visible in the data. Above the resistivity image is an aerial photograph of this same area showing what is visible on the surface of the ground

high up on the top of the ridge running through the southern portion of the city (fig. 3). Although portions of both areas had significantly less soil moisture than the lowest areas of the city, the results attained were extremely good. Along the 60 m wide strip portions of forty-three different urban blocks were surveyed and 132 unique building footprints from the buried city were identified in whole or in part (fig. 4). In the Palatial Complex the results were so impressive that next year a primary focus of the survey will be the complete coverage of this important complex. This will provide a better understanding of its inner workings and will complement what has already been learned through limited excavation. Of course the best result of all was the knowledge that the resistance survey can be successfully used to map out nearly the entire city in astonishing detail.

Complementing the collection of this data was the testing of several new ways to productively put it to use within geographic information system (GIS) computer software. This included the numeric combination of the growing amounts of resistivity data with that of the magnetometry survey data conducted from 1995 to 2002. When combined these complementary data sources can reveal more information about features such as floor surfaces or even the level of burning in the final destruction of the city around 547 B.C. One practical application of the GIS work conducted this summer was the preliminary modeling (fig. 5) of points at which the final fire was intentionally set by its destroyers within the city as well as the spread of the flames from building to building across entire neighborhoods on that fateful day of destruction.

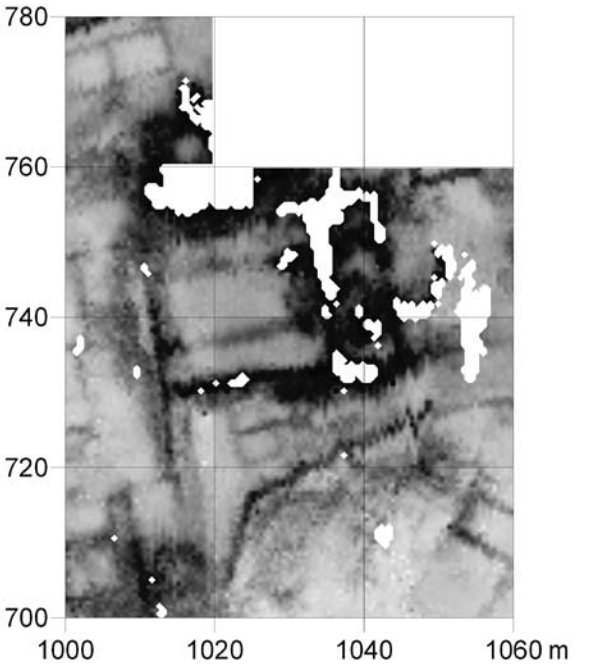

Figure 3. Results of the resistivity survey test area in the Palatial Complex. Most of the extended areas of white within the image are places where excavations occurred in past years. The large building in the center is a partially excavated columned hall that may have served as an audience hall in which the ruler would have received visitors

Significant work was also undertaken on ground-truthing the map of the urban blocks and streets of the ancient city that had been

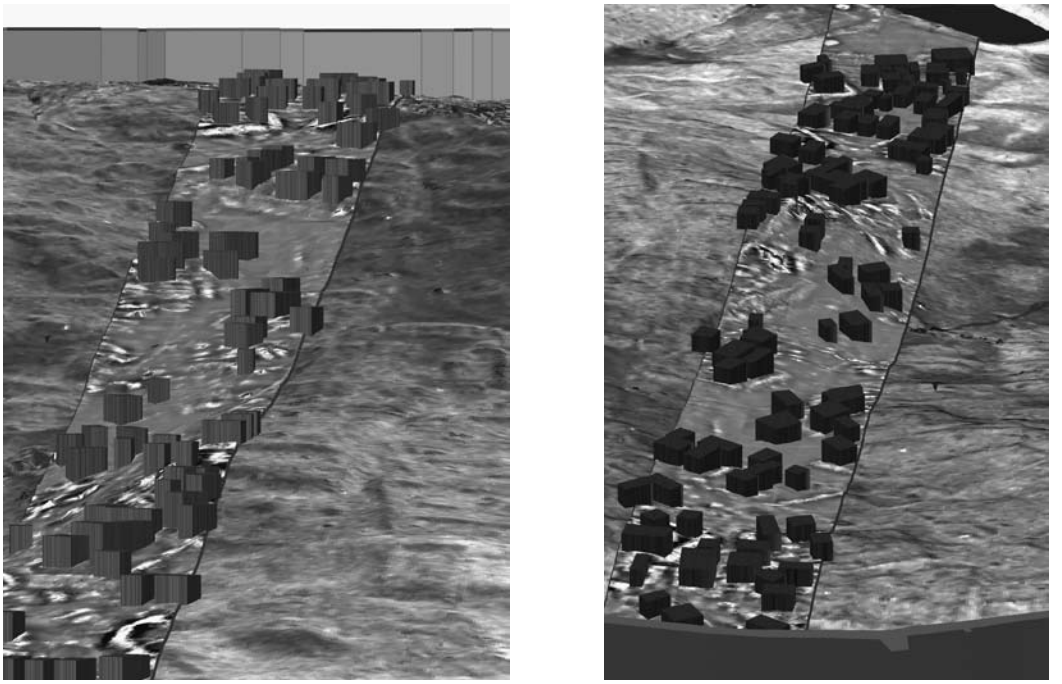

Figure 4. Part of a three-dimensional model of the locations of the numerous buildings seen in the resistivity survey data from the end of the 60 x 660 m long strip. (left) Looking up from the lower city to the eastern city wall, showing the slopes over which the survey was conducted this year, while (right) looks back down these same slopes. The resistivity data upon which this reconstruction is based can be seen on top of the aerial photo between the two parallel dark gray lines

created from a combination of aerial photographs, highly detailed maps of the terrain, and the various forms of geophysical data. It is this map of the urban blocks that the ongoing resistivity survey is able to fill in so wonderfully with detailed data on the locations of so many buildings. Using a handheld computer with a global positioning system (GPS) receiver the team was able to walk around on the surface of the ground and see in real-time where they were in relation to the buried walls and structures (fig. 6). This is extremely useful in figuring out which walls are walls that are partially visible on the surface in order to check them against the plan and where necessary to correct details on the map. The entire southern quarter of the city was checked in this manner during the 2006 season and several relatively minor updates were made to the plan of the city.

Conservation and Restoration

The key focus of this season's campaign, however, was to continue to piece together and conserve the thousands of shattered fragments of burnt stone architectural elements that work between 2002 and 2005 had uncovered in the monumental entryway to the Palatial Complex. Here the walls of the flanking towers and façades had come crashing down in the final fiery destruction of the city. The pieces of the wall's constituent architectural blocks and adornments mixing with those of the already smashed and scattered monuments, statuary, and inscriptions that had once stood proudly in the entryway prior to its looting. To add to this complicated stratigraphy robbers for centuries thereafter had dug through this massive pile of jumbled stone in a search for objects of value, thereby mixing and scattering pieces farther from those to which they once adjoined.

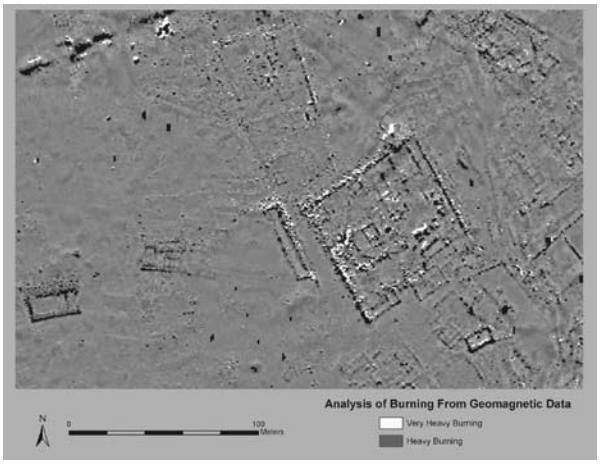

Figure 5. Some of the output from the preliminary modeling of the final burning of the city. This analysis can be used to better understand where the fires were intentionally set and how they spread across the city

Figure 6. Using a Dell Axim Pocket PC computer and connected Mobile Crossing GPS receiver team members can now walk around the site and see what lies buried directly beneath their feet

Against this seemingly inscrutable jigsaw puzzle the diligent work of conservator Noël Siver and the rest of the team produced remarkable results. By patiently finding and joining together piece after piece some amazing architectural elements have emerged. Foremost among these were at least nine different examples of sandstone blocks carved in a shape reminiscent of the letter Ω. Each stands approximately a meter in height with a roughly equally sized diameter in the upper circular top. Raised bands, varying in width from block to block, run around the circumference of the circular top and end on either side not in a line but in a closed circle with a raised boss in the center (fig. 7). These semi-aniconic representations, with the raised bands representing hair running around an empty face and curling at the shoulders, are found on both the inside and outside faces of each block demonstrating that they were freestanding. This as well as the position in which they were found strongly suggests that they were originally positioned on the top of the short towers, forming iconographic crenellations running around its edge. One can imagine how this would have looked to a traveler entering the Palatial Complex, passing down beneath the faces of the crenellations as they gleamed in the rays of the sun.

Other architectural elements that emerged from this mass of stone were bolsters and a stepped block that may have served as a base for the inscription. Still other forms are just beginning to emerge and will take more time and piecing together in future seasons in order to reveal what they actually are. In addition to what was found through diligent work in the laboratory, an exciting chance discovery was also made on-site within the Cappadocian Gate. This was a large curving piece of carved stone that proved to be a portion of the head of the semi-aniconic stele that had been uncovered in the inner court of the gate in

Figure 7. On the right is a reconstruction of one of the semi-aniconic crenellations being pieced together from the architectural fragments recovered in the monumental entranceway to the Palatial Complex. On the left, Pamela and Natalie Summers are flanking one of the partially reconstructed crenellations and demonstrate with their own curls of hair what is likely represented on these unique pieces

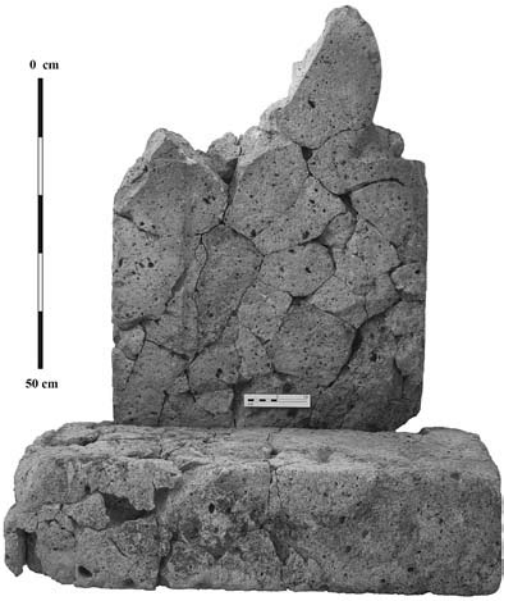

Figure 8. A photograph of the stele from the Cappadocian Gate showing the newly found large piece of the head in place on the top of the stele

2003. This large fragment joined directly to the body of the stele and provides a much better idea of what the whole would have looked like (fig. 8).

In addition to conserving and assembling the various architectural elements, each was photographed and drawn for full publication alongside the remaining fragments of the sculpture and inscription. A monograph dealing specifically with the sculpture and inscription was reviewed and accepted for publication through the Oriental Institute Publications Office. Two additional final report volumes on the excavations in the Cappadocian Gate and the Palatial Complex will appear in the next few years.

Limited conservation work was also undertaken on-site along the glacis in front of the Cappadocian Gate and in the monumental entryway to the Palatial Complex. In the monumental entryway the heavily burnt walls of the flanking towers and freestanding column bases weathered very badly over the winter. To prevent collapse and help insulate the stone from the elements a stabilizing layer of earth-filled tires were placed alongside the standing architecture and covered with earth and stone. Meanwhile in front of the East Tower at the Cappadocian Gate a breach in the glacis, started by the removal by vandals of the large glacis stones restored in 2003, was buttressed with large timbers and encased within a sloping ramp of stone. This will provide temporary support to the glacis while preventing further slippage that might undermine the entire glacis. Both measures were undertaken to ensure the safety of visitors and to preserve the standing architecture as well as possible until more permanent measures can be taken.

Kerkenes Eco-Center Project

Figure 9. Using solar energy to prepare part of a meal in Şahmuratlı. These solar cookers were a major initiative of the Kerkenes Eco-Center Project this year and many have been distributed throughout the village

Solar cooking and drip irrigation were two of the many projects undertaken jointly by the Eco-Center and the Şahmuratlı village cooperative this year. The limited availability of water in the village has always been a major problem. By pioneering and facilitating the use of drip irrigation in several fields within the village the project has helped to reduce the strain on this limited resource and provided a model that can be replicated throughout the region. A second primary focus was on designing solar cookers, large parabolic reflectors that focus the heat of the sun on pots or kettles held above, and training numerous families in the village how to use them to reduce their dependence on natural gas or other fuels (fig. 9). The training program

MODELING ANCIENT SETTLEMENT SYSTEMS (MASS)

Benjamin Studevent-Hickman

The year 2006/2007 marked the fifth year of the Oriental Institute's Modeling Ancient Settlement Systems (MASS) project. In collaboration with Argonne National Laboratory, members of the Oriental Institute and the University of Chicago create agent-based computer models of settlements (and groups of settlements) in Bronze Age Mesopotamia — all toward analyzing their reactions to and development under prescribed conditions. One specific goal of the project is to compare the rise and fall of cities and states in northern and southern Mesopotamia in light of the regions' distinct landscapes; to that end, the models incorporate the fullest possible range of social, economic, and ecological data available from texts, archaeological remains, satellite imagery, geomorphological analyses, and ethnographic studies. A final monograph, entitled *Modeling Mesopotamia: Exploring the Dynamics of Ancient Society* (University of Chicago Press), will present the project's framework and results. MASS is funded by the "Biocomplexity in the Environment" program of the National Science Foundation.

General Project Developments and the MASS Team

MASS saw several significant changes in 2006/2007. First, the project received a no cost time extension of one year, allowing the team to continue its work through July 2008. Second, McGuire Gibson became the Principal Investigator (PI) of the project in May 2007, replacing Tony Wilkinson, who now teaches at Durham University (Professor Wilkinson remains a Co-PI on the project, along with John Christiansen of Argonne). Third, Tate Paulette, a graduate student in Mesopotamian Archaeology at the University of Chicago and a long-standing member of the project, became the principal liaison between the Oriental Institute and Argonne. His primary