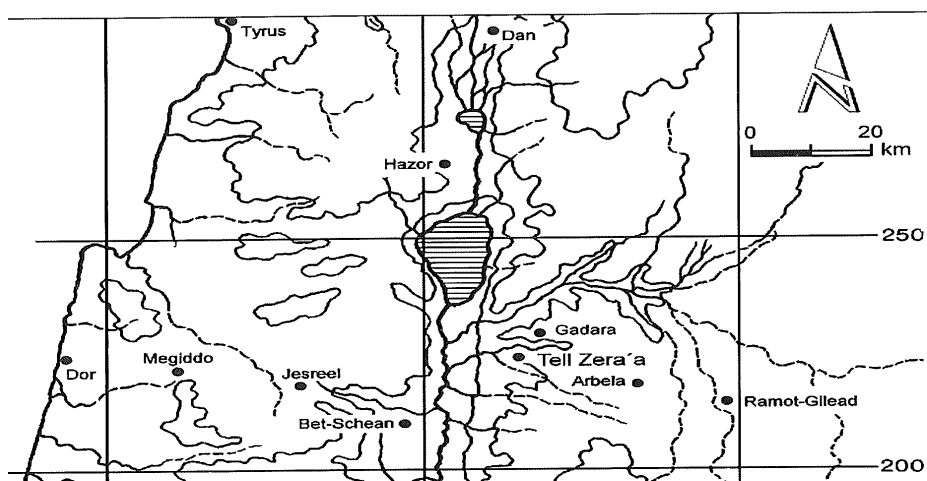


The 'Gadara Region Project' Archaeological and Archaeometric Investigations

The ruins of the Decapolis city of Gadara are fascinating because of their archaeological relevance as well as their extraordinary scenic location (FIG. 1). The city is majestically sited on the northeastern mountain spur of Transjordan high above the Lake of Galilee. If one looks to the south, one sees an unusually fertile valley: the Wādī al-'Arab and its tributary, the Wādī az-Zahar. Nevertheless, its relevance for the antique city of Gadara and its pre- and post-classical development has hardly received any

attention until now. The wadi and the trade route running through it are dominated by a remarkable settlement – the Tall Zar'a (FIG. 2).

For the next ten years an integrated study of the Wādī al-'Arab and its urban centers (Tall Zar'a and, from Hellenistic to Byzantine times, Gadara) will constitute the main research work of the Biblical-Archaeological Institute Wuppertal. The exploration, excavation, and conservation of the antiquities to be found in Tall Zar'a are the focal points



1. Map of northern Palestine, showing the location of the Tall Zar'a in the Wādī al-'Arab.



2. Tall Zar'a.

of the archaeological project. The excavation of Tall Zar'a will be conducted in close and trusting cooperation with the German Protestant Institute, Amman.

Aims

Within the framework of the 'Gadara Region Project', the research of the Biblical-Archaeological Institute, Wuppertal, focuses on the following specific questions:

- (1) What can be said about the ca. 5,000 year long settlement history of Tall Zar'a, which is distinguished both by its artesian well and its privileged location in the fertile and geostrategically important Wādī al-'Arab, and can be expected to reveal a stratigraphy representative of the Jordan valley and northern Jordan?
- (2) What insights can be expected into a settlement process of comparable duration in this relatively isolated, but clearly defined geographic area?¹
- (3) What were the survival strategies developed by the inhabitants over the millennia to adapt to the natural conditions of the valley, and how did they respond to changes in climate and given resources?²
- (4) What conclusions are to be drawn from the above for the trade routes (Mediterranean-Transjordan)?
- (5) What relations existed between the Tall Zar'a and the urban center of Gadara, which flourished almost exclusively in the Roman-Byzantine period?³

These regionally oriented questions, taking into

account the interplay of various factors within the region, assists us to develop the archaeology of a landscape.

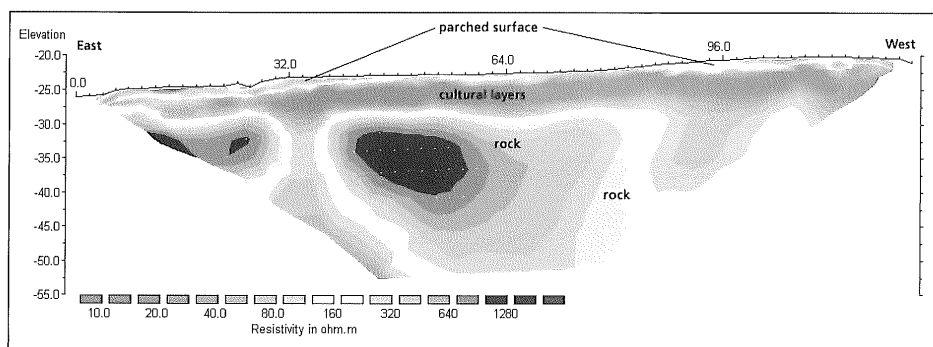
Goelectric tomography

Within the scope of the geophysical exploration of the tall, goelectric mapping and two-dimensional as well as three-dimensional tomographic techniques were brought into action in order to:

- be able to plan archaeological excavations in advance and to develop exact strategies for the planned excavation,
- acquire knowledge of non-excavated areas also, and
- leave larger excavation areas undisturbed for coming generations.

For the purpose of the geophysical exploration a LGM 4-Point Light μC and a Geolog 2000 GeoTom were used. On Tall Zar'a we measured more than 50 profiles in various configurations. Two outcomes are interpreted as follows:

The first measurement (FIG. 3) shows a profile (in dipol-dipol configuration) that runs across the tall in an east-west direction and yields essentially geological insights. For this, 63 electrodes were positioned at a distance of 2m. In the profile a cultural layer of 6 to 7m thickness can be recognized, showing a low-ohmic value (up to 100 Ωm to the max.) below the dried-up surface which, as expected, appears as a high-ohmic anomaly (more than 160 Ωm). An important observation of our survey confirms the enormous thickness of the cultural layer of Tall Zar'a. The cistern found in the



3. East-west profile of the tall plateau (Iteration 4, RMS-fault = 24.5).

¹ This includes a study of the neighboring settlements of Khirbat Bond (2128.2233) and Tall Kinise (Ra'an) (2191.2271), where settlement traces are present from the Early Bronze Age to the Ottoman period.

² This integrates an investigation of the agricultural potential, flora and fauna geological aspects (water, rock formation, and soil types), trade (road, infrastructure), and the strategic importance of the wadi.

³ Although Iron Age ceramics have been found in disturbed layers in

ancient Gadara as well as evidence of residential buildings of the Islamic Age, the investigation of the "classical periods" there was rightly considered of primary importance. The time before and after the flowering of Gadara will no doubt require further research. The region south of Gadara offers a unique opportunity to examine in a systematic and comprehensive way the development of settlement activities within a naturally defined territory, i.e., in relation to Gadara, exploring in greater detail the pre- and postclassical periods of the Gadara region.

southeast of the tall, which has a depth of 5.75m, reaches up to the actual tall surface directly above the cistern's round vault and is built on bedrock. In the east, bedrock almost reaches up to the surface. Since the tall as a whole slopes slightly toward the east, drainage occurred in that direction. The remarkable downward oriented double-conic (low-ohmic) area at meter 32.0 is connected with the functioning of the artesian well.

On the western slope (FIG. 4) about 20 parallel profiles were plotted and measured with 50 electrodes at 0.5m distance. Here the dipol-dipol configuration was also used in order to ensure a better resolution of the screen process prints. In this way, a location of the walls on the tall's slopes could be explored in 2001. In the model illustrated below, two high-ohmic anomalies can be traced at meter 4.0 and 11.0, lying up to 2m below the surface. Since these anomalies occur in all 20 parallel profiles, we assumed in 2001 that they were related to the remains of wall structures. When we excavated them in 2004 – these walls turned out to date from the Late and Early Bronze Age.

Survey in 2001

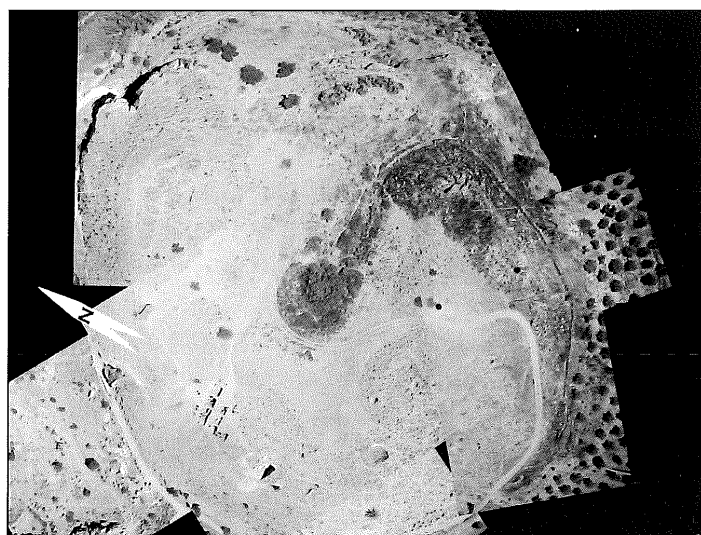
The survey area covered the whole tall and all its slopes. In all, 127 survey squares of 20m x 20m size were searched, i.e. 5.08 ha. We found about 24,000 sherds and plotted them on the tall and its slopes as shown in Vieweger 2002a, b.

Photogrammetry

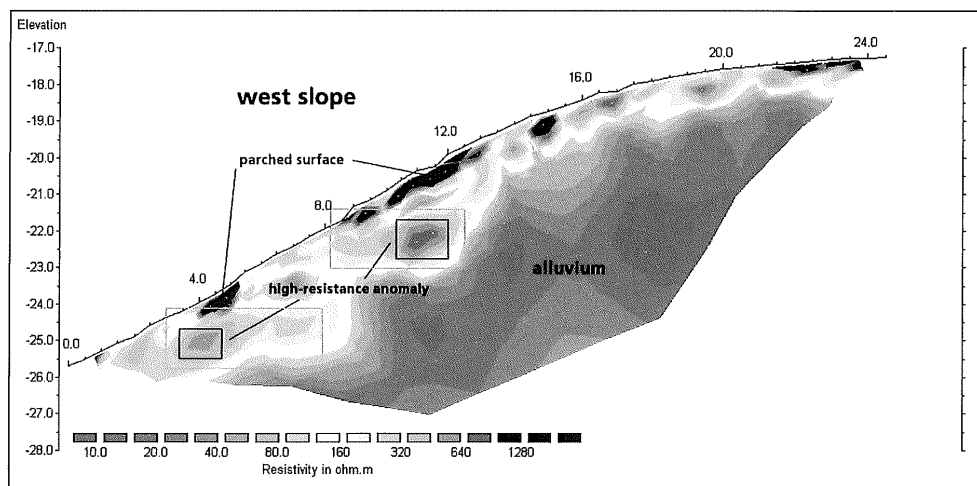
Aerial Photogrammetry for the Production of Site Maps

The mapping of features in large-scale surveys has long since been carried out by GPS in an effective and time-saving way. We combined this map-

ping method with the recording of objects, as has been common in archaeology for some time. We fastened a camera platform, equipped with three-dimensional mobility via remote control, to a helium-filled balloon. With a rope, the balloon was tied up on the ground or directed to the areas to be surveyed. In order to take photos, the camera had to be positioned perpendicularly above the areas to be mapped. This was done with the help of radio tele-control. The section in the viewfinder was relayed digitally to a ground station (TFT monitor or head display during strong sun radiation). Photos taken from heights of up to 135m supplied ground segments of 15,000m per picture. On one hand, these photos served as photograms for specific site data supplemented by GPS data. On the other, the overall view of the excavation area and its surroundings could be impressively documented. The pictures were rectified and assembled into a mosaic by way of control points (FIG. 5).



5. Rectified photographs, assembled into a mosaic by way of control points.



4. West slope profile (Iteration 4, RMS-fault 12.9).

Photogrammetric Documentation of Archaeological Features

With this method we documented our excavation areas in 2003 and 2004. On a daily basis, nearly perpendicular photos were taken from about 4m above the squares. First, the distortion of the lens was corrected. Then the digital photographs were rectified via control points (here the corner points of the squares). In this way, both the progress of the excavation could be documented and site sketches produced with great accuracy.

The evaluation of these photographs should be undertaken jointly by the surveyor and the archaeologist in charge, to ensure that the represented data are correctly interpreted. To improve our techniques, we will analyze potential error sources inherent in deeply excavated squares and consider strategies to eliminate these while taking into account aspects of practicality and accuracy.

Excavations in 2003 and 2004

The 2003 campaign marked the start of the tall's excavation. In addition, the survey was extended to the Wādī al-'Arab area. To begin with, excavations on Tall Zar'a concentrated on its northwestern slope (area I). The tall survey done in 2001 showed a clear concentration of prehistoric (in particular Early Bronze Age) sherds on the surface, especially on the slopes of this area.

Four hundred and fifty square meters (18 squares measuring 5m x 5m each) were opened up and explored to a depth of 3.3m. We excavated five strata: the most recent stratum dates to Roman-Byzantine times, followed by two cultural layers from the Iron Age and one from the Late Bronze Age. According to our geophysical investigations, the cultural layer as yet unexplored in this area is another 4m deep. Our survey indicates there may be settlement layers reaching down to the Early Bronze Age. An Early Bronze Age city wall has just been uncovered on the slope about 1m below the Late Bronze Age city wall.

Of course, little can be said about the excavated architecture after the first digging campaigns, but some basic features can already be described. In the top stratum (stratum 1), three large houses on both sides of a paved street were found from the Roman-Byzantine period, whose rooms showed a nearly exact northward orientation (like our grid). In one room, a threshold (AL 118), a pedestal/column base and, adjoining it, a narrow bench (AM

118) was found. Toward the western part of the slope, the building breaks off near the edge of the slope's steep incline.

The two subsequent strata (strata 2 and 3) date to the Iron Age. The building activities traced in these two layers are quite different. A sawtooth-like wall, following the curve of the tall, marks the western limit of the built-up area of the more recent Iron Age stratum (AL-AO 117). Due to the baulk it is unclear, if the wall in the squares AK/AL 116 is a continuation of the aforementioned wall. Both walls are built with field stones and are 1-1.20m thick. In AL 117, a well-wrought working surface, including a grinding stone, was exposed.

The older Iron Age stratum was disturbed several times by subsequent settlements. Therefore a comprehensive building structure can not yet be clearly determined in the few areas excavated so far, but all fragments found in this stratum follow the same alignment as a sizeable oven that was excavated in AM 118. Older Iron Age structures were partly built directly onto the wall stumps of the Late Bronze Age city wall located underneath, perhaps reusing the outer part of its wall (AL 116/117).

On the western slope, a settlement layer of the Late Bronze Age (stratum 4) and a contemporaneous casemate wall were excavated. In square AM 116, a small, stone-lined silo was found in one of the casemates. To the south and adjacent to this, a stone-paved room was found, which led into an extended paved room possibly belonging to something like a gate or a postern. Inside the casemate wall, a street ran alongside it. Unfortunately, several pits of the Late Iron Age disturbed the Late Bronze Age floor that was otherwise generally well preserved. A water channel was covered by stone slabs; the water drained from the city via a 3m deep vertical shaft.

The Late Bronze Age is characterized not only by its architecture but also by rich finds which, apart from bronze objects (fragments of daggers, mirrors, pins), include Cypriote and Mycenaean ceramics. On the floor of a building to the east of the street (AM 118), several stone vessels, ceramics, bronze fragments, and a fully reconstructed alabaster stand were found.

According to the survey conducted in 2001, the Early and Late Islamic settlements on Tall Zar'a do not extend across the entire tall area. They are concentrated near the spring and in the south of the tall.

Excavations will be continued in spring 2005.

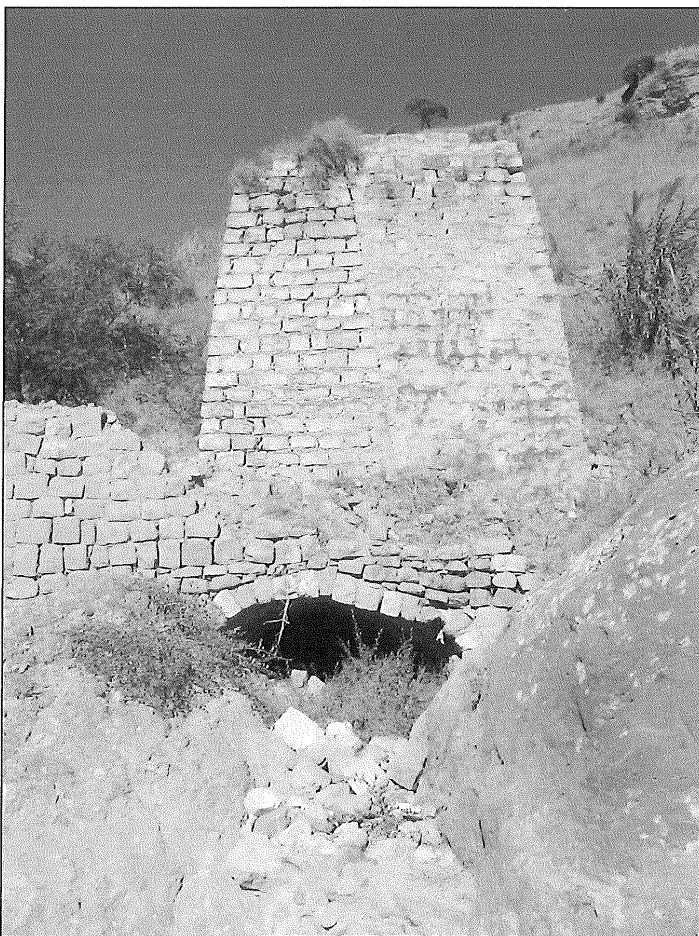
Ceramics

During the excavation campaign, ca. 25,000 sherds were found, *all* of which were determined according to ware; of these, the diagnostic sherds were additionally determined on the basis of typological criteria.

Together with the Bergbaumuseum in Bochum (Dr. Andreas Hauptmann), a selection of representative ceramics from Tall Zar'a will be scientifically analyzed on a continual basis. In the course of this, the focus will be on questions of provenance (local production, production in the surrounding areas, e.g., in Gadara, imported goods) and aspects of their technical production.

Mill and Water Culture in the Wādī al-'Arab

In the Wādī al-'Arab, six water mills⁴ were explored and measured (FIG. 6). In spring 2004, the building construction and milling technology of the individual mills will be studied as well as their



6. Water mill in the Wādī al-'Arab.

respective water supply. Another point of interest will be the water management in the wadi where the mills operated: to the northeast of the tall in fairly close proximity to it.

Experimental Archaeology

Following the excavation, a project with a technological-historical background was carried out. Within three weeks, Mustafa Saleh, the son of the last Tabunye still living in Umm Qays, built a bread-baking oven commissioned by the Biblical-Archaeological Institute. In particular, we analyzed and documented the following stages of construction: origin, grinding, cleaning, mixing of the clay, origin and use of added materials (e.g., rush and goat hair), manual construction of the oven, special make-up of the oven's base and upper rim, preparation of the pit in which the oven was set, heating it and of course, the baking of bread.

Acknowledgments

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