# Preliminary Report on the Exploration and Excavation of Mugharat el Wardeh and Abu Thawab

by
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## The Genesis of the Project

The project covered in this report had its beginning in the mind of James L. Kelso, now Emeritus Professor of Old Testament History and Archaeology at Pittsburgh Theological Seminary. In 1956 Kelso wrote to Nelson Glueck concerning his plans for excavations in the Ajlun area of Jordan, the best source of iron ore in the country and the most promising place to begin an iron industry investigation. Glueck had described two particular sites, Mugharat el Wardeh (Cave of the Rose) and what he called Abu Trab (1951:225, 237–38; 231–32). In his answer to Kelso he wrote the following:

> You will find that I have mentioned the piles of slag around Ajlun. However, I never found in any one place a sufficient amount of clear pottery which would enable me to assign the mining and smelting carried on there to any definite period. If my memory serves me correctly at the moment, the mining activities there have generally been attributed to fairly late periods. I should not be surprized to learn, were it possible to engage in exhaustive, almost square meter by square meter examination of the slag piles around Ajlun, that evidence might be found going back to B.C. times.

Kelso had to abandon hopes for the project when, in 1960, after the fourth season at Bethel, he suffered a heart attack just as he was in the final planning stages of an exploration in Ajlun. Finally, in the summer of 1976, twenty years after the Kelso-Glueck correspondence, a preliminary exploration and test excavation was made by the author of this report at the two sites Glueck had described, Mugharat el Wardeh and Abu Trab. The work was done under the auspices of the Kyle-Kelso Archaeological Fund, with permission of ACOR and the aid of the Department of Antiquities of Jordan.

## The Nature of the Project

Since the Ajlun district of Jordan is the best source of iron ore in Jordan from antiquity to the present (Van den Boom and Lahloub 1962:6; Torrente 1967:5; Basha 1968:3, Bender 1974:57), it is the best place to begin a study of the iron industry of Jordan. What may be learned of the persons who exploited the iron ore deposits, how they reduced the ore to metal and how they manufactured and used products of iron, and when all of this took place is what we would like to discover. Very little is known about the making and treating of iron in antiquity and virtually nothing is known of the state of the craft in ancient Jordan.[1] To date the best sources for the Wardeh area are the prospection studies of the iron mines by Van den Boom and Lahloub published in 1963, the papers of Torrente in 1967 and Basha in 1968, and the geologic surveys of Friedrich Bender of

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1)Initial bibliographic research and study of the subject was conducted under a DenUyl Grant from Hope College, Holland, Michigan. See the attached Bibliography.

the German Geologic Mission undertaken for the Hashemite Kingdom of Jordan in 1972 and 1973. Glueck's surveys of 1936–38 are of importance for describing the two sites with which we began, but little archaeological data is included from his all too brief visits.

Wardeh is dated by Bender, a geologist, as Crusader and by Glueck as medieval. Neither is a satisfactory designation by today's more sophisticated methods of description. Until our 1976 exploration and test excavation no pottery and little slag had been found at Wardeh to aid in the dating of the site (Glueck 1951:232; 238). James Swauger of Carnegie Museum in Pittsburgh, Pennsylvania did collect and analyze a few slag samples in 1961 when he studied Jordan's dolmen fields.

Our initial project is to fully explore the Wardeh smelting operation. In our second stage we propose to locate, describe, and to sample by excavation insofar as practicable other iron ore sources and smelting sites in Jordan. In the summer of 1976 were told by a Jordanian man from Anjara in the southern Ajlun district that he knows personally of four iron mine sites other than. Mugharat el Wardeh and that there are by local reckoning thirty one such sites from Laksheba, the southernmost village of Jebel Ajlun, to Ajlun, a distance by surface of c. 60–70 km. Whether or not the figure is inflated, it is certainly not impossible, as the Natural Resources Authority of Jordan and all others who have such information recognize that southern Ajlun is the most prominent ore source in Jordan.

We selected Mugharat el Wardeh because it is the best described and richest iron ore deposit of Jebel Ajlun and Abu Trab (and) because, according to Glueck (1951:225), it is the closest site giving evidence of a smelting operation.

A team of researchers was gathered together to undertake the work from August 9 to August 16, 1976. Two days were spent at Abu Trab (sic) and five days were spent at Wardeh. The author served as principal investigator and director of the work. Others were Oscar C. Schultz, Jr. of Winebrenner Theological Seminary, Findlay, Ohio who served as photographer; Carl S. Wheat, a mining engineer from San Marino, California as surveyor; Sultan Schraideh, inspector for the Department of Antiquities in the Irbid district; Oude Abass, our driver from the Department of Antiquities; Timothy Schultz and John Mark Coughenour, students with previous excavation experience at Tell Hisbân. The pottery specialist was James A. Sauer, Director of ACOR and analyzing our iron slag is J. Alfred Berger, principal metallurgist from the University of Pittsburgh.

### Mugharat el Wardeh

Mugharat el Wardeh is located about 35 km. NNW of Amman on the southern slope of Jebel Ajlun. The nearest village which unfortunately cannot be reached by road is Rajib, about 3 km. to the north. Deir Alla, in the Jordan valley, clearly visible from Wardeh, is an hour and a half distant by foot according to the local Wardeh villagers. Also the so-called Ajlun castle, Qalat al-Rabadh, some 50 km. to the north can be seen from Wardeh. The best access to the site by four wheel drive vehicle is from the village of Sakib midway on the E–W road from Jerash to Ajlun. One turns south and follows a donkey path to the caves at Wardeh. More precisely the caves are located by the following map coordinates: Eastern coordinates 217,000–218,000 at E – 217,225 and between 181,000–182,000 at N–181,115. The site is 2 km. NE of Furwan rather than NW as Glueck describes (1951:237). The elevation

of the test square is 661 m. above sea level and the elevation of the caves which open into the iron mine is 655 m. above sea level.

The caves at Wardeh are in a depression to the south of the present road when heading west toward the Jordan valley (Pl. XXXI, 1). The Wadi Zerka wends its way in front of the slope to the south about 10 km. away.

Our first task at Wardeh was a brief exploration of each of the three caves. Each of the three cave openings leads to horizontal shafts of the mine itself. To enter the mine one can enter any of the three openings. The largest cave entrance, a 3 m. wide x 2 m. high mouth, leads immediately to a longitudinal underground cavern whose floor is approximately 6 m. below the surface. Bender (1947:157–58), relying in part on the detailed study of the deposit carried out by Van den Boom and Lahloub (1962) described the ore body as «irregularly lenticular in shape, approximately 300 m. long (NW), about 200 m. wide and up to 9.80 m. thick. . . The main components [are] hematite and limonite. Calcite, quartz and chalcedony occur as accessory minerals; they are very rare in the main ore body. Sulphides were not observed... This deposit was formed by hydrothermal, probably late-magmatic, epithermal metasomatism. . . The average iron oxide content of 205 samples from 15 boreholes was 67.9% $Fe_2 0_3$; the proven ore reserves are 561,000 tons.» The caves had washed-in materials and a deep mud sediment to a depth of at least 30 cm. and more likely a meter. Only one very late sherd was recovered in the caves.

We began a systematic sherding of one km. in all directions with our center at the opening of the caves. In the process we located the test pits and shafts of JIMCO (Jordan Industrial Mining Corporation, a Jordanian company formed in 1956 to attempt to mine the ore reserves) c. 300 m. to the west of the caves site. Other JIMCO test pits are c.200–300 m. to the west of the caves area and just south of the present road to Furwan. We were told that JIMCO gave up the attempt to mine the ore due to the inaccessibility of the site to heavy equipment.

Sherding at the site recovered predominantly Ayyubid-Mamluk pottery, some Byzantine and Roman sherds and quite large amounts of slag. Glueck has described the location as without the presence of slag (1951:232) and without pottery (1951:238) so we were delighted to locate both in large amounts.

Final explorations of the caves led us to determine that no excavation of the caves' interiors or at the mouth of any of them would prove useful in the short time available. The mud, stone, debris and dead scrub washed into the cave left both the mouth and the immediate interior with a possible meter of mud. We reasoned that the users would not deposit much in the way of occupational evidence so we decided on another location for the test square. Our selection was based on several factors: 1) the area with the largest number and greatest concentration of sherds and slag; 2) the highest site to the north for view, breeze and watch over the cave entrances; 3) proximity to a water source (Ain Wardeh); 4) the deepest apparent soil where occupation could have layered.

We began excavating a three meter test square some 30 meters north of the caves entrance, a location which met all our criteria. In the course of the excavation five loci were numbered. Sherds from all loci in

the square were Ayyubid-Mamluk, with a few Roman body sherds (Pl. XXXII, 1). Slag taken from the test square at several levels totaled 149.5 kg. The largest amount, nearly five buckets full, came from a gray ash and slag locus (locus 3) which may be a pit-shaped smelting installation. The edge of a stone basin, the type of hearth used to smelt iron ore as early as Roman times emerged at 25 cm. below the surface (Tylecote 1965:225). Unfortunately, no time was available to complete the site to bedrock.

## Abu Thawab

Initially, we experienced some difficulty in locating the site Nelson Gluck described and named Abu Trab (1951:225; 238). As we progressed several factors of some importance emerged. First, Glueck had either misheard or mistransliterated the Arabic name. No villager recognized the name Abu Trab. The correct place name is Abu Thawab as indicated by the Department of Lands and Surveys Sheet 11/70. The second problem was the matter of Abu Thawab's distance from Wardeh. Glueck had it c. 10 km. to the SE-ESE of Wardeh on the south of the Wadi Zerka (1951:238). This figure is correct if measured on a flat map, but the actual distance traveled between the two points is 54 km. traveling the donkey paths, fording the deep cut of the Zerka and reaching Wardeh by the ancient road along the southern Ajlun mountain slope through the village of Burma, the most direct route possible. The third factor is the impossible identification of Abu Thawab as the smelting site of ore carried from Wardeh. The 54 km. distance across the Zerka to the south from Wardeh and the presence of smelting remains at Wardeh are enough to dissociate the two sites. Abu Thawab is indeed the site of an ancient smelting operation, but it is independent of the iron mine at Wardeh. In fact, preliminary ceramic evidence shows it may be an earlier site than Wardeh's own smelting operation though Wardeh's evidence is not yet completely clear.

Abu Thawab is located c. 2 km. ENE of Er-Rumman just off to the east of the present road between Amman and Jerash, c. 14 km. south of Jerash. Dhaharet Abu Thawab is nothing more than the northeast slope of a hillock beside Wadi Abu Thawab. The wadi runs to Wadi Rumman which flows immediately into the Zerka just west of the present ford of the Zerka crossed by the new road. The old ford is only c. 2 km. to the NNW of Abu Thawab. More precisely Abu Thawab is found at map coordinates between E–230,000 and 231,000 and N-174,723 and 174,750 at 551 m. above sea level.

The distinctive features of the site include three smaller caves not, however, of the mining type found at Wardeh, and an area of slag and sherd remains covering c. 300 m. square. No architectural remains are to be seen. Of the three caves currently used as animal shelters, two of them appear to have been used as cisterns. The presence of slag is greatest in front of cave two and between caves one and two, a 20 m. plateau strip where a slag dump is clear (Pl. XXXI, 2). A furnace or smithing operation might well be located by test excavation. The slag recovered is iron slag, but no source for the ore has been determined.

Systematic surface sherding yielded Iron I body sherds in every locus as well as Roman and Late Roman, Early Byzantine, a few Byzantine, some Umayyad, but predominantly Ayyubid-Mamluk pottery everywhere (Pl. XXXII, 2).

## Concluding Historical Observations

Obviously the preliminary investigations at Wardeh and Abu Thawab do not warrant elaborate hypotheses concerning the iron industry in Jordan. Nevertheless, a few observations which may show the potential significance of this research are in order.

We have established that ore from the Wardeh mines was smelted at the site. The predominance of Ayyubid-Mamluk pottery found with the slag in stratified loci suggests that we must seek historical data to link the mining and smelting operations with Ayyubid rule over this district. Evidence of Ayyubid interest in the Ajlun mines is found in Arabic historical sources.[2]

Trade in timber and iron were important government monopolies in the medieval states, because of their military significance (Ashtor 1976:114). So the production of iron is likely to have been a government enterprise rather than a private one. Also the establishment of the iron industry is likely to be related to state enterprise rather than individual or group ownership in the Ajlun district.

Despite an embargo on iron export imposed by both church and state in the twelfth through the thirteenth centuries (Ashtor 1976:240; Mayer 1972:120, 174), European merchants frequently circumvented the ban. The Ayyubids concluded a treaty with the Pisans in 1173 and again in 1215 by which the latter undertook to supply the Ayyubids with precisely those goods embargoed earlier: iron, timber and pitch (Ashtor 1976:240). Still the attraction of a dependable supply of iron must have been a considerable attraction to the Ayyubid governor who built the Qalat al Rabadh, the imposing castle near the village of Ajlun.

The local availability of iron ore and timber, hence charcoal for reducing these ores to iron, may together have encouraged the establishment of the iron industry in the Ajlun area. But the making of iron required not only the timber and ore as raw material; the essential ingredient was technology, and the experience built up through generations of working with iron. Where were such technology and craftsmen to be found? Specialists in iron production would have been available to the builder of Qalat al Rabadh, Izz ad-Din Usama, whom Saladin transferred from Beirut to become governor of Ajlun (LeStrange 1965:388–89; Johns 1931:23).

Beirut was already an important iron producer in 1154 when Idrisi, who prepared an economic digest for his Norman master, Roger II of Sicily, reported that

> In the neighborhood [of Beirut], and belonging to it, is an iron mine, of very good metal and easy to work. They extract from this, ore in quantity, and send it to all parts of Syria (LeStrange 1965:410).

At the time the Crusaders ruled Beirut, but the city fell to Saladin after a seige in 1187 and remained in Arab hands for ten years. The iron mines are located near Baabda, a few kilometers southeast from Beirut, so it is likely that they were already held by the Arabs When Saladin moved Usama from Beirut to Ajlun in 1184–85.

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2) I am indebted to Robert Miller, a graduate student at the Institute of Archaeology in London for this historical material and some of the references. A portion of his unpublished manuscript «Ayyubid Iron Industry in the Ajlun District, Jordan» has been used here with his permission.

At any rate, either then or on the fall of the city part of the booty could have been skilled iron-craftsmen. It is not unlikely that these workers were transferred from Beirut to the Ajlun district to begin iron production, perhaps as part of the preparations for the successful campaign culminating in the victory at the battle of Hattin in 1187. Such an early date fits well the circumstances of Usama's transfer and the known demand for iron represented by the treaty between Saladin and the Pisans in 1173. Indeed, no iron would have been forthcoming from the Pisans to Saladin when he renewed hostilities in 1179 against the Crusaders. His new source of iron, the Ajlun district, the technicians to produce it and the governor to oversee it would all have been in place by 1185–87.

The name of the craftsmen imported by Usama may even be commemorated in the name of the village near Ajlun, Kafrinje, i.e. Kafr-Franje, village of the Franks. The name suggests either a European origin (Johns 1931:30), or derivation from a Crusader principality if there is any connection, which is by no means certain, with the possibility of a link between the iron industry in Beirut and in Ajlun.

It may be then that the Ayyubid smelting operation uncovered this summer at Wardeh is as early as the governorship of Usama of Ajlun, c. 1185.

Whether Wardeh will yield evidence linking it to Roman use or to Iron Age use remains to be seen. The location of the mine and its smelting operation situated as it is so near to Deir Alla and to other sites in the Jordan valley where Iron Age materials have been found lead one to speculate that such links should be pursued.

Further excavation should expand our understanding of the iron technology employed such as the design and use of the furnaces, greater detail on the raw materials and hopefully on the product itself, iron bars or implements made from the refined metal.

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