



Most of the site is covered with a thick mantle of halfa grass, and a powdery earth stratum built up by collapsed mudbricks and aeolic redeposition. This stratum contained appreciable amounts of pottery, flints and stones. Below this deposit (10–40 cm below the surface) some fire installations, pits and first evidence of architectural remains occurs. In deeper layers many rectangular and semicircular constructions made of mudbrick were found, some of them paved with mudbrick floor. Total area of excavation before 1990 was 192 sqm. In 1998–99 the excavated area was 282 sqm large.

F. Chouker

Archaeological Site Investigation by Means of Geoelectric Measurements in Tel-Halawi (Northern Syria)

About 100 Vertical Electrical Soundings (VES-Points) were measured at the site of Tel-Halawi, located on the left side of the Euphrates just before flowing into the Assad Lake in northern Syria. The VES-Stations, of only 2 m spacing, were distributed along 9 profiles (5 meters apart from each other), covering the southern part of the site (s. maps in Fig. 1). The electrode array,

In 1998, a geophysical test was carried out in the western part of the site, in the area of 4,000 sqm. The survey revealed distinctive settlement traces. In 1999, the whole site was surveyed, i.e. the area of 27,000 sqm. A number of obstacles were caused by the fact that the survey was carried out in the area exploited by a densely inhabited village (huge amount of metal objects on the surface, traffic, driving of cattle etc.).

The fluxgate gradiometer FM36 (by Geoscan Research) was used. The test survey was in the grid of 0.5 x 0.5 m, the final survey in the grid of 0.25 x 0.5 m. Apparent traces of buildings from the latest settlement phases – the ones closest to the surface (Early Dynastic/Old Kingdom) are well visible on the magnetic map (fig. 2). The traces were registered on the middle mound (between Y=100 and 240) and the eastern mound (Y above 240, outside the area presented on the map enclosed). The survey revealed the general disposition of buildings. Traces of the buildings start disappearing towards the north, resulting from the increasing thickness of the deposits covering the remains of the settlement.

The survey shows that the settlement stretches southwards below the contemporary houses.

The survey has already been primarily verified by excavations, e. g. a distinctive, negative linear NW-SE anomaly (between Y=170 and 180, X=40 and 60) turned out to correspond to a mudbrick wall located immediately under the surface (fig. 3). The wall was accompanied by a concentration of ashes (a positive anomaly at the NE side of the wall).

The nature of a number of rectangular anomalies (between X=90 and 120, Y=30 and 50) on the eastern mound is not clear. They may correspond to a cemetery (?); but that will be clarified during the next campaign.

References

- M. Chłodnicki, R. Fattovich, S. Salvatori, "Italian excavation in the Nile Delta: fresh data and new hypotheses on the 4th millennium cultural development of Egyptian prehistory", *Rivista di Archeologia*, XV, 1991, p. 5–33
- M. Chłodnicki, K. Ciałowicz, "Tell el Farkha (Ghazala), Excavations 1998", *Polish Archaeology in the Mediterranean*, 10, Warsaw 1999 (in press)

adopted for doing geoelectrical survey, was a modified Schlumberger configuration (pole-dipole array with the B-electrode placed far enough to be of negligible effect), which was suitable to be run with the following steps: OA = 1; 1.5; 2; 3; 4; 5; 7; 10 m, while the separation of potential electrodes (MN = 0.5 m) was constant all over the soundings.

The resistivity data measured in the field were then treated and plotted as resistivity cross sections of different pseudo-depths, showing the specific influence of the different targets laying at the corresponding depths. The procedure, even though more time consuming, looks as a very promising technique for discovering near-surface targets through resistivity survey, reflecting successively the resistivity variations with depth, and

separating anomalies in regard to their depth situation below the surface within the first ten meters. It offers also higher reliability of results, due to confirmed response of the subsurface targets noticed as multiple anomaly on several cross sections with gradually growing depths. Many of these anomalies measured along the resistivity profiles were verified through excavation work.

R. Chujo

Assignment of Mummies in Chusonji Temple to Fujiwara Chieftains with the Aid of NMR for Silks in These Coffins

Chusonji is the buddhist temple constructed in the 12th century at Hiraizumi city, Northeast Japan. In this temple three mummies are still preserved: they are

- Kiyohira Fujiwara (died in 1128)
- Motohira Fujiwara (died in 1157)
- Hidehira Fujiwara (died in 1187)

All of them were Fujiwara chieftains. In the coffins of these mummies many silk materials were used.

The amino acid composition may be determined from ¹³C NMR (Nuclear Magnetic Resonance) for these silk materials. Due to the degumming of the materials they are not dissolved into any solvent. Only solid state NMR can be applicable. Solid state one is insufficient in the resolution compared with solution one. In Figure 1 are shown typical spectra. Chemical shift splittings are observed in C=O region between Gly and Ala. The mole fraction of these two amino acids are different with each other.

Possible candidate of the origin of such difference in the fraction is climate (especially temperature) when silkworm was reared. Actually, from the comparison with dendrochronological data good correlation was obtained. However, the number of samples is confined to only three. In order to overcome the insufficiency of number of the samples we have to introduce an alternative strategy. It is NMR observation of modern silk reared in definite temperatures. In this case we can use solution state NMR to silk gland extracted from silkworms. Chemical splittings were observed in C α region due to good resolution and the mole fraction was able to determine for Gly, Ala, Ser and Val. Three species were used as follows:

Shunrei No. 1 x Shogetsu No. 1: the most popular since Mendel's law.

Habataki: special species which can feed on apple as well as mulberry.

Koishimaru: the oldest species existing at present.

Temperature dependence was clearly observed for all species. Qualitative coincidence can be confirmed between the fraction of above and this NMR data. Only the numerical values for Habataki cover those for silks in the coffins. From the comparison between them temperature was estimated as follows:

1128: 27.1 °C

1157: 26.2 °C

1187: 27.5 °C

According to the document (established in the 14th century) of the sutra stock house of Chusonji, in the central, the left and the right coffins Kiyohira (the first), Motohira (second) and Hidehira (third) were preserved, respectively. This document is thought to be reliable. However, there is still one unsolved problem. There are two ways on the definition between left and right. In Japan the definition was usually done from the respected persons side. The respected person means buddha image in this case. This is a completely opposite definition from that of prayers side. From the NMR investigation in this study the definition from the respected person side is supported. The definition has to go back to the former one at least from this study. This conclusion is reasonable from the standpoint of Japanese traditional definition between left and right.

Fig. 1. Solid state ¹³C NMR spectra of silk materials preserved in the coffins in Chusonji temple

