

Digitizing Excavations

ROBERT ŻUKOWSKI

Institute of Archeology and Ethnology, Warsaw
Polish Academy of Sciences
zuko_arch@tlen.pl

Drawing up graphical archeological documentation is a very time-consuming endeavor, although new applications of digital technologies are now helping to make it much less so – even under adverse field conditions

Since 2001, the PAN Institute of Archeology and Ethnology has been involved in international fieldwork in northeastern Iceland, in cooperation with Iceland's Institute of Archeology in Reykjavík. This joint archeological dig is being conducted at the site of an early medieval settlement in Sveigakot, several kilometers to the south of the lake My, near the glacial river Kráká. The Polish team is working on uncovering unusual residential structures of sunken house type, at certain early medieval settle-

ments from the early stage in the island's colonization in the 9th–10th centuries.

The Sveigakot site, situated in marginal agricultural zone, was one of the settlements located farthest from the coast. Over the course of two centuries, the climatic situation (deteriorating from the start of the millennium) plus the inappropriate exploitation of the natural environment by the settlers led to the nearly complete disappearance of vegetation and left the soil barren, consequently forcing them to abandon their homesteads in the 12th century. These processes of erosion have continued on the deserted terrain and have led the site to nowadays be located on the edge of the rocky desert that occupies nearly all of the island's interior.

Before Polish archeologists arrived, the excavation work in Sveigakot led by Icelandic archeologist Dr. Orri Vésteinsson concentrated on the remains of a typical Scandinavian "longhouse" and its vicinity. During this work a team of American osteologists studying one of the numerous household middens (waste-dumps) came across part of a sunken feature, significantly deeper and



Przemysław Ułbacznyk

The self-constructed "Nattfari III" photographic tower in place over the excavation site, alongside a vehicle serving as documentation "field office"

different from the remainder. Work was suspended in this area and a team of researchers from the PAN Institute of Archeology and Ethnology led by Prof. Przemysław Urbańczyk was invited in to explore it.

Laptop replaces crayons

The first season of joint work identified the remains as those of a sunken house, a sort of house typical for Slavic settlement in the early Middle Ages. It also became clear that unfavorable weather conditions – strong winds, rains, and low temperatures – hampered or sometimes even precluded the use of traditional methods for documenting the site. These challenges gave rise to the idea of digitizing the process. This technique was moreover expected to have the additional advantages of overcoming the error inherent in the subjective impressions of the draftsman and the imperfections of hand-taken measurements. The concept met with full approval from the Icelandic-US leadership of the program.

The implementation of such an idea was made possible by the great advances seen in digital imaging technology in recent years. A miniaturized graphics processing workstation can now be set up under any field conditions – all one needs is a portable computer with a CD-DVD drive, a high-resolution digital camera, a color printer with independent power source, and a laser theodolite.

The prevailing standards in Iceland for keeping on-site archeological documentation require that separate sheets be used to record each successive stratum that attests to past processes, whether natural (e.g. sedimentation filling depressions) or resulting from human activity. For this purpose, sheets describing a layer and illustrations are traditionally drawn up in the form of maps marking the height of selected points.

Tower view

In order to document the appearance of the excavation site using photographs rather than drawings, a camera has to be mounted at least several meters high so as to minimize geometric image distortion. For this purpose, we ourselves designed and built a 5m tower, constructed of standard duralumin elements available from a construction equipment lender. To protect it from gusts of wind, the tower was stabilized using ropes. The digital camera was affixed to the top of this stand, at the end of a 3m arm, so that the optical axis was perpendicular to the surface of the terrain. Each series of images was sent as RAW graphics files to a computer and then rectified (corrected for optical distortions due to the shape of the lens). Next, the outline of the stratum and of related structures such as stones, post holes, and wood remains were superimposed onto the images. Finally, contour sections, obtained from geodesic data processed using the Polish software C-Geo, were added to the map.



Rectified image of a dugout with superimposed contour map (above) and a documentation drawing showing stones and holes for posts that once held up the roof structure (below)

Preparing such a detailed site map using traditional methods would take an experienced draftsman a whole day of fieldwork, plus another day to prepare it for publication. Moreover, excavation work would be halted in the interim. Our digital method, on the other hand, can produce a map ready for editing in only 3 hours, without the need to suspend archeological work. The resulting digital maps are characterized by exceptional precision and full objectivity. ■

Further reading:

Natuniewicz-Sekuła M., Urbańczyk P., Żukowski R. (2003). Instead of on Paper, Draw With a Computer – A Few Words About a Digital Method of Field Documentation [in Polish]. *Z otchłani wieków*, 58, 145–151.