# THE BAQ$^{c}$AH VALLEY, JORDAN: TEST SOUNDINGS OF CESIUM MAGNETOMETER ANOMALIES

P.J. McGOVERN

*MASCA The University Museum University of Pennsylvania Philadelphia Pa. 19104*

Plate 1:
LANDSAT view of the central Transjordan plateau from an altitude of 912 kilometers. The Jordan River (left) flows into the northern end of the Dead Sea. The Baq$^{c}$ah Valley (arrowed) stands out clearly as a flat, elliptical plain (*circa* 10 km × 5 km), at an altitude of about 625 meters above sea level, and more than a kilometer above the floor of the Jordan Valley.
(Photograph: Courtesy of EROS Data Center, Sioux Falls, South Dakota: identification 8114407430500.)

## Introduction

The third season of the Baq$^{c}$ah Valley Project, undertaken over the period from May 15th to June 30th, 1980,* proved to be a most rewarding follow-up to the geophysical survey previously reported in this *Journal* (see McGovern 1979). Concurrent with that survey, thirty-three partially or fully robbed-out burial caves, nineteen of which dated to various phases of the Late Bronze Age (LBA), had been located on the lower slopes of Jebel al-Hawāyah and Jebel al-Qeṣīr, in the Umm ad-Danānīr region of the northwestern Baq$^{c}$ah Valley (Plate 1). But in the geophysical survey proper, cesium magnetometer data documented some twenty-five additional, significantly high magnetic anomalies with a pattern of intensity variation consistent with their source being burial caves which had naturally silted up, and had remained undisturbed until this time. A line of individual magnetic highs, coincident with the LBA cave designated A1, follows a diagonal path uphill. Clumps of vegetation along this line are supporting evidence for the presence of cave entrances at these points. Six significantly low magnetic anomalies, possibly resulting from non-magnetic air voids amid the slightly magnetic bedrock, were also recorded potentially as burial caves, only the mouths of which had become sealed by subsequent silting. The attraction of this latter group of caves, of course, was that they would be far easier to excavate than fully filled ones.

## Excavation of Cave A4

Ultimate excavation priority was eventually placed upon an area *circa* 7 meters by 11 meters on Jebel al-Hawāyah, with a high magnetic anomaly of about 15 nanotesla (nT). Arguments favoring this choice included the proximity of a very rich LBA cave (excavated in 1977: see McGovern 1980) and of several other robbed-out caves, which overall suggested the area had served as a large cemetery.

When excavation began, only a small outcrop of bedrock was visible under the surface's heavy vegetational growth. But soon the mouth of a burial cave (designated as A4) was visible, with its sealing of six large boulders, each 1.5 meters in length, still intact. This main entrance faced due east onto a cobble-floored forecourt (of about 20 square meters), which in turn gave way to an entrance ramp on the southeast side (Plate 2). All of this area was completely silted over, in some



Plate 2: Cave A4 after excavation. (Photograph: Courtesy of N. Hartmann, MASCA.)

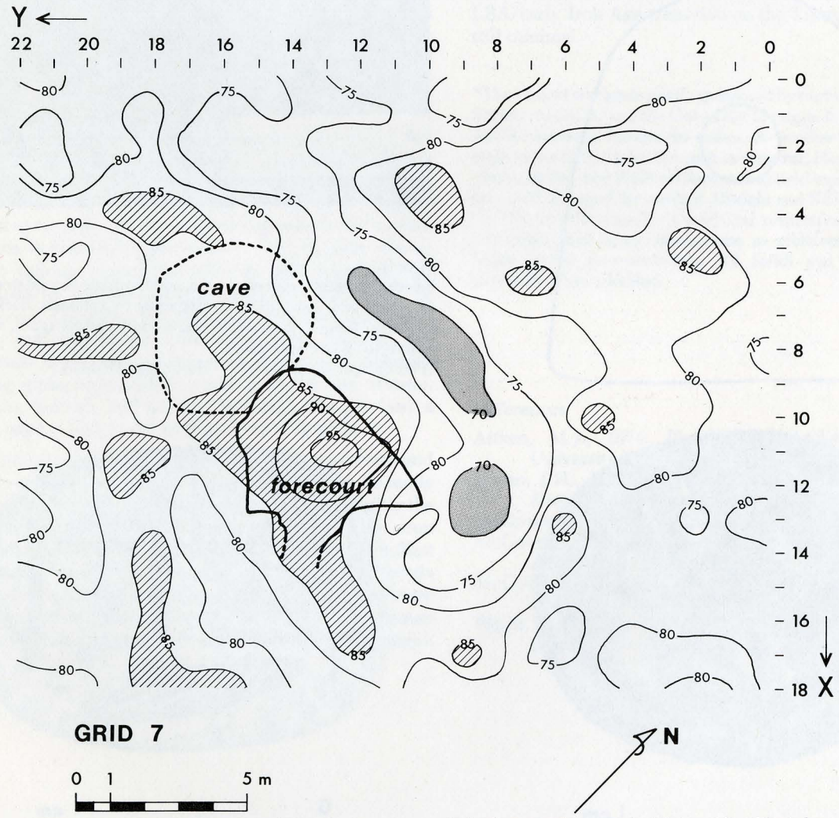
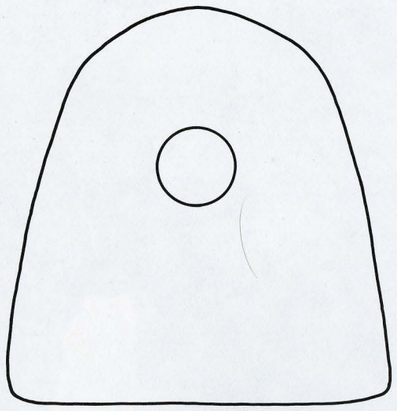



Fig. 1: Superimposition of the groundplan of cave A4 over the high magnetic anomaly (diagonal hatching): lows in magnetic intensity are indicated by stippling.

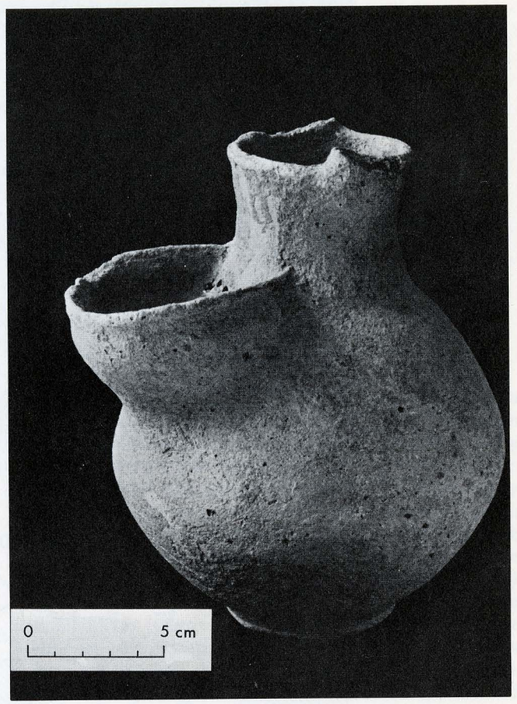





Plate 3:
Selected artifacts from cave A4: **a.**, anklet, made of mild steel, **b.**, Iron IA stamp seal, most probably depicting two animals, back-to-back, **c.**, "beer-strainer" (a characteristic Iron IA pottery type), **d.**, steatite scarab (of Ramesside date).
(Photograph: Courtesy of N. Hartmann, MASCA.)



places to a depth of 2.5 meters. A secondary entrance through the cave's roof—the so-called *npš* (= soul) hole—was blocked by a single boulder wedged into its mouth.

The cave itself proved to be circular in shape (*circa* 4.5 meters in diameter) and close to 2 meters in height. When the groundplan of the cave and forecourt was superimposed over the high-resolution meter-spaced magnetometer grid, the fit between them was extremely close (Fig. 1). The 85 contour line (recording the magnetic intensity of 43,885 nT) follows the general external configuration of the burial complex: the area of greatest colluvial accumulation in the forecourt matches the 15 nT high in the magnetic anomaly (at x = 11, y = 12.5). With some allowance for geometric variations the range of magnetic values (dropping to 5 nT on the periphery of the complex) corresponds very closely to calculated intensities for the soil volumes of the cave and the forecourt. The low magnetic anomalies to the north, rather than being due to non-magnetic air voids in this instance, correspond to large bedrock out-crops with a lower magnetic intensity that is not offset by any surface soil, which is further accentuated by the anti-magnetic 'tail' of the main magnetic high (for fuller explanation of this reversal effect, see Aitken 1974). Although groundwater percolation may have eroded away some of the soft limestone/sandstone bedding planes during the initial stages of cave formation, the final form of the relatively symmetrical cave and forecourt is man-made.

## The artifact record

Despite its relatively small size, cave A4 had been used to inter more than 225 individuals, the majority of which were deposited in two secondary heaps: women and children to the south, men to the north. And with the burials there was an excellent, unique assemblage of, not LBA material, but instead Iron IA artifacts (dating *circa* 1200-1050 B.C.): 78 whole vessels (including bowls, lamps, chalices and basalt mortars), iron and bronze anklets/bracelets, earrings and rings, beads in a wide assortment of types and materials (including glass, bone, faience, and semi-precious stones), toggle-pins, buttons, and one example each of a pendant, a scarab, a stamp-seal, and a cylinder-seal (Plates 3a-d).

The pottery ware is currently the subject of thin-section and neutron activation analyses, so that comparison can be made with the rich clay deposits of the region that are possibly the largest in Jordan (see McGovern 1981). The iron anklets/bracelets are, in fact, of mild steel, and are the earliest such artifacts from Transjordan, and fortunately retain substantial amounts of uncorroded metal in their structure (see Pigott and McGovern 1981). The study of the human skeletal and faunal material is being carried out in two stages. The gross quantitative and non-quantitative attributes are now being interpreted by Marilyn Saul, at ACOR in Amman, but the material will subsequently be studied by Dr. Donald Ortner at the Smithsonian Institution, with respect to the palaeopathology and genetic characteristics of the bones. Preliminary results already indicate all ages are represented, various diseases are in evidence (for example, arthritis and dental caries) and a number of individuals exhibit similar genetic traits of the patella and cranium. It appears, from the partial articulation of some of the skeletons, that several bodies were hastily pushed aside soon after initial use of the tomb, to make room for a large number of fresh individuals. This is perhaps suggestive of the impact of an epidemic, war, or other natural or human catastrophe, often hypothesized for this period (see, for example, Hayes and Miller 1977).

In general this tightly dated burial group promises to illuminate a critical period when the relatively advanced and cosmopolitan LBA culture was in decline and new peoples, such as the Ammonites and Israelites, were emerging as a major force in the area. These findings come at a time when the information we have about the mechanisms of the LBA/early Iron Age transition on the Transjordan plateau is still minimal.

*The project was again jointly sponsored by the National Geographic Society, MASCA, and the University Museum: it was affiliated with ASOR (Amman). Besides the author, three other MASCA personnel were in the field (Helen Schenck as registrar, Nicholas Hartmann as photographer, and William Glanzman as field supervisor): additional core staff included the resident Albright and NEH fellows at ACOR (Dr. Vincent Clark and Dr. David Graf, respectively), Marilyn Saul as osteologist, and Susan Balderstone as architect. The support of Departmental representatives, Ali Sa'idi and Sa'ad Hadidi, is gratefully acknowledged.

## References

Aitken, M.J., 1974: *Physics and Archaeology* (Oxford University Press, London).
Hayes, J.H., Miller, J.M., eds., 1977: *Israelite and Judean History* (Westminster Press, Philadelphia).
McGovern, P.E., 1979: *MASCA Journal 1* (2), 39.
McGovern, P.E., 1980: *Annual of the Department of Antiquities of Jordan.*
McGovern, P.E., 1981: *Archaeological Investigations in the Baqʿah Valley, Jordan.* Forthcoming.
Pigott, V., McGovern, P.E., 1981: *MASCA Journal 1* (8), in press.