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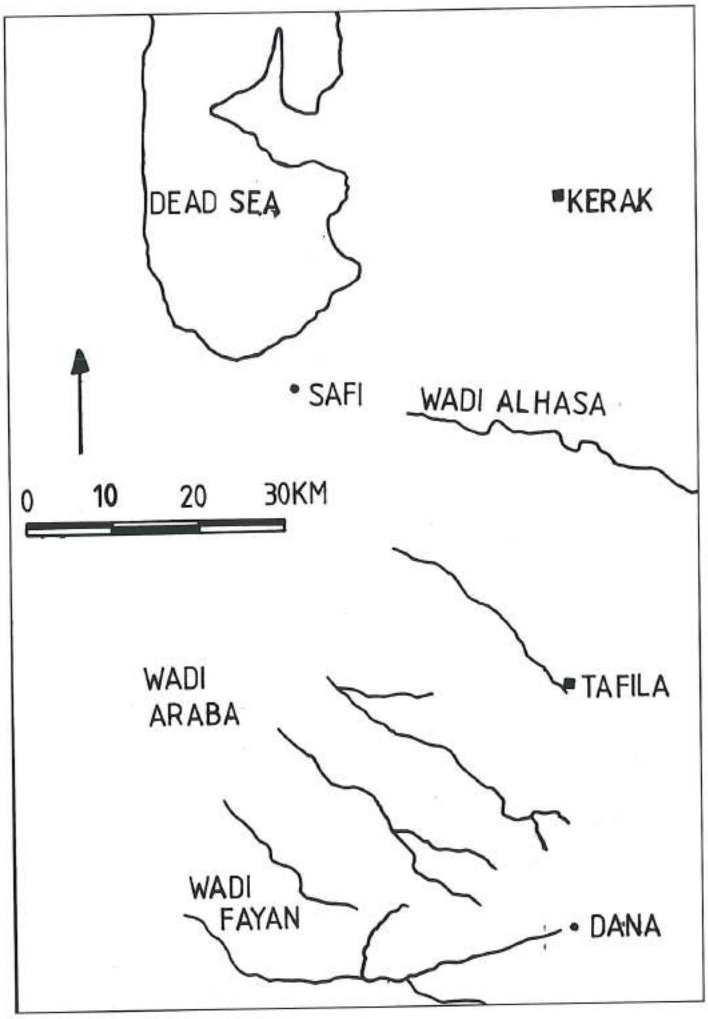
Towards a Commonly Accepted Chronological Framework of the Pre-Pottery Neolithic B Period in Jordan

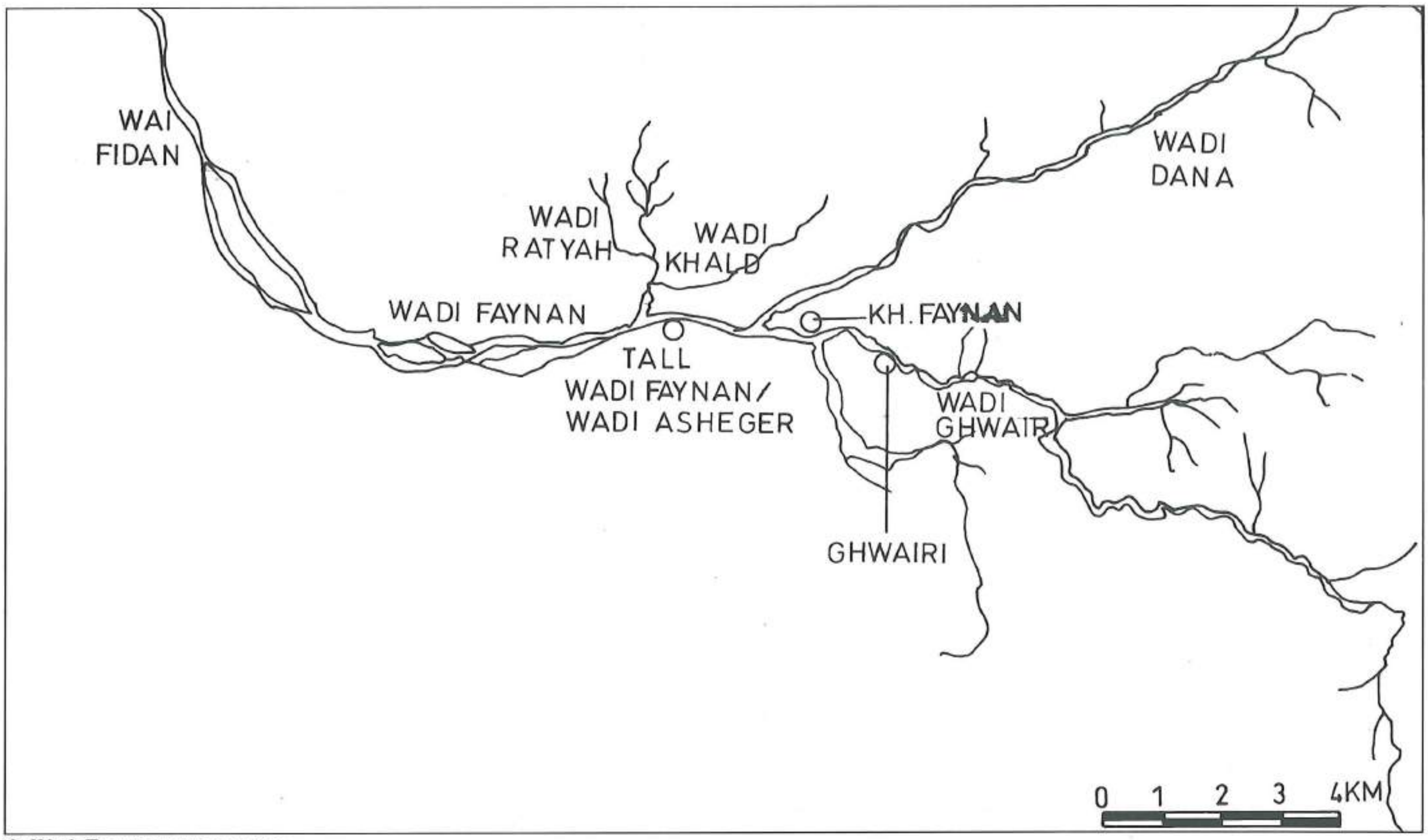
Introduction

Faynān is located at the eastern border of Wādī ʻArabah, some 60km to the south of the southern edge of the Dead Sea (FIG. 1). The wadi system, which is known as Wādī Faynān starts in the area of ash-Shawbak with two main tributaries, namely Wādī Ḍānā and Wādī Ghuwayr. After the confluence of these two wadis at Khirbat Faynān—the main archaeological site in the area known as Funun in Biblical times and Pinon in the Roman/Byzantine period—the wadi flows under the name of Wādī Faynān till it reaches ʻAyn al-Faydān. From this point it runs under the name of Wādī Faydān till its final water discharge in Wādī ʻArabah. So the same wadi system runs under different names from the Jordanian plateau in the east to Wādī ʻArabah in the west for a little more than 32km. Other tributaries to the wadi are Wādī Ushayqar, Wādī Khālid, Wādī Ratyah and a dozen small nameless wadis (FIG. 2). The onset of the wadi is situated at about 1400m. above sea level, then the wadi streams down sharply to about 250m. above sea level at the point when it emerges from the plateau at Khirbat Faynān. The big difference in the altitude plus the low temperature and relatively high precipitation in the form of snow and rain in the winter and early spring makes the wadi and its flood plain vulnerable to severe and dangerous flash floods at the aforementioned times (FIG. 3). During the rest of the year the wadi is completely dry except for tiny streams at certain stretches supported by underground water springs. At the upper flow of the wadi, juniper and oak trees cover the slopes to the bottom, but some 18km. to the west the sandy edges of the wadi are covered with acacia and tamarix (FIG. 4). The ancient inhabitants were drawn to the wadi by the accessibility provided by it. The distance between Ḍānā and Khirbat Faynān does not exceed 12km. That makes it the shortest natural trail from the Jordanian Plateau to Wādī ʻArabah and from there to the Negeb and the Mediterranean Sea. Furthermore, people were attracted by the availability of water sources and cultivable land. The establishment of the earliest settlements in the area at the edges of the wadi gave them a good access to the water and the agricultural land at the upper flow of the wadi, and to the water and hunting land at the lower flow.



1. Wādī Faynān in southern Jordan.

Starting from the eighth millennium BC, the presence of the copper ores has become the main focus of human



2. Wādī Faynān water system.

3. The flash floods in winter time.

4. Sand dunes at the lower flow of the wadi.

activities in the area. Copper ores in the form of "green stones" (malachite and copper silicates) were collected and redistributed in the eastern Mediterranean. These stones were found in the course of archaeological excavations at many Pre-Pottery Neolithic sites such as Jericho, Bayḍā, Ghuwayr, 'Ayn Ghazāl, Basṭa and several other sites like Tall Ramad, Munḥaṭa, Nahal Oren, Abū Ghosh, Nahal Hemar, and Nahal Issaron. Jewellery and cosmetic powders were manufactured of these "green stones". The results of a joint Jordanian-German (Department of Antiquities of Jordan and the German Mining Museum Bochum) archaeometallurgical project confirmed that the source of all these Neolithic stones and almost all the Chalcolithic copper artefacts was the copper ore deposit enclosed in the Middle and Upper Cambrian White Sandstone of 'Arabah and more precisely Faynān (Hauptmann *et al.* 1989). With the progression of know-how at the end of the fourth and the beginning of the third millennium the lower ore-bearing deposit (The Dolomite-Limestone-Shale Unit) both in Faynān and Timnā' have become the main source of copper ores (Najjar *et al.* 1990). Copper ore mining in the area continued, with some lapses, through the Bronze (Wright *et al.* 1998) and Iron Ages (Fritz 1994), the Roman/ Byzantine periods and the Islamic era. The latest archaeological evidence for copper mining and production came from an Ayyubid-Mamluk village in the fourteenth century AD.

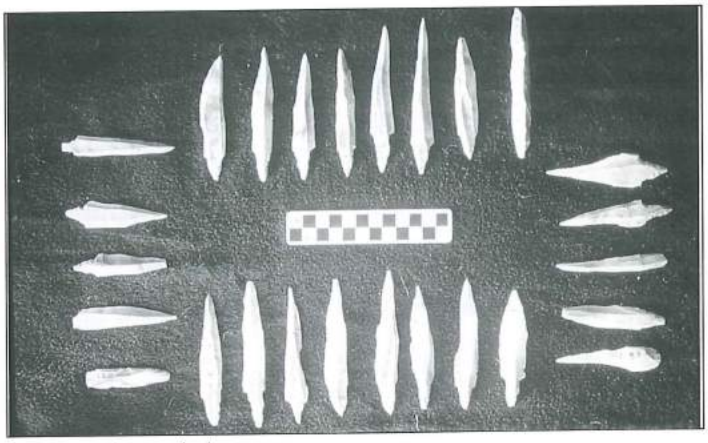
The Site

So far, four sites representing the Pre-Pottery Neolithic B period have been located along the wadi. The largest site, which has been under excavation since 1993, is known as Wādī Ghuwair I. What started as probe trenches aiming at the archaeometallurgical investigation of the site in 1993 (jointly with the German Mining Museum) is becoming now a project in its own right. The site is now under the excavation by a team from the Department of Antiquities of Jordan and the University of Nevada Las Vegas, headed by the author and by Dr. Alan Simmons from UNLV. The site is about one hectare in area, subdivided into two natural terraces. The PPNB site is located at the upper terrace while the lower terrace is covered by Roman water installations. Seven areas have been investigated so far. The earliest evidence of occupation was found at the eastern edge of the site—where one Khiamian point was discovered. Although many interesting artefacts were found at the site, including arrow heads (FIG. 5), blades, chisels, hammers, ground stones, stone and terracotta figurines and even some Pre-Pottery Neolithic B pottery sherds, the most extraordinary thing about the site is the state of preservation of its architecture . Some of the walls are still standing to the height of a little more than three meters. The rooms of the earliest levels have beaten earth floors, while the rooms of the second architectural phase have plastered floors and walls. The preliminary analysis of the architecture shows that the houses were two-story buildings with the ground floor used for storage and the first floor for living. These residential units were modified through their long history from big 10x10m houses in the first phase into smaller 5x5m rooms in the second. These rooms from the second phase were converted into very small 1x1.5m storage spaces during the third architectural phase. One big 4x4m sub-rectangular room with niches in its western and southern walls and plastered floor and walls was uncovered (FIG. 6).

Nine C-14 calibrated dates obtained from the site confirmed that it was occupied at the end of the ninth millennium and during the first half of the eighth millennium BC.

The other three sites are located at Wādī al-Faydān. (Raikes 1980: 43) identified two of them. In 1989 probe trenches were excavated under the direction of Russel Adams to establish the chronological sequence (Adams 1991: 183). The excavated materials from both sites have demonstrated that both of them are contemporary or slightly later than Ghuwair I.

The surveying team of "Jebel Hamrat Fidan Project" located the fourth site in 1998. This site can be interpreted as the eastern extension of "Wadi Faydan I".



5. Chipped stone industry.

6. The special-use room in Area 1.

Chronology

Three of the aforementioned C-14 dates were obtained in 1993 and six additional ones in 1996 (TABLE 1).

The time range for these dates in calibrated BC years is 8484-7309 according to different calibration techniques with different degrees of confidence. From the original nine C-14 uncalibrated radiocarbon dates, the sum total of calibrated dates equals 70. This means that for us (chronologically in calibrated BC years) to compare our site with other PPNB sites in Jordan, we have the choice to pick any of these 70 different values and use it for our interpretation of the archaeological data. In other words objectivity will be next to zero especially if we consider that the situation is almost the same for every other site in Jordan.

Nevertheless working with reliable groups of radiocarbon dates from Jordan is essential for establishing the chronology of prehistoric village cultures. Sites that permit us to obtain dates from successive cultural levels, preferably from sealed architectural layers, make our task easier and the chronological results more reliable. But we

TABLE 1.

Corr. C14 date	Lab. Number	Calibr. BC 1	Calibr. BC 2
8528±89	Hd 17221-17359	7575-7485	7840-7825 7700-7420
8627±46	Hd 17220-17550	7690-7660 7635-7540	7865-7815 7705-7530
8659±178	DRI 3254, SFN 20	7904-7756 7744-7537	8035-7411 7399-7377 7368-7309
8754±52	DRI 3256, SFN 13	7907-7839 7827-7700	7929-7592
8755±311	DRI 3255, SFN 4	8087-7480 7459-7439	8484-7033
8806±52	DRI 3251, SFN 18	7940-7880 7812-7711	8007-7693 7661-7636
8812±61	HD 17219-17541	7950-7870 7815-7705	8015-7670 7670-7620
8880±117	DRI 3252, SFN 19	8031-7880 7812-7711	8083-7592
9027±116	DRI 3253, SFN 9	8324-8317 8187-8161 8134-7940	8345-8297 8273-7881 7810-7711

must bear in mind that in using the scores of C-14 dates available from Jordan that these are not of equal quality. In the early days of radiocarbon dating, today's recognised standards of pre-treatment and other procedures were not uniformly accepted nor applied. But this is just one aspect of the problem. The second aspect is the large size requirement (the conventional procedures require large samples of 40-200g or long counting times with gas proportional counters), usually limits the material to wood and raises the question "how long before use was that particular tree felled" or "are we dealing with inner or outer growth rings" or for instance "was the wood cut for this building or was it pulled out from an ancient building in the area", which was a common practice in antiquity caused by the scarcity of wood as building material in the area. However, with the advancement of dating techniques, especially Atomic Mass Spectrometry (AMS), precision of ± 80 years can be obtained from a 1mg sample of carbon after only one hour of counting time.

Another aspect of the same problem is that, as demonstrated in many studies, difference in quality cannot be blamed only on the early methods of age determination. For radiocarbon age to be equivalent to the actual or calendar age, several assumptions must hold. Some of them are associated with the physical conditions of the samples and how they are obtained and analysed. These assumptions can be summarised as follows:

1) The radiocarbon activity of the carbon reservoir is known and has remained essentially the same over the radiocarbon time scale;
2) the half-life of the carbon is accurately known;
3) carbon isotope ratios in the sample have not been contaminated by any external factors since the death of the organism;
4) and last, but not least, the assumption that the natural levels of radiocarbon activity and stable carbon isotope abundances can be measured to appropriate levels of accuracy and precision, and correction can be made for isotope fractionation.

The conclusion is a chronostratigraphical analysis and a relative chronology based on the seriation of the assemblages of the material culture in good accordance with the radiometric data is the best combination to establish a chronological framework for the PPNB period in Jordan, and unless we have all these elements combined, it is much safer to use the radiocarbon age to establish a relative chronology for comparing different sites.

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