KERKENES DAĞ PROJECT

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

The 2007 season at Kerkenes Dağ marked the fifteenth consecutive season of exploration by the project at this massive late Iron Age Phrygian city in central Turkey. In a day and age where funding cycles are focused on short-term projects that cover a handful of years, the results this project has attained is a testament to the benefits that can be reaped from a longer-term commitment to research at a site such as this. Such a commitment to long-term research has always been a distinctive aspect of the Oriental Institute. In this season alone the highlights of research included the mapping of the entire plan of the enormous Palatial Complex, the testing through excavation of new computer simulation-based methods for understanding ancient cities, extensive work on reconstructing the unique architectural stone elements uncovered in previous seasons in the Monumental Entranceway to the Palatial Complex, and even a visit by the History Channel.

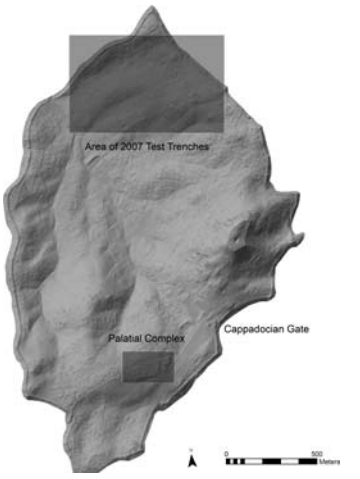

Figure 1. Locations of research at Kerkenes Dağ in 2007

Geophysical Investigations

The Palatial Complex has been the focus of survey and excavations over the past decade. Located in the upper, southern portion of the city, it is larger than any of the urban blocks, measuring ca. 75 m in width × 250 m in length, a total area just under 3½ football fields in size (fig. 1). Its size, along with the remarkable results of the excavations within it and the simulations around it, has shown it to be a key locale within the city. What has remained unknown until now is the full plan of its internal buildings and courtyards beyond what has been revealed through limited excavation. The use of the British Institute of Archaeology at Ankara's Geocscan RM15 electrical resistance meter, tried in a small test area of this complex last year (see *Annual Report 2006–2007*,

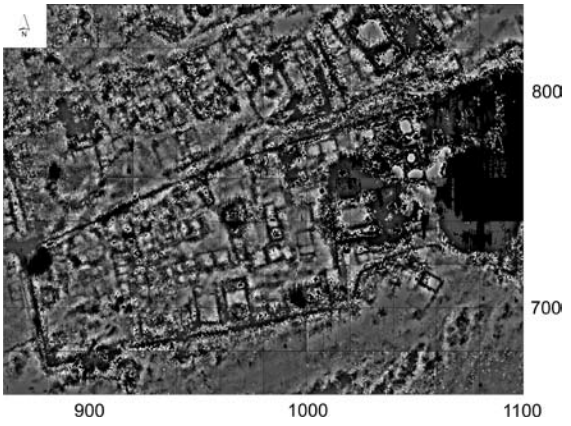

Figure 2. The results of the resistivity survey in the area of the Palatial Complex

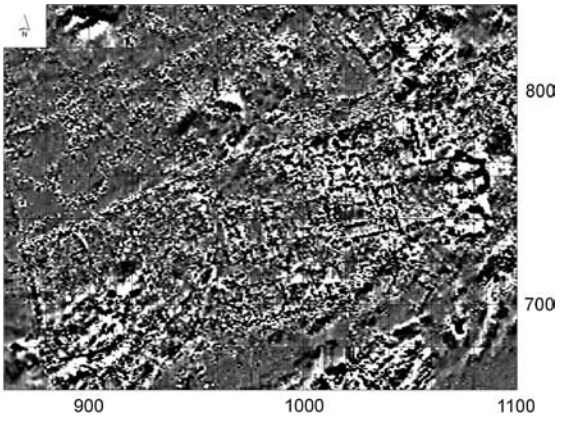

Figure 3. Magnetometry data collected in the palatial area in previous seasons. The interior walls and structures are much less clear in the magnetometry data than they are in the resistivity data

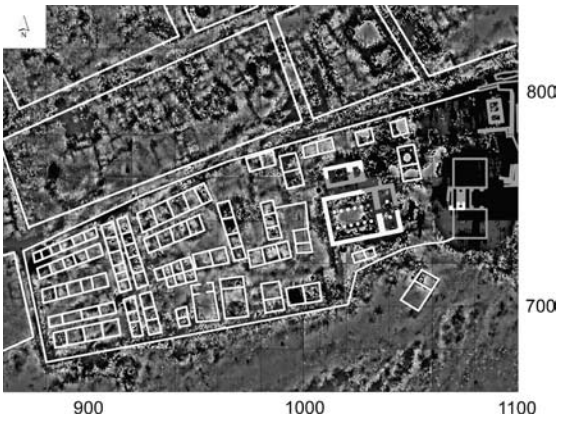

Figure 4. Interpretive plan of the Palatial Complex developed and ground-truthed in the field on the GPS-enabled tablet PC from the available data sets. Walls in white are unexcavated, while those in gray have been uncovered and confirmed through excavation

pp. 68–70), demonstrated the potential for the resistivity survey to provide just such a detailed internal plan even in this high and dryer area of the city (figs. 2–3).

Over a period of fifteen days in May, a total area of 42,000 m^2 (4.2 ha) was covered at a sampling density of two readings per meter. The imagery produced from this survey reveals not only the full extent of most of the buried structures within the Palatial Complex, but also significant portions of the plans of adjacent urban blocks. In contrast to the data collected for this area in previous years using magnetometry, the resistivity data reveals much more detail of the internal structures within this complex. An interpretive plan was drawn from the resistivity data (fig. 4); among the numerous items of note are several rows of small rooms in the back of the Palatial Complex. Based on excavated parallels elsewhere in the city, these may have been used for storage. In addition, the two side-by-side large megaron-like structures near the middle of the southern wall of the complex are particularly intriguing. Could they be the places where the king and queen slept?

The new interpretive plan was checked against observable features on the surface of the ground using a tablet PC computer and attached Global Positioning System (GPS) receiver (fig. 5). The use of the tablet PC has several notable advantages over the handheld computer and GPS used last year for ground-truthing. The tablet computer can not only provide the real-time location for the researcher within the imagery, but it makes drawing directly on the interpretive plan or data displayed on the screen much easier. The tablet PC can also run a full-featured version of the Geographic Information System (GIS) software packages allowing real-time integration or reprocessing of the different data sets and maps at any given location. This allows for much greater control in interpreting the data in the field and a more powerful and integrative plan to be drawn than was possible with old paper-based methods.

Excavations

Excavations were undertaken in 2007 in support of three different initiatives: validating the computer simulations of ancient pedestrian transportation, elucidating architectural details in the Cappadocian Gate, and recovering geomagnetic material samples from two previously excavated trenches.

The transportation simulation initiative is a pioneering way to try to understand how the builders and inhabitants of the ancient city at Kerkenes Dağ designed and made use of its ancient spaces and interacted with one another. It is an excellent example of innovations that can develop within the context of a long-term research project. The wealth of geophysical data collected during the first ten years of the project has enabled a complete reconstruction of the plan of the urban block and streets throughout the city. Using the streets and places known from the geophysics as a base map, simulations can be run within the computer of virtual human beings walking around within this reconstructed urban landscape. The models for how these virtual human beings move are drawn from a variety of studies in the medical fields involving human biomechanics and can

Figure 5. Ground-truthing with the GPS-enabled tablet PC. The GPS allows users to see themselves in real time within the imagery (a small gray circle with a black dot in the center) and where they are relative to buried structures or streets. The tablet computer also allows users to draw directly on the screen to produce plans of the urban architecture in the field. This same system also works in a vehicle, just like an onboard car navigation system, to allow project members to drive along the network of buried city streets

even be broken down by age and sex of the individual. The power of this new simulation method is that it can provide a way, based on what we know of how people move and the urban space that they created, to glimpse the more dynamic actions and activities of its inhabitants that are the life of a city.

On the simulation side of this new method, the past year saw the continued development of SHULGI, an open-source, agent-based software package that will make these pedestrian transportation simulation methods freely available to researchers around the world. The program is being developed in partnership with Mark Altaweel at Argonne National Laboratory and should be completed within two years, depending on funding. Requests are already coming in from researchers at a number of archaeological sites around the world, including Pompeii, to make use of SHULGI in their own research. It has also attracted the attention of modern city planners who wish to use it to design new cities and neighborhoods that optimize the use of pedestrian traffic as a way to minimize the need for automobiles. Initial funding to get SHULGI started has been provided by a grant from the Joint Theory Institute.

However, there is a need to find ways to test the validity of the results of these computer simulations and to show their usefulness in matching ancient traffic patterns. Validation tests have already been done to show that the simulations match modern pedestrian traffic patterns quite well. For past pedestrian traffic, there is the added problem of not being able to observe where people are walking, since the people who walked these streets are long since gone. To get past this difficulty, a method of analyzing the ancient street soil matrix for compaction and other soil properties was developed and tested briefly in 2004. Now that active excavations in the Monumental Entranceway to the Palatial Complex have finished, further trenches can be excavated to continue this testing and validation of the simulation results.

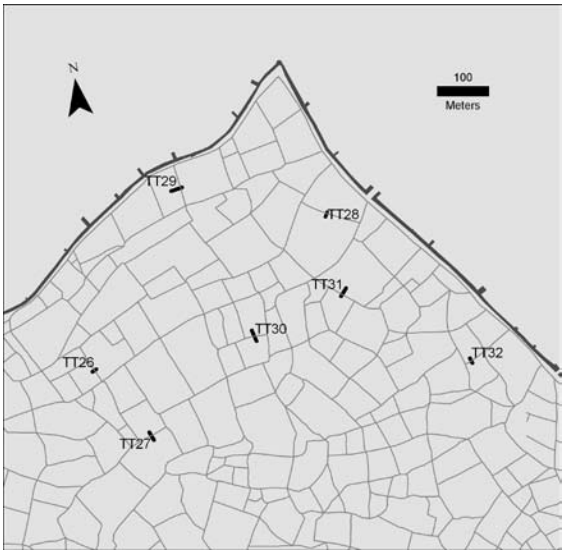

Figure 6. The locations of the Transportation Trenches excavated along ancient city streets in 2007

In 2004, three test Transportation Trenches (TT) were excavated across three different city streets in the vicinity of the Palatial Complex. Loose soil and micromorphology samples were collected from the street in each trench and were analyzed by the Charles McBurney Laboratory for Geoarchaeology at the University of Cambridge. The breakdown of the soil from the streets and evidence of compaction correlated extremely well with the results of the computer simulations. However, a mere three trenches from the same area of the city, no matter how promising the results, is too small a sample to statistically validate the simulations or to draw broader conclusions. Seven more transportation test trenches were therefore excavated in 2007 as a part of a multi-year program to expand the testing of the simulations against the data contained in the soils of the ancient streets.

Figure 7. Excavation in progress in Transportation Trench 29. A typical transportation trench takes just under a week to fully excavate

These seven 2007 test trenches, named sequentially TT26 to TT32, were excavated along streets in the northern third of the city (fig. 6). They were situated within the plan of the city using the real-time GPS-enabled tablet PC, which was set up in the project Landrover as a homemade version of a GPS car navigation system. Using this system, the Landrover could be driven down the buried ancient city streets, complete with turn directions on how to get where one wanted to go. Each of the trenches was 1 m wide and varied in length from 9.0 m to 23.5 m (fig. 7). They were positioned to completely expose the street area between two adjacent urban block walls, as can be seen in the section from TT26 (fig. 8). Soil samples were collected just as had been done in 2004. However, in the case of quite a number of the test trenches this year, the unpaved street surfaces were not precisely identifiable due to increased erosion. This is one area of the sampling strategy that will continue to be improved upon in future years. Pottery, bone, and a few metal items were also collected from the trenches, along with floral and faunal material recovered via flotation. This includes one very nice double-looped copper alloy pin, of a type found previously in the city. As additional trenches are excavated in the years ahead these materials will help provide distributional maps of changes in consumption and discard across the city.

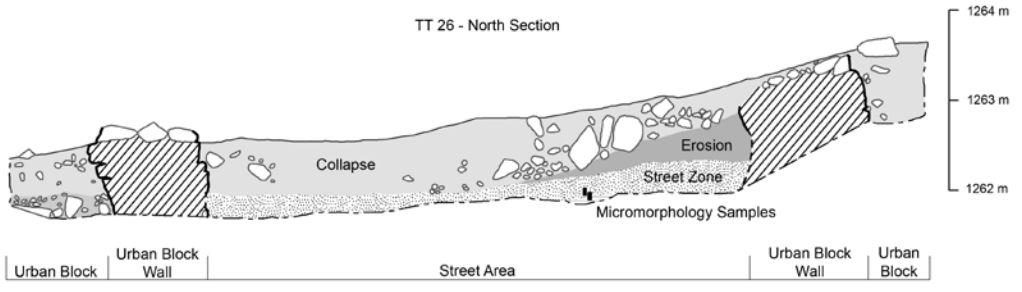

Figure 8. The northern section of Transportation Trench 26, typical of the trenches excavated this year. The section shows the street area running between the two urban block walls and the later collapse of the walls into the street after the destruction of the city. Micromorphological samples were taken as marked from the street zone since this particular trench lacked the well-formed street surface encountered elsewhere

In addition to the primary work on the transportation test trenches, limited work was also undertaken over two days in the Cappadocian Gate to elucidate details in the plan of the gate for the publication of the upcoming monograph. Geomagnetic samples were also collected one morning in two trenches excavated in 1996 and 2004. Both trenches yielded floor contexts that were heavily burnt in the final fiery destruction of the city. The samples were taken and are being analyzed by Nurettin Kaymakçı and Pınar Ertepınar of Middle Eastern Technical University, along with similar samples they have collected from archaeological projects throughout Turkey. They are hoping to be able to develop a technique for establishing the dates of sites in Turkey based on the changing location of magnetic north through time.

Conservation and Restoration

As anticipated, the new transportation test trenches yielded pottery, animal bone, seeds, and fragments of metal, but very few objects requiring subsequent conservation. This is precisely what had been hoped for so that the conservation staff could focus primarily on the continued conservation and restoration of the incredible stonework from the excavations in the Monumental Entrance to the Palatial Complex (figs. 9–10). The best exemplars of each size bolster block that were mended and recorded last season were gap-filled and photographed as part of the ongoing restoration program this year. Work also progressed on the intriguing semi-iconic idols that emerged so spectacularly from the thousands of fragments of stone at the end of last season. Numerous additional joins were found that fit into the growing number of exemplars of these idols. The most complete of these exemplars were drawn and photographed, though additional work on the reconstruction and conservation of these unique pieces will continue into 2008 and beyond.

Throughout the summer, work also progressed on completing the stone workshop building that will provide the facilities needed for working on the long-term conservation of the architectural pieces from the monumental entrance. It will also provide cover year round for the numerous fragments of stone brought down from the palatial complex during the 2003 through 2005 seasons.

Several additional pieces of worked stone identical to that of the stela from the Cappadocia Gate were also identified and recovered this season from the surface of an area of the site just inside the gate. Some of these fit directly into the head portion of this semi-iconic Phrygian idol. Others, including a single large piece, are impossible to fit anywhere on the existing stela. These may be evidence of additional stelae that would have been located in that same general area.

Figure 9. Conservator Noël Siver and assistant Tiffin Thompson restoring bolsters from the Monumental Entranceway to the Palatial Complex

Figure 10. Illustrator Ben Claasz Coockson drawing the best-preserved semi-iconic idol from the Palatial Complex

The History Channel

The importance of this large Phrygian city and the growing popular interest in the archaeology undertaken at Kerkenes Dağ was evidenced by a visit from a camera crew for the History Channel's program *Digging for the Truth*. A portion of an episode on the Phrygians was filmed on location during the last week following the excavations. While the episode never aired due to internal issues with the host at the History Channel, it does show the notoriety that this long-term project has gained.

Figure 11. Installing drip-irrigation systems, such as this one in the garden of the excavation house, is a way to help reduce the strain on limited local water resources both for the excavation and in the village of Şahmuratlı. Facilitating the acquisition of systems like this, though a micro-loan program for farmers working in fields around the village, has been a major focus of the Kerkenes Eco-Center in conjunction with the Şahmuratlı village cooperative over the past two years

Kerkenes Eco-Center

Solar drying and cooking, along with the expansion of the drip irrigation program, were the main foci in 2007 of the Kerkenes Eco-Center Project (fig. 11). This sister project, directed alongside the archaeological one, works in tandem with the Şahmuratlı village cooperative on rural sustainability projects that benefit the people who so graciously host us each year. The organic farming continues as well, with the farmers involved giving talks on their experiences to rural audiences in various parts of Turkey.

Acknowledgments

The Kerkenes Dağ Project is a joint undertaking between the Oriental Institute and the British Institute of Archaeology in Ankara, co-directed by Dr. Geoffrey Summers of the Middle Eastern Technical University (METU) in Ankara and myself. The Kerkenes Eco-Center Project is directed by Françoise Summers of METU. Our thanks go to the Director and staff of the General Directorate of Cultural Assets and Museums, our official representatives İsmail Sarıpınar and Erdal Yiğit, and the Director and staff of the Yozgat Museum. Our principal sponsors for this year were the Oriental Institute, the British Institute of Archaeology at Ankara, Middle East Technical University, the Joint Theory Institute of Argonne National Laboratory and the University of Chicago, the Archeocommunity Foundation, the Joukowsky Family Foundation, the Charlotte Bonham Carter Trust, Toreador Turkey, Erdoğan Mustrafa Akdağ Eğitim ve Kültür Vakfı, Yibitaş/Lafarge, Yenigün, Andante Travel, John Notz, Yozgat Çimento, Hayri Yıldız, Chevron Texaco, and anonymous donors. A full list of all participants and sponsors can be found on our Web site.