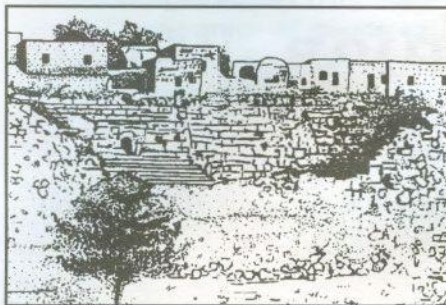




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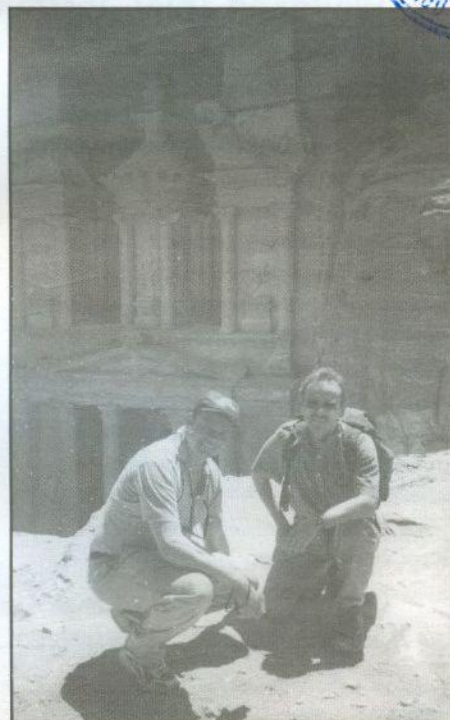
Newsletter of the German Protestant Institute of Archaeology in Amman



## German Archaeology in Jordan Beyond 2000



With the approach of the new millennium, Jordan is opening up more archaeological sites to the broader public and to growing numbers of tourists. The major focus is on the Petra region and the "baptism site." In addition to excavations, conservation and restoration work is becoming more and more important such that site preservation and presentation will become an integral part of archaeological projects. This being the case, the new millennium will face future archaeological projects with new challenges. However, despite the increasing need to broaden the field of research and incorporate conservation and site presentation into archaeological projects, financial cuts in the budgets of funding organizations present a major threat to continued archaeological research. For the year 2000, large cuts within the budgets of the German Protestant Church and the German government are affecting numerous cultural and archaeological activities abroad.



Dr. Friedbert Pflüger, member of the German Parliament (left) and Dr. Hans-Dieter Bienert (right) during a visit to Petra.

Therefore, our institute is being threatened once again with possible closure, despite the yearly growth in its activities. In 1999, two major archaeological projects were carried out. From March 21 to April 4, a second and final season of excavations was undertaken at the late Neolithic site of esh-Shallaf in Wadi Shellaleh, about 7 kilometers east of Irbid. This second excavation campaign, which was co-directed by Dr. Hans-Dieter Bienert (DEI-Amman) and Prof. Dr. Dieter Vieweger (Kirchliche Hochschule Wuppertal, Germany), focused on the extension of the settlement, its architectural remains, and their specific stratigraphical interrelation. A second preliminary report appears in this volume.

From October 2 to October 26, excavations and surveys were conducted in

the Ba'ja region, about 10 kilometers north of Petra. A preliminary overview of the region and the project also appears in this volume. The project consisted of several parts. First, at the site of Ba'ja I, archaeological excavations were conducted to clarify the stratigraphy of the settlement. This part of the project was directed by Prof. Dr. Dieter Vieweger from the Kirchliche Hochschule in Wuppertal (Germany). A survey of the site of Ba'ja III, an Edomite mountain stronghold, was undertaken by Dr. Hans-Dieter Bienert (DEI-Amman) and Dr. Roland Lamprichs (Dresden). At Ba'ja I and at the village of Fersh, about

(continued on page 53)

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# Gadara-Umm Qais: Studies on the Urbanization Process, Including a New Chronology for the Major Public Buildings at the Ancient Decapolis City

By: Wolfgang Thiel, Institute of Archaeology, University of Cologne (Germany)

Almost all the former members of the Transjordanian Decapolis went through a long, complex process of urbanization from their Hellenistic origin, which was followed by a period of decay in the Umayyad era; however, the details of this process are not yet very well known. A detailed chronology for most of their public buildings is missing or is still a matter of debate, although a great deal of effort has been expended on archaeological research there by many scholars.

For Gadara, where teams from Denmark and Germany have already conducted a series of excavation campaigns

since 1974, the stages in the development of its town plan are not yet very clear, despite the fact that a large number of ruins and a variety of structural remains are still present at the site today. It is only during recent years that this situation has changed. Unfortunately, the results of these investigations have not yet been published in a satisfactory manner. One of the main problems that could not have been satisfactorily solved by first the excavators was how to obtain a clue about the different stages in creating the urban system of ancient Gadara during the Hellenistic, Roman, Byzantine, and Umayyad periods, and to establish a coherent inner chronology of all known public monuments.

Finding a conclusive reply to such a ques-

tion is one of the main targets of the intensive research project at Gadara, initiated by The German Archaeological Institute / Berlin in 1985. For the reason, the present author who had the opportunity to participate in the recent investigations headed by Prof. Adolf Hoffmann tried to find a new approach to this subject by analyzing the rich architectural decorations scattered around the site. The material includes a multitude of decorated parts from the columns, entablatures, cornices, door posts, etc. Of these, the Corinthian capitals merit especially careful study, for they were used in almost every kind of public building during Roman times as a clear sign of Romanization. The advantage of this method is that such capitals can be dated accurately enough by comparison with corresponding pieces belonging to precisely dated monuments from major ancient sites in

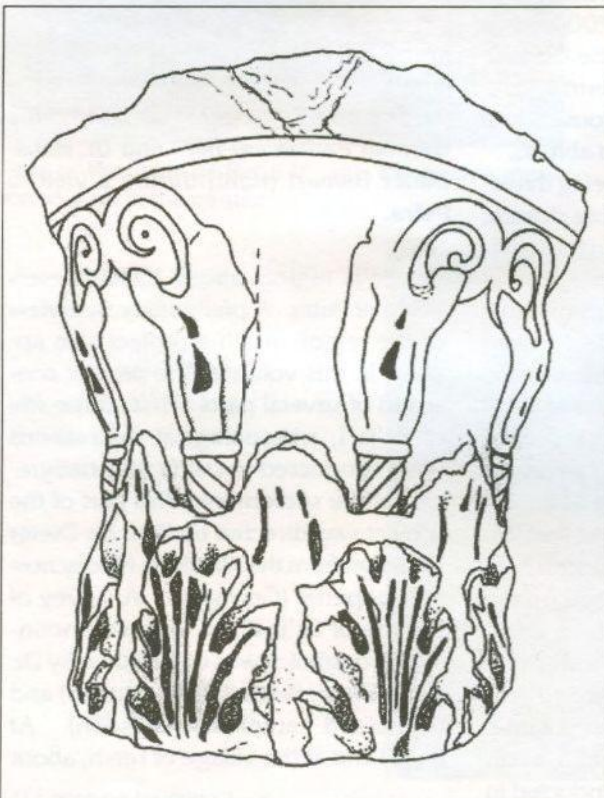


Fig. 1



Fig. 2

the region; such dating is done mainly by looking at building inscriptions giving the year of construction, or by studying the archaeological context.

If one compiles all the dated monuments with their specific architectural decorations throughout Syria, Palestine, and Transjordan, it is possible to obtain a clear idea of the stylistic changes typical of different periods (time style). Then, if one compares the material of several towns within a limited range beginning with the one which is the most distant, the motivic peculiarities of a certain region also become obvious (landscape style). Concentrating on these preconditions, it is easy to verify the spectrum of architectural decorations which once belonged to certain building contexts in a single town like Gadara.

These studies yielded a clear impression about the process of Romanization, in which the cities of the Decapolis had been involved since at least the early 1st Century AD. The resulting picture for Gadara is similar to that of other sites in the region, such as Gerasa, Philadelphia, and Bostra. During Hellenistic times there was only a small-scale settlement occupying a low hill (akra) and surrounded by a massive wall. A sanctuary consisting of a prostyle temple within a large square precinct lay opposite the town outside its inhabited area. This temple, built in the doric order, also contained Corinthian pilaster capitals, perhaps on the inside, which have close parallels in the capitals from Iraq al-Amir and in the Olympeum in

Athens, both built in the first half of the 2nd Century BC during the Augustean Age. There is not as much evidence of building activity as one might expect. However, the capitals from the large 'highplace' complex of al-Kabû, probably a sanctuary, situated at a distance of about 3 km to the east of the ancient city, may be assigned to that period (the last decade of the 1st Century BC).

For the following period of the 1st Century AD, one can discern an interesting phenomenon, namely some kind of gap in the production of the Corinthian capitals. The first capital built thereafter is a fine piece found by chance at the western end of the colonnaded street near the west gate. It can be dated to the Flavian period, i.e., the last quarter of the 1st Century AD, but unfortunately it is not yet possible to assign it to any building there (Fig. 1). This piece clearly illustrates an important change which also occurred in other towns in Palestine and Transjordan; for it shows all the typical features of the Roman Corinthian 'normal capital' deriving from Asia Minor. It appears to have been introduced into Palestine and Transjordan during that period.

By contrast, the traditional local types of Corinthian capitals, which are characterized by an amazing variety of forms, seem to disappear at the same time, being replaced by the new standardized capital designs imported from major commercial centers of production in Asia Minor (Ephesus, Aphrodisias, Proconnesus). Shortly thereafter, under the reign of the emperors Trajan and

Hadrian, one finds a few examples of capitals of monumental size which exhibit an extraordinarily high standard of quality. They may have belonged to huge public buildings, in all probability, temples. The next stage (mid-2nd Century AD) is represented by the first capitals coming from the sidewalk colonnades of the paved decumanus maximus. Therefore, one may assume that this splendid avenue spanning the entire city was partially constructed during the 3rd quarter of the 2nd Century. As one can see from the different style of the capitals lying along the track, the construction of the street with its magnificent porticoes was still in progress during the whole 3rd Century AD. Thus, we may suppose that the process went on slowly, lasting at least one and a half centuries until the whole distance was adorned by rows of columns which were more or less homogeneous in size and design.

An enormous 'building boom', a general phenomenon for the urban situation of the cities in the region, commenced around the last quarter of the 2nd Century AD and continues during the first quarter of the 3rd Century. This is also true for Gadara. It appears that the town became highly active in renovating old structures and constructing new public buildings according to common patterns of Roman town planning. Four Corinthian capitals are reused in the crypt of a five-aisled 4th Century basilica built over a Roman subterranean tomb in the vicinity of the so-called 'Tiberias gate' (Fig. 2). They can be



Fig. 3



Fig. 4

dated by stylistic criteria to around 180 - 190 AD. There is some evidence that the neighboring gate with its round towers was renewed during that time. It is possible that a new facade including Corinthian columns was attached to its western front side to which the capitals may originally have belonged. The four capitals were obviously reused in early Byzantine times together with other architectural elements from the building when the towers were demolished as the gate went out of use.

The main object under construction during the same time or only shortly thereafter is a huge complex in the center of the town comprised of a long, five-aisled corridor running from north to south which is clearly connected to the western theater, and a long nymphaeum lying across the decumanus opposite the entrance of the hall, but along the same axis. All these buildings were definitely planned together, as is also confirmed by their ornamentation. At least 15 capitals, all of them quite homogeneous in design and made of basalt stone, can be assigned to the columns originally standing in long rows along the walls on the inside of the corridor (Fig. 3). According to an inscription, they were partly financed through donations given by members of famous Gadarene families like the Annii. The annexed western theater probably served as a place for public assemblies. Parts of the splendid stage decoration, which contains a huge amount of marble, also point to a date shortly before 200 AD. The outlines of the nymphaeum, discovered only two years ago, correspond exactly to the length of the entrance facade of the hall building opposite the paved decumanus. Like the hall entrance itself, the nymphaeum must have been an impressive eye-catcher owing to its magnificent facade enriched by using different sorts of imported marble. At least four monolithic columns of greenish cipollino from Euboea presumably stood at the front side of the building. They were crowned by Proconnesian capitals that can be dated by comparisons to the period of ca. 160 - 190 AD. This build-

ing complex attests to the enormous efforts made by the people of Gadara to improve their status as a provincial city of the Roman Empire.

Most of the capitals in Gadara can be dated to the time of the Severan emperors, that is, the first half of the 3rd Century. A distinct expression of the wealth and power of Gadara during this period is the monumental arch situated at a short distance from the city and



Fig. 5

dominating access to it from the west. The arch, which shows, according to the detailed studies of C. Bührig, clear evidence of having been erected hastily and left unfinished, includes fine examples of two-dimensional Corinthian capitals. They were obviously created by foreign specialists rather than local masons. According to precisely dated parallels at the nymphaeum in Gerasa and the tychaion at al-Sanamein, they must have been produced during the first decade of the 3rd Century. The monumental arch at Gadara could have been built together with the unfinished hippodrome nearby in order to welcome the Roman emperor Caracalla who visited the province several times but apparently never arrived; this presumption is supported by the similar urban situation at Gerasa.

The last building of interest in this context is the so-called 'podium monument' marking the intersection of the most important streets in the heart of the town. This small square building with its three sumptuous facades, whose function cannot yet be exactly determined, has its only parallel in the neighboring city of Scythopolis in Israel. The

building obviously was decorated with marble panels, hundreds of fragments of which have been found, statues, and Corinthian-style pilaster capitals (Fig. 4). It appears that craftsmen coming from other regional cities such as Gerasa or Askalon may also have participated in the process of construction, which probably took place around 210/220 AD. This may be seen in a piece which has its closest parallels at Scythopolis and in the 'basilica' at Askalon, while another one is directly comparable to examples from the nymphaeum at Gerasa.

After a suspension of some years due to the general economic decline, building activity in Gadara was renewed again during Late Antiquity. At that time, white Proconnesian marble was still being imported to Gadara on a large scale. As has been shown, the four marble capitals deriving from the caldarium of the Late Roman baths excavated by a Danish archaeological mission are

not reused (with, perhaps, one exception), but rather, newly worked pieces dating back to the beginning of the 4th Century (Fig. 5). Some of the early Christian churches at Gadara might also have been furnished with a series of marble or limestone capitals. Such capitals once adorned the column rows which divided the naves, as was clearly the case in the Early Christian pilgrims complex uncovered in 1998 by Thomas Weber. Finally, the existence of some capitals of the late 5th/early 6th Century indicates an uninterrupted continuation of local manufacture of architectural decoration from Hellenistic until Byzantine times at Gadara. It is hoped that the results of my MA thesis will be confirmed, modified, and elaborated by further excavation and archaeological research at the site. For the generous support and indulgence of all persons and institutions that are involved in the project, especially Prof. Dr. Adolf Hoffmann from The German Protestant Institute in Amman under its present director Dr. Hans-Dieter Bienert, I am very indebted. ■

# A Radiometric Examination of Plastered Skulls from Jericho and Tell Ramad

By: Michelle Bonogofsky, University of California, Berkeley (U.S.A.)

Plastered and asphalt-decorated skulls have been recovered from the following Pre-Pottery Neolithic B sites in the Levant: Jericho, 'Ain Ghazal, Tell Ramad, Beisamoun, Kfar Hahores, and Nahal Hemar. As part of my Ph.D. dissertation research concerning "An Osteo-Archaeological Examination of the Ancestor Cult in the Pre-Pottery Neolithic of the Levant," I am undertaking a scientific documentation and analysis of as many of the plastered/painted skulls from Jericho, 'Ain Ghazal, and Tell Ramad as possible. This will entail X-rays, CT scans, and/or DNA analysis of the skulls thought to have been decorated for use in an ancestor cult 8,500 years ago. It is hoped that a detailed study of the plastered skulls held in museum collections in Jordan, Syria, England, Canada, and Australia will contribute to the current scientific knowledge about plastered skulls as a

group, particularly concerning the ages and genders of the individuals whose skulls were selected for such noteworthy treatment.

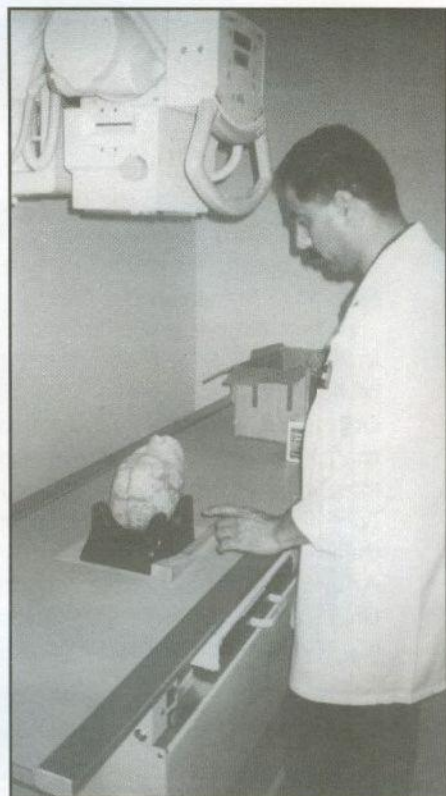
Four plastered skulls from Jericho, excavated by Kathleen Kenyon in the 1950's, are on display in the Jordan Archaeological Museum in Amman. Three of these plastered skulls (J5756, J5757 and J5758) were imaged using X-ray and CT (computed tomography) at the Department of Radiology of the Jordan University hospital under the direction of Dr. A. Hadidy. The fourth skull (J6934) is actually a cast of the original specimen held in the British Museum (BM WA 127414), and was therefore not imaged. This fact apparently went unnoticed until my initial study of the skulls in the Jordan Archaeological Museum in 1998.

Two plastered skulls from Tell Ramad, excavated by Henri de Conten-

son in the 1960's, are on view at the National Museum in Damascus. Only one skull (Ramad 66-2) was stable enough to undergo removal from the display case for X-ray and CT analysis at the office of Dr. Bassam W. Sawwaf, Chairman of the Department of Radiology, Damascus University. Other cranial material from Tell Ramad—two separate bones (mandible M4664 and frontal M4S.O.415) from fragmented plastered skulls—will be taken to Canada (Quebec 1999) and the United States (San Jose 2002; Natural History Museum) as part of an archaeological display on Syria (Dr. Yossra Al-Koujok, personal communication).



Drs. Sawwaf, a father and son team in radiology, Damascus.



Mr. Q. Rousan operating the X-ray machine at Jordan University Hospital.

I wish to acknowledge the following for making this study possible: The Council for American Overseas Research Centers (CAORC), the Near and Middle East Research Training Program, the American Center for Oriental Research (ACOR), the Mellon Fund/Center for Middle Eastern Studies, Dave Guis at DXR Imaging, Dr. Ghazi Bisheh, Director-General of the Department of Antiquities in Amman, Mohammad Fayyez, Department of Antiquities Photographer, Dr. Ahmed Ajaj, Director of the Jordan Archaeological Museum, Dr. Taysir Atiyyot, former Director, Samia

Khoury, Curator of the Jordan Archaeological Museum, Dr. A. Al-Hadidy, Director of the Radiology Department at the University of Jordan Hospital, Ihsan Omet and the Siemens Corporation in Amman, the Institute of Archaeology and Anthropology at Yarmouk University, Hussein Debagneh, photographer at the Institute of Archaeology and Anthropology, Dr. Gary Rollefson and Dr. Zeidan Kafafi, excavators of 'Ain Ghazal, Prof. Dr. Sultan Muhesen, Director General of Antiquities & Museums in Damascus, Yossra Al-Koujok, Curator of the Prehistory Museum, Dr. Bassam W.

Sawwaf, Chairman of the Department of Radiology, Damascus University, Mr. Saad Fansa, photographer in Damascus, and Dr. Henri de Contenson, excavator of Tell Ramad.

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## Donors to the Library

We would like to express our thanks to Mr. Franz Rutzen (Zabern Verlag Mainz, Germany) for his generous donation of books to the Institute's library. Mr. Rutzen is a well-known publisher of books on archaeology, history and art who has provided excellent support to our Institute for many years. We would also like to extend our thanks to the German Institute of Archaeology in Berlin, and specifically to Prof. Dr. Ricardo Eichmann and Dr. Margarete van Ess for their considerable donations and support.

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# Museum Without Frontiers: Islamic Art in the Mediterranean

By: Lubna Hashem and Fawzi Zayadine, Jordanian Department of Antiquities, Amman (Jordan)

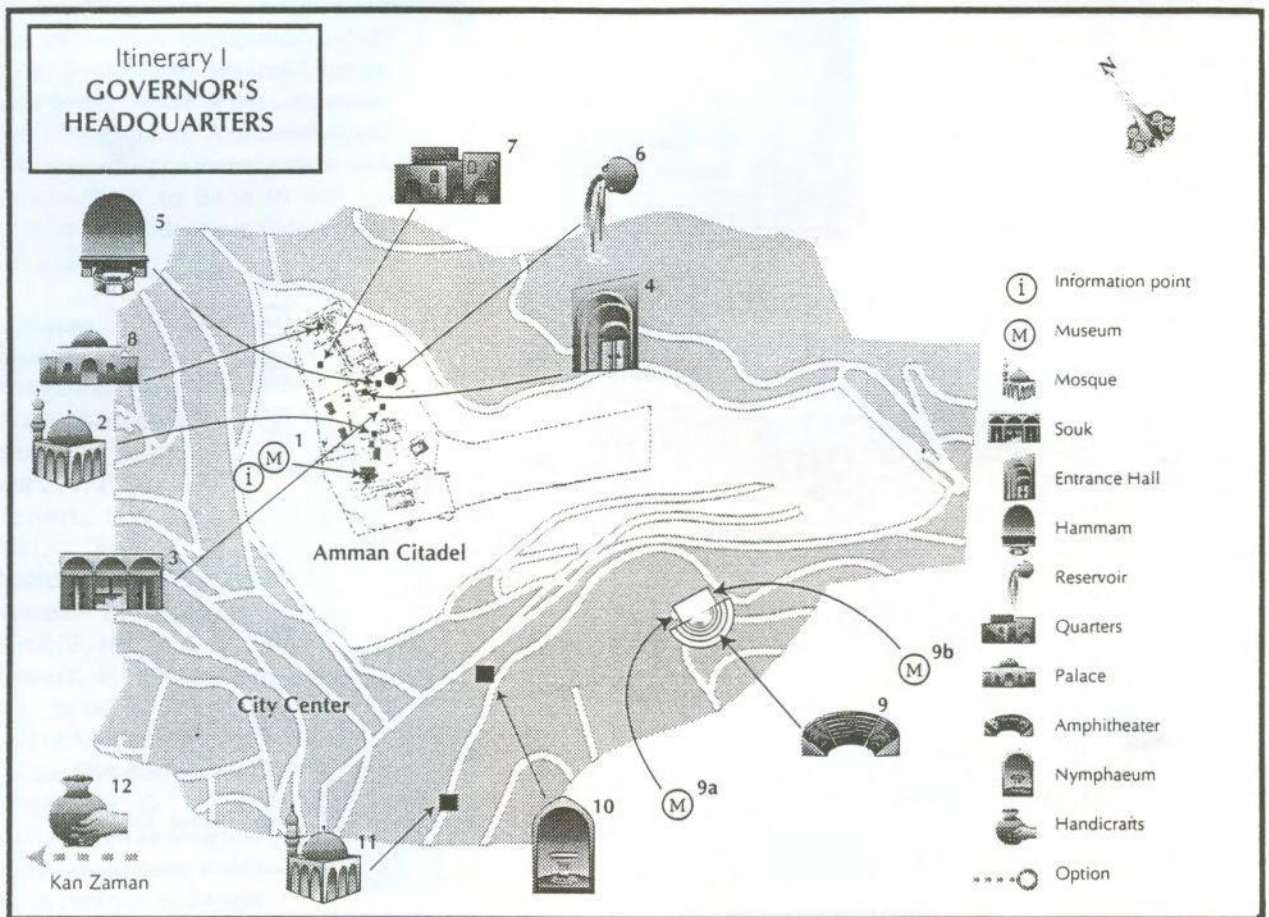
The Museum Without Frontiers program is based on the idea of organizing exhibitions without moving the works of art. Leading the public to the various monuments, sites and museums in their original environment rather than taking the work of art to the public is the concept behind this new form of exhibition which, by presenting heritage as a cultural event, allows the Euro-Mediterranean countries to increase the economic value and visual potential of their cultural wealth.

This program seeks to develop the conclusions of the Euro-Mediterranean Conference which was held in Barcelo-

na in November 1995. In so doing, it aims to establish a dialogue between Europe, North Africa and the Middle East based on their common cultural and historical identity; in addition, it seeks to promote Euro-Mediterranean integration through specific actions in which an active role is played both by the Associated Mediterranean countries and by the European Union countries.

The Museum Without Frontiers project is run by an international non-governmental organization which ensures the overall coordination of all network activities. This new form of exhibition—known as an “exhibition trail”—makes

it possible for the visitor to experience art as a living illustration of history. The “exhibition trail” is realized through cooperation among institutions concerned with cultural heritage and tourism in participating countries and supporting members (Austria, Cyprus, Finland and Sweden). Through the creation of exhibition trails, the Euro-Mediterranean region is presented as an immense, frontier-less museum which the public can visit and explore by following thematic programs presented in a well-defined geographical context (the exhibition trail). Each country or region in which this new form of exhi-





hibition is implemented becomes one "section" of a large museum covering the whole of the Mediterranean region. Each exhibition trail is divided into a certain number of itineraries of one or two days; each itinerary presents different sections of the exhibition and focuses on a specific aspect of the global theme.

The concepts behind the different exhibition trails are elaborated by local experts in each country and are linked to each other through a common approach to historical questions and the use of a joint methodology. After the successful launching of the pilot projects in Austria, the Museum Without Frontiers is now presenting exhibition trails on "Islamic Art in the Mediterranean" within the framework of the MEDA Program of the European Commission. This is a series of exhibition trails involving the eleven participating countries (Jordan, Algeria, Turkey, Tunisia, Morocco, Egypt, the Palestinian National Au-

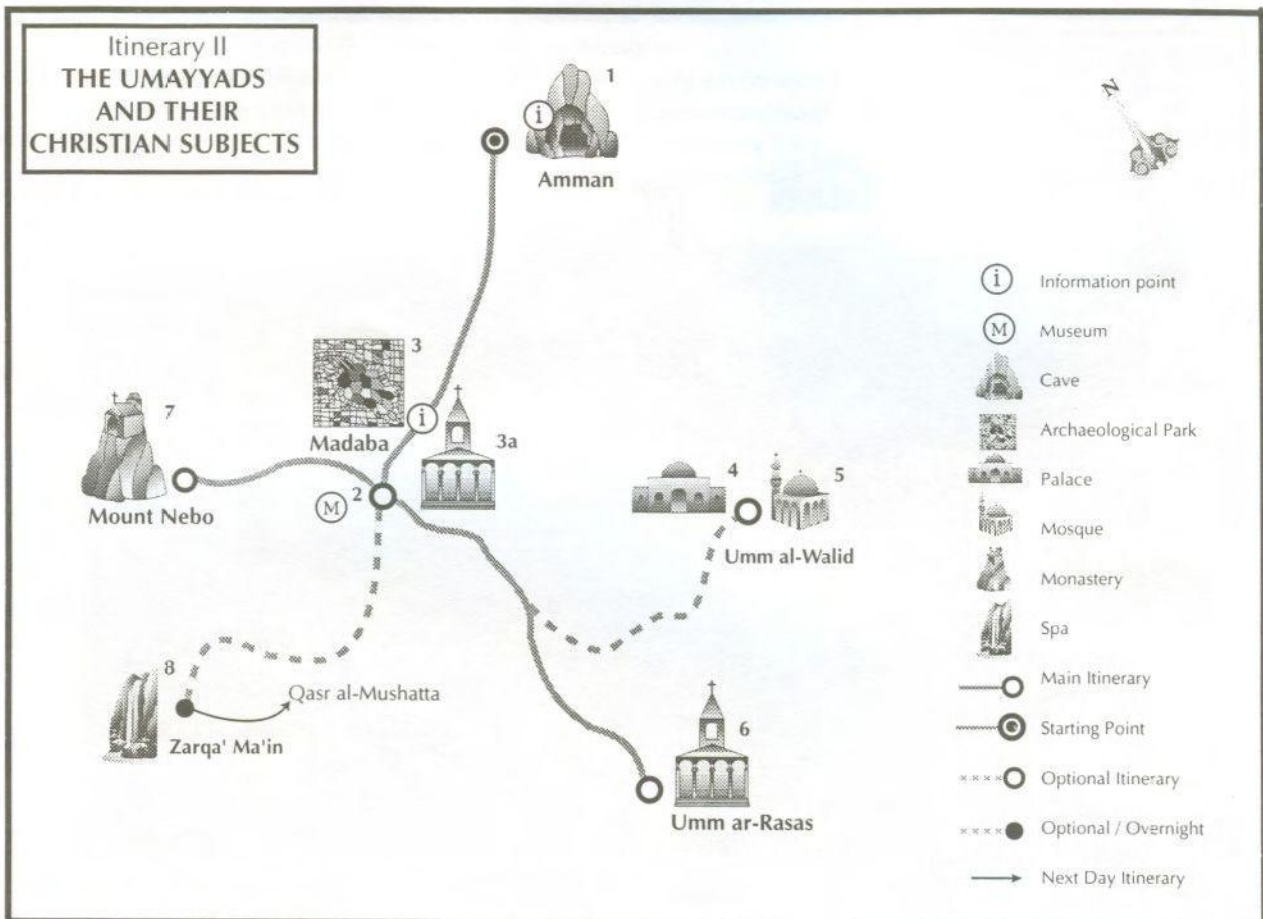
thority territories, Israel, Spain, Portugal, and Italy), each of which gives a different perspective on Islamic civilization. The various exhibition trails include the following: Jordan, "Umayyad Art"; Egypt, "Mamluk Art"; Morocco, "Andalusian Art"; and Turkey, "Ottoman Art."

It must be pointed out that Islamic Art is the first subject to be dealt with by the Museum Without Frontiers in the Euro-Mediterranean context. Later on, other new themes will be produced in the same manner. In order to raise awareness for the cycle "Islamic Art in the Mediterranean", a panoramic presentation was held in Stockholm on 23 October 1998 in the Museum of the Mediterranean and Near Eastern Antiquities based on the fact that Stockholm was the Cultural Capital of Europe for 1998. The presentation was based on a CD-ROM technology featuring the global cycles of exhibition trails on "Islamic Art in the Mediterranean". The

Egyptian New Technology company RITSEC/Cultureware, located in Cairo, has made the virtual reproductions of each exhibition trail.

The panoramic presentation was accompanied by the "Number 0" of the Museum Without Frontiers Magazine, which offers a brief description of each exhibition trail, a general introduction on Islamic Art in the Mediterranean, and a discussion of the pilot projects which have been carried out in Austria, Italy and Germany. The Jordanian exhibition trail will focus on the Umayyad period of monumental architecture and decoration. The trail will include several itineraries representing different aspects of Umayyad life: administrative, social, economic and religious. The first itinerary will focus on the administrative structure of the Umayyad governor complex at the Citadel of Amman.

Beginning in Amman, the journey will lead to the cities of Madaba and Umm al-Rasas, then go on to Mount



Nebo to visit the Christian churches under the Umayyads. Most of these churches were built in the Sixth Century and survived the political and military upheavals of 630 and 640 AD, when the Arab Muslims appeared on the map of Jordan. The third itinerary focuses on the social life of the Umayyad caliphs, which is richly illustrated by the palaces of the Badiya (steppe) of Jordan. These monuments fulfilled a variety of political, economic and social purposes. The most famous building is the baths complex of Qusayr 'Amra with its beautiful paintings, which are a good example of Hellenistic and Byzantine artistic and cultural influences. The visitors will then continue their journey to the Decapolis, which was an association of ten or more cities in Syria and Jordan (including Gerasa, Pella and Gadara). This itinerary allows the visitor to follow the development of the culture through different periods, for example, from the Roman period to the

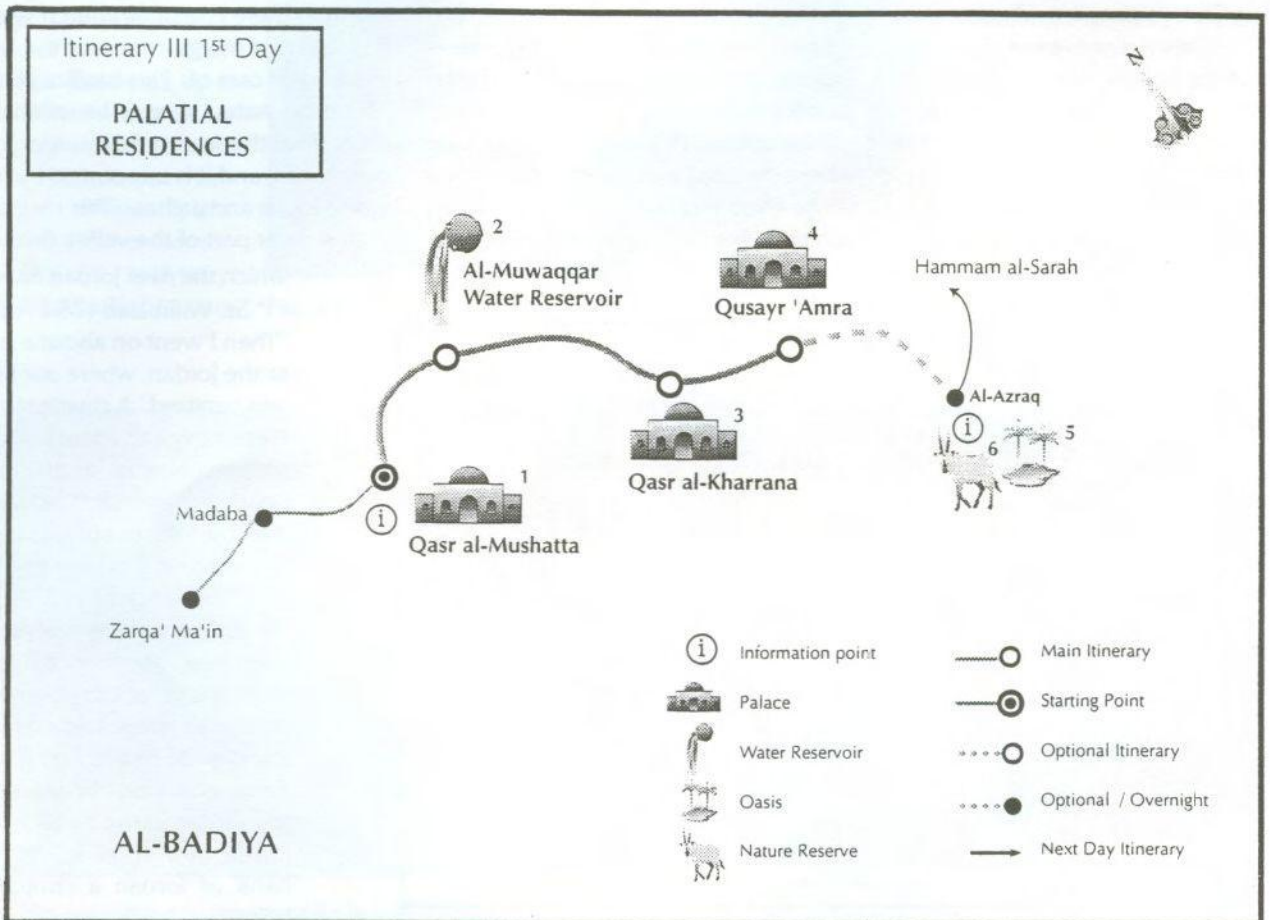
Islamic period.

Finally, we will end our itinerary in the south (Aqaba, Wadi Rum, Humayma, Udruh) to become acquainted with the caravan stations and the trading routes. The most famous of these routes is the King's Highway, which has been known since at least the second millennium BC and which continued to be used during the Islamic period. The southern cities have both commercial and economic significance, since they served as centers of commercial activity and as stations for pilgrims and traders. To show the cultural ties with neighboring countries, windows will be opened on specific subjects related to the main theme of the exhibition trail, such as iconoclasm, Umayyad pottery and numismatics, and the administrative system in Syria.

The project has been adopted by the Department of Antiquities and has the support and collaboration of the Ministry of Tourism, the Ministry of Culture,

and the Royal Jordanian Geographic Center. A committee of Jordanian experts on Islamic civilization has been formed to commence work on Islamic studies and monuments, while monthly meetings are held by the Jordanian Scientific Commission to explain the concept of the exhibition trail. Meetings have also been held in Barcelona and Madrid with the support of the Spanish government, to enhance international collaboration between the participating countries and to promote cultural ties between Europe and the Mediterranean Basin.

The inauguration of the Jordanian exhibition trail will be in October 2000; it will be accompanied by a catalogue which contains descriptions of all the itineraries proposed by the scientific committee, as well as signpostings and brochures. ■



# The Discovery of a Church East of the Jordan River

By: Dr. Mohammad Waheeb and Ms. Yara Doleh, Jordanian Department of Antiquities, Amman (Jordan)

## Introduction:

The Jordanian Department of Antiquities [JDA] team which is undertaking an archaeological survey and excavations in Wadi al-Kharrar has discovered a church built on the eastern bank of the Jordan River. This church is considered to be one of the most important remains on the site.

The JDA team of the Cultural Resources Management Department has so far discovered ten archaeological sites along the Jordan River in a narrow valley called Wadi al-Kharrar, which is located within an area extending less than two miles east of the traditional place of Jesus Christ's baptism. Another ten sites have been discovered along the banks of the nearby Wadi Gharabah.

In the southern part of Wadi al-Kharrar, a limited excavation revealed the presence of two large pools and a medium structure located on the southern edge of the wadi; these date back to

the Byzantine era as well as later periods. The two wadis were connected together by a ceramic pipe designed to draw the water to Wadi al-Kharrar. This piping of water from a distance of approximately 2 kilometers lends credence to the belief that additional water was required for baptism and other cultic purposes associated with the discovered pools.

The remains of the monastery discovered at the head of Wadi al-Kharrar confirm the importance of the area, which included three churches built on and around Tell al-Kharrar as well as other structures for worship, residence and accommodations for visiting pilgrims. Several pilgrims and travelers described the newly discovered church as follows:

\* Theodosius (530 A.D.): "In the place where the Lord was baptized there is a single marble pillar and on the pillar an iron cross has been fastened. There, too,

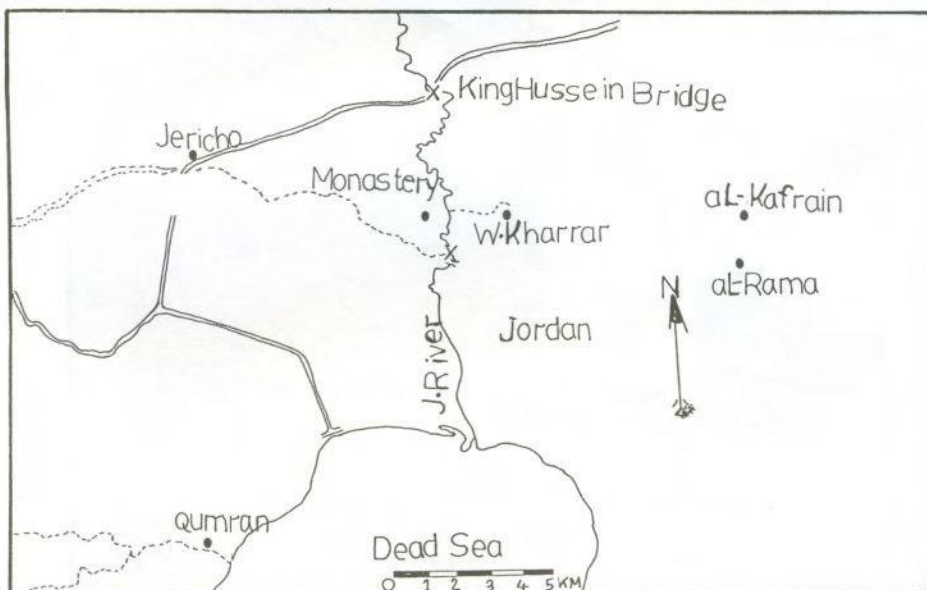
is the Church of St. John the Baptist which the Emperor Anastasius built; this church is very lofty, being built above large chambers, on account of the Jordan when it overflows. Where the Lord was baptized beyond Jordan there is a little mountain called Hermon."

\* Archulf (670 A.D.): "He told us also that the sacred, holy and honorable place in which the Lord was baptized by John is always covered by the waters of the river Jordan, and that in this place a wooden cross has been fixed. The site of the cross, where the Lord was baptized, is on the other side of the water bed, while at the edge of the river there is a small church where it is said that the garments of the Lord were taken care of. This basilica stands above the waters so as to be uninhabitable, since the waters flow under it on both sides, and it is supported by four stone vaults and arches. This church is in the lower part of the valley through which the river Jordan flows."

\* St. Willibald (754 A.D.): "Then I went on about a mile to the Jordan, where our Lord was baptized. A church stands there now, raised up high on stone columns, and underneath the church is now dry ground, where our Lord was baptized on this very spot."

\* Theoderich (1172 A.D.): "In the very place where our Lord was baptized by John there is a great stone, whereon our savior is said to have stood while he was being baptized, and thus the water of the Jordan came to him, but he did not enter it. On the bank of Jordan a church is built."

\* Johannes Phocas (1185



Location map of Wadi al-Kharrar.

A.D.): "On the bank of the Jordan River, about a stone-throw distant, is a square vaulted building, where the Jordan, bending back its stream, embraced the naked body of him who covereth heavens with clouds."

The remains discovered from the church are bordered on the east by the lissan marl cliffs, approximately 150 meters away; they are bordered on the west and south by the River Jordan, the traditional place of baptism, which lies around 200 meters away. The church is assumed to be part of the remains of Bethany beyond the Jordan, or "Aenon, now Sapsaphas", during the Byzantine era.

The preliminary results of the excavations showed arches, foundations, walls with partly preserved mosaic, and marble floors in situ. Since no excavations have been previously performed on the eastern side of the river, it is not surprising that the church discovered fits the description of the ancient pilgrims who were passing through this area on their way from Jerusalem to Mount Nebo along the eastern side of the Jordan River at this spot. This discovery removes all doubts about the exact location of the church, which was built on the eastern side of the river.

Not far from the church, just 300 meters to the east, the JDA team discovered a pool which is still under excavation. This pool, which is located at the point where the spring empties into the Jordan River, appears to be the only pool which drains the spring water (John the Baptist's Spring). Given the difficulty of building a pool in the alluvial area of the river, the builders chose the eastern raised area which consists of lissan marl, and dug deep.

It appears to us that with its staircase, inlet and outlet, this pool represents the first Byzantine pool built beyond the river near Christ's traditional place of baptism. The area in which the pool is located may possibly have been a natural pond during the Roman period; it was modified later, during the Byzantine period, in response to the needs of pilgrims to baptize or immerse themselves in the water of the spring during their holy journey to Bethany beyond the Jordan. ■



General view of Elijah's Hill.



Some of the remains of the Church of John the Baptist east of the Jordan River.



General view of the newly discovered pool east of the Jordan River.

## "Men of Dikes and Canals" - An International Symposium on the Archaeology of Water in the Middle East

By: Dieter Vieweger, Kirchliche Hochschule Wuppertal (Germany)

Under the title, "Men of Dikes and Canals," an international conference on the archaeology of water in the Middle East was held at the Petra Mövenpick Hotel from June 15-20, 1999. The six-day meeting was organized by the German Protestant Institute of Archaeology in Amman (Director: Dr. Hans-Dieter Bienert) and the German Institute of Archaeology, Orient-Section (Director: Prof. Dr. Ricardo Eichmann). The conference was held in cooperation with Yarmouk University, Irbid (President: Prof. Dr. Fayaz Khasawneh), and funded by the Fritz Thyssen Foundation (Germany).

Water is the most important element of life. In contrast to all of the changes witnessed by history, water remains the same today as it was in ancient times. Little wonder, then, that the important role of water was stressed during the welcoming addresses of Dr. Hans-Dieter Bienert (German Protestant Institute, Amman) and Dr. Jutta Häser (German Institute of Archaeology); it was similarly emphasized by H.R.H. Prince Ra'ad bin Zeid in his talk to the audience of foreign and Jordanian scholars. Prince Ra'ad stressed the importance of the symposium, especially at a critical time such as this, in which water plays a most important role in securing peace and stability in this troubled region.

Sixty scholars from different scientific backgrounds—archaeologists, historians, conservators, and hydrologists—spoke with politicians and tourism experts about ancient and modern water systems and the severe water shortages the region is facing.

The welcome addresses were followed by lectures focusing on water

use and storage in prehistoric settlements during the Neolithic period and the Bronze Age in Jordan. The following lectures dealt with the hydraulic systems of the Nabataeans at places like Humeima, the Negev, and sites in the Petra region. The results of the excavations of sophisticated water installations and of well-planned water management from the Hellenistic, Roman and Byzantine periods were reported from ancient Gadara (Umm Qays), Gerasa (Jerash), Madaba, the northern Jordanian Badiya, and a number of other places. Further lectures focused on the Islamic period and provided new information on the hydraulic system of the Amman Citadel and watermills in Jordan. Also of great interest were studies of the situation in Jordan and Palestine in comparison with water management solutions in Syria, Oman, Yemen, Egypt and other countries, as well as the reflections of water use and management in written sources such as the

Old and the New Testaments, Jewish literature, and the Koran.

Discussions of problems of modern water management in Jordan focused on the modern use of traditional water management techniques, like cisterns, and different solutions to competitive water demands. Of special interest was the lecture by Mr. Abdelkarim As'ad from Ramallah (Palestine), which discussed experiences with the European financed modern water management system as a means of coping with water shortages and drought conditions in Palestine. Prof. Dr. Nasim Barham from Amman dealt with a similar topic by discussing the human impact on water problems in Jordan.

Conference participants also had the opportunity to visit water installations in Petra proper, Beyda, the Siq Umm al-Hiran, and the Ba'ja region. As in ancient times, the problems of water management and solutions to water



Participants at the water symposium held in Wadi Musa.

shortages are complex. No one can expect to solve the water crisis in the Near East single-handedly, without the collective support of all the citizens of his country. Hence, the study of ancient water management methods and water systems may help us to find solutions to recent problems in this area. The

conference aimed to help build support for such research.

However, the wastage of water on a daily basis must stop; moreover, without the use of modern techniques together with reliable traditional methods, as well as an end to the dramatic population increase in the Near East, many

more regions will face a major water crisis. It is hoped that other, similarly successful, conferences on these issues will follow in the near future.

**Organizers:**

The German Protestant Institute of Archaeology in Amman, Jordan (Director: Dr. Hans-Dieter Bienert) and the German Institute of Archaeology, Orient-Section, Germany (Director: Prof. Dr. Ricardo Eichmann), in cooperation with Yarmouk University in Irbid, Jordan (President: Prof. Dr. Fayaz Khasawneh).

**Members of the Organizing Committee:**

In the Hashemite Kingdom of Jordan: Mrs. Katrin Bastert-Lamprichs, M.A. (German Protestant Institute of Archaeology in Amman); Dr. Hans-Dieter

Bienert (German Protestant Institute of Archaeology in Amman); Mr. Jens Eichner (German Protestant Institute of Archaeology in Amman); Miss May Sha'er, M.A. (Petra Stone Preservation Project, CARCIP); Mrs. Nadia Shugair (German Protestant Institute of Archaeology in Amman); and Miss Muna Zaghoul, M.P.A. (Jordan Department of Antiquities, Amman).

In Germany: Prof. Dr. Ricardo Eichmann (German Institute of Archaeology, Orient-Section, Germany); Dr. Jutta Häser (German Institute of Archaeology, Orient-Section, Germany); and Dr.

Susanne Kerner (Free University of Berlin, Germany).

Funding was provided by the Fritz Thyssen Foundation (Germany); the Mövenpick Resort, Petra; the Mövenpick Resort and Spa, Dead Sea; the Petra Regional Council (PRC); the Ministry of Water and Irrigation; the Ministry of Tourism and Antiquities; the Jordanian Department of Antiquities; the German Embassy in Amman; the Jordanian-German Project for the Establishment of a Conservation and Restoration Center in Petra (CARCIP); and Petra Moon Tourism Services. ■

**Program**

**Day 1 (15.06.1999):**

**Arrival**

- 14.00** Beginning of registration at the Petra Mövenpick Hotel (Wadi Musa)
- 18.30** Opening of the symposium

**Welcoming addresses by:**

- Dr. Hans-Dieter Bienert (*Director of the German Protestant Institute of Archaeology in Amman*) Dr. Jutta Häser (*Representative of the German Institute of Archaeology, Orient Section*)
- H. E. Dr. Ghazi Bisheh (*Director-General of the Jordanian Department of Antiquities*)
- Prof. Dr. Fayaz Khasawneh (*President of Yarmouk University, Irbid*)
- H. E. Prof. Dr. Kamel Mahadin (*Minister of Water and Irrigation*)
- H. E. Mr. Akel Biltaji (*Minister of Tourism and Antiquities*)
- H.R.H. Prince Ra'ad bin Zayd (*Royal Court*)

- 19.45** Keynote Address by Prof. Dr. Henning Fahlbusch (Lübeck), "Men of Dikes and Canals"
- 20.30** Reception

**Day 2 (16.06.1999):**

- Section 1:** Chairwoman: Dr. Jutta Häser (Berlin)
- 8.30-9.00:** Prof. Dr. Zeidan Kafafi (Irbid), "The Impact of Water Resources on Settlement Patterns of the Neolithic Period in Jordan"
- 9.00-9.30:** Dr. Roland Lamprichs (Dresden) and Mrs. Katrin Bastert-Lamprichs M.A. (Dresden), "Wasserspeicherung in der jordanischen Steppe (Wadi Qattar)"
- 9.30-10.00:** Dr. Hans-Dieter Bienert (Amman), "The Underground Tunnel Systems in Wadi al-Shallalah, Northern Jordan"
- 10.00-10.30** Coffee break
- Section 2:** Chairwoman: Mrs. Brigitta Meier, Dipl. Hydr. (Frankfurt)
- 10.30-11.00:** Prof. Dr. Elias Salameh (Amman), "Old Cisterns - Their Possible Use in Modern Water Supply Systems"
- 11.00- 11.30:** Dr. Andreas Kuck (Amman), "A Discussion of Approaching Solutions to Competitive Water Demands"
- 11.30-12.00:** Mr. Abdelkarim As'ad (Ramallah), "Water Demand Management Against Water

- Shortage and Drought Conditions in Palestine”  
**12.00-13.30** Lunch
- Section 3:** Chairwoman: Prof. Dr. Martha Sharp Joukowsky (Providence, RI)
- 13.30-14.00:** Prof. Dr. Zeidoun Muheisen (Wadi Musa) and Dr. Dominique Tarrier (Irbid), “Nabataean Water Systems”
- 14.00-14.30:** Mrs. Mathilde Padet (Reims), “The Nabataean Hydraulic System at Petra - New Research”
- 14.30-15.00:** Mr. Suleiman Farajat (Wadi Musa), “Some Nabataean Water Installations at Humeima”
- 15.00-15.30:** Mr. Ma'an Huneidi and Mr. Ueli Bellwald (Amman), “Petra National Trust Project: Nabataean Hydrological Systems Flanking and Running in the Siq of Petra”
- 15.30-16.00:** Dr. Talal Akasheh (Zarqa), “New Approaches to the Protection of the Wadi Musa-Petra Area from Flashfloods”
- 16.00-16.30** Break
- Section 4:** Chairman: Dr. Hans-Dieter Bienert (Amman)
- 16.30-17.00:** Prof. Dr. Martha Sharp Joukowsky (Providence, RI), “The Water Installations at the So-Called Great Temple in Petra”
- 17.00-17.30:** Dr. Helge Fischer (Amman), “The Cistern at Bayda - Construction and Catchment Area”
- 17.30-18.00:** Miss. May Sha'er, M.A. (Amman), “Nabataean Mortars Used for Hydraulic Constructions”
- 18.00-18.30:** Dr. Gunnar Lehmann (Beer-Sheva), “Nabataean Water Installations in the Negev Desert”

#### Day 3 (17.06.1999):

#### Excursion to the Greater Petra Region: “Water, Men and Environment”



Participants enjoy a guided tour through the siq of Petra.

- 8.30** Participants meet at Petra's main entrance gate.
- \* A walk through the Siq of Petra; a tour guided by members of the Jordanian Department of Antiquities (JDA), the Petra office (Dr. Khairieh Amr), and scholars working on projects in Petra.
  - \* The Petra National Trust (PNT) project in the Siq will be presented by PNT staff.
  - \* A visit to the Jordanian-German Project for the Establishment of a Conservation & Restoration Center in Petra (CARCIP). Participants will be briefed by the German project director, Dr. Helge Fischer.
  - \* A visit to the so-called Great Temple. Participants will visit the excavations with special attention to the building's water system. The project director, Prof. Dr. Martha Sharp Joukowsky of Brown University, will guide the visit.
  - \* A walk around the newly restored remains of a Byzantine Church, visiting water installations and passing through Wadi al-Mudhlim on the way back to Wadi Musa.
- 13.00-14.00** Lunch
- 14.00** Participants meet at the Mövenpick Hotel, then depart for Bayda and Ba'ja.
- \* A visit to the big cistern at Bayda.
  - \* A visit to the new sewage plant near the Siq Umm al-Hiran, which is still under construction. Participants will be briefed by project staff.
  - \* A visit to water installations at Ba'ja (canals, wine presses, cisterns, terrace walls, remains of a barrage blocking the Siq of Ba'ja)

#### Day 4 (18.06.1999):

- Section 5:** Chairwoman: Mrs. Alison McQuitty, M.A. (Amman-Oxford)
- 8.30-9.00:** Dr. Susanne Kerner (Berlin), “The Water Tunnels at Umm Qays (Gadara)”
- 9.00-9.30:** Dr. François Carré (Chartres), “The Watering System of the Domain of Hyrcanus”
- 9.30-10.00:** Dr. Jacques Seigne (Cormery), “The Ancient Water Supply of Gerasa (Jerash)”
- 10.00-10.30:** Dr. Mohammad Waheeb (Amman), “Recent Discoveries at the ‘Baptism Site’, Wadi al-Kharrar Archaeological Project”
- 10.30-11.00** Coffee break
- Section 6:** Chairman: Prof. Dr. Dieter Vieweger (Wuppertal)
- 11.00-11.30:** Dr. Pierre Bikai (Amman), “Madaba and its Water Supply Systems in Antiquity”
- 11.30-12.00:** Mr. Mohammad Daire, M.A. (Mainz), “Water Management as Seen in the Byzantine Architecture of Transjordan”
- 12.00-12.30:** Dr. Daifallah Obeidat (Mafraq), “Remains of Water Harvesting Techniques in the Northern Jordanian Badiya (Roman, Byzantine and early Islamic periods)”

- 12.30-14.00** Lunch
- Section 7:** Chairwoman: Dr. Susanne Kerner (Berlin)
- 14.00-14.30:** Dr. Ignacio Arce (Amman), "The Hydraulic System at the Citadel in Amman (Umayyad period)"
- 14.30-15.00:** Mrs. Alison McQuitty M.A. (Amman-Oxford), "Harnessing the Power of Water: Watermills in Jordan"
- 15.00-15.30:** Prof. Dr. Nasim Barham (Amman), "Human Impact on Water Problems in Jordan"
- 15.30-16.00:** Break
- Section 8:** Chairman: Prof. Dr. Zeidan Kafafi (Irbid)
- 16.00-16.30:** Prof. Dr. H. Fahlbusch (Lübeck), "The Saddle el Kafara: The Oldest High Dam in the World"
- 16.30-17.00:** Dr. Horst Jaritz (Cairo), "Ancient Water Installations and Dams in the al-Fayyum Oasis, Egypt"
- 17.00-17.30:** Dr. Katja Lembke (Damascus), "Wasser im Kult - Kult im Wasser. Zur religiösen Bedeutung des Wassers in Altägypten und in Vorderasien"
- 20.00:** Dinner in the Desert ("Little Petra") (Organization: Petra Moon Tourism Services, Wadi Musa)

**Day 5 (19.06.1999):**

- Section 9:** Chairman: Dr. Roland Lamprichs (Dresden)
- 8.30-9.00:** Dr. Ariel Bagg (Tübingen), "Assyrian Hydraulic Engineering (14th to 17th Century BC)"
- 9.00-9.30:** Dr. Ueli Brunner (Pfäffikon), "The Great Dam of Ma'rib (Yemen) as Part of the Hydraulic Culture of Southern Arabia"
- 9.30-10.00:** Dr. Hamdan Taha (Ramallah), "The Water Tunnel at Khirbat Bal'amah, Palestine"
- 10.00-10.30:** Coffee break



Participants examine part of the underground water channels at the 'Great Temple' in Petra.

- Section 10:** Chairwoman: Dr. Katja Lembke (Damascus)
- 10.30-11.00:** Dr. Jutta Häser (Berlin), "Agricultural Water Management on the Oman Peninsula"
- 11.00-11.30:** Dr. Klaus-Stefan Freyberger (Damascus), "Water Supply Systems and Cisterns in the Region of Jabal al-Arab, Syria"
- 11.30-12.00:** Dr. Stephan Westphalen (Damascus), "The Water Supply System at ar-Rasafa, Syria"
- 12.00-14.00** Lunch
- Section 11:** Chairman: Dr. Ariel Bagg (Tübingen)
- 14.00-14.30:** Dr. Fawzi Zayadine (Amman), "The Spring and Water Conduct of 'Ayn Braq and the Siq, Reconsidered"
- 14.30-15.00:** Prof. Dr. Dieter Vieweger (Wuppertal), "The Meaning of Water in the Old Testament"
- 15.00-15.30:** Mrs. Sabine Schmiedel (Amman), "The Meaning of Water in the New Testament"
- 15.30-16.00:** Miss. Julia Dröber (Leipzig), "Aspects of the Significance of Water in the Muslim Tradition"
- 16.00-16.30:** Break
- Section 12:** Chairman: Prof. Dr. Peter Udluft (Würzburg)
- 16.30-17.00:** Prof. Dr. H. Fahlbusch (Lübeck), "The Rehabilitation of the Al Hassa Oasis in Saudi Arabia"
- 17.00-17.30:** Prof. Dr. Yasser Adwan (Amman), Dr. Hans-Dieter Bienert (Amman), and Mrs. Brigitta Meier (Frankfurt), "Water Shortage in the Middle East - A Source of Cooperation"
- 17.30-18.00:** Dr. Khairieh Amr (Amman), "Archaeological Survey of the Tourist Development Areas Along the East Coast of the Dead Sea"
- 18.00 - 19.00:** Final Discussion

**Day 6 (20.06.1999):** Excursion and farewell

- 8.00:** Departure: participants meet at the Petra Mövenpick Hotel Travel from Petra to northern Jordan via at-Tafilah to the Dead Sea, with a stop at the Dead Sea Mövenpick Hotel
- 12.00-12.30:** Mrs. Brigitta Meier Dipl. Hydr. (Frankfurt), "The Geology of the Dead Sea Basin"
- 12.30-13.00:** Prof. Dr. Peter Udluft (Würzburg), "Thermal Springs: The Strange Paths of Herod's Spa Waters"
- 13.00-14.30:** Lunch break at the Dead Sea Mövenpick Hotel (sponsored by the Dead Sea Mövenpick Hotel)
- 14.30:** Departure, travel to the "Baptism Site"
- 15.00-17.30:** A visit to the archaeological excavations conducted by the Jordan Department of Antiquities.



- 17.30** Departure, travel to Amman  
**19.00-21.00:** Farewell reception in the garden of the German Protestant Institute of Archaeology in Amman.

The following papers will not be presented during the symposium due to prior commitments on the part of the scholars. However, the papers will be included in the proceedings (names are listed in alphabetical order):

- Dr. Hanswulf Bloedhorn: "Underground Jerusalem: The Siloah Tunnel and its Archaeological Context"  
 Mr. Ernst Gocksch: "The General Water Master Plan of Jordan: Past, Present, and Future"  
 Dr. Klaus Grewe: "Der Flußumleitungstunnel von Petra und Vergleichsbeispiele"  
 Dr. Manfred Lindner: "Hydraulic Engineering and Site Planning in Nabataean-Roman Southern Jordan"  
 Prof. Dr. Stefan Schreiner: "Water and Its Meaning in Ancient Jewish Literature"  
 Dr. Jochen Regner: "Rainwater Harvesting in the Marsa-Matruh Desert (Egypt)"  
 Dr. Thomas Weber: "Sculptural Evidence of Roman Nymphaea"  
 Mr. Gérard Robine: "The Norias Ancient Hydraulic Devices on the Orontes River"

The following are abstracts of some of the papers presented at the international symposium the rest of the abstracts will be published in *Occident & Orient* vol. 5, no. 1 in 2000.

### **The Impact of Water Resources on Neolithic Settlement Patterns in Jordan**

Zeidan Kafafi  
*Irbid*

The choice of a Neolithic village location next to a perennial water source was a necessary step towards permanent settlements and cultivation. In Jordan, as in other countries in the Middle East, rainfall has been unevenly distributed in space and time over the past few millennia, and the total amount which actually falls on a given area may vary dramatically from one year to the next. These factors, in addition to the topography, have always had an effect on the location of villages, their population densities, and their activities. Because water plays a major role in the survival of humans, plants and animals, and because local water resources were not always sufficient to sustain life in this country, settled communities have always had to manage with the natural hydrology. Although we still lack prehistoric archaeological evidence related to water works such as dams, cisterns, agricultural terraces, reservoirs and canals in Jordan, these have been found in large numbers at historic sites in Jordan. The best example we have is in Petra.

This paper aims to present ideas about the nature of Neolithic settlements in Jordan and how this relates to the availability of water. It also seeks to shed light on the types of relationships which prevailed between farming communities, semi-sedentary societies, and the pastorals who lived in Jordan throughout the Neolithic period.

### **The Wadi al-Qattar Catchment Area: An Archeological Perspective on Ancient Techniques of Water Use and Storage**

Roland Lamprichs and Katrin Bastert-Lamprichs  
*Dresden*

Recent forms of water and land use in the Wadi al-Qattar catchment area, situated southeast of modern Amman, are best described by a term like "pastoralism" and its various implications. Modern quarries and scrap heaps (especially cars), indications of the presence of the nearby Jordanian capital, are gaining ground in the area. Dry farming on a significant scale is nearly impossible due to an annual rainfall below 200mm and poor top soil. Even irrigation, not practiced nowadays, would result in only minor yields.

Despite this, and the fact that no significant change in climate has been witnessed for the last 7000 years, archaeological investigations at a site called Abu Snesleh, situated within the Wadi al-Qattar area, and a survey of its environs in 1990 and 1992 showed that there is evidence there have been different kinds of land and water use in the past. Most obvious in the archaeological record are several kinds of water storage facilities which may be observed all over the catchment area of Wadi al-Qattar.

The lecture will focus on a presentation of two of these facilities, namely, cisterns and runoff-systems, thereby providing an initial impression of the area and its potentials in ancient times.

### **The Underground Tunnel Systems in Wadi ash-Shallah, Northern Jordan**

Hans-Dieter Bienert  
*Amman*

An underground tunnel system which has not yet been dated is found below the Early Bronze Age II-III (2950-2350 BC) site of Khirbat az-Zayraqun, situated 13 km northeast of Irbid on the western edge of Wadi ash-Shallah. Seven archaeological excavations were carried out at Khirbat az-Zayraqun between 1984-1994. The fieldwork uncovered 5700 square meters of a 9-hectare settlement, of which two areas have been defined: the so-called "upper city" on the highest plateau of the hilltop, and the "lower city". In the southeastern part of the city area, three shafts have been found, entrances into an ancient tunnel system, which extend approximately 60 meters below the surface of Khirbat az-Zayraqun. This system could have been entered through an entrance at the western slopes of the Wadi ash-Shallah.

The whole tunnel system has not been thoroughly studied, and only some provisional research has been undertaken by members of the excavation team of Khirbat az-Zayraqun. Therefore, the date of the tunnels is still very much debated and ranges from the Early Bronze Age to Roman times. Furthermore, tunnels of a similar system have been found near Tell al-Fukhar in the eastern part of Wadi ash-Shallah, almost opposite Khirbat az-Zayraqun and very close to 'Ayn Guren, just southeast of Tell al-Fukhar.

This paper gives a description of these tunnels and discusses the state of research.

### **Ancient Water Supply Systems and Their Relevance to Today's Society in Jordan**

Elias Salameh  
*Amman*

A major characteristic of the Middle East is its aridity, with short rainy seasons and high evaporation rates. Water, with only a few exceptions, is scarce and precious. Therefore, it is not surprising that water and irrigation engineering both had their birth in the Middle East. In Mesopotamia, water from both the Euphrates and the Tigris Rivers was utilized for land irrigation, a fact which led to the initiation of irrigation techniques and the construction of irrigation canals; in Egypt, the Nile water was harnessed for irrigation, thus initiating and promoting Egyptian water engineering and land surveying. In Jordan, where 90 percent of the country is semi-arid and devoid of any perennial water sources, people were obliged to develop special techniques to survive during most of the seasons. Several examples of constructions related to water utilization are well preserved in Jordan. The oldest known dam in the world stands in Jawa in the northeastern part of the country as a witness to the need to collect water; it is 5.5 meters in height and around 5200 years old. Another impressive example is the water supply at Petra, where a spring in Wadi Musa village was diverted to the city through a system consisting of an interconnected network of ceramic pipes hanging 4-6 meters above ground. An open channel was also constructed to serve other uses.

In each village, settlement, house, or tent, cisterns were the most essential part. Without them, there was no survival. Rainwater was diverted into these cisterns to be used during the dry period of the year. Such examples illustrate the ingenious measures which inhabitants of the area have developed to assure their survival throughout the course of history. Forced by necessity, technicians of all civilizations worked to develop the hydrotechnical infrastructure without which none of the ancient empires could have developed or survived. The question now is whether such structures can assist in alleviating

the present water shortages in the country.

### **Approaching Solutions to Competitive Water Demand: The Upcoming Challenge for Irrigated Agriculture in the Jordan Valley**

Andreas J. Kuck  
*Amman*

The significant comparative advantage of the Jordan Valley is the high temperatures in late winter and early spring. This allows the production of off-season winter vegetables for local and international markets. The Valley is the agricultural region with the highest specific output in Jordan. However, out of a potential of 46,000 hectares of irrigable land, only about two-thirds are irrigated regularly because of water scarcity. The water situation is expected to become more severe in the future. Already today, about 20 percent of the available fresh water in the Jordan Valley is diverted to municipalities in the highlands to supply households as well as commercial and industrial users. With an expected increase in Jordan's population in the coming years, the gap between agricultural water demand and actual supply will widen. Therefore, the integration of new water resources, even those of marginal quality, becomes inevitable.

The challenge for future allocation of irrigation water in the Jordan Valley is the more efficient use of fresh water and a sustainable use of Marginal Water (MW) in agriculture, including the re-use of Treated Waste Water (TWW). As there is a high potential for MW, its use can significantly increase the quantity of available irrigation water in the Valley, and may provide better quality water for alternative uses in the domestic and industrial sector. Agriculture contributes some 8 percent of Jordan's gross domestic product, but generates some 24 percent of the jobs on the market. Although this has a valuable economic and social impact on the whole country, the public has demanded that water be used in agriculture only in those sectors and for crops that yield high value. No room is seen for self-sufficiency in food production.

The increased management efforts

and the higher risk of MW use in irrigation have to be compensated for financially through quality oriented water pricing, i.e., irrigation water with higher salinity or a higher content of TWW must be available at significantly lower costs than fresh water. Another important economic element that will facilitate the use of MW is tradable water rights based on farmland ownership. Similarly, water allocation for the agricultural sector on a commercial basis, with a free market among the farmers determined by supply and demand, will support future implementation and acceptance of MW in irrigated agriculture.

The use of water with increased salinity or irrigation with TWW requires specific watering, leaching, drainage and agricultural practices in order to achieve ecological and economic sustainability. This objective is met by the Brackish Water Project (BWP), which aims at the allocation and dissemination of the required information, knowledge and experience for a sound MW use strategy. Even if desalination of brackish water will turn out in the long run to be the ultimate solution to the water problem faced by Jordan and the region, priority must be given today to the efficient and sustainable use of the presently available water resources, regardless of whether they are fresh, brackish or recycled. Furthermore, it must also be acknowledged that this will lead to a decreased necessity to exploit fossil groundwater and to a possible delay of high investments in desalination plants. Therefore, integration of marginal water resources into agricultural irrigation can considerably ease the financial burden on Jordan's national economy for the years to come.

### **Water Demand Management Against Water Shortage and Drought Conditions**

Abdelkarim As'ad  
*Ramallah*

The climate of Palestine is of the Mediterranean type. The annual average rainfall levels for the coastal plains, the mountain regions and the Jordan Valley are 500-600 mm, respectively. Since the occupation of the West Bank and the Gaza Strip in 1967, the Israeli

authorities have placed all projects pertaining to water and water resources under their direct supervision and control through Military Order No. 92/1967. This has prevented Palestinian organizations from carrying out any work connected with the operation, maintenance, or development of water services or resources without prior approval and licensing from the Israeli military authorities. Water resources are still a disputed issue with Israel and will be negotiated in the final status negotiations. The water infrastructure is almost in ruins and must be rehabilitated in order to improve the efficiency of water systems. The average unaccounted-for water ratio is over 50 percent. At present, only 6 percent of all Palestinian communities have a piped water supply, and many of them lack sewerage networks.

The Palestinian Water Authority (PWA) was established in 1995. Since then, the PWA has conducted several studies and surveys for the evaluation of water resources, systems, and needs, then prepared plans for action to be taken in accordance with a prioritized method. Many projects have been implemented during the last four years, while many others are under construction, and there is a long list of projects still pending. The main focus of the PWA is the reconstruction of the devastated infrastructure (wells, networks, pumping facilities, and main conveyance pipelines). It has been estimated that the losses recoverable through the implementation of major rehabilitation processes range between 5 percent and 50 percent.

The facts on the ground, however, indicate that the gains will exceed these estimates. It has also been proven that these water-demand management activities are the lowest-costing activities that can lead to the provision of water for the deprived communities, increase water accessibility, and reduce the waste of precious, scarce resources. My presentation will focus on the experience gained by the Palestinians in their fight against water waste and shortages. Light will be shed on a wide variety of water-demand management activities that have been implemented in Palestine during the last few years, and

on the results which have been achieved.

### **Nabataean Water Systems**

Zeidoun Muheisen and  
Dominique Tariier  
*Irbid*

From the beginning of human life on earth, people have had to seek out various types of water resources. All ancient civilizations seem to have emerged and evolved along rivers and developed other ways of obtaining and distributing water. Thus, humans have had to learn to develop many methods of water engineering, as well as techniques of storing and distributing water to residential, agricultural, and industrial areas. In addition, they have developed ways of protecting towns and cities from the dangers of water, especially from flooding.

The Nabataeans were one of the ancient civilizations which paid attention to water engineering, particularly the technology of collecting rainwater for agricultural purposes. In fact, their interest in this area far surpassed their interest in commerce, architecture, and the art of sculpture. It should also be mentioned that the technology of water distribution and agricultural methods was similar throughout their large kingdom, despite its environmental variations; they invented different, but similar, water engineering techniques to suit the varied aspects of their physical environment.

As we can observe in Petra, the Nabataeans made good use of the surrounding spring water by constructing canals; these canals were either made of clay or dug into rocks and covered by stones to keep the water clean and prevent evaporation. The Nabataeans also built dams to save rainwater; these dams were of various sizes depending on their location and their importance for irrigation. They also built water storage areas, dug wells, and made various types of reservoirs. It should also be mentioned that the Nabataeans were able to deal with the desert climate, especially in the Negev and in the area of Umm al-Jimal, where they built towns, cities and commercial stations, and made use of rainwater which they stored during the winter months

for agricultural purposes.

### **The Nabataean Hydraulic Systems at Petra: New Research**

Mathilde Pade  
*Reims*

In order to provide the necessary water resources in a city destitute of any river or major spring, the Nabataeans who settled in Petra developed an ingenious water supply system based on the collection and distribution of both spring and rainwater sources. The site is interspersed with numerous water mains coming from remote springs, or vast rocky surfaces where rainwater was collected and which then flowed to outdoor dams, cisterns, and fountains. The water mains were either made of terracotta pipes or cut into the rocks and then waterproofed by the addition of an impervious coating.

Our purpose was a photographic documentation of the Petra hydraulic network's main characteristics within the framework of a fluid mechanics engineering project. Our aim was to carry out a technical study of the ancient system (flow, pressure drops, Strickler and Fourde's coefficients, critical level, swirl curves, etc.) in order to see what impact it might have on modern water distribution techniques.

### **Petra National Project: Nabataean Hydrological Systems Flanking and Running Through the Siq of Petra**

*Ma'an al-Huneidi and Ueli Bellwald*

### **Petra National Project on the Excavation and Findings in the Siq**

Ueli Bellwald  
*Wadi Musa*

In 1996, through funding by the debt relief program between the Swiss and Jordanian governments, the Petra National Trust (PNT) undertook, in cooperation with the Jordan Department of Antiquities, to execute the first of a three-phase project which focused on the Siq and the areas flanking it. Authors and executors of the project working under PNT are InterMeeM, Middle East Engineering Management of Amman, Jordan, and Intermonument Res-tauro Bellwald of Berne, Switzerland.

The first phase of the project, which was a survey of the Siq and the surrounding area, began in September 1996 and was completed in April 1997. This phase of the project involved a technical study and proposal for the consolidation of the Siq bottom and the conservation of the Siq area. This phase also involved an in-depth survey of the hydraulic components flanking the Siq.

The results of this study show that below meters of debris which have been washed into the Siq from Wadi Musa, lies an original paved street. The study shows that the street was substantially preserved in the lower portion of the Siq, whereas the upper portion of the street was washed out by the centuries of floodwaters originating from Wadi Musa. This study also attests to the existence of many street level installations, such as sidewalks. However, most amazing of all is the existence of a sophisticated water supply system.

During the second phase of the project, which began in July 1997 and ended in June 1998, the lower portion of the Siq, including the paved street and hydraulic installations, was completely excavated and partially restored. The upper portion of the Siq was then backfilled to its original level and slope. The excavations not only reveal the paved street and connected installations, but also a drinking water supply system composed of a closed conduit of ceramic pipes. It is believed that this closed system provided the daily drinking water needs of Petra. The excavation and findings also provide the evidence needed to date the construction of the street, its use, its repairs, and its eventual destruction. The same evidence has been used to date the water supply systems and structures used to protect the Siq from flash floods.

Furthermore, deep wheel tracks on the street's cobblestones and a camel caravan relief carved on the Siq's southern wall indicate that the Nabataean trade route passed through the Siq. Many of the newly discovered sanctuaries and niches show the close relationship which existed between water and the religious practices of the Nabataeans.

### **Petra National Trust Project on the Hydraulic Systems in the Siq And the Areas Flanking It**

Ma'an al-Huneidi

*Amman*

Since human beings' earliest history, water has played a primary role in the establishment of regional settlements. This fact is all the more significant when the settlement is located in a semi-arid region such as that of Petra. Water lies at the very heart of the mythology of Petra, and most significantly in the Siq, as it was the main conduit used by the Nabataeans to supply water to the capital city of their desert kingdom, Petra.

The hydraulic systems created by the Nabataeans are an awesome example of hydraulic engineering used to meet the needs of an increasing population and expanding agricultural production. The Nabataeans collected rainwater and diverted natural water sources from the surrounding mountains. With a skillful combination of reservoirs, dams, cisterns, channels, and even pressurized pipes with valves (bronze stopcock) (Oleson 1995), the Nabataeans increased the controlled flow of water into the very heart of Petra.

In 1996, with funding obtained through the debt relief program between the Swiss and Jordanian governments, the Petra National Trust (PNT), having contracted Middle East Engineering and Management and Intermonument Restauro Bellwald as project consultants, conducted an extensive survey of the hydraulic systems within the Siq and those flanking it. This survey formed part of a larger study in preparation for the eventual excavation and consolidation of the Siq. The hydraulic study revealed that the area abounds with hydraulic components suited to the topographical features of the terrain. The Nabataeans survived the scarcity of water resources through an efficient, effective and ingenious engineering feat. It is through their skillful rainwater collection, coupled with adept agricultural practices, that the Nabataeans sustained their civilization.

The investigations into the water supply and regulation systems within the surveyed area provide new insights into

how the water engineers of antiquity dealt with the problem of controlling, conveying and storing the catch water of the rainfall season, thus ensuring a supply of water all year round. The Nabataean's hydrological systems in and around the Siq are an incredible example of engineering technology, comprised of ingenious, resourceful structures.

### **New Approaches to the Protection of the Wadi Musa-Petra Area from Flash Floods**

Talal Akasheh

*Zarqa*

Seasonal flash floods in the Wadi Musa area are expected to continue to threaten the monuments in Petra, as well as people and property. A description of the Nabataean water system in Wadi al-Mataha is given, with reference to the Siq. The natural outcome of urban expansion will be to reduce the plant and soil cover, which will be replaced by concrete and asphalt, thereby reducing water retention by soil and leading to the possibility of even more serious flash floods. A number of alternative means of curbing the risks involved are discussed.

### **The Water Canalization System of the Petra Great Temple**

Martha Sharp Joukowsky

*Providence, RI*

In Book II, Chapter IV, Diodorus Siculus describes the Nabataeans as nomads who "inhabit a tract partly desert, and in other parts without water, and there is very little of it that bears any fruit..." Once nomads, the Nabataeans became a settled people; however, in order to master urban planning, their control of water was vital. They built Petra and, as is well known, one of their great achievements was to develop hydraulic engineering systems to collect water in underground cisterns and reservoirs, to cut out channels in the rock face to divert and direct water into their city, to dam the Wadi Musa, and to construct tunnels for water flow. With these irrigation systems, they redesigned nature, in effect, and increased their control over their environment.

The Nabataeans manipulated the landscape, with the result that water resources were more than sufficient to serve the needs of their great city.

Excavations done under the auspices of the Jordan Department of Antiquities have shown that in the very heart of Petra there lies a Great Temple, which has been dated to the end of the First Century BC. A complex of water tunnels was uncovered beneath the temple forecourt by Brown University archaeologists; then, with the aid of a ground penetrating radar, a mining engineer and an economic geologist made the tunnels safe for entry and study. Aided by slide illustrations, this paper will describe the results of an analysis which was conducted on the tunnels, their purpose, their method of construction, the cause of their collapse, and the objectives of future study.

### **The Cistern at Bayda: Construction and Catchment Area**

Helge H. Fischer  
*Amman*

Mounting evidence suggests that the Nabataeans were able to support a community which probably exceeded 20,000 people in their capital, Petra, with an adequate supply of water in an area essentially surrounded by desert and arid land. The method which they employed is termed here "aggressive water harvesting," which implies a strategy by means of which water from any source may be harvested to the fullest extent possible. It appears that the benefits of aggressive rainwater harvesting have been underestimated, and that the methods and techniques employed by the Nabataeans are worth studying. Such benefits suggest the usefulness of a cost/benefit analysis of the reuse and reopening of ancient Nabataean and Roman cisterns for present-day use.

An example is cited here of a detailed survey of one of the larger Nabataean cisterns at Bayda, which has continued to supply water to the local people since Nabataean times, i.e. for more than 2000 years. The maximum capacity of the cistern was measured to be 1000 cubic meters, while the catchment field exploited by the Nabataeans

through elaborate channeling and retaining measures comprises an area of 16,500 cubic meters. The yield of the catchment area based on a mean annual rainfall of 130 mm in this region is calculated, respectively, at 2,145 meters with no loss, 1,073 meters with 50 percent loss, and 643 meters with 70 percent loss. A loss of 50 percent due to evaporation and absorption is considered realistic. This means that the Nabataeans appeared to match the capacity of the cistern to the expected annual yield of the catchment area. Even at a loss of 70 percent of the total water supply from the catchment area, the harvest would still be 643 meters, enough to fill the cistern more than half way. In this case, the over-capacity of the cistern would allow for storage of higher yields in years with above average rainfall.

There appears to be sufficient evidence to prove that the Nabataeans were able to make such computations, thereby corroborating the claim that they were indeed among the earliest true masters of water harvesting techniques. It also indicates that the Nabataeans would not have expended any unnecessary effort on practical applications. It is noteworthy that an area comprising only about 130 meters x 130 meters would, even at present, be sufficient to harvest between 600 to 1,000 meters of water per annum. Through slight modifications and repairs, the accumulated rainwater could be improved to drinking quality. It is suggested that the viability of supplying work to the local people through the reopening of historic cisterns is worth serious study and consideration.

### **Nabataean Mortars Used for Hydraulic Constructions**

May Sha'er  
*Amman*

"... they take refuge in the desert, using this as a fortress; for it lacks water and cannot be crossed by others, but to them alone, since they have prepared subterranean reservoirs lined with stucco, it furnishes safety." (Diodorus XIX.94)

This statement was included in the

account of Diodorus of Sicily, who refers to the military campaign launched by Antigonous against the Nabataeans in 312 BC. and gives a description of the Nabataean way of life. In order to ensure good storage of collected water, the Nabataeans apparently lined the walls of cisterns and dams with a strong, relatively hard, long-lasting mortar that prevented water from seeping through. Some of these mortar coverings, which were often applied in thick layers, have survived to this day. In terms of appearance, they are of a grayish color and contain large coarse aggregates of stone.

Analysis has revealed that these mortar samples are lime-based with sand as the filler, and that fragments of limestone, chert, sandstone, pottery and charcoal have been added. The high concentration of lime in the mortar makes it strong. Moreover, the addition of large aggregates of stone not only increases the strength of the mortar, but also improves its adhesion to the rock and prevents it from cracking. Finally, the addition of pottery fragments and charcoal increases the hydraulic property of the mortar.

In conclusion, remarkable similarities exist among all the mortar samples that were investigated. This consistency, as well as the good quality of the mortar produced, shows that the Nabataeans must have had specifications and standards for the production of cistern and dam mortars, and that such standards were probably developed as a result of experimentation and experience.

### **The Water Systems in Gadara and Other Decapolis Cities of Northern Jordan**

Susanne Kerner  
*Berlin*

The water systems employed by the relatively large Decapolis cities of Hellenistic and Roman times show careful planning and skillful execution. The system in Gadara itself includes two very large tunnels between the main spring and the city, collection systems for surface water and other spring flows, distribution installations inside the tunnels, and several different delivery

mechanisms. Inside the city the water was delivered in various pottery, basalt and lead pipes, which have been used in different time periods for different purposes.

The distance between the main spring and the city is 22 km, while the tunnels follow one contour line inside the hills over most of this distance, changing only at the very end towards an open course via an aqueduct. The other cities in the north of Jordan have similarly large water systems: Capitolias has huge cisterns and a differently constructed tunnel, while in the surrounding area of Abila there are tunnels very similar to the ones in Gadara.

### The Watering System of the Domain of Hyrcanus at Iraq al-Amir (Jordan)

F. Carré  
*Chartres*

Identified as the estate of Tyros which was organized and installed by Hyrcanus in the late Second Century BC (183-175), the site of Iraq al-Amir as described by Flavius Josephus is reckoned to be well known. The standard description, recently illustrated with computerized 3-D images and presented during an exhibition from July-October 1998 at the 'Institut du Monde Arabe' (Paris), shows the palatial residence of Hyrcanus, 'Qasr al-Abd', standing in the middle of an artificial lake, retained to the south by an impressive dyke, and supplied with water by a system of aqueducts and canals, of which the so-called Square Building played the role of a distributing structure like a castellum. Hyrcanus is said to have equipped the nearby caves to be lived in and provided them with running water.

We suggest, however, that the domain has not been accurately or fully understood, and that the standard depiction of it must be challenged. The two levels of caves - only one of which can be considered as a dwelling - show no evidence of a running water system. Moreover, although one of the canals runs alongside the lower level, which diverted to the domain the water caught far upstream in the perennial

wadi, several of the caves are likely to have been cisterns of different types. The western-most cave on the upper level may have been filled with surface water caught by a dam in the adjacent ravine.

Paul Lapp's excavations have shown that the so-called Square Building dates back to the Byzantine period, and there is no evidence of any kind of hydraulic function even by that time. The exact position, shape, dimensions, and functions of the Hellenistic buildings which preceded it in the area are unknown. IFAPO (F. Carré, L. Borel) is currently excavating a structure on the slope above the caves which is comparable to the Square Building, including very similar architectural elements of the Doric order. This rectangular pool (10 x 5 x 3 meters), which dominates the dale in front of the Qasr and is flanked from behind by a wall, caught the seepage water from a marly level of the adjacent outcrop. This pool, which may have been a bath, was independent of any watering system.

The two canals, which still channel the water caught at two different points of the Wadi al-Sir Valley to the fields above and below the Qasr, are obviously ancient in part and presumably follow more or less the ancient course. Even so, the details of the original water distribution are unknown, as is the water supply of the Qasr itself. The position of most of the canal features, while they are very likely ancient in themselves, is by no means certain to be the original one, especially in the area of the Square Building, which appears to have been thoroughly rebuilt in Byzantine times. Another structure which has been dated to the Byzantine period is a strange system of pierced, rough limestone blocks placed in double parallel lines and usually thought to be the remains of a pipe pressure aqueduct from the upper canal to the Qasr.

The depression surrounding the Qasr appears never to have been entirely flooded. The 'dyke' or 'dam', built in two parts and probably in two phases, would have been quite inadequate to hold any quantity of water; it was by no means water-proofed, and the low-

er part is made exclusively of sub-decimeter limestone fragments. However, evidence from soundings suggests the earlier existence of a large, deep, but limited ditch or moat around the Qasr platform. This fact adds credence to Flavius Josephus' description of Hyrcanus' project, however inaccurate he may otherwise have been in his interpretation of the caves.

The main function of the 'dyke', which was built in the first stage — presumably before Hyrcanus' campaign — to about half its present height, seems to have been to provide easier access to the road from Jericho to Amman. The sections of canals known to have reached the depression probably irrigated a series of terraced gardens before filling the moat, which could have played a regulatory role. These observations allow us to draw a preliminary sketch of Hyrcanus' work of designed landscaping, which was more complex than has been previously assumed.

### The Water System in the Wadi al-Kharrar

Mohammad Waheeb  
*Amman*

The Romans and Byzantines often brought water over considerable distances to cities, towns, villages and buildings. The excavations being conducted by the JDA team "Baptism Project" have revealed the presence of ceramic pipes and aqueducts in the Tell al-Kharrar area. Several pools and wells discovered through this excavation are clear evidence of the Byzantine period. These discoveries suggest a dependence on water sources in a dry area east of the Jordan River.

The recovered water system mostly relates to the nearby churches and chapels which were built in and around Tell al-Kharrar. Pilgrims who passed through this area usually depended on the water in the springs and the pools.

The area, when reached its apex during the Byzantine era, the monastery was established here. ■

## **Fellows in Residence and Associated fellows (December 1997-November 1999)**

- Dr. Ute Wagner-Lux, Basel (Switzerland), "Research on Finds from Archaeological Excavations in Umm Qais (Church and Church Terrace, parts of the Decumanus, southern Basilica)".
- Dr. Karel Vriezen, University of Utrecht (Netherlands), "Research on Finds From Archaeological Excavations in Umm Qais (Church and Church Terrace, parts of the Decumanus, southern Basilica)".
- Mr. Jan Scheithauer, Berufsakademie Frankfurt/Main (Germany), "Temporary Trainee at the GTZ office, Amman".
- Mr. Johannes Amberger, Berlin (Germany), "Temporary Trainee at the Embassy of the Federal Republic of Germany, Amman".
- Mr. Thomas Flamm, Lübeck (Germany), "Temporary Trainee at the Embassy of the Federal Republic of Germany, Amman".
- Mr. Jens Eichner, Kirchliche Hochschule Wuppertal (Germany), "Preparing for a Ph.D. Thesis on the Pottery Collection of the Late Dr. Ernst Krüger".
- Mr. Helmut Burkard, National Music Conservatory, Noor al-Hussein Foundation/Deutscher Musikrat (Germany), "Courses for Music Teachers of Basic Music Education".
- Mr. Martin Rother, University of Karlsruhe (Germany), "Hydrogeological Investigation of the Thermal Springs Along Zerqa Ma'in and Ain ez-Zara and the Fresh-Saltwater Interface to the Dead Sea: Multinational BMBF Project (a joint research project for the sustainable utilization of aquifer systems)".
- Ms. Michelle Bonogofsky, University of California, Berkeley (U.S.A.), "Ph.D. Research on Osteo-Archaeological Examination of the Ancestor Cult in the Pre-Pottery Neolithic of the Levant".
- Mrs. Katrin Bastert-Lamprichs, Dresden (Germany), "Pottery Reading and Analysis From Late Neolithic esh-Shallaf, and Preparing in Cooperation With the Excavators the Final Report on the Pottery".
- Dr. Roland Lamprichs (Dresden), "Preparing for an Archaeological Excavation at Ba'ja, Southern Jordan".
- Ms. Hannah Slavik, University of Malta (Malta), "Comprehensive Arabic Language Studies at Jordan University, Amman".
- Ms. Christiane Spieß, Ruhr University, Bochum (Germany), "Ph.D. Research on Environmental Politics and Policy in Jordan".
- Ms. Katharina Nötzold, University of Leipzig (Germany), "Arabic Language Studies at Jordan University, Amman".
- Mr. Stefan Martens, Technical University, Freiberg (Germany), "Ground Water Investigations Along the Wadi Zerqa".
- Ms. Sandra Breyer (Germany), "Temporary Trainee at the GTZ office, Amman".
- Team members of the DEI excavation team at Shallaf, directed by Dr. Hans-Dieter Bienert (DEI-Amman, Jordan) and Prof. Dr. Dieter Vieweger (Kirchliche Hochschule Wuppertal, Germany).
- Team members of the DAI-Umm Qais survey, directed by Ms. Nadine Riedl (DEI-Amman, Jordan).
- Team members of the excavation/survey team at Tell Khanasiri, a joint German-Jordanian project directed by Prof. Dr. Ricardo Eichmann (German Institute of Archaeology, Orient Section, Berlin, Germany) and Prof. Dr. Fawwaz al-Khraysheh (Yarmouk University, Irbid, Jordan).
- Team members of the excavation team at Sal, a joint German-Jordanian project directed by Prof. Dr. Dieter Vieweger (Kirchliche Hochschule Wuppertal, Germany) and Prof. Dr. Zeidan Kafafi (Yarmouk University, Irbid, Jordan).
- Team members of the DAI-Umm Qais excavation, directed by Prof. Dr. Adolf Hoffmann (Technical University, Cottbus, Germany).
- Team members of the Khanzire-Ashrafiye project, directed by Mr. Wolfgang Thiel (University of Köln, Germany).
- The excavation team of the "Ba'ja Project 1999", directed by Dr. Hans-Dieter Bienert (DEI-Amman, Jordan), Dr. Roland Lamprichs (Dresden, Germany) and Prof. Dr. Dieter Vieweger (Kirchliche Hochschule Wuppertal, Germany).
- Scholars holding one-year travel scholarships from the German Institute of Archaeology (DAI).
- Scholars holding one-year travel scholarships from the German Protestant Institute of Archaeology (DEI): Dr. Peter Busch (Schwegenheim, Germany), Dr. Alexander Fischer (Jena, Germany), Dr. Jan Gertz (Göttingen, Germany), Dr. Sebastian Grätz (Leipzig, Germany), Dr. Markus Müller (Uttenreuth, Germany), and Dr. Zoltan Kustar (Debrecen, Hungary).

# Archaeological Survey of the Khanasiri Region/Northern Jordan, Preliminary Results

By: Karin Bartl, German Institute of Archaeology - Orient Section, Berlin/Free University Berlin (Germany), Ricardo Eichmann, German Institute of Archaeology - Orient Section, Berlin (Germany) and Fawwaz al-Khraysheh, Yarmouk University, Irbid (Jordan)

Tell Khanasiri is one of the most prominent archaeological sites in northern Jordan, located between Irbid and Mafrāq. It is a tell site of about 30 meters in height situated on top of a natural hill, thus forming a landmark overlooking a wide land expanse which extends as far as the Ajloun mountains to the west, and Jabal al-'Arab to the north-east. The site and its surrounding area have been visited by such scholars as Gustav Schumacher (Steuernagel 1924-26), Nelson Glueck (1951), and Siegfried Mittmann (1970). However, no detailed studies have yet been done on the area.

Since the archaeological potential of Tell Khanasiri and of the entire area between Irbid and Mafrāq is little known, a joint project of Yarmouk University's Institute of Archaeology and Anthropology and the German Institute of Archaeology - Orient Section, entitled "Palaeoenvironmental and Archaeological Studies in the Khanasiri region" was begun this spring. The project has two primary aims: (1) to define the structure and function of the Tell Khanasiri site itself (see the contribution of S. Kerner in this volume), and (2) to undertake systematic archaeological surface investigations of the surrounding area (Fig. 1). The project is being directed by Fawwaz al-Khraysheh and Ricardo Eichmann, while the survey was carried out under the direction of Karin Bartl. The following explanations deal with the results of the Khanasiri survey, which was carried out in April/May 1999 (for a more detailed report, see Bartl et al., in prep).

Tell Khanasiri is situated near the border of two different landscapes. The first of

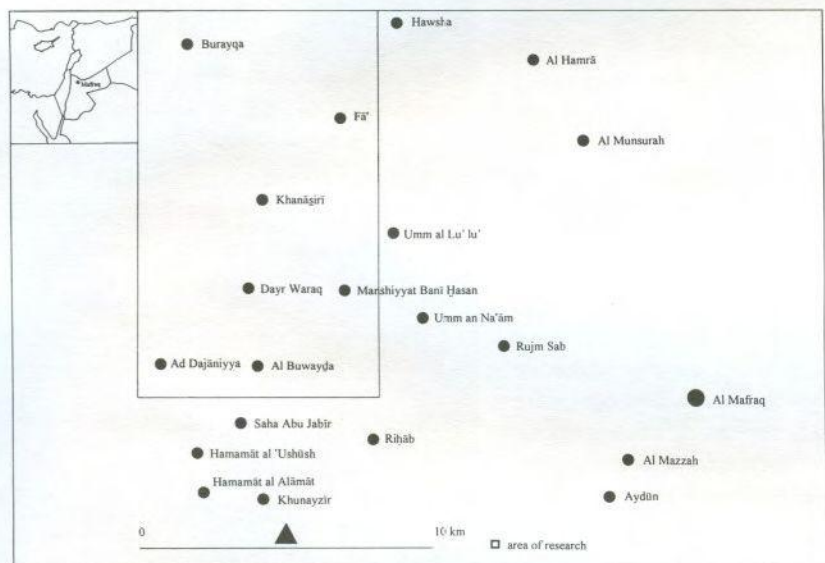


Fig. 1

these includes the regions to the north and immediate south of the hillside near the villages of Dayr Waraq and Manshiyyat Bani Hasan, which are characterized by very sparse vegetation and are used mainly for extensive sheep/goat pastoralism. The second is the area south of the above mentioned villages; this landscape contains soils of the "terra rossa" type which allows for more intensive cultivation, and forms the transition to the Ajloun area. The intensively surveyed region of nearly 100 km<sup>2</sup> contains a chain of low hills, on one of which Tell Khanasiri is situated, and a plain where the two large villages of Faa and Burayqa are located (Figs. 2-3). The plain is crossed by several large north-south wadis which cut deeply into the alluvial sediments.

The documentation of the sites was done with differential GPS (DGPS) readings. By correcting the errors of the re-

ceived satellite data, this system is able to generate coordinates with an accuracy of [plus or minus] 2 meters. The recorded data are transmitted to a CAD system and can eventually be inserted into a digitized map of the region.

During the survey field work, nearly 250 find units—that is, sites within the villages and in the landscape—were investigated. The surface materials, mostly pottery and flint artefacts, were collected according to these units. The entire collection consists of about 2,500 pot sherds and about 6,900 lithic tools, cores and flakes. The preliminary analysis of the surface material indicates two main phases of interest: The Palaeolithic periods and the time since the Late Iron Age when the area was settled permanently. Almost all sites and find units visited near the modern villages, within the wadis and along the wadi banks were covered with large



amounts of flint material, i.e. raw material, cores, flakes and tools. According to the preliminary analysis, most of the material can be dated to the Middle Palaeolithic and the Upper Palaeolithic periods. Most frequently found is material from the Levallois/Mousterian period. Almost all kinds of diagnostic tools are found in abundance, including different kinds of scrapers, burins and borers (Fig. 4). The Upper Palaeolithic material shows fewer specific tools. However, the material can easily be differentiated from the Levallois flint material. Tools of the late Lower Palaeolithic period were rare. Several very elaborated bifaces (Fig. 5) were discovered on different wadi terraces. These results confirm an analysis by E.F. Zeuner (1957) of lithic material found in the Khanasiri region in the fifties.

The entire corpus of flint material in the Khanasiri region is of very good quality and comprises a broad variety of raw material of different colours and types, among which are several kinds of pink flint which are of special interest. At several spots, flint layers embedded into the bedrock were discovered. Large amounts of flint cores point to production in the area itself. Parallels to our material are reported from several sites in the Pella region like Masharia (Macumber/Edwards 1997), Wadi Hammeh (Macumber 1992) and, for the Lower Palaeolithic, the Azraq region (Rollefson et al. 1997). Surprisingly little evidence of the Epipalaeolithic period was found. Although the presence of very small flakes and tools on several hills and terraces points to the existence of younger prehistoric periods, it is not yet clear whether real Epipalaeolithic sites exist in the area. Early Neolithic sites are rare as well. Only a few PPNB sites were found, all situated on top of small hillsides. Almost no finds or settlement remains point to a permanent occupation of the area in the periods after the PPNB. Thus far, Late Neolithic, Chalcolithic and Bronze Age sites are completely missing.

It is only in the Late Iron Age, during the mid-6th Century, that

permanent settlements appear. All of the larger villages in the area such as Khanasiri, Faa, and Burayqa seem to have been founded during that period. Settlement activities are documented by pottery finds from the Late Iron Age to the Hellenistic, Roman/Late Roman-Early Byzantine and Islamic periods. Most of the fine wares of the Hellenistic to Late Roman period are of rather poor quality, thus pointing to a local production. Imported pottery like Attic black glaze and Eastern terra sig-

illata were rare. Concerning the Islamic period, pottery from the 9th to 12th Century AD is seemingly absent. However, further analysis might change this impression. Pottery of the 13th/14th Centuries, i.e., the Mamluk period (Fig. 6) is very common at every village site and at several smaller find spots, which might represent nomadic camp sites.

To sum up, it seems that the Khanasiri region was used quite intensively throughout the Middle and Upper Pal-



Fig. 2 Landscape south of Tell Khanasiri - view to the tell site.



Fig. 3 Landscape north of Tell Khanasiri.

aeolithic period, but was of less importance after the last Glacial, especially during the Epipalaeolithic and Neolithic period. This is rather surprising, since during these periods even marginal areas like the Azraq area and the Negev show an increase in occupation. Hypothetically, the differing results of the Khanasiri survey might be connected with unfavourable climatic and ecological conditions prevailing in the region since 20,000 BC; however, such an assumption could only be verified through further geomorphological and palaeoclimatical research.

The absence of permanent occupation in the area after the PPNB cannot yet be explained with certainty. It is possible that the decrease in occupation which is documented throughout the Levant and which currently is explained by a specific ecological deterioration at the end of the PPNB, affected the Khanasiri region in an even more intensive way. It might be that after the end of the Early Neolithic period, the Khanasiri region was used for a long time period, including the Late Neolithic, Chalcolithic and Bronze Age periods by a mobile population whose subsistence was based on pastoralism and/or hunting. Since the recognition of prehistoric nomadic camps requires very detailed survey strategies, we are not yet able to identify this kind of non-permanent occupation.

Although palaeoenvironmental studies are still lacking in the area, it seems possible that the ecological conditions since the last Glacial age have been those of a marginal area, especially when compared to those of the adjacent regions of Ajloun and Hauran. It might be that the capacity of the Khanasiri region in most periods was too limited to support subsistence for a larger number of permanent settlers. The existence of only a few permanently occupied sites seems to support this hypothesis. However, mobile pastoralists might have used the area during every period, since they were flexible in their adaptations to the landscape.

The reasons for the permanent re-occupation of the area during the Late Iron Age and the character of this occupation are questions which are raised by the survey and which need further research. Also, more information is necessary to define the settlement types of the Antique and Late Antique periods.

Although architectural remains of these periods are very rare, it is assumed that most of the many cisterns and wells found throughout the area may date back to these periods, thus pointing to an elaborate water supply system.

Concerning the historical context, it



Fig. 4 Tools the Middle Palaeolithic Period (Levallois/Mousterian).

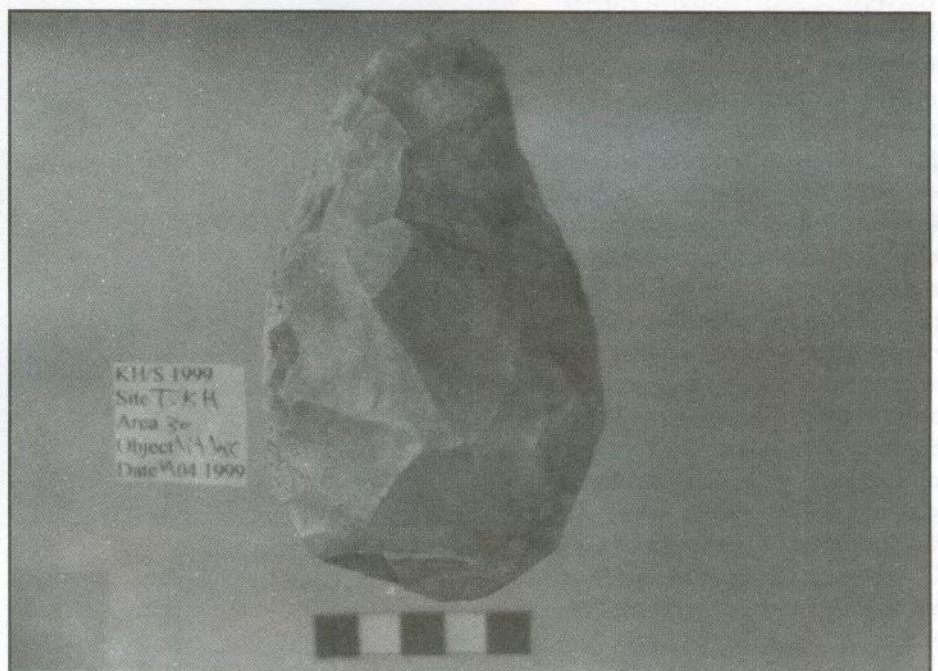


Fig. 5 Late Lower Palaeolithic biface.

may be stated that only a few written sources deal with the region east of the Jordan, especially with the area east of Ajloun. Therefore, the region can only vaguely be related to specific historical events. However, the Khanasiri region must have functioned as a transit area and link between the Harra, the Hauran and the Ajloun mountains through the ages. It also forms a point of intersection between the "desert and the sown". Further research concentrating on these aspects will provide more detailed insights into the relationship between settled and non-settled populations since prehistoric times.

To conclude, it can be stated that the first phase of the Khanasiri survey has provided evidence of the rich archaeological potential of the area, especially in relation to the very early prehistoric periods. Further survey work in the region between Khanasiri and Mafraq will allow us to put these results into a broader context and to reconstruct the cultural history of the entire Khanasiri region.

### Acknowledgements

We would like to thank all staff members who participated with us in the 1999 campaign: Mohammed Ababneh (Yarmouk University), epigrapher; Abdulrahim Atia (Yarmouk University), archaeologist; Hussein Debajah (Yarmouk University), photographer; Carola Hupbauer (Technische Fachhochschule Karlsruhe), surveyor; Jochen Eisele (Technische Fachhochschule Karlsruhe), surveyor; and Bernd Müller-Neuhof (Freie Universität Berlin), prehistorian/archaeologist. We would also like to express our gratitude to Khaled al-Jbour, Inspector of the Department of Antiquities, Mafraq, who supported our work in every respect. Our special thanks go to Hans-Dieter Bienert (German Protestant Institute of Archaeology in Amman) for logistical support, and to Zeidan Kafafi (Yarmouk University) and Gary O. Rollefson (Walla Walla College) for valuable comments on the lithic finds.

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Fig. 6 Mamluk pottery from al Buwayda.

## Palaeoenvironmental and Archaeological Studies in the Khanasiri Region: Preliminary Results of the Archaeological Investigation of Tell Khanasiri

**By: Susanne Kerner, German Institute of Archaeology - Orient Section, Berlin/Free University Berlin (Germany), Fawwaz al-Khraysheh, Yarmouk University, Irbid (Jordan) and Ricardo Eichmann, German Institute of Archaeology - Orient Section, Berlin (Germany)**

The palaeolithic and archaeological study in the Khanasiri region between Irbid and Mafraq is a joint project of the Orient Section of the German Archaeological Institute and the Institute for Archaeology and Anthropology at Yarmouk University. This research into a hitherto little known area, initiated and directed by R. Eichmann and F. Khraysheh, has two components: a systematic survey of the region (carried out by K. Bartl, see contribution in this volume) and a study of Tell Khanasiri itself, which was done by S. Kerner. The archaeological investigation of the site was conducted between 10 April and 8 May 1999. This was followed by a documentation period which ended on 17 May.

The study of the tell is, therefore, part of a larger project which includes an area of 100 km<sup>2</sup> in all directions around Tell Khanasiri. The widely visible tell was visited by such early travellers as Schumacher, who described it as follows: "Es ist ein isolierter, runder, hoher Hügel mit ausnehmend dominierender Lage. ... Der eigentliche Bergkegel von chanasira ist künstlich aufgeworfen, 20 m hoch, und von einem 6-10 m tiefen, in den Felsen gehauenen Laufgraben umgeben ..." (Steuernagel 1925, 361). However, although other scholars, such as Glueck and Humbert, have also visited the site, the tell has nevertheless remained largely untouched. This is surprising given the fact that it is one of the largest tells in northern Jordan and can be seen from as far away as the roads east of Irbid and the Ajloun Mountains. The tell is situated in a very interesting geo-stratigraphical

position and on a clear morning, the view extends all the way to Jebel Arab in the northeast, Mount Hermon in the northwest, and several ranges of the Ajloun Mountains, but is slightly obscured to the south and east. Movements on the plain could therefore have been detected even from a great distance.

The archaeological examination of Tell Khanasiri was intended to achieve two goals: 1) to gather information about the different time periods which are represented in the site itself, and 2) to gather as much information as possible about the structures on the tell as far as they are visible on the surface. This information could then provide a framework for the information collected from the systematic survey, while the survey at the same time would allow the tell to be seen in its relationship with its surroundings (for a description of the geographical conditions of the area, see K. Bartl, this volume).

Tell Khanasiri is about 30 meters high (bedrock is visible up to 10-15 m) and is roughly 360 m<sup>2</sup> on the relatively flat top (60 x 60 m), while the base measures ca. 120 x 130 meters. The tell is nearly circular, with a very even shape and contour, although the eastern and southern slopes are slightly steeper than the northern and western sides. The tell is surrounded by a wide ditch which is partly filled with small stones that have tumbled down from the top and slopes of the hill. The outer side of the ditch is cut into the bedrock, where the stone-cutting marks provide evidence for rather substantial quarrying in antiquity. It is thus possible that the ditch

was primarily created through quarrying, and that it was only secondarily used for defensive purposes.

Firstly, the tell was surveyed using a conventional survey system, with an EDM connected to a computer. A 10 x 10 meter grid was laid over its top, as far as the steeply sloping sides allowed. The ditch around the tell was independently divided into roughly 30-meter-long sections. These 30m points were then connected with grid-points on the top of the tell, which produced triangular or trapezoidal shapes along the slopes of the tell.

Secondly, the 10 x 10 meter areas (called squares), the 30 m-long areas in the ditch (Ditch 1-17), and the irregularly shaped areas along the slopes (Unit 7-23) were sherded. Every pottery sherd larger than 2 cm<sup>2</sup>, basalt fragments, flint material and other objects of interest were picked up in the squares, as there was very little material. On the slopes, only the larger shreds (over 6 cm<sup>2</sup>) and diagnostics were collected, and the same was done for the units in the ditch. Third, the surface of the tell was cleaned (which included weeding, sweeping and removal of small grit on the surface), so that the structures already visible could be documented.

The surveyed area includes nearly 8,000 m<sup>2</sup>, of which the largest area is along the slopes of the tell. The material consisted of 6,800 pieces of pottery, a dozen lamp fragments, 10 basalt fragments, and approximately 60 flints. The pottery, particularly from the top of the tell, was very worn and broken into very small pieces. The slopes

and the ditch produced slightly larger pieces, which were easier to date. The periods of occupation on Tell Khanasiri include the late Iron Age, the Hellenistic period and, to a much lesser extent, the Early Roman period.

The Iron Age pottery (which at this point in our research cannot be clearly distinguished as to whether it dates back to the Late Iron Age II or the Persian period) consisted mainly of slightly concave, small bowls and several cooking pots. The cooking pots showed the typical rough textures with a gritty temper, and were mainly hole-mouth jars. Jars with triangular lips and large pithoi were also numerous. (The cooking pots can be compared with TJO/2 and TJO/24 [Lamprihs 1996, 332] and the pithoi with TJO/47 and TJO/32 [Lamprihs 1996, 336]). The Hellenistic pottery included very few imported fine wares, with a shiny, black slip (HSLIP A as described in Kerner 1997: Appendix). However, there were numerous imitations of these Hellenistic fine wares, which showed differing standards of quality. The imitated wares have slips as well, but they are normally not shiny and they are often thin and watery. They also have a tendency to be brownish and reddish rather than black. Other pottery included large pithoi-rims of a coarse, buff-orange ware, large amounts of cooking ware, and relatively few common Hellenistic wares. The imported wares are HSLIPB, HSLIPD and HSLIPE, the pithoi-wares C ORA, and the common wares primarily H BUFF, H BUFF B and FH BUFF (Kerner 1997, Appendix). Some Nabataean pottery was found on the northern and eastern sides of the tell.

The Roman pottery consisted mainly of very small pieces of Eastern terra sigillata and a few shreds of cooking pots and water jars. There was very little material other than pottery. Only some 60 flints (tools as well as nodules and waste) were found. Although there is no basalt flow in the immediate vicinity, there were at least three different qualities of basalt, one of which was extremely fine. A shallow, carefully worked bowl and a grinding stone, which has little feet on its rounded lower face to stabilize it, are made from fine basalt with very small pores. Only

sparse information is available about basalt items from later periods, but the basalt grinder with feet is comparable to a piece from Umm Qais/Gadara.

The architecture of the site is definitely one of fortifications. The entire tell seems to be surrounded by one and, in places, two circular walls, which are partly visible on all sides (Fig. 1). The circular walls are slightly curved to follow the contour of the tell, and they run at the same level. So far, only the outer faces of most of these walls are visible, but they might be between 1.2 m and 2 m thick. Some of the stones in the circular wall are up to 1 m x 1 m x 0.8 m in height. They are generally well worked, but not particularly smooth. On the eastern side one may discern other walls, which run at a right angle to the circular walls. They might connect the two circular walls, and they could have the function of casemate walls, although this is not yet clear. A large fortification structure consisting of outer walls, casemate walls and glacis is known from sites like Umeri, although it comes from an earlier period there (Geraty et al. 1989; Herr et al. 1996).

On the northern and southern sides, the circular walls are particularly large, consisting of stepped walls with buttresses or other walls at a right angle. The walls there are 1.2 m wide and are very well preserved. They might have been a specific kind of structure, such as a gate or tower. The northern side is the only place where a major wall does not follow the general direction of the wall lines, but instead runs straight to the east. This wall is made from both smaller and larger stones, and is visible close to the modern path up the tell. It might well be that this irregularity is connected with an entranceway of some kind.

The interior walls tend to run in a southeast to northwest direction (Fig. 1), with only one small wall deviating from this general pattern. It is impossible to judge from the surface of the walls what their stratigraphical relationship is. However, the fact that they are all built in the same direction gives strong support to the suggestion that these walls on top of the tell originally followed a single plan and layout. There are certainly several phases in

some of these walls; some have been rebuilt, the direction of some has been changed slightly, while the entrances to others have been blocked. This could be seen as evidence of later building activities which simply followed the already existing plan. That we do have different phases is clear from the existence of some far more elaborately cut and smoothed stones, which might date back to the Hellenistic period; however, nothing as yet proves this assumption.

Other features on top of the tell include a large hole and a depression in the center, both of which are filled entirely with large boulders. The hole might once have been very deep; local informants claim that it was a cistern of considerable depth (this has also been mentioned by Schumacher). Some method of water storage has, of course, to be expected in a fortress. The remains of a small channel with thick plastering directly on the surface might strengthen this assumption, but no definite statement is possible without excavation. A small water basin outside the actual circular wall also proves the existence of water related structures.

Another remarkable feature of Tell Khanasiri is the glacis. On the southwestern and northern slopes, small parts of the glacis are still preserved and in situ, but most of it has broken off and fallen down into the ditch. It consisted of smaller stones, 30 x 30 cm and smaller, which were very closely set on the ground and once covered the entire surface of the slope. Small terracing walls running all around the slope, sometimes set only one meter apart, might have provided the structural support for this glacis.

Finally, two small test trenches were dug on the northern and northeastern slopes of the tell. The trench in Square R 96 was meant to provide some idea about the stratigraphic situation outside the tell. The walls on the tell give the impression of a fortification rather than a domestic structure; therefore, it is necessary to look elsewhere for a possible settlement. Square R 96, with dimensions of 4 x 2.5 m, was opened up to check the immediate surrounding of the tell. Next to three obviously re-used stones of very good quality,

there was a floor made of flagstones and several other layers of domestic occupation beneath it. While the upper layers might date back to the Late Antique period, the layers below clearly date back to the same Early Hellenistic/Late Iron Age period as the main tell. An old surface which was reached has brought to light the same palaeolithic material as was found in the survey.

Under the direction of the Department of Antiquities, another trench, U 97, was made into a surface structure to provide information about it. Square U 97 revealed a rather recent structure with badly eroded stones which were not well cut, and lots of surrounding rubble stones. The pottery from the surface was Hellenistic, Roman and Mamluk, with very little in between. Some really nice finds came from the surface, including a basalt pestle, a Hellenistic plate, an oil lamp, and the spout of another, rather large, oil lamp which was made from some kind of red marble.

The preliminary results of the study of Tell Khanasiri show that the tell was settled in the late Iron Age, Hellenistic (Nabataean) and probably Roman times, while the immediate surroundings of the tell itself also show Late Antique and Islamic occupation. Articles from the Mamluk period in particular can be found in abundance at the foot of the tell. The architecture on the tell provides clear evidence of the military character of the settlement there.

**Acknowledgements**

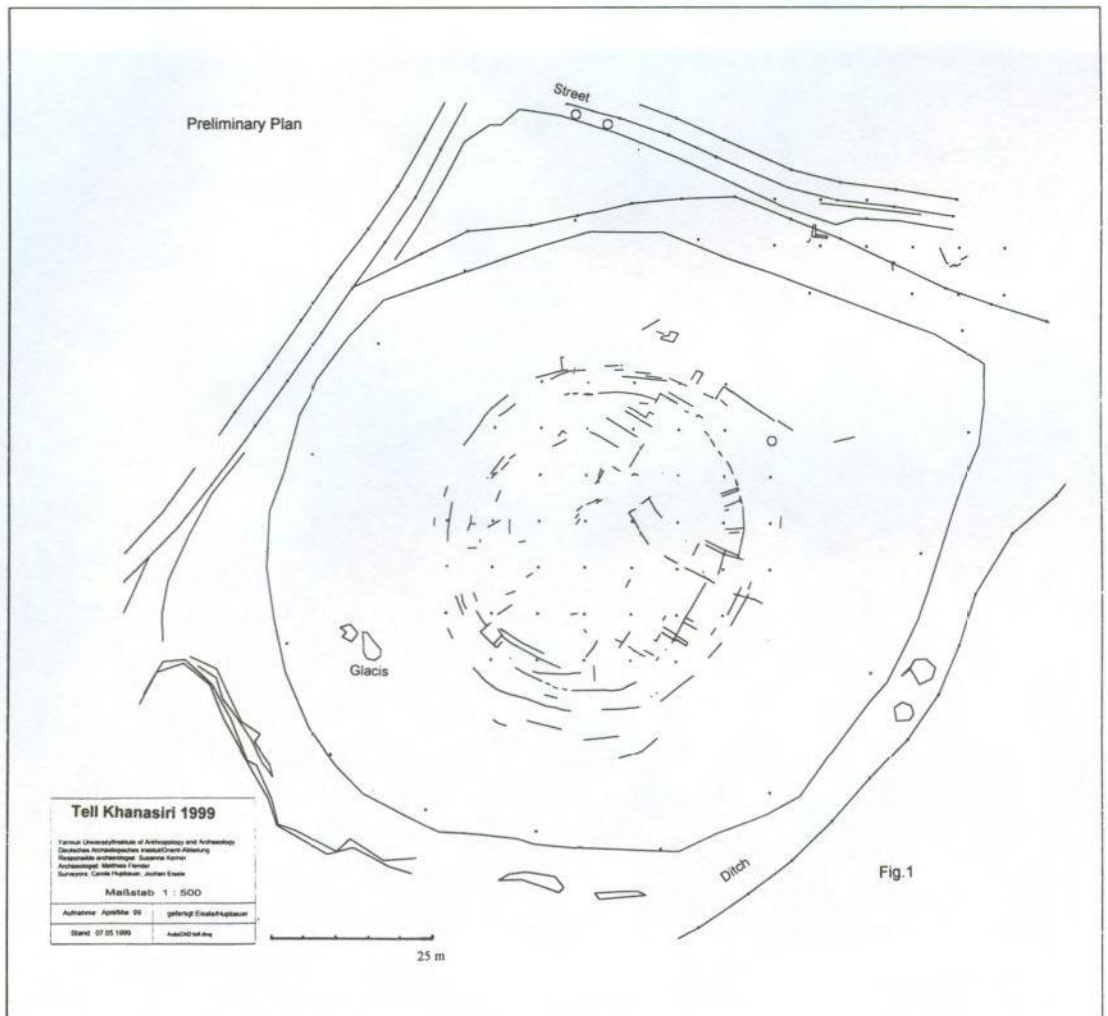
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## Ghwair I, An Exceptionally Well Preserved Pre-Pottery Neolithic B Community in Wadi Feinan

**By: Alan H. Simmons, Department of Anthropology, University of Nevada at Las Vegas (U.S.A.) and Mohammad Najjar, Jordanian Department of Antiquities, Amman (Jordan)**

One of the most isolated areas of Jordan is Wadi Feinan/Fidan, located amidst spectacularly rugged mountains south of the Dead Sea. Despite its apparent harshness, this region has witnessed human occupation for millennia. Remains dating to the Bronze Age and later are abundant. One reason for the intensity of settlement was, undoubtedly, the rich copper sources that are so abundant throughout the region. We now know that even prior to the intensive use of metallurgy during the

Neolithic period, the area witnessed substantial habitation. The most substantial and best preserved example appears to be Ghwair I, dated to the Pre-Pottery Neolithic B (PPNB) phase of the Neolithic period.

Ghwair I was originally investigated in the early 1990's by Mohammad Najjar (Department of Antiquities) as part of the German-led Archaeometallurgical Investigation Project. In 1996, Najjar and Alan Simmons (University of Nevada at Las Vegas), with support from

the Brennan Foundation, renewed investigations to assess Ghwair I's potential for addressing regionally relevant topics relating to Neolithic adaptations in Jordan. Since the limited 1996 study, we have completed two additional major seasons during the winters of 1997/98 and 1998/99, with support from the National Science Foundation and the National Geographic Society.

A major goal of the project is to investigate the concept of "core and periphery" during the Neolithic. We wish



One of the excavated Neolithic rooms at Ghwair I.

to determine if Ghwair I, located in the periphery of the Neolithic world, functioned as a "frontier outpost" with minimal amenities, or if it was an elite, but small center. Ultimately, we will compare small settlements such as Ghwair I with larger Neolithic core centers, such as 'Ain Ghazal, Wadi Shu'eib, or Basta. Other project objectives include paleoenvironmental and paleoecological reconstruction; examining if the occupants of Ghwair I contributed to environmental degradation as they did at larger communities; and seeking to define the site's boundaries, architectural layout and social indicators, material culture, and chronology.

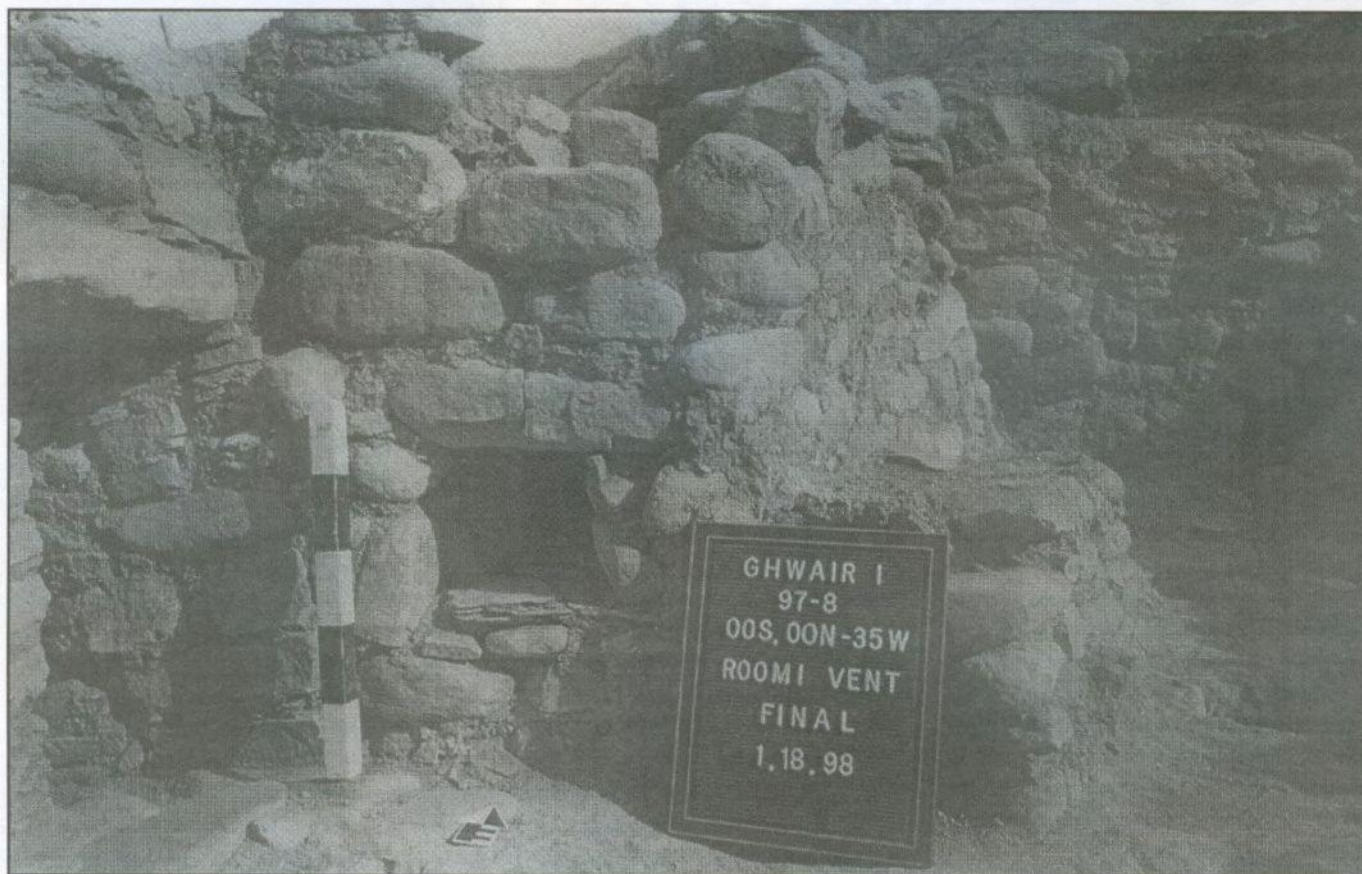
Ghwair I is strategically located on a hillslope at an elevation of 290-320 meters above sea level with a commanding view of the surrounding area. The site is small, covering an estimated 1.5 acres. Our excavations have concentrated on six major areas of the site. The well-preserved architecture is certainly the most spectacular aspect of the site, with walls containing windows and

doorways preserved to over 3 meters high. Excavations have indicated a depth of over five meters in some areas. Confirmation of buried features has been provided by a Ground Penetrating Radar study conducted by Jon Cole.

While the architecture at Ghwair I is relatively typical of the PPNB, there are some unusual features, as the following examples demonstrate. Near the eroded western end of the site, where a series of complex structures has been exposed, we excavated an unusually shaped room, roughly square, but with a "jog" in the western wall. The southern wall contains at least 3 niches, and the western wall has a blocked-in doorway. The western wall also has a small niche, a plastered bench, and a window-like feature. At least two of the "niches" may in fact have functioned as vents, as they are hollow up the length of the walls. Expansion of the excavation to include units adjacent to this room exposed a complex of structures. The room appears to be a core from which surrounding rooms

branched off. Many of these are small bins, several with passageways. Rather than following typical rectangular arrangements, however, these are arranged less symmetrically. Eight bins were excavated. Material was relatively rich, although the floors were usually cleared. Plaster, much of it painted red, also extended up the walls of some of these features. Chipped stone and, especially, ground stone was abundant and varied in this region. This room complex was an unusually sophisticated structure for the PPNB period, and suggests a special use.

Several other interesting structural features occur at Ghwair I. Of particular note is one room that contained a cache of goat and cattle skulls lying almost directly on a plastered floor. This room appears to have been a workshop of some sort, since in addition to the goat skulls there was another cache of chipped stone blades and points, a polishing stone with malachite imbedded into it, and several malachite pendant "blanks". Finally, beneath this floor,



View of the room ventilation system at Ghwair I.



where the plaster was disturbed, was an intact burial, the first clear Neolithic interment for the site. This appears to be a "typical" Neolithic burial in that it is beneath a structure's floor and is in a flexed position. What is not typical, however, is that the skull is intact.

In the same area, we also removed a series of balks that had been left in place since 1993. Once these were removed, the architectural plan was much clearer. What is particularly striking is that the earliest building phase seems to have included a very large room, approximately 10 meters on each side.

In another area of the site, the deep-est yet, excavation revealed a remarkable degree of wall construction and rebuilding; at least 33 separate walls/building episodes were recorded to a depth of about 5 meters. One individual wall (toppled at the top) reaches a height of approximately 3.6 meters. At the bottom of the excavation, an intact floor with a hearth, large and flat stones that apparently functioned as "chairs", and numerous ground stone artifacts occurred, suggesting a work surface. Near the floor of this we also recovered impressions of mats, indicating the type of flooring. We also excavated a small sounding below the work surface/floor, exposing an intact hearth.

Finally, of considerable interest is a series of thick and parallel walls which may have served as retaining walls to prevent erosion or to aid in water control. These have only been sporadically exposed thus far.

As expected, a huge assemblage has been recovered. This consists of chipped stone artifacts (over 50,000) and a surprisingly varied and complex ground stone assemblage. The chipped stone reflects a typical PPNB assemblage, with a very large number of projectile points. The majority are Byblos types, but there is also a considerable amount of variation. Other tools include perforating implements, burins, and numerous microliths. Surprisingly rare are scrapers. A wide variety of cores is present, including numerous naviform types.

Non-chipped stone includes a wide array of the usual small finds associated

with Neolithic villages, such as spindle whorls, beads made of bone, stone, anthropomorphic and zoomorphic figurines, and marine shells. In addition to grinding implements, ground stone includes numerous small "cups," possible phallic representations, two "gaming boards", possible "tokens", and "palettes" with pigment still adhering to them. We also recovered large perforated ground stone artifacts that superficially resemble "weights" of some sort. The ends of these, however, are smoothly ground and polished, which suggests that the perforation could, in fact, have functioned as a handle for some sort of grinding activity.

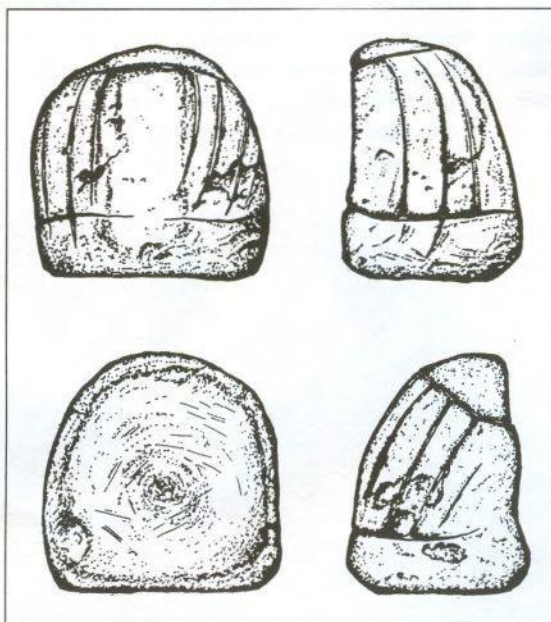
Finally, one unusual artifact is a small, finely incised stone piece. When viewed laterally, it resembles a small bowl or cup of some sort with one ex-

identified charcoal, barley, emmer wheat, peas, and pistachios. Other specialized studies include examination of soil samples for phytoliths, which is being done by David Rhode. Finally, Rolfe Mandel conducted a preliminary geomorphological analysis of the site. His study will place Ghwair I within a wider geological context; in addition, it will address site formation and post-occupational processes, and assess the site's economic potential. This study will explore the possibility that the inhabitants of Ghwair I caused severe environmental stress, as has been suggested for larger Neolithic settlements, such as 'Ain Ghazal.

Six radiocarbon determinations are currently available. These are stratigraphically consistent and indicate an early Middle PPNB placement during the mid-eighth to early ninth millennium BC (calibrated). Additional samples are presently under analysis.

In conclusion, our renewed investigations at Ghwair I have been extremely successful. We now know that the site is far more complex than previously believed, and that it is unlikely that the settlement was a simple "outpost". Its relationship with a wider early Neolithic "interaction sphere" is yet to be determined, but it clearly functioned as an important settlement. In particular, it will be interesting to compare this small site with the numerous Neolithic "mega" settlements with near "urban" characteristics that have recently been documented in both central and southern Jordan.

We wish to thank the Department of Antiquities and its director, Dr. Ghazi Bisheh, for its assistance in this project. We also would like to thank the people of Wadi Feinan for their help throughout the project, as well as the Royal Society for the Conservation of Nature, the British Institute at Amman for Archaeology and History, and the American Center for Oriental Research. ■



A possible 'mask' base from Ghwair I.

tremely flat end. When placed vertically on the flat end, however, it is suggestive of the back part of a composite figurine bust, possibly representing the back of a head, into which a molded face or "mask" could have been fitted.

Faunal remains are abundant, and are under analysis by Paul Croft. A variety of economic forms include caprines, cattle, pigs, a small carnivore, and one or more species of bird. Paleobotanical material was also recovered and is being studied by Reinder Neef, who has

## Lost Paths of Edom: Climbing Towards an Edomite "Eagle Nest"

**By: Hans-Dieter Blenert, German Protestant Institute of Archaeology in Amman, Amman (Jordan), and Jens Eichner, Kirchliche Hochschule Wuppertal (Germany)**

"Ba'ja III is very important as a counterpart to Um el-Biyarah and el-Sade, and should therefore be excavated. Rope ladders have to be used for an excavation, and the equipment has to be brought to the mountain top by helicopter. So far, only one of five cisterns has been excavated." (Lindner 1989, 189). These statements by Dr. Manfred Lindner who, together with some German and Austrian comrades, discovered the Edomite "eagle-nest" in the mountains of Ba'ja, well describe the very difficult access to that remote place on top of a rock (Fig. 1 the rock to the left).

In summer 1984, while surveying the Ba'ja region, an area approximately 10 km north of the ancient Nabataean city of Petra, Manfred Lindner and his team from the Naturhistorische Gesellschaft in Nürnberg (Germany) discovered a number of prehistoric and historic settlements (Lindner 1987, 175; 1996). However, the Edomite mountain stronghold, which Lindner named Ba'ja III, enjoys the most outstanding setting of the sites discovered by the Naturhistorische Gesellschaft. In two visits to the site (1984 and 1986), Lindner and his team collected a number of pieces of Iron Age pottery, excavated one cistern (out of approximately seven), and made a sketch of the visible archaeological remains on the mountain top (Lindner 1987; 1989/1990, 354; 1996, 270-273). However, as Lindner pointed out, it would be worthwhile to further investigate the site (Lindner 1989, 189).

Hence, the German Protestant Institute of Archaeology in Amman (DEI) is planning a new

expedition to Ba'ja III in October 1999. In preparation for this campaign, we wanted to have a first look at the possi-

ble access to the site (Figs. 2-4), which Lindner (1989, 187) described as follows: "Circa 40 m N of the Siq exit lead-



Fig. 1

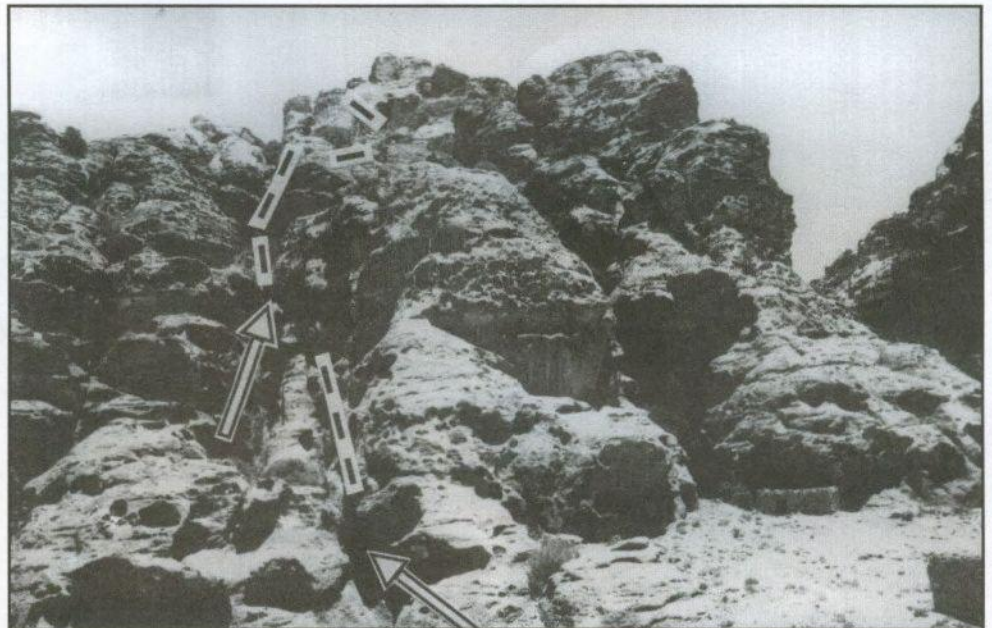


Fig. 2

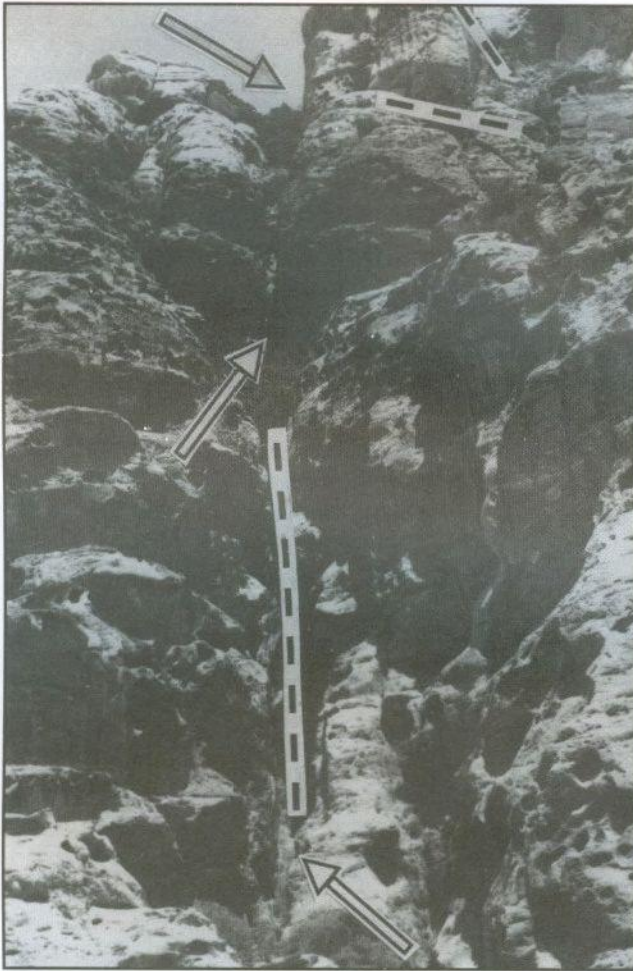


Fig. 3

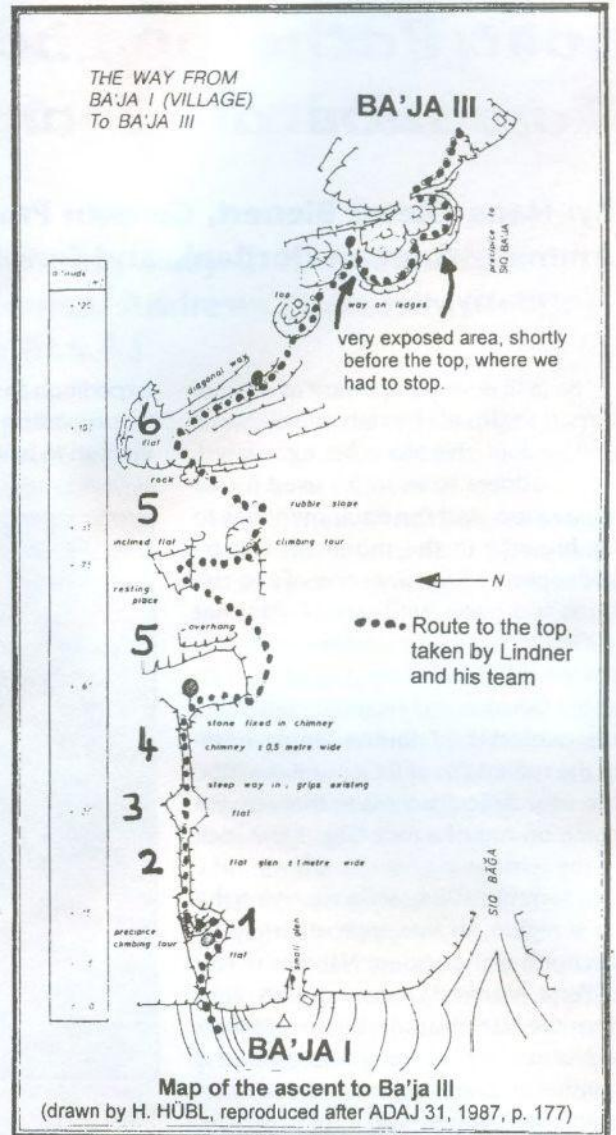


Fig. 4

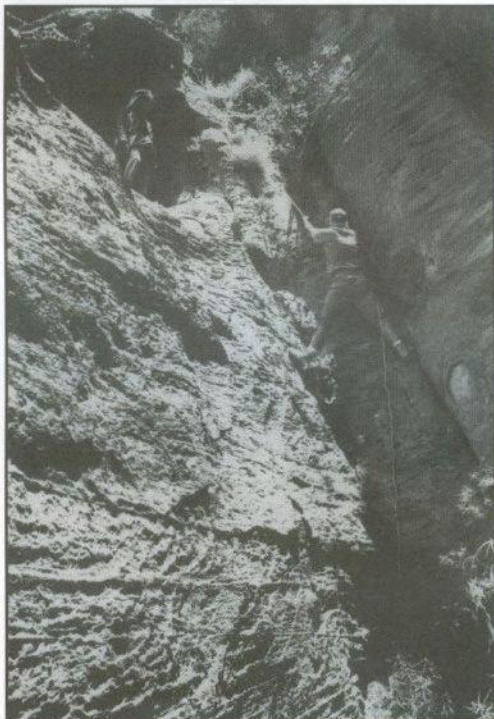


Fig. 5

ing up to Ba'ja II there is a series of chimneys and fissures with tiny worn footholds to climb up. About 140 m above the village of Ba'ja I, one reaches a rugged mountain top consisting of dome- or tower-like eroded rocks. Rock-cut stairs and house foundations together with cisterns, grinding plates and Edomite pottery indicate an Edomite mountain stronghold (...)"

Accompanied by a local bedouin, we started out on 6 June just north of the ruins of Ba'ja I (Figs. 2 and 4), where a fissure in the rock allows access further up and where Lindner and his team also began their

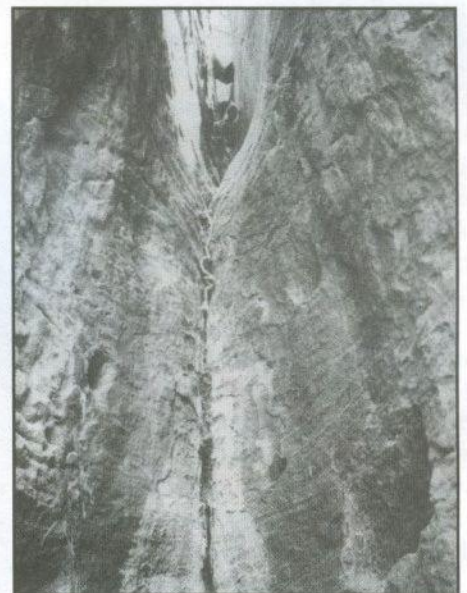


Fig. 6

climb. After passing up through a narrow rock fissure, we had to overcome a first difficult passage by climbing over a huge rounded rock (see No. 1 in Figs. 4 and 5). Then a narrow and steep passage followed (see No. 2 in Fig. 4 and the lower dotted line in Figs. 2 and 3); it ended in a small, flat platform (see No. 3 in Fig. 4). Rock-cut steps (Fig. 6) of unknown date ease the entrance into a very narrow and steep chimney (see No. 4 in Fig. 4; arrow in middle of Figs. 2 and 3) which requires the help of ropes and some experience in climbing. It is possible that the rock-cut steps, also mentioned by Lindner in his report about Ba'ja III (Lindner 1987, 176), indicate an ancient route to the summit, probably made by the Edomites or later Nabataeans. However, these steps are the only visible indications of human activity in the lower part of the ascent.

After having climbed through the steep and narrow chimney, the ascent continued through a steep area partly covered with vegetation as well as small and large rocks (see No. 5 in Fig. 4 and the dotted lines in the upper right corner of Fig. 3). After one and a half hours, our route to the summit ended on a small platform (see No. 6 in Fig. 4 and to the left of the dotted line in Fig. 7). From here we had a marvelous view of Ba'ja I and most parts of the Jabu plain. Continuing further would have been too dangerous, as the final part of the ascent would have required more professional climbing equipment to secure a very exposed area crossing an almost vertical wall (dotted line in Fig. 7). A proper path did not exist and only small ledges would have offered some support. Therefore, we decided to stop our attempt to reach the summit and slowly descended by the same route. After almost three hours, we happily reached Ba'ja I from where we started our trail (Fig. 8). During the coming months we will try to find another, easier way to the summit. We believe that the Edomites must have used another ascent, as the one we took seemed to us far too steep and narrow. However, at the end of the day we could only ad-

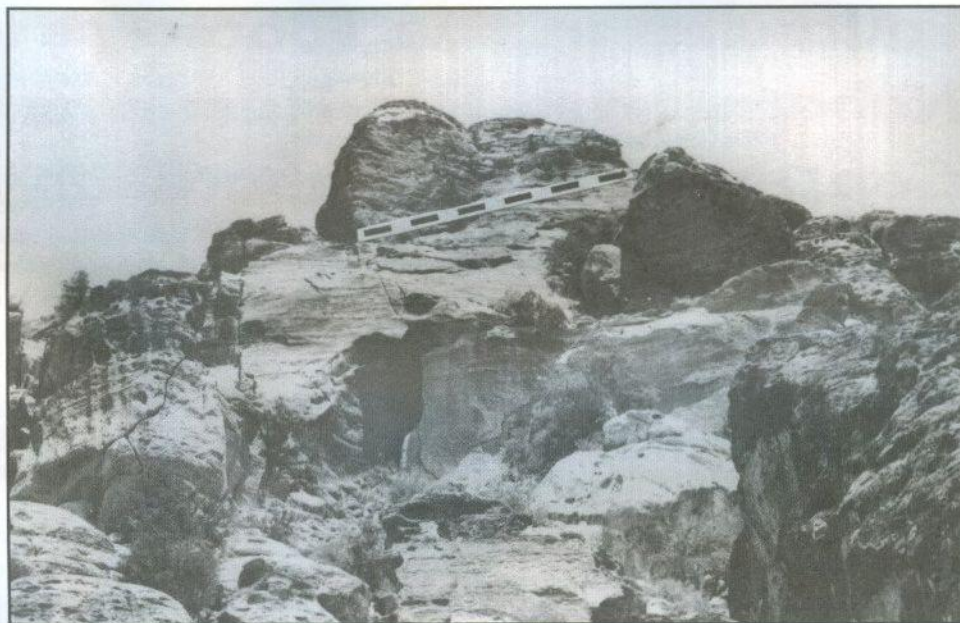


Fig. 7

mire the courage and strength of our friend Manfred Lindner who, at the age of 67, reached the summit in 1984. Congratulations!

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Fig. 8