

One Hundred Years of Archaeological Research in Jordan

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Abstract

This three-part article presents the history of archaeological research in Jordan, especially in the last one hundred years and concentrating on methodological advances. The first part of the article by Gary Rollefson covers the prehistoric periods, first by presenting the achievements of the pioneers and then by concentrating on research developments in the Neolithic and Chalcolithic periods from 9,750 to 3,750 BC. The second part of the article by Katharina Schmidt covers the Bronze and Iron Ages and highlights trends in archaeological research over the past one hundred years. The third part of the article by Robert Schick presents archaeological research in the Hellenistic to Islamic Periods, focusing on the contribution of foreign researchers, and presenting developments by decade

Keywords: Archaeology in Jordan, Archaeological Methodology, Prehistory, Jordan.

Introduction

In the one hundred years since the establishment of the modern state of Jordan, archaeological research has developed from the pioneering efforts of the first generations of researchers into the methodologically sophisticated projects of today.

This article presents the history of those methodological developments in three sections, covering prehistory, the Bronze and Iron Ages, and the Hellenistic to Islamic periods.

Prehistory Research in the 20th and 21st Centuries (by Gary Rollefson)

“Walking in the torrent bed at Maan my eyes lighted upon, – and I picked up, moved and astonished, one after another, seven flints chipped to an edge ... we must suppose them of rational, that is an human behavior. But what was that old human kindred which inhabited the land so long before the Semitic Race?” (Doughty 1888: 74).

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Standing on the Shoulders of Giants

Charles Doughty was one of the first scholars to note that there were prehistoric archaeological remains in Jordan, but it would be thirty years later that systematic research would begin investigate the kingdom's distant past. Surveys and excavations that involved Paleolithic periods – i.e., such as the “seven flints” Doughty found – would take decades to appear. Some of the earliest attention was by Henry Field (1960), who spent years in the Arabian deserts, including Jordan. Among the stone tools he collected from surface sites were many that were hundreds of thousands of years old (cf. Garrod 1960), setting human history in the unconceivably ancient past. Excavations of *in situ* Lower Paleolithic artifacts at Lion's Spring (Ain al-Assad) in the Azraq area in 1956 produced hundreds of Lower Paleolithic bifaces and flake tools (Kirkbride 1989), but attempts to continue research were unfortunately not possible. Nevertheless, a published report on the Paleolithic sites in Jordan (Zeuner et al. 1957) drew the attention of other prehistorians a couple of decades later (Garrard and Stanley Price 1975; Rollefson 1983a), and the attention persisted through the rest of the millennium and into the 21st century (e.g., Copeland and Hours 1989; Rollefson et al. 1997; 2005; Nowell et al. 2016).

A culmination of the concentration on the Lower Paleolithic reflected in recent work in the middle reaches of the Zarqa River has now provided evidence of human presence in Jordan back 2.5 million years ago. Excavation in the Dawqara formation produced a pre-Acheulian stone tool industry that is strikingly similar to the Olduvai Industry from the Olduvai Gorge, characterized by crude choppers and flakes. Also recovered from the sediments were bones from such extinct species as *Mammuthus meridionalis*, *Equus cf. tabeti*, and *Bos primigenius* (Scardia et al. 2019).

But the astonishing impact of the excavation is the age of the sediments that produced the cultural and faunal material. Using paleomagnetic, $^{40}\text{Ar}/^{39}\text{Ar}$, and U-Pb dating methods, the Dawqara Formation was deposited between 2.52 ± 0.01 Ma (Million years ago) and the Matuyama Olduvai geomagnetic reversal (1.95 Ma). The stratigraphic layers that bear the artifacts have ages of 2.48 Ma, 2.24 Ma, 2.16 Ma, 2.06 Ma, and 1.95 Ma (Scardia et al. 2019). These Pliocene dates are Basal Paleolithic, not simply Lower Paleolithic (Scardia et al. 2019: 10). Other Lower Paleolithic sites in Jordan, some of them enormous, are usually less than 750,000 years to 250,000 years old (e.g. Copeland 1991; Rollefson et al. 2005; al-Nahar and Clark 2010).

One of the first systematic prehistoric investigations was the extended program of excavations at Teleilat Ghassul at the northeast edge of the Dead Sea that began in 1926 and lasted until 1938 (Mallon et al. 1934; 1940). Excavations began again in 1967 (Hennessey 1969) and continued as a focus of Chalcolithic research with renewed excavations in 1994 (Bourke et al. 1995).

Another early project that focused on prehistoric archaeology was led by Hans Rhotert; he and his colleagues spent six weeks from late November 1934 to the end of December in Kilwa (then still within Jordan's borders). The team made a modest surface collection (184 flint tools) that spanned (based in part on the artifact drawings) the period from the Acheulian through the Middle Paleolithic (and possibly Upper Paleolithic), the Epipaleolithic, the Neolithic, and the Chalcolithic periods. The group also made a large number of drawings of rock art of both animals and people (Rhotert 1938).

A research team led by J. Waechter and V. Seton-Williams spent four months in late 1937 and mid 1938 in the Wadi Jilat (which they reported as Wadi Dhobai) that, in places, was canyon-like. Their survey found six sites in addition to four that had been found before

their project began (Waechter et al. 1938). Five of the sites were “Dhobaian” (today they are called PPNB and PPNC) and two were described as “Aurignacian”, although the artifacts are now classified as Epipaleolithic (Garrard and Byrd 1992). The work by Waechter and Seton-Williams prompted renewed interest in the Wadi Jilat, and a multi-season investigation of survey and excavations added considerable detail to the Neolithic and Epipaleolithic periods in that part of Jordan (Garrard and Byrd 2013).

During the war years of 1939-1945, there was little prehistoric field research in Jordan, but a survey of Wadi Rum by A. Kirkbride and Harding (1947) recorded more than 200 ritual sites in the form of rectangular walled enclosures a single stone high, in the center of which was a standing stone about 35-40 cm high; the two researchers had no way to determine the age of them, but they were so strongly suggestive of ritual activity that they called Wadi Rum the “Holy Valley”. New research begun in the middle of the first decade of the 21st century continued the examination of these and other evidently ritual structures (e.g. Farés 2013; Rollefson and Matlock 2007). Radiocarbon dates from the excavations Farés undertook indicate two major periods: Late Neolithic (ca. 5340-5063 cal BC) and Early Bronze Age (2834-2475 cal BC) (Farés 2013: 71-72).

Diana Kirkbride had also excavated in Wadi Rum at a spring location named ‘Ain Abu Nekheileh (now spelled Nukhayla) (Kirkbride 1978). After planning curvilinear and rectilinear walls on the surface of about half of the site (ca. 1,700 m²) she excavated a trench 12 x 1 m in size, which intersected eight walls of PPNB walls (Kirkbride 1978: 2-3 and Figs. 1 and 2). Don Henry went to ‘Ayn Abu Nukhayla (Henry and Beaver 2014) about four decades after Diana Kirkbride tested the MPPNB settlement (Kirkbride 1960a). In seasons from 2001 to 2007, Henry was able to demonstrate through extensive excavation (including Kirkbride’s trench sounding) that the inhabitants visited the site over 200-270 years during the Late PPNB period with domesticated goats and possibly farming during years when rainfall was sufficiently abundant (Henry and Beaver 2014: 137). The floral landscape in Wadi Rum is as bleak and barren as the Black Desert, perhaps even more so, yet pollen analysis has revealed that *Salix* (willow), *Tamarix*, *Typha* (bulrushes), and *Concentricystes* (a freshwater algae) were present in the Late PPNB period, all three indicating perennial water, likely including ponding in the qa adjacent to the site. In addition, *Alnus* (alder), *Pinus* (pine), and *Juniperus* pollen also occurred (Emery-Barbier 2014: 109-111) as did *Cerealia*-type pollen. Starch granules recovered in relatively large amounts from the sediments at the site and represented cereal plants, most probably *Triticum* (wheat), supporting the view that cereals were cultivated at the wet edge of the pond in the qa (Emery-Barbier 2014: 110).

But it is probable that Kirkbride’s most important contribution to understanding the prehistory of Jordan was her seven seasons of research at Beidha (Kirkbride 1960b; 1966a; 1966b; 1967; 1968a; 1968b), firmly establishing an analog to the eighth millennium partner site of Jericho. The length of the occupations at the site and the changes in architecture – including several ritual buildings – became a focus of attention even after Kirkbride’s last season there (1984) (cf. Rollefson 2005; Makarewicz and Finlayson 2018). Kirkbride was also drawn to the site of Risqeh, south of Wadi Rum and only three km north of the Saudi border (Kirkbride 1969a, b). The site yielded a wealth of carved sandstone figures; more than forty are visible in one of the illustrations (Kirkbride 1969b: 191). They ranged in size from over a meter tall to as little as approximately 20 cm (Kirkbride 1969a: 121). Charcoal

recovered in the excavated trench through the site yielded a date of 6010 ± 120 BP, about at the edge of the Chalcolithic/Early Bronze age transition, although the figures were found beneath the surface (Kirkbride 1969b: Footnote 4); some disagreement about the age of the artifacts continues.

New Generations

The initial pace of survey and excavation was slow and sporadic until the mid-1950s, when projects became more intensive and sustained. Now, after a century that has witnessed a growing surge of Jordanian and international teams of archaeologists in the field and in the laboratory, the prehistory of Jordan has emerged as a dense culture history ripe for increased investigations with improved and new technologies and interpretive capabilities: the science of prehistoric archaeology has enriched our understanding of not only what happened, but also how and why. The following examples are just a small sample of how the analysis and interpretation of archaeological phenomena have improved over the past century.

The Black Desert Survey by Alison Betts began in 1979, investigating the basalt fields in eastern Jordan, and the field work continued to the early 1990s (Betts 1998; 2013). The wealth of sites in her survey area – mostly Neolithic, but also some Chalcolithic and Early Bronze Age – ranged from small ephemeral hunting camps to seasonal residences as well as large traps for driving herds of gazelle for annual slaughter (“kites”) and curious circular enclosures (usually subdivided into a number of “wedges” with low interior walls) she called “jellyfish,” but today are called “wheels”. Her excavation at Dhuweila, a seasonal hunting camp, finally established the period when kites were first built, since a wall of the LPPNB hut was stratigraphically on top of a wall guiding a kite, proving the kite was built sometime near the end of the eighth millennium (Betts 1998). Additional late eighth millennium evidence in the form of numerous radiocarbon dates has since confirmed the age Betts had determined (Abu-Azizeh et al. 2021; al-Khasawneh et al. 2018). Betts was also able to document Neolithic rock art in the Black Desert with many gazelles pecked onto basalt boulders as well as four men in headdresses and weapons (Betts 1987a: Figs. 2-12 and Plates 1-9; also see Betts and Helms 1986).

The survey of the Wadi al-Hasa by MacDonald (1988) was very important for identifying sites throughout the gamut of prehistoric time. The Middle Paleolithic (ca. 250,000-45,000 years ago) was particularly rich (e.g., Clark et al. 1987) as was the Upper Paleolithic (Coinman 2000), and Epipaleolithic (al-Nahar and Olszewski 2015; 2016; al-Nahar et al. 2009; Neeley et al. 2000).

Epipaleolithic archaeology has been active in the past 35 years. Excavations by Muheisen at Kharaneh IV in 1983 and 1984 produced a stratigraphic context for succeeding phases of Early Epipaleolithic occupations (Muheisen 1985; 1988 a, b) and analysis of the artifacts (Muheisen and Wada 1995). A new campaign of excavations at Kharaneh IV began in 2008 (Maher et al. 2012), and the excavations have continued since then (e.g. Maher 2019; Maher et al. 2021) producing details of semi-permanent occupation at the site and paleoecological and paleoclimatic data in abundance (Ramsey et al. 2018). Because of “the wetland, the inhabitants at Kharaneh IV were able to aggregate in large groups and settle for longer than ever before in one place, facilitating the development of a rich social and material existence” (Ramsey et al. 2016: 3). Analysis of gazelle dental cementum shows that Kharaneh was occupied for more than one season, and perhaps even permanently (Jones 2012: 200).

The Early Epipaleolithic site of Ayn Qasiya in South Azraq revealed a unique burial practice (Richter et al. 2010), and the Late Epipaleolithic (Natufian) site of Shubayqa 6 in the Black Desert yielded evidence of bread baking 12,000 BC, thousands of years earlier than the domestication of cereals (Arranz-Otaegui et al. 2018). Shubayqa 6 also produced extensive evidence on paleoclimate and faunal exploitation (Yeomans and Richter 2020; Yeomans et al. 2017) for the Natufian and PPNA occupations.

There are several small Natufian sites scattered around Jordan (e.g., Betts 1982; Betts 1987b; Bocquentin and Garrard 2016; Byrd 1989; Henry et al. 1985; Kuijt 2004; Gebel and Muheisen 1985; Muheisen et al. 1988; Henry et al. 1985; Richter et al. 2016; Richter et al. 2019). One of the richest Natufian sites is Wadi Hammeh 27 (Edwards 2013a). The size of the site is not determinable due to erosion, but two large structures were excavated (one was 11 m in diameter, the other 14 x 12 m, the latter with an interior curved wall ca. 5.5 m long; cf. Fig. 4-1). The tortoise shell motif carved into three stones of the exterior of a wall is iconic for the site (Edwards 2013b: 83, Fig. 4.25). Interesting clusters of in situ artifact clusters included two basalt mortars, two handstones and a pestle (Edwards 2013c: 113-114, Fig. 5.26); two basalt mortars and four pestles (Edwards 2013c: 108, Fig. 5.18); and a sickle with two slots carved side-by-side in a caprine horn core into which lunates had been inserted (Edwards 2013c: 109, Fig. 5.21). The site also yielded a rich inventory of small finds, including numerous dentalium shells and other sorts of ornaments and figurines (Edwards et al. 2019).

The Neolithic Archaeology Revolution

Probably no period of prehistory in Jordan has seen as much increased intensity in the excavation of sites as the Neolithic period. The earliest phase is the Pre-Pottery Neolithic A (PPNA), lasting from 9750–8600 cal BC, followed by the Early Pre-Pottery Neolithic B (EPPNB) from 8600-8300 cal BC. The Middle Pre-Pottery Neolithic B (MPPNB) ranges from 8300-7,500 cal BC, then the Late PPNB at 7,500-6900, and the PPNC from 6900-6500. Finally, the Pottery Neolithic (or the Late Neolithic [LN]) from 6,500–5,000 BC.

The PPNA

There are four major PPNA sites that have outlined the character of this period, which witnesses the transition from a hunter-gatherer lifestyle to the onset of agriculture.

Dhra', located near the top of an alluvial fan at the mouth of the Wadi adh-Dhra' that empties into the central Dead Sea, was excavated for several seasons over a ten-year period (Kuijt and Mahasneh 1998; Finlayson et al. 2003; Kuijt and Finlayson 2009). The settlement is small (but has suffered severe erosion), but several buildings remained available for excavation, including houses/processing structures. Four other buildings (granaries) revealed clear evidence on how productive cereal agriculture was. The circular granaries were approximately 3 m in diameter. Inside the walls notched stones were placed on end to hold two rows of wooden beams to raise the floor 35-50 cm above the floor, elevating the material to be stored from potential decay due to moisture in the soil (Kuijt and Finlayson 2009).

Zahrat adh-Dhra' is situated about 1.5 km downslope (west) of Dhra'. Although the terrace on which the settlement was founded has been severely eroded, several structures remained; four were selected for excavation (Edwards and House 2007). Only a small part

of Structure 1 was opened, and little can be said of it. Structure 2 was the largest of the four, measuring around 8 x 8 m; the walls were curvilinear but very irregular, almost bag-like. There was an opening of about 4 m in the northeast corner, and a deep hearth rectangular in shape and measuring roughly 1.0 x 0.5 m was situated near the western wall. Structure 3 was only partially excavated, but Structure 4 was complete; It was semicircular in form, with a long curved wall with an arc length of 7 m and a radius of 4 m. Subsistence was based on some barley, but also a good deal of undomesticated grasses; hunting was the main source of food, with gazelle dominating; caprines were also present but to only about one-sixth the importance of gazelle, and *Sus* about one-tenth the figure for gazelle.

Wadi Faynan 16 (WF16) is located on a hill on the south bank of Wadi Faynan. More than 70 structures were found over an area of about 600 m², all but one elliptical and semi-subterranean ranging in floor area to 25 m² or less, and most with interior features, including upright notched stones indicating an elevated floor similar to Dhra' (Finlayson et al. 2011: 8184). Building O75 is enormous in comparison at more than 250 m² for the floor area, generally resembling a circular theater with broad stepped benches facing a stage at the eastern edge of the building (Finlayson et al. 2011: 8184). It is not known if any of the smaller buildings were "houses", but some seem to have been working sites for manufacturing objects or for storage of materials, including food. The huge O75 structure is clearly a communal building for public meetings (Mithen et al. 2011: 360-362 and Figs 3-4).

El-Hemmeh is a multi-phase settlement on the north bank of the Wadi al-Hasa (Makarewicz et al. 2006). One excavated section of the site produced PPNA architecture and odd burial practices. Ten excavated buildings were circular and 3-5 m in diameter; floors were resurfaced many times, and structures often had interior features (Makarewicz and Rose 2011). Structure 6 had several burials under strange circumstances: Three nearly adjacent features (F13-F15) had been excavated into the floor, and a pit dug into through a clay platform in Feature 13 contained a juvenile skull. Feature 14 was a stone cist 80 cm in diameter and ca. 70 cm deep; it contained a bench made of fine-grained basalt on which a young adult was seated upright, whose legs and much of the arms were covered with lime or gypsum plaster; the entire cist was covered by three basalt slabs about a meter long along with fragments of basalt. In Feature 15 a child was placed in a rectangular cist with walls of thin upright slabs. The child was also in a sitting position, with much of the body beneath the neck covered with lime or gypsum plaster. Structure 10 was also unusual in the sense that three complete infants were evidently placed in an abandoned structure and covered by collapsing the walls over them (Makarewicz and Rose 2011: 26-28 and Figs. 5-6).

The PPNB

The Early Pre-Pottery Neolithic B (EPPNB, 8,600-8,200 cal BC)

Near the end of the tenth millennium B.C., a new technology began to influence how blades were formed for use as arrowheads and other tools. Naviform ("boat-shaped") cores had striking platforms at opposite ends of long, thin cores from which mass-produced long and very standardized blades were struck off, likely by specialists (Quintero and Wilke 1995). Accompanying this technological change were large arrowhead types that gradually replaced the diminutive al-Khiam points of the PPNA with more elaborately made Helwan points and, eventually, tanged Byblos points. Architecture also changed from curvilinear buildings to rectangular shapes with rounded corners. This "EPPNB package" first arose in northern Syria, but after several centuries it had made its way to the southern Levant.

Based on the presence of Helwan and al-Khiam points as well as the use of naviform blade technology, EPPNB sites were located at Wadi Jilat 7 (Garrard et al. 1994:74) and at Abu Hudhud in the Wadi al-Hasa (Rollefson 1996). Unfortunately, there were no C14 dates to substantiate the EPPNB assertions for those sites. Jilat 7 had circular architecture, possibly because it was more of a camp than a permanent settlement. Abu Hudhud was so badly eroded into the wadi that no architectural patterning could be detected.

Harrat Juhayra site 202 (Fujii et al. 2019) produced early to middle tenth millennium radiocarbon dates as well as a rich assemblage of al-Khiam and Helwan points in addition to naviform blade cores; architecture was circular. Karin Bartl's excavations at Mushash 163, east of Sahab, recovered radiocarbon samples ranging between 9800-8600 BC and also recovered abundant naviform cores, al-Khiam, Helwan, and Aswad points, but also points that later became more typical of the MPPNB (Bartl 2018: 27, 32-32 Bartl and Rokitta-Crumnow 2017); the architecture at Mushash 163 was also curvilinear (Bartl 2017). On the western side of the Jordan Valley, EPPNB architecture was a hybrid of earlier and later wall configuration: straight walls but curved corners (Gopher 1977; Khalaily et al. 2007).

The Middle PPNB (8,300-7,500 cal BC)

Middle and LPPNB sites are numerous in Jordan, but only a few have been excavated. At the end of the ninth and the first half of the eighth millennium, MPPNB sites were small to medium size (ca. two to four or five hectares), but there was also the first indication of regionally distinct traditions across the land (cf. Rollefson 1989a: 169, Tableau 1; 1989b). Architecture was rectilinear and served individual family households. In view of the impressive ritual practices in the central Levant, including Syria from the Damascus area south to 'Ain Ghazal and west to Israel, this phase of the Aceramic Neolithic might be considered the "Classic PPNB". The classic nature involves burial practices, a skull cult, and memorials to ancestors. Two examples of this classic period are 'Ain Ghazal (Rollefson and Kafafi 2013) and Tell Abu Suwwan (al Nahar 2010; 2013; 2018).

In the northern part of Jordan at 'Ain Ghazal, burials were placed beneath house floors; apparently one burial was celebrated each generation in each household (Rollefson 1998: 56). The honored person in this ritual could be male or female (Bonogofsky 2002). After six months or more during which the soft tissues decayed (Croucher 2018: 6), the burial was re-opened in order to retrieve the skull, which then was cleaned of remaining tissue preparatory to recreate the facial characteristics by modeling the features with lime plaster (Bonogofsky 2001). Modelling also included different treatments, including the application of red or black pigments and often the addition of specific details of the eyes of the new "face". At least eight plastered skulls were retrieved from 'Ain Ghazal, although six other skulls did not show such decorations. The physical condition of the undecorated skulls suggests that the plaster may have fallen away or even was intentionally removed (Croucher 2018: 6). Currently it is understood that 'Ain Ghazal produced 14 plastered skulls (Schmandt-Besserat 2013: 223).

Two plastered skulls were also recovered at Tell Abu Suwwan (al Nahar, personal communication). As was the case for all of the plastered skulls throughout the region, at Abu Suwwan there was a distinctive treatment of rendering the eyes by placing small pieces of obsidian on the eyes to represent the pupils. This contrasts with 'Ain Ghazal, for

example, where the pupils were represented by bitumen, and bitumen was also used to create an “eyeliner” around the eyes (Rollefson 1983b: 35). At Jericho, shells represented the pupils of eyes (Schmandt-Besserat 2013: 224).

In southern Jordan (divided from the north by the Wadi al-Hasa) MPPNB architecture was based on curvilinear floor plans, as at Beidha and Shkārat Msaied (Kinzel 2013; 2019; Kinzel et al. 2017). It was not until the very end of the MPPNB or the onset of the LPPNB that rectilinear architecture appeared in the Jafr Basin (Fujii 2013), nor would rectilinear structures characterize the south until the LPPNB was established.

The MPPNB is best represented at two sites in the south: Beidha and Shkārat Msaied, both in the Petra region. Both were relatively small settlements of around one hectare each. Architecture was circular and subterranean and for the most part consisted of domestic single household buildings. Beidha had at least one large building (B 37, 10-11 m diameter) that had been only excavated partially by Kirkbride, but when fully exposed its size (c. 32.6 m²) indicated it was probably used for communal purposes (Byrd 2005; Makarewicz and Finlayson 2018). Kirkbride had also excavated three small buildings outside the settlement proper, and their isolation indicated that they may have been dedicated as ritual centers or “temples” (Kirkbride 1968b; Rollefson 2005). Burials were subfloor, but only ten adults missing their skulls were found (Kirkbride 1967: 9), suggesting a local version of the skull cult seen at ‘Ain Ghazal and Tell Abu Suwwan. One isolated skull was found as well, but there was no evidence of plaster on the skull. In general, burial practices are similar to the northern MPPNB region of Jordan in the sense that there are so few adults that there must have been an “undiscovered cemetery” outside the settlement (Kirkbride 1967: 9).

The more than 15 Shkārat Msaied buildings were circular and semi-subterranean of a size similar to those of Beidha: 5-6 m in diameter (Kinzel 2013; Byrd 2005), and, like Beidha some of the buildings are “special” in their character. Building F, for example, produced 32 burials, including two infants and three subadults, as well as finely crafted artifacts (Kinzel 2019: 82-83; Kinzel et al. 2016: 14). Buildings H, J, U and K all have a staircase (as many as six steps or more) leading down into the interior (Kinzel 2019: 85).

The Late PPNB 7,500-6,900 cal BC

A sudden, short, and very deep drought that lasted only about two to three generations (c. 7460-7400 cal BC) appears to have had a severe impact on residents of the Jordan Valley and Israel (Fig. 1), for every MPPNB settlement in those regions was abandoned. Kenyon (1979) remarked that Jericho, for example, would not be occupied again for a thousand years after the MPPNB collapse (cf. Rollefson 1989b: 136-137). The LPPNB became, then, confined to Jordan in the southern Levant.

The translocation of the MPPNB populations in the west to the highlands of Jordan led to the LPPNB “megashite” era of Jordan’s prehistory, lasting from c. 7,500 to 7000/6900 cal BC. Megashites are defined as settlements of eight or more hectares in area, and eleven megashites are known: ‘Ain Ghazal (e.g. Rollefson and Kafafi 2013; Rollefson and Simmons 1986), Wadi Shu‘eib (Simmons et al. 1988), Tell Abu Suwwan (al Nahar 2010), Kharaysin (Ibañez et al. 2015), eh-Sayyeh (Bartl and Kafafi 2015; 2016), Basta (Nissen et al. 2004; Gebel, Nissen and Zaid 2006), Ba’ja (Gebel and Bienert 1997), ‘Ain Jammam (Fino 1997), and Khirbet Hammam (Peterson 2004), al-Basīt (‘Amr 1997), and as-Sifiya (Mahasneh 1997). The first five sites were simply large expansions of earlier PPN settlements in northern Jordan, but the last six were newly founded towns that bore little resemblance to MPPNB sites in southern Jordan. It should be noted that Ba’ja, although

the smallest of the LPPNB settlements, yielded a stunning burial that reflected a well-developed social hierarchy (Gebel et al. 2020).

The size of the populations in these LPPNB centers had important consequences in several ways for the residents. The number of inhabitants in the larger megasites reached as much as 3,000-4,000 people (Rollefson and Köhler-Rollefson 1989; Gebel personal communication), and the strains social organization, ritual, and communal interaction is clearly evident. The skull cult, for example, ended abruptly, as did the production of monumental statuary. The MPPNB arrangement of independent households was replaced (at least to a great extent) by two-story architecture that appear to be extended family residential and production/consumption units. The practice of subfloor burials associated with ties to ancestral veneration ended, although there were small apsidal buildings near multi-family households that may have served to maintain some elements of ancestral association, but the emergence of large communal architecture such as the cult buildings ("temples") at 'Ain Ghazal (Rollefson 1998) and the huge platform at Tell Abu Suwwan (alNahar 2010) served to unite the community's otherwise competing kinship factions, and a new focus on standing stones also served to concentrate attention on ritual aspects of the community (Kafafi 2013).

Ironically, the probable ultimate cause of the collapse of MPPNB settlements in the Jordan Valley and Israel probably was the catalyst for the collapse of LPPNB megasites: turbulence in rainfall amounts between 7080-6980 cal BC appear to be associated with the collapse of the LPPNB (Fig. 1).

The PPNC/Final LPPNB (6,900-6,400 cal BC)

The persistent demand for farmland and pasturage under drought conditions undoubtedly led to serious abuse of landscape resources. The great exodus of the mid-eighth millennium into the Jordanian highlands was reversed at the beginning of the seventh (Rollefson 2020). All of the megasites south of the Wadi al-Hasa were totally abandoned, and the megasites from 'Ain Ghazal and farther north contracted in size and population by up to 90 percent. The extensive and at times flamboyant architecture of the LPPNB megasites was replaced by smaller and simpler buildings (some with dirt floors), and the use of lime plaster disappeared. At 'Ain Ghazal deserted LPPNB structures were modified for re-use, but on scales much less extensive in size (Rollefson and Köhler-Rollefson 1993).

PPNC presence has been identified at a number of northern settlements, including 'Ain Ghazal, Tell Abu Suwwan, Wadi Shu'eib, and as-Sayyeh, but not in the south, and superficially, at least, southern Jordan does not have PPNC settlements of any importance. Over the half-millennium of the PPNC period conditions began to improve and population slowly increased again. Two areas that became more intensively exploited were the steppe and desert areas to the east of the highlands, as shown by the small sites of farming and herding groups in the Wadi Jilat (Garrard et al. 1994) and at Wisad Pools by hunter-pastoralists (Wasse et al. 2018).

The Pottery Neolithic (c. 6,400-5,000 cal BC)

Pottery appeared throughout the southern Levant almost simultaneously, but even from the beginning there were two geographically distinctive traditions that gradually evolved

through the last half of the seventh millennium and the first half of the sixth (the early Ceramic Neolithic) to become a generally similar tradition across the southern Levant during the last half of the sixth millennium (the Late Ceramic Neolithic).

In the earlier period, one tradition has several different names: PNA, Jericho IX, and Lodian, found all along the Jordan Valley and across all of Israel. The second tradition is the Yarmoukian (also known as the PNB in some publications), the principal tradition throughout Jordan and into the Jordan Valley as well (cf. Kafafi 1987; 1993) characterized by the distinctive “banded herringbone” decoration. The two traditions reflect a degree of territoriality, although this was not a strict separation (Kafafi 1992: 116), for Jericho IX sherds were found at the Jordanian sites of Wadi Shu‘eib (Simmons et al. 2001), Khirbet edh-Dharih (Bossut et al. 1988), and Dhra‘ (Bennett 1980).

The later Ceramic Neolithic period comprises the Wadi Rabah pottery tradition found across Jordan (Kafafi 1987) at ‘Ain Rahub (Muheisen et al. 1988), Ghрубba (Mellaart 1956), Tell ash-Shuna North (Gustavson-Gaube 1986), Abu Hamid (Dollfus 1993; Dollfus and Kafafi 1988), Ghassul (e.g. Hennessy 1969) and Sahab (Ibrahim 2016).

Yarmoukian sites are numerous in Jordan, including Tell Abu Thawwab (Kafafi 2001), ‘Ain Ghazal (Kafafi 1990), ‘Ain Rahub (Muheisen et al. 1988), Wadi Shu‘eib (Simmons et al. 2001), Tell Abu Suwwan (al Nahar and Kafafi 2015), and al-Shalaf (Bienert and Vieweger 1999; 2000). Kafafi has suggested that the pottery from Tell Wadi Faynan (Najjar et al. 1990) is also Yarmoukian based on its date (Kafafi 1993: 106), but the dates at the site are from the second half of the sixth century BC, so the material might better be assigned to the Wadi Rabah tradition.

One phenomenon contemporaneous with Yarmoukian pottery is the special activity sites called “burin sites”. They are usually found in steppe or desert areas, and the stone tool inventories are generally heavily dominated by burins, especially burins on concave truncations as at Kharaneh 15 (Muheisen and Rollefson 1985) and Umm Meshrat I and II (Cropper 2011), reaching levels of 88% or more.

Yarmoukian settlements tended to be relatively large (perhaps 6-7 hectares at both ‘Ain Ghazal and Wadi Shu‘eib and perhaps 1.5 hectares at al-Shalaf), but populations were not very large in view of the distances between houses at the sites. By the last half of the sixth millennium, sites with Wadi Rabah pottery appeared on the eastern edge of the Jordan Valley and along the streams leading from the highlands to the valley. One common feature of these occupations was their small size, reflecting not villages or hamlets, but rural farmsteads with only a few families at most. The Wadi Ziqlab is a small stream in northern Jordan with a number of settlements fitting this category, including Tabaqat al-Bûma and Basatin (Banning et al. 1992; 1996; 2005), whose lithics and pottery changed gradually towards Chalcolithic status (Banning 2011: 57-58) as shown at the site of WZ 121 (Banning et al. 1998).

The Chalcolithic Period in Jordan (5,000-3,750 cal BC)

The excavations at Tuleilat Ghassul resumed in the 1990s (Bourke et al. 1995; 2000; 2007). In addition to expanding the database concerning chronology, architecture, subsistence economy, and environmental information, two new spectacular sanctuaries and their courtyards were exposed that reflected the arrangement of ritual behavior in the later occupational phases of the site.

The Chalcolithic and Early Bronze Age site of Sāl, above the Wadi Shellaleh near Irbid, is estimated to be 36 hectares in size. Although badly disturbed by construction and

agriculture in much of the site, excavations sampling intact areas revealed walls of houses and courtyards as well as large samples of lithics and pottery (Kafafi and Vieweger 2000).

Abu Hamid is a large (6.6 hectares) Chalcolithic settlement in the central Jordan Valley excavated in the mid-1980s and 1990s (Dollfus and Kafafi 1993). The lowest level of the site was a dense occupation affiliated with the Wadi Rabah tradition that developed slowly into the Chalcolithic period (Lovell et al. 2007). The site was sampled by 1,200 m² of excavation that exposed houses of sizes of about 4 x 6 m spaced relatively far apart, in part separated by what might be a street, suggesting that the large site did not have a particularly large population. The ceramic storage jars are impressive in their size; a hollow ceramic figurine of a bovid, though incomplete, is remarkable for its size (Dollfus and Kafafi 1988: Fig. 25). Some insight into ritual behavior is afforded by smaller ceramic animal figurines as well as stone figurines of stylized humans.

Hujayrat al-Ghuzlan, near Aqaba, is a site about one hectare in size surrounded by a "town wall" (Khalil and Eichmann 2006: 143) and a "street" (Khalil and Schmidt 2011: Fig. 6), of which 2,200 m² were sampled. Buildings were made of stone and mudbricks, all covered with mud plaster decorated in places with finger-impressed figures of gazelle (Khalil and Eichmann 2003: Figure 6). Buildings shared walls and comprised large rectangular rooms and small square cells, some with windows and doors (Khalil and Eichmann 2003: Figs. 3 and 4). Copper smelting was a major activity that produced ingots of copper as well as several copper axes/adzes rods, and pins (Khalil 2013).

Qulban Beni Murra (QBM) is a large burial ground with megalithic tombs incorporating long ashlar standing on end and a hydraulic system based on nine wells and associated water channels in the southeastern Jordan desert (Gebel 2012); the complex is associated with a concentration of pastoral camp sites with animal enclosures. Organic material included in a well lining gave a calibrated 14C age of 4459-4346 cal. BC (2 σ range). Two samples of the same hardened sediment were taken to apply OSL dating of the quartz fraction, with an average age derived from quartz of the two samples is 4,600 \pm 200 BC and 4,770 \pm 270 BC, closely reflecting the radiocarbon tests (al-Khasawneh et al. 2016: 129 and Table 2).

The megalithic grave burial grounds of Qulban Beni Murra are on the shallow banks of Wadi as-Sahab al-Abyad for about 1.5 km. The well structures extend over at least one square kilometer, not including the burial areas. One of the wells measuring 1.2 m in diameter was excavated to a depth of 4.4 m, but the bottom was not reached. If the other eight wells are as deep, this must have been a vital desert oasis, and the archaeology demonstrates that the origins of the Arabian oasis cultures were already in existence around the mid-fourth millennium BC, if not earlier.

Jordan's Black Desert Research

The fascinating research by Svend Helms and Alison Betts in the basalt landscapes of the Black Desert in Jordan's panhandle, the advent of wide-spread aerial photography in the region (Kennedy 2011), and the broad coverage of the desert provided by Google Earth (cf. Kempe and Malabeh 2010) encouraged a survey to investigate the possibility of finding links between the subsistence economy of such LPPNB sites as 'Ain Ghazal with the eventual emergence of analogous Neolithic developments in Saudi Arabia (Wasse and Rollefson 2005). Subsequent surveys and excavations among the basalt-capped mesas in

the Wadi al-Qattafi 60 km east of Azraq at the western boundary of the Black Desert (Rollefson et al. 2014; Rollefson et al. 2017) and at Wisad Pools, 60 km farther east at the eastern edge of the Black Desert (Wasse et al. 2018), all of this research taking place between 2008 and 2022. The region also saw intensive research in the same region (e.g. Richter et al. 2016; Akkermans and Brüning 2020; Akkermans et al. 2014; Smith 2020) that covered differing portions of the chronological spectrum of the archaeology in the area.

Concluding Remarks

In a synthesis of Jordan prehistory that appeared in 1998, Henry published a small graph that depicted the growth of publications in five-year intervals from 1924 until 1986 (Henry 1998: Fig. 1), which grew from one publication in 1930 to 118 in 1980-1986 (this particular range amounted to an average of 17 articles per year). This was astonishing to prehistorians working in Jordan at the time, but that accomplishment would pale to insignificance compared to what the *monthly* publication numbers are currently. Jordan's prehistoric heritage has enthused generations of prehistorians, and they continue in rising numbers of Ph.D. degrees annually. Because of the annual avalanche of new articles, books and dissertations, one is entirely dependent these days on databases such as Google Scholar, ResearchGate, Academia.org, and the publication databases of the Department of Antiquities of Jordan (ADAJ and SHAJ). The excitement of research in Jordan is overwhelming.

An Overview of Approaches and Methods Applied at Bronze and Iron Age Sites (1921-2021) (By Katharina Schmidt)

Introduction

This article highlights trends in Jordanian archaeological research concerning the Bronze and the Iron Ages. The emphasis is on projects of foreign missions that lasted for more than a single season, with references to the final and most relevant publications. However, only a monograph could cover the high number of field research projects adequately, and therefore this article concentrates on selected examples. Besides, the sites with Bronze and Iron Age strata are almost exclusively multi-period, so that often methods and approaches discussed for other periods are valid here as well.

The First Major Research Missions

In the 1920s, ceramic typologies were developed as a method of dating. William F. Albright was one of the first archaeologists to date sites through his approach of pottery sequencing. He traveled to Jordan in the early 1920s with a special interest in Bronze Age sites (Albright 1926; 1929).

Nelson Glueck, a student of Albright, continued his teacher's method of pottery identification, and drafted the first pottery typologies for Jordan, specifically relating to the Bronze and Iron Ages (Glueck 1951, 1970). His work was particularly important with regard to the location of Iron Age sites in Edom (Glueck 1935), but also in Moab and Ammon (Glueck 1939). His work on both pottery and site identification forms the basis of archaeological research in Jordan and often has remained the only surviving witness of some sites (van der Steen 2017: 221).

Systematization of Archaeological Works: The Establishment of the Department of Antiquities

With the post-World War I period, the British Mandate in Jordan set in and the Department of Antiquities in Amman was founded to organize archaeological research; its first director was George Horsfield (1928–36). Foreign research efforts could now be better coordinated on the ground (van der Steen 2019: 157; Yassine 2001: 27; Geraty and Willis 1986: 5–6).

After the establishment of the Hashemite Kingdom of Jordan in 1946, G. Lancaster Harding continued to serve as director of the Antiquities Service; he had been in charge from 1936. Harding recorded a number of Ammonite stone statues that had come to light during private construction work starting in the late 1940s. In 1949 four Ammonite statues were discovered north of the Citadel (Barnett 1951: 34), another Ammonite torso was found four years later in the same area (Abou Assaf 1980: 19). These finds were only the beginning of a long series of discoveries caused by the increasing construction activities, especially in the greater Amman area. Furthermore, Harding documented tombs at Sahab, Meqabelein, Jebel Jofeh, Madaba, and on the Citadel of Amman as important testimonies for Iron Age Ammon (Harding 1945, 1948, 1953). The discovery of the Balu'a stele in 1930 intensified the interest of archaeologists in the highlands of Moab (Routledge and Routledge 2009).

Pioneer Excavations: Groundwork for Archaeological Research

Starting in the 1950s excavations increased all over Jordan. At that time, missions were still carried out by various foreign institutions located in Jerusalem. Stratigraphy and ceramic typologies for the Bronze and Iron Ages were established with the excavations of large tells. In this regard, the stratigraphic method of Kathleen Kenyon, developed since the late 1950s at Tall es-Sultan, was a milestone in archaeological research. Many of the excavation missions begun in the 1950s and 1960s were later continued and expanded into multidisciplinary excavations (see section below).

The Moabite site of Dhiban, where the Mesha Stele was found in 1868, had already been surveyed by Duncan Mackenzie in the early 20th century (Mackenzie 1913); from 1950 to 1953, major excavations were conducted under the direction of Fred Winnett, William Reed, and Douglas Tushingham, which, among other things, exposed the massive Iron Age fortification (Winnett and Reed 1964; Tushingham 1972). The 1955, 1956, and 1965 campaigns were conducted by William Morton (Morton 1989); in the late 1990s, a survey project was directed by Chang-ho Ji (Ji and Lee 2000).

The exploration of Edom had already begun with Albright and Glueck, but Crystal Bennett's excavations initiated a shift: Non-biblical narratives guided her research questions but she developed an understanding of the pottery and architectural styles. She began excavations in 1958 in Umm el-Biyara, later in Buseirah and Tawilan. The final publications were post-mortem provided by Piotr Bienkowski, who had worked on these excavations with Bennett (Bennett and Bienkowski 1995; Bienkowski 2002; Bienkowski 2011); these monographs form the foundation of research in southern Jordan (Crowell 2021: 19–23).

Paul Lapp excavated in Tall ar-Rumeith in 1962 and 1967, and finished just one month before the Six-Day War (Barako and Lapp 2015). James Pritchard's excavations of the

main tell of Tall es-Sa'idiyah started in 1964 and also continued until the war in 1967 (Pritchard 1985; Lapp 2007: 16). E. Olávarri worked on the Moabite site of Ara'ir from 1964–66 (Olávarri 1965). After the war of 1967, archaeological schools based in Jerusalem, now also opened institutes in Jordan: Rudolph Henry Dornemann was the first director of The American Center of Oriental Research (1968-1969) (Lapp 2007: 17; Dornemann 1983) and conducted the first excavations at the Amman Citadel with the focus on Iron Age strata (1968–1969). This research was essential to obtain stratified material from the Iron Age Ammon (Dornemann 1983). A series of excavations have since been carried out at the Amman Citadel, of central importance to the study of Ammon are those in the late 1980s that yielded part of an Iron Age residence on the third terrace and which were directed by Fawzi Zayadine, Mohammad Najjar, and Jean-Baptiste Humbert (Humbert and Zayadine 1992; Zayadine, Humbert and Najjar 1989).

Multidisciplinary Fieldwork

Since the late 1960s, there has been a trend in archaeological research in Jordan to include various disciplines and thus to expand the methods used in field research: This was the start of multidisciplinary research projects. Techniques and methods from the natural sciences such as radiocarbon dating and chemical analyses were applied more regularly. Furthermore, the research questions were broadened, now the focus was no longer on a single site but on the surrounding area of a site with the aim to provide the basis for broad and comprehensive anthropological modeling about the history and culture of an entire region.

The Madaba Plains Project (MPP) is representative of the changing perspective of archaeological research and of the establishment of a multidisciplinary excavation that is certainly characteristic for other missions as well. The excavations at Tall Hesban began in 1966/1967, excavations were carried out in 1968 under Siegfried Horn and Roger Boraas. Larry Geraty led the 1974 and 1976 excavations and after the hiatus from 1984 he was one of leaders for the MPP with Larry Herr, Oystein LaBianca and later Douglas Clark and Randall Younker. So the Tall Hesban project became the “founding arm” (Lapp 2007: 17) of the MPP. The methods employed and matured at Tall Hesban were “the first truly interdisciplinary undertaking in Jordan on a large scale” (King 1983: 193). Besides the careful stratigraphic pottery study by James Sauer (Sauer 1973) the work of specialists in climate, geology, soil hydrology, phytogeography, zoogeography and ethnoarchaeology was an important factor. The systematic use of computers and “open sourcing” research collaboration led to quick and sophisticated results that were also available to other archaeologists. (Geraty 2011: 4–5; King 1983: 193–194). The New Archaeology was introduced by adapting the “archaeological food systems” theory (Dever 1993; LaBianca 2011: 25). In addition to Hesban, “New Archaeology” approaches guided works in Tall al-Umayri (1984–2014) (Herr, LaBianca, Clark, Geraty) (Herr et al. 2020, 2022) and in Tall el-Jalul (starting 1992) (Younker, Constance Gane, Paul Gregor, Paul Ray) (Younker et al. 2001). Thus, the tells and the surrounding area have been placed in a large environmental and historical-cultural framework and bound together by a conceptual framework as a common theoretical construct. The most recent phase of the MPP takes up the important trend of cultural heritage preservation, restoration, presentation and site development (see below).

Both the Tall Madaba Archaeological Project and the Jawa and Mudayna ath-Thamad Project are spin-off projects of the MPP that developed their own questions to test

theoretical approaches. The excavations in Tall Madaba (Timothy Harrison) started as a larger regional research effort, to test theories about the development of centralized institutions and the layout of an early state-ordered society (Harrison et al. 2007: 143–152). In the Tall Jawa and Wadi ath-Thamad Project (Michelle Daviau and Robert Chadwick), the focus was on early Iron Age state formation theory. Tall Jawa was excavated in six seasons (1989, 1991–1995) (Michelle Daviau) (Daviau 2003, 2020; Battenfield et al. 2016). Through pottery studies, the territories of Ammon and Moab could be assigned and discussed (Daviau 1997: 225-227; 2007; MacDonald 1999: 44; Daviau and Dion 2007; for critiques see Steiner 2009: 161). Important excavations at Moabite sites are Khirbat 'Ataruz (Ji 2012, 2018), al-Balu'a (Worschech 1995; Bramlet et al. 2020) where in 2008 a volute capital was found (Tyson and Ninow 2019), Khirbat al-Mudayna al-'Aliya (Routledge 2000b), Khirbat al-Mudaybi' where six volute capitals were found (Mattingly et al. 1999). Lahun was excavated between 1978 and 2000 by Paul Naster (1978-1984) and Denyse Homès-Fredericq (1978–2000); the restoration component of the excavation should be emphasized, as not only was the entire excavation site equipped with trails and signage, but the Belgian Excavation House was transformed into a “Regional Museum” (Homès-Fredericq 1997).

The 1980s and 1990s were also significant for the study of Edom, as data was generated from the numerous surveys and excavations that showed a differentiated picture with regard to the political development and settlement structure during the Iron IIB and C. Theoretical attempts were developed to reconstruct the societies in the Iron Age kingdoms. Bienkowski and Eveline van der Steen developed a “tribal kingdom” model for ancient Edom (Bienkowski and van der Steen 2001), whereas Routledge discussed the “Segmented Society” model, taking the Mesha inscription as basis (Routledge 2000a).

In the Jordan Valley, large tells have been excavated since the late 1950s. Precisely because the excavations at the sites of Pella, Tall Abu al-Kharaz and Tall Deir Alla yielded such far-reaching results for the Bronze and Iron Ages, they were combined into the regional research project SCIEEM 2000 (The Synchronization of Civilizations in the Eastern Mediterranean in the Second Millennium BCE) coordinated by Manfred Bietak (Fischer 2006b). This research cluster illustrates the general need observed in this period for the cooperation between research projects in order to deal with major supra-regional questions. The excavations in Pella had begun in 1958 (Robert Funk and Neil Richardson) and led to a major excavation program in 1967 by Robert Smith (Smith 1973). In 1978 the University of Sydney (B. Hennessy, Antony McNicoll, and Stephen Bourke) became partners and both institutions worked there until 1985, when the Sydney team took over the excavations (McNicoll et al. 1992; Knapp 1993; Bourke 1997). The excavations at Tall Abu al-Kharaz between 1989 and 2001 by Peter Fischer established a settlement sequence and pottery sequence backed by absolute chronological data (Fischer 2006a; 2014). Excavations at Tall Deir Alla started in 1960 under Henry Franken (Franken 1969, 1992), Gerrit van der Kooij and Moawiyah Ibrahim directed the dig since 1979 and Zeidan Kafafi since 1994 (van der Kooij and Ibrahim 1989).

Research questions regarding the Early Bronze Age culture in Jordan, focused on its historical interpretation within the broader scenario of the southern Levant. Since the 1980s, researchers have increasingly incorporated theoretical issues such as the degree of complexity of the society and its social organization (Nigro 2013: 189).

In the 1970s, the Expedition to the Dead Sea Plain (Thomas Schaub, Walter Rast, and later Meredith Chesson) was launched to excavate the cemeteries of Bab adh-Dhra', Fifi, and Khirbat al-Khanazir and the site of Numeira. The interdisciplinary team of archaeologists, geologists, physical anthropologists, faunal and botanical specialists pursued the question of regional settlement patterns, environment, community life and mortuary practices (Chesson and Schaub 2007; Schaub and Chesson 2007). Of great importance is the Early Bronze Age cemetery (EB IA - EB IV) of Bab adh-Dhra' which had previously been investigated by Albright and Père A. Mallon in 1924 (Lapp 2007: 16).

The archaeological expedition to Khirbat Iskander (Suzanne Richard) is a long-term project, carried out from 1981 to present, dedicated to the Early Bronze Age, especially to the urban collapse of the EB IV period (Richard 1987; Richard and Long 2006). It included a survey and in last few decades restoration and preservation became major components (Richard 2017).

The process of urbanization and the character of urban culture in the Early Bronze Age was explored in the Khirbat az-Zayraqun Regional Project (1984-1994) (Siegfried Mittmann and Ibrahim) (Ibrahim 2000; Genz 2002; Douglas 2007). In its framework, a survey was carried out from 1989–1994 by Jens Kamlah (Kamlah 2000); northern Jordan had previously been surveyed by Mittmann (Mittmann 1970). Lorenzo Negro excavated Early Bronze Age Khirbet al-Batrawy in 2005–2012 (Nigro 2006, 2008, 2012, 2013); faunal and palaeobotanical remains were sampled for chemical-physical analyses (C-14 dating, pollen analyses, isotope analysis for metal artifacts, thermoluminescence).

Especially with regard to the development of large Early and Middle Bronze Age sites in the southern Levant, it became clear that the small rural villages played an important role with regard to the economic basis they provided for the large settlements, and therefore projects like the Jordan Valley Village project were initiated (Falconer et al. 2007: 261).

Landscape Archaeology, Surveys and Aerial Archaeology

Since the 1960s Landscape Archaeology has become prominent in archaeological research. A project that deals with Early Bronze Age is “The Ritual Landscape of Murayghat”, conducted by Susanne Kerner since 2014. In its theoretical approach the relationship between rituals and landscape is considered paramount for understanding the site of Muryaghat (Kerner 2019, 2021).

Geoarchaeology has played an important role since the 1980s. For the Early Bronze Age one thinks of recent research in the Eastern Badia where the current research focuses on socio-economic activities and external relations (see the latest contributions in Akkermans 2020). One methodological focus of the studies of Bernd Müller-Neuhoff is the incorporation of sedimentological analysis and hydrological investigation methods (Müller-Neuhoff 2014, 2020). Certainly, the pioneering work of Alison Betts must be mentioned in connection with the study of Eastern Badia and the excavations at Jawa (Helms 1981; Betts and Helms 1991; cf. Rollefson, this publication).

Field surveys are an important part of landscape archaeological investigations. Starting in the 1970s, these became more systematic and more intensive. Regional surveys are now often performed together with excavations and aim to analyze a region or an industry. Surveys have helped enormously to select sites for excavations (e.g. Kennedy 2001; Banning 2017; MacDonald 2007a: 161–167; MacDonald 2007b: 27–35.). Since surveys are fundamentally multi-period, a specification to the Bronze and Iron Ages is neither possible nor relevant; particular reference must be made to the extensive survey work of Burton MacDonald (MacDonald 1988; 2004; 2015; MacDonald et al. 2016).

Aerial archaeology had already formed an important part of archaeological work in Jordan in the 1920s and 1930s, and it was revived in the 1980s by David Kennedy (Kennedy 1997: 77). The work of Kennedy and Robert Bewley since 1997 resulted in the famous book *Jordan from the Air*, which also shows Bronze and Iron Ages sites (Kennedy and Bewley 2004: 79-119).

Archaeological research in the copper mining region around Wadi Feynan is characterised by the fact that all the missions there have a diversity of disciplines integrated into their research. Andreas Hauptmann and Gerd Weisgerber conducted the first intensive modern investigation in the 1980s; they investigated raw material sources, smelting techniques and trade structures (Hauptmann 2007). In the 1990s, Graeme Barker, David Mattingly and D. Gilbertson initiated the Wadi Faynan Project and developed further the methods for recording (Barker et al. 2007). In 1996, Bill Finlayson and Steven Mithen began another survey to locate prehistoric sites and later conducted excavations in WF16 with Mohammad Najjar (2000–2010) (Finlayson et al. 2011). Russell Adams, after his research in metallurgy since 1989, investigated Wadi Fidan 4 and Khirbat Hamra Ifdan, as well as the Iron Age cemetery at Wadi Fidan 40 and Khirbat an-Nuhas together with Tom Levy and Najjar. Levy and Najjar initiated the Edom Lowlands Regional Archaeology Project, which was significant for the emergence of cyberarchaeology through its application of digital technologies (Levy et al. 2014).

Perspectives: Cultural Heritage Conservation at Multi-Period Talls

The development and management of archaeological sites, both for tourism and for the protection of tangible heritage of Jordan, has become a major focus. Numerous field projects have launched major restoration and consolidation projects (see above) with the aim of both preserving the archaeological structures and making the sites accessible and better understood by visitors. Thus, the aspect of cultural preservation is today immensely linked to archaeological research. Many outstanding examples of such projects could be cited here, but only a pilot project carried out on Tall Zar'a in northern Jordan in 2021 will be discussed in more detail. On this multi-period site, layers from the Early Bronze Age to the Ottoman period have been excavated since 2001–2011 by Dieter Vieweger, Jutta Häser, and Frauke Kenkel (Vieweger and Häser 2017; Kenkel and Hoss 2020) and from 2018–2021 by Katharina Schmidt (Schmidt 2022). The now almost 20 years of excavation have left their mark in the form of vertical and often deep trench cuts, which have been exposed to constant erosion and thus have become a danger both for archaeology and for visitors. In a large-scale cultural conservation and social project (GPIA, UNESCO, International Labour Organisation: Schmidt, Frank Andraschko, Dima Melkawi, Giorgia Cesaro) a pilot project was carried out in 2021 to secure the edges of the trenches. These were graded and sloped based on calculations and modelling of the slope angles to counteract erosion in the future (cf. Fig. 1). These interventions are intended to stop the destruction of the site and to keep it open to visitors in the future and may also serve as a case study for other talls facing similar problems due to decades of excavation activity.



Figure 1: Pilot Project for cultural heritage at Tall Zar'a in 2021: above: Workers equipped with safety equipment stepping and grading the steep trench cut of Tall Zar'a Area I. Below: Stepped and sloped trench cuts to counteract erosion in the future.

Archaeological Research into the Hellenistic to Islamic Periods in Jordan by Foreign Researchers (By Robert Schick)

Investigation of the history and archaeology of the last two thousand years in Jordan has mostly been a development since the establishment of the modern-day state of Jordan in 1921. General surveys of sites had been carried out since the 1890s, while excavation projects began in the 1920s and have expanded in number since the 1980s.

The bulk of archaeological research in Jordan has been done by non-Jordanians from Europe, North America and Australia. Virtually no archaeological research has been done by teams from Latin America, Africa, the rest of the Arab world, or Asia. A wider international pool of scholars have contributed to historical studies, including scholars from the Arab World for the Islamic periods and scholars from Turkey for the Ottoman period.

A characteristic feature of archaeological sites from the Hellenistic to Islamic periods is that they commonly have building remains visible above the surface and so archaeologists typically know from surface remains what they are excavating before they start. Such sites with remains visible on the surface are commonly identified in Arabic as a *khirbah* (ruin) as opposed to a *tell* (mound) occupied over millennia.

All major sites with visible surface remains were identified by the 1980s at the latest, although there are still large areas that have not been extensively surveyed for smaller-scale sites. Rock-drawings and rock inscriptions in vast areas in the Eastern Desert have yet to be recorded.

The Hellenistic and later periods are also extensively documented historically, so that many research questions about Jordan's past can be addressed through the analysis of both historical and archaeological evidence.

Archaeological investigation developed more slowly in Jordan compared to Palestine, where excavations had already started by the 1860s in Jerusalem and Jericho.

Before the First World War

Archaeological research in Jordan started with the first explorers in the early 19th century beginning with Ulrich Jasper Seetzen (1854) in 1806-1807 and Johannes Burckhardt (1822) in 1812. Petra was an attraction for explorers from the beginning. The American Dead Sea expedition led by William Francis Lynch (1849, 1852) in 1848 was the first important scientific expedition that was done as a team effort, rather than by individual explorers.

At the end of the 19th century, Rudolf Brünnow and Alfred von Domaszewski (1904-1909) in 1897 and 1898 surveyed Roman sites from southern Syria to Petra and systematically documented the monuments of Petra for the first time. Their survey of Petra was supplemented by the explorations of Gustaf Dalman (1908, 1912) in Petra between 1908 and 1912. Gottlieb Schumacher (1889; 1890) surveyed northwest Jordan in 1886, followed up by Carl Steuernagel (1927) around 'Ajlun between 1896 and 1913. Alois Musil (1907-1908) traveled in the areas of Moab, Edom and the Negev between 1896 and 1902; he was most famous for being the first person to visit Qusayr 'Amra. One of his volumes contains ethnographic observations he had made about the local population during his travels. Another pioneering ethnographic study of the population of Moab was by the Dominican Father Antonin Jaussen (1908).

The Princeton University Archaeological Expedition to Syria in 1904-1905 and 1909 by Howard Crosby Butler (1907-1920) also documented architectural remains in Syria and northern Jordan. So, by the start of the First World War, the major architectural monuments in Jordan had been located, but no excavations had taken place yet.

The First World War

The First World War brought archaeological research to a halt, except for investigations of the Petra city center and the Sinai Peninsula with Jabal Harun by Walter Bachmann, Carl Watzinger and Theodor Wiegand (1921; Wiegand 1920), members of a German "Monument Preservation Command" of the German-Turkish army staff.

The 1920s and 1930s

The two decades between the First and Second World Wars witnessed the start of archaeological excavations in Jordan and the development of analysis of pottery typologies as a dating method.

The modern state of Jordan was established in 1921 and the Jordanian Department of Antiquities was established in 1923, first directed by George Horsfield. Initially, the amount of archaeological work was rather less than the survey and architectural documentation done before the First World War.

The first major archaeological excavation project started in Jerash in 1925, directed by George Horsfield, while the first foreign project to receive a regularized permit from the

Department of Antiquities was Italian excavations on the Amman Citadel from 1927 to 1938 (Parapetti 2008). The Jerash project soon expanded into a joint British and American project in 1928 and continued until 1934, directed by John Crowfoot and C. S. Fischer. The Jerash project focused on the excavation of public monuments, notably the Roman temples of Zeus and Artemis, the south theater, and many Byzantine-period churches with mosaic floors. The excavation methodology entailed non-stratigraphic clearance of the buildings, and the excavators' rudimentary understanding of pottery as a dating tool led them to misdate the abundant remains from the Umayyad period to the Byzantine period. The results of the project were published by Carl Kraeling (1938), the first major excavation report published about an archaeological site in Jordan. The report focused on the architectural remains and included chapters on the mosaics, numerous Greek inscriptions and some coverage of small finds.

The first investigation of a medieval site was by C. N. Johns (1932) at the castle of Qal'at al-Rabad, near 'Ajlun during clearance and conservation in 1927-1929.

Meanwhile the Franciscans from the Studium Biblicum Franciscanum in Jerusalem led by Sylvester Saller and Bellarmino Bagatti excavated the major early Christian basilica at Mount Nebo between 1933 and 1937, along with four churches at the nearby Town of Nebo site of Khirbat el-Mukhayyat. The excavation methodology was rudimentary and consisted of non-stratigraphic clearance. A report about the Mount Nebo excavations (Saller 1941) included chapters on the small finds. A volume about the pottery by Hilary Schneider (1950) was the first major study of pottery from an archaeological site in Jordan. Another volume about Khirbat el-Mukhayyat (Saller and Bagatti 1949) included a list of known early Christian sites in Jordan.

The discoveries at Jerash and Mount Nebo enabled John Crowfoot (1941) to give ample coverage to Jordan in his study of early churches in Palestine.

The first limited excavations in Petra took place in 1929 by George Horsfield and Agnes Conway, soon a married couple (Horsfield and Conway 1930, Horsfield and Horsfield 1938-1941) and in 1937 by Margaret Alice Murray and J. C. Ellis (1940). Those two projects were the first ones in Jordan to be directed by women. Murray (1939) also published a general study of the antiquities in Petra.

The use of aerial photographs for archaeological research in Jordan started in the 1920s (Kennedy and Bewley 2009).

Archaeological research in Jordan saw a major advance when Nelson Glueck (1934, 1935, 1937-1939, 1951) conducted regional surveys in Jordan from 1932 to 1938, finding over one thousand archaeological sites of all periods, most not previously identified. His reliance on the analysis of pottery found at his surveyed sites for dating the periods of occupation at the sites was innovative. He then excavated a Nabatean temple at Khirbat et-Tannur in 1938-1940, the first major excavation of a Nabataean site. His excavation methodology was ground-breaking, by paying attention to stratigraphy, and included collection of samples for post-excavation analysis. The full results of the excavations were published by Judith McKenzie (2013).

Another kind of archaeological survey was undertaken by Reginetta Canova (1954), who as a hobby collected hundreds of early Christian Greek tombstones from sites in the Karak Plateau during the years between 1936 and 1938, when she was in Karak with her husband, Francis Canova, the superintendent of the Italian hospital in Karak. Those tombstones and her descriptions of the sites where they were found provide the bulk of the evidence for a number of otherwise little investigated sites.

The 1940s

The Second World War and the 1948 war with Israel brought archaeological work in Jordan to a virtual halt.

1948 to 1967

During the period between the 1948 war and the June 1967 war, East Jerusalem and the West Bank were incorporated into Jordan. Of special note during that period, James Kelso and Dimitri Baramki (1955) and James Pritchard (1958) excavated Roman-period sites in Jericho in the early 1950s, using rudimentary stratigraphic methods of excavation; the Franciscans carried out excavations in connection with renovations and rebuilding of churches at the Christian holy sites of the Tomb of Lazarus in Bethany (Saller 1957) and Dominus Flevit on the Mount of Olives (Bagatti and Milik 1958), as well as Bethlehem and surroundings (Bagatti 1952; Corbo 1955), while Roland De Vaux (1961) excavated at Qumran from 1951 to 1956, although his results were never fully published. Kathleen Kenyon (Prag 2008) excavated a number of trenches in various areas of the Old City of Jerusalem in the 1960s, using sound stratigraphic methods.

The first issue of the *Annual of the Department of Antiquities of Jordan* was published in 1951 and the Friends of Archaeology society was established in 1962.

G. Lancaster Harding published an overview of the archaeology of Jordan in 1959, with a revised edition in 1967. Frederick Peake (Peake Pasha) (1958) wrote a major study about the tribes of Jordan; his study complements Alois Musil's study from 1908.

Among the handful of major excavation projects was the three seasons of excavations at Dhiban directed by Fred Winnett and William Reed (1964) and A.D. Tushingham (1972) in 1950-1953. The second season in 1951 introduced stratigraphic methods of excavation based on the methods that Kathleen Kenyon had introduced in Jericho (Winnett and Reed 1964: 40). The Dhiban excavations were the first at a tell site with occupation extending over millennia and where the excavators paid careful attention to all periods of occupation. Later seasons at Dhiban directed by W. H. Morton in 1955, 1956 and 1965 were very poorly published.

Petra began to receive sustained archaeological attention, notably when Philip Hammond (1965) excavated the theater stratigraphically in 1961-1962. He (1970) later investigated the Crusader fort of el-Habis.

Paul Lapp also carried out small-scale, stratigraphic excavations at the Hasmonean palace at 'Araq el-Emir in 1961-1962, published by his widow, Nancy Lapp (1983).

The first major recording of Safaitic inscriptions in the Eastern Desert was in 1950-1951 by Fred Winnett (1957), followed by the excavation by G. Lancaster Harding (1953) in 1951 of the Cairn of Hani near H5 in the Eastern Desert, with its hundreds of inscriptions. The next major project in 1958-1959 involved the recording of some four thousand more inscriptions by Winnett and Harding (1978) and by Willard Oxtoby (1968).

In the 1950s and 1960s comprehensive topographic maps of Jordan at scales of 1:25,000 and 1:50,000 were produced, based on aerial photography (see Miller 1991: 17).

In 1963 to 1966 Siegfried Mittmann (1970) surveyed northern Jordan, a region that Nelson Glueck had not covered in his own surveys.

By the mid-1960s, new foreign excavation projects were poised to get underway, but they were brought to a halt by the June 1967 war. The first season of excavations at Umm

Qeis directed by Ute Lux started in 1966, while the first season of excavations at the multi-period site of Pella started in early 1967, directed by Robert Houston Smith. The West Church was excavated stratigraphically, the first for a church in Jordan. The excavation report (Smith 1973) set new standards: the book included a chapter on the environment, and the pottery chapter included lavish color photographs of pottery sections, something that other archaeologists have concluded are not worth the cost of including in their own reports.

1968 to the 1970s

The June 1967 War changed the archaeological scene in Jordan. The Jordanian government no longer administered East Jerusalem and the West Bank. It was no longer possible to use Jerusalem as a base for excavation projects in Jordan. That led to the establishment of the American Center of Oriental Research in Amman in 1968. The French Institute of Archaeology of the Near East followed in 1977, the British Institute at Amman for Archaeology and History in 1978 and the German Protestant Institute for Archaeology of the Holy Land in 1979.

The post-1967 period saw the start of long-term excavation projects that continue to this day. The first major new excavation project started at Tell Hesban in 1968 (see Merling and Geraty 1994); the expanded Madaba Plains Project has continued ever since as the longest lasting project in Jordan. Directed initially by Siegfried Horn (see his *Festschrift* edited by Lawrence Geraty and Larry Herr 1986), the staff members are now into the third generation. The Hesban project proved to be a seminal excavation experience for a generation of American archaeologists in Jordan. One aspect of the Hesban excavations of special importance was James Sauer's (1973) pottery typology spanning all periods of Jordanian archaeology, based on his excavations of a deep trench in Hesban in 1971.

Another new project got under way in 1972 at Umm el-Jimal, directed by Bert De Vries (1998), a project that turned into a life-long commitment for him. The German excavations at Umm Qeis resumed in 1974 (see Weber 2002).

The poor security situation in the Jordan Valley after 1967 meant that excavations at Pella were only able to resume in 1979, first as a joint project with Robert Smith from Wooster College and archaeologists from Australia. The Australian team's involvement has continued ever since (Walmsley 2001). After 1967, Mount Nebo was a military zone, and the Franciscans were only able to resume work there in 1976 (Piccirillo 1982).

J. Maxwell Miller and Jack Pinkerton (Miller 1991) carried out a comprehensive survey of the Karak Plateau in 1978-1982. That project was the first in Jordan to use the emerging technology of a laser electronic distance measurer (EDM) total station in the 1978 season. Robin Brown, a participant in the survey, wrote her MA and PhD theses about the Late Islamic settlement patterns and pottery of the Karak Plateau (1984 and 1992) based on the survey results.

In Petra Philip Hammond (1996) also started excavations of the Temple of the Winged Lions in 1973; his work at the Temple continued into the 1990s. Manfred Lindner started his excavations and surveys of remote and inaccessible sites in the Petra area in 1973; a medical doctor in extraordinarily good physical condition, he continued his work well into his 80s (Zayadine and Farajat 2008).

A Spanish team worked on the Umayyad Palace in the Amman Citadel in the 1970s, demonstrating a widening international involvement in the archaeology of Jordan (Almagro Gorbea 1983; Olávarri-Goicoechea 1985).

The four-volume *Encyclopedia of Archaeological Excavations in the Holy Land* (Avi-Yonah and Stern 1976) was a major reference work. The first edition concentrated on sites west of the Jordan with more limited coverage of sites in Jordan. But the expanded five-volume *New Encyclopedia of Archaeological Excavations in the Holy Land* published in 1993 (Stern, Lewinson and Aviram 1993) gave expanded coverage to Jordan.

Ian Browning published a popular book about Petra (1973) and later another book about Jerash (1982).

The 1980s

The 1980s marked the start of an increased number of archaeological survey and excavation projects. The number of such projects grew to the point that only some can be highlighted here.

Technological advances in the 1980s included the development of personal computers. The IBM PC was launched in 1981 and the Apple Macintosh in 1984. There were early cell phones available in the 1980s, but cell phones only became common in the 1990s and later.

The International Conference on the History and Archaeology of Jordan was first held in 1980. It has been held on a normal schedule of once every three years ever since.

Denise Homès-Fredericq and J. B Hennessy produced a number of *Archaeology of Jordan* volumes in the 1980s providing a comprehensive bibliography, published in 1986 and field reports published in 1989. That project was continued by Denise Homès-Fredericq, J. B Hennessy and C. Saba with a bibliography volume covering 1980 to 2005, published in 2010. That bibliographic effort has not kept up since then and has been superseded by internet resources.

By the 1980s the full range of periods were receiving sustained attention ranging from a major British project on the Amman Citadel by a British team (Northedge 1992) to the ethnoarchaeological study of the traditional houses in the village of 'Aima near Tafilah between 1985 and 1989 by Michèle Biewers (1997).

The early 1980s saw a large international project in Jerash in 1981-1983 (Zayadine 1986) and 1984-1988 (Zayadine 1989). One offshoot of the international project was the continued life-long involvement in the archaeological investigation of Jerash by two of the international project participants, the soon-to-be husband and wife team of Antoni Ostrasz and Ina Kehrberg. Their non-stop work on the hippodrome from 1984 to Ostrasz' death in 1996 was the longest continuous project in Jordan (Ostrasz 2020).

After S. Thomas Parker had conducted a survey of Roman military sites in Jordan in 1978 (Parker 1986), inspired by an article about the Roman province of Arabia by Glen Bowersock (1971), he excavated at the Roman legionary fortress of Lejjun, near Karak from 1980 until 1989 (Parker 1987 and 2006). This was the first major excavation of a Roman military site in Jordan.

Excavations at the Decapolis city of Abila were directed by W. Harold Mare from 1982 until 1990, but were not well published (see Fuller 1987). Excavations at Abila have continued to the present.

A French team from the École Biblique et archéologique française in Jerusalem worked at Khirbet es-Samra in the 1980s and early 1990s, but only one final report volume has been published (Humbert and Desreumaux (1998), focused on the early Christian cemetery and its tombstones.

Konstantinos Politis began excavations at Deir ‘Ain ‘Abata (Lots Cave) on the north site of Ghor al-Safi in 1988. After the excavations there ended in 1996, with conservation efforts up to 2003 (Politis 2012); Politis shifted his attention to the rest of the Ghor al-Safi area (Politis 2020).

Burton MacDonald started methodologically rigorous site surveys in southern Jordan in 1979. First was his survey of Wadi Hasa in 1979-1983 (MacDonald 1988), followed his survey of the Southern Ghors and Northeast ‘Arabah in 1985-1986 (MacDonald 1992). His later survey projects were between Tafila and Busayra from 1999 to 2001 (MacDonald et al. 2004), from Ayl to Ras an-Naqb from 2005-2007 (MacDonald et al. 2012) and finally from Shammakh to Ayl from 2010 to 2012 (MacDonald et al. 2016). (For a summary of his results see MacDonald 2015).

Udo Worschech (1985a; 1985b) surveyed the north Karak plateau starting in 1983 and Geoffrey King surveyed along the east shore of the Dead Sea and the northeast ‘Araba Valley (King et al. 1987). Andrew Petersen surveyed the Ottoman Hajj forts in 1986, with later surveys in 2002 and 2006 (Petersen 2012).

Most excavations in the early decades had focused on monumental public architecture. In Petra the first major excavation to focus on a residential area in the city center was the excavations at ez-Zantur on the south ridge of Petra by a Swiss-Lichtenstein team led by Rolf Stucky from 1988 to 1992. That project was the first to publish meticulously the results in massive volumes that are too heavy to lift (Bignasca et al. 1996, with later volumes in 2000, 2006 and 2010).

Khirbat Faris in the north Karak Plateau was deliberately selected for excavation by Jeremy Johns and Alison McQuitty starting in 1988 because it was an ordinary village site undocumented in historical sources (McQuitty, Parton and Petersen 2020).

Excavations at Islamic Ayla by Donald Whitcomb began in 1986, inadequately published in a series of articles (e.g. Whitcomb 1994). Robin Brown also conducted small-scale projects in Wueira (1987), Shobak (1988) and Kerak (1989). Excavations at Humayma by John Oleson began with a survey of the water-supply system from 1986 to 1989 (Oleson 2010).

By the 1980s excavation projects had all adopted careful methods of stratigraphic excavation and recording. The one exception was Michele Piccirillo, who continued to rapidly clear early Christian church sites non-stratigraphically down to their mosaic floors, evidenced most starkly by the rapid clearance of the Church of St Stephen complex at Umm al-Rasas in 1986 (Piccirillo and Alliata 1994), the first year of many seasons of work by the Franciscans at the site. Only later in the 1990s did the Franciscan projects begin to adopt sound methods of excavation, e.g. at the church in Nitl, near Madaba, excavated between 1996 and 1999 (Hamarneh 2006).

The late 1980s saw the introduction of the concept of Cultural Resource Management in Jordan, first by Joe Greene starting in 1987 and then followed by Gaetano Palumbo, who prepared the JADIS data base of archaeological sites (Palumbo 1994).

The 1990s

Archaeological work continued at a high rate in the 1990s, although the Iraqi invasion of Kuwait in 1990 brought foreign projects to a halt until 1992. Only some of the major projects are highlighted here.

The decade witnessed the revolution in information technology, including the development of the Internet in the early 1990s. The World Wide Web took off in 1994 and first became available to the public in Jordan in 1996.

A major development in the 1990s for archaeology in Jordan was the large-scale involvement of the United States Agency for International Development in support of ACOR projects, starting with the establishment of the Madaba Archaeological Park in 1990 (Bikai and Dailey 1996), which involved a year and a half of excavations in 1992-1993 by Cherie Lenzen and Ghazi Bisheh, and work on the Temple of Hercules Project on the Amman Citadel in 1990-1993 (Kanellopoulos 1994; Koutsoukou et al. 1997). The United States Agency for International Development also funded the excavations of the Petra Church in 1992-1993 (Fiema et al. 2001) and the publication of the *Mosaics of Jordan* book by Michele Piccirillo (1992).

The continued excavation of the Petra Church in late 1993 led to the discovery of a unique cache of papyrus documents from the late sixth century. The full publication of the documents in five volumes was a major Finnish and American effort (Frösén, Arjava and Lehtinen 2002; Arjava, Buchholz and Gagos 2007; Arjava, Buchholz, Gagos and Kamio 2011; Koenen, Kaimio, Kaimio and Daniel; Arjava, Frösén and Kaimio 2018).

The excavation of the Petra Church marked the start of a major expansion of archaeological work in Petra, which included the excavation of the Great Temple at Petra from 1993 to 2008 by Martha Joukowsky (1998, 2007, 2017) and, after initial surveys in 1992, excavation of the Crusader castle of Wueira by an Italian team directed by Guido Vannini; that Italian team later expanded to work at Showbak (Vannini 2007; Vannini and Nucciotti 2009).

As a spin-off of the Finnish involvement with the Petra papyri, a Finnish team excavated the Nabataean to Byzantine remains at Jabal Harun between 1997 and 2005 (Fiema and Frösén 2008; Fiema, Frösén and Holappa 2016; Kouki and Lavento 2013), and as a spin-off of that spin-off, Päivi Meittunen (2021) studied ethnographically local traditions of holy places in southern Jordan.

Another spin-off of the Petra Church project was the North Ridge Project, focused on the Ridge Church and Blue Chapel, directed by Patricia Bikai between 1994 and 2002 (Bikai, Perry and Kanellopoulos 2020).

Another new development of the 1990s was the start of systematic aerial photography in 1997 by David Kennedy and Robert Bewley (2004); their annual flights continue to this day.

John Oleson broadened his excavations of the settlement center in Humayma, starting in 1991 (Oleson and Schick 2013); excavations at Humayma, now directed by Barbara Reeves, continues to this day.

One feature of the mid to late 1990s was the explosion of work on Byzantine period churches. For a number of years around four new churches were being excavated each year, both by foreign and Jordanian projects (Schick 2019).

The 2000s

In the 2000s the number of articles published in the *Annual of the Department of Antiquities* and *Studies in the History and Archaeology of Jordan* continued at such a high level that it is not possible to mention more than a few of the major projects.

The major development of the 2000s was the continued rapid progress of digital technology. Digital photography had begun to be usable in the late 1990s – the Humayma project, for example started using digital cameras in 1996 – and the quality of digital photography became good enough to replace photography using film by the mid-2000s.

The American satellite Global Positioning System first became accessible for the general public when Google Earth was launched in 2004, while smart phones became widespread once the iPhone was released in 2007.

With the development of the internet, a number of on-line data bases were set up. The aerial photographs from the systematic annual flights by David Kennedy and Robert Bewley became fully digitalized in the 2000s and are available on-line at the Aerial Photographic Archive for Archaeology in the Middle East website (www.apaame.org).

A major project in Jerash to excavate a previously unknown congregational mosque from the early Islamic period was started in 2002, led by Alan Walmsley at the University of Copenhagen (Walmsley et al. 2008; Blanke et al. 2010).

As always Petra continued to receive a great deal of attention. Excavations on the North Ridge in Petra were continued by Tom Parker and Megan Perry starting in 2012 (Parker and Perry 2021).

The Italians worked at Showbak in the 2000s (Vannini 2007; Vannini and Nucciotti 2009). That project continues to this day, now directed by Michele Nucciotti and focusing on careful analysis of architectural stratigraphy (Nucciotti and Fragai 2019).

The archaeological study of World War I sites associated with the Great Arab Revolt was conducted between 2005 and 2014 (Saunders 2020).

The 18th Congress of Roman Frontier Studies was held in Jordan in September 2000 (Freeman et al. 2002). David Kennedy (2000, 2004) published a handbook about Roman military sites in Jordan for the Congress.

The 2010s

A major development of the 2010s was the formal launch in 2011 of MEGA Jordan, the Department of Antiquities' on-line data base of archaeological sites in Jordan. This pioneering effort, supported by the Getty Museum and the World Monuments Fund, was an outgrowth of the earlier JADIS database.

The 2010s have also seen increased interest in community engagement, demonstrated by ACOR's Sustainable Cultural Heritage Through Engagement of Local Communities Project (SCHEP), with funding from the United States Agency for International Development, that has been underway since 2014 (Adarbeh et al. 2020). Much of ACOR's attention has been focused on documentation, publication and site presentation of the Temple of the Winged Lions in Petra.

The Japanese government has become involved as well through their support for the establishment of the Jordan Museum in Amman, opened in 2014, and the Petra Museum, opened in 2019.

The World Archaeology Congress was held at the Dead Sea in January 2013.

An international consortium was organized to deal with the accidental discovery in 2016 of a spectacular painted Roman tomb in Bayt Ras (Harun et al. 2021).

Among the many major archaeological projects of the 2010s, a Hungarian archaeologist Győző Vörös, sponsored by the Hungarian Academy of Sciences, led work at the Herodian Palace of Machaerus / Mukawar starting in the fall of 2009 (Vörös 2013 and later volumes).

A joint Danish-German team has been working in Jerash since 2011, concentrating on the northwest quarter of Jerash, with an extensive list of publications (Lichtenberger and Raja 2018 and subsequent volumes in the Jerash Papers series).

Petra never ceases to receive a lot of attention. Laila Nehmé (2012) published the first of several planned volumes of an archaeological and epigraphic atlas of Petra, while the

most recent major work about Petra is a study of Petra's archaeological landscape by Will Kennedy (2021).

Major efforts have been expended for decades on epigraphic surveys in the eastern Desert, and an on-line data base – the Online Corpus of the Inscriptions of Ancient North Arabia (OCIANA) got underway in 2012; for Jordan the Hismaic and Safaitic corpus are of special interest. The latest PDF version dating to 2017 can be found at [ociana safaitic.pdf \(ox.ac.uk\)](https://ociana.safaitic.pdf(ox.ac.uk)) and [ociana hismaic.pdf \(ox.ac.uk\)](https://ociana.hismaic.pdf(ox.ac.uk)). Meanwhile a Corpus of Nabataean inscriptions was developed by L Nehmé under the auspices of the [Digital Archive for the Study of Pre-Islamic Arabian Inscriptions](https://dasi.cnr.it) (dasi.cnr.it).

As an offshoot of the aerial photography of David Kennedy and Robert Bewley (www.apaame.org), the Endangered Archaeology in the Middle East and North Africa (EAMENA) project was set up in 2015 to use aerial photographs to monitor the status of endangered archaeological sites, not only in Jordan.

Drones have not yet been used much in Jordan, because their use has been prohibited or tightly restricted by the Jordanian government.

2020s

The Covid 19 pandemic brought archaeological work by non-Jordanians to a halt in the spring of 2020. Excavations at Hesban were held in second half of 2021, but most field work did not resume until the summer of 2022.

One major publication that came out in 2020 was a gazetteer of Islamic heritage sites in Jordan (Weber-Karyotakis and Khammash 2020), listing 449 sites. An up-dated on-line version was released in March 2022 under the auspices of the Gerda Henkel Foundation: <https://edit.gerda-henkel-stiftung.de/islamic-heritage-sites-in-jordan/a-students-gazetteer/>. The availability of that gazetteer on-line points to the future of publication of archaeological reports.

مائة عام من البحث الأثري في الأردن

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ملخص

يعرض هذا المقال المكون من ثلاثة أجزاء تاريخ البحث الأثري في الأردن، خاصة في المائة عام الماضية ويركز على التطورات المنهجية. التي اتبعتها الباحثون. يغطي الجزء الأول من مقالة غاري روليفسون فترات ما قبل التاريخ، من خلال تقديم إنجازات الرواد ثم من خلال التركيز على التطورات البحثية في العصور الحجرية القديمة والعصر الحجري الحديث حتى نهاية العصر الحجري النحاسي من 9750 إلى 3750 ق م. ويغطي الجزء الثاني من مقالة كاترينا شميدت العصرين البرونزي والحديدي ويسلط الضوء على اتجاهات البحث الأثري خلال المائة عام الماضية. ويقدم الجزء الثالث من مقالة روبرت شيك بحثاً أثرياً في الفترة الهلنستية إلى العصور الإسلامية، مع التركيز على مساهمة الباحثين الأجانب، وعرض التطورات حسب العقد الزمنية.

الكلمات الدالة: علم الآثار في الأردن، المنهج الأثري عصور ما قبل التاريخ، الأردن.

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