Studies in the Material and Spiritual Culture of the Negev and Sinai Populations, During the 6th-3rd Millennia B.C.

Thesis Submitted for the Degree
Doctor of Philosophy

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Submitted to the Senate of the Hebrew University, Jerusalem
December 2002
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Preface

In this work I attempted to make an interim summary of some of my studies in the archaeology of the southern Negev and eastern Sinai, during the 6th-3rd millennia B.C. (Late Neolithic, Chalcolithic and Early Bronze Age). My acquaintance with the archaeology of the area began in 1969, when I joined the Eilat Field School as a guide. The studies are by-products of my work for the Department of Antiquity and the Israel Antiquities Authority since 1977, which was aimed at the protection and conservation of the region’s archaeological remains. During the surveys, excavation, and negotiations on the sites survival, a cultural picture of the desert population gradually emerged. This picture, which I have described in publications and lectures, was different than that commonly accepted, and was not easily adopted. Here I tried to integrate both material and spiritual cultural aspects, in an attempt to build and present a broader view of the past desert life. The various subjects demanded different research tools, and eventually required efforts in interpretation of the finds.

Although the view on desert culture presented here is my own, I owe my gratitude to many friends who joined me on field excursions, surveys and excavations. They are too many to name, but I would like to mention some who joined me or shared with me their own discoveries in the desert during the last years: Moti Shemtov, Lior Emmar, Gideon Ragolski, Amihud Naor and Alfonso Nusbaumer. Their names also appear in the site catalogues (Tables 11 and 14) next to the sites they discovered. I also thank Rami Bar with whom I took flights on an ultra-light plane to photograph and discover sites.

Several friends helped me in reading German, French and Italian material: Barbara and Philipp Pfeffer, Alfonso Nusbaumer and Tedi Mazola. Others took the task of proof reading the chapters: Jeff Ginsburg and Moti Shemtov. I was fortunate to discuss various matters with several scholars before and during the writing, mainly with Profs. Treggve Mettinger, Wiliam Dever, Issac Gilead, Avi Gopher, Anna Belfer-Cohen and Ofer Bar-Yosef. I thank Dalya Enoch, Iris Inbar, Elisheva Gordon and Tedi Mazola for drawing the artifacts and part of the plans (my own part in the illustrations includes the drawings in Tables 11 and 14, the maps, part of the site plans, and the photographs, unless otherwise stated).

Special thanks to both my Professors. Ami Mazar and Nigel Goring-Morris for their guidance before and during the writing, and for their fruitful comments. I thanks to the members of the dissertation committee: Professors. Emanuel Marx, Anna Belfer-Cohen and Steve Rosen, who approved and supported the proposal of this work.

And last, special thanks to my wife Rina for participating in all stages of the work in the field and office, for her devotion in proof reading the dissertation and in editing the bibliography.

Script notes

Non-English words and names, mainly Semitic, are written in italic, with diacritic marks where necessary. However, due to technical difficulties and the instability of the characters (mainly when transferring data between Mac and PC computers), no dots are marked under “H” when they denote the Semitic Ā, Ū, Ū‘ For similar technical reasons, italic is not used for names in the figure captions. ‘Arabic names are written without a space between the prefix and the name, according to Semitic languages, e.g. Darb alHajj rather than Darb al Hajj. A space is sometimes inserted in writer’s personal names, if that is how they are spelled in English publications, e.g. Al ‘Asfour or al-Ansary).
CHAPTER 1. INTRODUCTION

A. Environmental Setting

The Negev and Sinai are characterized by an arid to hyper-arid climate. Environmental conditions vary between regions, but generally, aridity increases as one travels south.1 In the Negev Highlands, ca. 500-1020 m above sea level, summer temperatures usually reach 30-35°C, average annual precipitation is 80-100 mm, and the annual average potential evaporation is ca. 2600 mm. Despite the negative water balance, the terrain and climate of the Negev Highlands enables growth of Irano-Turanian vegetation, even with some Mediterranean species. Vegetation is not limited to wadi beds alone, but is often on the slopes as well, especially the northern ones which are less affected by sun radiation.2 In the past, the region sustained a fairly rich fauna, including herbivores, which served an important role in human subsistence, whether game or domesticated.3

In the southern Negev (south of the Ramon Crater to Eilat), environmental conditions are much harsher. In the Eilat region, the annual average rainfall is only 28 mm, while the potential evaporation rate rises to 4000 mm annually.4 As a result, the vegetation is Saharo-Arabian, with less species adapted to these conditions, and with the rare exception of eastern ‘Uvda Valley, it is totally restricted to the wadi beds. This means a lower carrying capacity for animal and man, in addition to the rarity of perennial water sources. The conditions in eastern Sinai are quite similar to those of the Eilat region, with one distinction, that several major wadis drain rain water from large areas; thereby, supporting a fairly rich vegetation, some water sources and even oases (e.g. ‘Ein Fortaga, ‘Ein Huderah, ‘Ein Um Ahmed). Larger oases were created where the major wadis flow into the Gulf of ‘Aqaba (Nuweiba’, Dhahab and Nabek).

Two neighboring mountainous regions enjoy a better water balance. The Edomite Mountains, of southern Jordan, receive up to 400 mm of rain per year, the vegetation is much denser than that of the Negev and even includes oak-juniper forests. The southern Sinai mountains receive ca. 100 mm annually, in addition to snow almost every winter. The region’s lithology creates numerous small water sources, small oases, and a large oasis in Wadi Feiran. Mountain valleys and the large wadis support mixed vegetation, sometime quite dense.5 The differences in ecological conditions of the various desert zones finds clear expression in the archaeological remains (see Chs. 2 and 8).

In order to understand the implication of environmental conditions, some interpretation is required. Although the high summer temperature seems formidable, it is not the significant obstacle to living in the desert, for several reasons. High heat prevails only three or four months a year (June to August or September), while comfortable daytime temperatures dominate the alternate months. More important than heat alone is the “heat burden”, which combines temperature and humidity. In the desert, relative humidity is low (15-25% in Eilat during hot hours, and even lower in inland Sinai), perspiration evaporates well and the body’s cooling mechanism is efficient.6 When one is protected by shade and exposed to the dry wind, heat burden is significantly reduced even when the air temperature exceeds body temperature. Summer temperatures of the southern Negev are only slightly higher than in the Beit She’an-Dead Sea Basin, but since humidity in the latter is higher, the “heat burden” rate is also higher than in the southern Negev and Sinai (Ganor 1987). In the Negev Highlands, the “heat burden” is much lower than in the Beit She’an Valley, so that high temperatures alone could not be a factor that would prevent living in the desert, certainly not for those born there. This is even true for the southern Negev, but here another positive factor is important, the constant dry northern wind, which increases perspiration and reduces “heat burden”. However, heat does have an important negative consideration, the increased need of drinking water, which is not always obtainable in the desert. This is the main reason why desert societies have adopted a life style that minimizes physical activity and exposure to the sun during the hot hours of summer.

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2. For the flora of the Negev and Sinai see Danin 1979, 1983.

3. Until the early 20th century A.D. the fauna of these regions was much richer than today. The severe reduction in wild life and extinction of species occurred during and after World War I, when guns became common among the Bedouin population. For the faunal situation before the war see Qamsiyeh 1996; Shalmon 1998; Paz in press. Still after the war, Jarvis (1941:187-214) described a fairly rich wildlife in Sinai, and he even issued orders prohibiting the hunting of several species.


6. For human physiology under heat see Zohar 1977b,c; Shapira & Sheinfeld 1977a,b.
Typical for the desert is low winter temperatures, especially at night. Barometric highs prevail over the desert during most of the winter time, with clear skies and almost no wind. In these conditions, sun radiation absorbed by the earth during the day is quickly lost soon after sunset, temperatures drop drastically and quite often frost accumulates in the low areas. The cold demands serious consideration, not less than the heat, and as a result, the consumption of combustible material is high. If in the fertile lands wood is readily available, in the desert it is limited and therefore constitutes an important factor in the assessment of carrying capacity.

The negative balance between precipitation and evaporation is indeed an obstacle to life in the desert. The lower the rainfall, the higher the fluctuation from year to year, or between clusters of years, and in general, rain is very unpredictable. An average annual precipitation of 30 mm means that there are years of 60 mm and more, and years of no rain or minimal amounts that do not influence plants and animals. In addition, rains in the desert are usually concentrated in both space and time. On one hand, it means that different areas may receive rain in different years, and on the other, concentrated rains create floods (Figs. 2:72, 73), which are highly important for the ecology of the desert. By virtue of the floods, the wadi beds support vegetation, which supports animals and people. Floods were essential for agriculture in the past, since outside the limited oases, agriculture was possible only on the basis of the flood regime (see below).

Another obstacle to life in the desert is the rarity of arable land. As long as desert societies subsisted on hunting and gathering, they followed the food resources, animal and plant, and their population was in balance with the environment. However, once they adopted agriculture and grazing, they were dependent on their skill to produce the food. Cultivation was possible only in wadi beds, where floods run, but where the soil is usually too stony. Therefore, cultivated soil had to be ‘created’ by means of terracing or other methods. This was possible only where the lithology, the topography and the flood regime permitted.

The present living conditions in the desert are not necessarily identical to those of the past. Obviously, knowledge of the ancient environment is crucial for understanding the sites, being aware of the fragile nature of the desert ecological system. Although numerous paleoclimatic studies were published during the last half century, there is still a debate on this question. However, accumulating data do support the view that during most of the time-span discussed hear (6th-3rd millennia B.C.) the climate was somewhat moister than the present (see Ch. 7).

The desert and its inhabitants were sometimes seen in a negative light by the peoples of the sown-land. For example, the Egyptian King Meribere Khety (=Akhtoy III), in an instruction letter to his son Merikere (ca. 2160 B.C.) warned him of the Asiatic (of Sinai): “Beware of the wretched Asiatic— it goes ill with the place where he is. Afflicted with water, difficult from many trees, their ways thereof painful because of the mountain. He does not dwell in a single place (but) his legs are made to go astray. He has been fighting ever since the time of Horus (but) he does not conquer nor yet can he be conquered. He does not announce a day in fighting, like a thief who... for gang” (Wilson, ANET 416)

Desert people, on the other hand, viewed themselves in a different light and even preserved a “desert ideal” long after leaving the desert. When Jeremiah tempted the Rachabites to feast with him, their answer was:“...Yehonadab son of Rechab, our father, commended us, saying that you shall not drink wine you and your descendents for ever. And you shall not build a house and you shall not sow a seed and not plant a vineyard, in tents you will dwell all of your days for you will live longer on this land” (Jer. 35:6). Three hundred years later, Hearonimus, a Greek army officer, described the Nabatean for the first time (quoted by Diodorus 19:94, 4-8, 2nd cen. B.C.) in almost the same words: “...their custom is not to sow any seed, not to plant any fruit tree, not to drink wine and not to build a house. They passionately observe these customs since they think that a one who does all these will easily submit to a stronger one”. The desert life, therefore, was perceived by desert societies as materially modest, permitting higher spirituality and morality that ensured longevity, while their love of freedom reflects pride.

Some of the past negative attitudes toward the desert were apparently transmitted to the present, and sometime scholars tend to hold the desert environment, population and archeological remains in low esteem. For example, the desert “could not sustain a local population for any length of time” (Haiman 1992b:93), thus, the population was “hungry, on the verge of death” (Haiman 1992c:304). Desert habitation is described as “short lived and a passing phenomenon” (Haiman 1986:16, 1989b:185) and having a “brief life span” (Beit-Arieh 1982:155, 1986:51). Accordingly, “There is no doubt that these small scattered open settlements could not have existed without the support of a strong stable political and economic body” (Beit-Arieh 1984b:22).

In my opinion, these descriptions are not necessarily correct. If the early 20th century is considered a pre-modern period in the region, the Negev, including the Be’er Sheva’ Basin, was inhabited by 70,000 Bedouins (Al’Aref 1939a:8), who were not supported by the Ottoman government. This figure implies that past populations could be at least equal in size, for two main reasons. First, the climate during most of the periods discussed here was somewhat
moister than the present (see Ch. 7). Second, a comparison of the ancients’ material culture to that of recent Bedouin shows that the former probably exploited the desert carrying capacity more effectively (see Ch. 2). The nine archaeological survey “maps” published to date from the Negev Highlands (covering 900 sq km), encompass 1998 sites from the Neolithic to the Early Islamic period. During the later periods, the Negev Highlands even supported several towns and large agricultural areas. In the southern Negev, 1650 sites are recorded to date, of which 1500 are within the Eilat region (from ‘Uvda Valley to Eilat), ca. 1200 sq km. For an area which is the harshest in the Negev, this number of sites is unexpected, especially since only 7% of the area has been systematically surveyed to date. These sites represent a wide range of activities, and unlike other areas of the desert, an uninterrupted sequence of settlement is revealed over the last 10,000 years. This settlement picture seems to extend into eastern Sinai, but since only limited parts were investigated, the actual intensity is not clear as yet.

B. Early Explorations in the Negev and Sinai

The Negev and Sinai were visited by many explorers during the 19th century. Most of them focused on biblical issues, mainly the search for the route of the exodus and the location of Mount Sinai, or for later ancient remains of the Roman-Byzantine period. The southern Negev and eastern Sinai did not generally attract much attention, although, some explorers did visit the region and publish their discoveries.

In the early 19th century Rüppell (1829:264-6) explored ancient copper mines and smelting sites in southwestern Sinai (Bir Nasib and Jebel Rina), and in 1845 J. Petherick was the first European to briefly describe ancient metallurgical remains in Timna’ Valley (Petherick 1861:37). He was impressed by the quantity of slag in two smelting camps, but did not theorize about their age. About 20 years later, the Ordnance Survey of Sinai, headed by C.W. Wilson and H.S. Palmer, recorded several nawamis clusters and tumuli fields. In 1867, Holland, a member of the expedition, was the first to excavate nawamis tombs; he found two skeletons and sea-shell bracelets, a discovery that was later repeated by Currelly (see below) and in modern excavations (Bar-Yosef et al. 1977, 1986; Goren 1998). In Wadi Wa’ara the OSS team excavated several tumuli tombs which contained skeletal remains and some shell beads. They also mentioned excavations of tumuli by other explorers (Bouerma & Lord) in Wadi Sidreh in 1868, where skeletal remains were found associated with a sea-shell necklace, a copper bracelet, flint arrowheads and a flint lance-head. The team concluded that nawamis were ancient “stone houses” contemporary with the tumuli, which were later used for burial. They related both to a “very early date”, or to the biblical ‘Amalekites (Wilson & Palmer 1869:194-196). Interestingly enough, no remains of habitation sites were mentioned by the teams, even in areas that they surveyed and described in detail, such as Nebi Saleh and Watiyeh Pass; these were only discovered much later. Before and during the survey, Holland explored the turquoise mines of Serabit elKhadim and Wadi Maghara, and the slag heaps of Bir Nasib, all in southwestern Sinai. He discovered several other copper mines and smelting sites, including the long vein of copper mineralization at Wadi Regaita (=W. Reqitiyah), with nearby remains of smelting furnaces (See Ch. 3) and another copper mine in southeastern Sinai, most probably in Wadi Samra (Holland, in Wilson & Palmer 1869:121, 223-4).

E. H. Palmer, who participated in the Ordnance Survey of Sinai, continued to explore the peninsula and the western Negev Highlands. He was actually the first to consistently scrutinize pre or proto-historic sites, and to correctly identify sites with circular courtyards and rooms as pastoral camp-grounds. He termed them “primeval remains” of prehistoric races, or the ’Amalekites ( Palmer 1871, e.g. 288-230, 318-322, 344-6, 372). He discovered several nawamis clusters, including the site near ‘Ein Hudeirah (later rediscovered by Rothenberg and excavated by Bar-Yosef et al.), and excavated some nawamis in ‘Ein ‘Elya (Palmer 1869:344-6, later excavated by A. Goren). Palmer correctly dated the nawamis to prehistoric times based on the flint arrowheads that he collected. He also identified several tumuli fields, the largest between Wadi Sa’al and Wadi Mara, which he identified with Kibroth Hattaavah, one of the Israelite stations on the sojourn from Egypt (Pp. 257-260). Near Nakhel, in central Sinai, he excavated a few tombs in a large tumuli field (p. 337), and described another large burial ground in Wadi Lussan (Nahal Lotz, Pp. 345-6). In Jebel Muwileh, west of Wadi el’Ain (Qadesh Barne’a) Palmer described a line of well built cairns on a hilltop, that we presently call “crenelations” (see Ch. 5). He interpreted the site as a series of

7. See e.g. Evenari et al. 1971.
8. The surveyed areas include Timna’ Valley (Rothenberg 1962, 1967a, 1972), and several surveys by myself in eastern ‘Uvda Valley, along the Eilat- ‘Uvda road and other limited areas. Sites are known outside these areas, but not as a result of meticulous survey.
9. Petherick did not mention the name Wadi Mene’ije for Timna’ Valley, as later explorers did, but two other unknown site names, Rignel Hadid and Wadi il-Mahait. However, his description of red sandstone in the sites’ vicinity certainly indicate Timna’ Valley, and the mention of a limestone wall surrounding one of the two sites, can only fit Site 30 of Rothenberg’s survey, west of “Solomon’s Pillars”.
10. Indeed, this is a very large burial site, 6th-3rd millennia B.C. In a brief visit in 1982 I noted several tabular scrapers.
Early Islamic and in Bedouin ethnography. Occasionally he briefly and generally mentioned older remains, in 'Uvda Valley (centered in Timna' Valley). In later studies and publications he added ample information on the archaeology of the southern Jordan and to northern Hejjaz. His main interest was in late antiquities (Nabatean, Roman Byzantine and Early Islamic) and in Bedouin ethnography. Occasionally he briefly and generally mentioned older remains, in 'Uvda Valley (Wadi 'Oqfi, 1908:181) and in Timna' Valley (Wadi Mene'ijje, Pp. 188-9, with no mention of metallurgical remains); while in Nahal Shaharut (Wadi ed-Dil, Pp. 181-2) he described several lines of "crenelations". In Moab Musil documented the dolmen field of El Kwejzije (1907:265-9), and in southern Edom he briefly described two sites of menhirs (1926:16).

L. Woolley and T. E. Lawrence made their survey in the Negev and northeastern Sinai in 1914. In the area of ‘Ain Guderat (Qadesh Barne‘a)- Kossaima- ‘Ein Muweileh they surveyed ancient remains of several types of habitations, tombs and cairns, and conducted excavations in some (Woolley & Lawrence 1915:39-41). Based on handmade pottery sherds, they dated the remains to the 2nd millennium B.C. and later, and concluded that the Stone Age left no remains in the area (Pp. 42-46). Today we know that some of these remains are actually older.

In the years 1942-1934 F. Frank (1934) conducted surveys along the ‘Araba Valley, instructed by A. Alt. He made a number of important discoveries, including Tell Heleifeh, near ‘Aqaba (Pp. 243-4) and several Nabatean-Roman fortresses. Generally, Frank distinguished between “Pre-Roman” or “very old” sites, and Roman or later. He preceded N. Glueck by four months in exploring the copper production complexes in Faynan (Fenan, Pp. 217-225) area and in Timna’ Valley (el-Mene’ijje, Pp. 241-2). In ‘Uvda Valley (Wadi el-‘Okfi, Pp. 263-265) he briefly mentioned ancient sites, and large cultivated fields. In the Yotvata Oasis (Ghadian), he mapped the Qanat and other water systems (Pp. 238-241).

During the years 1934–1935 N. Glueck conducted his first survey throughout the Negev and southern Jordan, and renewed the Negev survey in the early 1950s and the early 1960s (Glueck 1935, 1961, 1965 1968, 1970). Altogether he recorded ca. 1000 ancient sites in the Negev, which were later compiled as a site-list and analyzed by Baron (1978, 1981). Glueck related the sites to several periods, including Early Neolithic, Chalcolithic, Early Bronze, Middle Bronze I and later. Glueck was the first to suggest a historical outline for the desert, of short periods of settlement interrupted by long gaps. His work will be discussed in Ch. 8.

During the 1950s the survey team of Glueck included B. Rothenberg as a photographer. Rothenberg later continued his own investigations in the Negev and Sinai, and still continues today. His first book (1961) mainly describes his exploration in Sinai in 1957. Another book (1967a) discussed several historical issues of the Negev’s history and presented preliminary results of his investigations in the ‘Araba Valley, the Eilat region and the copper production centered in Timna’ Valley. In later studies and publications he added ample information on the archaeology of the Negev and Sinai, mainly regarding ancient copper production. His survey of the Eilat region (Rothenberg 1967b; Rothenberg & Cohen 1968) recorded 216 ancient sites, including those discovered by Musil, Frank, Glueck and others. The extension of the survey into Sinai in 1957 and in 1967-1978, yielded a total of 715 recorded sites, including those of the southern ‘Araba Valley (Rothenberg 1961,1970, 1971, 1973, 1974, 1979)11

Since the 1960s, many archaeological studies have been conducted in the Negev, and in Sinai since 1970; they are too many to be mentioned here, but they will be discussed throughout the following chapters.12 About 100 sites were excavated during the last 40 years by R. Cohen in the Negev Highlands (e.g. Cohen 1986, 1999). An intensive stage of research in the Negev began in the late 1970s when the Israel Department of Antiquities (now the Israel Antiquities

11. Rothenberg’s studies will be addressed in several chapters of this work, and the history of his research is best described by himself in the introductions to his books and articles (especially 1988, 1999a).

was accepted by ibid. recent view (see Ch. 8), his database and analysis require criticism. In 1993, following Rothenberg's publication with Glass (ca. three different cultural phases, termed "Sinai-'Araba Copper Age Phases"—Early (the Eilatian and Timnian actually coexisted during the 6th to 3rd millennia B.C. This time-span was then divided into 16:1). Later, Rothenberg published with Glass (1992) another cultural-chronological concept for the desert, in which the industry basically continued through these periods with little change (see Ch. 8). In general, it is likely that the desert societies were less affected by political or cultural changes in the fertile lands, and could have continued to use tools that practically went out of use in other regions. As a result, desert sites of the 6th-3rd millennia B.C. are often difficult to date, cultures and periods are not easily recognized, and the periodization of Near Eastern archaeology is hardly applicable to the desert.

The first attempts to define cultures, rather than fixed periods in Sinai and the Eilat area were made by Ronen (1970) and Kozloff (1974), who analyzed flint assemblages collected by Rothenberg in surveyed sites of the 'Araba Valley and Sinai. Ronen examined the flint from two selected sites, one in Wadi Feiran, southwestern Sinai, and the other in Wadi Sidri, west of Eilat, in Sinai. Kozloff examined flint from a larger variety of sites and identified six different industries, including those of Ronen. Based on these studies, Rothenberg emphasized two industries, or cultures, the "Eilatian" and the "Timnian". The former continued Paleolithic traditions, with large, coarse tools and the "Levallois technique", but also included tabular scrapers, adzes and others. The latter was characterized by smaller sized cores and tools, with tabular scrapers, adzes, knives and others, but lacked the Levallois technique. Some characteristics are shared by both industries, including end scrapers (dominant in both), tabular scrapers, drills and borers, and a large proportion of ad-hoc tools (Kozloff 1974:46-47; Rothenberg 1979:111, 114). Although Ronen and Kozloff dated both industries to the 4th millennium B.C., Rothenberg saw them as two consecutive, autochthonous cultures, which he also termed "periods". He formulated a cultural-chronological table for the desert in relation to the chronologies of Egypt and Israel. The Eilatian was dated 4500-3500 B.C., followed by the Timnian period, 3500-2650 B.C. (Rothenberg 1979:111-116; Rothenberg & Ordentlich 1979; Conrad & Rothenberg 1980:26, and see here Table 16:1). Later, Rothenberg published with Glass (1992) another cultural-chronological concept for the desert, in which the Eilatian and Timnian actually coexisted during the 6th to 3rd millennia B.C. This time-span was then divided into three different cultural phases, termed "Sinai-'Araba Copper Age Phases"—Early (ca. 6000-2955 B.C.), Middle (ca. 2955-2300 B.C.) and Late (ca. 2300-2000 B.C., and see Table 16:2). Unfortunately, the definitions of these cultures and their chronology are questionable.13

C. The Desert Chronology

One of the characteristics of 6th-3rd millennia B.C. desert remains is the rarity of diagnostic objects, mainly pottery. Prehistoric sites, including the PPNB, are generally still well recognized since typical flint tools are often shared by different societies over large geographical areas (e.g. Gopher 1985, 1994; Goring-Morris 1987a). With the Late Neolithic, the situation changes. Yarmukian pottery is not found in the Negev, and Wadi Raba sherds are very rare. Most of the flint tools are ad-hoc or non-standardized (Rosen 1983a:138, 2002:27; Forenbacher 1997), while the more standardized tools had a long life-span (see Ch. 2 and 8). With a few exceptions, this problem lingers into the following periods, the Chalcolithic and Early Bronze. Pottery of the Be'er Sheva' or Ghassul cultures are rarely found in the Negev and Sinai, and EB Canaanite pottery is also rare, with the exception of sites in southern Sinai. The flint industry basically continued through these periods with little change (see Ch. 8). In general, it is likely that the desert societies were less affected by political or cultural changes in the fertile lands, and could have continued to use tools that practically went out of use in other regions. As a result, desert sites of the 6th-3rd millennia B.C. are often difficult to date, cultures and periods are not easily recognized, and the periodization of Near Eastern archaeology is hardly applicable to the desert.

The accumulated information concerning Negev prehistory and history is enormous, but still, in my own opinion, we are far from really understanding the desert remains, and do not yet have the means to fully appreciate them. During the last decade, surveys in the Negev have been totally restricted to development projects and excavations are extremely limited.

1. The definition of the Eilatian and Timmian cultures was based almost totally on surface finds collected in surveyed sites. The cultures were described as sharing territories and partially sharing the same flint tool-kit, but the possibility that different groups used the same sites in different times was not considered. Thus, attribution of characteristic items to cultures, and using them to identify cultures are problematic. Nevertheless, according to Rothenberg, once the analyses of four major cultural elements was completed (architecture, flint tools, pottery and metallurgy), all fit together well (Rothenberg & Ordentlich 1979:235). Unfortunately, the survey reports presenting these elements were never published, so that the very base for the cultures’ distinctions has never been presented. The architecture of both is described in the same words (e.g. Rothenberg 1979:111, 114), and the only examples of site plans representing the suggested cultures (ibid. Figs. 17, 18) show no principle differences between them. They both consist of circular courtyards and rooms, which are common throughout the Near Eastern deserts, in numerous different combinations (see Ch. 2). The only remaining difference is that in the final, Timmian II stage, rectangular rooms were introduced into the circular, traditional architecture (ibid, p. 114). However, in ‘Uvd'a Valley square and rectangular rooms were dated by 14C to 3200-2500 Cal. B.C. (See Ch. 2). Rothenberg (same page) relates copper mining and smelting to the Timmian only, although he previously did attribute the earliest copper mining and the adjacent earliest smelting site (Mine G and Site F2 in Timna’ Valley) to the Eilatian culture (Conrad & Rothenberg 1980:169-170). These changes are unexplained, and they exemplify the fluid nature of attribution of sites to the suggested cultures. A distinction is also asserted in types of burials, i.e. “empty” tumuli for the Eilatian, and “full” tumuli

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13 In a series of publications (1969:28-30, 1970:15, 1971a:62, 1973:35) Rothenberg described the population of Sinai as invaders from the northeast, but later he emphasized their autochtonic nature (Rothenberg & Glass 1992). Although I fully agree with his recent view (see Ch. 8), his database and analysis require criticism. In 1993, following Rothenberg’s publication with Glass (ibid.), a review article was written by D. Ilan, M. Sebbane, N. Pore et myself, addressing his cultural-chronological scheme. The paper was accepted by Levant (for Vol. 25), but ultimately was never published. Here are only a few selected critical points:
A somewhat similar approach was adopted by Anati (1986, 1993, 2001) in his survey of Har Karkom. He suggested the term “Bronze Age Complex” (BAC) for the Chalcolithic and Early Bronze Age as one period, ca. 4600-2000 B.C. Unfortunately, the artifacts and architecture representing this culture are not well dated. Presently, they are supported by only one 14C date (ca. 2700 Cal. B.C., Anati 2001:9), and no discussion explaining the concept has been provided.

Similar difficulties have faced the teams that surveyed the northeastern ‘Araba Valley and Wadi el Hasa, in southern Jordan (MacDonald 1988, 1992), despite the fact that diagnostic pottery sherds are more frequent in these areas. Sites were dated as Late Neolithic-Chalcolithic, Chalcolithic-EB I, and EB I-III (see further in Ch. 8). Also Rosen (1994:15-16), in the survey of Makhtesh Ramon, did not separate the Chalcolithic from EB.

Because of the difficulties in typological dating of LN-Chal-EB desert sites, in my own publications I refrained from ascribing them to specific periods. Shortly after the beginning of the Emergency Archaeological Survey in ‘Uvda Valley, I dated the majority of sites to the 4th-3rd millennia B.C. (e.g.

Avner 1982a 1984, 1990), and later discussed in detail the cultural continuity of the desert population during the 6th-3rd millennia B.C. (Avner et al. 1994; Avner & Carmi 2001). In my opinion, the present state of research does not allow us, as yet, to define chronological or cultural division in the desert within the 6th-3rd millennia B.C. Hence, this period is treated here as one cultural entity, that passed a process of evolution over time. It is hoped that in the future finer chronological and spatial definitions will be possible.

In an attempt to overcome the difficulties in typological dating of desert sites, radiometric dating (14C) will be often referred through the various chapters, despite limitations of the method. The overall scenario revealed from these dates will be discussed in Ch. 8). All 14C dates mentioned throughout the work are calibrated, following OxCal 3.4 (Ramsey 2000), including quoted dates which were previously published otherwise.

In the following chapters, selected themes of Negev and Sinai archaeology will be discussed. Some will address subsistence strategies and material culture, others will address the inhabitants’ spiritual world. Although these aspects of life are commonly studied separately, here some integration of the two is attempted, in order to obtain a broader cultural picture, and to examine the relationship between the desert and the sown.

for the Timnian (Rothenberg & Glass 1992:142). However, these are only two out of several different types of tumuli (see here App. 1). They are found together in the same sites, and in any case, surface finds in tumuli fields are very rare (e.g. Haiman 1992a), too rare to permit any sub-cultural definition or dating.

2. The chronological frame for the suggested cultures was based on the fact that their lithics “were often accompanied by diagnostic sherds” (Rothenberg & Glass 1992:145). However, the same diagnostic sherds are repeatedly mentioned as rarely found (e.g. Rothenberg & Ordentlich 1979:235; Rothenberg & Glass 1992:141, 145). Also, the remarkable conversion from the concept of two consecutive cultures, or “periods” (Rothenberg 1979:111-116) to two coexisting, long lasting cultures (Rothenberg & Glass 1992), again remains unexplained. Dating of the Eilatian is not supported by any excavation or any 14C date, and its time-span is also unexplained. The Timnian is dated by 19 14C dates from sites excavated by Kozloff in 1978 near Jebel Hashem al-Taref, ranging from ca. 6000 - 2850 B.C. (Rothenberg & Glass 1992, Table 2, and here Table 1:46, 48, 49, 54, 55), but since the excavations were never published, nothing is known as to why these sites are identified as Timnian, and which architecture, flint, pottery or metallurgy is associated with which dates. There are further confusions about the suggested cultures’ chronology. In the earlier publications (e.g. Rothenberg 1979:111, 114), the text marks the turn from the Eilatian to Timnian at 3500 B.C., but the chronological tables mark this shift at ca. 3800 B.C. (Rothenberg 1979:238; Rothenberg & Ordentlich 1979:234; Conrad & Rothenberg 1980:26, and here Table 16:1). In the later publications (Rothenberg & Glass 1992, Table 1), the major cultural-chronological scheme (here Table 16:2) begins around 4700 B.C., while in Table 2 the Timnian 14C dates beginning at ca. 6000 B.C. Also, it is unclear why in the later publication, the two cultures were omitted from Table 1, although they are constantly discussed throughout the text.

3. A strong Egyptian and Nubian influence was first ascribed to the Timnian culture, in architecture, the flint industry and pottery (Rothenberg 1979:114-115). Furthermore, “...Lower Egypt and the Sinai region as far east as the ‘Araba, during the Timnian period, formed a homogeneous cultural zone...” (ibid. p. 115). In other publications, however, the Egyptian background of the Timnian was omitted, and is mentioned only once as restricted to western Sinai (Rothenberg & Glass 1992, Note 25). Instead, some unspecified common traits with Egypt are ascribed now to both the Eilatian and Timnian (ibid. p. 145).

Besides adoption of the term Timnian by D. Henry (1995, Ch. 15) the cultural-chronological scheme of Rothenberg has not been widely accepted.
CHAPTER 2. AGRICULTURAL SETTLEMENT IN ‘UVDA VALLEY

Introduction

‘Uvda Valley, located 40 km north of Eilat and 10 km west of the ‘Arabah Valley, is 15 km long, up to 5 km wide, and is surrounded by ridges 50-150 m high (Figs. 2:1-3). The eastern ridges are built of Turonian limestone “Grofit Formation”, while the western side is comprised of the Senonian “Sayarim Formation” of chalk and flint. The valley itself is filled with Pleistocene and Holocene alluvium of silt, clay, lime-sand and fine gravel, at least 52 m deep (Ginat & Zilberman 1992).

Summer maximum temperatures reach over 40°C, approximately 4°C lower than the Araba Valley, while minimum winter temperatures reach -5°C on the eastern side of the valley. Since this side is 20 m lower than the west, frost often occurs in winter, but is never observed on the western side. The prevailing wind is from the north, but during the winter, cold western winds up to 50 km per hour sometimes occur, which strongly affect the eastern side of the valley. In spite of these conditions, almost all ancient settlements are located on the eastern side (see below).¹

The drainage system of the valley covers an area of 400 sq km, mainly in the mountainous zone to the south, 550-890 m above sea level (Fig. 2:1). This area seems to receive more rainfall than the surrounding area, which affects the flood regime of ‘Uvda Valley. The valley's gradient is moderate, from 500 m above sea level in the south to 415 m in the north. The southern gradient is 1%, while in the north it is only 0.3%. Since the eastern side is lower than the west, it is better irrigated by flood water. In addition, the wadis running into the valley, mainly from the south and east, are fairly rich with vegetation which can support large numbers of herbivorous animals (Figs. 2:4, 70, 71, 74).² Several perennial water sources are a half-day walk from the eastern side of the valley. Most important is the Yotvata Oasis in the ‘Araba Valley, others are smaller, but still significant, especially for the herds.

‘Uvda Valley (Wadi ‘Uqfi, ‘Yafa Arabic) was first briefly described by A. Musil (1908:180-182, 1926:85) and by F. Frank (1934:263-265). Both recognized ancient remains, while Musil noted that the eastern side was cultivated by the Haiwat Bedouin, and by citizens of ‘Aqaba who rented plots from the Bedouin. The first archaeological survey was made by Rothenberg (1967a:138, 1967b:303-307) who documented 15 sites, and noted more sites distinguishable from the air.

In December 1978 a team under my direction began a new survey of the area, as a part of the Negev Emergency Survey, conducted by the Israel Department of Antiquities and the Israel Archaeological Survey (today the Israel Antiquities Authority). This survey was intended to precede the redeployment of the Israel Defence Forces (IDF) from Sinai, while ‘Uvda Valley itself was selected for a new air base. The survey lasted until 1982, but was never completed. The western side of the valley only revealed a low density of sites, however, on the eastern side the number of sites was surprising. Here, a third of the area was meticulously surveyed, resulting in the documentation of approximately 400 sites in an area of 40 sq km (see Fig. 2:2, and Avner 1979, 1982a,b, 1990a, 1989a, 1998, 2002).³ The remains in the valley present an almost complete sequence of settlement, from the Pre-Pottery Neolithic B (PPNB) to the present, some 10,000 years. Most sites are dated to the 6th-3rd millennia B.C., i.e. the Late Neolithic, Chalcolithic and the Early Bronze Age. Of these, 186 are stone-built habitation sites and corrals, while the others include tent camps, agricultural installations, and cult and burial sites.

In June 1979, Early Bronze habitation sites were excavated for the first time by Amiran, Arnon and Avner (1979). Larger scale excavation campaigns took place in February 1980, directed by A. Eitan and R. Cohen, in which 22 sites were excavated (Hadashot Archaeologiot 64-65, 1980:35-49). Later, excavations and conservation of additional sites were undertaken (Avner 1982d, 1983, 1986, 1991a). Unfortunately, the excavation results and the finds from most sites were not published.

¹ The climatic data briefly given here are based on ample information I received from the Israel Meteorological Service and from the Meteorological Unit of the Israel Air Force, covering the years 1978-1988. I am grateful to both.
² At least 34 different species of edible plants for herbivorous can be listed today in the area of ‘Uvda Valley, both perennial and annual. Certainly this vegetation was important for human economy, especially since the emergence of pastoralism. I thank B. Shalmon for the preparation of this list.
³ The survey of ‘Uvda Valley was based on systematic scanning of the desert surface, mainly by foot, in an attempt to locate and document every visible archaeological remain. Occasional aerial surveys contributed sites not discovered from the ground. These included small installations usually adjacent to larger sites. Documentation of each site included a detailed written description, photographs, ground-plan drawings, and collection of surface artifacts. Since the survey was not completed, it was not published as a survey volume, as required, but the major results have been described in various publications (see e.g. Avner 1990a, 1998, 2000, 2002 and in press 7).
Initial plans for the air base required destruction of 104 sites. However, after long negotiations with the Israel Air Force, the plans were re-adjusted so that all but one site remained outside the base perimeter. The U.S. Army Corps of Engineers constructing the base also displayed a high sensitivity to the ancient sites and avoided damage. Today, the sites are accessible and an archaeological park is being planned, but the area is still in demand for military training.

A. Habitation Sites and the Settlement Scenario

1. Neolithic Sites

Seven sites of the PPNB period (8th-7th millennia B.C.) were discovered on the eastern margin of the valley and in the wadis to the east. Three are stone-built dwelling sites, the rest are camping or flint industry sites. Two habitation sites were excavated: Nahal Re‘uel (Site 20) only partially, and Nahal ‘Issaron (Site 14), almost completely. In the Nahal Re‘uel site, 76 sq m were excavated out of 400 (Fig. 2:5). Here an open space was uncovered (L. 4), ca. 2x3 m, which is described by the excavators as a central courtyard (Ronen et al. 2001:117, 154). The lithic assemblage included 30.2% arrowheads (n=245), indicating the importance of hunting, but no faunal remains have been preserved. A possible silo (L. 10) and tens of grinding stones represent grain consumption. The site is of a single phase, dated by three ^14C dates and by artifacts to the middle PPNB, first half of the 8th millennium B.C. (Ronen et al. 2001:126-7, 153-4).

The site of Nahal ‘Issaron, Stratum C covers an area of nearly 500 sq m, consisting of circular structures, 2-3.5 m in diameter, with limited open space (Goring-Morris & Gopher 1983; Goring-Morris 1993; Gopher et al. 1995, and here Fig. 2:6). It is similar to contemporary habitation sites excavated in the southern Sinai (e.g. Bar-Yosef 1981b, 1984), though somewhat larger. Arrowheads are the most prominent flint tools (Fig. 2:7) comprising 20% of the flint assemblage and indicating the importance of hunting. Correspondingly, the faunal remains collected include ibex, gazelle, wild ass, wild cattle, hare, several bird species, fish and ostrich egg shells. No remains of domesticated animals were found, similar to the situation in southern Sinai sites, but contrary to contemporary sites in the Edomite Mountains, Beidha and Basta, c.a. 70 km northeast of ‘Uvda Valley (Becker, in Nissen et al. 1991:29-32). Many grinding stones, as well as possible silos (Fig. 2:8), indicate utilization of cereals, probably for preparing porridge and baking bread. Again, no sign of plant domestication has been discovered. The architectural remains and artifacts imply the presence of one extended family in the site (cf. Gopher 1981:125, with references), from autumn to spring, returning to the site repeatedly. Stratum C was dated by artifacts to the terminal PPNB, and by nearly 20 radiometric dates, from the early 8th millennium B.C. to the mid 7th millennium B.C. (Fig. 2:9).

The next stage in Nahal ‘Issaron, Stratum B, was dated to the Late Neolithic (Pottery Neolithic), first on the basis of arrowhead types (Fig. 2:10) and later by fifteen radiometric analyses, 6th-5th millennia B.C., continuing into the 4th millennium (Table 1:29). Stratum B was poorly preserved, partially reusing Stratum C rooms, and described as having circular rooms surrounding an open space. If the open space served as a courtyard, it may be considered as heralding an architectural innovation. With the exception of Nahal Re‘uel, courtyards or open spaces are absent in the PPNB sites of the Negev and Sinai. However, they are characteristic of many hundreds of 5th-3rd millennia B.C. sites in these regions, as well as in other desert areas of the Near East. In ‘Uvda Valley Site 9, a level of crushed goat dung was dated to the 6th-5th millennia B.C. based on small winged and transversal arrowheads, and the radiometric date of an adjacent cult installation (Table 1:25, first date). In two additional sites (Nos. 4 and 7), courtyards were dated to the 2nd half of the 6th and the 5th millennia B.C. (Table 1:18, 21). Accordingly, it seems that stone-built courtyards first

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5. All dates in this paper are calibrated, based on OxCal 3.4 (Ramsey 2000).

6. Numbers of sites mentioned here unfortunately follow two different systems. One is the survey numbering, and the other is numbers of excavated sites, from 1 to 21, as given during the excavation operation in February 1980. In the text, however, the chance of confusion between the two is limited.

7. Initially, the excavators of Nahal ‘Issaron pointed out the high percentages of Capra bones as a possible indication of an attempt to domesticate these animals, but this was not necessarily the case. In the Neolithic site of Wadi Theik, southern Sinai, no sign of domestication was found (Tchernov & Bar Yosef 1982) and in ‘Ujrat el Mehed, southern Sinai, a high percentage of Ibex bones, one year old or older, were only interpreted as an incipient attempt to domesticate the Ibex, which could not be continued (Dayan et al. 1986). In any case, the high percentage of arrowheads in Nahal ‘Issaron obviously indicates the importance of hunting in the economy of the population. In the following publications, the excavators were more cautious about domestication in the site.

8. In the first publication (Goring-Morris & Gopher 1983) the excavators did not mention the open space, but in a later one (Goring-Morris & Gopher 1987:18) they describe an open courtyard surrounded by rooms. In personal communications they preferred to term it as an open space, since built walls were not preserved.

9. For the courtyards as an innovation related to grazing see e.g. Rosen 1988. At the time, based on his excavation in the Kvish Harif site, Rosen dated the appearance of courtyards to the early 4th millennium B.C.
appeared in the 6th millennium B.C. and signify the emergence of herding in the Negev and Sinai. This innovation had an enormous influence on the desert population, which will be addressed below and in Ch. 8.10

2. Late Neolithic, Chalcolithic and Early Bronze Sites

Near Eastern archaeology, in the Mediterranean zones, clearly distinguishes between these periods, in settlement pattern, material culture, art and other elements. The desert culture, on the other hand, demonstrates a great continuity (Rothenberg & Glass 1992, Avner et al. 1994, 2001, and see Ch. 1 and 8). Therefore, the ‘Uvda Valley remains from these periods will be described as one entity.

One hundred and eighty-six stone built sites, and 40 tent camps, were documented during the survey. At present they are generally dated to the 5th-3rd millennia B.C., but some were already established by the 6th millennium (See Table 1). As stated before, the large majority are concentrated on the eastern side of the valley (Fig. 2.2). Following is a brief description of the site types:

**Tent camp remains:** These are rows of cleared circles 3-5 m in diameter, with medium size stones scattered around them, originally used to secure the tent ropes. The camps, 50-200 m long, each contain 8-25 tent bases (Fig. 2:11). Approximately 2/3 of these sites were in locations shielded from north or west winds, indicating they were most suitable for winter occupation. About 1/3 were exposed to the north wind, and therefore best suited for the summer. Winter camps contained larger amounts of pottery sherds and flint than their summer counterparts. The circular shape of most of the tent bases is evident in all ancient tent camps of various periods. Remains of large, rectangular tents, such as those known in Bedouin societies today, were found only in a small number of sites, always in association with recent artifacts, such as segments of ropes and black “Ghaza ware” sherds.

Comparisons with recent Bedouin tent camps in the Negev and Sinai indicate that tent dwellers are not necessarily nomads or even semi-nomads (Al ‘Aref 1936:117-119; Marx 1967:83-86; Eldar et al. 1992; Avni 1992; Goren-Inbar 1993). Prior to the recent sedentarization of the Bedouin populations, they practiced only short distance, seasonal migration of tens of kilometers, two or three times a year, in order to seek fresh grazing, free the camp of insects attracted by the herds, and to accommodate the tent’s location and orientation to the various seasons. Similarly, it is reasonable to assume that the ancient tent camps in ‘Uvda Valley also could have been used for approximately half the year and were an integral part of the settlement system in the valley (see below).

**Built dwelling sites** may be divided into three main types:

**Small sites:** A group of 19 sites, consisting of 1-3 circular or rectangular rooms, without a formal, built courtyard (Figs. 2:12, 13). At first glance, they seem to be temporary dwellings for small or nuclear families. However, two excavated sites of this type revealed uninterrupted living levels, 50 and 80 cm thick, as well as installations and artifacts which contradict the initial impression, including a well-paved silo (Fig. 2:12).

**Medium size sites:** A group of 132 sites, usually covering an area of 200-900 sq m (Figs. 2:14-19), averaging 665 sq m, though some were larger, up to 1600 sq m; albeit none are identical, they all share the same basic pattern of one or several courtyards surrounded by clusters of rooms. The majority of courtyards and rooms are circular, while some are square or rectangular. Site 9 breaks the pattern by having one row of five square rooms with a courtyard at each end (Fig. 2:20). At a later stage (EB IV), a dwelling unit consisting of a circular courtyard and circular rooms was built attached to and on top of the earlier southern courtyard. Most sites of this group are suited to one extended family, though the largest of this group may have contained up to four (Fig. 2:21). Ten of these sites were excavated (Hadashot Archaeologiot 54-55,1980:35-49). Agricultural flint tools (see below) and ovi-caprine bones were discovered in all of them (Horwitz et al. in preparation); some also contained dung deposits (Sites 7, 9, 124/IV)11. Evidently, herding and agriculture were elements of the inhabitants’ economy (see below).

**Large sites:** This group comprises only three sites, each covering 3300-4500 sq m, characterized by a scatter of single or small clusters of rooms, with almost no courtyards. It is difficult to discern the precise plan of these sites since they were all damaged by later Nabataean building activity. In one only, a fair proportion of the rooms could be identified, at least 23, with one courtyard.12

**Corrals:** In addition to the built dwelling sites, there were 32 animal pens. They are characterized by broad

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10. In the eastern desert of Jordan, in Wadi Jilat and Wadi Ruweshid, the emergence of herding was dated around 6000 B.C. (McCartney 1992; Martin et al., in Garrard et al. 1994, 1996). The site of Dhuweileh, in the same area, was considered as having the earliest known built courtyard, dated by 14C to the early 6th millennium B.C. in connection with the emergence of herding (Betts 1988). However, the final publication demonstrates that no domesticated ovi-caprine bones were recovered in the site (Martin in Betts et al. 1998:159-184). For further discussions on the emergence of grazing in the Near East in general and in the desert see Garrard 1996, 1998; Horwitz et al. 2000; Martin 2000, Rosen 2002.

11. Only part of the faunal remains, from five of the excavated sites, were analyzed by Horwitz. In all, ovi-caprine bones predominated, while hunted animals were almost solely hares. In four of the five sites, some sheep bones were identified, indicating that climatic, floral and water conditions allowed sheep grazing, not only goats. The discovery of a small piece of painted wool from an EB I tomb at Ma’aleh Shaharut (Avner 1986), may be related to the find of sheep bones.
courtyards surrounded by stone walls, with the remains of a few adjacent rooms or huts. This group is divided into two subtypes. One is built on low ground (Fig. 2:22), the other on a slope, beneath a cliff with a rock shelter (Fig. 2:23). The animal pens each cover an area of 80-750 sq m, most being located in the wadis east of the valley (see Fig. 2:2).

**Miscellanies:** This group contains only two sites. One comprises eight circular rooms arranged in a circle of 26 m in diameter, with a *tumulus* tomb inside (Fig. 5:181). The other has a somewhat similar ground plan, six rooms and two *tumuli* tombs arranged in a circle 36 m in diameter, while the perimeter is marked by a stone wall. It is not clear as yet whether this type of site, which is common in the Negev and eastern Sinai, should be considered as habitations. They will be mentioned again in Ch. 5.

The general nature of the architecture and stratigraphy will be addressed below.

**B. Finds in the 5th-3rd Millennia Sites**

None of the excavated sites exhibited any sign of violent destruction; they were all abandoned peacefully. Therefore, the amount of artifacts is generally expected to be low in comparison to sites that have suffered destruction. Nevertheless, the ‘Uvda sites were quite rich with finds. Although no quantitative, comparative analysis was made, a clear, consistent pattern emerged during the survey showing the ‘Uvda sites were much more abundant in surface finds (mainly flint, pottery sherds and grinding stones) than their counterparts in the surrounding desert. Excavations also yielded ample finds, but almost no excavated sites in the southern Negev can be compared with those of ‘Uvda Valley.\(^\text{13}\)

In this section only the principal types of finds, directly connected to economy, will be addressed. Since most of the excavated finds did not undergo full analysis or preparation for publication, only a limited description can be given.

1. **Pottery**

Already at the beginning of the survey it was found that the sites in the valley were much richer in pottery sherds than similar sites in the southern Negev in general, and this impression was confirmed during the excavations. Following the excavation, however, only limited attempts were made for pottery reconstruction.

Two related types of pottery are most common in all surveyed and excavated sites, the “hole-mouth cooking pot” and the “hole-mouth jar”. The first is globular in shape, and the second is ovoid, with a flat base. For the sake of illustration, Fig. 2:29 shows complete vessels of these types from ‘Arad. Both types are handmade and share the same form of rims. Many of the rims are thickened (Fig. 2:24, 25) as mainly known from EB sites of the south (e.g. Amiran *et al.* 1979, Pls. 43-54), but less noticed are non-thickened rims (Fig. 2:24, Nos.1-5), similar in repertoire of shapes to those found in Late Neolithic, Chalcolithic and EB IV sites. The petrography of the two differ (Table 3). The clay and temper of the cooking pots are a magmatic composition, termed the ”Arkose group”. They contain no carbonates, and therefore, can only have originated from the wadis of southern Sinai. The jars are made of magmatic clay with some carbonates, but the temper contains fossil fragments representing sedimentary rocks. This group may have originated from a much larger geographical area, including the ‘Araba Valley (Amiram *et al.* 1973; Glass in Amiran 1978:50; Porat 1989).

Although no statistics have been prepared from the excavated sites, the impression is that in ‘Uvda Valley the hole-mouth jars and cooking pots comprise more than 95% of the pottery. Alongside and associated with them, other types are occasionally found: Late Neolithic sherds of the Wadi Raba culture (Fig. 2:25, No. 4), Chalcolithic and EB I pottery (Figs. 2:26, 27), “Aradian” sherds, and EB IV- “Southern Family” pottery (Fig. 2:28). Due to the petrographic composition of the hole-mouth vessels, and their predominance in ‘Uvda Valley (as well as in the Negev and Sinai in general), they can be safely considered to be the local pottery of the desert population. In the Negev survey, hole-mouth jars and cooking pots were dated almost exclusively as EB II (ca. 3000-2500 B.C.), however, a closer examination reveals that their time span was much longer (see Ch. 8).

The amount of pottery in the ‘Uvda Valley sites is much lower than in Chalcolithic sites in the Be’er Sheva’ Valley, or in EB ‘Arad, but contrasts the scarcity in southern Negev sites. This may indicate that the inhabitants possessed more vessels for storage and cooking than their neighbors. It also suggests a longer duration of presence in the sites, giving more opportunities for vessel breakage.

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\(^{12}\) Sites of the third type are somewhat similar to several large sites in the Negev Highlands, considered as central settlements: ‘Ein Ziq, Masha’bei Sadeh, Be’er Resisim and Nahal Nizzana (Cohen & Dever 1981; Cohen 1999:117-129, 137-188, 200-224, 267-8; Haiman 1996). No plans of the large sites in ‘Uvda Valley were prepared during the survey due to lack of means.

\(^{13}\) Only one temporary habitation site was excavated, near Giv’at Shehoret in the southern ‘Araba Valley, and just a few flint flakes were found (and two Paleolithic tools). See Avner in press 6.
2. Flint Implements

“Sickle Blades” are usually described as characterized by gloss, created by friction of the blades with microscopic silica needles stabilizing the cereal stems. Generally, several blades were connected in a row to a wood or bone handle, as exemplified by the complete Neolithic implement from Nahal Hemar (Bar-Yosef & Alon 1988:16-19, Pl. 5) and the remains of three EB II sickles from Tell Abu al-Kharaz, Jordan (Fischer 1994:132, Pl. 11).

Several hundred blades usually identified as used for sickles were found during the survey and excavations in ‘Uvda Valley. Their proportion in the flint tool assemblage was 2-2.4% in excavated sites dated as Chalcolithic-EB I, and 7.6-10.7% in sites dated as EB I-III (Rosen 1983a:138-143, 199-238). In two limited excavations near cult installations, the percentage of these blades reached 15.9% and 77% of the tool assemblages (see Ch. 4, Sites 124/IV, 124/VII, and in Tables 4 and 5). Taking the EB I-III sites alone, these percentages are surprisingly high in view of the environment, and in comparison with those of Chalcolithic and EB sites in the Negev Highlands and Beer Sheva Valley, which enjoyed a better climate: 0% in the Kvish Harif site (Rosen 1984a), 0% in Nahal Horsha (Rosen 1991:170-173), 0.5% in Ramat Matred (Haiman 1994:30), 1.2% in Nahal Mitman (Rosen 1993a:63), 2.3% in Shiqmim (Levy & Rosen 1987:288, 291) and 2.5% in ‘Arad (Schick, pers. comm.). A very high proportion of sickle blades, 24%, was found in the Chalcolithic site of Nahal Gerar, but this is considered as exceptional (Gilead 1995:146, 272, 278). The “sickle blade” percentage in ‘Uvda Valley is similar to that in Bab edh-Dhra’, 9.6%, which in the past enjoyed good water supplies from Wadi Kerak (McConaughy in Rast & Schaub 1980:53-55), and is even similar to those in fertile areas in the north, such as ‘Ein Shadud in the Jezrael Valley- 9.8% (Rosen in Braun 1985:155,166).

To date, these statistics are actually invalid throughout the Near East for several reasons: 1. Micro-wear analysis and experimental studies indicate that only long term use creates gloss, thus many sickle blades do not bear any gloss (Quintero et al. 1997:280-282, and see below). 2. Gloss may be created by several different uses, not only cutting cereal (Anderson 1994b:80). 3. Micro-wear analysis on blades with no gloss from ‘Uvda sites showed a non-cereal striation, probably created from legumes (see below). This may mean that sickle blades could have been used for cutting plants others than cereal. 4. Micro-wear analyses demonstrated that many flint blades commonly considered sickle blades were actually sledge blades used for threshing cereal (Anderson 1994a, 1998, 1999; Anderson & Chabot 2001; Chabot 2002, Ch. 5), and this is also true of glossed blades from ‘Uvda Valley (see below). Nevertheless, the very presence of many glossed blades in ‘Uvda sites is significant.

Following is a brief description and discussion of the main types:

Backed blades with a steep retouched back and one cutting edge (Fig. 2:30, No. 1). This type is characteristic of Chalcolithic sites in the Levant (Levy & Rosen, in Levy 1987:288; Gilead 1995:245-255) but continued into the Early Bronze (McConaughy, in Rast & Schaub 1980:54; Rosen 1997a:65). In ‘Uvda Valley sites the majority of backed blades did not bear any gloss, and therefore were not considered sickle blades. In Site 9, 74 non-glossed backed blades were found, 12.1% of the flint tool assemblage (Rosen 1983a:206-238). One blade was recently microscopically examined by Anderson, and despite the gloss it did not show any characteristic pattern of either harvesting or threshing.

Crescent-shaped blades (=macrolunates, Fig. 2:30, Nos. 2-6). More than 300 of these were found in ‘Uvda Valley, while only small numbers are known from other areas14. Therefore, these blades seem characteristic of the material culture of ‘Uvda. In Site 9 alone, 116 blades were found, 19% of the flint tool assemblage (Rosen 1983a:216). Only 20% of these blades had use-gloss, but, as mentioned, micro-wear analysis on non -glossed blades showed striation of non-cereal, hard stems, probably legumes, as well as indications for bone hafting (Bueller 1988:30). Surprisingly, a recent micro-wear analysis on similar blades from ‘Uvda sites by Anderson and Chabot, showed a one-direction, longitudinal striation with “comet-shaped” depressions, a clear indication of use as sledge blades (Fig. 2:59).

Canaanean blades (Fig. 2:30, No. 7) are highly standardized tools, with a trapezoid or triangular section, and usually the two long edges are active alternately. They are well known from the settled parts of the Levant, but are rare in the Negev (e.g. Rosen 1997a:58-9). Only five have been found to date in ‘Uvda Valley, and they most probably reached the area by trade. Blade 7 in Fig. 2: 30 bears a heavy gloss on both cutting edges, and one side is darker as a result of hafting with bitumen (c.f. Schick, in Amiran et al. 1978:60; Marder et al. 1995:77, 84; Anderson & Chabot 2001:266). These blades were long recognized as used for sickles (e.g. Rosen 1983c, 1997:55-58, however, recent micro-wear analyses on blades from EB sites revealed a different story. Analysis on 180 Canaananean blades from Tell ‘Atij, NE Syria, all showed use-wear typical for sledge blades and not sickles (Anderson & Chabot 2001; Chabot 2002, Ch. 3). Out of several hundred blades analyzed from some 30 sites, only one blade, from Telul eth-Taletat shows double use-wear, of both harvesting and threshing, while all others showed threshing wear only (P. Eid, pers. comm.).

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14. The Negev Highland sites (Haiman 1986:58.93; Rosen 1993a:62-63), Tuleilat Ghassul (Mallon et al. 1934, Pl. 29:14; Koeppe 1940 Pl. 110:8), and Fayum, Egypt (Currelly 1913, Pl. 19). The Hula Valley blades are exhibited in the Ma’ayan Baruch Museum; I thank Amnon Asaf, the curator, for calling my attention to these blades.
One Canaanean blade from 'Uvda, analyzed microscopically by Chabot and Anderson, also showed the typical sledge use-wear. These results do not imply that Canaanean blades were used for threshing only, as they were also discovered in three wooden sickle remains at Tell Abu Al-Kharaz, Jordan (Fischer 1994:132, Plate 11).

Until recently Canaanean blades were considered to be restricted to the EB I-III periods (Rosen 1983c, 1997a:59-60), but actually, their roots may be much earlier. Identical or very similar blades were found in a series of Chalcolithic sites: Giv’ataim (Sussman & Ben Arie 1966, Fig. 6), Azor (Perrot 1961, Fig. 43), Nahal Grar (Gilead 1995:257), Gilat (Rowan & Levy 1994, termed “Proto-Canaanean”), Tel Magass (Khalil 1992:143), Serabit el Khadem (Beit-Arie 1980, Fig. 8) and Maadi in Egypt (Rizkana & Seeher 1988 II, Pl. 76:1-7). They were even found in three Late Neolithic sites: Ashkelon (Perrot & Gopher 1996:156), Jilat 13, eastern Jordan (Garrard et al. 1994:86-87) and Tell Sabi Abyad, northern Syria (Copeland 1996, Pls 4.13:8, 4.14:5). It is not impossible that the Canaanean blades actually developed from the PPN “long blade” industry (e.g. Noy 1996).

Scrapers. (Fig. 2:30, Nos. 8-12). Several hundred scrapers were found during the survey and excavations, which were divided into two main groups. One is general scrapers, with no cortical left, and the other—“tabular” scrapers characterized by cortex on their dorsal side. Each group contains several sub-types, depending on technology, length/width proportions and type of retouch.

General scrapers form the majority; in the excavated sites they comprise 7.1%-38.2% of the tools (Table 4). Many are heavy duty, usually with a steep retouch, but some have a fine retouch (Fig. 2:30, No. 12). Others fall into a category of less standardized, ad hoc items.

Tabular scrapers comprise 2-13.5% of the flint assemblage in the excavated sites (Table 4), and are divided into several sub-types (tongue shaped, fan, rounded, etc.). Most bear semi steep retouch (Fig. 2:30, Nos. 8, 9), but more than a few are steeply retouched (Fig. 2:30, Nos. 10, 11). Incision on the cortex, a well known phenomenon from other EB sites (e.g. Schick in Amiran 1978:62, PI. 87; Greenhut 1989:64-78), are rarely found (Fig. 2:30, No. 10).

Tabular scrapers are more common in Sinai, the Negev and southern Jordan, than in the north. They were manufactured in desert regions (Ronen 1970; Rosen 1983d, 1997a:75; Fujii 1999; Quintero et al. 2002), and from here they were traded to the fertile zones of Levant, as well as to Egypt (Rizkana & Seeher 1985, 1988:27-31). In the Negev Highlands survey, much like the hole-mouth vessels, they were dated to the EB II period, but indeed they had a longer life span (see Ch. 8). A common assumption is that tabular scrapers are directly related to grazing, used for skinning animals and leather processing (e.g. Lee 1973:252), cutting meat (McConaughy 1979:69, 301-304), and possibly for shearing (Henry 1995:372). However, micro-wear analysis has shown they were also used for cutting and scraping hard and soft materials such as bone, wood and plants (Bueller 1988:30; Rizkana & Seeher 1988:29-31; Rowan & Levy 1991:131). In general, it seems that tabular scrapers did relate mainly to a herding economy.

Adzes are relatively rare in the Negev, south of the Beersheva Valley. Eighteen have been found to date in 'Uvda Valley (8 during the survey and 10 in excavated sites), and only in context of the “early phase” as termed by Rosen (1993a:144-163, 206-238), 4th millennium B.C. Most adzes were the common shape (Fig. 2:31, No. 2), but some were large and coarse (Fig. 2:31, No. 1).

Adzes were hafted so that their active edge was perpendicular or in a sharp angle to the handle’s axis; a complete Chalcolithic adze handle was found in Wadi Murbat, Judean Desert (Fig. 2:31). They served several purposes, mainly wood cutting and shaping, and soil tilling (Rosen 1997a:97, with references). Barkai (2000:49-55, 337-358) emphasized the use of both axes and adzes for wood cutting. Quoting Semenov (1976:124-133, 124-5), he suggested that adzes were only rarely used for tilling soil, and that damaged polished adzes were converted for soil tilling. Microscopic use-wear analysis on 13 polished adzes from Israel also indicated wood cutting (Barkai 2000:51).

The adzes from 'Uvda Valley differ from those in the north in several ways, mainly, their active edges are unpolished and bear obvious use-damage. Their function is illuminated by over 20 adzes found on the surface of an ancient cultivated field in Nahal Paran (see below). They are identical in shape and size, and active adzes are unpolished and damaged. Their specific location and physical condition actually indicates soil tilling, which was most probably their primary function in 'Uvda Valley as well. Similar wooden tools used for tilling are known from pre-dynastic Egypt (Fig. 2:32) and were still used in Africa until recently (Fig. 2:33). Yet, micro-wear analyses are needed to confirm the adzes' function.

Adzes are characteristic of Late Neolithic and Chalcolithic sites, and are absent from Early Bronze assemblages (Rosen 1997a:98; Barkai 2000, passim). The only safe occurrence of adzes in EB I (to my knowledge) is in Wadi

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15. For the distinction and comparison between sickle and sledge use-wear see Anderson & Chabot 2001, Tables 1, 2, and associated figures.

16. Currently, a very large scale flint industry is being studied near Al Jafr, southern Jordan, by P. Wilke and A. Quintero, covering several square kilometers and millions of flint items. The dominant tool manufactured in this area was the tabular scraper. Temporary results of this study were presented in a lecture in Boulder, Colorado, in November 2001.
Ghaza, Site M (Roshwalb 1981, Fig. 175). Possible explanations for their disappearance include replacement by copper tools at the end of the Chalcolithic period (McConaughy 1979:217; Rosen 1984b,1997a:93-97; Barkai 2000:45-49) and the emergence of the plough (see below).

The limited number of adzes in ‘Uvda Valley may be due to the soft soil (see below), cultivatable by a variety of wooden tools, as found in pre-dynastic Egypt (Fig. 2:32), but rarely preserved. Also, since the ‘Uvda Valley is less than a one day walk from Timna Valley, it is possible that copper adzes replaced flint ones during the Chalcolithic. Presently metal adzes have not been found in the excavation sites, probably due to the limited scale of excavations, the fact that the sites were abandoned peacefully, and to the repeated remelting of the valuable metal.

An additional type of flint tool will be described below.

3. Stone Tools

**Grinding Stones.** More than 400 upper and lower grinding stones were collected during the survey and excavations, some very worn or broken. The majority were of exceptionally hard sandstone, others were limestone, flint and granite. The stones are various sizes (the lower stones- 24-46 cm long) and two basic shapes, rectangular and oval (Fig. 2:35, Nos. 1, 2). These forms were also distinguished in southern Sinai (Beit-Arieh 1977:126) and in Arabia (Zarins et al. 1981:20). In several cases, pairs of upper grinding stones were found *in situ* on top of the lower ones (Fig. 2:34). The large number of grinding stones in the valley's sites further emphasizes the importance of agriculture in the economy of the population.

**Stone Hoes** (Fig. 2:36). Only two were found during the survey; they are made of hard limestone slabs, 19 and 22 cm long, and have a biconical perforation in the center. Parallels are known from Tuleilat Ghassul (Mallon et al. 1934:70, Fig. 25, Pl.38:2; North 1961 Pl. 11; Lee 1973:273-275) and from Chalcolithic sites in the Golan Heights (Epstein 1998:236, Pl.42-43). Also, a few stone ards from Syria are similar in size and shape, and are also perforated (Steensberg 1964:133). Since these hoes are so different from adzes, it is suggested that they were not used for tilling soil, but for the preparation and maintenance of water channels and earth embankments (see below).

**Ard-Shares** (Fig. 2:37). The distinction between an ard and plough is that the ard only opens a furrow in the soil, while the plough also turns the soil over (Glob 1951:109). Both were dragged by animals, rarely by man (Steensberg 1964).

Two specimens of this implement were found in ‘Uvda Valley. They are similar in shape and workmanship to the adze, but are much larger and made of hard limestone. One tip was found in Site 96/III next to a flint workshop in an occupation level dated to the Chalcolithic-EB I periods (see below). It is 28 cm long and weighs 2.6 kg., the active edge was formed by transversal flaking but it bears no evidence of use-wear. The other was found in Site 124/IV incorporated in stone Wall 8, dated to the 4th millennium B.C. (see Ch. 4, Fig. 4:48). It is 32 cm long, weighs 2.8 kg, and bears clear use marks on the narrower end. Based on ample parallels worldwide, these tools are identified as ard shares. Similar ones made of limestone, flint and metamorphic rocks, were found in northern Europe (Glob 1951; Lang 1999), England (Rees 1979), the Sahara Desert (Hugot 1968; Rees 1979; Milburn & Rees 1984; Milburn 1989, and see Fig. 2:37, No. 3), Egypt (Hartmann 1923:79), India (Mackay & Litt 1938, Pl. 106:56) and Mongolia (Licent & DeChardin 1925). From Scotland alone 452 ard shares were meticulously studied, most bear clear use-wear as a result of ploughing. The average length (of different types) is 19.2 - 37.3 cm, the average width is 6.8 - 8.3 cm, and based on striation, they penetrated the soil to a depth of up to 10 cm, at an angle of 28.30 - 32.30 (Rees 1979, Tables 1-3).

The invention of the ard/plough in the Near East and in Europe was dated to the mid 4th millennium B.C. based on accumulated circumstantial evidence (Sherratt 1981:261-272). The stone ard-shares from the Sahara and Mongolia were found on the surface in association with “Neolithic” artifacts, a period that ended in both areas ca. 2000 B.C. The earliest ards from Scotland are also dated ca. 2000 B.C., while all others are of later dates. The ard-shares from ‘Uvda Valley are dated to the Chalcolithic-EB I (4500-3000 B.C.), and therefore are the earliest archaeological relics of a ard/plough known thus far.18

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17. The grinding stones were examined by T. Weissbrod, Israel Geological Survey, Jerusalem, who concluded that their raw material was exceptionally dense and hard. In his opinion, in order to locate such sandstone, a very intimate knowledge of the area was required. It is possible this kind of knowledge was acquired during copper mining in Timna’ and other ‘Araba Valley sites, where mines penetrated the sandstone.

18. I’m grateful to V. Lang for handing me his article (1999) on ard-shares from Estonia, with references to the ards’ studies from northern Europe and England.
4. Botanical Remains

Botanical remains in archaeological sites are usually found charred, otherwise they rarely survive (cf. Hopf, in Amiran et al. 1978:64). Since the excavated sites in ‘Uvda Valley showed no evidence of conflagration or other violent destruction, the chance of detecting vegetation remains was low. To date, only limited attempts were made to locate microscopic remains. Nevertheless, two excavated sites did provide botanical remains which have been analyzed by M. Kislev. Excavation of a Chalcolithic-EB threshing floor (see below) rendered one olive pit (Fig. 2:38, No. 1), 16 cereal grains and other parts, including cultivated barley (Hordeum vulgare, Fig. 2:38, No. 2), six-rowed barley (H. vulgare hexastichum) and small grained wheat (Triticum parvicaucum). The excavation of a tomb in a rock shelter of the same periods (Avner 1986) revealed 88 remains of several cultivated cereals: two-rowed barley (H. v. distichum, Fig. 2:38, No. 3, 4), six-rowed barley (H. v. hexastichum, Fig. 2:38, No. 5), cultivated barley (H. vulgare, Fig. 2:38, No. 6), cultivated wheat (Triticum dicoccum, Fig. 2:36, No. 7), naked barley (H. v. nudum), and small grained wheat (T. parvicaucum). In addition to these, recent analyses on soil samples from Site 96 (by P. Anderson, B. Tay May and L. Cummings) demonstrated ample cereal pollen and cereal phytolith (see below).

Based on these limited finds, it seems that barley was dominant among the cereals, while wheat was of only secondary importance. This situation was not unique to ‘Uvda Valley; it was also found in ‘Arad (Hopf, in Amiran et al. 1978:66-67), in 3rd millennium Mesopotamia (Jacobsen 1982:14-31), and in the Near East in general (Harlan 1967:201). At the beginning of the 20th century, the Bedouin of the Beersheva district still sowed barley on 90% of their cultivated area (Al ’Aref 1936:157).

The find of the olive pit is interesting in light of additional pits recently discovered during excavations of two “desert kites” near Eilat. In one, they were found in association with Chalcolithic pottery sherds, and in the other with Chalcolithic-EB I microlunates (Holzer & Avner 2000, and in press)\(^{20}\). Intensive utilization of olives for oil production had begun by the mid 5th millennium B.C. (Galili & Shavit 1995; Kislev 1995), while domestication occurred during the Chalcolithic (Neef 1990), or only the EB I (Liphschitz et al. 1996; Liphschitz & Bonani 2000; van den Brink et al. 2001). Olive horticulture and oil production greatly expanded during the Chalcolithic period (Baruch 1986; Epstein 1993). The olive pits from ‘Uvda Valley and the Eilat area could have arrived through trade. However, during the Nabataean period, olive horticulture and oil production did take place in the ‘Arabah Valley (Cohen 1987), in a climatic regime similar to that of ‘Uvda Valley and the southern ‘Arabah. Therefore, it is not improbale that olives were grown in ‘Uvda Valley, at least in past climatic conditions (see Ch. 7). Moreover, several of the ‘Uvda Valley sites contained installations with anvils, hammer stones, mortars and basins (Fig. 2:39), which may have been used for household oil production\(^{21}\). These sites were dated from the second half of the 4th millennium and early 3rd millennium (Table 1:22, 23). For possible indications of other crop species, see below.

5. Additional Indications of Agriculture

Silos. Well-built installations paved with flagstones were found in two of the excavated sites (Fig. 2:12, 40), while similar, unpaved installations were uncovered in most others, usually in the corners of rooms.

Parallels for the paved installations are known from other Late Neolithic, Chalcolithic and EB sites: es-Sayyeh, Jordan (Kafafi et al. 1999), Tuleilat Ghashoul (Koeppl 1940, Pl. 13), ‘Arad (Amiran et al. 1978:28, 32, 33, 37), Kh. et-Tel (Callaway 1980:189), Tel Dalit (Gophna 1997:Fig. 21), Kh. et-Tuwal in the Bet She’an Valley (Eisenberg 1998) and in Tel Te’o (Eisenberg et al. 2001:38). Based on these parallels, there is no difficulty in interpreting the installations in ‘Uvda Valley as silos. The main purpose was to protect the grains from moisture and prevent rodents and insects from penetrating from below. Modern experiments indicate that properly built ancient types of silos allow grain storage for numerous years (Currid 1985:107; Currid & Navon 1989). In the dry weather of ‘Uvda Valley, long term storage of grains can certainly be imagined. Although no remains of grain were recovered from the silos, crop-related objects were found in several: two Canaanite sickle blades in the paved silo of Site 124/IV (Fig. 2:30, No. 7); a pair of grinding stones in the paved silo of Site 16 (Yogev, unpublished); and two pairs and a trio of grinding stones in three different silos in Site 96. In light of similar discoveries from the Near East\(^ {21}\), these finds may be interpreted as caches of...
symbolic purposes. Based on ancient Egyptian and Mesopotamian artistic presentations (Wreszinski 1923, Taf. 63; Moortgat 1940, No. 775; Currid 1985:Figs. 2-5,) and ethnographic examples, the silo can be reconstructed as a domed clay container, two meters high or more, with an opening at the top for filling and a lower opening for the daily extraction of grains. The estimated volume of the circular silo of Site 16 is ca. 6000 L., i.e. 5 tons of grains, which is sufficient for the annual consumption of 30 people (see below).

The items described to this point, stone and flint tools in large numbers, plus the botanical remains and silos, present an exceptional picture when examined in light of the environment and in comparison to other contemporary sites in the Negev and Sinai. Together they attest to the agricultural economy of the ‘Uvda Valley population, but these are not the only indicators.

6. Indications for Grazing

Several indications for grazing were mentioned before: corrals, tent camps, layers of animal dung in courtyards and possibly the frequent occurrences of tabular scrapers. In addition, the faunal remains yield important support. Ovi-caprine bones were found in all excavated 6th-3rd millennia sites, unfortunately, usually in a poor state of preservation. The bones from five sites were analyzed by Horwitz (Horwitz et al. in preparation). In all, the ovi-caprine bones predominated, while hunted animals were very rare, and almost totally restricted to hares. In four of the five sites, some sheep bones were identified, indicating that climate, floral and water conditions allowed sheep grazing, not only goats. Despite the arid environment, the surrounding vegetation offered quite a high grazing capacity (Figs. 2:4, 70, 71, 74, Notes 2 and 9, and see below).

An installation which relates to grazing is the predator traps. Two types were recognized in the valley’s survey, large and small. Six large traps were discovered, 2-3 m long, two were built by Bedouin during the last centuries, but four are ancient. Their dates can be deducted from flint tools and some pottery found next to them, from their proximity to ancient habitation sites with corrals, and the uniform patination on the stones. Traps of this type are well known in Sinai and in the surrounding deserts (Levi 1977; Tillner 1981:15); they were usually related to trapping leopards, but other predators could have been captured as well (Jarvis 1938:151-2). One trap excavated in ‘Uvda revealed a well made pavement, similar to that found in silos. The pavement prevented the trapped animal from digging and escaping. Thirteen small traps were also found, most probably aimed at small predators such as desert cats and foxes. All small traps were ancient, with the same indications as the former type, and were not recognizable as traps to the Bedouin of the Negev or Sinai when questioned. Predators were not hunted for their meat, but for the purpose of protecting the herds. The installations were considered to be a Bedouin invention of the last centuries (see references above), but the traps from ‘Uvda (and others), demonstrate that their innovation should be attributed to the early shepherds of the 5th-4th millennium B.C.

Another find connected with grazing is a small piece of sheep wool found in an EB I tomb at Ma’aleh Shaharut (Avner 1986, and here Fig. 10:16). It is 12x14 mm and dyed with red and yellow. Although it could have been imported to ‘Uvda from elsewhere, it may have been made locally since sheep bones were identified in the ‘Uvda faunal remains. The earliest non-direct indication for utilization of sheep for milk and wool is based on the survivorship pattern of the animals as studied from excavated bones. It is dated between 5000 and 3000 B.C. (Davis 1987:157-160) or during the 4th millennium B.C. (Grigson 2000:25-6). The earliest real find of wool presently known is from central Europe, dated ca. 1900 B.C. (Sherratt 1981:282-3; Davis 1987:161-2). Hence, the small piece of wool from the tomb at Ma’aleh Shaharut may be the earliest find of its kind in the Near East and Europe, but this must still be confirmed by an AMS 14C dating. Although sheep were raised in the valley (see above), it is expected that goats predominated. As will be discussed below, the herd density in ‘Uvda was probably quite high, but grazing was still secondary in comparison to its importance in the Negev Highlands, and second to the agriculture of the valley.

I'm grateful to J.P. Gregoire for the information and reference.

In a conference in Antibes, October 2002, P. Anderson presented several photographs of present-day household silos in Syrian villages, and J. P. Gregoire presented ample ancient artistic Mesopotamian examples. I thank Gregoire for the references to these, of which only one seal impression is mentioned here.

I thank A. Scheffer and A. Gurski for the identification of the fabric as wool.
C. Threshing Floors

1. Identification of the Installations

During the survey, 32 circular installations were recorded on the eastern side of the valley, 8-17 m in diameter. Twenty installations were cut into the rock surface to depths of 30-80 cm (Fig. 2:41), while 12 were circles of beaten earth (Fig. 2:42). Pottery sherds and flint implements of the 4th-3rd millennia B.C., as well as of later periods, were collected in and around them. The interpretation of these installations as threshing floors (Avner 1979, 1982a,b) initially faced objections, due to the absence of known archaeological parallels at the time. Over time, however, more conclusive evidence was collected. Presented first are a few ethnographic arguments:

1. During a field trip with Haiwat Bedouin (December 29, 1979), who cultivated ‘Uvda Valley until the mid 20th century (see below), they confidently identified these installations as threshing floors. They claimed that their fathers had built them, and explained in detail the successive stages of threshing barley and wheat.

2. Near Borot Lotz, in the Negev Highlands, similar installations were observed adjacent to agricultural terraces (by Y. Porat, and later surveyed by Haiman 1999a:66). During my own visit to the site, April 1980, one of these was found covered by a dense growth of barley, the result of seeds remaining from the previous Bedouin threshing season. From around this threshing floor I collected flint implements and pottery sherds of several periods, beginning with the 4th millennium B.C. Another threshing floor excavated nearby (Avner 1981) revealed a similar picture.

3. Small circular installations, about two meters in diameter, were observed adjacent to all threshing floors in ‘Uvda (Figs. 2:42, 48, 50). Similar shallow circular installations were also found near threshing floors in Nahal Yaham, southern Negev (Fig. 2:43), and in the Be’er Sheva Valley, used by Bedouin until the mid 20th century. In these, barley hay was found (Fig. 2:44), indicating their use as silos. Similar to those of the Bedouin, the ancient silos were most probably used for storing clean grain during the threshing season, prior to being transferred to silos in the habitation sites.

4. In 1979-80 I examined 38 beaten-earth threshing floors in the northwestern Negev and Be’er Sheva Valley. Some were still used by Bedouin (Fig. 2:45), but they all yielded ancient pottery and flint. Similarly, M. Haiman encountered a Bedouin threshing floor in use in the western Negev Highlands (Fig. 2:46), and later collected ancient pottery and flint scattered around.

As described above, some threshing floors were beaten earth circles, sometimes scarcely visible. Probably, many more of this type were prepared on the cultivated fields which left no remains. Therefore, their original number could be far greater. Even the existing concentration of ancient threshing floors in ‘Uvda Valley is outstanding; 29 of 32 were built on an area of 0.5x2.5 km along the eastern side of the valley (Fig. 2:47). Indeed, this is the largest concentration known to date in Israel and in neighboring countries.

2. Excavation of a Threshing Floor

The aerial photograph of Site 96, in the mouth of Nahal Yitro (Fig. 2:48), showed intriguing details, particularly a light-colored strip stretching north-south, which included the two rock-cut threshing floors. A reexamination of the site revealed that the upper layer of weathered rock had been removed along this strip, while the circular threshing floors seemed to be cut into this cleared area at a later time. This was confirmed during the first excavation of the northern threshing floor (Avner 1982d). Flint and pottery generally indicated 5th-3rd millennia B.C., with repeated use through several later periods, up to the 20th century. In the summer of 2002 I renewed the excavation in the site in an attempt to better define the stratigraphic sequence and date the various stages. As a result, the present description of the site’s stratigraphy is more complex than that previously published (Avner 1982d, 1990, 1998).

The excavation concentrated first in the area east of the northern threshing floor, which was covered by a stone dump. It was arbitrarily divided to several loci (7, 14, 15, 16), but here it will be referred to as Locus 7. The loci were also divided vertically, so that L. 7a is the upper stone dump layer, and L. 7b is an underlying living level which covered the cleared rock surface (Fig. 2:52). Following are the stages as found at the northern floor, from early to late:

In the first stage, the upper layer of weathered rock was removed from the surface and a straight rock floor was reached on an area of ca.18 x 42 m. The removed rocks were used for building a low wall surrounding the cleared area.

25 Forty threshing floors were published during the last years from the Negev Highlands (Haiman 1986:53,156,213; 1991:37,47,80,84,97,100,101,109,118,120,125,133;1993a:28,46,63,65,87,91,97,106; 1999:56,59,61,66,74; Lender 1990:105,114,115,172,191,197,202; Avni 1992:49,57,94,126,127). However, according to my own observations, the numbers of threshing floors are higher than published. In several cases, threshing floors were described as "circular structures" or "corrals" (e.g. Lender 1990:165; Avni 1992:41, 50) and in a few surveyed sites I noticed unrecorded threshing floors.
whose remains were found mainly to the east of the excavated (W. 7) threshing floor as well as to the northwest (W. 8). A vague curved line connecting the two walls marks its original contour at the north (Figs. 2:48-50, 53). The wall, termed “Shall” in the Bible (2 Sam 6:7), is ca. 30 cm high and 40-60 cm wide, built of small stone blocks. In the south, Wall 7 is cut by a later stone construction (L. 11). A curved line of small rock piles, some 10 m to the south (same figures), indicates an extension of the cleared rock, and that the full length of the cleared strip, 120 m, was actually reached in several sub-stages. Parts of the rock floor was later covered by a stone dump (see below), and were re-exposed by excavation (L. 7); the dark gray patination found on it (Fig. 2:51) indicates prolonged exposure and use, probably for several centuries. The circular silo of L. 10, which is cut by Loci 5 and 11, seems to belong to this stage, followed by the silos of L. 3 which continued in use to the later phases of the site.

In the second stage the circular structure (L. 11. Figs. 2:55, 53, 56) was built, directly on top of the cleared rock surface. It contained a stone anvil and a flagstone bench, hundreds of flint debitage pieces and several dozen tools (see below). Since large amounts of flint was also found around this structure it obviously served as a flint workshop. The stone bench was built in several layers of flagstones, added to from time to time as the living level gradually accumulated. This may mean a long period of use, as was also indicated by the finds and pottery (see below).

During the third stage, most of the area of L. 7 was covered by a thin living level, 5-7 cm thick (L. 7b, Fig. 2:52), of fine silt and sand mixed with ash, flint debitage, some tools, some pottery sherds and other finds. The accumulation of the living level indicates that part of the large cleared rock surface silo was no longer used for threshing. The silo of L. 5 was probably built at this stage.

In the forth stage, the silo of Loc. 6 was built on top of the living level and against Wall 7. The construction of the silo indicates that other parts of the rock surface continued to be used for threshing.

In the fifth stage, the two circular threshing floors were cut into the large cleared rock surface. The northern one (L. 1) measures 13x17 m and is 0.6 m deep, a depth that was reached after three separate cutting phases, each removing another rock layer in an attempt to renew the decaying rock floor. Part of the dug-out rock was used for building the Shall surrounding the threshing floor (W. 1), while the rest was dumped on top of the living level to the east (L. 7a, Fig. 2:52), also covering the silo of L. 6. A thin inclined wall (W. 2, Fig. 2:51) was built to prevent the dumped stones from falling back onto the threshing floor.

Excavation of additional features in the site will be mentioned only briefly. In the northern circular threshing floor (L. 1), about two thirds of the area was covered by wind-blown silt and sand, and was excavated. On the rock surface three hearths were found, containing only a small amount of ash, and flint debitage was found on the rock surface on the eastern part of the threshing floor, certainly originating from the adjacent flint workshop (L. 11).

Three out of four additional stone structures (Loci 20, 23, 24) were found covered by stones in a quite uniform way that seem intentional. They were probably concealed, following the last EB threshing season with the hope of returning, while later users of the threshing floors ignored them. This can be deduced from some of the artifacts found: two pairs of grinding stones in the silo of L. 3 (Fig. 2:49), a single top grinding stone in L. 9 and a trio of grinding stones in L. 22 (Fig. 2:62). They were all neatly arranged with the top stones placed on the bottom ones and covered by rocks.

The circular structures of L. 21 and L. 22, near the southern threshing floor, were initially considered as silos, but excavation revealed that L. 21 was large enough for a dwelling room (3 m inner diameter), and contained stone installations. During the site’s survey, a compact pile of 29 scraper-like tools was found between the cover stones, slightly exposed on surface, and another similar tool was uncovered during the excavation below the cover stones, 40 cm away. The adjacent L. 22 was indeed a silo (1.7 m inner diameter, in which the trio of grinding stones was found. Loci 23 and 24, ca. 2.5 m inner diameter, could be either silos or dwelling rooms. In both pairs of structures, the cleared rock face served as a floor, and contained flint, pottery sherds and other finds.

3. Finds and Dating

Flint was the dominant find, over 4000 pieces were collected in both seasons of the dig, in addition to the thousands still laying on surface. Table 5 includes 2375 flint items from the first excavation only, collected from a limited excavated area in and around the flint workshop (L. 11) and analyzed by S. Rosen. The large majority is debitage, 96.2% of the total, and among the 90 tools, scraper-like implements are dominant (43%) while smaller blades of several types comprised 28.9%.

The scraper-like tools form a distinctive group. Although a few were found in excavated habitation sites in the valley, they were particularly associated with the threshing floors, primarily in ‘Uvda. I also found some in threshing floors in the Negev Highlands. In Table 5 they were divided into three morphological groups according to technical
criteria: steep, flat and tabular. The pile of 29 tools from L. 21 presents similar and additional types. Some are heavy duty, (Figs. 2:57, Nos. 1.2, 6-8), others are elongated (Fig. 2:57, Nos. 3-5). Some specimens of both are transversal, similar to fan scrapers, but thicker (Fig. 2:57, Nos. 6-8). Eighteen of the 29 tools retain the cortex on the dorsal side (Fig. 2:57, Nos. 4-8).

The persistent occurrence of these tools around the threshing floors raises the question whether they were used for threshing. Indeed, ample ethnographic material, mainly from Cyprus, Turkey and the Balkans, demonstrates that flint blades were widely used for sledges until a few decades ago (Fig. 2:58), and have also been identified in archaeological contexts in 3rd millennium Mesopotamian sites (Adams 1975). More so, an on-going study of P. Anderson, J. Chabot and others, based on micro-wear analyses of ancient flint tools, ethnographic and experimental flint, phytoliths and pollen analyses, had already contributed much new information on the use of flint for sledge blades.

A number of tools from ‘Uvda are currently also under micro-wear study by Anderson and Chabot. At this stage, three types of flint tools were identified as bearing threshing use-wear. One is the glossed macrolunates, initially considered sickle blades, which now show longitudinal striation, additional striae in other directions, “comet-shaped” shallow depressions created by a single direction, horizontal motion, and larger shallow depressions from plucked out flint grains, clear indications of threshing wear (Fig. 2:57, and see Note 17). Second is a glossed Canaanean blade (Fig. 2:30, No. 7) with the same pattern of micro-wear, and the third is the scraper-like tools (see below). These results coordinate with additional findings, of ample cereal pollen in soil samples from the site (analyzed by B. Tay May, and by L. Cummings), and cereal phytoliths with straight cuts perpendicular to their fibres (Fig. 2:58). The latter again indicates threshing by a sledge equipped with longitudinal blades.

The identification of the scraper-like tools as sledge blades is still somewhat problematic since they lack use-gloss. Comparison with ancient and ethnographic sledge blades reveal similarities and differences. The ‘Uvda tools represent a flake industry, where flakes account for 18.6% of the debitage, in contrast to only 1.3% blades, and most tools were also made on flakes. This trait is similar to that of ethnographic sledge blades (e.g. Ataman 1999:218). On the other hand, the ‘Uvda “scrapers” are larger than the ethnographic blades (averaging 9 and 5 cm long respectively), a characteristic which was also noticed on ancient blades from Syria (Anderson 1994a:311, 316; 1998:154). Cortex found on tools from both ‘Uvda and Uruk is rare on modern blades, and retouch, which is found on all specimens from ‘Uvda and Uruk, is also rare on modern blades (but see Whittaker 1996:114).

Previous micro-wear analysis of “scrapers” from Site 96 by Bueller (1988:32, Pl. 7, 8) indicated non-glossed vegetational wear, created by hard stemmed, non-cereal plants, probably legumes. On their back he found indications of friction with wood as well as leather immersed with ochre. These traces recall the instructions in the Sumerian agricultural document, the “Georgica” (late 3rd millennium B.C.): “When you thresh, tie leather thongs around the teeth of your threshing sled and have them smeared with bitumen....” (Jacobsen 1982:60). Eight “scrapers” microscopically analyzed to date by Anderson & Chabot showed minor, inconsistent patterns of wear due to two factors. One is the coarse-grained nature of the flint (local to ‘Uvda and to the site), and second is patination. Two of the tools showed longitudinal striation, probably of non-cereal plants, and another showed striations on the very edge, but perpendicular to the long axis. Experimental work on the coarse flint is planned in an attempt to better understand the type of wear discovered.

Based on these findings and on the persistence of the scraper-like blades in threshing floors and the micro-wear patterns, it may be suggested that the sledge equipped with smaller blades was used for threshing cereal, while the sledge with the larger “scrapers” was used for threshing non-cereal crops. The best candidate for the latter is the chickpea (Cicer aritinum), which was already domesticated in the Early Neolithic period (Zohary & Hopf 1993:101-106), its threshing is hinted at in the Bible (Isaiah 30:24) and it was still being threshed in traditional agriculture until the mid 20th century (Avitsur 1984:3; Butler 1999:36). Logically, chickpea threshing does require larger sledge blades than those used for cereals. To date, however, no remains of chickpea have been found in ‘Uvda.

It should be noted that most sledges in recent traditional agriculture in Israel were equipped with basalt “teeth” (not blades), but in areas lacking basalt, flint blades were used (Avitsur 1965:20, 1966:64, and here Fig. 2:58).

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26. Hornell 1930; Crawford 1935; Bordaz 1969; Whallon 1978; Cheetham 1982; Pearlman 1984, 1987; Fox & Pearlman 1987; Skakun 1999; Ataman 1999. In 1990 Prof. A. Ronen, Haifa University, documented on video a craftsman in Nicosia preparing this type of sledge blades for sale. I am grateful to Ronen for showing me the film. During my own visit to Cyprus in 1993, I was told by Pearlman that the craftsman had died. Recently, J. Whittaker interviewed retired flint knappers in Cyprus (Whittaker 1996, 1999).


28. When Bueller studied the flint in 1985, he did not know the proposed interpretation of these tools, and did not know the Sumerian text. Bitumen remains, as mentioned in the text, were often found on ancient sledge blades from Syria (e.g. Anderson & Chabot 2001).

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The Sumerian text can be interpreted differently and it was used by Anderson’s team to reconstruct an experimental sledge. It is composed of several wooden staves 4 cm in diameter, tied together by leather laces to form a board. The flint blades are inserted with bitumen into the v-shaped channels created between each two staves. The sledge proved to be solid and efficient (Anderson 1999:141; Anderson & Chabot 2001:266-270). However, no similar sledge is known (to me) in ethnographic material; those of the Near East and southern Europe are made of wooden boards with inserts of flint blades or basalt teeth.
complete sledge of this type from the Judean Hills is on exhibit at the Kfar ‘Etzion Field School. In addition, flint ‘teeth’ were found around several threshing floors in ‘Uvda Valley, including the excavated one (Fig. 2:61), similar in size and shape to basalt teeth, some still bearing use-gloss. Their low numbers indicate they were probably of secondary importance to the sledge blades.

Stone tools included the ard share discussed above (Figs. 2:37, No. 1) and the grinding stones (two pairs, one trio and a single top stone, Fig. 2:62). The latter are all made of hard sandstone and most are a low level of workmanship when compared to others uncovered in habitation sites. Several chunks of sandstone found around L. 11, and the unused ard share, indicates that stones tools were also manufactured in the flint workshop.

Pottery sherds from the site were of hole-mouth jars (Fig. 2:63), dated to the 5th-3rd millennia B.C. (see Ch. 8), and were found in every excavated locus. Two loci (L. 4, L. 11a) also yielded a few EB IV body sherds of the ‘southern family’ jars, but this period may be under-represented in the site due to the difficulty in distinguishing between hole-mouth sherds of various periods. Pottery sherds of later periods (Late Bronze-Early Iron Age, Nabatean, Early Islamic and recent Ghaza ware) were collected from surface, but not found in the dig.

Other finds included the end of a wooden tool, 95x28x16 mm, from the living level of L. 7a, identified as tamarisk by N. Liphchitz (Figs. 2:64); an iron pick found in the threshing floor (L. 1); Red Sea shells, ostrich egg shells and some caprin bones.

Dating of the various stages in the threshing floor is not yet conclusive, since both flint and pottery from the site had extended life-times, the 5th-3rd millennia B.C. or even longer (see Ch. 8). Radiometric dating of charcoal from the silo of L. 3 was ca. 2800 B.C. (Table 1:19), and new 14C dates of the living level of L. 7b are now anticipated. Presently, it seems that the site was established during the 5th-4th millennia B.C., continued uninterruptedly through the 3rd millennium into the EB IV, and was reused in later periods.

4. Site 96 and Development of the Threshing Floors

The finds from the excavated threshing floor, and identification of the various stages, allow a suggested course of development in the site:

Some threshing became necessary since the early collection of wild cereal, mainly for separating the grain from the glumes. Cereal exploitation is already documented in the Levant some 19,000 years ago (Kislev et al. 1992; Zohary & Hopf 1993:62). The domestication process brought a continual selection of individual stem mutants with stronger rachis, which minimized the loss of grain during harvesting. As a result, selected cereals demanded systematic sowing on the one hand, and efficient threshing on the other. The simplest threshing method, beating by stick, was most probably employed in the incipient stage of agriculture. It was later mentioned in the Bible (Judges 6:13, Ruth 2:17), in Egyptian texts and art (Murray 2000:524-5 with references) and actually persisted until the 20th century (Fig. 2:67). Obviously, threshing on a hard, straight rock floor was more efficient and motivated the inhabitants to invest time and energy in clearing the large area of Site 96. Since the shape and dimensions of this cleared rock surface is not compatible with the circular motion of animals, threshing by beating may be assumed, by several families laying their heaps of crops and threshing them along this work area. The dark patination on parts of this floor indicates that this work area was used for threshing.

In the second stage the flint workshop was built, partially on top of the cleared rock floor while cutting W. 7, and was followed by accumulation of the living level to its north. The necessity of a flint workshop next to the threshing floor, with the reduction of the required threshing area, can be best explained by the emergence of the sledge. This suggestion is well supported by the flint sledge blades found at the bottom of the flint workshop (L. 1b) and the sledge-cut phytoliths in the living level of L. 7b. The construction of the silo of L. 6 also indicates that part of the cleared rock surface continued to be used for threshing.

In the next stage the circular threshing floor was cut into the rock. Its shape was undoubtedly suited for the circular motion of animals, or more specifically, by an animal-drawn sledge. If this sequence of events is correct, the appearance of the circular threshing floor followed that of the sledge.
The appearance of sledge was associated with harnessing animals for labor, an important innovation for the human race. According to Sherratt (1981), this was one element of the “Secondary Product Revolution”, which occurred during the 4th millennium B.C. and included four additional elements: processing milk into storable products, the beginning of wool use for weaving, the domestication of fruit trees and the invention of the plough, associated with harnessing oxen or asses for labor. Others suggested that evolution of these innovations was a prolonged process, 5000-3000 B.C. (Chapman 1983; Davis 1987:168; Grigson 2000). Now, based on the evolution of the threshing floor, as studied in ‘Uvda Valley, we may add the appearance of the animal-drawn sledge to this revolution. Interestingly, the same site (96) yielded an early beginning of the threshing sledge and one of the two earliest finds of stone ard shares in the Near East, both from ‘Uvda (Figs. 2:37, No. 1).

In this regard a notable observation was made by Aivtisur (1966:52-88; 1984:36-39), that the production rate, measured by clean grains per person per one working day, is equal in threshing by beating and sledge, 70-100 kg. Therefore, the question arises, what was the advantage of the sledge and what motivated its invention? The answer is that the sledge had dual functions. Besides separation of the grains, it simultaneously chopped the straw to hay, which was used as fodder for animals, as well as a temper for mud-bricks and pottery, and bedding (Avitsur, ibid; Anderson & Chabot 2001:271-2). In fact, a twofold connection was created between the sledge and working animals. Harnessing animals for labor enabled the invention of the plough, the sledge and the circular threshing floor, while the use of animals for labor greatly increased the need for hay as fodder.

As mentioned above, the dating of the various stages in the ‘Uvda threshing floor is not yet conclusive. For Mesopotamia, Adams (1975) proposed the appearance of the sledge during the 3rd millennium B.C., and a sledge-type micro-wear was identified on hundreds of flint blades from a series of 3rd millennium sites in Iraq and Syria (see above and Note 17). In ‘Uvda Valley, however, the sledge may have appeared already in the Chalcolithic period, as it is indicated by the flint microlunate found in both the living level and the flint workshop (see Note 19). Another clue is one Chalcolithic adze that I found in each of two threshing floors in Nahal Elot, in the Negev Highlands, (Fig. 2:68).34

Another question is the geographic distribution of the sledge. As mentioned before, sledge was mainly used in the Levant, in Turkey, the Balkan and Cyprus. All are countries with hot dry summers that enabled out-door threshing. From ancient Egypt, however, certainly a hot country and also technologically advanced, the only known threshing methods are beating (or flailing) and animal trampling (Fig. 2:69); threshing sledges were unknown before or during the Pharaonic period (Murray 2000:524-5). The desert population, on the other hand, did use the sledge as early as the 4th millennium B.C., and more so, the concentration of threshing floors in ‘Uvda Valley is the oldest and largest known to date in the Near East.

An interesting philological point unites ‘Uvda Valley with the threshing floors. The Bedouin-'Arabic name for the valley is Wadi ’Uqfi, which means a wooden pole harnessed to the animals dragging the sledge (Avitsur 1966:76, and Fig. 2:66). The word originated from the semitic root -UÔ “walk about”. The Bedouin of the Negev and Sinai, however, threshed their yields by trampling only (Figs. 2:46, 47, and see below), and when questioned, were unfamiliar with the sledge and with the source of the valley’s name. Since they could not have been the source of the geographical name, the Nabataeans could be an alternative, who also used the same threshing floors in the valley some 2000 years ago. Their language was Aramaic (e.g. Naveh 1982:9-11. 135-159) and the root “walk about” also appears in Aramaic documents (e.g. Jean & Holfijzer 1965:220). Therefore, it is possible that the origin of the valley’s name is ancient, passed on to the Bedouin as were many other geographical names. In any case, the occurrence of an agricultural geographical name in such a harsh desert environment is unexpected, but accords well with the archaeological finds.

The appearance of the sledge and circular threshing floor as studied in ‘Uvda Valley, should not be automatically applied to other regions. Another possible process was suggested by Anderson (1994a), based on micro-wear study of PPNB flint from Ali Kosh, which revealed use traces resulted from a longitudinal, one direction motion, but of a lighter instrument than the sledge. Similar wear and gloss on blades were also identified on flint blades from Can Hasan (Ataman 1999:221). These may indicate some manual threshing device equipped with flint blades as early as the 7th millennium B.C., possibly aimed at cutting straw into hay. Such manual instruments could have been the predecessor of an animal-drawn threshing sledge.

32. In previous publications (Avner 1990a, 1998) I assumed the threshing by animal trampling preceded the invention of the sledge. This is now corrected based on the results of the recent excavation in the site.

33. For harnessing animals for labor see also Epstein 1985b; Davis 1987:162-4; Ovadia 1992; Bartosiewicz et al. 1997:9-12).

34. One study suggested the appearance of the sledge already by the 6th millennium B.C. (Diamond 1975, dissertation quoted by Cheetham 1982:130), but the present knowledge on the beginning of the use of animals for labor cannot support this early date (see e.g. Davis 1987:161-168.)
D. ‘Uvda Valley Agriculture in Light of the Environment

Following the description of the agricultural evidence of the 5th-3rd millennia B.C., it becomes necessary to examine the environmental conditions which allowed an agricultural economy in this desertic area.

1. Cultivated Soil, and Water

The soil along the eastern side of ‘Uvda Valley is unusual in its physical characteristics, which bears botanical implications. Lime-sand, the rare and unique component, makes the soil light, well ventilated, easily tilled, and highly water absorbent. These characteristics are quantifiable. At a depth of 0.5 m it consists of 50-70% lime-sand, 20-40% silt and 10-14% clay. The soil is slightly alkaline (Ph 7.8-8.35), with a low level of salinity, only 0.9-2.3 millimho/cm (units of electrical conductivity). The water absorption capacity is very high, up to 39% of its volume. The clay percentage increases with depth, reaching 18-23% at a depth of 1.2 m, a situation which minimizes water loss through seepage. This fact, along with the high water content capacity, enabled excellent watering of the soil at the "efficient root-depths” for cereal, bushes, and even trees. These qualities are well demonstrated by fairly thick plant growth on the eastern side of the valley outside the wadi channels, in contrast to the rest of the southern Negev. Sand Wormwood (Artemisia monosperma) a Mediterranean plant, looks large and green even through the summer (Fig. 2:71), and White Saxaul (Haloxilon persicum) reaches 5 m high, the tallest known in the Negev and Sinai (Fig. 2:70).

In a situation of low precipitation (28 mm annual average), only floods can supply the amount of water necessary for cereals. The drainage area of ‘Uvda Valley is 400 sq km, mainly to the south, 550-892 m above sea level (Fig 2:1). Most of the surface is barren rock which absorbs a comparatively small amount of the rain water. In addition, most desert rains fall in a concentrated way (Shanan et al. 1967; Finkel & Finkel 1979; Sharon 1979), so even a small amount is often enough to create floods (Fig. 2:72). Because all wadis merge on the eastern side of the valley, this area enjoys the best flood irrigation (Fig. 2:73). Due to the very low gradient of the valley (see p. 1 and Fig 2:1) flood water flow is slow, does not wash the soil away, and is well absorbed by the soil. Following the flood, a thick growth of wild cereal appears (Fig. 2:74).

Nevertheless, the inhabitants of the valley did not rely on natural conditions alone. Observation of surface and aerial photographs reveals a system of low earth embankments perpendicular to the water channels, sometimes with one layer of rocks on top (Figs. 2:75-77). These embankments may have contributed greatly to the quality of the cultivated land. They retarded the flow of water, further increased the amount of water absorbed by the soil, prevented soil and seed erosion, increased the sedimentation of new soil enriched with organic material with each flood, and widened the irrigated strip. Another long embankment, running south-north is discernible, west of the water channels (Fig. 2:75), most probably constructed to limit the irrigated strip to approximately 500 m. This actually turned the east-west embankments into a series of “limans”. Their advantages lead to another important result, that the inhabitants were able to plough and sow the land before the first flood, not 2-3 weeks later, as practiced by the Bedouins (see below). In addition, the enrichment of the soil with organic material brought by the flood, and dung from animals grazing on the stubble, could allow cultivation year after year, with no need to lay the fields fallow.

The date of the embankments in ‘Uvda Valley was not fully clarified. However, several arguments favor early dates: 1. Studying the Bedouin agriculture (see below) showed that they did not attempt to control flood water in any way. 2. Flint and pottery of the 5th-3rd millennia B.C. predominated in every surface collection of finds near the embankment, and this is the period to which most agricultural remains belong. 3. In Nahal Paran, 40 km north of ‘Uvda Valley, I discovered the remains of an agricultural field based on rectangular limans and water conduits (Avner 1997a, 2002, and Figs. 2:78, 79). The limans are surrounded by embankments identical in technique to those of ‘Uvda Valley. The present remains cover seven hecarts, and on the surface more than 20 flint adzes were collected (Fig. 2:80), dated to the late Neolithic and Chalcolithic (see above, and for a dated LN adzes in the Negev see Forenbaher 1997, Fig. 4:9). The site, its function and date, indicate that water management and engineering already existed by the 5th-4th millennia B.C., and this could well have been the case in ‘Uvda Valley.

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35. I am grateful to Igor Mindel, from the Jewish Agency, who tested the soil during 1983-1986 and provided me with this information. The low values of electric conductivity as measured in ‘Uvda can be better appreciated when compared with the salinity tolerance of barley - 16 millimhos/cm, and wheat- 10 millimhos/cm before suffering a decrease in yield (Jacobsen 1982:15).

36. The total drainage area of Nahal Hayun, including ‘Uvda Valley, is 1116 sq km, and the annual average flood water volume in the northern end reaches 1,000,150 cu m. This is the second largest amount of flood water in the Negev, after Nahal Paran, with 2,005,000 cu m (Finkel & Finkel 1979:134).

37. Repeated cultivation of fields without fallingow or overuse of the soil is described by Marx (1988:90) in connection with Bedouin agriculture in the Be’er Sheva area, even though in this case it was not flood agriculture, and the only source of fertilization was animal dung.

38. Barkai examined the adzes from Nahal Paran, and dated them to LN-Chalcolithic in general, with no indication for preference for either (a letter of 13/5/97).

39. For a possible Chalcolithic flood irrigation method based on "micro-catchments” see Levy 1987: 55-58, 77-78.
The cultivated strip in eastern ‘Uvda Valley is 12 km long and averages 500 m wide, equal to 600 hectares (Fig. 2:2). Another plot in the south-center of the valley provides an additional 150 hectares. Remains of low stone terraces in the wadis to the east of the valley indicate another 250 hectares of cultivated fields, and embankments in Nahal Hayun, which drains the valley to the north, adds approximately 200 hectares. Altogether, these cultivated fields covered at least 1200 hectares. This brings to light a special aspect of ‘Uvda Valley. While in the Negev Highlands cultivated plots are divided into relatively small wadis, ‘Uvda Valley provides large, uninterrupted fields with high quality soil, efficiently irrigated by floods.

Besides embankments and the broad cultivated fields, the presence of small semi-circular stone terraces should be mentioned. These are built on the lower part of the slopes, consisting of one row of medium size fieldstones, up to four courses high and three meters in diameter (Fig. 2:81). They are irrigated by rain water through natural channels and were probably built for planting bushes or small fruit trees. Most plausible are vines, which were domesticated during the Chalcolithic period (Zohary & Hopf 1993:148). Vine botanical remains have not been found as yet in ‘Uvda, however, vine pollen was recently identified by L. Cummings, in soil samples from the threshing floor of Site 96, 4th-3rd millennia B.C. (to be published).

2. Drinking Water

The availability of drinking water for man and animal is critical to the existence of any settlement, especially in the desert. Five natural water sources are found around ‘Uvda Valley, within a half day walk from the heart of the settlement (Fig. 2:1), but only one, the Yotvata Oasis, supplies an unlimited amount of water (Robinson 1841:286, Musil 1908 II:183-185; Frank 1934:263; Glueck 1935:40). Nevertheless, during the survey we encountered three different methods for rain water collection and the utilization of underground water:

1. In 36 locations, series of dams were found in small wadis (Fig. 2:82). Usually only limited remains of 3-6 dams are visible, but in one site 17 dams were found in a single wadi channel. All dams are situated near dwelling sites of the 5th-3rd millennia B.C. Since these dams are generally in a poor state of preservation, one may assume that many others were totally eroded or covered. Another variant of this method was the conveyance of flood water into caves, as has been detected in two sites to date.

2. Along the cliff edges east of the valley is a series of closed depressions developed from vertical faults in the rock, and filled with marl and clay soil. These naturally collect and retain rain water. Inside or near most of these depressions, dwelling sites of the 5th-3rd millennia B.C. were built, enabling convenient utilization of the accumulated water (Fig. 2:83). In some depressions, Bedouin dug cisterns to collect and store rainwater. They used to clean them before every winter, then cover them with plants after filling, to minimize evaporation. It is highly likely that similar cisterns were also excavated in these depressions in the past.

3. In the same area east of the valley, four wells have been found to date, two of which were never completed. One was fairly well preserved, enabling study of how it functioned. The well's neck is 0.8x1.4 m, cut into a hard and cracked layer of limestone, which has a low gradient from east to west (Figs. 2:84, 85). At a depth of 1.5 m the rock changes to a soft chalk where the well widens into a bell shape, presently filled with debris. The cracks in the hard rock enable rain water to seep down, while the chalk layer stopped the seeping water, causing it to flow slowly and drip into the well. Flint and pottery collected from around the well dates it to the 5th-3rd millennia B.C., however, the well still remains moist today.

The well in ‘Uvda Valley is among the earliest dated in the Near East. The oldest known are a PPNB well at Mlyouthkia (McCartney & Peltenburg 2000:8, 10; Peltenburg et al. 2001:62-78), two wells in Haçilar, Anatolia (Mellaart 1970:35) and two wells in the submerged Neolithic village near ‘Atlit, northern Israel (Galili & Nir 1993; Galili et al. 1999). Both sites have been dated to the 6th millennium B.C. A well in the site of Abu Hof, central Israel, was dated to the Chalcolithic period (Alon 1988), as was the well in Wadi Sirhan, northern Saudi Arabia (Zarins 1979:76). This date is also suggested for the wells in ‘Uvda Valley, based on collected artifacts.

Another well was discovered by A. Shapira near Ma’aleh Shaharut (Avner 1989a). It is covered by clay soil (of the “Ora Formation”), but the fill is moist even during the summer. A few flint pieces were collected near the well, in addition to recent Ghaza ware. In May 1989, a flow of water appeared 20 m below the well, with a supply of 100 liters per hour, while another spring appeared 500 m to the south. Both are still active today. A large cult site located below the springs indicates activity during the 6th-3rd millennia B.C. The possibility of additional water sources in the valley was recently indicated by pollen analyses from ‘Uvda 96 (by B. Tay May and L. Cummings), which included Cyperus and Scyпус sps. These water plants indicate a nearby spring or springs, which no longer exist today. Sweet water molluscs (Melanopsis buccinoidea) found in Sites 16, 96 and 124/IV (Horwitz et al. in prep.) may also have originated from unknown springs.

The springs were first noticed by N. Minkowski, from the Ma’aleh Shaharut settlement. Shortly thereafter, the flow measurement was taken by A. Greenberg from the Agricultural Research Center in Yotvata.
Of the three artificial means of water collection described above, the series of dams are the most important quantitatively. An average series of dams can contain at least 100 cubic meters. If annual water consumption per capita in the past was 1 cubic meter (Rosnan, in Amiran et al. 1978:14) this amount of water could support 100 people. If we consider water loss, due to seepage and evaporation, and use for the herds, it could be estimated that a series of dams would support one extended family, ca. 25 people with their herds. If so, the series of 36 dams identified during the survey could supply water for 900 people. As stated, however, the original number of dam sites could have been much higher. If the dams became depleted, the inhabitants could have walked with their herds to one of the natural water sources every four days to water them and fill water bags.41

In general, we may assume that utilization of all water sources, natural and artificial, could support a considerable population, even through the summer.

3. Bedouin Agriculture in 'Uvda Valley

During the survey we found many indications of Bedouin agriculture from past generations, in addition to the ancient remains. Several caves contained stored agricultural equipment, such as iron sickles and hoes, iron plow tips, wooden plows and millstones (Fig. 2:86). We also found plowing marks on the surface, and hundreds of silos (Figs. 2:87, 88).

Short descriptions of Bedouin cultivating the valley were provided by several explorers. Musil, who visited the area in 1902, mentioned the valley while describing the people of 'Aqaba: “In Wadi 'Uqfi, the soil is good for cultivation and the crop is plentiful when the rain is sufficient to create floods. In this valley the citizens (of ‘Aqaba) are renting plots from the Haiwat, sowing wheat and barley and living in tents by the fields in the seasons of sowing and harvesting. After the harvest they return to ‘Aqaba with the threshed grain” (Musil 1926:85).

On December 29, 1979, I visited the valley with four Bedouin elders of the Haiwat tribe who had cultivated the land in the past, in order to learn their agricultural practices. The visit was undertaken with the assistance of anthropologist G. Stewart, who was studying the legal system of the tribe. Following is the essential information supplied by the elders:

1. Approximately 20 days after a flood, while the soil was moist but not too wet, they sowed barley and wheat by hand. Then, to cover the seeds, they plowed the soil with light wooden ploughs, pulled by donkeys or camels (cf. Marx 1967:20-22). No attempt was made to build embankments or to control the flood water.

2. Between 1939-1948, the Bedouins cultivated the valley four times, when the amount of rain was sufficient to create floods, i.e. almost every second year. However, nearly every year of sowing provided a good crop, enabling grain storage for 3 years, with enough grain reserved for sowing and even sale of part of the yield in ‘Aqaba and Al 'Arish. In addition, the tribesmen rented land to the citizens of ‘Aqaba in return for 1/3 or 1/2 of the yield. The Bedouin claimed that their yield reached 800 kg per hectare (translated from their own measurements of weight and area) and the number of people subsisting on the yield was more than 4000. Although there is some doubt as to the accuracy of these figures, there are several indications that they are not far from reality (see below). Threshing took place both on temporary threshing floors in the fields and on the ancient ones, which they claimed were made by their own fathers. Their threshing method was animals trampling (cf. Figs. 2:45, 46), and they explained in detail the various stages of work in the threshing floors.

3. All the silos excavated in the ground presently visible in the valley (Fig. 2:87) belonged to the Haiwat. Each had a capacity of 10 quntars of clean grains, which equates to three tons. The number of silos in the valley known to date is over 400, and could therefore contain a total amount of 1200 tons of grain. In addition, they had another site of silos in Nahal Girzi, 10 km north-west of the valley (Fig. 2:88).42 Moreover, only part of the yield was stored in the silos, while the rest was immediately sold or distributed in the tent camps throughout their tribal territory. If a Bedouin family of five consumed approximately 500 kg annually (see below), then the amount of grain stored after a successful season could have supported at least 2400 families. But, since this yield was to be used over a 2-3 year period, as well as for sowing, we reach an estimation of 800 families or 4000 people. This figure is four times higher than what was known about the tribe in the first half of the 20th century (Marx 1967:12). Yet, it seems that ‘Uvda Valley was indeed an important food source for the Bedouin. According to the testimony of Kibbutz Yotvata members, the Haiwat still continued to penetrate the Sinai border until as late as 1957, in attempts to cultivate the valley.

41 In Sinai, Bedouin shepherds camp and graze their herds up to 15 km from water sources, or a distance of two grazing days. In the desert of eastern Jordan, mixed herds of sheep and goats regularly cover 16-20 km a day while grazing (Lancaster & Lancaster 1991:130). The black, desert goat can survive on totally dry food, and drink water only every 4 days or more. The water and food demands of sheep are much higher (see e.g. Lancaster & Lancaster 1991). For the unique physiological adaptation of the goat see Shkolnik 1977:109-112.

42 This location contains about 60 granaries which are not dug into the ground, but are cleared circles, 3 m in diameter, on which a layer of straw was laid first, covered by a pile of grain, and then covered again by straw and beaten earth.
The Bedouin success in gaining high yields in ‘Uvda Valley, with a relatively inferior agro-technology, and in present day climatic conditions, gives additional support to the scenario of the ancient agricultural settlement described above. The question of the past climate will be addressed in Ch. 7.

E. Ancient Population and Demography of ‘Uvda Valley

Several questions arise from the documented remains in the valley concerning the nature of the sites and settlement in general. Were the inhabitants nomadic or semi-nomadic, present in the area only during agricultural seasons, or were they sedentary? And what population could the area sustain?

1. Nomadic or Sedentary Society?

Ethnographic and anthropological studies show a clear distinction between full nomads and partial nomads. Full nomads worldwide developed from agricultural, permanent settlements, not from hunters and gatherers. They subsisted on a “specialized economy” of herding only, while for most other living needs they relied on outside craftsmen, excluding weaving, some leather work and bead making. They were dependent on exchange with settled societies, as well as on riding and pack animals that enabled a migration cycle of hundreds of kilometers twice a year (e.g. Rowton 1973, 1974; Khazanov 1986: Chs.1, 2; Cribb 1991, Ch 1, 2). Partial nomads, on the other hand, maintained a ‘combined economy’, based on grazing, agriculture, crafts and trade. The proportion between the economical branches may have varied from place to place, and even from time to time, according to environmental and political conditions. Partial nomads practiced only limited annual migration cycles, over only tens of kilometers. In the Near East, camels could have served the nomads, but, they were not domesticated before the 12th century B.C. (Resto 1991; Köhler-Rollefson 1993, contra Ripinsky 1983). Even having the camel, Bedouins of the deserts surrounding the Levant were not true nomads, but only practiced “Enclosed Nomadism” (Rowton 1974). Some of them used to move their camps only a few hundred meters, in order to accommodate the changing seasons (a’Aref 1936:117-119; Marx 1967:84,86). Even in the past, full nomadism apparently never existed in these deserts (Marx 1992, 1996, Khazanov & Bar-Yosef 1993).

Since the material cultural remains in ‘Uvda Valley indicate a complex economy, and since full nomadism could not possibly have existed there before domestication of the camel, the valley’s population can only be seen as partial nomadic, sedentary, or a combination of both.

2. Seasonal or Permanent Sites?

Many sites similar to those in ‘Uvda Valley are known in the Negev, Sinai, Jordan and other desert areas of the Near East. They are most commonly attributed to nomadic or semi nomadic groups, and are considered to be “short lived” (Beit-Arieh 1982:155, 1986:51), “seasonal”, or “inhabited for only a few years” (Haiman 1986:16, 1989b:185).

Various studies raise the question of how to determine the nature of a site, whether seasonal or sedentary. Most discussions on this question addressed the transition from hunting and gathering to agriculture and herding, to the Natufian culture and the Early Neolithic. Bar-Yosef and Belfer-Cohen (1989:60) proposed the combination of several criteria that define sedentary settlement: architecture of permanent buildings, evidence for rebuilding and floor modification, storage facilities, floral and faunal indications for year-round subsistence, and burial in or near the site. Saidel suggested several additional criteria: “anticipated mobility” of the population, agriculture, small craft and exotic items, labor-intensive construction projects and rectilinear architecture (Saidel 1993:75-84, based on Kent & Vierich 1989, and others).

In my view, the habitation sites of ‘Uvda Valley are outstanding in comparison to most of those in the surrounding desert, and many of them do contain characteristics of permanent settlement. Following is a brief discussion on the main criteria, as integrated from both proposals:

1. The architecture of most ‘Uvda sites is fairly solid. Many are built of large, roughly cut rectangular stones, up to 1.2 m long, and up to 1.5 tons (Fig. 2:89). The investment in masonry seems totally unjustified if the sites were only temporarily inhabited.

Several phases of building were discerned in almost all surveyed sites and in all excavated sites, a phenomenon only rarely found in other desert sites (e.g. Haïman 1991b:1.12; Cohen 1999, passim)43. Two examples will be addressed. In site 9, probes excavated in the southern courtyard and in a room penetrated into a lower level, dated by “Haparsa” and transversal arrowheads to the 6th and 5th millennia B.C. One radiometric determination from a massebah shrine, 5 m south of the courtyard, dated its erection to the early 6th millennium B.C. (Table 1:25, first date, Fig.

43. In a number of habitation sites in the Negev Highlands, two phases of the EB II-III and the EB IV were found, but each period is represented by one architectural phase (Cohen 1999:37-8, etc.).
2:20). The middle level is dated by $^{14}$C to the late 4th and early 3rd millennia B.C. (Table 1:25, 2nd-5th dates), but it also contained microlunates of the 5th-4th millennia B.C. (see Note 19). The upper level belongs to the Early Bronze IV, late 3rd and early 2nd millennium B.C. In Site 14 (Nahal ‘Issaron) level C is a PPNB occupation, level B is dated to the Late Neolithic and the Chalcolithic, and level A, adjacent to the others, was not excavated but most probably dated to the Chalcolithic-EB. The $^{14}$C series of the site cover a general span of more than 4000 years (Fig. 2:9). Although this site was seasonals (see above), and most probably not occupied each and every year, its long duration is significant, and is unparalleled by any excavated site in the Negev and Sinai. Other sites which only yielded limited radiometric series, also demonstrate a much longer time span than expected for this environment. In Site 124/IV, six dates from a single room rendered a span of 420 years, from ca. 3100 to 2680 B.C. (Table 1:22, first 6 dates). From the middle level of Site 9, six dates cover 560 years (Table 1:25), between ca. 3230 and 2670 B.C. Again, the sites should not be considered as being inhabited every year throughout their life time, but the settlement scenario is still surprising, and bears great cultural significance (see Ch. 8).

Specific floor levels and floor modifications were usually difficult to distinguish. Instead, in every excavated site we did observe gradual accumulation of living levels, consisting of fine layers, and indicating an uninterrupted elevation of floors. Site 17 may be the only exception. In Site 124/IV (Fig. 2:12) a clear example of elevation of installations in a room was found, due to the gradual rise of the floor. The stratigraphic data of the ‘Uvda Valley sites stand in contrast with the common situation of the shallow nature of other excavated desert sites (cf. Rosen 1984a; Haiman 1991b, 1994; Cohen 1999, passim).

Some of the sites contain square or rectilinear rooms (Figs. 2:12-14, 20) which represent permanent settlement (Wachman 1959, Flannery 1972; Saidel 1993). Some of the rectilinear rooms have rounded corners (Fig. 2:12), which means that the builders partially maintained the circular, indigenous architectural tradition. The fact that most sites consist of circular rooms and courtyards does not imply that they were temporary, given the fact that they contain all the elements of permanent settlements discussed here. In addition, there are ample examples of permanent circular habitations from various parts of the world. In short, circular architecture does not necessarily imply mobility, while rectilinear architecture usually does imply sedentism.

2. The economy of ‘Uvda Valley also greatly differs from that of the surrounding desert. As described above, the importance of agriculture was considerable, judging from the numbers and percentages of agricultural flint tools and grinding stones. The dimensions of cultivated fields and the number of threshing floors may indicate intensive agriculture, which demands a permanent presence (see below).

3. Storage facilities. The amount of pottery found in the ‘Uvda sites is far lower than that of ‘Arad, for example. No doubt that the citizens of ‘Arad possessed more pottery, but a major difference was ‘Arad’s sudden destruction (Amiran 1986) while in ‘Uvda Valley no sign of violent destruction was ever found. As mentioned above, the amount of pottery in ‘Uvda, however, is much higher than that of the surrounding sites, which means the population had more goods to store. The same is true of silos, especially the paved ones (Figs. 2:12, 40) which indicate large scale storage.

4. Intensive labor investment can be seen in several types of projects: water reservoirs (see above, and Fig. 2:75), rock-cut threshing floors (above and Figs. 2:41, 48, 50) and embankments in the cultivated fields (see above and Figs. 2:75-77). By estimation, an average reservoir consisting of 5 dams, demands 10 days of labor for 4-6 persons, and then it must be regularly reinforced and cleared of sediments before every winter. Digging wells (Figs. 2:89) certainly required skill and labor investment, and cutting threshing floors into the rock surface is also a demanding task. Altogether, labor investment in ‘Uvda Valley seemed to greatly exceed the investment around contemporary Negev Highlands sites.

The original estimated length of embankments in the valley was at least 75 km in total. Each embankment was ca. 50 cm high and 1.5 m wide at the base. We may assume that they were not built in one operation, but in any case,
their construction and annual maintenance can hardly be related to private or occasional enterprise. Rather, they seem to be the result of a communal initiative, requiring planning, cooperation and organization, which are not expected from a mobile population.

5. Population mobility. The architecture of the ‘Uvda Valley sites indicates suitability for mainly winter conditions. For example almost all doorways face east, towards the morning sun, the side which is also protected from the westerly winter winds. On the eastern side of the Valley, solid architecture was certainly necessary in winter time, due to the low night temperatures and the cold western winds (see above).

Nevertheless, there are indications of presence and activity during the other seasons as well. As described above, the embankments in the fields enabled ploughing and sowing before the first rain. Therefore, the ploughing season would have begun in August or September. During May and June the crops were cut, and threshing took place during July and August. In this way a year-round cycle of agricultural activity was completed. It is certainly possible that parts of families, or their employees, attended the herds some distance from the dwellings, but due to the carrying capacity of the area (see below and Fig. 2:4) grazing during most seasons could have been attained within a days walk from the heart of the settlement, and on the stubble of the vast cultivated area. It is also possible that during the winter, families or parts of them, went to Timna Valley, less than a days walk away, to produce copper. However, these movements do not make the population temporary or nomadic. Water shortages during the summer could also have necessitated movement to other areas, but possibly, the combined use of the few natural water sources around the valley, with the man-made reservoirs, enabled the population to remain. (see above).

Based on the above arguments, in my opinion, at least part of the ‘Uvda Valley population can be considered as permanent, despite the desert environment.

3. Cultural and Social Scenario

The settlement pattern of the valley seems quite complex. It consists of stone built habitation sites of various sizes, corrals of different types, tent camps, agricultural and water installations, and cult and burial sites (see Chs. 4, 5 and App. 1). Some polarity was observed in the distribution of the various sites. Stone built habitation sites are mainly located along the eastern margin of the valley; while the wadis to the east are characterized by corrals and tent camps, with dwelling sites which are smaller and of a lower architectural quality. The same types of flint and pottery were found in all sites during the survey, however, those in the wadis yielded a lower quantity of finds, notably fewer sickle blades. The similarity in artifacts and in general architecture, indicates that both groups of sites were contemporary, including tent camps.

The question is what was the relationship between the two groups of sites? Theoretically, based on anthropological and ethnographic studies (see Note 51), three principle alternative scenarios can be proposed:

1. The groups belong to two different societies or cultures, one sedentary, mainly farming and living nearby the cultivated fields; the other, more mobile and generally subsisting on grazing.

2. The two groups belong to different families or clans within the same society or tribe, with a degree of specialization or even social stratification. Some emphasize agriculture, others emphasize grazing.

3. Both groups belong to the same society, but when necessary, parts of the families or hired shepherds, move with the herds to pastures some distance away from their homes.

Since the distance from the valley’s margin to the sites inside the wadis is only up to five kilometers (to the cliff line above the ‘Araba Valley), it is difficult to imagine two different societies or cultures sharing such a small area and using the same flint tool kit and pottery without assimilating over time. Therefore, the first alternative can be discounted. Alternatives 2 and 3, or a combination of both, are more realistic. In all excavated sites evidence for both economic branches was found, meaning that the same extended families were engaged in both. The tent camps, however, seem to be belong to those whose emphasis was on grazing. Many ethnographic examples support the reality of this general scenario, with numerous local nuances.

In sum, it seems that the different site types represent one society and culture, subsisting on a combined economy of agriculture, grazing, copper production and trade. The sedentary segment of the population, emphasizing agriculture, was probably dominant and enjoyed a higher social status.

49. Cf. Dalman 1933:216-217; Marx 1967:83, 94. In my own observations in the Negev and Sinai between 1969-1984, the threshing season lasted until the end of August. Today the threshing season is shorter due to domination of mechanical equipment and the disappearance of threshing floors.

4. Estimation of Population Density

As previously described, ‘Uvda Valley is characterized by an exceptionally high density of sites. To date, 233 sites of the 5th-3rd millennia B.C. have been documented, many consisting of more than one architectural unit. Altogether, 154 dwelling units have been counted, 40 tent camps, 32 animal pens, 36 water installations, 32 threshing floors and 42 cult and burial sites. All were recorded within an area of 40 sq km.

These figures prompt the next question, what was the size of the population? The discussion here will address the climax of settlement, the 3rd millennium B.C., a time when all excavated sites were inhabited, and which is best covered by {\C} dates (see Tables 1, 2). In attempting to arrive at an estimation, precautions will be taken to avoid exaggerated figures by: 1. ignoring the 40 tent camps, 2. ignoring the 32 animal pens with their adjacent rooms or huts, and 3. assuming that only half of the 3rd millennium sites were simultaneously occupied. The last precaution is taken despite all the excavated sites presented 3rd millennium occupation, and all sites that yielded {\C} series indicated a long duration of hundreds of years, or even more (see above). As stated, 154 dwelling units were surveyed, however, if the survey had been completed, the number would be over 200. Therefore, we will assume 100 sites were concurrently inhabited. Since the possible margin of error in demographic calculations is fairly large, I scrutinized several methods of calculation practiced in demographic studies. Results will be rounded to the nearest 10:

1. Family units. This simple method assumes that each dwelling unit is inhabited by one extended family of 25 people on average (cf. Gopher 1981:125, with references), although many sites, based on their area and ground plan, were suited to larger numbers (see above and Fig. 2:21). According to such calculations, the population of 100 sites would be 2500 people.

A more detailed analysis of the sites’ area was based on 70 sites, whose state of preservation, or limited coverage by sand, permitted documentation of their ground-plans (Table 6). Calculation of several elements was made: room area, courtyard area and overall area (see Fig. 2:90). The summaries of the data were rounded to the nearest 10, and then applied to 100 sites as follows:

- Total roofed area, of total 700 rooms- 5,400 sq m.
- Total courtyard area- 23,090 sq m.
- Total built area (rooms plus courtyards)- 28,470 sq m.
- Total sites’ area (built area plus open spaces)- 64,640 sq m.

The above data will now be used for the following calculations:

2. Persons per total site area. Demographic, ethnographic and archaeological studies in the Near East have indicated various coefficients of between 20 and 50 persons per 1000 sq m of settlement, for towns and villages:

<table>
<thead>
<tr>
<th>Source</th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frankfort 1950</td>
<td>30-50</td>
</tr>
<tr>
<td>McAdams &amp; Nissen 1972</td>
<td>23.1</td>
</tr>
<tr>
<td>Rosenan 1978</td>
<td>32-40</td>
</tr>
<tr>
<td>Marfoe 1980</td>
<td>20</td>
</tr>
<tr>
<td>Shiloh 1980</td>
<td>50</td>
</tr>
<tr>
<td>Finkelstein 1980</td>
<td>25</td>
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<tr>
<td>Van Beek 1982</td>
<td>28.6-30.2</td>
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<tr>
<td>Broshi &amp; Gophna 1986</td>
<td>25</td>
</tr>
<tr>
<td>Gophna &amp; Portugali 1988</td>
<td>20</td>
</tr>
<tr>
<td>Zorn 1994</td>
<td>45</td>
</tr>
</tbody>
</table>

The average of these various coefficients will be adopted here- 31.4 persons per 1000 sq m. Accordingly, the population density in ‘Udva Valley would be 2030 people.

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52. Much lower co-efficients were calculated by Kramer (1982:155-170), averaging 150 persons per hectare in Iranian villages, but these were due to the dispersal nature of these villages.
Most demographic studies adopted one coefficient for settlements of various sizes. However, a study based on a census of Palestine in 1938 demonstrated, among other points, that the smaller the settlement is, the greater its population density. In the smallest ones, covering one hectare or less, the population coefficient was 50 persons per 1000 sq m (Biger & Grossman 1993, Table 1). The main reason for the density difference between large and small settlements is that every settlement required open spaces. The smaller the settlement, the more efficient the use of the surrounding open spaces, thereby reducing the demand for open spaces within. (Hassan 1981:69, Fig. 6.2; Biger & Grossman 1993:23). Since all settlements in ‘Uvda Valley are much smaller than one hectare, the coefficient of 50 persons per 1000 sq m should be adopted. Accordingly, the population of the valley would be estimated at 3230 people.

3. Persons per built area (rooms and courtyards). Density coefficients proposed for built areas are 5 or 10 sq m per person (Marfoe 1980:319; Hassan 1981:74, Figs. 6.7, respectively). Accordingly, the population size of the valley would be 2820 or 5640.

4. Persons per roofed area (rooms only). Similar figures, 5-10 sq m per person, were proposed for density coefficients based on room area only (Naroll 1962; Kramer 1978, 1979; Hassan 1981:74). These make the ‘Uvda Valley population 540-1080, low figures when compared to the above.

5. Persons per number of rooms. Assuming that 2/3 of the 700 rooms served as dwellings, and that each dwelling room served a nuclear family of 5 persons (cf. Hassan 1981:74-75), the population of the valley would have been 2330. However, comparison between site plans drawn before and after excavations showed that only 80%-90% of the rooms were discernible before excavation. Therefore, adding 10% to the last result will render 2570 people. Higher figures for a nuclear family, or a household, were found in several studies, averaging in 5.64 persons (Zorn 1994:40, with references). This would yield a population of 2900, if the additional 10% of the room area is calculated.

6. Cultivated area. Another calculation may be based on the cultivated area and estimation of yields. As described above, yields of the Haiwat Bedouin were stated to be up to 800 kg per hectare. For our calculation, a lower amount of 500 kg will be adopted\(^5\), although, in my opinion, the ancient agriculture was a higher level than that of the Bedouin (see above). If the cultivated area of the ‘Uvda settlements was 1200 hectares, the yield could have reached 600 tons. If 11% of the grains were reserved for sowing, and 16% used as animal fodder (McAdams 1981:86), the amount remaining for human consumption would have been 440 tons.\(^6\) An average annual grain consumption of a seven-person present-day traditional family is approximately 700 kg,\(^7\) and a rounded-out average of 100 kg per person per year can be adopted for a population of men, women and children. Based on this data, 440 tons of grain could have supported 4400 people in ‘Uvda Valley.

The various figures derived from the different methods of calculation are:

| Family units- | 2500 |
| Persons per total inhabited area (a)- | 2030 |
| Persons per total inhabited area (b)- | 3230 |
| Persons per built area (a)- | 2820 |
| Persons per built area(b)- | 5640 |
| Persons per roofed area (a)- | 540 |
| Persons per roofed area (b)- | 1080 |
| Persons per numbers of rooms - | 2900 |
| Cultivated area- | 4400 |

After omitting the highest and lowest figures, the remaining ones are quite close, averaged in 2980 and rounded to 3000. This is the estimated population for eastern ‘Uvda Valley during the climax of settlement, 3rd millennium B.C., concentrated in an area of 70 sq km, including the cultivated fields. Considering the harsh desert environment, and our notion of desert settlements in general, this population figure is unexpected, indicating a very high density of

\(^5\) The traditional Bedouin agriculture in the Be’er Sheva area reached yields of 200-1000 kg wheat per hectare and slightly higher yields of barley (Ben David 1988:46-47). In this area, the agriculture was based on direct rain irrigation, which is usually less productive than flood irrigation. In the traditional agriculture of the Petra area, which generally enjoys good amounts of rain, the wheat yields are similar to the Be’er Sheva area, while barley yields are between 200-2000 kg per hectare (Russell 1995:697).

\(^6\) McAdams also took into consideration the loss of 25% of the yield due to contamination during storage, but this is not necessary in an arid environment such as ‘Uvda Valley. Based on modern experiments, as mentioned above, grain could be well stored in paved silos for years.

\(^7\) 800 kg of grains for a six person Bedouin family, when grains were subsidized and therefore their consumption was higher than normal (Ben David 1982:180). 500-700 kg for a seven person Arab family in Samaria (Dar 1982:327).

In several studies higher values of grain consumption were adopted, 140-230 kg per person (e.g. Broshi 1986:42, with refs.; Zorn 1994:43, with refs.; Gregoire 1999:30-31). In my opinion, these figures are too high, for the following reasons: 1. They usually address adult consumption, while more realistic calculations should take the average between adults and children. 2. Baked bread contains up to 50% water. 200 kg of grain equates to ca. 400 kg of bread, i.e. 571 present-day loaves per person per year. This means 1.5 loaves per day, or 2600 k.cal., almost the total calorie consumption for a working person per day. Even in a society that subsists on a limited food basket, there is no justification for such high bread consumption, certainly not for a society which subsists on a combined economy, such as existed in ‘Uvda Valley.
The population density in the valley should be evaluated first in light of the previous periods. The number of PPNB habitation sites discovered in the survey is only three, while the number of the 5th-3rd millennia B.C. habitation sites in the same area is 154. This means a growth of 51 times in the number of sites, and a dramatic population growth which occurred during two or three millennia. Unquestionably this should be related to the introduction of agriculture and grazing into the desert, which enabled better exploitation of its carrying capacity.

It is also interesting to compare the site density and population of ‘Uvda Valley to that of the Negev Highlands, an area of 1400 sq km, during the 3rd millennium B.C. Counting the dwelling units in the published surveys of the area, including corrals and single room sites, from LN to EB IV (Cohen 1981, 1985; Haiman 1986, 1991, 1993, 1999; Lender 1990; Avni 1992; Rosen 1994) a total of 317 dwelling units is reached, in an area of 900 sq km systematically surveyed, or an average of 0.35 sites per 1 sq km. Similar calculations by Haiman (1992b:121) rendered 550 sites throughout the Negev Highlands, or 0.39 sites per 1 sq km. In ‘Uvda Valley, however, the number of dwelling units and corrals is 186 in an area of 40 sq km surveyed. 4.65 sites per 1 sq km. In comparison with the higher figure of Haiman, the site density in ‘Uvda Valley is higher than that of the Negev Highlands by 11.9 times.

As to the population size of the Negev Highlands during this period, Cohen (1986:229-230) estimated 1650-2350 persons. Haiman (1992c:101) suggested the potential number of adults in the Negev Highlands sites at 800, and the total population as not more than 1000. Elsewhere he suggested 270 adults, or 540 people (Haiman 1992b:121). Rosen and Finkelstein (1992:50) calculated that over an area of 200 sq km around Sede Boker, a population of 300 shepherds and farmers could exist. If this density is applied to the Negev Highlands in general, the result would be 2100 inhabitants. Ignoring the lowest estimations, the average of the remaining suggested figures would be 1925 people, and a density of 1.4 persons per 1 sq km in the Negev Highlands. In ‘Uvda Valley, on the other hand, the density is 42.8 persons per sq km (3000 people per 70 sq km), 30.6 times higher.

5. Estimated Herd Size

In an attempt to estimate the herd size in the Negev Highlands, Haiman (1992b:121) calculated the total area of corrals occupied simultaneously, and multiplied it with a density coefficient of one goat or a sheep per 2 sq m (after Becker 1948:219). His total was 8000 small cattle (sheep and goats) in an area of 1400 sq km, or 5.7 head per 1 sq km. A similar density of 5 head per 1 sq km was reached by Seligman et al. (1962:21-22, 31-33), based on analysis of the vegetational carrying capacity of the Negev Highlands. Rosen and Finkelstein (1992:55), preferred a different data base, one goat or sheep per 1 sq m (after Epstein 1985:74), which means 16,000 head in the same area of corrals. An average between the two will be adopted here, 12,000 small cattle, or 8.6 head per 1 sq km.

Although the calculation of herd size is hypothetical, it would be interesting to compare the figures of the Negev Highlands and ‘Uvda Valley. Following the above studies: the area of the courtyards in 100 dwelling sites is calculated to 23,090 sq m. Since dung deposits were found in only part of the excavated courtyards, it is assumed that only half served as corrals, and therefore, the estimated corral area in these sites would be 11,545 sq m, rounded to 11,550. To these we should add the animal pens outside the dwelling sites, covering 20,750 sq m, thus the total calculated area of corrals is 32,300 sq m. If only a third of the corrals were used simultaneously (due to grazing cycles), the area occupied by herds at any one time would be 10,770 sq m. According to both density coefficients, the number of caprids occupying the corrals was 5385 or 10,770; the average of the two is 8077.5. Assuming (arbitrarily) that the grazing area of ‘Uvda Valley extended from the western margin of the valley down to the ‘Arabah Valley in the east, and from ‘Ein Qetura in the north to Be’er Milhan in the south (see Fig. 2:1), it covers 300 sq km. The density would then be 26.9 head per 1 sq km, 3.1 times higher than in the Negev Highlands. Now, if the relation between man and animal is examined in both areas, it would be 1:6.2 in the Negev Highlands, and only 1:2.7 in ‘Uvda Valley.

These estimates illuminate two principle points. One is that the grazing carrying capacity of ‘Uvda Valley was probably 3 times higher than that of the Negev Highlands. This unexpected result could be explained partially by the unique combination of local environmental conditions (see above, and Figs. 2:4, 74) and the large supply of stubble, hay and grains from the 1200 hectares of cultivated fields. Secondly, the ratio of small cattle per person in the Negev Highlands was double that of ‘Uvda Valley. The impression is that the economy of the Negev Highlands population was closer to that of true nomads, who specialized in herding, and maintained a ratio of ca.10 herd animals per person (e.g. Khazanov 1986:30). In ‘Uvda Valley, however, the relative importance of the herds was lower, or, in other words, agriculture was of a greater importance. This interpretation is well supported by the ample agricultural artifacts and installations in ‘Uvda Valley, and their rarity in the Negev Highlands sites. More so, the estimated grain yields in ‘Uvda could support 4400 people, but the combined calculation of population reached 3000. This may mean that the inhabitants could have had a substantial surplus of grains to trade or store for lean years.

Cautious measures included omitting the tent camps and the rooms attached to the corrals. Tent camps could have added some 450 people to the total, assuming that only 10% of the 40 tent camps were simultaneously occupied, that an average tent camp contain 15 tents, and each tent represents 7.5 a family of people (Cribb 1991:117). Likewise, the rooms attached to the corrals could have added some 150 people.
If indeed the carrying capacity of the ‘Uvda Valley area, for both man and animal, was higher than that of the Negev Highlands, it stands in contrast to the present environmental situation, which obviously favors the Negev Highlands (see above and in Ch. 1). Unavoidably, the question of past climatic conditions arises, and this will be discussed in Ch. 7. In any case, the anomaly of the settlement pattern, population density and economy of the valley gains emphasis with the progress of research, but there is still much to study. The settlement scenario of ‘Uvda Valley also necessitates a reexamination of the desert settlement pattern in general, and this will be addressed in Chapter 8.
CHAPTER 3. COPPER PRODUCTION

Copper mines, industrial remains and copper objects, have been discovered in many sites in the desert zones of the Negev, Sinai, southern Jordan, the Be‘er Sheva’ Basin and the Judean Desert. Although ample studies have been published on the region’s copper production, confusion and lacunae regarding the overall historical and technological picture remains. The role of my own studies in this field is modest, but some discoveries may enrich the picture, while personal familiarity with the sites may contribute to clarify confusions, or to highlight them. Some issues addressed here are beyond the immediate study area (the southern Negev and eastern Sinai). They were included to serve the main goal of the chapter – a search for the role of the desert populations in the development of copper mining, production and trade. The chapter will present and discuss the data in four main topics: a brief history of early metallurgy in the Near East; copper mining in the ‘Araba Valley and Sinai from Neolithic (?) to EB IV; copper production; copper artifacts.

A. The Beginning of Metal Use in the Near East

Until several decades ago, it was believed that the first discovery of metallurgy, namely smelting copper ore into copper metal, occurred accidentally, when hunters threw copper ore into a camp fire (Peake & Fleuer 1927:10; Childe 1966:116). Today, it is clear that copper ore cannot smelted in a camp fire, but requires a metallurgy, which underwent a long and gradual process of development, occurring independently in different parts of the world.\(^1\)

Copper was first used in its ore form for ornamental purposes due to its attractive colors. The earliest known example in the Near East is a pendant shaped from a malachite nodule (CuCo\(_3\)Cu(OH)) from the Shanidar Cave, Kurdistan, dated 10,000 or 9000 B.C.\(^2\) (Solecki 1969; Moorey 1985:22; Muhly 1995:1503; Muhly et al. 1998:534). Malachite was also used for beads at Çayönü ca. 8500 (Muhly et al. 1998:536; Özdoğan & Özdoğan 1999). Intensive use of copper ore for dyeing was found in the Nahal Hemar Cave, Judea Desert, dated ca. 8000 B.C. (Bar-Yosef & Alon 1988). Copper ore nodules found in several PPNB sites in the Levant\(^3\) testify to the ancients’ interest in colorful minerals, and to the fact that they were traded and exchanged.

The oldest metallic copper objects currently known were found in Çayönü eastern Anatolia, dated ca. 8500 B.C. They include 113 small objects and fragments shaped from hammered native copper, mostly thin disk beads about 5 mm across, while some were rolled into a cylinder shape. A few pins, hooks and awls were found as well. Analysis of 13 objects showed that they were all made of native pure copper, about 99.7%, and only one awl contained 0.87% arsenic (Muhly et al. 1998:537, Table 1; Özdoğan & Özdoğan 1999). Metallographic analyses showed that three out of 44 analyzed objects were annealed during their shaping process, i.e. repeated heating of the object above 500°C in order to avoid cracking while hammering (Maddin et al. 1999:39). Therefore, they represent the earliest occurrence of annealing technology. Similar disk and cylindrical beads were also discovered in Asıklı, eastern Anatolia, dated ca. 7800 B.C. (Esin 1993, 1999). Out of 14 analyzed beads, 12 were found to be annealed and hammered native copper; 9 additional analyses showed similar results (Yalçın & Pernica 1999:51). A series of 7th millennium sites in Anatolia, Mesopotamia, Iran and Syria yielded native copper beads, awls and rings, but in low numbers.\(^4\) Although several objects have been analyzed, it is unclear whether some were shaped from minerals, or from native metal which corroded back into minerals. Besides the objects from Çayönü, only a few others were positively identified as products of native copper. Several copper artifacts of the Hassuna culture from Yarim Tepe I, Tell Soto and Tell Sawwan contain up to 10% iron. In Moorey’s opinion (1985:22, 1988:29) this indicates the use of iron minerals as flux, which implies a full metallurgical process of smelting copper ore into metal by the late 7th millennium B.C. However, this interpretation has been rejected by several scholars (Muhly 1989:4; Palmieri et al. 1993:575, 589; Craddock 1995:94) since iron may be found within copper ore and in native copper. Additional indications proposed for 7th millennium B.C. metallurgy were also inconclusive. Among them is copper slag from Çatal Hüyük VIA (ca. 6000 B.C) which was first interpreted as smelting slag (Neuinger et al. 1964; Mellaart 1967:217, and see Hauptmann’s support 1989:131-2), but later identified as melting slag only (Tylecote 1976:5; Muhly 1989:4, Muhly et al. 1998:538; Stech 1999:61). Other copper objects from Çatal Hüyük (Mellaart, ibid.) were not analyzed, and cannot be considered yet as indicative of PPNB copper smelting technology (Stech 1990:59, 1999:60-61).

Most copper objects mentioned above were found in burial contexts, which demonstrates their high prestige value. However, their rarity and small size shows that their role in Early Neolithic cultures was very limited. In any case, at present, there is no evidence for real metallurgy during the PPNB, i.e. a technology for smelting copper ore into metallic copper. Also, excluding the slag from Çatal Hüyük, no further evidence was found for melting native copper and casting it into metal objects.

\(^1\) For a more detailed survey of theories concerning the emergence of metallurgy see e.g. de Jesus 1980:35-39.
\(^2\) All \(^{14}\)C dates mentioned in the text are calibrated, even if they were not so in the original publications (following OxCal 3.4, Ramssy 2000, 1 Sigma).
\(^3\) For example: Tell Ramad, Yiftahel, Nahal Oren, Munhata, Abu Ghosh, ‘Ain Ghazal, Jebel Naga, Jericho, Ghwair 1, Beidha, Basta, Nahal Re‘uel, Nahal ‘Issaron (Hauptmann 2000:162-165 with references and a map).
The earliest large copper object found to date is a macehead 53x43 mm, from Can Hasan, southeastern Anatolia, dated ca. 5000 B.C. It was interpreted as being produced by melting and casting pure native copper (with 0.05% Ag), thereby, representing a new stage in the early development of metallurgy (Moorey 1985:23; Muhly 1988:7,1995:1503; Stech 1999:61). However, new analyses indicates that it was produced by hammering a solid mass of native copper (Yalçın 1998; Yener 2000:32). Copper chisels and axes from Mersin XVII have also been dated to the early 5th millennium B.C. The remains of small furnaces and many fragments of slag crucibles from Tell i-blis, southern Iran, were similarly dated and related to a melting installation (Muhly, op. cit.; Pigott 1999a:77). The possibility of one-stage crucible smelting in the site (Pigott 1999b:110-111) is still inconclusive, since no chemical or metallographic analyses on the copper objects have been made.

The major revolutionary technological step was the beginning of smelting copper ore into metal. This step required two basic capabilities, an intimate knowledge of the different minerals and their various properties, and the ability to reach temperatures above 1100°C. The latter demands the combination of three principal elements: the technology of charcoal preparation5, the technology of blowing or concentrating the natural wind, and the knowledge of fluxes (for most copper minerals)6. It also requires reaching the optimal dimensions and geometry of the furnace (Tylecote & Boydell 1978:28-9; Bamberger & Wincierz 1990:153-156; Craddock 1995:112).

Industrial remains from Tepe Ghabristan, northern Iran, are considered the earliest indication of smelting. Here, two workshops contained fragments of crucibles, a mold, 20 kg of malachite stored in a large deep bowl, and some remains of a furnace. These finds were dated to the Late ‘Ubaid period, ca. 4500 B.C (Muhly 1995:1504; Pigott 1999a:77; Pigott 1999b:111-112). In Degirmentepe, the upper Euphrates, eastern Turkey, abundant industrial remains were uncovered, dated to the late 5th millennium B.C. They represent a household industry, but on a large scale and centrally organized, (Yener 2000:33-44, with references). In Seh Gabi, Luristan, copper industrial remains were similarly dated (Muhly, op. cit.; Pigott op. cit.). The remains of copper smelting from Chalcolithic sites in the Be’er Sheva’ Valley fall between these two dates, in the 3rd quarter of the 5th millennium B.C. (Gilead 1994b:11); the same as the new 14C dating of the Nahal Mishmar hoard (see below).

B. Copper Mining in the ‘Araba Valley and Sinai, Neolithic to EB IV

Copper mines are known from several localities along the ‘Araba Valley. The largest concentration is in the Faynan area in northeastern ‘Araba, followed by Timna’ Valley. Others are found near Be’er Ora, in Nahal ‘Amram, Nahal Roded, Nahal Rehab’am, Wadi Tweiba and Jebel Merah (Figs. 3:1, 2). Several copper mines have also been found in southern and southwestern Sinai. To date, most information on early copper mining and smelting in the Near East has been retrieved from Timna’ and Faynan.

1. Mining in the Faynan area

In the Faynan area (Fig. 3:3), copper ore and ancient mines are found in three different rock formations (Hauptmann 2000:46-61). The lower unit is the “Dolomite Limestone Shale” (DLS) in which the main mineral is chrysocolla (CuSO₂,2H₂O). This rock unit is parallel to the “Timna” formation in the southern ‘Araba, but unlike in Timna’ Valley, here the copper content is high, up to 51.8% (Hauptmann 1989:121-123, 2000:214, Table 1a). The second is white sandstone of the “Um al’Amed” formation, parallel with the “Shehoret”, “Amir” and “Evrona” formations in the southern ‘Araba. This formation bears malachite (CuCo₃), atacamite (CuCl₂) white sandstone of the “Um al’Amed” formation, parallel with the “Shehoret”, “Amir” and “Evrona” formations in the southern ‘Araba. These Early mines in the Faynan area, are horizontal penetrations into the Um al’Amed sandstone and the MBS, especially in Wadi Qalb Ratiye (Fig. 3:5). The mines were dated to the Chalcolithic period on the basis of stone digging tools (Fig. 3:7) and pottery sherds found in the mine dumps (Hauptmann & Weisgerber 1987, 1992; Hauptmann 1989). These early mines could not be studied in detail since they were re-exploited in later periods. The finds from the mine

5. Preparation of charcoal involves cutting hard, heavy wood (e.g. Oak, Acacia) into small pieces, and burning it under reductive combustion. The result is almost pure carbon, weighing 50% of the original wood and yielding 300% energy (Avitsur 1988; de Jesus 1980:37-39).

6. Flux is another mineral added to the copper ore as an agent that reduces the copper from the other components of the minerals, such as carbonates, sulfides and silicates. Physical-chemical-mathematical models, and laboratory and field experiments, demonstrated that smelting of a given amount of chalcocite requires at least 1.5 times the amount of flux (Bamberger 1988:9). Another role of the flux is that it reduces the separation temperature of the copper, and the viscosity of the slag.

7. According to Muhly (1988:7) even here the evidence is doubtful, and probably indicates melting of native copper only. There is also some confusion about the date of the Ghabristan remains. Moorey (1994:257) attributes them to the Early Uruk period, i.e. early 3rd millennium B.C. Ehrich (1992:127) dates Ghabristan strata I-IV around 4000 B.C.
dumps were similar to those from three smelting sites initially dated to this period (Adams & Genz 1995). Other circumstantial evidence for Chalcolithic mining in Faynan is that copper ore discovered in Chalcolithic sites of the Be‘er Sheva’ Valley were identified by both chemical analyses and lead isotope ratios as originating in Faynan (Hauptmann 1989, 2000:166-171; Shugar 2000:169-182). However, excavation of Fidan 4, one of the three sites originally identified as Chalcolithic, subsequently proved to be EB I (see below). As a result, both mining and smelting in the Faynan area during the Chalcolithic are presently uncertain. Broken and unfinished stone digging tools discovered in Fidan 4 demonstrate that the inhabitants were intensively engaged in mining (Adams 1999:94, 124).

During the EB II-III mining concentrated in the DLS formation, which is richer in copper but more difficult to mine. This demanded a new mining strategy of vertical shafts, up to 15 m deep, leading to galleries up to 50 m long. Elaborate mines were found in Wadi Khalid, and others were found in Wadi Abiad, Wadi Dana, Wadi Ruweibeh and at Umm Sahur. These sites represent a much larger scale of mining than before, requiring a larger number of workers, more extensive logistics, and probably a centralized organization (Hauptmann & Weisgerber 1987:424; Adams 1999:95). The shift in mining occurred simultaneously with an abrupt growth in the scale of smelting (see below). The evidence of mining during the EB IV is unclear; pottery fragments of oil lamps from this period were reported from one mine in Wadi Khalid (Hauptmann et al. 1985:171-173).

2. Mining in the Southern ‘Araba

Most mines in the southern ‘Araba (Figs. 1, 2) are found in the white sandstone of the “‘Evrona” and “Amir” formations; in some locations several greenish horizons appear, bearing small copper ore nodules in which malachite, atacamite and chalcocite are the dominant. Some mines are also found in a white sandstone member of the “Shehoret Formation”, and several mines were found in igneous, pre-Cambrian rocks (see below).

Possibly, the earliest indication of copper-ore mining in the ‘Araba Valley is a single, unpublished 14C date, mid 7th millennium B.C., from a gallery in Mine S27 in Timna’ Valley5. At first glance this date seems much too early for actual mining. Yet, in light of other discoveries, it should not be discounted. One is the existence of PPNB flint mines, in the northeastern Negev (Taute 1994) and near ‘Ain Ghazal, Jordan (Quintero1996). Second, are the PPNB settlements discovered next to several copper mines in Sinai (see below), and third is a mid 6th millennium 14C date from a turquoise mine in Sinai (Table 1:69). Hence, the concept and technology for mining apparently existed long before the emergence of real metallurgy. Copper ore was probably not only collected from the surface, but was deliberately mined and traded for a variety of non-metallic objects and paints. Unfortunately, the single date from Mine S27 cannot be regarded as decisive evidence of very early copper mining at Timna’.

Other mines in Timna’ Valley were dated to the Chalcolithic period, but they also present some difficulties. Site 42, in southern Timna’ Valley (Fig. 3:4) was identified as a Chalcolithic copper mine, based on a basalt digging axe found inside (Fig. 3:9), and see Rothenberg 1972:26-7, 1978:1-2). Parallels to this axe are rare in the Levant. A similar limestone tool from Tuleilat Ghassul (Lee 1973:274, No. 44) may confirm its Chalcolithic date (Adams & Genz 1995, Fig. 8:1; Adams 1999:125). The main problem concerning this site is that it is not a copper mine. It includes one narrow natural cavity only 1.5 m long, with a man-made groove surrounding its opening (Fig. 3:8); although it is situated in the “Evrona” sandstone formation, no copper nodules are found here.6 It seems, therefore, that the cavity was used for storage only.

Site G in western Timna’ Valley, is described as the earliest copper mine in the area. It consists of several shallow depressions dug from the surface of a flat alluvial terrace, 1-2 m in diameter and 0.6 m deep (Conrad & Rothenberg 1980:70, Abb. 45; Rothenberg 1999a:76-7). According to the excavators, the motivation for this mining method was to obtain copper mineral nodules washed from the nearby sandstone cliffs and sedimented in the alluvium. The site was first dated as Early Chalcolithic, or the Eilatian Culture, based on site F2, 70 m to the east, where slag, pottery fragments and a tuyere fragment were collected (Conrad & Rothenberg 1980:26, 169, 183). Later, this date was changed to the Late Neolithic Qatifian Culture (Rothenberg 1995, 1999a:76-7).7

Here a few problems arise: First, the site is located within the largest area of mining shafts in Timna’, mainly dated to the late 2nd millennium B.C. Hundreds of these shafts, only a few meters apart from each other, were dug from the surface through the alluvium, in order to reach and penetrate the underlying copper bearing sandstone layer

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5. The date, from Mine S27 (Bonn 2360: 7680±120 B.P., 6650-6410 Cal.B.C.) was derived from charcoal found during excavation of the mine (Conrad & Rothenberg 1980:137-144), but considered unreliable and therefore not published. I thank Rothenberg for this information.

6. I thank A. Gopher for the reference to this publication. Gopher is currently studying several flint mines in Israel, indicating mining already existed in the Upper Paleolithic period.

7. One of my visits to the site was in March 1987 with geologists (S. Ilani & A. Ayalon) of the Israel Geological Survey, Jerusalem. Several hours of search did not yield any copper nodules, nor cutting marks on the rocks.
Mine T in northwest Timna' Valley, consists of several broad vertical shafts, ca. 4 m deep, dug into the sandstone and connected by subterranean galleries (Fig. 3:10, and see Conrad & Rothenberg 1980:148-170). Two phases were distinguished in the mine, based on both stone axe and chisel scars found in the galleries’ face (see below). The early phase was attributed to the ‘Timmian Industry’, i.e. Late Neolithic to EB (Conrad & Rothenberg 1980:170,183), or to the Chalcolithic period (Rothenberg 1999a:79). However, this dating was based on artifacts only, namely stone hammers and a few, undiagnosed pottery sherd, (Fig. 3:11). Although the excavation of this mine was recently extended (February-April 2001), no further datable artifacts were found, and collected charcoal has not yet been analyzed for ^14C dating (Rothenberg and Holzer, per. comm.).

Several mines in Timna can be dated to the Early Bronze Age based on technological characteristics, some artifacts and ^14C dates. Mine S28 presents two distinctive digging technologies. One gallery was dug by stone axe or digging hammer, leaving shallow, rounded scars on the rock face, while an intersecting gallery was dug by chisel (Fig. 3:12, and see Conrad & Rothenberg 1980:82-85, 145-147). The chisel marks represent the later and more advanced mining technology, which enabled cutting narrower shafts and galleries, thereby allowing faster and more efficient prospection. Three ^14C dates from charcoal collected during excavation of the mine represents both stages of digging. Two dates fall in the mid 3rd millennium B.C. (Table 1:36), and the third is ca. 920 B.C.12 What paved the way for the manufacture of a sufficiently hard chisel was the emergence of tin bronze by the late 3rd millennium B.C.13 The occurrence of both stone axes and chisels marks in the same mine further demonstrates the advantage of chiselling, which made the re-exploitation of older mines profitable. Mine 28 enabled dating the axe marks prior to the appearance of tin bronze, and based on this definition, at least three nearby shafts (S10, S17, S19, see Conrad & Rothenberg 1980, Beil. 4), which bear only axe marks, can be tentatively dated to the 3rd millennium as well (Fig. 3:13). The important point here is that mines consisting of cylindrical, deep shafts and horizontal galleries were already dug during the 3rd millennium B.C. This mining strategy most probably developed from the earlier, broader penetrations into the rock, as seen in Mine T, and later they further developed into the narrow shafts dug by chisels.14 The extent of mining during the EB at Timna’ remains unknown since only very few mines were studied by means of excavations, and the intensive mining during the late 2nd millennium B.C. disturbed the older mines (Conrad & Rothenberg 1980, Rothenberg 1999b). Other discoveries in the southern ‘Araba (see below) do indicate quite extensive copper production in the area during the 4th-3rd millennia B.C.

An EB IV mine was reported in Site 250a, northeast Timna’ Valley (Rothenberg & Shaw 1990a, 1990b:290-292; Rothenberg 1999a:84-5). The site includes a cave ca. 10x3 m and up to 1.5 m high (Fig. 3:14). A survey of the site revealed a few hammer stones and some blue mineralization of blue copper ore, identified as chrysocolla (CuSiO₃, 2H₂O)and bisbette (Cu₃SiO₅H₂O).

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11. Different details are mentioned in different publications about site F2. In Rothenberg 1990a:6, “two large stone bowls” were found, and 3-4 kg of slag. In Rothenberg & Merkel 1995:3, “a deep mortar found”, and about 5 kg of slag. Fig. 7 in Rothenberg 1999a:77 presents a photograph of two “stone mortars”, but one is actually an anvil, and the other is a bowl, which is very different from the bowl drawn in Rothenberg & Merkel 1995:3, Fig 5.

12. Conrad & Rothenberg 1980:179- Bonn 2361, 2780±90 B.P., 820-1020 C.B.C. An earlier date of chisel digging, from Mine S18- Bonn 2359, 3050±70 B.P.,1410-1210 C.B.C. (ibid.), but this is not necessarily the earliest use of a chisel in Timna’.

13. For different theories and dating of the emergence of true tin bronze in the Near East see Eisenberg 1985; Philip 1991; Stech et al. 1985; Muhly 1993; Rosenfeld et al. 1997; Yener & Vandiver 1993; Yener et al. 1998; Stech 1999. Hard chisels would be also expected to be produced from arsenic and/or antimony copper, but in fact this alloy is both softer than tin bronze and too brittle (Moorey 1994:253; Charles 1980:171-2 respectively). This is probably the reason why only stone hammer or axe marks were identified in the early mines in Timna’ and Faynan. It seems that metal chisels for mining appeared only with the emergence of tin bronze.

14. Rothenberg attributes the chisel-cut advanced shafts to a new Egyptian mining technology, imported into the ‘Araba Valley during the 19th-20th Dynasties, i.e. the 13th-12th centuries B.C. One of the difficulties with this theory is that not one mine of that type has ever been published from Egypt. In my opinion, these shafts are the result of indigenous, local development.
Two major problems emerge from this site: First, no artifacts were found and no $^{14}$C dating was available. The only basis for the EB IV date was the presence of similar ore fragments in smelting Site 149, 1.5 km southeast, dated to this period by pottery sherds (see below). Also, the excavators reported that no indications were found of galleries, exploration probes, digging marks or mining dumps. Being aware of the absence of these, Rothenberg & Shaw suggested (1990b:292) that it was not a large mine. After several visits to the site, my own impression is that Site 250a is a natural cave, with almost no copper minerals discernible in or around it. Moreover, the cave is located within a subarkosic sandstone member of the “Timna’” formation (Druckman et al. 1993), which served as the source of copper for the modern industry, unused since 1984. In Timna’, unlike in the Faynan area, minerals from this formation bear only a low copper content, and Rothenberg previously demonstrated (1962:8-9) that these minerals are totally inappropriate for copper extraction by means of the pyrotechnology employed by the ancients. This explains why no ancient mines are found in the southern ‘Araba in the “Timna’” formation. If Site 250a did not serve as a mine, no other mine in the southern ‘Araba Valley is presently positively dated as EB IV. This, however, does not imply that no mining took place during that period.

Three additional early copper mines in the Eilat area should be mentioned. One is across the Sinai border, within the former ‘Etzion Air-Base (Avner & Naor 1978). Three trenches were dug into the red Pre-Cambrian quartz-porphyry rock, 8-22 m long, up to 4 m wide and 2 m deep (Fig. 3:15). Copper mineralization is seen all across the trenches, but a sample analyzed from the remaining ore (not from a vein) showed only 1.4% copper (Ilan, unpublished). Several low structures were built near the trenches, with adjacent remains of smelting installations. The two types of scattered slag represents two different smelting technologies. Artifacts collected from the surface were also of two different periods, Chalcolithic-EB and Late Bronze-Early Iron Age. The earlier ones included coarse handmade pottery sherds, flint tabular scrapers, retouched blades and flakes, notches and borers, all common in 6th-3rd millennia sites in the region.

The second site is in Nahal Roded, near Eilat (discovered by the author, unpublished). Four trenches were cut into a white sandstone layer of the “Shehoret’” formation, 7-12 m long, ca., 1 m wide and deep (Fig. 3:16). Flint implements collected in and around the trenches are only roughly dated to the 5th-3rd millennia B.C., one is a coarse digging axe (Fig. 3:17). A habitation site with circular rooms and courtyards, built 90 m to the west, is most probably related to the mine, otherwise the site’s location on the cliff top is unexplained.

The third mine is situated north of Be’er Ora, on a “Grofit” formation hill of Turonian limestone. An area of 150x300 m on the hilltop is covered by hundreds of small depressions excavated into the rock, 1-2 m in diameter and at least 1 m deep (Avner 1993b, Fig. 3:18). The dug-out rocks were broken into small pieces and small copper nodules are visible in some (Fig. 3:19). Stone anvils and tens of hammer stones (Fig. 3:20) still bear green mineral spots from pounding. Smelting activity also took place on the hill, indicated by a scatter of glazed stones originating from furnaces walls (Fig. 3:21), and by dumps of copper slag, ash and charcoal. Flint and pottery collected from the surface represents several periods, beginning in the Chalcolithic, including fragments of crucibles and clay rods (Fig. 3:22) mainly known from EB smelting installations in Faynan (Hauptmann 2000:149-155, and see here Fig. 3:23) and from Site 149 in Timna’ (see below). Four $^{14}$C dates from the slag and ash dumps all fall within the Middle Bronze II (Table 9), a period almost totally unrecognized in the Negev. Although there are some occurrences of copper ore in limestone in the Negev, and in dolomite rock in the Judaean Desert (Ilan et al. 1987), this is the only copper mine in limestone known today in the southern Levant.

3. Mining in Sinai

Many locations with copper mineralization were found in the crystalline rock area of southern Sinai, but ancient mines were developed in only a few (Fig. 3:1). On a ridge between Wadi Reqitia and Wadi Rimti, north-east of St. Katerina, an ancient mine was already discovered in the 19th century by Holland (in Wilson & Palmer 1869:121). A modern geological survey documented two veins of copper ore 1.7 and 4.2 km long, and nearly 1 m wide (Bogoche 1972; Bogoche & Zilberfarb 1979). Open mining has been observed along these veins by both Holland and the modern geological survey, but no indication for dating was published. In the nearby Wadi Ahmar a large Neolithic (PPNB) site was discovered by Currelly (in Petrie 1906:239) next to copper deposits, where he found many fine flint drills. The site was re-surveyed by Rothenberg (1973:35-37; 1979:138), who suggested that the copper ore was already mined by that period. Smelting sites discovered near these veins (see below) indicate exploitation of the copper ore in several periods, including Chalcolithic and EB (Rothenberg ibidem.), but the production extent is unclear. Chalcolithic mines were also

15 One type of slag was of small and porous pieces, containing 2.3% copper. The other, of larger and solid pieces, broken from slag “plates”, contained only 0.9% copper (Ilan, unpublished). Obviously, the former type is the older; it is similar in form and chemical composition to slag from other early smelting sites in the area, although the copper content is lower (see below).

16 The dates from Be’er Ora Hill are: Rt 1440, 3470±60; Rt 1437, 3430±50; Rt 2518, 3495±40; Rt 2547, 3455±40. The mean calibrated values are 1785, 1760, 1810, 1785. The charcoal samples were taken from a 20.8 x 30 cm probe, from depths of 5-20 cm.
noted at Jebel Samra, north of Sharm ash-Sheikh and in Wadi Shalaleh, east of Dahab (Rothenberg 1969:32, 1971a:62), with no further information. In Wadi Tar, southeastern Sinai, a copper mine was discovered with an open trench 20x1-2 m, dug along a copper-rich vein (Ilini and Rosenfeld 1994, Ilani et al. 2000). This site is quite unique since it contains native copper ore, with up to 40.5% or more Cu, and of special importance- ca. 10% arsenic.

The sandstone area of southwestern Sinai is best known for its turquoise mines of Wadi Magharah and Serabit el-Khadim (Petrie 1906; Gardiner & Černý1955). Two PPNB campsites discovered by Rothenberg (1979:138) next to turquoise mines may indicate early mining. 17 In Jebel 'Adeideh, 9 km south of Bir Nasib, a turquoise mine was dated by 14C to the 6th millennium B.C. (see Table 1:69), 18 and turquoise mining continued at Serabit el-Khadim during the Chalcolithic period (Beit-Arieh 1985).

Copper was also mined in this area in antiquity. The large slag heap of Bir Nasib was already noted by several explorers during the 19th century (e.g. Rüppell 1829:264; Wilson & Palmer 1869:223-4), and Petrie (1906:18-19) noted additional slag heaps near Bir Nasib and at el-Markha, 7 km to the west. He estimated 100,000 tons of slag at the site of Bir Nasib (ibid.), which implies production of 5000-10,000 tons of copper. Rothenberg (1987:4,7) dated the slag by pottery from Chalcolithic to Nabatean. To date, most of the visible slag are fragments of large “cakes”, representing a late, tapping technology of smelting (personal observation), and the majority of pottery found on surface was Nabatean and Late Roman. In Jebel Umm Rinma, 5 km to the north of Bir Nasib, Rüppell (ibid. 265-6) found two large mines with high quality copper ore, which in his opinion did not require fluxing. Rothenberg (ibid.) dated these mines to the Old and Middle Egyptian Kingdoms, and similarly dated an additional mine in Wadi Kharig, 7 km northwest of Bir Nasib, based on a rock stela of King Sehure (Dynasty V, 2491-2477 B.C.). An even earlier date for Egyptian expeditions to the region is indicated by the rock stelae of Sanakhte from Wadi Maghara (Dynasty III, 2686-2668 B.C., Gardiner & Černý 1955:24, 52-56). A recent publication (Gayar & Rothenberg 1999) reports predynastic, 5th millennium B.C. copper production in this area (see below).

C. Copper Smelting in the ‘Araba Valley and Sinai, Chalcolithic to EB IV

Chalcolithic to EB IV

Several sites along the ‘Araba Valley provide information on copper smelting during the early periods, probably Chalcolithic and certainly EB. Nevertheless, many details in the history of early metallurgy in the region are still lacking. Following is a brief chronological description and discussion of these remains.

1. Copper Smelting in the Faynan Area

The earliest confirmed indication of copper smelting in the Faynan area is attested to at Fidan 4. This site was first dated as Chalcolithic (Raikes 1980:55), corrected later by MacDonald (1992:250-252) as Chalcolithic-EB I, but also suggested to be Qatifian, Late Neolithic (Gilead 1990:60; Goren 1990:102-105). Following the first excavations, the site was dated as Chalcolithic (Adams & Genz 1995), but later proved to be EB I (Genz 1997; Adams 1998:653, 1999:108-112, etc.). Metallurgical remains spread over the excavated areas included small copper slag, copper nodules, many copper prills, fragments of crucibles and a fragment of a round-sectioned awl. The finds were interpreted as representing household scale copper production, based on crucible smelting and blow-pipes, which yield small amounts of copper, and a very limited amount of slag. 19

Large, industrial scale copper smelting first appeared in EB II sites, as studied in Faynan 9 and 11, adjacent to Kh. Faynan 20, and in Kh. Hamra Ifdan (Fig. 3-3, and see below). In the first two sites the remains of 31 furnaces were excavated, and the estimated amount of slag reached 100-300 tons (Hauptmann & Weisgerber 1992:63; Hauptmann 2000:74-78). The total amount of EB II-III slag in the larger Faynan area was estimated at 5000 tons, which means

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17. Since turquoise is gradually losing its color when exposed to the sun, it cannot be collected from surface. Since a turquoise lump was discovered in the PPNB site of Nahal Issaron (Goring-Morris & Gopher 1983:156), and western Sinai is the only known source of turquoise in the broader region, it can be assumed the precious stone was indeed mined already by the PPNB.

18. The site was excavated by A. Goren, but not published.
true metallurgy was based on a crucible process. The slag is very solid (Fig. 3:23), broken off from tapped slag ‘plates’, and represents an advanced technology. This is also attested to by the composition of the slag, which contains an average of only 2% copper, and up to 43.2% MnO (Hauptmann 2000:218). The high content of MnO means an intensive exploitation of the self-fluxing manganese-rich copper ore, found in DLS rock formations. The furnaces were open bowl-shaped, with inner diameters of ca. 50 cm, repeatedly lined by many layers of clay (Figs. 3:24). Many fragments of clay rods (“lady fingers”) with attached slag were found near the furnaces (Fig. 3:25). Unlike at Timna’, here they were interpreted as being vertically set in the front of the furnace, as either a support for the front wall (Hauptmann 2000:149-155), or a grill which kept the smelting charge inside, but allowed the natural wind to blow the combustion (Hauptmann 1989:129-30).

The built and lined furnace seems to be an innovation of this period at Faynan, enabling a much larger scale of smelting and repeated use. The operation of many furnaces demanded increased manpower for mining, charcoal preparation, transportation of ore, charcoal and provisions, and transportation of the copper products. This means larger scale logistics, and most probably central control by the elite (Adams 1999:186, 249).

The picture of industrial copper production in the Faynan area recently changed dramatically with the excavation of Kh. Hamra Ifdan by Levy et al. (2002). The site is now considered the largest copper industry in the 3rd millennium Near East, with a full sequence of EB II-IV. The EB II Stratum IV was only limitedly excavated and yielded 22 archaeometallurgical items. The EB III Stratum represents the climax of copper production, and due to destruction in an earthquake a nearly complete factory was preserved. This stratum has yielded 3356 archaeometallurgical items, including 50 copper tools (pins and axes), 58 “bar ingots”, 866 casting molds, 117 “lady fingers”, large amounts of slag and copper ore, and others. The bar ingots were previously known only from EB IV sites (see below), but now it is clear that they were already produced and traded on a large scale during the EB III. Copper production in Kh. Hamra Ifdan continued in the EB IV, on a smaller, but still considerable scale, and Stratum II has yielded to date 404 archaeometallurgical items, including 16 casting molds for bar ingots, 51 other molds and additional finds (Levy et al. ibid.).

2. Copper Smelting in the Southern ‘Araba

Three sites in Timna’ Valley concern the early stage of metallurgy: S39, F2 and N3. They present both intriguing finds and confusions.

Site 39a, southeast of Mount Timna’, is a habitation unit consisting of a courtyard, 29x23 m, and a circular room (Rothenberg 1978, 1990a:4-5; 1999a:80-82; Rothenberg & Merkel 1998; Merkel & Rothenberg 1999). Surface finds included flint implements, pottery sherds, stone mortars, hammerstones and pestles, copper ore nodules and a small amount of copper slag. Similar artifacts were found during the excavation of Locus 1, a dwelling room previously identified as a tumulus. The site is described as a habitation and work camp, where the smelting charge was prepared for use in Site 39b. In the latter, 130 m to the north, the remains of a smelting furnace was found, with small copper slag, flint and pottery sherd scattered around, similar to those of Site 39a. Excavation around the furnace yielded charcoal, small slag fragments, small copper prills, flint tools and pottery sherds. The furnace itself is described as “a hole in the ground”, about 25-40 cm in diameter and 40 cm deep—“the most primitive smelting ‘installation’ found anywhere” (Rothenberg & Merkel 1998:2). Therefore, the furnace represents an initial “trial and error” technological stage (c.f. Rothenberg 1978:6-7, 9-11; 1995:12 with references; Bachmann 1978:21-22).21

The furnace’s description raises some problems. Its base is at least partially stone built (Fig. 3:25), and additional slagged stones which surrounded it were interpreted as the remains of a superstructure, originally up to 80 cm above the furnace bottom (e.g. Rothenberg 1978:90). If so, the furnace was more than a “hole in the ground”.

The slag surrounding the installation was identified as ‘furnace slag’ which had coagulated inside the furnace, and was then taken out and crushed in order to release the entrapped copper prills (Fig. 3:26). They were highly viscous during the smelting process, very porous after cooling, and contained up to 16.6% Cu, indicating that only about half of

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19. Several scholars described a one-stage, crucible smelting and casting in Chalcolithic and EB I sites (Adams & Genz 1995:14; Hauptmann et al. 1996; Adams 1999:135-145, 152-153; Khalil & Eichman 1999:518), but later Hauptmann (2000:142-3) corrected it to two stages. The detailed analyses of Shugar (2000:83-120, 244-249) on the finds from Abu Matar and Nevatim, demonstrated a clear distinction between furnace smelting slag and crucible melting slag, which means a two-stage process (and see below). Craddock, on the other hand (2001), collected evidence from the broader Mediterranean zone and showed that the earliest stage of true metallurgy was based on a crucible process.

20. For the dating of the Faynan sites see Hauptmann 2000:62-67, and here Tables 1, 2.

21. The furnace’s dimensions are also reported as 45 cm in diameter and 45 - 50 cm deep (Rothenberg 1978:7, 9), and other dimensions are mentioned in various publications. The most recent one (Merkel & Rothenberg 1999:155) rendered a diameter of 25 - 40 cm, but the attached plan (Fig. 12) shows a diameter of 50 cm.
the copper ore charge was actually smelted to metal. Therefore, the slag represented an incipient, primitive technological stage (e.g. Rothenberg 1978:9). However, all analyzed slag fragments bear other indications for a higher technological level than expected. They are characterized by a high FeO content, 14.2%-49.5%, even by fayalite (Fe,SiO) crystals, and actually a moderate content of Cu, averaging in 3.9% (Bachmann 1978:20-23) or 4.9% (Rothenberg 1990a:7, 69). These necessarily indicate intentional fluxing using iron oxide (Rothenberg ibid.; Bachmann ibid.), as was reconfirmed by a recent study of the slag (Merkel & Rothenberg 1999:161-163). In addition, the smelting temperature, as inferred from re-melting the slag, was 1180°C-1350°C (Rothenberg 1978:9), high enough to allow an efficient separation of the copper and explain the low Cu content in the slag. This temperature, according to Rothenberg (ibid.), serves as a clear indication for the use of bellows.

If the furnace had a stone superstructure, bellows were used, the temperature was high and intentional fluxing took place, then the furnace of Site 39b cannot be considered primitive at all.

The Chalcolithic date of the furnace is also questionable. First, although flint from the site included four core-tools characteristic of the Late Neolithic and Chalcolithic, the publication (Bercovici 1978) did not distinguish between the finds from Sites 39a and 39b. Only in a recent article (Rothenberg & Merkel 1998:2) it was first mentioned that two of the adzes were actually found on the hard working floor surrounding the furnace. Second, a 14C date from the furnace wall indicated the early first century A.D.,12 which led to criticism of the Chalcolithic dating of the furnace (Muhly 1984:288; Hanbury-Tenison 1986:160; Weisgerber & Hauptmann 1988:53; Adams 1998:625; Craddock 2001:156). Rothenberg's reply (1990b), that the late 14C date represented later reuse of the furnace, raises the questions: where is the slag from this later smelting? And why was only one type of slag found? Recently, a 14C date of the mid 5th millennium B.C. was published from Site 39a (Table 1:35, and see Rothenberg & Merkel 1998, Rothenberg 1999a:81). If slag identical to those of the furnace were found in direct context with the dated charcoal, and if the furnace does indeed share the date of the habitation units, then Sites 39a and 39b could be considered the earliest installation for copper smelting discovered to date in the Levant.

Smelting Site F2 in western Timna' Valley is regarded as even earlier in date and technological stage than Site 39 (Rothenberg 1990a:5-8, 1999:77-8; Rothenberg & Merkel 1995:5). On the surface a granite mortar and few crushing stone tools were found, with 3-4 kg (or 5 kg in some publications) of small slag scattered on an area of 20 sq m, with pottery sherds and some flint tools. The site was excavated to the bedrock, but only slagged lumps of sandy soil hinted at the presence of a smelting installation. The slag was porous and unhomogeneous, containing unmolten or half-molten copper ore, resulting from incomplete smelting at a temperature of only 700°C-800°C. This is described as the most primitive stage of smelting. On the other hand, three analyses on one slag fragment showed a high content of copper, averaging 12.3% (Segal et al. 1998:230). This could indicate a lower technological stage than that of Site 39b, if more slag pieces were analyzed and showed consistent high Cu content.

Several problems emerge from this description: 1. Fragments of a tuyere were also found in the site and are considered the earliest discovered anywhere (ibid.), but a tuyere implies the ability to reach a high smelting temperature and advanced technology. Indeed, laboratory tests demonstrated that the two types of slag from the site, crystalline and glassy, which were formed in temperatures of 1150°C and 1250°C respectively (Rothenberg & Merkel 1995:5-6), both are much higher than stated in the later publication (Rothenberg 1999a). 2. The slag is characterized by a high content of iron oxide, and four of 12 samples even contained fayalite crystals (ibid.). But, unlike in Site 39b, here the high content of iron is interpreted as accidental, only "near the threshold" of iron-ore fluxing (ibid.). A recent study (Segal et al. 1998) confirms the high iron oxide content, up to 44.36%, and the use of iron-rich copper ore. Another recent study of the site’s slag suggests the use of a mixed smelting charge of three elements: copper ore, iron oxide ore, and iron-rich copper ore (Merkel & Rothenberg 1999:160, 163). This again means intentional fluxing, and therefore the slag of Site F2 cannot represent the most primitive stage of smelting. On the other hand, three analyses on one slag fragment showed a high content of copper, averaging 12.3% (Segal et al. 1998:230). This could indicate a lower technological stage than that of Site 39b, if more slag pieces were analyzed and showed consistent high Cu content.

The date of site F2 is also questionable. The pottery sherds were identified as Late Neolithic Qatifian (Rothenberg & Merkel 1995; Rothenberg 1999a:78), but this identification was disproved by Goren,22 and the flint tools were never published. A copper needle discovered in the excavation was dated as Chalcolithic based on its chemical composition (Segal et al. 1998, Note 5: As 1.1%, Sb 0.7%, Bi 0.8%). However, a 14C dating of charcoal from the site rendered 13th century B.C., and an almost identical TL date was recently retrieved from the tuyere fragments (Hauptmann, lecture in

22 In 1994 S. Rosen received the flint from Sites 39a and b from Rothenberg for re-examination, and preparation of an updated publication. However, he did not receive the information on the archaeological context of the finds (Rosen, pers. comm. 24/10/2000).

23 Burleigh and Hewson 1979:349- Bm 1116, 19454–300 B.P., Cal.- 400 B.C.- 450 A.D.

24 Rothenberg based the Qatifian identification of the sherds on comparisons to the studies of Gilead (1990) and Goren (1990). Goren, who studied the petrography of the Qatifian pottery, examined the sherds from Timna’ F2 without petrographic analysis, but denied their identification as Qatifian (pers. comm., Sept. 1995).
Amman, 17.4.2000). It was only first noted in a recent publication (Merkel & Rothenberg 1999:152) that the small F2 site suffered a later intrusion. Since the sedimentation of the site is merely 18 cm deep, the stratigraphic situation, as recently published (ibid.), only adds to the confusion concerning the site’s date and its technological stages of development.

Site N3 is located 1.2 km north of F2, and was only recently published (Segal et al. 1998). It contained several crushing stone tools and about 10 kg of crushed slag, but no architecture or furnace remains, nor pottery sherds or flint to help date the site. The Chalcolithic date was determined by the slag typology only, indicating a ‘technological horizon’ equal to that of Site 39b, but more advanced when compared with site F2.

This, again, raises questions. The copper content in the slag was only 4.8% and 5.2% (ibid., p. 230), which means an advanced smelting technology. In addition, iron oxide was up to 42.8%, almost the same as that of site F2, but unlike in Site F2, here the slag is interpreted as representing deliberate iron oxide fluxing (ibid., p. 233).

An additional small Chalcolithic smelting installation was identified in Site 250b (Rothenberg & Shaw 1990b:292). No artifacts or furnace remains were described, and the only clue for the Chalcolithic date is the technological stage indicated by the slag type—small, irregular, with a low content of iron (no analyses were published).

The above discussion of smelting remains from Timna Valley emphasizes the present confusion in the study of the early development of metallurgy. Further information and much broader research is needed before attempting to reconstruct the Chalcolithic metallurgy. The major problems are the lack of a clear criteria for phasing the slag and the technology they represent, and the dating of these phases. The possibility of simultaneous use of different technologies should be taken into consideration, as well as differences in the quality of smelting achieved from one operation to another, even by the same copper-smith.

On a hill near Kibbutz Yotvata, an Early Iron Age fortress was excavated by Z. Meshel (1993). A large area within the fortress’ courtyard was scattered with earlier copper slag and flint, while layers of ash, charcoal and slag were intersected by the fortress’ casement wall. An outer rampart built to the west of the fortress was first interpreted as an additional Iron Age defence, but its core was dated by 14C ca. 4300 B.C. (Table 1:30). Another 14C date, from the ash and slag layer, was ca. 3340 B.C. (Table 1:30). Recently, the slag from the site was examined by I. Segal and showed chemical composition similar to the slag from Timna’ 39b (Segal, pers. comm. 23/10/2000; to be published by Meshel, Rothenberg and Segal). It is possible, therefore, that Chalcolithic and EB I copper production did take place on the hilltop. The smelting activity on the Yotvata Hill represents a widespread phenomenon of slag dumps found on almost every hilltop in the southern Araba, as will be described below.

Ample remains of copper industry, including copper ore, slag, crucible fragments, molds, copper lumps and artifacts, were discovered in Tell alMagass and Hujeirat alGhuzlan, just north of ‘Aqaba, but most have not yet been published (presented by Khalil in a lecture in Amman, April 17, 2000). On the background of the harsh desert environment these sites are unusually large. Tell alMagass, covers 3000 sq m, Tel Hujeirat alGhuzlan is 2-3 times larger and their cultural sediments are ca. 5 m thick. Both sites are dated to the Chalcolithic and EB I (Khalil 1987, 1992, 1995; Khalil & Riederer 1998; Khalil & Eichmann 1999). The presently published series of radiometric dates span from ca. 4100 to 3600 B.C. (Table 1:40, 41), but the upper layers in both site are still attributed to the EB I. Remains of copper production were also found in five additional Chalcolithic-EB sites in the southeastern ‘Araba (Smith et al. 1997:51-56).

No EB I-III smelting sites were discovered in the Timna Valley, however, these periods do not remain without indications of copper production. In Nimra Valley, just south of Timna’, a small smelting site was found with surface finds that included porous small slag, similar to those of Site 39b, copper nodules, a flint tabular scraper and hammerstones, a fragment of a stone digging hammer, a few hole-mouth pottery sherds, and a fragment of a clay tuyere of a later date (Sebbane & Avner 1993). The tabular scraper and hole-mouth sherds represent a long time-span, 6th to 3rd millennia B.C. (see discussion in Ch. 8), but a tomb built in a rock shelter on a nearby cliff contained an early EB I jar and a cup (Fig. 3:27). If both sites were related, the smelting activity in Nimra Valley could be tentatively dated to the EB I. About 150 m south of this site, a fragment of a copper ingot was found on the surface (by Y. Qishon), measuring 54.2x68.2x21 mm and weighing 304.5 gr (Fig 3:28). Chemical analysis, by I. Segal, showed 90.01% copper, 8.32% iron and other minor impurities. The connection of the ingot to the site is only a possibility.

25 Contrary to the technological basis for the dating of Site N3, in other publications Rothenberg rejects the connection between technology and the date of a given site: “Trying to compare Chalcolithic smelting debris of different sites, even in adjacent areas, is often a rather tricky undertaking... Furthermore, trying to compare archeo-metallurgical technological levels of the different sites and regions, we soon appreciate that in many cases the technological level of the different sites are not at all congruous with their absolute dates...” (Rothenberg& Shaw1990b:282).
Several habitation sites are located approximately three km north of Timna’ Valley and east of Kibbutz Elifaz, some are characterized by copper slag. One site (No. 201) was excavated by I. Ordentlich (Rothenberg 1999a:83-4) and dated by pottery sherds and flint to the EB II-III. Only a few slagged stones on the slope of a nearby hill remained from a smelting furnace, implying that part of the furnace was built above ground level. The slag was described as larger and more solid than that of Site 39b. The new type of slag is interpreted as the result of tapping out most of the slag to form a ‘plate’ at the furnace’s foot, leaving a copper ingot on the bottom of the furnace. This innovation demanded a lower viscosity of the slag, which means a higher smelting temperature and a larger amount of flux (chemical analyses of the slag were not published). Following smelting, the slag ‘plates’ were crushed in an attempt to extract remaining copper prills. The use of bellows was implied from the slag’s type, although no remains of tuyeres or bellows were found. Rothenberg (ibid.) suggested that the site represented a new, Egyptian technology, as he also suggested for Site 590 in Sinai (see below).26

From smelting Site 30 in Timna, Late Bronze-Early Iron Age (Conrad & Rothenberg 1980:215-236; Rothenberg 1999b:158-162), a single δ13C date was obtained, ca. 2625 B.C. (Table 1:37), which is very close to those of Mine S28 (see above), and almost identical with the date of furnace remains near Giv’at Shehoret (see below). This date implies that below the layers of the late 2nd millennium B.C. smelting sites EB remains may be present.

On almost every hilltop in the southern ‘Araba Valley, scatters or dumps of copper slag with furnace relics were recorded (Avner & Naor 1978). One of these was excavated in 1981 by D. Davis and myself on a hill west of Giv’at Shehoret, 5 km north of Eilat (unpublished). The site included poorly preserved remains of a stone built furnace, of ca. 40 cm inner diameter, built to a depth of 30 cm below surface. The furnace was surrounded by slagged and glazed stones, several kilograms of small viscous slag, crude hammerstones and other flint tools, and a few crude stone anvils. Measurements of wind velocity demonstrated that it was three times higher at the furnace’s location than at the foot of the hill27.

This site was also briefly mentioned by Rothenberg as Site189a, with five analyses of slag identified as Chalcolithic (Rothenberg 1990a:5, and Table 1). All analyzed fragments contained a high percentage of MnO, 19.74-27.68%, in addition to FeO,12.69-25.64%. This indicates the knowledge and use of both manganese and iron oxide fluxing, while high MnO content is unparalleled in Chalcolithic sites. In fact, charcoal from inside the furnace yielded a later δ13C date, ca.2600 B.C. (Table 1:38).

From the limited remains of Giv’at Shehoret we can conclude that the furnace was built on the hilltop in order to harness the prevailing northern wind to enhance the fire, and no bellows were used. The temperature reached did not allow complete separation of metallic copper from slag; therefore a mass of viscous slag which included copper prills coagulated within the furnace. After cooling, part of the furnace wall was broken off, and the slag mass was removed and crushed in an attempt to release the copper prills. This furnace was probably used only once, but on other hills, the amount of slag indicates rebuilding and repeated use of the furnaces several times.

The wind measurements taken at this site may explain the recurrence of many furnaces on hilltops in the southern ‘Araba, usually on their northern side. Also, they may be relevant in the long debate on the early use of bellows. As mentioned above, Rothenberg asserted the use of bellows in Timna’ as early as the Chalcolithic (Sites 39b) or even Late Neolithic (Site F2). Hauptmann (1989:129), on the other hand, emphasized that no remains of bellows or tuyeres have ever been found in Chalcolithic or EB smelting sites at Faynan. He demonstrated by experimentation the feasibility of smelting in a wind-based furnace (Hauptmann 2000:153-155). The possible Chalcolithic date of Timna’ 39b and the Yotvata Hill, and the δ13C dating of the furnace at Giv’at Shehoret, indicates that during the 5th-3rd millennia B.C. wind-based furnaces were used.

In the Be’er Sheva’ Valley, however, two fragments of a clay tuyere were found in the context of Chalcolithic metallurgy, one at Abu Matar (Gilead et al. 1991:175; Shugar 2000:99) and the other in Neve Noy, an extension of the

26 Following the discovery of the miners’ sanctuary near ‘Solomon’s Pillars’, Rothenberg attributed technologies of both mining and smelting, as well as many remains in Timna’ Valley to Egypt, especially in the late 2nd millennium B.C. However, no mine similar to those of Timna’ has been discovered as yet in Egypt, nor any smelting furnace, only melting ones. Therefore, no technology in Timna’ or the ‘Araba Valley in general can presently be related to Egypt, certainly not in the 3rd millennium B.C. (Avner 1999).

27 The measurement of the prevailing northern wind was made on 18/4/81, morning, noon and evening. The average of the three measurements was 9.8 km/h at the northern foot of the hill, while the average at the furnace was 29.8 km/h.

Another case of a large hilltop smelting site was found by Petrie (1906:18-19) in Wadi Ba’ba’h, southwestern Sinai. In four smelting sites in southern Sinai, tuyeres were attributed by Beir-Arieh (1977:160) to the EB II. He described them as significantly smaller than the LB-IA I tuyeres from Timna’, and therefore, different and earlier. In fact, they are identical to the most common type of tuyeres in Timna’, 5-8 cm in diameter (Rothenberg 1990:36). In Wadi Abudar-Wadi Reqitaya, one of these four sites, Currely (in Petrie 1906:240) found Late Kingdom Egyptian artifacts (in addition to Neolithic ones) which most probably relate to the tuyeres. Before meticulous excavations in these sites the tuyeres cannot be safely dated as EB II.
same site (Eldar & Baumgarten 1985:137; Golden 1998:69). At present, the earliest known bellows associated with copper smelting are from the 2nd millennium B.C. (Davey 1979; Beit-Arieh 1985:106-111; Rothenberg 1990a:29-38), therefore it is possible that these tuyeres were used for blow-pipes, not actual bellows.

Site 149 in Timna’ Valley covers an area of 10x15 m and comprises two low walls (5 and 3 m long) and a few stone anvils and mortars (Fig. 3:29); small pieces of slag are scattered on the low hill to the east. During the survey and excavation of the site (Rothenberg 1991, 1999a:84-86; Rothenberg & Glass 1992:144; Rothenberg & Shaw 1990a,b) fragments of a blue copper ore of bisbeeite were found, as well as EB IV, comb-decorated pottery sherds and fragments of clay rods. The site is described as inaugurating an important innovation in the history of metallurgy of the southern ‘Araba Valley. Slagged stones represent the first stone-built furnaces, replacing the previous “hole in the ground” type (although stone-built furnaces were already described in the EB II Site 201 and the Chalcolithic Site 39b). The majority of slag is described as solid and larger than the earlier ones, a result of the new tapping technology (which also appeared before in Site 201). Small slag pieces, on the other hand, were interpreted as representing another innovation, crucible-refining, while the clay rod fragments were interpreted as remains of clay coils for the manufacture of crucibles (but see a different interpretation below). These innovations were attributed to migrants, newcomers from the north, who established the earliest industrial-scale plant for copper smelting in the ‘Araba Valley, and produced hundreds of kilograms of copper in the site (Rothenberg & Shaw 1990a:8). Alternatively: “...this new metallurgical efficiency was a local development, probably motivated by the increasing demand for copper...” (Rothenberg & Glass 1992:151). Based on the industrial nature of the site, and on chemical and lead isotope analyses, Rothenberg & Shaw (1990b:293) suggested that the bar-shaped copper ingots discovered in several EB IV sites in the Negev Highlands (see below) were produced in this site, while the source of copper ore was the mine at Site 250, 1.5 km northwest.

There is no question that copper was produced in Site 149, but the above picture demands re-examination. First, the stone-built furnace and the tapping technology could not appear twice as the first time, in the EB II and the EB IV. If two different tapping technologies were introduced, differences were never mentioned. Second, Site 250a cannot be considered a mine but only a natural cave, with very minimal copper mineralization (see above). Even if it was a mine, Rothenberg and Shaw (1990b:292) acknowledged that it was not large (10x3x1.5 m), and if this is the only EB IV mine identified in Timna’, the industry it supported would be extremely limited. Third, Site 149 is very small (Fig. 3:29), the amount of slag scattered on the adjacent hill is not larger than on any other hill in the southern ‘Araba Valley, and no similar site has been found in the Timna’ area to justify the EB IV industrial picture. The above description is certainly invalid, in light of the real, large and well established EB II-IV copper industry in Faynan (see above).

3. Copper Smelting in Sinai

Perhaps the earliest indication of copper smelting in Sinai comes from the sandstone area in the southwestern peninsula, with only limited material published to date. In Site 702b of Rothenberg’s survey (in Wadi Ahmar, west of Bir Nasib), several types of slag were distinguished, from two different periods. The earlier, glassy-viscous slag and dense crystalline slag were dated to the 5th millennium B.C., i.e. Chalcolithic (or Predynastic according to the publishers, Gayar & Rothenberg 1999). The chemical composition of the slag, however, is interesting, including 2.2%-5.4% Na, 1.5%-2.8% Al, 12.8%-24.5% Ca, 0.2%-1.9% Mn, 10.2%-24.7% Fe, and up to 0.3% As. This composition is very different from any slag analyzed to date in desert regions of the southern Levant. Since no reaction was discerned on the quartz grains in the slag, the deduced smelting temperature is only 800°C, far below the smelting point of copper ore (Gayar & Rothenberg 1999:149, Table 4). In contrast, no Cu remained in the slag, which indicates a high smelting temperature and balanced chemical conditions, unexpected for the incipient smelting technology of the period.

The later, crystalline feyalite slag from Site 702b is related to the Early Kingdom of Egypt, 3rd millennium B.C. Their smelting temperature was 1100°C, and it was suggested that iron oxide ore found in the site was used as flux (Gayar & Rothenberg 1999:147). The slag composition is interesting: 1.5%-9.3% Na, 3.9%-5.7% Al, 7.0%-11.5% Ca, 1.1% -8.8% Mn, 7.8%-14.9% Fe, and other elements (Gayar & Rothenberg 1999:147 and Table 8). Copper content in the slag was again very low, only 0.1%. Of special interest is the content of 2.9% As in copper prills, and more so, the presence of arsenopyrite ore in the site, containing up to 19.1% As and up to 53.5% Cu (Gayar & Rothenberg 1999, Tables 6, 7).

Remains of ancient copper industry were found in several locations in the area of Wadi Reqitia- Wadi Zagha’a- Wadi Sened in southern Sinai. Some were already reported by Holland (in Wilson & Palmer 1869:121), who identified the remains of smelting furnaces near ancient mines. A site in Wadi Ahmar, in the same area, was later surveyed by

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28. Unfortunately, the evidence for dating and attribution of the slag and copper prills to the different stages was not published. It was not stated whether the definition of stages was based on stratigraphy, whether the site was excavated, nor was the extent of industry described.
Currelly (in Petrie 1906:240) next to a copper mine, where he found Neolithic flint tools and metallurgical remains. Later on, the site was re-examined by Rothenberg (1973:36, 1979:137) and Beit-Arieh (1977:159-162), the latter also discovered three additional production sites (ibid., Pp. 67-70, 159-162), containing the remains of furnaces, clay tuyeres and copper slag. The location of these sites was certainly affected by the occurrence of two copper ore veins within igneous rocks in Wadi Rinti-Wadi Reqitja, as described above. Further remains of copper industry were uncovered in EB habitation sites in Nabi Saleh, Sheikh Muhsain, Watiya North and in Site 1014 (Beit-Arieh 1977:149-172, 1981a:112-113, 1983:44, 1986:41-42). They included copper ore, copper prills, slag, crucible fragments and molds and copper utensils (Beit-Arieh 1977:157, 159). Another nearby EB site was surveyed by Rothenberg (No. 590), where he excavated a smelting furnace (unpublished). Analysis of the clay lining from the furnace indicated a smelting temperature of 1035-1100°C, and analysis of attached slag showed a low Cu content of 3.0%, 7.5% Fe and other elements (Kingery & Gourdin 1976). Clay lining indicates an advanced furnace, built for repeated smelting. In a later publication (Rothenberg 1979:139, 149), this furnace was described differently— with a stone lining, and, for the first time in Sinai, a technology that taps out the slag, leaving a copper ingot on the furnace’s bottom (similar to Site 201 north of Timna Valley, see above). In the nearby Site 701 even a further advance was found— plug-shaped clay tuyeres set inside the furnaces. These innovations are dated to the Timnian II stage (=EB II-III), and attributed to the Early Dynastic Egyptians (ibid.), although no such remains were ever published from Egypt. Since no other tuyeres were found in an EB smelting context, the impression is that these sites contain the remains of several different periods, and indeed, Currelly (in Petrie 1906:240) found Late Kingdom Egyptian artifacts of the XIX Dynasty, in the Wadi Ahmar Site.

All sites in this region were included by Beit-Arieh into one network of EB II settlement and copper production. However, dating the production sites was based almost only on surface collection of flint artifacts and hole-mouth jar sherds, and a limited excavation of a single installation in one site. The flint and hole-mouth sherds, usually dated as EB II, should actually be extended to a longer period of time, 6th to 3rd millennia B.C. (see Ch. 8). Therefore, the copper production sites should not necessarily be seen as limited to EB II only, they could be both earlier and later. Further implications of the copper industry remains will be discussed below.

D. Copper Artifacts in the Negev, the ‘Araba Valley and Sinai, 

Chalcolithic to EB IV

1. The Industry of the Be’er Sheva’ Basin and the Nahal Mishmar Hoard

The best known early copper find in the Near East is the hoard from Nahal Mishmar, in the Judaean Desert (Fig. 3:30). Discovered in 1961, it consisted mostly of cult objects: 6 ivory, 7 hematite and limestone, and 416 of copper. The latter, weighing over 140 kg, included 249 piriform maceheads, 11 disk-shaped maceheads, 123 standards, 10 crowns, 5 jars, 1 axe, 15 chisels, 1 hammer, and others items (Bar-Adon 1980). The first 14C dates from the mat which wrapped the hoard yielded calibrated mean values 3850-3510 B.C., towards the end of the Chalcolithic period, while one date was earlier, 4350-4040 B.C. (Bar-Adon 1980:199). However, six new AMS 14C dates of samples from the same mat yielded much earlier dates. The range of four calibrated mean values is 4580 to 4190 B.C., while two others are even earlier (Aardsma 2001). Therefore, the Nahal Mishmar hoard should be re-dated as Early Chalcolithic, only a short while after the first emergence of true metallurgy in the Near East. The hoard's revised dating is quite astonishing considering its sophisticated technology and the number of copper objects.

Considerable numbers of copper artifacts, similar or identical to those of the Nahal Mishmar hoard, were found in 15 other Chalcolithic sites in Israel, mostly in the south: Six sites in the Judaean Desert, five sites in the Be’er Sheva’ Basin and four sites in central and northern Israel (Table 7).

Chemical and metallographic studies of the copper artifacts (Key 1963,1980; Potaszkin & Bar Avi 1980) included 34 objects from the Nahal Mishmar hoard, Nahal Ze’elim Cave and Tell Abu Matar. Both studies indicated division of the copper artifacts into two different groups. One was utilitarian, in which all analyzed pieces, but one, were made of pure copper, bearing only ca.1% impurities. The other group included cult objects, of which all analyzed objects, but one, were made of copper alloy, usually with 2-11.9% arsenic (As) and ca. 0.5% antimony (Sb). Later, two teams re-analyzed objects from the hoard and other sites, using more advanced methods and equipment (Shalev & Northover 1987, 1993; Shalev 1991, 1992, 1994; Tadmor et al. 1995). Altogether, 98 objects were studied by both teams,

29. Only once did Rothenberg attribute tuyeres to the EB, in Site 229 in the mountains west of Timna’ Valley (1979:149). In the survey of the Eiloth region, however, he described metallurgical remains in Site 229a, including tuyeres fragments, but they were dated by pottery to the Iron Age (Rothenberg 1967b:302). The site was not mentioned again in any of his many publications.
including 12 objects previously analyzed by Key. The most important result was the discovery that in the prestige cult object group, antimony was the major addition to the copper, usually comprising 2%–10% and in a few cases up to 22.5%. Arsenic was only second, usually 1.5%-5%, in several cases below 1.5%, and in two objects 8.2% and 15.3% (Shalev 1992:59-63, Table 2-b.3; Tadmor et al. 1995, Table 2). Another result was that some objects bore a high nickel content, in place of antimony, up to 8.6% (ibid.). Both teams confirmed the fact that utilitarian items, such as awls, chisels and axes, were generally made of pure copper with only about 1% impurities.

The division of the analyzed objects into two different technological and typological groups, the pure copper and the alloyed one, was unanamous. It is also agreed that the ore for the first group originated in the ‘Araba Valley, mainly in Faynan, as it was confirmed by chemical and lead isotope analyses of ore found in several of the Be’er Sheva’ Basin villages (Hauptmann et al. 1989:126-128; Hauptmann 2000:166-173; Shugar 2000:159-182). It is also agreed that the pure copper utensils were produced in these sites, based on ample copper industrial remains discovered on site, including furnace remains, crucibles fragments, ores and slag. At, Shiqmim these remains were found in several houses, throughout the inhabited areas, and therefore, the industry is described as a widespread, household scale (Levy & Shalev 1989:361-2, Shalev & Northover 1987; Shalev 1991; Golden et al. 2001). A similar situation was also found in the site of Nevatim, 9 km to the east (Gilead & Fabian 2001). At Tell Abu Matar, on the other hand, intensive remains have been found concentrated in three locations, in Locus 244 (Perrot 1955:79-80) and in areas A and M (Gilead et al. 1991, 1992); it seems that here the copper industry was of a larger scale and better centralized. More so, Tell Abu Matar may be seen as one large, major industrial settlement together with Neve Noy, Bir Safadi and Miftan, on both banks of Nahal Be’er Sheva’ (Shugar 2000:49, 259).

Theories on production of utilitarian objects in Chalcolithic and EB I sites described a one-stage, crucible smelting and casting (see Note 19). However, in recent analyses of the finds from Abu Matar and Nevatim, Shugar clearly distinguished between furnace and crucible fragments and between smelting and melting slag. This leads to reconstruction of a two-stage process. In the first, copper ore was smelted in a furnace, resulting in a coagulated slag mass that contains copper prills. In the second, the prills were released from the slag by crushing, melted in a crucible and cast into open molds (Shugar 2000:83-120, 244-249). Following the cast, the tools were annealed and hammered repeatedly in order to reach the final shape and hardness (Shalev & Northover 1987:361; Tadmor et al. 1995:128).

The cult objects present an unprecedented technological level; all metallographic studies showed that they were cast by the “lost wax” technique. The copper alloy with antimony and arsenic was necessary for the production of these objects due to the specific properties of the alloy. It reduces the melting temperature of the metal from that of the copper, 1085°C to only 900°C, and it increases the fluidity of the melted metal, enabling higher precision in casting. The alloy increases the de-oxidation of the metal, and increased hardness close to the degree of tin bronze. It creates a smoother surface that can be better polished, and gives the metal a dark brown-gray-silver color (Potaszkin & Bar Avi 1980:237; Northover 1989; Shalev 1992:48; Shugar 2000:217-220).

The alloy was either deliberately prepared by mixing copper ore with antimony and arsenic minerals (Potaszkin & Bar Avi 1980:237; Key 1980:242), or from one specific ore, containing all three metals (Shalev & Northover 1987:358-9; Tadmor et al. 1995:143, 145). Since such ore is not found in the ‘Araba Valley, it was suggested that these metals were imported to the area, either as minerals or as a ready-alloyed metal (Key 1980:243; Golden et al. 2001:961-2). A different theory is based on one mineral containing all three metals, and the likely candidate is fahlerz, which occurs in nature as a mixture of two variants, tetrahedrite (Cu,SbS3) and tennantite (Cu,AsS4). Fahlerz is found in Iran, Azerbaijan and Anatolia, where antimony-arsenic-nickel copper ores are also found (Potaszkin & Bar Avi 1980:237; Key 1980:242; Charles 1980:170-172; Gale et al. 1985: 145; Tadmor et al. 1995:131, 141-3; Wagner et al. 1989:303; Piggot 1999a:80, 86; Yener 2000:52). No minerals of these types have been found as yet in the Chalcolithic sites, and until recently all copper industry remains uncovered were those of pure copper technology (Shalev 1991:417; Shalev & Northover 1993:45; Golden et al. 2001). Therefore, it was also suggested that the alloyed copper cult objects were imported as end-products from Anatolia or elsewhere (Perrot 1968:441; Hauptmann & Weisgerber 1992:63), or were locally produced by foreigners or newcomers (Rothenberg et al. 1991:1-2).

Nonetheless, increasing evidence indicates that the prestige-cult objects did indeed belong to the indigenous culture and industry:

A. To date, 451 prestige objects of antimony-arsenic copper have been found in Israel. Forty-five of these were found at 15 different sites in addition to the Nahal Mishmar cave, almost all in the south. In total they include 18

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30 Key’s analysis was made by means of optical spectrography determination. Shalev & Northover based their analyses on electron probe microanalysis (EPMA) equipped with wave length dispersive spectrometer (WDS), and on atomic absorption spectrometry (AAS). Tadmor et al. made their study using AAS, neutron activation, lead isotopes, X rays, gamma rays and 75x magnification visual examination.
crows, 141 standards, 281 mace-heads and 11 varia (Table 7). From the stylistic and iconographic perspective, all crows and standards are directly related to the Chalcolithic cultures of this region (Bar-Adon 1980:202; Epstein 1982; Hanbury-Tenison 1986:159; Beck 1989; Tadmor 1989, but for a different opinion see Elliot 1977:23). Outside Israel, on the other hand, only one site, Tepe Hissar in northern Iran, yielded three copper standards somewhat similar to those of the Nahal Mishmar hoard (Fig. 3:31) but they are ca. 1200 years or more later then the Nahal Mishmar hoard. Two standards are from Stage II, late 4th millennium B.C., and one from stage III, mid 3rd millennium B.C. (Schmidt 1937, Pl. 29; 48. For \(^{14} \text{C} \) dates of Tepe Hissar see Ehrich 1992 II:135-6).\(^{31}\)

B. The 451 prestige-alloyed objects discovered in Israel are quite consistent in chemical composition, but they have no Chalcolithic or EB parallels in chemistry anywhere else in the Near East. No chemical analyses were published from the standards of Tepe Hissar, but the preliminary analysis of 11 other copper objects from the site showed a very different chemical composition from those found in Israel. They were cast of relatively pure copper, 93.2%-99.2%, with up to 2.24% tin (Schmidt 1937:360). Later analyses on 198 of the 1109 copper objects from the site also showed a dominance of relatively pure copper, although some had a low arsenic content, 0.04%-2.59% (Pigott 1999a:86). This composition, with only some occurrences of a very low antimony, is characteristic of the metallurgy of the Iranian plateau in general during the 4th-3rd millennia B.C. (Stech & Pigott 1986; Muhly 1988:10; Pigott 1999a:79-88; Vatandoust 1999:128-131). Copper objects from Luristan contain up to 5% arsenic and 5% antimony (Tadmor \textit{et al.} 1995:141-2, with references), quite close to the composition of the cult objects from Israel, but these are more then 2000 years later.

In Mesopotamia, only 15% of analyzed copper artifacts from Ur, contained nickel and arsenic, ca. 3% in total. In only a few cases did arsenic reach 16.1%, nickel to 14%, and cobalt 4%, while antimony was not reported. In Tepe Gawra, only one out of 118 objects contained arsenic and nickel (Tadmor \textit{et al.} 1995:142, with references).

In Anatolia, 207 analyses on 55 copper objects from Arslantepe showed arsenic content of usually 3%-5%, but a very low antimony, usually 0%-0.4%, and in only three cases 1.03%, 1.31% and 1.62% Sb (Caney & Palmieri 1983:646-652). A similar profile was also found in nearby Hassek Höyük, up to 4.9% arsenic and a maximum of 0.3% antimony (Tadmor \textit{et al.} 1995:141, with references). At Norsun Tepe, industrial remains included copper ore with only low contents of antimony, arsenic and nickel (Zwicker 1980, Tables 1-6). Fifteen analyzed objects from Troy bear up to 3.3% arsenic, but only up to 0.08% antimony. A lower content of both was found at Mersin, as well as at Kastri and Siyros in the Cyclades. Nickel in these sites was usually below 0.3%, in four samples it reached up to 0.47% Ni (Gale \textit{et al.} 1985:148, 168). In Dégirmen tepe, by the upper Euphrates, the maximum content of arsenic in copper prills was 2.33% and antimony 1.43% (Yener 2000:39-40). In general, a low arsenic content in copper objects was common in Anatolia, (de Jesus 1978; Gale \textit{et al.} 1985; Yener \textit{et al.} 1998), and only during the 3rd millennium B.C. did arsenic reach a higher content in copper objects, up to 12.6% (Yener 2000:46).

C. A soft limestone core of an alloyed copper macehead from Shiqmim was identified as originating from the Eocene “Paran” formation, exposed in the central ‘Araba Valley and in some locations in the western Negev Highlands. Petrographic study of ceramic cores from ten maceheads of the Nahal Mishmar hoard, one from the Nahal Ze’elim Cave and one from Nahal ‘Ashan, showed a range of clay sources, primarily the “Taqiya” formation. The petrographic data indicates that all of these cores were locally made in several locations. This implies that more than one production center of alloyed copper existed in the south (Goren 1995:303-305).

D. Although the two Chalcolithic technologies in Israel are described as totally different, representing two separate classes of craftsmen (Key 1980:240; Levy & Shalev 1989:366-7; Shalev 1991, 1992:230-231, 1993), there are indications of close contacts between them. Artifacts of both groups (the pure copper utensils and the alloyed cult objects) were actually found together at almost all sites mentioned above. Some prestige objects were cast from pure copper, while in several utensils, the copper contained antimony, arsenic and nickel.\(^{32}\) Probably, metal from defective alloyed artifacts was remelted and added to the pure copper while casting new utensils (Tadmor \textit{et al.} 1995:138). Ten out of 16 analyses on four objects from the Nahal Qana Cave showed that Sb was 3.49%-22.55%, and As was 1.76%-6.89% (Shalev 1996). These objects included a standard, a twisted wire, a decorated fragment and a lump of metal, and again they demonstrated that not only “regular” cult objects were made of antimony-arsenic copper. Another point of affinity between the two is the common polish technique (Tadmor \textit{et al.} 1995:145). All these attest to close contacts between the two technologies (cf. Moorey 1988b:185; Tadmor \textit{et al.} 1995:145).

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\(^{31}\) Bar-Adon (1980:40) mentioned a copper standard from Tepe Gawra IX, as similar to standard 115 of Nahal Mishmar, but in Note 5 he refers to two standards from Tepe Hissar II, not Tepe Gawra, published by Schmidt (1937, Pl. 29). For the updated \(^{14} \text{C} \) dates of the Nahal Mishmar hoard see Aardsma 2001.

\(^{32}\) Key 1980:239, Nos. 61-52, 61-147; Shalev 1992, Table 2-B.2, No. 18, Table 2-B.3, No. 17, etc.; Tadmor & Kedem 1995:132-3, Table 2, Nos. 3, 28; Segal \textit{et al.} 2002.
E. Most scholars emphasized the absence of antimony and arsenic in the copper ore of the ‘Araba Valley, Sinai and ‘Arabia. However, a growing body of evidence does indicate the presence of arsenic copper ore in our region, as well as arsenic copper industry.

Native copper with a high content of arsenic was discovered in an ancient mine in southeastern Sinai (Ilani & Rosenfeld 1994, Ilani et al. 2000). The mine is an open trench 20x1-2 m, dug along a copper-rich vein near Wadi Tar. The ore attached to the native copper contains up to 40.5% copper and 10% arsenic, but only 25 ppm antimony. Copper ore containing 8% arsenic was also found in Nahal Netafim near Eilat (M. Shirav, pers. comm. June 1992). Arsenic copper ore was found in smelting site 702b in southwestern Sinai, containing up to 19.1% As and up to 53.5% Cu (Gayar & Rothenberg 1999, Tables 6, 7). Arsenic copper was also found in two EB sites in southern Sinai (Sheikh Muhsein and Watiyah), 1.1% in a copper axe, and more important, three out of five copper prills contained up to 5.5% As (Lupo in Beit-Arieh 1977:166, 167,171). The latter indicates that arsenic copper was locally produced in southern Sinai.

Industrial remains of arsenic alloyed copper were recently discovered in the Be’er Sheva’ Basin sites. At Tell Abu Matar and Nevatim, copper prills entrapped in slag contain 1% As in average and 6.72% maximum (Shugar 2000:183-202, 221-223; Gilead and Fabian 2001:74-75). This slag remained adhered to the walls of the smelting furnace and melting crucible fragments. Antimony, on the other hand, was much lower, up to 0.25% (Shugar 2000:208, Table 8.20). A high As content was also found in a copper ingot from Bir Safadi, by Golden.33 In Site 702b, southwestern Sinai, the slag matrix from the earlier stage, probably 5th millennium B.C., was found to contain 0.36% As, and the copper prills contain up to 0.34% As. Copper prills of a later stage, 3rd millennium B.C. contain 2.87% As (Gayar & Rothenberg 1999, Tables 4-7).

Based on the chemical analyses of the slag, copper prills and refractory remains from Abu Matar and Nevatim, Shugar suggests a two-stage production process. First, co-smelting of various ore in a furnace, including the arsenic ore. This resulted in a slag mass, containing copper prills of various chemical compositions. The prills were then released from the crushed slag and separated according to their color. In the second stage, the prills were separately remelted in crucibles. Orange colored prills were remelted and cast into utensils, while the more silvery prills, containing arsenic, were remelted and cast into prestige objects (Shugar 2000:244-259).

The technological picture is still incomplete, since neither arsenic ore nor mold fragments have been found as yet in Tell Abu Matar and Nevatim. The occurrence of arsenic in the slag of these sites is also problematic since it is contained only in the prills, while no arsenic occurred in the slag matrix. Also, antimony is still missing to match the usual composition of prestige objects. Apparently a third technology, of arsenic copper only, is revealing. Indeed, some prestige objects do contain arsenic only, one is a standard from Abu Matar (Perrot 1955:172), analyzed by Shalev & Northover (1993:41, Table 1:61-311). Although Shugar (2000:224-230) suggests an Anatolian source for the arsenic ore, the possibility of Wadi Tar, the Eilat region or southwestern Sinai should be examined. Certainly there is still more to investigate in this field, but obviously, the recent analyses do indicate an on-site alloyed copper industry.

To date, lead isotope ratios do not show a connection between the Wadi Tar ore and a number of Chalcolithic to MB I arsenic copper objects examined so far (Ilani et al. 2000:66). Since no significant content of antimony was detected as yet in the geographical sphere of the Negev, Sinai and southern Jordan, it is still probable that fahrlez or other copper minerals bearing arsenic and antimony arrived in southern Israel through trade. Evidence of long range trade was found in the excavation of the Late Neolithic-Early Chalcolithic burial ground at Eilat, in a lump of realgar (AsS) which most probably arrived from Anatolia, and faience and glazed talcus-enstatit beads arrived from Mesopotamia (Segal, in Avner in press 1).

Although several questions still remain unanswered, all evidence leads to the conclusion that in addition to the pure copper technology, the more sophisticated alloyed, prestige industry was indigenous in southern Israel and Sinai. It is also possible that some of the ore for this industry was locally available. It seems now that there were actually three copper industries in the Chalcolithic period; that of copper with only arsenic may be added to the other two discussed throughout this chapter.

33. The arsenic copper ingot is mentioned several times in Golden’s Ph.D. dissertation (1998, e.g. Pp. 11, 78, 328, 410), but the chapter containing its description and analysis was not available to me. An attempt to receive it from Golden also failed.
2. Copper Objects from the Southern 'Araba

Possibly the oldest copper object in the southern Levant is a small bead, 9.8x7.8x0.4 mm (Fig. 3:32), found in Tomb VII in the Eilat burial site, dated to the Late Neolithic–Early Chalcolithic (Table 1:39, and see App. 1). Chemical and metallographic study of the bead by Segal and Kaminski (in Avner, in press 1), demonstrated that it was made of smelted copper ore, cast to a sheet form, which was then cut and pierced. According to our present knowledge of the emergence of ore smelting, there is a low probability that the bead was produced before the mid 5th millennium B.C. If the bead is integral to the site, it may be considered as one of the earliest copper metallurgic objects found in Israel. However, the copper contains 2.3% tin, which raises two problems; the first is the bead’s date. On the one hand, no indication was observed that the bead was intrusive; it was found with other types of beads common to all tombs in the site, and with other dated artifacts. On the other hand, its tin content may mean deliberate alloying, i.e. tin bronze, which is commonly believed to have appeared in the Near East only in the late 3rd millennium B.C. (see Note 13). In fact, tin content in copper objects is known in the Near East in Chalcolithic and EB I sites. A content of 2.3% tin was found in a copper axe from Susa I, Iran, as early as 4000 B.C. (Stech & Pigott 1986:43). In Anatolia, tin bronze first appeared in the Late Chalcolithic, and was regularly produced since the early 3rd millennium B.C. (Yener 2000: 29, 66-88-110, 126). Several Anatolian Late Chalcolithic and EB I copper objects, from Alishar, Kusura, Mersin and Troy contain 1%-10% tin (de Jesus 1980:127-139). In the southern Levant, two Chalcolithic copper chisels from Tuleilat Ghassul contain 7% tin (Mallon et al. 1934:75, Pl. 34), identical in shape to other contemporary copper chisels. A4 An awl from the site of Nabi Saleh, southern Sinai, contains 1.15% tin (Lupo in Beit-Arieh 1977:166), a site which is dated as EB II, but also yielded a 14C date of 3500 B.C. (Table 1:73). Various scholars suggest different thresholds of tin content for definition of bronze, between 0.5% and 9%.35 Gale et al. (1985:155) referred to many copper objects containing tin in Anatolia, before the coming of true tin bronze, and argued for a threshold of 5% Sn. Charles (1980:172) showed that smelting stennite (Cu₂Fe₅Sn₅), yields an actual tin bronze, without the deliberate alloying of copper with tin. Conversely, de Jesus (1980:128, 150) sees the occurrence of tin bronze as an intentional development of Anatolian metallurgy already in the Chalcolithic. Nevertheless, in light of the above data, the Eilat bead should not necessarily be considered intrusive.

The second question concerns the origin of the bead. Tin content in copper ore from the ‘Araba Valley is much lower, up to 0.17% in Timna’ (Leese et al. 1986:94-5) and up to 0.115% in the Faynan area (Hauptmann 1989:123). This implies that neither the bead nor its original ore were local. Stennite ore is found in several mining areas in Anatolia and neighboring countries (de Jesus 1980:53-56), and copper disk beads, similar in shape and size to the one in Eilat, were discovered in a number of 8th-5th millennia B.C. sites in Anatolia and Mesopotamia (see above). At first glance, no trade can be envisioned between these two distant regions in the 5th millennium B.C. However, there were other objects in the Eilat burial site that originated in these countries (see above, and in App. 1). Thus, it is possible that the copper bead also originated in the north-east. If the Eilat bead was imported, it implies that by the 5th millennia B.C. the desert population was, at least, familiar with the existence of metallic copper.

As mentioned above, numerous copper objects were recently discovered in Tell alMagass and Tell Khueirat alGhuzlan, just north of ‘Aqaba, in addition to industrial remains, most are unpublished. They are safely dated now to the Chalcolithic and EB I on the basis of artifacts and 14C dates.

Currently, other sites in the Eilat area have yielded a limited number of copper objects. Nine awls were found at five sites in ‘Uvda Valley dating to 4th-3rd millennia B.C. Five are square-sectioned and four are rounded (Fig. 3:33). In addition a narrow adz or a chisel, 6 mm thick, was found in ‘Uvda Site 17, containing 91.57 Cu, 5.82% Fe, 1.26 As and 0.45 Sb. (Beit-Arieih 2001:104, Fig. 8:11). Another square-sectioned awl was found in an EB level of a habitation site built on top of a desert kite near Kibbutz Samar (Avner 1983c, Table 1:33, first date, and Fig. 3:33, No. 6). This awl, analyzed by I. Segal, contains 97.09% Cu, 1.78% As, 0.58% Fe and 0.17% Sb. Commonly, square-sectioned awls are dated as EB II, and rounded ones as Chalcolithic or EB IV (Ilan & Sebbane 1989a; Beit-Arieh 2001:100,104). However this distinction does not seem valid, since both types are found together in Chalcolithic, EB I and EB IV sites. About ten copper prills from ‘Uvda Valley, Site 17 (Beit-Arieih 2001:104), indicate a connection with copper production, either near the site or in Timna’ Valley, less then one day’s walk away.

34. See Nahal Mishmar (Bar-Adon 1980, No. 172, 174, 177, 179) and in Nahal Mikhmach Cave (Eshel & Zissu 1999, Fig. 4). Based on a new series of 14C dates from Tuleilat Ghassul (Bourke et al. 2001), Level IV, in which the chisels were found, must be dated to the late 5th millennium B.C.

35. De Jesus (1980:124) adopted a threshold of 3%; Moorey (1985:18) quoted several scholars suggesting various thresholds, 0.5% to 9% tin; Muhley (1993:240) and Stech (1999:62) adopted 2%. Hauptmann claims that the 2.3% of tin in the Eilat bead certainly makes it bronze (a letter from 17.8.2000).

36. Hadashot Archeiologist 74-75:39-41, 45, 47. The awls were found in Site 9, excavated by Amiran, Arnon, Ilan & Avner, Sites 10 and 18, excavated by Eitan and in Site 17, excavated by Beit-Arieih. See also Ilan & Sebbane 1989b:156, N.13 and Beit-Arieih 2001:101-105.
3. Copper Artifacts from Sinai

Two groups of finds from Sinai should be discussed: one is the copper objects of the *nawamis* tombs and the other the finds from the EB sites of southern Sinai.

A total of 60 copper artifacts were found in the 200 excavated *nawamis* tombs of southern Sinai, in nine of 19 *nawamis* fields. Their original numbers may have been much higher, since many tombs were robbed in antiquity or modern times. The first copper objects were discovered by Currelly in 1904 in the excavation of *nawamis* at Wadi Nasb (Currelly, in Petrie 1906:243-4, Fig.179). They included a thin, twisted copper wire, similar to those found in the Nahal Qanah Cave, and three awls. Two awls were square-sectioned and one was rounded (judging from the published photograph), the longest being ca. 120 mm. Chemical examination indicated that the metal was almost pure copper, with a minor tin impurity. Although this examination was made in the early 20th century, the results match the analyses of awls from the *nawamis* tombs of ‘Ein Hadera, 99.46%-99.70% copper, up to 0.184% tin, and other minor impurities (Bar Yosef et al. 1977:80). Similar chemical composition was found in four awls from the habitation site of Guna 100 and the adjacent *nawamis* tombs; however, another awl contained 28.7% iron (Bar Yosef et al. 1986:147). The copper assemblage from all excavated *nawamis* includes 47 awls, four rings, two axes, one twisted wire, five copper fragments, two copper ore nodules and one lump of copper slag. Twenty-two of the 47 awls are square-sectioned, the others are rounded, but some were probably worn. The occurrence of copper slag in one tomb (in Wadi Sawawin) is also of interest, since it may testify to copper smelting in Sinai during the Chalcolithic.

The *nawamis* tombs were dated as both Chalcolithic and EB I (Bar-Yosef et al. 1977:88). This dating is still generally valid, but some amendment is necessary. They had already appeared by the Late Neolithic, were mainly built during the Chalcolithic, and continued somewhat into the EB I. Based on the occurrence of square-sectioned awls in these tombs, Ilan & Sebbane (1989a:153) suggested that at least the tombs which contained these awls should be dated as EB I. However, since the chronological distinction between the two types has been disproved, the *nawamis* awls could well be Chalcolithic, and the beginning of metallurgy in Sinai may be dated to this period as well. Although the copper objects could have arrived in Sinai through trade, the number of copper objects that survived the *nawamis* robbery seem to support the possibility of a local industry (as suggested below).

The second group comprises 22 copper objects uncovered in four EB habitation sites in southern Sinai (Nabi Saleh, Sheikh Muhsain, Watiya North and Site 1014, Beit-Arieh 1977:149-172, 1981a:112-113, 1983:44, 1986:41-42). They included five axes, one adze, two chisels, eight awls, and six miscellaneous fragments. Remains of a copper industry were also found in these sites, including copper ore, copper prills, slag, crucible fragments and molds (Beit-Arieh 1977:157, 159). Several copper production sites were discovered as well, one was first surveyed by Currelly (in Petrie 1906:249) next to a copper mine, where he found Neolithic flint tools and metallurgical remains. Later, the site was re-examined by Beit-Arieh (1977:159-162) and by Rothenberg (1979:137). Three additional production sites were discovered in the same area by Beit-Arieh (1977:67-70, 159-162); these also contained remains of furnaces, clay tuyeres and copper slag. The location of these sites is due to two veins of copper ore in Wadi Rimti, within igneous rocks, as described above.

Based on chemical analyses made by A. Lupo, Beit-Arieh pointed out the connection between the copper ore, the industrial remains and the copper objects found in the habitation sites. These, and the ‘Aradian pottery found in the sites, led to the construction of a comprehensive historical and social scenario, in which the habitation sites represent a Canaanite ‘Aradian’ colonization of southern Sinai, monopolizing its copper sources and developing a broad trade network (Amiran et al. 1973; Beit-Arieh 1974, 1977:149-172, 1981a,b, 1983). However, the published data does not support this scenario, for the following reasons:

1. The habitation sites excavated by Beit-Arieh are 12-60 km away from the copper sources of Wadi Riqeta-Wadi Rimti. If the purpose of building these sites was the exploitation of copper, they should be much closer to the ore.

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37. Most *nawamis* sites were excavated by A. Goren (1980,1998), and the finds were prepared for publication by N. ‘Arad-Ayalon, in a monograph presented to the IAA (unpublished). The data on the copper objects were compiled from this monograph; I thank Goren and ‘Arad-Ayalon for permitting me to use this material.

38. For early artifacts in *nawamis* see e.g. polished axe from J. Guna (Bar Yosef et al. 1986, Fig. 7:12), "Haparsa" arrow-heads from the adjacent habitation site (ibid., Fig. 11:10, 11) and "Haparsa" arrow-head from a *namus* tomb at Wadi Daba'ya (Arad-Ayalon unpublished). See also 5th millennium 14C dates from *nawamis*, Table 1:59, 70.
sources, however, only one site (No. 1041) is found near the copper veins, with only limited habitation architecture (Beit-Arieh 1977:161).

2. No ‘Aradian’ pottery or other related artifacts were found in the southern ‘Araba Valley (Rothenberg 1999a:82, and my own observation). This indicates that ‘Arad did not rule the southern ‘Araba, which is en-route to southern Sinai. If ‘Arad was powerful enough to monopolize the remote southern Sinai, it is not clear why it could not monopolize Timna’, which is much richer in copper, much closer to ‘Arad and more easily controlled.

3. Chemical analysis of 61 samples of copper ore from Wadi Riqetia-Wadi Rimti, showed that the main mineral was chalcocite (Cu$_2$S), of a low concentration. Only two samples contained a relatively high portion of copper (38% and 49%) which could have enabled copper extraction by smelting; 13 samples contained between 1%-7% Cu, far less than required for smelting, while the remaining 46 were below 1% Cu (Bogoche 1972; Bogoche & Zilberfarb 1979). Four samples of ore from the smelting sites near Wadi Reqitia-Wadi Rimti, most probably originating from these veins, were recently analyzed by Hauptmann et al. (1999:7, Table 4). Here the copper content was higher, 15.4%-31.9%, while iron content was 0.13%-3.27%. On the other hand, copper content in ore discovered in the EB habitation sites was much higher: 22%-67% in eight of 12 samples and 7%-12% in the remaining four, while iron content was also very high, up to 37.06% (Lupo in Beit-Arieh 1977:169, Table 4). These differences in chemical composition obviously mean that the two groups of ore were of different origins. In addition, other impurities in the ore from the habitation sites (mainly Sn, Zn, Pb, As, Ni), were almost identical in percentages to those of the Timna’ ore (Leese et al. 1986:94-5, Table 1). This indicates that none of the analyzed nodules from the habitation sites could have come from the southern Sinai igneous rocks, but only from sandstone deposits, i.e. the ‘Araba Valley or southwestern Sinai sandstone. From the latter, only one sample was analyzed (Hauptmann & Begemann 1999:7, Table 4) and a single analysis was published from Site 702b, (Gayar & Rothenberg 1999, Table 1).

4. Chemical composition of 24 slag samples from the habitation sites (Lupo in Beit-Arieh 1977:168, Table 3) showed a high content of FeO / Fe$_2$O$_3$, up to 50.6%. This content is very similar to the slag composition of Timna’ (Rothenberg 1999a:69, Table 1), and it obviously indicates the use of iron oxide as flux (in addition to exploitation of iron-rich copper ore). The amount of iron-oxide flux necessary for smelting chalcocite is much larger that of the sulfide copper ore (see Note 6), but no significant iron sources are known in the igneous rocks of southern Sinai (Bugoch, pers. comm. and see Hauptmann & Begemann, op. cit.). Hence, iron minerals, mainly hematite, must also have been imported into southern Sinai in large quantities. Manganese oxide, which is abundant in the Umm Bugma area, southwestern Sinai, could perfectly serve as flux (e.g. Hauptmann 2000:116-129) but, interestingly enough, all analyzed slag from the southern Sinai habitation sites contained very low MnO, usually below 0.2%, though one sample contained 2.3% (Lupo, op. cit.). This means that fluxing minerals were not brought to the sites from southwestern Sinai, and therefore, the closest source for iron oxide was the ‘Araba Valley. If flux could be brought to the EB habitation sites of southern Sinai from afar, copper ore could be brought as well.

5. Recent comparative chemical and lead isotope study of copper ore and objects from southern Sinai and ‘Arad (Hauptmann & Begemann 1999) have contributed new information. The main result was that the analyzed copper objects from ‘Arad and southern Sinai were similar in both tests, but greatly differ from the ore of southern Sinai (cf. Segal et al. 1997:23). Based on these analyses both teams suggested that Faynan was the source of ore for the copper objects of ‘Arad and Sinai. This conclusion may require some amendment, for two main reasons; 1. In both tests (chemical composition and lead isotope ratios) the ore from Faynan and Timna’ are similar (namely, those of the white sandstones). 2. The main argument in favor of Faynan was the abundance of EBI-IV copper mining and production remains in this region, and their purported absence at Timna’. However, there are indications for EB mining and smelting in Timna’ (see above). Therefore, the ‘Araba Valley ore in general should be considered as the source for the copper objects of both ‘Arad and southern Sinai.

6. The obvious differences between the chemical compositions of the ore of the Wadi Rimti copper veins, and the copper nodules, slag and objects from the habitation sites, leave the impression that the two are unrelated and not necessarily contemporary. The EB II dating of the four smelting sites near these veins was based on hole-mouth sherds (Beit-Arieh 1977:69-70, 159-162), but, today it is clear that hole-mouth jars and cooking pots had a long life-span, from the late 6th to late 3rd millennia B.C. (see Ch. 8). Hence, these sites could also be Chalcolithic and/or EB I, not necessarily EB II (while the tuyeres and other finds are much later, see above).

The unavoidable conclusion from the above data is that the southern Sinai was not the source for ‘Arad’s copper trade. Rather, the analyzed EB copper objects from southern Sinai were most probably imported into this region. The industrial remains from the habitation sites and the four smelting camps in the area of Wadi Riqeta-Wadi Rimti do indicate the existence of a local copper industry in southern Sinai, but their chronology, technology and other aspects should be further studied.40

40. The only location where iron oxide was reported is Site 702b in southwestern Sinai, where a lump of iron ore (mineral unstated) contained 46.4% Fe (Gayar & Rothenberg 1999, Table 2). The slag from this site contains 7.8% to 24.7% Fe (ibid., Tables 4, 8), much lower that that of Timna’ slag. No source for the iron ore was suggested.
4. Copper Artifacts from the Negev Highlands

No Chalcolithic copper objects are known to date from the Negev Highlands, and were rare even during the EB. Two awls and two copper beads were uncovered in the “Camel Site” (Rosen 1997b:101) and a few fragments of copper objects were found in six additional EB sites (Haiman, in preparation). Copper utensils and some industrial remains were found in the EB I-II levels of ‘Arad, in Small Tell Malhata and a few additional sites in the northern Negev. ‘Arad’s wealth of copper objects (Ilani & Sebbane 1989a,b) does indicate that the city was engaged in copper trade, but according to Hauptmann’s analyses (see above), ‘Arad was linked with Faynan, not to southern Sinai. Adams (1998:252-255) showed that Egypt was a major copper consumer during this period, and ‘Arad served as a trade station between Faynan and Egypt.

A substantial number of artifacts, uncovered in EB IV sites of the Negev Highlands, can be divided into three groups: bar ingots, weapons and utensils. The bar ingots are 156-209 mm long and 14-28 mm wide, usually with a triangular section, and weigh 123-437 gr (Fig. 3:34). To date they have been found in 9 sites in Israel and Jordan. The majority are from the Negev Highlands, the northern-most being Tel Lachish and the Hebron Hills, and the easternmost is Kh. Hamra Ifdan in the Faynan area. Altogether, 159 complete and segmented ingots were found (Table 8). Their chemical composition is uniform and comprises 94.8-98.9% copper, up to 2.76% iron, up to 2.26% lead and other minor impurities (Kochavi 1967:110-112; Maddin & Stech-Wheeler 1976:172; Segal & Roman 1999:24; Segal et al. 1999:184). This uniformity may indicate one source of ore and one production center. Merkel & Dever (1989:3) suggested that the ingots were produced in both Timna’ and Faynan. Rothenberg (1991:3-4) pointed to Timna’ as the most probable source for the EB IV ingots, cast at Site 149, and mentioned the Faynan area as a second option. Updated chemical analyses and lead isotope study of the ingots, of copper lumps and attached slag, from ‘Ein Ziq and Be’er Resissim (Segal & Roman 1999:29; Segal et al. 1999) demonstrated a high content of manganese-oxide and up to 5% cobalt in the slag., which point to the “DLS” formation in the Faynan area as the source for the ingots. Today, following the discovery of both ingots and molds in Kh. Hamra Ifdan (see above and Fig. 3:35), there is no doubt that the Faynan area served as the production center for the bar ingots, smelted from copper ore of the DLS formation. Following excavation of Kh. Hamra Ifdan, it is clear now that the production of the bar ingots already reached it’s full scale in the EB III, and continued through the EB IV (Adams 1999, Ch. 7). This discovery presents a virtual problem, since at the time of climax in copper mining and production in Faynan, the neighboring Negev was considered to be uninhabited (see Ch. 8).

Of the weapons group, eight daggers were found in EB IV sites in the Negev Highlands, three are complete and five damaged. One was found in a tomb, while all others were uncovered in habitation sites, at Be’er Resissim, Nahal Boker, Har Dimon, and ‘Ein Ziq (Cohen 1999:243-4). All daggers belong to types known mainly from burials in the northern and the central regions of Israel, which persisted or developed from earlier types of the EB I-III. A spear-butt recovered in ‘Ein Ziq (Cohen 1999, Pl. 114) can also be related to this group.

Copper utensils include knife blades, chisels, pins and awls. Two knife blades found in the habitation sites of ‘Ein Ziq and Har Dimon, are of types known only from southern Israel and Egypt (Cohen 1999:264; Philip 1989:141). One complete thin chisel, two fragments of similar tools and 36 awls/pins were found in nine EB IV sites in the Negev Highlands (Cohen 1999:264-5). Since the distinction between pins and awls is inconsistent in various publications, they are referred to here as one group. They are up to 120 mm long and up to 4 mm thick, and their section is either rounded or square, as in the previous periods (see note 37). Several awls/pins were also found at the Har Yeruham site, one with a square section and the others rounded (Kochavi 1967:110, Pl. 7:13, 14).

Chemical analysis of 34 objects from EB IV sites in the Negev Highlands demonstrated that 25 (73.5%) contained 1.05%-4.14% arsenic (Segal, to be published). This result bears several implications: 1. The chemical composition of copper objects from the Negev Highlands EB IV sites is totally different from that of the bar ingots discovered in the same sites. This means that either the copper objects were not produced from the ingots, or, arsenic copper was alloyed with the ingot metal before casting. 2. While EB IV weapons and utensils from central and northern Israel were produced of both tin and arsenic bronze (e.g. Eisenberg 1985; Stech et al. 1985; Rosenfeld et al. 1997), tin bronze was very rare in the south; instead, arsenic copper was intensively used. 3. It is clear now that the Negev Highlands population was deeply involved in the trade of ingots produced in Faynan. In addition, some industrial remains, such as copper slag and crucible fragments, were found at Har Yeruham (Kochavi 1967:101, Pl. 6) and at ‘Ein Ziq (Cohen 1999:262). Since arsenic was also found in some copper objects and copper prills from previous periods in the south, this may be a continuation or even an enhancement of an older, local technological tradition. No connection has yet been found between these arsenic copper objects and the arsenic copper ore in southern Sinai and the Eilat area (Ilani et al. 2000), but further research is needed.

41. For another site in central Sinai with copper industry remains see Rothenberg 1979:119, Site 688. The date of this site is also uncertain, 4th-3rd millennia B.C.

42. See crucible and artifacts in Amiran et al. 1978:55-6, PI.67:12; Ilan and Sebbane 1989a:143, Notes 4, 5.

43. Based on the occurrence of iron and lead in the ingots’ metal, Maddin & Stech-Wheeler (1976:172) suggested they were produced in a secondary casting process, using defective utensils. Merkel & Dever (1989:3), Segal & Roman (1999:29) and Segal et al. (1999) showed the opposite, i.e. that they were produced directly from the smelted ore near the mines.
Haiman (1996) suggested that copper trade was the principal economic base for the larger EB IV settlements of the Negev Highlands (cf. Palumbo 1990:53; Cohen 1999:290-291). Adams (1999:242-244) added that Egypt was most probably the main destination for the bar ingots, and were imported there even through the first intermediate period (contemporary with EB IV). The Negev Highlands sites, therefore, served as important trade stations for copper, as did ‘Arad during the EB II.

E. Summary

At present, the scenario of copper mining and production in southern Israel, southern Jordan and Sinai is far from complete. Mining probably, but not certainly, took place as early as the 7th millennium B.C., before the emergence of proper metallurgy, and a Late Neolithic date for smelting in Timna’ Site F2, is not convincing as yet. Hard evidence for Chalcolithic mining is still missing in both the Faynan and Timna’ areas, and smelting possibly took place in several sites in the southern ‘Araba, on the Yotvata Hill and other hilltops in the southern ‘Araba, and maybe at Timna’ 39b as well. Chalcolithic dates for copper objects and minor industrial remains are possible in the nawamis tombs. The well-established Chalcolithic copper industry in the Be’er Sheva’ Valley certainly received large quantities of ore from the ‘Araba Valley, mainly from Faynan, and it is hard to imagine the desert population remaining disconnected from the metal production system. Intensive Chalcolithic copper industry is now evident in Tell al-Magass and Hujeirat al-Ghuzlan, and possibly in related sites in the southern ‘Araba. In this light, future discoveries and dating of Chalcolithic mining, smelting and casting in the desert are expected. The prestige copper objects of Nahal Mishmar and their parallels, must be seen as a part of the local industry, whose full extent, technology and other aspects still await further studies. Already in the Chalcolithic-EB I copper trade can be seen with Egypt, as it appears through the “Canaanite” material culture and the copper finds discovered in Maadi, which included copper ore, ingots, slag, crucibles fragments and copper objects (Rizkana and Seeher 1989:13-18, Pl. 3, 4). The ore was probably brought from Faynan’s DLS formation, and possibly from Timna’ too (Pernicka & Hauptmann 1989).

The copper industry continued during the EB I and even greatly intensified. Although this period was, until recently, considered “missing” in the desert history, mining can most probably be dated to this period in both Faynan and Timna’ (Area T). In Sinai, no sites were dated to the EB I, except for some nawamis tombs, but this picture should be amended (see Ch. 8). It is highly possible that the copper mines and production sites near Wadi Riqitia operated during the Chalcolithic and EB I, as well as in southwestern Sinai, Site 702b. Most important for this period is the continuation of extensive copper industry in Tell al-Magass and Hujeirat al-Ghuzlan.

From the technological perspective, the EB I industry shows great continuity with that of the Chalcolithic periods (Segal et al. 1997:23., 27-8; Adams 1999:145, 247). In the desert, the intensive copper industry continued at Tell al-Magass and Hujeirat al-Ghuzlan, near ‘Aqaba, and in Fidan 4: the inhabitants were mainly engaged in copper mining, along with household copper production. The remarkable development occurred in the production scale. This is indicated from industrial remains discovered is several EB I sites: ‘Arad IV and Small Tell Malhata44, Tell Erani (Brandel Per. Comm.), Wadi Ghaza H (Macdonald 1932:12, Bachmann, in Roshwalb 1981:450-453), Ashkelon,45 and even farther north, at Metzer (Dotan 1959b) and Yiftah’el (Shalev & Braun 1997). Since copper production in most of these sites began in the EB Ia, it seems that with the collapse of the Chalcolithic settlement of the Be’er Sheva’ Basin, copper production soon re-organized in nearby regions. However, one significant difference from the Chalcolithic period should be noted, that now, most industrial remains in these sites are of melting and casting, not of smelting (Genz 2001:61). This may imply that copper was smelted in the desert sites, and traded as ingotes.

The reason for the change in pattern and scale of copper production could be the establishment of strong commercial contacts between Egypt and Canaan and the Egyptian settlement in the southern costal plain of Canaan (Brandel 1992; Harrison 1993; Gophna 1997). Commercial contacts between Canaan and Egypt were usually described as mainly based on Canaanese olive oil and grapes (raisins or wine), but it seems now that copper trade had an important role in this commerce (Adams 1999:252-3). This view now gains support from the recent discoveries at Ashkelon (Gophna, lecture in Amman, 17.4.2000).

Production activity continued and intensified during the EB II with the rise of urbanism (Kempinski 1989, Miroschedji 1989:70; Ilan & Sebbane 1989b:156; Shalev 1992:230-232). This development is clearly seen in Faynan, while in Timna’ the dimension of mining and smelting has yet to be revealed. Copper industry also existed in Sinai during this period, in some of the habitation sites. Copper mining and production, at least in Faynan, continued without interruption during the EB III, another “missing” period in desert history when the casting and trade of bar ingots began.

44. See crucible fragments and artifacts in Amiran et al. 1978:55-6, Pl.67:12; Ilan and Sebbane 1989a:143, Notes 4, 5.
45. Golani (1997) only briefly mentioned the copper industry remains, but orally described them (20.1.2001) as intensive and concentrated in one quarter, with two furnaces, crucibles, ore and a large quantity of slag (Golani in press). Extension of the same quarter was later excavated by Y. Yekutiel (unpublished). The chemistry and metallurgy of the Ashkelon copper industry is discussed in Segal et al. 1997.
The EB IV scenario is also incomplete. The large number of bar ingots and copper artifacts from the Negev Highlands, is not supported yet by dated mines in either Timna’ or Faynan, except for the pottery fragments in one mine at Wadi Khalid. Industrial scale production continued in Kh. Hamra Idfan from the EB III, while in Timna’ production is only known to date from the small Site 149. Interestingly enough, copper mining and production continued even during the MB II, at least on the Be’er Ora Hill, at a time when the desert is thought to be totally uninhabited (e.g. Cohen 2002). Radiocarbon dating lists from mining and industrial sites in the ‘Araba Valley (Tables 9, 10) indicate a greater degree of continuity of copper production than is otherwise revealed from the present state of research.

The question arises, as to the role of the desert populations in the operation and development of copper mining and production. Several studies have demonstrated that in the southern Levant, during the Chalcolithic period, almost all copper artifacts and industry remains were found in the desert or the desert fringes, while the main production centers were all in the Be’er Sheva’ Basin (Shalev & Northover 1987; Ilan & Sebbane 1989a; Levy & Shalev 1989; Shalev 1994). Despite recent discoveries of Chalcolithic copper objects in some sites in the north, this picture is still valid. During the EB I-III, copper objects became more common in the north, but the major industry still remained and greatly developed in the south. It seems that during the Chalcolithic period, the inhabitants of the Be’er Sheva’ Basin controlled the copper industry, while the desert population participated, mainly in mining and transporting the copper ore. From the early EB I, following the abandonment of the Chalcolithic villages of the Be’er Sheva’ Basin, copper production developed mostly near the mines. The EB industrial remains in the sites outside the desert are mainly those of melting and casting, not smelting. This indicates that mining, smelting and the marketing of copper ingots during the EB I-IV were controlled by the desert tribes (e.g. Miroshedji 1989:171-173; Rosen 1993b:47; Genz 2001).

The indigenous desert population continued to develop its skill in mining and smelting for many generations, including through the “missing” periods and even during the MB II (Table 9). Furthermore, in the late 2nd millennium B.C., when Egypt took control over the southern ‘Araba copper mines (Rothenberg 1988, 1999b), the Egyptians were highly dependent on the geographical and metallurgical skills of the desert tribes (Avner 1999). This recalls the Kenites, one of the biblical desert tribes, mentioned as experts in metalwork (Gen. 4:22; Glueck 1970:66-68; Avramski 1975); the name Keni already appeared in the early 2nd millennium B.C. in an Egyptian inscription in the copper and turquoise mining area of southwestern Sinai (Petrie 1906:118, Fig. 121). Later, the private name, Kini/Kinu, appears in the same region in many Nabatean inscriptions (Negev 1991:9, 83, 160), and the Kinuka tribe of metal smiths lived in the Northern Hijaz until the early 7th century A.D. (Wensinck 1978).

It may be concluded that metal mining, smelting and trade, was an integral part of the skill, economy and cultural traditions of desert populations.
CHAPTER 4. MASSEBOTH SITES IN THE NEGEV AND SINAI

Introduction

Masseboth (plural) and massebah (singular) are the Hebrew biblical words commonly used in English literature for “standing stones” or “pillars”. Another term for standing stones is baetyl, originating from the biblical beth-el—“house of God” (Gen 28:22), often referred to as portable sacred stones. The term menhir (Celtic for “tall stone”) is usually applied to the large standing stones of Europe and other continents.

Masseboth are either natural, unshaped stones, or made with varying degrees of shaping, but unlike stelae1 they usually do not bear inscriptions or reliefs. They are found in various sizes, from several centimeters to a few meters high, set vertically into the ground individually or in groups, and arranged in lines or circles. Masseboth are known from most continents: western and northern Europe, Africa, the Far East and South and North America, but in the Near East they probably gained more scholarly attention. There is general agreement that masseboth bore cultic significance, but there is no consensus on their precise meaning (see below).

According to our present knowledge, masseboth first appeared in the desert during the Natufian, in the 14th and 13th millennia Cal.B.C. Later, they became common in the desert, especially during the 6th to 3rd millennia, and most of the surveyed and excavated masseboth sites discussed here were dated to this period. In addition, many masseboth in the Negev are dated to later periods: the Late Bronze—Early Iron Age, Nabatean (3rd century B.C. to 7th century A.D.), and are even found in Byzantine and Early Islamic sites (see below).

This chapter describes the results of surveys and excavations of masseboth sites in the desert areas of the southern Levant. The recovered archaeological data from desert masseboth will first be described, then compared to masseboth from other Near Eastern areas, followed by discussion of their interpretations. Presented is a catalogue of 207 masseboth locations (Table 11), in 147 different sites: 47 in the Judaean Desert, 24 in the Negev Highlands, 122 in the southern Negev and 15 in eastern Sinai. Although most masseboth locations are in the southern Negev, the inclusion of sites from neighboring areas serves two purposes: one, to increase the analytical base, and two, to avoid the impression that masseboth are almost unique to the southern Negev.

It should be noted that the number of recorded masseboth locations is constantly increasing. Therefore, the recorded locations do not represent any distribution patterns, but only hint at the richness of masseboth in the desert in general. While visiting six masseboth sites in the Negev Highlands published by Haiman and Avni (see details in Table 11), I identified eight others nearby. While visiting three sites near Be’erotaim, surveyed by T. Gini, I identified six additional ones within one square km. In Nahal Ashalim, in the Judaean Desert, Y. Israel identified several masseboth groups, but following his information I documented 41 of only the best preserved masseboth groups in an area of 0.5 square km. Additional masseboth sites in the same area still await documentation. On Har Karkom, southwestern edge of the Negev Highlands, 50 masseboth locations were surveyed by Anati (2001:23); however many are questionable. Of the fifteen sites that I visited, only four could be safely included in the catalogue (Table 11, Nos. 1:5, 1:6, 1:44, 5:1). One famous site with 12 masseboth (Anati 2001:56-59) is actually, in my opinion, an elongated stone cell, while the supposed “Paleolithic” site with multiple standing stones (Anati 2001:8, Figs. 27-29) is actually not an ancient site2. In other sites, the stones were recently reset, with no documentation of their original position (Anati, per. comm. April 2001). The sites in eastern Sinai were discovered in only a few field excursions, and the area certainly contains many more masseboth. Clearly, with additional detailed surveys, the number of masseboth in desert areas is far greater than those presented here or in other published surveys. Moreover, individual or groups of masseboth are also found attached to hundreds of tumuli tombs, to tens of open-air sanctuaries and to other cult installations in the same desert areas. These will be briefly described but will not be included in the quantitative analysis.

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1. Stelae decorated with reliefs and inscriptions are well known from historic periods in Egypt, Anatolia, northern Syria and Mesopotamia, but they already appeared in the Natufian culture (Edwards 1991:135, Fig. 10), and became quite common during the Early Neolithic period in northern Syria and eastern Anatolia (Schmidt 1997, 2000; Özdoğan and Basgelen 1999; Çelik 2000; Verhoeven 2001).

2. This site was first published in 1992 (ten years after the beginning of Anati’s survey of Har Karkom). It was described as the earliest sanctuary in the world, 40,000 years old, with multiple “anthropomorphic” standing stones. When I visited the site in April 1993 it was apparent that they had only recently been set upright, based on differing patinations on the different faces of the individual stones. Furthermore, the stones were set in a wadi-bed where ancient remains could not possibly survive. Inquiry revealed that first three stones were set up by a group of youth led by geologist Y. Avni in April 1984. Additional stones had been set up by A. Nussbaumer from Eilat in April 1990, and the others were raised by Anati’s team. At my request, Nussbaumer wrote to Anati admitting to setting up some of the stones. Although Anati (1993:14) quoted from his letter, he based on it his claim for the authenticity of the site. Evidently, the stones originated from a local natural layer, exposed by the wadi, and not brought from a distance as described by Anati. Stones of the same nature are still visible in the place partially protruded from the natural soft limestone layer.
The first sections of the chapter will present the desert masseboth in five categories: 1. Catalogue of surveyed sites; 2. “Eyed” masseboth; 3. Masseboth incorporated in tombs; 4. Masseboth in open sanctuaries; 5. Excavated masseboth sites. The following sections include a catalogue of masseboth in the broader Near East, a comparative discussion of masseboth in both regions, and a discussion of the role of masseboth.

A. Catalogue of Surveyed Masseboth Sites (Table 11)

Methodological Notes

Documentation of surveyed masseboth sites followed several steps: photography, drawing of their frontal aspect and/or plan, measurement of the stone’s dimensions and azimuth, and collection of surface finds. Most stones were found standing upright. When found fallen or tilted, or when requiring only minor intervention, they were reset, photographed, drawn and measured again, and then replaced in their original position. These cases are noted in the catalogue. The catalogue comprises only “independent” masseboth sites of the 6th to 3rd millennia B.C., surveyed in the Negev, eastern Sinai and the Judean Desert. Masseboth with no clear context, or lacking evidence for dating, were excluded, as were masseboth incorporated in tumuli tomb, open sanctuaries or in installations with “eyed” masseboth. Earlier masseboth sites from the desert fringe, and sites from the fertile zones of the Near East, were compiled in a separate catalogue (Table 13).

The large sample size enables analysis of various features and observations concerning the consistency of characteristics, such as the recurrence of groups with certain numbers of stones, and the absence of other numbers. Also, the catalogue demonstrates that stone shapes, whether broad or narrow, were significant in the arrangement of the groups. Accordingly, several types of pairs, triads, etc. can be distinguished, and these influence the catalogue's structure (see Tables 11, 12). The order of sites within each type is from north to south. Grid references are given in the local-ITM system (Israel Grid). Numbers of locations in the following text refer to those of the catalogue. All statistical results should be considered interim and are subject to change as additional sites are documented.

1. Location of Masseboth

About a third of the documented sites were discovered adjacent to habitation sites and tent camps (19.5% and 15.2% respectively). All others were found in burial and cult sites, commonly situated next to ancient roads. The locations of masseboth indicate where they were needed, and help in understanding their role.

2. Orientation

The orientation of masseboth (individual or groups) is determined by several indications: 1. Their faces are usually smoother, or sometimes bear a special natural feature (see e.g. 1:73); 2. Various items are found in front of the masseboth, which help identify their face: a low stone cell, a flat stone, a pavement and others (see below); 3. Masseboth commonly face the lower side of a slope, even when the surface is almost horizontal. Exceptional are some groups in Nahal Ashalim, in the Judean Desert, and Site 3:37. In the field orientations were measured by precise azimuth, but here they are described by cardinal and sub-cardinal directions of the compass. Orientation could be ascertained in 202 out of 207 locations. In two locations orientation was not published and personal examination was not possible. In three locations the masseboth are arranged in a circle, making orientation undeterminable.

In 103 locations (50.9%), the masseboth face due east or near it, while 43 others (21.2%) face the general east, i.e. between northeast and southeast. This indicates that the majority of masseboth (72.1%) face the general east, between the summer and winter solstice (ca. 60° and 120°, and see Fig. 4:1).

The second important orientation is west, with 24 locations (11.9%). Other orientations are minor, with 4% facing north and south respectively. In some cases the compass bearing alone did not dictate the orientation. Masseboth may also face prominent topographical features, such as a high mountain (7:14, Fig. 4:67). Others were probably oriented towards various celestial bodies in particular positions, similar to the orientations of sanctuaries (cf. Martini 1932) and tombs (Hoskin 2001:8-18, etc.).

It can be generally concluded that masseboth were not set arbitrarily, but with regard primarily to sunrise and, secondarily, sunset. Minor orientations may also bear some symbolism. See below for further discussion on orientation.

3. Attached Features

Various items are found next to masseboth with some consistency. A low stone cell, usually circular or semi-circular, was found in 86 locations (41.5%). Flat stones, or pavements, were found at the foot of masseboth in 96 locations (46.4%, Figs. 4:3, 6, 23, 28, 33, 43, etc.). Since several excavations revealed special objects beside the flat stones (see below), it is suggested that these stones served as offering benches. In five locations stone basins were
found (2.4%, Figs. 4:47, 55-55, 68-70), and hearths or sunken altars in 7 locations (3.4%, Figs. 4:45-46, 50-52, 54-55, 77, 79, 85). These features were found mostly in excavated sites (see below), and thus, their present number does not represent their real occurrence. Another recurring element is smaller masseboth, in random numbers, found set or fallen next to the main group in 26 locations (see e.g. 2:4; 2:11; 2:21; 2:25; 3:10; 5:3, Figs. 4:42, 71-72). This is also the case in sites with multiple masseboth (Table 11, last section). Possibly the smaller, additional masseboth bore a different role or meaning from the larger main group.

4. Numbers of Stones in Groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>No. of locations</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals</td>
<td>84</td>
<td>40.6</td>
</tr>
<tr>
<td>Pairs</td>
<td>41</td>
<td>19.8</td>
</tr>
<tr>
<td>Triads</td>
<td>38</td>
<td>18.4</td>
</tr>
<tr>
<td>Fives</td>
<td>9</td>
<td>4.4</td>
</tr>
<tr>
<td>Sevens</td>
<td>14</td>
<td>6.8</td>
</tr>
<tr>
<td>Nines</td>
<td>6</td>
<td>2.9</td>
</tr>
<tr>
<td>Multiple</td>
<td>15</td>
<td>7.2</td>
</tr>
<tr>
<td>Total</td>
<td>207</td>
<td>100</td>
</tr>
</tbody>
</table>

Most dominant are single masseboth, pairs and triads, followed by groups of five, seven and nine. Groups of four, six, eight or ten were absent; one group (3:7) appeared to contain four stones, but actually consists of a triad with an additional detached stone on the right side. In light of the large number of sites documented to date, the recurrence of the above numbers, and the absence of the others, cannot be fortuitous. Rather, the preferred groups had some symbolic meaning to those who set them. These groups are further divided into sub-types, as described below.

5. Masseboth Shapes

Almost all masseboth are natural, unshaped stones, but a close inspection reveals that their shapes were carefully considered when selected, whether narrow or broad (Figs. 4:2, 4:3), as was their relative size within the group. Distinction between the two is not always obvious, but is more apparent when certain repeated patterns are found, especially in pairs and triads (Table 12).

Among single masseboth broad stones are predominant in 61 out of 84 locations (72.6%), while four different types of pairs are observed. One type comprises two narrow stones, of which only two pairs were discovered (2:1, 2:2, Fig. 4:4); in both locations the taller stone stands on the left side. The second group consists of 17 pairs of broad stones (2:3-2:19, Fig. 4:5), 15 of which are set so that the taller stone stands on the left side. The third type contains 12 pairs of a narrow taller stone and a shorter broad stone (2:20-2:31, Fig. 4:6); eleven of these pairs stand with the narrower stone on the left side. The fourth type includes ten pairs with a taller broad stone and a shorter narrow stone (2:32-2:41, Fig. 4:7). Here, in nine out of the ten pairs the taller broader stone stands on the left side. Altogether 37 pairs out of 41 (90.2%) were set so that the taller stone stands to the left. This order, therefore, can be interpreted as some principle or “rule”.

Distinct positioning of broad and narrow stones was also observed in triads, which can be divided into five types: 1. A central taller and narrow stone (3:1-3:9, Fig. 4:8); 2. A central broad and taller stone (3:10-3:19, Fig. 4:9); 3. Three narrow stones (3:20-3:22); 4. A central shorter stone (3:23-3:30, Fig. 4:10); 5. Miscellaneous arrangements (3:31-3:37). It is significant that seven triads out of nine of the first type were set so that the left stone is narrower and taller than the right one, and this pattern is repeated in other triads (3:15, 3:19, 3:24, 3:25, 3:29, Fig. 4:8). Thus it appears that the “left/right rule” of tall and short was also applied to the side stones of triads, although with a somewhat lower consistency.

In larger groups the relation between broad and narrow stones is less obvious, or more complex. However, two notes are worthwhile. A group of seven stones (7:11, Fig. 4:43) was set in a distinct pattern of alternating broad and narrow stones. In three groups of nine (9:1, 9:2, 9:6, Fig. 4:83), the central stone is broad and the tallest.

Multiple masseboth (M:1-16, Figs. 4:11, 35, 54) differ from the other groups in several aspects. No order or “rules” are apparent in their arrangement, but some characteristics can be defined: 1. Their numbers are random; 2. The vast majority of stones are narrow; 3. Unlike the other groups, in about half of them (8 of 15) the stones are detached; 4. Orientation seems less important, especially in those arranged in circles where the stones face all directions. Other features do connect the multiple masseboth sites to the general complex. The stones are crude, unshaped; alignments do face east, and in four locations larger familiar pairs or triads are set in the middle of the groups. In this they share
affinities with 26 locations where smaller masseboth were annexed to the main group. It seems, therefore, that the multiple masseboth form a distinct class within the general sphere, erected in sites where stones were gradually added over time.

From this brief analysis several preliminary conclusions may be offered: 1. Masseboth form a consistent phenomenon, with repetitive characteristics such as orientation, attached features and the number of stones in groups (except the last type); 2. The recurrence of combinations of stones indicates that shapes were important to the ancients. However, since they did not shape the stones, they had to carefully select them, and then set them up according to certain patterns or “rules”. Basically, they distinguished between two main types of stones, broad and narrow. It is true that the distinction is not always obvious in our eyes. Probably the pure mathematical proportions of the stones were not the sole criterion for distinction. Rather the general appearance and dimensions of the stone, and its relations with neighboring stones, were considered.

Although the ongoing survey of masseboth has contributed basic information to the study, at this point it only leads to the non-revolutionary general conclusion that they should be interpreted within the symbolic-religious realm.

B. Installations With “Eyed” Masseboth

In the Eilat Mountains 27 cult installations have been found in 12 sites. The installations are formed by small thin flagstones set vertically into the ground, each consists of an elongated cell, ca. 4x1 m, sometimes pointing to a circle (Figs. 4:13, 4:15). Inside and beside them, small masseboth are found, up to 30 cm high, of random numbers from one to twenty, usually set separately. Close to their tops the stones are perforated by a careful chiseling from both sides (Fig. 4:12), while others bear a natural hole and were obviously selected for this feature (Fig. 4:14). The installations are located on topographic “shoulders” or plateaus just below mountain summits, usually in scenic lookout points. With future surveys in the Eilat Mountains and other desert areas the identified number of these installations will certainly increase. Flint tools are the only finds in these installations, mainly ad-hoc retouched flakes.

Following is a list of installations with “eyed” masseboth, from north to south:

1. Ma’aleh Yethro G.R. 15329309- one installation, a trio of masseboth (Fig. 4:12)
2. Har Argaman I G.R. 14939174- one installation (Fig. 4:13)
3. Har Argaman II G.R. 14889170- two installations, 150 m apart (Fig. 4:15)
4. Har Argaman III G.R. 14789168- one installation
5. Har Timna’ G.R. 14629102- one installation
6. Har Ora G.R. 14589004- two installations
7. Ma’aleh ‘Amram G.R. 14298956- one installation
8. Har ‘Amram G.R. 14438968- one installation
9. Har Amir G.R. 14358940- one installation
10. Nahal Roded G.R. 14098918- one installation
11. Nahal Roded G.R. 14038902- eleven installations
12. Har Yedidiah G.R. 14138911- six installations

Several features of “eyed” masseboth may be mentioned: 1. Most masseboth are limestone. In sites located in ignious terrain or sandstone, it is clear that they were intentially selected from a type of rocks other than the surrounding, and brought to the sites from some distance. In sites located on limestone terrain, the “eyed” masseboth are either sandstone or limestone; 2. In some site, individual masseboth were deliberately buried vertically, so that only a few millimeters or centimeters remained exposed (Fig. 4:16); 3. In the site of Ma’aleh Yethro, a triad of “eyed” masseboth was found (Fig. 4:12), the only “eyed” group discovered to date. It is interesting to note that masseboth with biconical perforations were also found in the Chalcolithic Gilat sanctuary, but unlike those in the Eilat area, they were perforated at the base (Alon and Levy 1989:183). “Eyed” masseboth also somewhat resemble much larger anchor-shaped perforated masseboth found around the Sea of Galilee and dated to the Early Bronze Age (see Table 13:52, 53, Fig. 4:17).

3. In January 2002, L. Enmar discovered four additional installations of “eyed” masseboth near Har Argaman. Since I did not visit the sites as yet, and did not document them, they are not included in the list.

4. Site 9 was discovered by M. Shemtov, Site 1 discovered by myself, all others by L. Enmar. See also Avner 1997c.

5. This trio of “eyed” masseboth was stolen from the site in June 2000.
The main information retrieved from these installations can be briefly summarized:  1. “Eyed” masseboth form a special group, their perforation indicates human intervention in their shape, unlike almost all other masseboth as previously mentioned. However, apart from the perforations they are usually unmodified, and those with a natural “eye” are totally unshaped;  2. Since the “eyed” masseboth were found detached and in random numbers (except the triad in the first site), they seem to relate to the type of multiple masseboth, especially those found in some open sanctuaries (see below section D, and in Ch. 5).

Addendum
Following the submission of this thesis, the picture of these installations drastically changed. Forty five additional sites of “eyed” masseboth were discovered (through April 2004) by M. Shemtov, G. Ragolski and myself on the mountain ridges around Nahal Roded, with intriguing new features. The sites certainly require detailed study and publication; here a brief description of their main features is given:

1. Forty two out of 49 sites are located on granite mountains, 23 of which are concentrated in one square kilometer. They are characterized by limestone slabs and other items brought from a distance of ca. 3 km. In some, the elongated oval installation is paved with small lime flagstones (Fig. 4:133), while limestone and sandstone masseboth are common, both with and without perforation.

2. In 18 sites, 23 schematic limestone anthropomorphic images were found, 13-44 cm high. Commonly, only the neck was carved (Fig. 4:134), but in some, a complete figure was carefully shaped, still in a schematic way (Figs. 4:135-6). All were laying on surface, some were broken at the neck; and some were found up to 30 m away from the sites.

3. Stone bowls and bowl fragments are also found, 25-36 cm in outer diameter; most are limestone, some are sandstone (Fig. 4:137). One limestone fragment indicates a shallow bowl at least 60 cm across.

4. Three circular or oval shaped limestones with an elongated groove have been found and 28 fragments, probably symbolizing a vulva (Fig. 4:138). One such object bears a carved snake (Fig. 4:139).

5. In most sites flint flakes were found, generally representing an ad-hoc industry of the 6th-3rd millennia. However, in some sites many blades and “naviform” cores indicated a Late PPNB date.

6. The unexpected and still increasing number of these cult installations, discovered in a limited area, indicate that many more may be found on the Eilat mountains (from Eilat to the Shizafon Junction), and far beyond. This emphasizes the richness of the desert with cult sites in general (including the usual masseboth locations, open-air sanctuaries and other types of cult sites (see Ch. 5).

C. Masseboth Incorporated in Tombs

As stated above, masseboth are found attached to hundreds of tumuli tombs in the Negev and Sinai. The following is a brief description of a limited selection, most from excavated sites, listed from northeast to southwest:

1. The Eilat burial site (C.G.R. 14328855). Dated by 14C to the 6th and 5th millennia B.C. (Table 1:39), consisted of at least 20 tumuli tombs, two open sanctuaries and other installations (App. 1). Seven of the nine well-preserved tombs contained masseboth, of two types. In six tombs masseboth were incorporated on their eastern side; four also contained masseboth within the tombs; in one tomb masseboth were set inside only.

Tomb I. Two broad stones were lying on the surface on the outer, E-NE side, 70 and 0.55 cm across. Two shallow depressions in the ground indicated that until recently they were incorporated in the tomb’s perimeter, set on their narrow side facing approximately to Az. 74° (Figs. 4:18-19).

Tomb III. On the eastern side, two masseboth stood facing E-SE, (Az. 109°). The southern one (left) is 44x40 cm, the northern one (right) is 44 cm high and 80 cm across at its base, which is lower than the base of the southern one (Fig. 4:20). As a result, the left stone is higher than the right one.

Tomb IV. One massebah stood in the center of the tomb, 62 cm high, with a small offering table at its foot on the northern side. Another massebah was standing at the doorway on the tomb’s eastern side, 47 cm high and facing north, with an offering table at its foot (Fig. 4:21).

Tomb V. This is divided into two cells containing several masseboth, both inside and in the outer perimeter. In the southern cell a row of three detached masseboth was set, 52-63 cm high, facing north. The western stone, although unshaped, is clearly anthropomorphic (Fig. 4:22), and a cache of six skulls was found at its foot. The northern cell contained a single massebah 31 cm high. On the outer, eastern side of the tomb was a pair of broad masseboth facing east (Az. 80°), 52 and 44 cm high; the left stone is the taller (Fig. 4:23). A few flat stones at their feet served as offering tables, and adjacent to it a polished stone axe was uncovered. Another massebah, 57 cm high was set ca. 1 m to the right of the pair, facing northeast (Az. 40°).
Tomb XVII. This contained two detached masseboth set in the center of the burial cell on an east-west axis facing north, 49 and 47 cm high.

Tomb XV. A tilted broad massebah, 90x70x50 cm, was ca. 1 m east of the tomb, in front of a doorway which also face east (Az. 78\(^2\), Fig. 4:24).

Tomb XVII. A pair of broad massebah 62 and 58 cm high stood on the eastern side, facing E-NE (Az. 76\(^0\)), with an offering bench of two stones at their feet (Fig. 4:25). In addition, a semi-circular cell made of small stones, 1.6 m in diameter, was built in front of them, but is poorly preserved. Another massebah 62 cm high was standing inside the cell, with a flat stone offering table at the foot on its eastern side.

2. Muyat Galla (=Hajj I, G.R. 10628999). A tumulus tomb in eastern Sinai, built on the western edge of a cluster of tent camps and dwelling units, spread over an area of 0.5 square km. The site is adjacent to the ancient road Darb alHajj and 1 km north of Muyat Galla, a seasonal water source. The burial cell (L. 2) contained a single piece of young male skull, and a few bladelets of the Ramonian industry which greatly predated the tomb (Goring-Morris and Avner 1985). Five masseboth were erected on the eastern side of the tomb facing east (Az. 92\(^0\)), the highest 80 cm high, and a stone offering bench was placed at their feet. The two right side masseboth were offset from the axis of the tomb, and their bases were 20 cm higher than the others (Fig. 4:26). These indicate that originally there was a triad of masseboth at the front of the tomb, and the two others were later additions. A few surface finds of ad-hoc flint tools generally dated the tomb to the 6th to 3rd millennia B.C.

3. Bir Sawaneh. The excavated tomb was one out of six tumuli in a large complex of habitation units, 5th to 3rd millennia B.C. The well-built burial cell contained a primary flexed female burial with a triad of masseboth facing east (Az. 101\(^1\)) on the eastern side; the left one was tilted forward. At the feet of the masseboth was a stone cell with a pair of smaller masseboth found in situ (Figs. 4:27).

4. Wadi Zalaqa 301. A tumulus tomb with a well-built and paved cell, containing a primary flexed male burial. On the eastern side of the tomb was a trio of masseboth facing E-NE (Az. 75\(^5\)). The central stone is broad, 88x83 cm, and those on either side are much smaller. A stone cell with an offering bench was built in front of the masseboth, where three tabular scrapers were found (Figs. 4:28).

5. Wadi Zalaqa T2. A semi-circular tumulus tomb, well-built of even courses of stones, 1.2 m high. On the straight eastern side, a broad massebah was incorporated, 90x84x35 cm, tilted forward facing E-NE (Az. 76\(^6\), Fig. 4:29). A fragment of human skull, 40x40 mm, was found at the bottom of the burial cell, recalling similar finds in several other tumuli. Two charcoal samples from within and outside the tomb yielded \(^{14}C\) dates of ca. 4400 and 4200 B.C. (Table 1:63).

6. Wadi Marra, eastern Sinai (G.R. 07868043). An unexcavated semi-circular tumulus tomb, 6x5 m, built of sandstone blocks, with a group of seven masseboth on the straight eastern side. They are up to 1.3 m above the aeolian sand and face east (Az. 98\(^8\)). A semi-circular cell covered by sand is discernible at their feet (Fig. 4:30).

7. Wadi 'Aradeh (G.R. 07808012). An unexcavated tumulus tomb built of sandstone blocks with a pair of narrow masseboth on the eastern front, approximately 1.4 m high and facing east (Az. 93\(^8\)). Additional masseboth lean towards the central pair from both sides, and a stone offering platform is built at their feet (Fig. 4:31).

The main information provided by masseboth incorporated in tombs, of which only a few examples were described here, can be briefly summarized: 1. Massesboth are most commonly attached to the eastern side of the tombs and face the general east, much like the dominant orientation of independent masseboth locations; 2. The numbers and arrangements of masseboth incorporated in tombs are identical with those of independent masseboth locations; 3. Both independent masseboth and those incorporated in tombs are natural, unshaped stones; 4. The same features are found in both, i.e. stone cells, offering benches, offering objects and hearths. The basic preliminary conclusion is that masseboth incorporated in the outer perimeter of tombs share a similar role and meaning with the independent masseboth sites; 5. Massesboth within the tombs differ from the first group in several characteristics, and will be addressed separately (see below).

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\(^6\) Skeletal remains in this site and the following ones were identified by I. Hershkovitz.
D. Masseboth in Open-Air Sanctuaries

Masseboth were discovered in or near open-air sanctuaries of various types. In this section only six examples will be presented to illustrate the typical occurrences. For further information see Ch. 5.

1. Ramat Barne'a (G.R. 10390096). This site, surveyed by Haiman (1992), comprises tens of tumuli tombs and at least 30 stone alignments, ca. 20 long. The alignments are actually narrow and elongated stone cells filled with rocks, ca. 1 m wide and 50-70 cm high, which are identical to those built in some types of open sanctuaries (see Ch. 5). In the center of some alignments a single or a group of masseboth is incorporated; one is a familiar triad with a central broad massebah, 72 cm high and facing SE. A semi-circular stone cell is built in front of the masseboth (Fig. 4:32).

2. Har Tzuri'az (G.R. 13849702). In the center of an elongated cell, similar to the previous site, a single broad massebah is oriented east (Az. 96°), 81 cm high and 92 cm wide (Fig. 4:33). A rectangular stone cell is built in front of the massebah. Most stones of the elongated cell were robbed for construction of an adjacent later tomb.

3. Har Tzuri'az (G.R. 13989717). In the center of an elongated cell of the same type of open sanctuary as in the previous site, a pair of masseboth is oriented E-SE (Az. 109°), the left stone is the taller, 68 cm high and 28 cm wide, the right one is 55 cm high and 95 cm wide (Fig. 4:34).

4. ‘Uvda Valley (G.R. 14699298). In the center of a well-built rectangular cell, on the western side of the sanctuary courtyard, a group of 17 small masseboth was excavated (Yoge 1983). They are up to 30 cm high, protected by four larger stones standing detached and facing east (Az. 98°, Fig. 4:35). Four 14C dates from the sanctuary fall in the mid 6th millennium B.C. (Table 1:20), but other finds indicate a later continuity. A somewhat similar find was reported from ‘Ain Yerqa, in central Sinai, where a trio of small masseboth was found in an elongated cell, interpreted as a long tomb (Rothenberg 1979:110).

5. Wadi Radadi, eastern Sinai (G.R. 13718926). In a pair of sanctuaries a circular installation was excavated, 1.4 m in diameter and 0.28 m deep, in which a single broad massebah was found, supported by a few small rocks at its base (Fig. 4:36). A similar but smaller massebah was noted during excavation of a circular installation in a pair of sanctuaries in Makhtesh Ramon (Y. Israel per. comm., and see Cohen 1999:21-24). Singular masseboth within circular installations are known from other locations (Table 11- 1:22, 1:83, 1:84).

6. Eilat Burial Site. One of the two open sanctuaries in the site contained a low depression with a cluster of 99 small masseboth. Two were larger than the others, 70 and 58 cm long, while all others were up to 30 cm tall (Figs. 4:37-39, and see Ch. 5 and App. 1). Twelve stones were found still upright or tilted, the rest were fallen.

The main information retrieved from masseboth incorporated in open sanctuaries is that they are found in different types of sanctuaries, and in several locations within them. Generally, they follow the same properties and patterns of independent masseboth and those incorporated in tombs, but here only singles, pairs and triads were found. Two open sanctuaries present a different picture, of multiple, detached masseboth. These demonstrate some affinities with other groups of multiple masseboth, which will be discussed separately.

E. Excavated Masseboth Sites

Methodological Notes

Fifteen masseboth sites have been excavated in the southern Negev and eastern Sinai. Investigations included: 1. Photography of the sites as found; 2. Collection of surface finds ca. 5 m around the sites; 3. Removal of free stones scattered or piled in front and behind the masseboth; 4. Excavation of the cell or the spaces in front and behind the masseboth; 5. Raising tilted or fallen masseboth, when necessary; 6. Digging adjacent installations. Although the dig was usually shallow, loci were divided vertically, when necessary, according to soil layers, and numbered so that L. 1a is below L. 1. All excavated sediment was sieved through 4 or 1 mm mesh. In the plans of the Sinai sites levels are relative to each individual site, while the lowest point in the dig is marked as zero.

Following is a brief description of the excavated sites, from northeast to southwest.

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7. One site was excavated by Eisenberg (below, Site No. 3), the others by the author.
1. Ma’aleh Yethro  (‘Uvda 69, G.R. 15299313).

The site is adjacent to the top of Ma’aleh Yethro, an ancient road leading up from the Yotvata Oasis to ‘Uvda Valley, then continuing westward and joining Darb Ghaza, the road from the Red Sea to the Mediterranean. Before excavation, a low, oval cell was visible, covered by stones, with seven masseboth on the western side. The three southern stones were upright, while the others were tilted (Fig. 4:40). Two additional broad stones, one large and one smaller, stood behind the main group (Fig. 4:41), with a pile of stones leaning against them. “Ad-hoc” flint tools were collected from around the site, and a few others were found on the ancient trail, 7 m to the north.

During excavation of the front cell (L. 1) the loose stones were first removed, revealing nine rectangular stones, 18-65 cm long; additional masseboth were most probably annexed to the main group (Fig. 4:42). Underneath was a layer of fine yellow silty dirt, up to 24 cm thick. On the cell’s floor a hearth was found, and at the foot of the central massebah a horizontal flagstone was laid, 39x14x3 cm (Figs. 4:43, 4:44), and a silver pendant was found beside it (Fig. 4:90). The cell was built of one course of rectangular stones, three were tilted or fallen inward.

The removal of the piled stones at the back of the masseboth (L. 2) completely revealed the two broad standing stones, as well as a few medium-size stones placed for support at the back of the masseboth (Fig. 4:41). Similar retaining stones were found in most excavated sites.

A few unretouched flint blades and flakes and two small sherds of hole-mouth jars from the fill of the front cell indicate a general date of 6th-3rd millennia B.C., while the silver pendant is of a later date (see below). An attempt to radiometrically date charcoal from the front cell failed due to insufficient amounts at the time (1980).

Following the dig, the masseboth were straightened and the fallen stones of the cell’s perimeter were reset to their original position (Fig. 4:43).

2. ‘Uvda Valley 19 (G.R. 14639334).

A special circular room was excavated by Eisenberg next to an EB II-IV habitation site (Table 11: 3-34), ca. 4 m in diameter. The wall surrounding the room comprises a single row of natural stone blocks, one course high, in which three separated masseboth are incorporated (Figs. 4:45). The masseboth are 38-54 cm high. At their feet is a long bench built of small flagstones. Adjacent to the outer, southern side of the bench is an oval sunken installation, lined with flagstones and filled with ash, charcoal and fragments of burned animal bones (Fig. 4:46). Since it is similar to other installations found in masseboth locations and in open sanctuaries (see below excavated Sites 11, 12, and Ch. 5), it seems to be a type of an altar, sunken into the ground.


A single broad massebah set adjacent to an excavated habitation Site 9 (Amiran et al. 1979, and see Fig. 1:9). The stone was mostly exposed before the excavation, 59 cm high and 113 cm wide, slightly tilted back and facing E-SE (Az. 124°). A small in situ natural stone basin was visible to the left. Low piles of stones were laid at the back and front sides of the massebah, including several large ones.

An area of 4x6 m was excavated around the massebah. In the front (L. 1-1b), two trios of grinding stones were discovered just below the surface. One remained in situ, with the upper stones resting on the bottom stone, while in the other trio the upper stones fell aside (Figs. 4:47, 4:48). The massebah and the basin were found set on top of a single course wall (W. 7), which is the earliest element in the site. Based on one large sherd of a “Wadi Raba” type hole-mouth jar fragment and a few flint tools (see below), W. 7 may be dated to the Late Neolithic period. Excavation at the back of the massebah (L. 3-3a) indicated that the stone pile found here was built on the contemporary virgin soil level in order to support the massebah.

The excavation yielded 821 flint items, including 61 tools, mainly sickle blades (77%), and 266 pottery sherds of hole-mouth jars. These most probably originated in the adjacent habitation unit and are not directly associated with the massebah. Notable finds were the two trios of grinding stones which did relate to the massebah, a stone ard tip found incorporated in W. 8 (Fig. 1:35, No. 2), the Wadi Raba hole-mouth sherd and, several crescent-shaped sickle blades dated from the Wadi Raba culture through the EB I-II (Khaleily, in Avner in press 7, and see Fig. 4:91, 4:92). The massebah was erected between the early 5th and mid 3rd millennium B.C.


A broad massebah, 400 m south of the previous site, next to an excavated habitation unit (Amiran et al. 1979; Avner and Ilan 1980, and see Fig. 1:17). It was 124 cm wide and 64 cm above surface, facing west (Az. 280°) and incorporated into a rectangular cell open to the west. A stone platform, 1.7x2.1 m, attached to the massebah on its western face was visible, including a cracked large flat stone, 59x77 cm bearing conflagration discoloration (Fig. 4:49).

The excavations of masseboth locations were briefly published in ESI and Hadashot Arkheologiyot. For detailed excavation reports see Avner, in press 2, 6, 7.
Following removal of the stone platform (restored nearby), an area of 4.5x3.5 m was excavated on the western side of the massebah (Loci 1-1b, 2); its bottom was reached at a depth of 75 cm (Figs. 4:50-52). Throughout the dig the section was divided into four vertical loci, but in fact, only one living level was observed. The section (Fig. 4:51) was characterized by undisturbed thin layers of fine sediment mixed with ash, flint and pottery sherds. Just below the platform stones a few “southern family” EB IV pottery sherds were found. A hearth west of the platform and 8 cm lower than its base level rendered a \(^{14}C\) date of ca. 2700 B.C. Another hearth at the bottom of the massebah, originally covered by a pile of small stones, rendered a \(^{14}C\) date of ca. 5800 B.C. (Table 1:25). At a level between the two hearths and next to the southern large stone, a trio of grinding stones were discovered lying upside down, slightly scattered and covered by a pile of small stones. These seem to be related to the massebah, similar to the find in the previous site. At the back of the massebah (L. 4-4a), three medium size support stones were found.

The finds included 1258 flint items, 48 of which were tools (Khalaily, in Avner in press 7), and 690 pottery sherds. They occurred in all levels and actually cover the range between the two \(^{14}C\) dates. Notable are a non-tabular flint scraper and a crescent-shaped sickle blade, both are the largest of their kind discovered in ‘Uvda Valley (Fig. 4:93). Sickle blades comprised 15.9% of the tool assemblage.

The history of the site may be described as follows: the massebah was erected in the early 6th millennium B.C. when the adjacent habitation site was first established. The dimensions of the massebah are 124x121x30 cm, and its calculated weight is 1.1 ton. A stone table placed 1 m in front, supported by small stones, probably served for offerings. Sometime later the open rectangular cell and stone platform were added, incorporating the stone table. The platform was occasionally elevated with the rise of the surrounding surface. This is indicated by several levels of the conflagration discoloration observed on the face of the massebah, between 23 and 59 cm above its base. At some stage the trio of grinding stones was left, covered first by a pile of small stones and then with dirt. No indication of disturbance or gap was observed in the excavated sections, and it appears that the massebah was used continually during the full life span of the habitation site, nearly 4000 years. Short periods of abandonment, however, could have certainly occurred without leaving archaeological traces.

5. Ma'aleh Shaharut (Uvda 151, G.R. 14989238).

The site is located east of ‘Uvda Valley, close to the cliff-top above the ‘Araba Valley. It was built next to a water reservoir and two temporary dwelling sites. When discovered, a circle of various sized elongated stones was visible on surface, five stones were standing upright or tilted, and many others were fallen. Two fallen stones on the western side were notably larger than the others, 134 and 136 cm long (Fig. 4:53). In appearance the site was totally different from common remains of circular habitation structures in the area.

During the excavation small and medium stones were removed, and the area was dug to bedrock, reached at a maximum depth of 20 cm. The shallow nature of the site may account for the fact that most stones did not remain standing. During the dig the masseboth were gradually raised, based on the position of each stone and the order in which they fell, revealing three additional stones still standing. Although total accuracy in resetting the stones could not be guaranteed, the final result was quite clear: 69 masseboth standing in two or three concentric lines on the perimeter of an oval area, 4x5 m, with the two largest stones on the western side facing east (Figs. 4:54, 4:55). The other masseboth were much smaller, varying in height and facing all directions but relating to the larger pair. A flat and broad stone, 42x55 cm, lying on the eastern side could be an additional massebah or an offering table.

In the center, a stone basin was found lying upside down and covered by a pile of small stones (cf. excavated Sites 4 and 13). It was an unhewn stone 30 cm in diameter with a natural depression 20 cm across and 18 cm deep. A hearth, 60 cm across, found next to the basin, yielded a \(^{14}C\) date of ca. 4500 B.C., i.e. on the verge of the Late Neolithic and Early Chalcolithic periods.

The only finds from the dig were nine flint flakes, however, surface collection around the site yielded eight tools, including a crude adze and a standardized adze (Fig. 4:94); the latter is typical of the Late Neolithic and Chalcolithic (see Ch. 2).


The site is a habitation unit built on top of the head of a desert kite. In the lower level of a courtyard a low oval installation was found, ca. 1 m across, built of one course of stones. Lying inside was the largest stone in the site, 64x45x32 cm (Fig. 4:56). When lifted, four small stones were revealed underneath on the western side; these probably served as support for the massebah (Fig. 4:57). Additional support stones were found just outside the western edge of the installation, i.e. at the back of the massebah when it was still standing, facing due east. No artifacts were found in the installations, but the finds from this level indicate a Chalcolithic-EB I date, including two crescent-shaped, transverse arrowheads (Avner 1982c; Holzer and Avner in press).

The site consists of low remains of a temporary 6th to 3rd millennia B.C. habitation site with a circular courtyard and four circular huts, built of small and medium-size stones. On the obscure border between two huts (L. 1, 2) three stones were initially partially exposed. Two of the three were naturally split but all the fragments were in place, and their bases remained set into the ground to a depth of 15 cm. Mending the stones yielded a pair of masseboth with an offering table on the eastern side (Fig. 4:58). The left stone is taller, 47 cm high and the right one is globular and broad, 24x55 cm; both face east, to Az. 95°. The left/right order and the proportion of the stones follow the majority of pairs, as described above.

Finds contemporary to the site were one flint core waste and several flakes. However, three tools were of much earlier date (see below).

8. Give'at Shehoret (G.R. 14668897).

A single broad massebah was found on the eastern end of a tent camp. It was 24 cm high above surface and 28 cm wide, facing west (Az. 273°). In front was an offering table, 43x47 cm, mostly sunken into the ground, and two circular installations, 60 and 90 cm in diameter (Fig. 4:59). The offering table was flintstone, which is rare in this area, and unusual in size. The fill in each circle was different. One contained a soft fine matrix up to 32 cm deep, and the other was hard but porous fine sediment to a depth of 17 cm. A chemical analysis by I. Segal did not provide decisive reasons for the difference. A few artifacts were found on the surface only at the foot of the massebah, and included four flint flakes and a natural, finger-like piece of dark chert, 6 cm long. The massebah was found set to a depth of 19 cm with the pointed side down, probably placed intentionally to create a broad massebah that faced west; to date only broad masseboth have been found with a western orientation.


The site, in eastern Sinai, included three dwelling units, the remains of one tent camp, a group of six tumuli tombs and one group of masseboth. The masseboth consist of three granite stones found standing upright and facing east (Az. 108°); the central one measures 1.3 m high. A semi-circular cell was built of large and medium stones in front of the masseboth with another cell of large stones behind them. Both were found partially filled with medium-size stones (Figs. 4:60). Removal of the free rocks in the front cell (L. 1) revealed a stone offering bench at the foot of the masseboth (Figs. 4:61, 4:64). The cell was filled with a fine sediment, and the virgin soil was reached 20 cm below surface, 13 cm below the base of the cell's stones. In the back cell (L. 2), retaining stones were found at the masseboth base, and virgin soil was reached 24 cm below surface.

The excavation did not yield any finds, however, dozens of flint tools collected on the surface around the masseboth and in all other units of the site, indicate a general date of 6th-3rd millennia B.C. (Hermon in Avner in press 2).


The site, in eastern Sinai, contains 19 sub-sites of built habitation units and tent camp remains. Masseboth were set adjacent to circular Tent Camp VIII. Prior to the excavation two granite masseboth, 1.3 m high were visible, facing E-SE (Az. 115°), with another smaller massebah between them. Stone cells were built in front and behind the masseboth (Fig. 4:62). Surface collection yielded 13 well-rounded flint hammerstones, fragments of shell bracelets, fragments of two grinding stones and a sandstone bowl fragment (Fig. 4:100).

Following the removal of loose stones from both cells, excavation of the front cell (L. 1) uncovered a well-built pavement of flat cobbles 10 cm below the surface (Figs. 4:63, 65). Underneath the pavement was a layer of fine sediment, 15 cm thick (L. 1a), which contained several finds: a fragment of a shell bracelet, a few flint flakes, a pottery sherd, and two attached small stones of unique natural shapes (4:96). All finds were lying at the foot of the masseboth below the pavement.

Inside the back cell (L. 2), an additional smaller cell was revealed, constructed of stone slabs vertically set (L. 3). Excavation of the inner cell exposed numerous fragments of shell bracelets, a few Dentalium shells, and bone splinters. After removal of the inner cell stones, the outer cell (L. 2) was excavated and more artifacts were found near the back of the masseboth, including sea shells, fragments of shell bracelets and small fragments of animal bones (Figs 4:97-99). These continued to be found 4 cm deep into the virgin soil.

The masseboth location of Wadi Watir was comparatively rich with finds, and all sub-sites in the cluster were also rich in flint tools, mostly of a high quality (Hermon, in Avner in press 2). A 14C analysis on a shell bracelet fragment rendered a date ca. 4100 B.C. (Table 1:58).

The site consists of the low remains of a dwelling unit, a group of masseboth and a tumulus tomb with masseboth. Seven masseboth of large cobbles were visible before excavation, some slightly tilted sideways (Fig. 4:66). The third stone from the right is the tallest, 62 cm high, and at its foot was a flagstone offering table, 42 cm long. The masseboth face N-NE (Az. 24°), an unusual orientation. A possible explanation for this is revealed when one stands behind the masseboth and sees their orientation towards Ras alQalb, the most prominent mountain peak in the area (Fig. 4:67). Three meters left of the masseboth a natural stone basin was set, supported by a few smaller rocks (Figs. 4:68, 70), measuring 40x40x40 cm, the depression is 20 cm across and 15 cm deep. An area of 6x2.5 m was excavated in front of the masseboth to a depth of 15 cm, yielding no artifacts or additional installations. Excavation of a small semi-circular installation behind the masseboth (L. 3) produced a single flint flake. The habitation unit and the tumulus tombs, however, supplied a number of well-made tabular scrapers of the 6th-3rd millennia B.C. (Hermon, in Avner in press 2). Following the dig the masseboth were straightened (Fig. 4:69).


The site, in eastern Sinai, is located on an elongated hill, in a complex consisting of one habitation unit, a tent camp, two masseboth sites, two open sanctuaries and 15 large tumuli tombs. In the masseboth location almost no excavation was required. A row of five flint and limestone cobbles, up to 80 cm high, was standing upright and facing east (Az. 104°), while the left stone was tilted slightly backwards. In front was a horizontal row of flat cobbles creating a long offering bench, and on either side was an additional row of elongated cobbles leaning towards the masseboth and towards each other (Figs. 4:71, 4:72). Based on similar finds from 25 other masseboth locations (see above), these were interpreted as smaller masseboth annexed to the main group. At the back of the masseboth, the tops of two additional stones were visible. When the back pile of stones was removed, a pair of masseboth was revealed (Fig. 4:74), a narrow stone 89 cm high, and a broad stone 46 cm high. Although they are seen here from the back, their left/right order follows the majority of masseboth pairs (see above). A similar pair was also found behind a single broad massebah at Neot Semadar (Table 11- 1:54). Two meters in front of the masseboth is a stone circle, 1.2 m inner diameter, made of a single line and one course of cobbles. Excavation of the installation exposed a small massebah, 21 cm high with a tapered head, and a small offering bench on its eastern side (Figs. 4:72, 4:85).

Surface finds around the masseboth location included flint flakes and two tabular scrapers; three additional flint flakes were uncovered in the circular installation. Three 14C dates from two adjacent tumuli tombs were ca. 4400 B.C. (Table 1:63).


The site is situated on a low terrace of Wadi Sa'al, eastern Sinai, and contains the remains of a tent camp, 120 m long, and two stone-built habitation units. Two masseboth groups were erected in the site about 100 m apart. Recent Bedouin use of the site caused disturbances in both groups. 13. The northern group (S. I) comprises seven granite masseboth facing E-SE (Az. 124°) with a semi-circular cell built in front. The second and third masseboth from the right were found fallen, the others were standing; the middle stone was 1.33 m high (Fig. 4:76). A few low walls around the masseboth were of a later date. Surface finds included complete and fragmented tabular scrapers, a Chalcolithic-EB I jar handle and a sandstone grinding stone fragment. Following the removal of a few free stones, the semi-circular cell was excavated (L. 1). The cell was found filled with fine sediment mixed with ash and charcoal, and virgin soil appeared at the same level as the masseboth base, 0.25 m below surface. A small pavement 45x30 cm made of seven small flagstones (one broken) was found at the foot of the third massebah from the left, covered and surrounded by ash and charcoal (Fig. 4:77, 81). Finds from the cell included a fan scraper, a shell bracelet fragment (Figs. 4:103) and a few flint flakes.

Behind the masseboth a trench of 1.2x 0.8 m was excavated (L. 2). Several retaining stones were revealed, and virgin soil appeared 0.20 m below the surface. Various flint flakes were found in the trench and a granite grinding bowl was uncovered (Fig. 4:102) lying upside down and covered by small and medium stones (cf. excavated sites 4, 5).

Twelve meters southwest of the masseboth, a sunken “vase”-shape, stone-lined installation was excavated, 35 cm inner diameter and 32 cm deep (Fig. 4:79). Its bottom was stone-paved and covered by ash. Similar but larger installations were discovered in ‘Uvda 19 (see above), and in several open sanctuaries (Ch. 5). Following the dig, the fallen masseboth were reset (Fig. 4:78).
14. The southern group (S. II) Consists of a curved line of nine granite masseboth facing E-SE (Az. 121°). The middle massebah, the broadest and largest (127 cm high), was tilted forward while the others were standing upright (Fig. 4:82). In front of the masseboth and on the right side was a semi-circular cell covered by rocks, while a larger semi-circular space marked by detached stones was in front of the whole group (Fig. 4:86). Surface finds included several tabular and heavy duty scrapers, two awls and others, generally dated to the 5th-3rd millennia B.C.

Before digging, free stones were removed and the central massebah was reset. The cell's stones (L. 1) were lying on surface, but virgin soil was reached 24 cm deeper (Fig. 4:83). The masseboth bases were then exposed, displaying uneven levels. Possibly they were set intentionally as to allow their heads a symmetrical, graduated appearance.

Excavation of the rest of the front space (L. 2) exposed seven hearths ca. 2 cm below surface, approximately 0.60 m in diameter and 10 cm deep (Fig. 4:86); some contained a single stone on the margin.

Behind the masseboth (L. 3) free stones were first removed and a trench was excavated along the back of the masseboth. This exposed a full row of medium-size retaining stones carefully laid for support (Fig. 4:84).

Two larger hearths were found south of the masseboth, one surrounded by a complete belt of stones (L. 4, Fig. 4:85). These hearths contained an ash layer with no charcoal.

Four ^14C dates from hearths of both locations all had late dates, resulting from repeated encampments of Bedouin in the site. However, the 5th-3rd millennia B.C. attribution of both masseboth groups is based on the flint assemblage, pottery sherds and fragments of sea shell bracelets (Fig. 4:103).

15. Wadi Daba’iya (G.R. 06727995).

A group of five sandstone masseboth is located in Wadi Daba’iyah, in eastern Sinai, next to a large habitation site, partially excavated first by A. Goren (unpublished). They are up to 2.05 m high and face east (Az. 88°), the second stone from the right was tilted forward, while the others were upright. In front and behind the masseboth are well-built semi-circular cells of large sandstone blocks; an additional smaller cell is adjacent on the southern side (Figs. 4:87, 89).

During excavation of the front cell (L. 1), the tilted massebah was reset, and a fill of quartz sand containing some small and medium stones was excavated. Virgin soil was reached at a depth of 20 cm on the south side and 35 cm on the north. Small offering benches were found in front of the central massebah and the one on its right (Fig. 4:89). No finds were detected in this cell.

Excavation of the back cell (L. 2) showed indications of later disturbance, and the bottom was 20 cm higher than the front cell. This cell contained several artifacts: two retouched flint flakes, a large globular flint hammerstone, and a shell bracelet fragment (Fig. 4:104). All masseboth were found supported by medium size retaining stones (Fig. 4:89).

A ^14C date of early 5th millennium B.C. was obtained from the bracelet fragment; another date from the habitation site was approximately 700 years later (Table 1:65).

F. Finds and Dates

Most artifacts uncovered during excavations of masseboth locations were buried at the foot of the masseboth, sometimes next to an offering bench, or they were buried behind them. In several locations simple flint flakes were placed, but usually there were more prestigious objects. According to their nature and position, these artifacts should be interpreted as offerings. Since artifacts were also found behind the masseboth, it is possible that they were first placed on the offering tables and later concealed behind the masseboth. In the Wadi Watir site fragments of prestige objects, such as shell bracelets and a sandstone bowl fragment, were found on surface next to the masseboth, most logically the result of robbery in antiquity. This may be the case in other locations as well, and may also explain why artifacts were not found in some locations. Following is a brief discussion of selected finds.

Among the flint tools, tabular scrapers predominate. Examples include: the thin tabular scraper at the foot of the masseboth location in Wadi Sa’al I; a trio of scrapers at the foot of masseboth in Wadi Zalaqa 301; surface finds of scrapers in a number of other locations; and the large non-tabular scraper in ‘Uvda 124 XVII, all of high level workmanship. These occurrences are not accidental since tabular scrapers were often found in other cult and burial sites: the nawamis tombs of southern Sinai (Bar-Yosef et al. 1977:77, 1986:134-5); a total of 98 tabular scrapers in

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9. Northern location (S. I): Rt 657- 400+140 BP, Rt 657a- 320+140 BP. Southern location (S. II): Rt 870a- 1030+90 BP, RT 870b- 680+140 BP.
eight other *nawamis* sites excavated by A. Goren (Arad-Ayalon, unpublished); several hundred (!) at Mispeh Shalem (Greenhut 1989); five scrapers in a sanctuary at Bab edh-Dhra’ (Rast and Shaub 1980:31); 39 in an cult installation at ‘Ain Yanqa, central Sinai (Rothenberg 1979:126); a concentration of 35 in a “plaza” site near Har Karkom (Anati 1993:46); tens of scrapers in a number of open sanctuaries in the southern Negev and Sinai (see Ch. 5); and tens in the Eilat burial ground, 31 were in one pile (Fig. 10:26). Among the functions of tabular scrapers identified through micro-wear analysis were meat cutting, animal skinning and leather processing (see Ch. 2). These functions could indicate that the scrapers were used for sacrificial purposes at the *masseboth* locations. However, since in some cult and burial sites they were found in large piles, their role as offerings should not be overlooked (cf. Rosen 1997:81).

Another occurrence of flint should be mentioned. In the excavation of a pair of *masseboth* in the temporary habitation site near Give’at Shehoret, an almond-shaped hand-axe (Fig. 4:95) and two retouched Levallois flakes were found. These obviously greatly predate the site; the first is Lower Paleolithic, and the others are Mousterian. At first glance, their occurrence seems incidental, however, similar artifacts were also found in several open sanctuaries (see Ch. 5). Therefore, it is not impossible that these early artifacts were collected from the surface by desert people during the 6th-3rd millennia B.C., recognized as ancient tools and brought to cult sites as offerings.

Grinding equipment was found in several *masseboth* sites. Trios of grinding stones were uncovered in front of two single broad *masseboth* in ‘Uvda Valley, additional fragments were found in Wadi Watir and Wadi Sa’al, and a granite grinding bowl was found in Wadi Sa’al I. Grinding grain into flour could be part of a ritual performed to ensure soil fertility, as it is eloquently expressed in the Bible (Jer 7:18; 44:19), in ancient Akkadian records (CAD, 8:110, with references) and in Egyptian ones (LA 2:429-432, with references).

A sandstone bowl fragment was found on the surface near the *masseboth* of Wadi Watir (Fig. 4:100). Made of hard, compact sandstone, well-shaped and smoothed, this bowl is very different from other known stone bowls from Chalcolithic sites in material, thickness and level of workmanship. Parallels are known from Rizqeh, southern Jordan (Kirkbride 1969:192), where several bowls were decorated with reliefs. Five bowls and 15 bowl fragments were found in the Eilat burial site (see App. 1), and additional fragments were found in burial sites during the survey of ‘Uvda Valley and the Eilat region (unpublished). All sites where sandstone bowls have been found are of cult or burial, thus, they were probably produced specifically for offering or libation. The presently known 14C range of these sites is ca. 5500-4000 B.C.

Red Sea shells and shell fragments (identified by J. Dafni) were found in three locations. The largest collection is from Wadi Watir, including 6 *Dentalium lineolatum* shells, fragments of at least 10 bracelets made of *Lambis truncata sebae* and *Conus textile* shells (Figs. 4:97-99). Most bracelet fragments are identical to those found in the *nawamis* tombs (Currelly in Petrie 1906:244; Bar-Yosef et al. 1977:75-76, 1986:136-7; Arad-Ayalon, unpublished)10, and in other sites in the Levant and in Egypt (Schaub & Rast 1989:310-312; Payne 1993:218-219, with references; D. Bar-Yosef 1999:119-121, with references). However, some bracelets from Wadi Watir are somewhat different. They are rounded in section and carefully smoothed, they are thinner, up to 9 mm, and smaller in size, up to 66 mm in their outer diameter (Fig. 4:97, bottom). One parallel for this type is known from the *nawamis* tombs at ‘Ein Hudera (Bar-Yosef et al. 1977, Pl. 12B), while thicker and larger rounded-sectioned bracelets are known from predynastic Egypt (D. Bar-Yosef *ibid*). Until recently shell bracelets were considered Chalcolithic and EB I, based on the sites where they were discovered (see the above references). Now, fragments of two bracelets from *masseboth* locations are directly dated by 14C, ca. 4900 and 4100 B.C. (Table 1:58, 65), demonstrating a longer tradition of shell industry in Sinai, beginning in the Late Neolithic.11 In addition, *nawamis* tombs in which shell bracelets were found, were dated by 14C to the 5th millennium B.C., beginning as early as 4850 B.C. (Table 1:59, 70). Also notable are the 5 *Morula anaxeres* shells (Fig. 3:98), 11 mm long, and cut in half along the long axis, probably for some symbolic purpose.

Stones of special natural shapes and colors were found in several locations: for example a finger-shaped piece of black chert from Giv’at Shehoret, two conical nodules of hematite and limestone from Wadi Watir (Fig. 4:96) and another pair of small rocks with unusual shapes from the same location. Of the latter, one is an elongated cone-shaped

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10. The latter work presents a total of 317 complete and fragmented bracelets, excavated by A. Goren.

11. Two reservations should be taken into consideration in 14C dating of sea shells. One is that marine material requires additional calibration, specific to each ocean. This is due to the local amount of ancient inorganic carbon dissolved in the water originating from land limestone formations of older geological periods. This may add 0-3% to the date (Biagi 1994; Dye 1994; Higam & Hogg 1995; Thomson et al. 1995). No marine calibration has been established for the Red Sea, however, since the Red Sea drainage catchment contains only limited exposures of limestone, and exchange of water with the Indian Ocean is also limited, the influence on results is probably negligible, and the common calibration for 14C dates on Red Sea shells can generally be taken as sufficient. Second is the possible time gap between the death of the shell and its collection production into bracelets. Since shells gradually lose their gloss when exposed to the elements, a gap of no longer than several years, or decades as a maximum, may be considered. Hence, radiometric dates on sea shells may be considered reliable.
fossil 41 mm long and the other, a sandstone nodule consisting of two balls 26 mm long (Fig. 4:69). Their position together at the feet of the masseboth and under the pavement probably attests to some symbolic value. Stones of special shapes, fossils and shells were also found in open sanctuaries (see Ch. 5), in the burial ground of Eilat (App. 1) and in other Near Eastern cult sites, such as Çatal Hüyük (Mellaart 1967:187, Pl. 56, 69), Beidha (Kirkbride 1966:30, Pl. 17b) and Timna’ (Rothenberg 1988, Pls. 152-155). A logical explanation for their occurrence is that they were brought to these sites as offerings.

The silver pendant from ‘Uvda 69 (22x14x3 mm, Fig. 4:90) was discussed in detail elsewhere (Avner in press 7). When discovered it was covered by green corrosion, and therefore published as copper (Avner 1984:115). However, in 1996 after cleaning in the IAA laboratory it was found to be silver. In 1998 it was analyzed under SEM in the Geological Institute in Jerusalem by I. Segal, and found to contain 55% silver, 30% copper and additional elements. The pendant is hollow, made of two thin metal sheets welded together by lead, with a thin silver strip surrounding its narrow edge. There is a shallow “omega” shaped relief on each side, a symbol appearing on jewelry, rock art and other artifacts from the Chalcolithic and later (e.g. Anati 1976:46, 80-85; Tufnell 1958, Pl. 13:44; Winter 1983:Abb 393; Alkim 1983:32; Curtis 1984, Pls. 2, 3; Eldar and Baumgarten and 1985:134). Several of the referred occurrences connect this symbol to the “Hathor hairstyle”, to female fertility symbolism and to fertility goddesses (Barkay and Kloner 1986:36; Keel et al. 1986:70-75; Black and Green 1992:146).

Silver jewelry had already appeared by the 4th millennium B.C. (Prag 1978; Philip and Rehren 1996) but lead welding is known only from the early 3rd millennium B.C. and later (Moorey 1994:298). The only known close parallel to the pendant is even later, from southern Tell Far’a and dated to the 24th Egyptian dynasty (ca. 720 B.C., Petrie 1930:14, Pl. 42:328). It bears a low relief of Hathor’s face on both sides and is similar in shape and dimension. The pendant of ‘Uvda, therefore, could be cautiously suggested as belonging to the 1st millennium B.C.

Bone fragments recovered at the base of standing stones were mainly hind limbs of young animals, both wild and domesticated. They attests, therefore, to their sacrificial nature and support the cultic interpretation of the sites (Horwitz, in Avner in press 2).

Most surveyed masseboth locations were only roughly dated to the 6th-3rd millennia B.C., mainly based on surface collection of flint. However, the excavated artifacts and 14C dates fully confirm this range (Table 1). At present, there are six 14C dates directly obtained from four excavated masseboth locations, 16 dates from adjacent habitation units or tumuli tombs, and ten dates from the tumuli tombs of Eilat, which include masseboth. The dominant flint tool, the tabular scraper, is dated to this range (see Ch. 8), the crescent-shaped blades from two locations in ‘Uvda Valley are dated the 5th-3rd millennia B.C., and the shell bracelets are dated to the 5th-4th millennia B.C. (see above).

G. Properties of Masseboth

The various occurrences of masseboth and their characteristics raise numerous questions and the need for some interpretation. Since masseboth are mute, additional, later materials are required. There is much room for debate on the question as to whether later written texts, artistic material and anthropological studies, are relevant or not for interpretation of prehistoric finds. At first glance, it seems that no connection between the different sources can be claimed. However, the study of these materials shows that some concepts or perceptions have not changed much through the millennia, and disregarded geographical barriers. In fact similar religious ideas and cultural elements are found in different, unrelated societies, and can be examined on a phenomenological, universal level. The attempt to illuminate the masseboth from later materials should not be immediately dismissed, but taken as a base for critical approach and future amendments.13

1. Orientation

As mentioned above, 72.1% of the masseboth face the general east, 11.9% face west, and 16.8% are oriented in other directions. The predominance of the eastern orientation requires further examination. Of the 146 desert sites that

12. I’m grateful to B. Sass for the reference.

13. For the universal nature of religious ideas see e.g. Frazer 1913; Campbell 1949; Eliade 1958; Jung et al. 1964; Neumann 1974, Levi-Strauss 1981. A quotation from Frazer (1913 V:109) will exemplify this approach: “...the present is the best guide to the interpretation of the past; for while the higher forms of religious faith pass away like clouds, the lower stands firm and indestructible like rocks. The ‘sacred men’ of one age are the dervishes of the next, the Adonis of yesterday is the St. George of to-day”.

Personally, I find unavoidable the endeavor to understand some of the thoughts and emotions behind the silent archaeological remains, but I’m aware of the possibility of misinterpretations. However, since Semiotic is gradually being adopted today in archaeological studies, and Cognitive Archaeology is already present and active, they can supply the archaeologist with the “license” for interpretation and for bridging over gaps in time and space, not forgetting the chance of being mistaken.
face east, 103 are due or near east, while 43 others are directed between azimuths $60^\circ$ and $120^\circ$ (Fig. 4:1). Most probably, masseboth were oriented towards the point of sunrise when they were erected. As a result, their orientations are distributed between the summer and winter solstices\textsuperscript{14}.

Orientation towards the rising sun obviously played an important role in the ancients’ perception as well, but this general notion still requires some inquiry. In Near Eastern religions the sun was worshipped as a prominent deity governing life and death, while the rising sun was perceived to radiate life, fertility and prosperity. In an Akkadian/Assyrian myth the sun god Shamash guides King Etana to find the “plant of birth” (ANET 114-118), and his rays reach the underworld to revive the dead (Shifra and Klein 1996:452-455). In Ugirat the sun goddess Shapash is termed “mother”, i.e. birth-giving (KTU 1.100:R. 14, etc.: Wyatt 1998: 378-387). She is also described as going down to the underworld and shining on the dead (KTU 1.161:R 17; ibid. 437). In ancient Israel the east was the only sacred orientation. The tabernacle faced east (Num 3:38), the temple of Arad faced east (Aharoni 1968:21), and so did the first and the second temples in Jerusalem (Ezek 8:16; 2Ch 5:12; J. Flavius, Wars, V. 5.3). Yahweh was even identified with the rising sun (Ps 84:12), shining from the east (Isa 59:19), and appears and enters the temple from the east (Ezek 43:2-4). He was also described riding a chariot (2 Kgs 2:11, 23:11; Ezek 1; 1 Chr 28:18) much like other sun deities, as well as Helios in the Hellenistic and Roman religions (see in detail- Taylor 1994; Gordon 1995). In Egypt, the sun god, Re’ was also described as giving life to the dead in the underworld (e.g. The Book of the Dead, Spell 15; Faulkner 1993:41). Doorways facing east were built in tombs to enable the dead to pass through and visit the world of the living (e.g. Spell 93), and this was also the orientation and purpose of “false doors” in Egyptian tombs (Haeny 1984). In various cultures in the world the rising sun is perceived to rejuvenate people and fertilize women (Frazer 1913, I:72; VI:143, N. 4; X:74-5).

In this light the winter solstice, the orientation of 27 masseboth locations, may be understood as the point from which the sunrise starts traveling northward over the horizon, signifying the coming of spring and the renewal of nature (cf. Frazer 1913 V:303, X:246-7, 331-3). For desert people, it mainly heralds new growth of the pastures.

The western orientation is second in importance in the desert, with 24 locations (11.9%). The west is obviously the direction of the setting sun, which universally symbolizes the “setting of life”. In the Egyptian Pyramid Texts the dead are named “the Westerners” (e.g. P.T. 304; Lichtheim 1975:39). This title is more common later in the Book of the Dead (Spell 108, etc.), and the world of the dead is termed “the beautiful west” (e.g. Spells 1, 131). Re’, the Egyptian sun god is described as shining in the evening in the world of the dead (Spell 15, Faulkner 1993:41), and in Spell 102 he carries offerings of bread and beer from the living to the dead (cf. Spells 3, 182, etc.). According to this perception, Egyptian burials usually took place on the western side of the Nile (after crossing in a funerary boat) in the realm of the dead. In Sinai, doorways of navamis tombs were oriented westward, enabling the setting sun to illuminate the tombs every year on the date the tomb was first established (Bar-Yosef et al. 1983; Hershkovitz et al., 1985, and see below). Until recently doorways of dolmens in Madagascar were also oriented westward (Joussame 1985:296). In the Eilat burial ground the doorways were oriented east, but all skulls and stone pillows were on the western side of the tombs (see App. 1). A similar perception of the west is also found in Ugirat texts (KTU 1.6.I) in which Shapash is described as escorting the dead to the other world (Healey 1980; Lewis 1989:35-46; Schmidt 1994:84-87). Identical perceptions of the west are still found among present day cultures. For example, in Canton, China, the realm of the dead is termed the “Western Paradise” (Watson 1987:164), and in western Africa it is believed that the dead cross an “Ordeal River” westward to the other world (Goody 1962:371, 374)\textsuperscript{15}.

An intriguing pattern is revealed in the western orientation of desert masseboth. All those which face the west are broad stones, including individuals, pairs of broad stones and pairs dominated by broad stones, while narrow stones or groups dominated by narrow stones do not face west. Altogether, these broad stones were found in 84 locations, 24 of which (27.6%) face west, 52 locations face east and eight face north or south. Since these broad stones are the only ones that face the west, it may imply that in the mind of the desert people there was some specific association between broad stones and the symbolism of death.

2. Shaping the Masseboth

Only a few masseboth exhibit shaping. The earliest known massebah, in the Natufian site at Rosh Zin, was carefully shaped (see below), as was a massebah from Beidha, dated to the Natufian or the PPNB (see below). From the 6th to 3rd millennia B.C., a small flint massebah from ‘Uvda Valley (Table 11- 1:16) was shaped by knapping and a single massebah from ‘Uvda Valley (Table 11- 1:13, Fig. 4:2) was roughly retouched to form an arched top. A delicate circle halved by a vertical line was carved on the face of another, unshaped massebah from ‘Uvda Valley.

\textsuperscript{14} For ample examples of this principle in orientation of tombs see Hoskin 2001. Masseboth and tombs may have good reasons to share orientations (see below).

\textsuperscript{15} For the universal nature of sun worship and its various aspects see Frazer 1925:441-667; Singh 1993.
The absence of shaping cannot be interpreted as a lack of technology on the part of the desert people, for several reasons: 1. They were competent in knapping flint, shaping grinding stones from various types of hard rocks (see Ch. 2), and they carefully carved decorated stone bowls (Figs. 5:129; 10:25), anthropomorphic images and other symbolic stone objects (Figs 4:133-139); 2. If Natufian desert people could shape masseboth, there is no reason why later ones could not; 3. The sculptured masseboth of Risqeh (5th millennium B.C.) clearly demonstrate the high technical and artistic ability of desert people.

These arguments lead to the conclusion that the use of natural, unshaped stones for cultic purposes was a matter of principle, as it was later emphatically expressed in four biblical passages, saying: "...but if you make for me an altar of stone, do not build it of hewn stones; for if you use a chisel upon it you profane it" (Ex 20:25, and see also Deut 27:6; Josh 8:31; 1 Kgs 6:7). Instead of shaping, stones were carefully selected based on their general appearance, proportions and relative size. This was probably a solemn act, as is also described in later periods. 16

Interim Summary
Several points may be summarized at this stage:

1. Excavated masseboth sites reveal a consistent method of construction. The cell’s stones are laid on the surface level, while the floor was excavated and lowered by 20-40 cm, then the masseboth and the offering bench were set on this floor level (Fig. 4:105). The sunken floor recalls a common architectural characteristic of dwelling rooms (see Ch. 2).

2. Features such as offering benches, offering objects, hearths, altars and basins are found in excavated sites at a much higher frequency than in surveyed sites. This may imply that they were more common in masseboth locations than is evident from the survey, and that they formed an integral part of these sites.

3. Masseboth incorporated into tombs and open air sanctuaries are similar in all characteristics to those in isolated locations, and thus, may be expected to have the same general significance.

4. Investigation into the orientation and the unshaped nature of masseboth reveals a symbolic attitude of the ancients towards the masseboth. These, combined with the other described features, clearly attest to their religious role. Hence, masseboth locations can be termed “shrines”.

5. Piles of stones commonly found in front of and behind the masseboth may indicate intentional concealment of the shrines when abandoned. Also hidden were grinding stones, basins and hearths found covered by piles of small rocks. Concealment may be understood as a practical or ritual act meant to protect a sacred object or element.

6. Masseboth described to this point are divided into two main classes. One comprises the individual or groups of attached stones with repeating numbers, while the other includes groups with random numbers of stones, usually detached, sometimes also single ones. Since both classes have similar features, they may be close in meaning, but still distinctive.

H. Catalogue of Masseboth in the Broader Near East

In order to better evaluate the desert masseboth, they should be compared with those of the ancient Near East in general. Therefore, an additional catalogue has been prepared (Table 13) of masseboth locations from Anatolia, Mesopotamia, the Levant and Egypt, covering a time-span from Epipaleolithic to EB IV (11th to 3rd millennia B.C.). Almost all locations were retrieved from publications, and some are based on personal communication from excavators. The locations are listed according to periods, and then in geographical order within each period from northeast to southwest. Since the desert catalogue contains only 6th to 3rd millennia B.C. sites, a few earlier desert sites were

16. A letter from Emar, 18th century B.C. mentions a team of men sent to a quarry to cut stones for masseboth for the gods Ishtar, Dagan and Addum, and shipment to Mari. The team is attended by an expert “who knows how to make Sikanatim stones” (Durand 1985:82-3). In the 9th century A.D. Ibn alKalbi described selection of a stone for a massebah (see here section J:8). In northern India, still in the late 20th century, village members searched for the ‘right’ stones for use as standing stones (Kenoyer et al. 1983:93).
included here from the Negev and southern Jordan. Data is often missing in the publications, so they are noted with question marks; whenever possible, I added missing details obtained personally from the excavators. Certainly some masseboth locations in the vast Near Eastern archaeological literature did not reach my attention. Nevertheless, the information retrieved from this catalogue does contribute to the understanding of masseboth.

The Near Eastern catalogue contains 96 masseboth locations from approximately 72 different sites. They include four locations from Mesopotamia, seven from Anatolia, 82 from the Levant including ten locations from the Negev and southern Jordan, and three from Egypt. Excluding the ten desert locations, 47 locations are from settled zones, and 39 are from the desert fringe, mainly Moab in Jordan and the Be’er Sheva’ Basin. Following is a short chronological examination of the content of the catalogue.

Epipaleolithic

The earliest occurrence of a massebah known to date in the Near East is in the Natufian habitation site of Rosh Zin, in the Negev Highlands, 14th and 13th millennia Cal.B.C. (Table 13:1, with references). The stone was found broken, but the base was in situ in a paved circular space, 6 m in diameter, built on the southeastern edge of the site. Seventeen fragments of decorated ostrich egg shell also emphasized the uniqueness of this circular space. The massebah was well-shaped, 118 cm high, described by the excavator as resembling a phallus (Figs. 4:107, 109). It was set next to the northwestern wall of the space, opposite the doorway and directly facing it towards the southeast. In front, at the base, a cache was discovered with several basalt and flint objects, interpreted as having symbolic significance (Fig. 4:108).

Another possible early massebah was uncovered in the Harifian site of Abu Salem in the Negev Highlands, dated to the 11th millennia B.P. (Goring-Morris 1991b). The stone is unshaped, 78x55x30 cm, vertically incorporated into the wall, protruding into the room by ca. 10 cm and carefully supported by small stones at the base (Fig. 4:110). In front of the stone and close to the room’s center, a large stone slab was laid, 140x80 cm, with some 15 cupules on the top. The stone was not identified as massebah by the excavator, but in my opinion it could be so, based on two main arguments: 1. All walls in the sites are built of medium size field stones, while this stone is the largest and the only monolith vertically set. According to the Goring-Morris (pers. comm. 5/1995) monoliths are absent in Harifian architecture; 2. The room containing the stone (L. 1) is somewhat isolated, on the southern edge of the habitation compound. The stone stands on the northern side of the room, opposite the doorway and directly facing it. Its location and position is identical to that of the Natufian massebah of Rosh Zin, and to other Early Neolithic locations (e.g. Qermez Dere, Jericho, es-Sifiya, Nahal Re’uel, Table 13:1, 3, 4, 15, 16, 19).

Early Neolithic

In the Early Neolithic, six out of 17 masseboth locations were set within habitation sites, six in public buildings, sanctuaries or open-air installations, and five in a burial context. In the majority of PPNB locations (12 of 17) single stones or several detached stones were set. Possible pairs of attached masseboth were found in two sites (Çayönü and Nahal Re’uel, Nos. 5, 19, Fig. 4:112), and in two additional sites detached pairs were found (Qermez Dere and Çayönü, Nos. 4, 7). Triads of stones were discovered in two sites (Kfar Hahoresh and ‘Ain Ghazal, Nos. 8, 14). Orientation is known in 11 locations. In five the stones face south and southeast, in three they face east, and one faces north, west and northwest respectively. Generally, the south seems to gain some dominance. In four locations the stones are roughly shaped, in two others well-shaped, while the other 13 are either natural or information was not supplied. In most sites attached items were uncovered, including stone or plaster pavements, offering benches, hearths, cup-marks and one basin. In two locations (Qermez Dere and Kfar Hahoresh, Nos. 3, 10), skulls or a skull cache were found next to masseboth.

Late Neolithic

Only five Late Neolithic masseboth locations are known to date, three in the fertile zones, one on the desert fringe and one in the desert. In two locations at Haçlar (Nos. 20, 21) single stones were found; a possible pair was found in ‘Ain Ghazal (No. 23); and a group of six small detached stones were uncovered at Hagoshrim (No. 22). The site of Risqeh (No. 24) near Wadi Ram in southern Jordan is unique. It consists of tens of masseboth arranged in a circle 22 m across. Some stones are crude and unshaped, some are carved in a human silhouette, and others are carefully carved in male and female forms with anatomical and other details (Fig. 4:106).

17. The present number of locations is only estimated, since in some sites the actual number of locations is unknown. For example, at ’Biq’at Kinarot (No. 52) the masseboth were not discovered in situ, so they are arbitrarily listed here as occupying five locations. The site of Kh. Iskandar (No. 77) includes many circles of menhirs, but their number was not reported.

18. These locations include a massebah from Beidha, originally attributed by Kirkbride (Table 13:17, Fig. 4:111) to the Natufian stage of the site, but it was not included in the final report of Byrd (1989) on the Natufian Beidha. In a letter from 3/3/2001, Byrd wrote that this stone belongs to the earliest Neolithic occupation of the site. I thank him for this information.
Chalcolithic

Nineteen masseboth locations are listed for the Chalcolithic period. All are from the Levant, eight from the fertile zone, eight from the desert fringe, mainly the Be’er Sheva’ Basin, and two from the desert of southern Jordan. Four locations are in habitation contexts (Rasm Harbush, Give’at Oranim and Tell Abu Matar, Nos. 25, 33, 40, 42), four are in the sanctuary of Gilat (Nos. 36-39), and the contexts of two locations (at Wadi Aheimar, Nos. 43, 44) have not been published. The other ten locations were found within burial caves or adjacent to burials, and in addition, two locations at Gilat and Nevatim were also connected with burials within the sanctuary or the settlement. Altogether, 13 out of 19 Chalcolithic masseboth locations are related to burials. Groups of stones were discovered in five locations, three triads (at Rasm Harbush, Kissufim and Gilat, Nos. 25, 34, 39), and an additional triad and a group of seven are located in Wadi Aheimar, in the desert of southern Jordan (No. 42, 43). Orientation is known in only two locations, and therefore cannot be plotted. Attached items are few. In seven locations ossuaries were found with the masseboth, but in these cases the masseboth are only secondary to the ossuaries. Platforms of mud bricks or stones were found in two locations (Rasm Harbus Hand Kissufim, Nos. 34, 39), and in Nevatim (No. 40) a built pit was located next to the masseboth.

Early Bronze I-IV

Fifty-one masseboth locations are dated as EB: two in Mesopotamia, two in Anatolia, three in Egypt and 44 in the Levant. Within the Levant 29 are located on the desert fringe, mainly Moab in Jordan, three are in the desert, and 12 are in the fertile zones. Seven masseboth locations in the fertile zones are in temples/sanctuaries, three in open-air cult sites (Tell ‘Ashir, Hartuv, and Jebel Qa’aqir, Nos. 55, 59, 61) and one in a city gate (Beit Yerah, No. 52). Two locations at Jebel Qa’aqir (Nos. 60, 61) are in a burial context (Nos. 60, 61), the vast majority of masseboth from the desert fringe (Moab, Nos. 62-88) are in open-air sites, associated with burial grounds, and the only three masseboth locations in Egypt (Nos. 93-95) are also in a burial context. Distinctive groups of masseboth are rare. Pairs are found in five locations (Beyçesultan, Kh. Iskander, Hadra Minwa, Saqqarah, and Meydum, Nos. 48, 83, 90, 94, 95) but they are all detached. There is one group of five at Nahal Refa’im (No. 58), partially detached. All other locations are of singles or detached multiple stones. Orientation is known in only 21 locations: 10 face the general east, other orientations are too few to identify a pattern. Attached items are similar to those found in earlier sites (offering benches, pavements, etc.) but they were rarely reported.

From the overall picture of masseboth occurrences in the fertile Near East and the desert fringe, 11th to the 3rd millennia B.C., three main points emerge:

1. The great majority of the masseboth locations, 82 out of 95 (86.3%) are from the Levant, while only 13 (13.7%) were discovered in the much larger area encompassing Mesopotamia, Anatolia and Egypt.

2. Considering the large area of the Near East, the overall number of masseboth locations is limited. Only during the Early Bronze Age did they become more common, but then they were mainly concentrated in the desert fringe, in Moab.

3. Orientation is known in 49 masseboth locations. The general east is dominant, but is less distinct than in the desert masseboth (see comparison below).

4. In the fertile zone distinctive, attached groups are scarcely found, while in the desert fringe they are somewhat more common but still rare. Altogether in both zones three possible attached pairs were reported, five attached triads, and one possible group of five. Others are 49 single stones and 36 locations of detached stones of random numbers. One triad and one group of seven included in this catalogue (Wadi Aheimar, Nos. 43, 44) are from the desert. Several other properties of masseboth in the Near East will be discussed below.

I. A Comparison of Masseboth in the Desert and the Sown

When characteristics of masseboth from both zones are compared, some differences emerge. Following is a discussion of several properties.

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19. The site was dated by Kirkbride as close to the first century B.C., based on Thamudic inscriptions on some of the adjacent tombs. However, the finds were from the 6th-4th millennia B.C., and a 14C date was of early 5th millennium B.C. (see Table 1:42). In March 1983 I had the opportunity to discuss the site’s date with her, and she agreed that the masseboth did belong to the early artifacts and the 14C date.
1. Geographical Occurrence and Distribution of Masseboth

Presently, the earliest known masseboth are from the desert, the Natufian site of Rosh Zin and probably the Harifian site of Abu Salem. In the fertile zones masseboth first appear somewhat later, in the Early Neolithic sites of Qermez Dere, Çayönü, Kfar Hahores and ‘Atlit Yam (Table 13:3-14). They are also found in desert fringe and desert sites: ‘Ain Ghazal, Jericho, es-Sifiya, Beidha and Nahal Re’uel (Table 13:14-19).

From the Late Neolithic and later, the desert masseboth greatly outnumber those of the sown lands. If both catalogues and all periods discussed here are calculated, 303 masseboth locations are known to date. Of these, the desert masseboth number 217 locations (71.6%), the desert fringe 39 (12.9%) and the fertile zones 46 (15.2%).

It may be claimed that the difference in numbers is biased by the fact that desert masseboth, as well as other archaeological remains, have a higher rate of preservation. However, it should be remembered that: 1. The desert area from which the masseboth were documented covers only ca. 1% of the Near East, and is mostly unsurveyed; 2. The desert sites assembled here do not include masseboth incorporated into hundreds of tumuli tombs, open-air sanctuaries or other cult installations. If these were included, the statistical difference between the two zones would be far greater; 3. Masseboth of other desert areas of the Near East are also excluded. They have been reported from the Arabian peninsula and North Africa20, although not usually meticulously documented, if included, they too would add considerably to the relative weight of the desert masseboth. One example of the potential of masseboth studies in other desert areas is the site of Rajajil, in Wadi Sirhan, Northern Hejaz, where 39 groups of large masseboth are clustered in an area of ca. 500 m square (Winnett and Reed 1970; Parr et al. 1978; Zarins 1979).

In later periods masseboth were also very common in the desert, but they were rare in the fertile zones21. For example, around ‘Uvda Valley alone about 2000 small Nabatean masseboth were documented (Avner 2000); masseboth are still found in Byzantine sites (Rosen & Avni 1997:16, Figs. 4.19-4.21, and here Fig. 4:128) despite the Christian prohibition against them (Allcroft 1927; Daniel 1978:20-26), and many were still erected in the Early Islamic period (Fig. 4:129), despite rigorous Islamic prohibition22.

2. Numbers of Stones in Groups

One of the characteristics of the desert masseboth is the consistency of their numbers in groups and the recurrence of arrangements within the group, according to relative size and shape (see above, and Table 12). The masseboth of the fertile lands, however, rarely show any clear grouping. The only distinctive ones are three possible pairs, five triads and one group of five, while all others are either singles or random numbers of detached stones. The impression is that concepts represented by the groups of desert masseboth were only rarely shared by those of the sown.

3. Orientation

Orientations of masseboth in the desert exhibit distinct, interpretable patterns, in contrast to those of the wider Near East. For example, the general eastern orientation encompasses 72.1% of the masseboth in the desert, but only 42.9% in the rest of the Near East (Figs 4:121). The impression is that orientation in the desert was considered to be more meaningful than in other regions.

4. Shaping of Masseboth

Publications of masseboth in the fertile lands rarely address the question as to whether or not the stones are shaped, therefore, the catalogue (Table 13) does not properly present this characteristic. Nevertheless, a general trend


21. Masseboth were found in many Late Bronze and Iron Age sites in the fertile zone, as well as in the desert (Avner 1996d with references). They are known from classical records (see below), and are presented on coins (Donaldson 1852:105-109; Cook 1940:898-909; Du Mensil du Buisson 1973), but they are rare in archaeological remains. One of a very few sites where they were unearthed is the Iturean sanctuary at Har Senaim (Dar 1993:33-46).

22. For early Islamic masseboth in the Negev see Israel & Nahlieli 1991; Avni 1992, Sites 54, 248; Rosen & Avni 1997:16, Figs. 4.26, 4.27; Haiman 1999a, Sites 37, 64, 88, 245. Many stones were identified by Nevo as Early Islamic stelae (Nevo & Koren 1985; Nevo 1991:126-135), however, based on my personal observations in the sites during a visit with Nevo in 1986, only a few are actually masseboth (see Nevo 1985, Fig 1:3; 1991, Pl. 36.5).

Recently, a National Geographic television program, photographed in 2000, showed members of a salt caravan in the Sahara desert entering an open mosque containing a triad of masseboth set in the mihrab (the central one was ca. 3 m high). In the mosque the prayers prayed to Allah before the masseboth, then rubbed them with their hands and then rubbed their faces (see Figs. 4:129-131). This is an example of how an old tradition of masseboth worship still exists today, despite long prohibition.
can be observed: in the Neolithic period the masseboth of Qermez Dere were obviously shaped from clay, as were some of the stone masseboth of Çayönü, and the stones from Jericho and es-Sifïya. In the Chalcolithic period almost all stones were roughly shaped. In the Early Bronze, the masseboth of Mari and Byblos are well-shaped, the masseboth of Beycesultan were made of clay, and those of Beit Yerah and Biq’at Kinarot are all shaped and perforated in an anchor form. Most menhirs in Jordan are roughly shaped, and the stones from the three Egyptian sites are obviously well-shaped. Actually almost all masseboth in the fertile lands are shaped in varying degrees.

The conclusion is that the “rule” to refrain from shaping stones selected for cultic purposes applied to almost all desert masseboth, but it did not apply to masseboth in the sown.

5. Attached Items

Despite the fact that only a few desert masseboth have been excavated (15 out of 207), the frequent occurrence of attached items (stone cells, offering benches, pavements, hearths, basins, and smaller masseboth annexed to the main groups) was quite high. In the excavated sites of the fertile areas however, these features were rare. Their scarcity may be partially explained by a lower degree of preservation, and a lower level of excavator awareness or incomplete reporting. Nevertheless the differences in the frequency of these features between the two zones is remarkable.

In general, comparison between masseboth of both zones demonstrates that the desert masseboth appear to be a more consistent phenomenon. They first appeared in the desert, they outnumbered those of the sown, and they were more durable and more congruous by every criterion. A study of masseboth during later periods (until the end of the Iron Age, Avner 1996b, App. 3, 4) indicates that only by the early 2nd millennium B.C. did masseboth become really common in the fertile lands, several millennia after they were already well established in the desert. The impression is that masseboth were basically a desert cultural element, that to some extent was adopted in the sown lands.

J. The Meanings of Masseboth

At this point, masseboth are generally explained as cult objects, but still the question is “What do those stones mean?” (Josh 4:6).

The first attempt at a comprehensive, critical study of standing stones and other megalithic monuments was made by J. Ferguson, who referred to and personally examined large numbers of sites in Europe, Asia and Africa. His basic interpretation was that menhirs served as representations of ancestral spirits, mainly of warriors who died on the battlefields (Fergusson 1872:57-60, 463, 509, etc.) Other scholars of the 19th century and the early 20th century saw masseboth as mainly representing deities (Conder 1885:203-245; Robertson-Smith 1889:203-212; Evans 1901:13-15; Moore 1902, 1903). In contrast most scholars of the 20th century minimized the cultic role of the stones and emphasized more functional aspects, such as commemoration of persons and events, signifying treaties and vows, representing prayers permanently standing before the gods, and marking tombs and boundaries (Avi-Yonah 1950; Broshi 1968; Graesser 1969, 1972; Stockton 1970; Canby 1976). Eliade (1978a:114-118) interpreted menhirs as representing the dead and containing their spirits. Recently, there is a growing tendency to accept the masseboth as aniconic representations of deities (Avner 1984, 1993c, 2000, 2001; Mettinger 1995; Van der Toorn 1997; Keel & Uehlinger 1998:33, 384; Zevit 2001:256-262).

Following is an attempt to verify the various aspects ascribed to masseboth, based on the aforementioned studies and my own research. The discussion will include material from later periods which illuminate the ancients’ perception of masseboth. Decorated and inscribed stelae will be referred to as well, due to their closeness to the “mute” masseboth. Although later material is used here for interpretation of prehistoric and protohistoric archaeological remains, I believe that the validity of the integration of both domains will appear through the discussion (and see above Section G).

1. Commemoration of Events

This function is mainly known from inscribed and decorated stelae, prepared and set to commemorate the victories of rulers during their campaigns of conquest (e.g. ANEP 274, 320, 321, 342, 442-444). Inscriptions on these stelae clearly express their function. The Bible supplies further examples of masseboth commemorating important events. The 12 stones that Joshua erected in the Gilgal clearly demonstrate this: “so that this may be a sign among you. When your children ask in time to come, ‘What do those stones mean to you?’ Then you shall tell them that the waters

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23. See e.g. Sussman & Ben-Arieh 1966:27, 34, 35; Alon & Levy 1989:182-3; Gilead & Fabian 2001:75; Goren & Fabian, in press.
24. Personal observation while visiting some sites in Jordan, and from published photographs.
of the Jordan were cut off in front of the ark of the covenant of the Lord ... So these stones shall be to the Israelites a memorial forever.” (Josh 4:6). Similarly, the “helping stone” (‡·Ô†‰Úʯ) that Samuel erected commemorated the Israelite victory over the Philistines (1 Sam 7:12). The texts imply that these masseboth not only memorialize the events, but also preserve their lessons for future generations.

In this light several excavators interpreted the masseboth they discovered. At Gezer two different stones were identified by Macalister as commemorating events, one outside the city wall, the other stone No. 7 in the Gezer high-place, which he believed was brought to the city as war-booty (Macalister 1906:59-61, 1912, II:337, 390f). Three elaborately shaped pillars set upside down within the masseboth rows at Assur were similarly interpreted (Andrae 1913:25-36, Nos. 15-17, 1938:106; Canby 1976:127-8), and this interpretation was also suggested for the masseboth of Tell Chuera (Moortgat 1960:52). Some scholars saw the commemoration of events as the main purpose of masseboth (Avi-Yonah 1950; Broshi 1968; Graesser 1969:299, 302-3).

2. Commemoration of Individuals

This type does not concern tombstones, rather, masseboth that memorialize the names and deeds of distinguished persons, mainly rulers. Naturally this type is related to the first since the commemoration of a ruler’s victories simultaneously commemorates his own name. One basis for the interpretation of this group is the emphasis given to the rulers names in various stelae inscriptions (e.g. KAI 202, 214, 215; ANET 281, 655). Some stelae were prepared and set during the ruler’s lifetime (e.g. KAI 35). In the Bible, Saul erected a “hand” (È”) for his name (and fame) after his victory over the ‘Amalekites (1 Sam 15:12), a stone that most probably commemorated the event as well. Another “hand/massebah” was erected by Abshalom (2 Sam 18:8), with no connection to any event, but entirely for self-commemoration.

The renowned archaeological example of commemorating individuals comes from Assur. Two rows of shaped masseboth, 130 in total, were discovered in a large open space between the inner and outer city walls. Each stone bears a short cuneiform inscription, opening with the word “Image of,” followed by the name and title of a king or high official. The names cover the period from Adadnirari I to Esarhadon, ca. 1300-650 B.C. (Andrae 1913). Obviously, these masseboth preserved the names of distinguished dead (Andrae 1938:108; Graesser 1970:41; Canby 1970:126).

A number of other masseboth from excavated sites were interpreted similarly. According to Graesser (1970:59-61), the masseboth of area C at Hazor memorialize the early founders of the city, and their discovery in a sanctuary indicates that some ancestral cult developed around them. A similar interpretation has been given to the masseboth of Riqqeh (Kirkbride 1969) and to those of Hartuv (Mazar and Miroshchedji 1995). If so, masseboth commemorating individuals were connected with the ancestral ones, a point which requires further discussion (see below).

3. Funerary Masseboth

At first glance, this type is simply grave-markers. They are mainly known from the Iron Age or later periods, and are identified as such by inscriptions (KAI, passim.; ANEP 280, 635 ANET 661-2; Stager 1984; E. Mazar 1994).

Nevertheless this interpretation seems too narrow, for several reasons: to date, masseboth have been discovered inside eight Chalcolithic burial caves (Table 13:26-33), where they could not have served as markers at all, as was the case of masseboth within the burial building of Kisufim (Table 13:33). Masseboth were also discovered standing in situ inside tumuli tombs in Eilat (see above) and in Bab Edh-Dhra’ (Clark 1979), originally not visible, covered by stone cairns. In addition, ample masseboth are incorporated in tumuli tombs and share the same properties with independent masseboth locations (see above). Therefore, another meaning must be sought for this type. In my opinion, funerary masseboth do not form a distinctive group, at least not during the early periods, and should be included in types 7 and 8 (below).

4. Boundary Masseboth

The Babylonian Kuduru stones are clear examples for this type. They bear relief symbols of the gods which legalize and validate them, while the attached inscriptions cursed anyone who would venture to move or damage the stones (CAD VIII, 495-6; ANEP, 454, 518-521). Violation of a boundary stone was the pretext of the war between Uma and Lagash (see above). In the Bible, the stone erected by Jacob in the Gile’ad not only witnessed the treaty between Laban and himself, but also marked the border between them (Gen 31:52). Likewise, the “large stone” at Beith-Shemesh marked the border between the Philistines and Israelites (Judg 6:12).
Stelae erected by rulers on the perimeters of their conquests commemorated their heroic acts on the one hand, but also served as border masseboth, since they physically marked their expanded boundaries (ANEP 320, 321, 443, 444). Such stelae usually bore the ruler's image, symbols of the gods that launched him on his mission, and inscriptions describing his victories.

4. Masseboth Witnessing Treaties

These are often mentioned in Near Eastern texts of treaties signed between individuals (rulers), between groups or between people and gods. The stones actually served as witnesses in the signing ceremonies, while some bear inscriptions stipulating the treaty. For example, on the Sumerian “Stelae of the Vultures” (ca. 2500 B.C.), the relief commemorates the victory of Lagash over Uma, while the inscription documents the vassal treaty between the cities’ rulers, Eannatum and Ennakal (Kramer 1963:310-313; ANEP 298-302). The Sefire inscriptions are inscribed stelae with a detailed vassal treaty between Bargayah the ruler of Ktk and Matti’el of Arpad in northern Syria (ca. 750 B.C.), which were written in several copies (KAI 222-224; ANET 659-661; Fitzmyer 1967).

The role of the stelae and masseboth in treaty signing becomes clearer in light of biblical and extra-biblical texts. The massebah erected by Jacob and Laban in the Gile’ad is “witnessing” the treaty between them when signed, and “watches” the parties afterwards (Gen 31:44-49). In the covenant signing ceremony that Moses performed in Sinai, 12 masseboth are present (Ex 24:4) and the tablets of covenant are termed “the witnessing tablets” (Ex 24:12; Ex 31:18, 32:15, etc.). According to several scholars, these tablets were actually masseboth (e.g. Tur-Sinai 1956, II:54-5; Kaufmann 1963, II:70-71). The “large stone” that Joshua erected under the terebinth tree in the temple of Yahweh at Shechem serves as an eloquent example of a witnessing stone: “and Joshua said to all the people, “See, this stone shall be a witness against us; for it has heard all the words of the God that he spoke to us; therefore it shall be a witness against you, if you deal falsely with your God.” (Josh 24:27). The enthronement ceremony of King Josiaia was performed “at the pillar” (2 Kgs 23:3; 2 Chr 34:31), in a ceremony that also served as the re-establishment of a threefold covenant between the king, the people and God.

Signing treaties in the presence of masseboth or “stones” occurs in additional records. Sikkannu stones, i.e. masseboth, were set at Emar and Munbaqa (ca. 1800 B.C.) in ceremonies of personal treaties (Dietrich et al. 1989:135-137), although their precise connotation is not clear in the documents. Herodotus (III:8) described a treaty signed between ‘Arabs in the presence of seven stones, and Thucydides (V:18.10, 56.3) quoted the stipulations of a treaty between Athen and Lacedemon. The tenth stipulation says that the parties will erect stelae in several temples, on which the words of the treaty will be written. This obviously recalls the Sefire stelae and the “Large Stone” of Joshua at Shechem.

As for excavated masseboth, Graesser (1970:57) suggested that those of the Gezer high-place were witnessing masseboth, either for a treaty between ten clans within the city, matching the number of stones, or between ten cities, including Gezer.

6. Vow Masseboth

These stones designate the acceptance of a vow, or its fulfillment. By the stone that Jacob erected at Beith-El he made a vow saying that if God will protect him on his sojourn to Padan, then Yahweh will be his God (Gen 28:21). An Aramaean inscribed stela defines this function, saying: “This is the massebah set by Bar-Hadad... king of Aram for his Lord Melqart, to him he vowed and he listened to his voice” (KAI 201; ANET 655). This stela presents the image of Melqart, to whom the vow was addressed, standing above the inscription. Many vow stelae are known in the Phoenician-Punic culture. They bear inscriptions mentioning the addressed gods (e.g. KAI 72), some attended by a symbol or an image of the god. The fulfillment of the vow is also noted in some inscriptions, for example; “For Rabat, for Tanit-Face-of-Ba’al, for the Lord Ba’al-Hamon, to whom Matti-Ba’al the wife of Ebed-Melqart vowed... that they heard my voice and blessed (me)” (KAI 88).

7. Masseboth for the Dead or Ancestors

According to some scholars, this is the essential meaning of masseboth (Burrows 1934; Neiman 1948; Albright 1957; de Moor 1995). At first glance this type of stone is not different from those that commemorate individuals, and in most studies no distinction was made. However, there are conspicuous differences, as will be explained below.

In ancient written sources these masseboth are mainly known from the 2nd millennium B.C. Most familiar is the Ugaritic myth of Aqhat, repeating four times: “...massebah (skn) to ancestral spirits in the sanctuary....” (KTU 1.17.
The Uguritic word for ancestral spirit is ilib (𐤗𐤃𐤇𐤁), a combination of god and father, or “divine ancestor.”25 Another related Uguritic and biblical term is pgr, which occurs in the context of bamah—a high-place, or in some rituals (Lev 26:30, Ezek 33:7-9), and is translated as a massebah which represents the dead.26 The semitic term nephesh (=soul, person) was also applied to ancestral masseboth, and both terms were connected with bamah. Bamah is commonly accepted as an open-air cult place, but some scholars specifically interpret it as a place for the ancestral cult (Burrows 1934; Neiman 1948; Albright 1957; de Moor 1995).

The cult of ancestral spirits is well known from Near Eastern sources, mainly the marzeah, and the kispa.27 This cult, which includes the erection of stone and wooden pillars, is also universally known from anthropological studies as playing a central role in the life of almost every traditional society.28 Documentation of customs relating to the ancestors reveals that menhirs, wooden pillars, or even statues, do not simply represent the dead or perpetuate their memory, but are perceived as physically containing and preserving the ancestral spirits. Further, these spirits are commonly believed to maintain close contact with the gods. The universal nature of the ancestral cult may explain why menhirs are found on all continents (Figs. 4:122-124), except Antarctica.

8. Masseboth for Deities

As mentioned before, this was the primary interpretation of masseboth in the 19th century, but it was not favored in later studies. A selection of Near Eastern written sources and artistic representations from different periods may contribute to the discussion.

Written Sources

In Genesis 28:22 Jacob says: “... and this stone which I set up for massebah will be a God’s house” (מeah תות). This means that the stone was perceived as containing God’s power and spirit. Similarly, an Assyrian document of Tukulti Ninurta II (ca. 885 B.C.), says that during his campaign to the Lebanon coast “he camped by the stones in which the great gods are dwelling” (Schramm 1970:150). Other Semitic languages use the same terminology for standing stones. The Aramaic “Sefire inscriptions”, written on stone pillars, refer several times to the very stones as “house of god (𐤐𐤆𐤅𐤃𐤇𐤁, Sefire II, C:3, 7, 9-10; Fitzmyer 1967:83, 90; ANET 660), and later, Philo of Byblos (I,10.23, quoting Sanchunyathon, and then quoted by Eusebius) mentioned that the sky god Ouranos “invented baetyls (=Beit-El stones) by devising stones endowed with life” (Attridge and Oden 1981:52-53). Likewise, ‘Arabian sources also referred to standing stones of the Pre-Islamic era as, “Bait Allah” (Lammens 1929:17).

These ancient references attest that masseboth were perceived as containing the god’s power and spirit. This idea also find expression in the Sikkannu stones in the letters from Emir and Munuba, concerning the cutting of stones 5-12 cubits long for the gods Ishtar, Dagan, Addu and Hepet (Durand 1985:82-84; Dietrich et al. 1989:135-137). According to Dietrich et al. (p. 134), the term skn, sikkannu originated in the western Semitic root “תו, to dwell”. Hence, the Akkadian term for massebah confirms the concept that it contained the god’s spirit or the ancestor’s spirit as at Ugarit (see above). Possibly, the Hitite word for massebah-“havasi”, is a direct translation of the Semitic word, and bears the same meaning (Dietrich et al., ibid.)29 Van der Toorn (1997, with references) showed that four different Semitic terms, Beth-El, Sikkannu, Abnu (‡È·Ô) and Salmu (†È·Ô, all denote masseboth (the latter actually stelae), they

25. For different translations and commentaries on the text see Pope 1981; Avishur 1986; Puech 1986; Margalit 1989b:268-273; Lorezt 1989; Van der Tooren 1993; de Moor 1995. For additional occurrences of “ilib” see Bergman (Biran) 1936; Cross 1984. On the connection between “ilib” and biblical terms see Bloch-Smith 1992:123; Van der Tooren 1993; de Moor 1995:8,15.

26. See e.g. de Moor 1995:5-6, but an inscription on a shaped massebah from Ugarit (KTU 6:14, de Moor ibid.) identifies the stone as “pgr raised by ‘zn for Dagan his Lord...”. Hence, pgr can be a massebah for a god as well.


I personally visited over 100 menhirs sites in northern and western Europe (Fig. 4:122). In August 1999 I visited several locations of menhirs in Indonesia. They were especially common in Toraja-land, Sulawesi, where every village has a Rante, a field of menhirs (Figs. 4:123-124). The custom of building menhirs for the dead ceased some 20 years ago, due to foreign, modern influence, but in general the Toraja’s special burial customs prevail. In a Rante near the village of Bori, I received a convincing explanation for the meaning of menhirs— as containing and preserving the spirits of the dead. The local elders still knew for whom some of the stones were erected.
were all sacred and were worshipped, and then evolved into gods in their own right. They continued to bear their original terms as their names, and were worshipped in various parts of the Near East throughout a long period.

In several Nabatean sites small niches are found cut into the sandstone rocks, usually with rectangular low reliefs inside. About 30 niches were reported from Meda'in Saleh (Doughty 1884:62, Pl. 45, 46; Jaussen and Savignac 1909:407-441), nine are known from ‘Ain Shelleleh, Wadi Ram (Savignac 1933, 1934), and over 180 niches were documented in Petra (Dalman 1908:117-148, etc., 1912 II:44-49, cf.; Merklin & Wenning 1988). Doughty termed the rectangular carvings "votive reliefs", while Dalman named them "stone idols", meaning they represented deities. This interpretation is strongly supported by the inscriptions accompanying some niches, directly identifying the schematic reliefs as deities. For example, an inscription from Mada'in Saleh (Hegra) refers to a niche with a single rectangular relief as "Massista" (Doughty 1884, No. 1; Jaussen & Savignac 1909:204, No. 39) which means a "place of worship" or a "sacred pillar" (Hillenbrand 1991:644). Other inscriptions address the gods by their very names. An inscription below two adjacent rectangular reliefs at ‘Ein Shelleleh mentions the goddesses "alKatba" and "al’Uzza" (Fig. 4:113). Another in this site addresses an additional pair of rectangular reliefs in a niche as "...al’Uzza and the lord of the house (=Dushara ?)...." (Savignac 1933:414). An inscription from Petra relates to an empty niche, stating that "These are the masseboth (_NOTIFYINGG, E) of al’Uzza and the lord of the house ..." (Torrey 1907:349; Dalman 1912, No. 85). This niche most probably originally contained a pair of portable stone slabs\(^3\). The niches and reliefs are directly paralleled by thousands of small Nabatean masseboth found in the open desert areas, exhibiting a variety of groups of stones in repetitive patterns (Avner 2000).

Several written sources from the 2nd to 6th centuries A.D. describe standing stones as representing deities in the classical world\(^2\), while others are closer geographically to our region. Antoninus of Piacensa, 6th century A.D, while addressing the cult of the southern Sinai population, wrote "On this mountain there is a place where the Saracens set up their idol, which is a snow-white stone ....". He then describes how the stone miraculously changes its color (Wilkinson 1977:87). The Suidas Lexicon, 10th century A.D, writes in relation to the Nabatean cult in Petra– "Theusares (=Dusares- Dushara)- this is the god Ares of Petra in ‘Arabia. This god is most venerated by the people. His statue is a square block of stone four feet tall and two feet wide. It stands on a golden base and they sacrifice before the stone and pour on it blood libation" (Adler 1931 II:713).

‘Arab writers also referred to standing stones. Ibn alKalbi, 9th century A.D., often mentioned masseboth (‘Arabic-anssab) and described the cult surrounding them, including sacrifices, blood libation, and circumambulation. On page 33 he wrote "Whenever a traveler stopped at a place or station in order to rest or spend the night he would select for himself four stones, pick out the finest among them and adopt it as his god, and use the remaining three as supports for his cooking-pot...." (Amin-Faris 1952:28). A similar description was later repeated by Ibn Sa’d (Fahd 1968:26) and other ‘Arab writers. When describing the cult of the goddess Allat at Taif, Ibn alKalbi wrote "Allat is a newer goddess than Manah. She was a cubic rock....". About the god Sa’d in the Judaean coastal plain he said- "... it was a long rock...covered with blood" (Ibn alKalbi:16, 37; Amin Faris 1952:14, 32).

**Artistic Representation**

In addition to written sources, several masseboth from different sites and periods, although crude, bear the symbols of deities. Following are examples, from north to south.

The top of a crude massebah from Allalah (ca. 1800 B.C.) was carved in the form of a god, wearing a conical hat with horns (Fig. 4:114), a symbol of a storm god, Theshub, Hadad, Ba’al or Reshef (cf. ANEP 476, 486, 488, 490). Another massebah from Allalah bears a different symbol of the storm god, a spear with lightning bolts (Fig. 4:115).

On a Late Bronze Age massebah from Hazor two raised hands are depicted, with a disc within a crescent (Fig. 4:116). The symbols were identified as representing Ba’al Hamon, the moon god (Yadin 1970: 216). An identical combination of these hands and symbols was found on a massebah from Palmyra, 2nd century A.D. (Drijvers 1976 Pl. 3).

A well-shaped massebah found in the city gate of Bethsaida (ca. 800 B.C.) bears the image of a warrior with a bull head and horns (Fig. 4:117) identified as a storm or a moon god, probably Hadad, the chief Aramean storm god (Bennett and Keel 1998:91-94; Arav et al. 2000:51). This decorated massebah has four close parallels from Eastern Anatolia and Syria (Bennett and Keel 1998:8-12, 31-2).

On a small, crude stone slab from ‘Arad (not found *in situ*), two crossed figures with raised arms are incised, one horizontal and one vertical, surrounded by a rectangular frame (Fig. 4:118). Amiran (1972) interpreted the horizontal figure as the dead Dumuzi-Tamuz in a grave or a coffin, and the vertical figure as mourning woman. An amendment to

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31. For additional inscriptions identifying baetlys in reliefs with deities, see Savignac 1933, 1934; Patrich 1990:50-63; Linder & Zangenberg 1993.

this interpretation can be proposed based on two main arguments: 1. Amiran noted that both figures are identical, therefore, the scene likely depicts the same figure in two different positions; 2. The raised hands with greatly enlarged palms were interpreted by Amiran as a gesture of mourning, but this is not necessarily so. The gesture is world renown therefore, the scene likely depicts the same figure in two different positions; 2. The raised hands with greatly enlarged palms were interpreted by Amiran as a gesture of mourning, but this is not necessarily so.

A 4th millennium B.C. broad massebah from a tomb in a rock shelter in ‘Uvda Valley was incised with a circle halved by a vertical line (Fig. 4:120). This is a well-known symbol from rock art all over the world and from incised Late Neolithic pebbles. The latter were interpreted as a female fertility symbol (Stekelis 1972:25-27; Gopher and Orrelle 1996:267). Most probably, the symbol identifies the massebah as representing a fertility goddess. It is interesting to note that similar symbols also appear on a 3rd millennium B.C. broad menhir from Portugal (Gomes 1983:393).

A symbol of Seth is carved on a massebah from Abydos, overlapping the name of King Peribsen (2880 B.C., Quirke 1992:63).

The written sources and the deity symbols selected above span some 5000 years. They attest to a long tradition of veneration of deities in the form of crude stones, and there is no reason not to apply this perception to earlier masseboth erected before the emergence of writing. Altogether, the masseboth demonstrate a continuity of tradition for over 10,000 years.

K. Discussion: The Role of Masseboth

The question now is how to “navigate” between the various aspects or interpretations of masseboth. To begin, several points should be briefly addressed.

1. From the biblical and historical records we learn that an individual massebah may fulfill more than one function. For example, the massebah that Jacob erected in the Gile’ad served as a boundary stone between Laban and himself, but also witnessed their treaty and supervised both parties afterwards. Stelae that commemorate rulers also memorialize events connected to their carrier. 34

2. The “funerary massebah” do not form a separate type, rather, they should be identified as either masseboth for ancestors or masseboth for gods. A suggested key for the distinction between them is offered below.

3. The other types of masseboth actually form two related groups. One consists of commemorative stones which mainly memorialize rulers and events, the second of witnessing stones, which participate in the signing of treaties or vows, and supervise their fulfillment.

The various masseboth can now be condensed into four types: 1. Commemorative stones (for both individuals and events); 2. Witnessing masseboth (for both treaties and vows); 3. Ancestral masseboth; 4. masseboth for gods. Border masseboth are too rare to constitute a type (besides the Akkadian Kuduru, which are not true masseboth), and they are actually assimilated into the other types.

In the case of commemoration, it is clear how inscribed and decorated stelae can communicate their message, but these are not true masseboth. For crude, mute stones, a firm tradition of passing oral history or mythology is essential for the fulfillment of their commemorative role.

Another question arises, how can a crude stone witness a vow or treaty signing, and then supervise the parties? How can it memorialize the treaty for generations? And the same question should be asked about the witnessing masseboth. One clue can be found in treaty texts, of which at least 52 are known to date from the ancient Near East. In these, long lists of gods, symbols of gods, natural elements and nature forces are all called to attend the signing ceremony, witness it, and then supervise fulfillment of the treaty 35. For the same purpose gods are addressed in vow making (e.g. KAI 72, 88, 201). A logical answer to these questions is that crude stones can function as such by virtue of the god’s spirit that dwells within them, spirits that “hear the words” (Josh 24:27) and “watch” the parties (Gen 31:49). This also explains why a stone inscribed with the treaty’s stipulations is called “House of God” (Sefire II). In

33. On the phenomenon of dying gods see Frazer 1913 Vols. IV-VI; Mettinger 1998, Mettinger 2001, with references.


35. See e.g. ANET 529-541; Wiseman 1958; McCarthy 1978; Barré 1983.
the same vein the divine spirits within a boundary stone guarantee that the stone will not be moved, for if it is, the gods within the stone will give the betrayed side full legitimacy and support to retaliate without mercy. If a commemoration stela is violated, the gods presented in the relief or addressed in the inscription will take revenge. This may also be the case with mute masseboth, which have no apparent image of god.

If the above description is correct, it may mean that at first masseboth were perceived as containing the spirits and power of gods or ancestors; this was their original, fundamental meaning. Other aspects, or functions developed over time based on this foundation, without obliterating the original meaning.

The primacy of divine and ancestral masseboth may become clearer if we return to the desert. The body of material found here, still far from being exhausted, was not available to the writers of many studies on masseboth, and therefore it may revive the discussion.

The desert masseboth preceded those referred to in previous studies by several millennia, and therefore present the more original nature. The consistency of their characteristics demonstrate a well established religious tradition. In addition to the general cultic nature attested to by the various features (orientations, natural shapes, stone cells, offering benches, hearths, altars, and offering objects), I believe that the sites listed in Table 11 represented deities and ancestors. In cases of single stones, the distinction between the two is not always clear, but it is quite apparent that the attached groups represent groups of deities, for the following reasons. The number of stones in groups is consistent: 1, 2, 3, 5, 7, 9, while 4, 6, 8 are absent. Since this result is amply documented, it cannot be accidental. Further, the same repeating numbers also recur as groups of deities presented in artistic and written sources of the Near East in later periods (3rd millennium B.C. and later), even in a similar relative frequency. Correspondingly, the missing numbers from stone groups are absent or are extremely rare in mythological groups of deities as well (Avner 1993c, 1996, 2000). Attention to the masseboth shapes, their relative sizes and relative positions within the group also supports this view. A narrow stone usually represents a male god, and a broad stone- a goddess. Based on this distinction the composition of groups can be “deciphered” and directly equated with artistic presentations of Near Eastern groups of gods (ibidem).

Identification of groups of masseboth as representing groups of gods raises a potential problem. They may represent a complex religious world and a rich mythology, with an elaborate pantheon. All this is found in the desert as early as the 6th millennium B.C., apparently much earlier than in the settled zones of the Near East. It is believed that before the 3rd millennium B.C. a single great goddess was worshipped, while supremacy of a male god appeared only with the emergence of the city (ca. 3000 B.C.) and the enthronement of a king at the top of the social ladder (Miroschedji 1993:215-216, with references). If so, how did the desert people, who lived in a simpler social structure, develop a complex pantheon several millennia before the emergence of pantheons in the settled societies?

It is true that during the Neolithic and Chalcolithic periods, representations of fertility goddesses predominated, however, male symbols were present as well. It is also true that manifestations of groups of gods are not common, but information on the complexity of the Neolithic and Chalcolithic religions is constantly growing . In addition, although coherent groups of masseboth are rare, two locations of Neolithic triads (at Kfar Haohen and ‘Ain Ghazal), and two possible pairs (at ‘Ain Ghazal and Nahal Re‘uel) indicate the existence of a concept of pairs and triads in the Neolithic period. The finds from Çatal Hüyük indicate further groups, since bull horns (bucrania), for example, occur in the sanctuaries in certain numbers: 1, 2, 3, 5, 7 (Mellaart 1967, passim), similar to the groups of masseboth. The development of Neolithic and Chalcolithic religions deserves a thorough discussion, but a temporary conclusion is that it was richer and more complex than commonly believed.

Nevertheless, it seems that the desert masseboth do represent a complex and well-established religious, philosophical world. In some spiritual aspects the desert population probably antedated that of the sown.

Multiple Masseboth

Locations of multiple masseboth stand out in the above pattern. Their numbers are random, they usually consist of narrow stones only, in more than half the sites the stones are detached, and they face various orientations. However, there is some coherence in their appearance. They occur in alignments, circles and clusters, and often a larger familiar pair or triad of stones takes a prominent position (Table 11- M:1-15 ; Figs. 4:11, 37-39, 54-55). Due to these characteristics it is hard to imagine all these stones as representing deities, rather, they may represent ancestors. Ancestral shrines with standing stones, or menhirs, are known worldwide (see above and Note 29). They are arranged in the same recurring patterns, while their random numbers are the result of stones added as community members die. In the desert groups the larger stones may well be pairs or triads of deities, with which the ancestors gather .


37. The perception of ancestors gathering with the gods is well known in ancient Near Eastern texts see (Pope 1981:169-175; de Moor 1995:15-18; Pitard 2001; Schmidt 1994, passim., in the Egyptian Book of the Dead (Spells 96-7, 100, 114; Faulkner 1993:88, 98, 112) and in present day traditional societies (Buxton 1973:21, 154-156; Middleton 1987:141,151).
This combination may also explain the occurrence of several smaller masseboth next to the main groups in 26 locations of desert masseboth (Table 11- 2:4, 2:25, 2:36, 5:3, M:6, M:7, 5:8, etc.; Figs. 4:31, 42, 71-72), i.e. ancestral stones annexed to those of the deities.

If the distinction between masseboth for deities and for ancestors is correct, as I believe, it may proffer a tool for better identification and understanding of masseboth in the field. In addition to sites where masseboth were already interpreted by scholars as representing ancestors (see above) many more can be added to this group. Large numbers of menhirs in Jordan, more than 700 according to Conder (1885:198), were mainly arranged in alignments and circles, their numbers are random, they were set detached (Table 13:62-88), and they lack familiar groupings or other indications of representing gods. By all characteristics they resemble the menhirs of Europe and other continents (Fig. 4:122-124). Hence, they can best be interpreted as ancestral masseboth as well.

The suggested criteria for distinction between the masseboth for gods and for ancestors may now help to understand some of the findings in the context of burials. The detached masseboth set inside the tumuli tombs in Eilat (6th-5th millennia B.C.) and the masseboth in Chalcolithic burial caves could well be ancestral masseboth. They preserved the spirits of the deceased, in addition to the bones, but for a longer period of time. Masseboth attached to tombs on their outer side most probably represent deities, since they were set attached, in the same numbers and arrangements as the independent groups, in the same orientations, and with the same attached features. Their role was to protect the tomb and the dead.

The menhirs of Europe and of other continents may support the interpretation of the large masseboth of Moab, Gezer, and Tell Chuera, but not necessarily help interpret the small multiple stones (Table 11- M:1, 2, 4-10, 14, 15; the "eyed" masseboth and the additional small masseboth, Figs. 4:12-14, 35, 37-39, 54). However, multiple, detached small masseboth do occur in Europe adjacent to ancient monumental burials (Leisner 1943:31-41, Taf. 14, 18, 28, 30, 116; and here Fig. 4:125), and in present-day traditional societies in the Far East they are eloquently explained as representing the ancestors and containing their spirits (Fig. 4:126, 127). Therefore, the small masseboth in the desert may also share the ancestral role.

In fact the majority of masseboth locations in the fertile zones of the Near East and the desert fringe seem to belong to the ancestral type. Seventy-seven locations out of 86 in these regions (89.5%) are either singles or detached groups of random numbers. There are only three possible attached pairs, five attached triads, and one possible group of five. Hence, until the late 3rd millennium B.C., consistent attached groups are almost unique to the desert.

The difference between commemorative stelae and ancestral masseboth can also be better understood now. The first is exclusive to rulers and high officials, and perpetuate their glory through inscriptions and reliefs. The latter is abstract and mute, erected for both commoners and nobles, and represents a different religious concept, that the stone contains and preserves the spirit of the deceased. The masseboth of Assur, although set for kings and high officials, are relatively modest in appearance and their brief inscriptions merely mention the names and titles of the individuals they represent. Therefore, they belong to this ancestral group. Ancestral masseboth are far more numerous worldwide than the commemorative stelae, yet, they have received comparatively little scholarly attention (but see Mazar & Miroschedji 1995).

L. Summary

Based on the archaeological evidence, ancient records and anthropological material, several points can be offered for the present state of research into masseboth:

1. The earliest masseboth known to date (11th millennium B.C.) are from desert sites. During the 6th to 3rd millennia B.C. they greatly outnumbered those in the Near Eastern fertile lands, and maintained their supremacy in later periods. They prevailed into the Byzantine and Early Islamic periods (Figs. 4:128, 129), and in some desert areas they are still worshipped today (Fig. 4:130-132, and see Note 22). Altogether they exhibit a firm tradition extending over 10,000 years. In addition to their longevity, desert masseboth appear to have been a more consistent phenomenon by every criterion. These facts imply that masseboth were primarily a desert cultural element, which was adopted to a lesser extent by fertile land cultures.

2. The desert masseboth basically served as an abode for the spirit and power of the gods and ancestors. In many cases, but not always, a distinction between the two in archaeological remains seems possible. Other functions of masseboth developed later on the foundations of this basic meaning, but the original significance endured and dominated.

38. Fergusson 1872; Perry 1918; Koppers 1942; Monterio & Gomez 1981; Jansson 1987; Thom & Thom 1990; Burl 2000. For modern studies see e.g. the last two which present meticulous descriptions, but almost no interpretation. Interpretation was offered by Fergusson (e.g. 57-60, 463, 509), and by Eliade (1978:114-118).

39. Even in later periods attached groups are rare in the fertile zone. Several groups stand in the MB-LB "obelisk temple" of Byblos (Dunand 1950 II:646-648), three at Tell Dan (Biran & Naveh 1995), and one at Tell Rehov (Mazar 2000). Other groups of the fertile zones are detached and random in number of stones.
3. The fact that all but a few desert masseboth are unshaped indicates a religious concept. While the peoples of the fertile lands commonly made their gods from stone, wood, clay and metal, the desert people adapted natural, unhewn rocks as an abode and symbol for their deities. These rocks were shaped by nature, *i.e.* gods, not by humans, and in their minds, shaping the rock meant desecration of its innate holiness. Their basic perception of gods was abstract. This was probably the source from which aniconic theology developed, a theology that challenged the common practice in the neighboring countries which sculptured their gods in human or animal forms. For several millennia this polarity prevailed, but during the first millennium B.C. aniconism gradually settled in the fertile countries as well, alongside iconism (Ornan 1993; Mettinger 1995). Interestingly, "programmatic" aniconism is found in the Near East in three religions, the Israelite (*e.g.* Mettinger 1995; Van der Torn (ed.) 1997), the Nabatean (Patrich 1990; Avner 2000; Wenning 2001), and Islam (Sell 1914; Wensinck & Fahd 1997). All three had a common arena of origin—the desert. The roots of their abstract, aniconic theology may be found deep in the prehistoric desert culture.
CHAPTER 5. OPEN-AIR SANCTUARIES

Introduction

Open-air sanctuaries are fairly large structures, of several repetitive designs, simply marked on the surface by one course of stones. They are modest in appearance, but bear special interest. When first discovered in 1977, their purpose was unknown, but they clearly differed from habitation sites. Initially, their interpretation as open-air sanctuaries (Avner 1982f, 1984, 1990) was not welcomed. To date, 154 open sanctuaries have been documented and ten were partially or entirely excavated. Their cultic interpretation is well established, based on attached features (masseboth, basins, stone drawings, etc.), orientations, connection with burial, and specific artifacts. More open sanctuaries still await documentation, and numerous other cult installations are associated with the general phenomenon. The presently available $^{14}$C dates from open sanctuaries indicate 6th-4th millennia B.C., while artifacts and circumstantial evidence suggest continuation of use through the 3rd millennium B.C.

This chapter will first present the surveyed open sanctuaries, cult installations, and the results of excavations. It will discuss the various types of sanctuaries, the attached features and their relationship with built temples in the fertile lands.

A. Catalogue of Surveyed Open Sanctuaries

Technical Notes

In the catalogue (Table 14), sanctuary plans are schematic. Numbers of parallel lines mark the actual number of stone lines surrounding the courtyards, which differ from one sanctuary to another. Solid lines denote complete preservation, a broken line denotes partial preservation, and dotted lines are conjectured, where stones were missing. The thicker lines in some of the sanctuary types denote an elongated cell filled with stones, built on the back side of the courtyards. The scale and the north-arrow are for all plans and are presented once on each page of the catalogue. In sites with clusters of sanctuaries, the grid-reference marks the site’s center (C.G.R.), and is shared by all sanctuaries in the site. For the specific location of each sanctuary in the clusters, as well as other elements, see the reference maps, presented in the figures. Site numbers in this chapter refer to those of the catalogue (Table 14). The typology and statistics of sanctuary types are presented in Table 15, and Fig. 5:1 denotes the sites’ location.

1. Types of Open Sanctuaries

Three essential types are distinguished, each divided into sub-types:

Type 1 includes 55 sanctuaries with an elongated cell at their back. Sub-type 1a (n=36) is the basic, rectangular form; sub-type 1b (n=14) is similar, with the addition of a tumulus incorporated in the elongated cell or added to it; in sub-type 1c (n=5) the courtyard is semi-circular. The smallest sanctuary in this group is probably that of Jebel Hamra (No. 84), ca. 12.5x8.0 m¹, and the largest are at Wadi Mara (No. 122), 30.2x13.0 m, 392 sq m and Makhtesh Ramon III (No. 11) 28.3x14.4, 407 sq m. Demarcation of the courtyard by a double line of stones is the most common, in 37 sanctuaries (Figs. 5:20, 25), while 18 others are demarcated by single or triple lines (Figs. 5:26, 101). In two adjacent sanctuaries in Wadi Zalaqa (Nos. 120, 121, Fig. 5:110) the courtyard is gently demarcated by small flagstones vertically set into the ground and perfectly preserved. The sanctuary of ‘Uvda Valley 6 (No. 49), classified in “miscellaneous”, is related to this group since it contains a short elongated cell, 4.5 m long.

The back cells are usually built 50-70 cm high, either by courses or by vertically set stones. Typical to both, their edges are made of larger stones vertically set, up to 1.2 m above surface (Figs. 5:31, 105). The cell’s interior is always filled with medium size stones, and as the excavations revealed, they are quite even in size and orderly laid. In the sites of Makhtesh Ramon (Nos. 9-12) and Wadi Radadi (Nos. 86-88) the cells were partially covered by horizontal stone slabs.

Masseeboth were found either incorporated in the center of the elongated cell, or set just in front of it, in 19 of this sanctuary type. Most are single masseboth (Nos. 21, 35, 87, 97, 99, 100, 105, 110, 116, Figs. 4:33, 21, 5:34), but pairs were found in Har Tzuri’az VI, Darb Ghaza IV, and Wadi Zalaqa 315 (Nos. 26, 81, 121, Fig. 4:34), and one possible disturbed triad was found in Jebel Hashem alTaref XV (No. 106), similar to a triad in an elongated cell without a courtyard in Ramat Barnea’ (Fig. 4:32). A group of 17 small masseboth were found inside the cell of the ‘Uvda 6

¹. The plan and dimensions are based on a small published plan (Eddy & Wendorf 1999:36, 39), with no further information. My attempts to receive the missing information were unsuccessful. Since this sanctuary is much smaller than all others of these types, the dimensions as implied from the plan may be incorrect.
sanctuary (Fig. 5:80), a location paralleled by a triad of masseboth within an independent elongated cell, in central Sinai, excavated by Rothenberg (Fig. 5:35). Since the elongated cells were excavated in only three open sanctuaries (‘Uvda 6, Zalaqa 306, 315, see below), and a tumulus is built in the center of the latter (see below), it is possible that masseboth were set within more elongated cells. A basin of natural stones was found in the courtyard of one sanctuary in this group (Fig. 5:17).

Semi-circular and quadrangular stone cells or stone platforms were built attached to the elongated cell in 24 sanctuaries (e.g. Nos. 9, 10, 29, 33, 79, 81, 101, 103, 104, 116, Figs. 5:15, 25, 33, 34, 111-113, 161). Generally, these installations are similar to the “altar” of the ‘Ein Gedi sanctuary (Ussishkin 1980:10, Pl.8), in location and dimensions, and most are similarly semi-circular.

Stone circles, 1-1.5 m in diameter are found on the surface in front of 20 sanctuaries of this group (Figs. 5:25, 109, 114, 160). Additional identical circles are sometimes found next to the sanctuaries in various locations (e.g. Nos. 97, 105), and long chains of such circles were built in clusters of sanctuaries, (see below). In addition to the circles, stone alignments were built in front of three sanctuaries. They are 4-6 m long, either straight or somewhat curved, made of single or double lines, (Nos. 86, 97, 120, 121, Figs. 5:109, 114). As with the circular installations, similar alignments were also found arranged in chains (Figs. 5:18, 5:22), although more rarely. Another feature is an oblique line of detached stones laid in front of sanctuaries in Wadi Zalaqa (Nos. 30, 31, Fig. 5:9), and in another (Jebel Hashem alTaref XXII), an oblique line of a vase-shaped installation was built of small flagstones, with an additional four lines of such installations parallel to the sanctuary’s long axis (see drawing in No. 113).

Near five sanctuaries of Type 1 in Jebel Hashem alTaref, and near the sanctuary of ‘Uvda 6, unique stone drawings were found. They are made of small stones set vertically into the ground, and form animal figures and other images. These will be described below and discussed separately.

**Type 2** includes 55 quadrangular sanctuaries demarcated all around by one course of stone lines, with no elongated cell. Sub-type 2a encompasses the majority (n=51) which are usually rectangular, but closer to square in proportion than Type 1. Sub-type 2b includes only four sanctuaries (Nos. 38, 40, 43, 48, Fig. 5:10) with a trapezoid-shaped courtyard and a curved back wall. The smallest of Type 2 is Wadi Zalaqa 311 (No. 117), 5.5x4.5 m, and the largest is Har Tsuri’az 10 (No. 34), 21.0x11.9, 180 sq m. In 42 sanctuaries the courtyard is demarcated by a double line of stones, in six by a single stone line, in six others triple lines were built, while in some even four or five lines surround the courtyard (Figs. 5:8, 10, 27, 28, 107, 108).

Sanctuaries of Type 2 are characterized by a circular stone installation built in the courtyard, found in all but six. In three such installations a fallen or broken massebah was exposed on the surface (Nos. 39, 58, 59, Fig. 5:36), and masseboth were found in situ in two excavated installations (Figs. 4:36, 5:15, cf. Figs. 4:5, 99). Masseboth were also found in the courtyards of two sanctuaries of this type (Nos. 39, 74). In two sanctuaries, the circular installation in the center was massively built (Nos. 30, 41, Figs. 5:8, 160). Circular stone installations were built in front of 25 sanctuaries (Figs. 5:8, 14, 27, 28), similar to those in front of 20 sanctuaries of Type 1. Unlike in Type 1, no tumuli are found attached to sanctuaries of Type 2, although they are sometimes found nearby. A stone basin was found in one sanctuary of this type (Nahal Betanim, No. 62, Fig. 38).

**Type 3** comprises 40 circular sanctuaries of four sub-types. Type 3a is the dominant (n=16), up to 14.8 m in diameter. Most are built with one line of stones, two are built with a double line (Nos. 8, 15). In one sanctuary, in Nahal Hatseva (No. 6), half of the perimeter is built with two detached lines, while the space is filled by dark flint gravel (Figs. 5:41, 42). An interesting point is that all but two sanctuaries of Type 3a are attached by “ladders” or elongated cells (Figs. 5:39-41, 57, 59, and see their description below). The only two which are not attached by these “ladders” contain stone lines inside them (Nos. 56, 57, Fig. 5:49), while another (No. 53) has both a crossing line (Fig. 5:50) and a short “ladder”. Fallen broad masseboth were found in two sanctuaries of this sub-type (Nos. 8, 15), and two additional ones were found in a circular enclosure at the foot of Ma’aleh Tsurim, in the Judean Desert (see below). In a circular open sanctuary next to Ma’aleh Shaharut, a winding ancient road leading from the Yotvata Oasis to ‘Uvda Valley, a well shaped (but weathered) stone “drum” was found (Figs. 5:50-53). A pair of similar drums was also found in a nearby cult installation (see below). These recall the stone “drum” in the ‘Ein Gedi sanctuary (Ussishkin 1980, Pl. 8), but they are somewhat larger and shaped with a concentric profile at the top. Following the interpretation of the ‘Ein Gedi “drum” (Ussishkin 1980:10), they probably served as the base for some cult objects.

Sub-type 3b includes eight circular stone platforms (one oval). Four platforms are built in one cluster at the foot of Har Karkom (Nos. 17-19, Fig. 5:43; Anati 1968:167-8), their diameter is 6-16 m, each contains a stone cell on its eastern sides, crossing stone lines and other features. Two of the Har Karkom platforms were probably built as a pair, large and small (No. 19), an arrangement repeated in Mitspeh Sayarim (No. 55, Fig. 5:43). In one platform, in Nahal Paran (No. 42), a massebah was set in the center, similar to three smaller circular platforms that are included in the

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2. No photograph of this sanctuary exists due to its loss in the laboratory. During a visit to the site in 1994 I learned that it was destroyed during the construction of a new road crossing Sinai.
category of various cult installations (see below). In another platform, in Nahal Qatsra (No. 130), a low and broad massebah was set on the eastern perimeter (Fig. 5:45).

Sub-type 3c comprises 10 structures, roughly circular in shape, 10-17 m in diameter. One site at the foot of Har Shani, originally contained 13 sanctuaries, but only nine could be documented (Nos. 64-72, Figs. 5:11, 12), another sanctuary of this type is near Give’at Shehoret (No. 75). The sanctuaries of Har Shani were used in several periods, up to the late Byzantine, and therefore, little remains from the original, Chalcolithic phase. They are different in appearance from other sanctuary types, and at first glance appear similar to tent remains. However, there are enough indications to interpret them as open sanctuaries: 1. They are situated adjacent to ancient road junctions, an atypical location for ancient habitation or camp sites, but shared by all known open sanctuaries; 2. They are much larger than tent remains of all periods (cf. Ch. 2); 3. They are mostly built of small rocks that indicate a symbolic, non-functional usage; 4. They contain cult installations and features, and most finds are characteristic of cult sites (rocks of unusual colors and shapes, sea shells, fossils, etc.). More details will be given below in the description of the excavation of Sanctuary X at Har Shani.

Sub-type 3d includes five circular sanctuaries of various dimensions and designs. No. 50 in ‘Uvda Valley is ca. 20 m in diameter and built up to 25 cm high, mostly of small rocks, ca. 15 cm across. On the southeastern side is a rectangular cell, somewhat similar to that of alGhazlaniyah in the Judean Desert (No. 1). Number 51 (‘Uvda 147) at the top of Ma’aleh Shaharut, is 34 m in diameter and built of a double line of stones, about 1 m apart. Its southeastern side is covered by silt. Isolated boulders to the south were adopted in antiquity as massebeh (Table 11, 1:62). Number 63 in Biq’at Se’ifim is oval in shape, 19.5x16.5 m and comprises several individual elements (tumuli, cairns and a stone cell) connected by a low wall. A broad massebah is set on a low hill, 15 m to the southeast. The site is somewhat similar to the “Plaza” sites (see below), but smaller. Number 91 is built on the ancient trails of a road that crossed Sinai east-west, later known as Darb alHaj. It is ca. 15 m in diameter, 30 cm high and contain two cairns.

Miscellaneous sanctuaries number only three, and since they were all excavated, they will be described below among the excavated sites.

2. Summary of the Catalogue Data

The accumulated data from the 154 open sanctuaries surveyed to date permits identification of several characteristics:

1. All sanctuaries were built near the ancient roads, usually a few meters or tens of meters away (Figs. 5:1, 6, 7, 18, 40, 41, 59), while clusters of sanctuaries are found near crossroads. The best example is the site of Jebel Hashem alTaref (Figs. 5:23, 24), with 33 open sanctuaries. These locations are atypical for habitation sites, although in a few cases habitations are found in the sanctuaries’ vicinity.

2. In all open sanctuaries, other than the circular Type 3d, courtyards are marked by only one course of stones, with no remains of any superstructure. This trait affirms their symbolic nature. Despite their simplicity, they display emphasis on esthetic appearance, by the selection of stones and the methods of placement. Most common is the double line of stones for demarcating the courtyards, in 85 sanctuaries (64.9%, excluding Types 3b and 3c).

3. Open sanctuaries are consistent in design and features. Most common are Types 1 and 2, which recur both individually and in pairs (see below). Only three (miscellaneous) sanctuaries do not fully conform with the above typology, but they do share principal characteristics.

4. Most sanctuaries (n=109, 70.7%) are quadrangular in shape, in contrast to the vast majority of desert dwelling sites, which consist of circular courtyards and rooms (see Ch. 2). They enclose fairly large areas (up to 30.2x13 m and up to 407 sq m, see above). Theoretically, the smaller ones could contain congregations of tens of people, the larger ones several hundred people, while clusters of sanctuaries could theoretically accommodate thousands.

5. The 109 quadrangular sanctuaries present a broad ground-plan; only one sanctuary, grouped in “miscellaneous” (No. 77), is longitudinal. This characteristic accords well with the ground-plan of almost all Chalcolithic and EB built temples in Israel and Jordan (see below), and with the vast majority of dwelling rooms of these periods (see e.g. Amiran et al. 1978:14, etc.; Porat 1987; Epstein 1998:6-16).

6. Cultic features are found in the sanctuaries and adjacent to them, such as stone cells or platforms, masseboths, either in front of the elongated cell, incorporated with it or set inside, chains of stone circles up to 700 m long, or more rarely chains of stone alignments, and the “stone drawings”. These features will be described and discussed below.

7. The orientation of sanctuaries is determined perpendicularly to their back wall, which is always on the higher side of the slope, even if the gradient is minimal. The incorporated masseboths also indicate the orientation, as described in Ch. 4, and the front is often marked by a stone circle.

Orientation could not be defined for 34 open sanctuaries, mostly circular ones, but of the remaining 120 sanctuaries, 92 face generally east, i.e. 76.7%. Seventy two sanctuaries (60.0%) face E-SE, toward the winter sunrise, and they were most probably built at this time of the year. Twenty other sanctuaries (16.7%) that face east, and four (3.3%) that
face E-NE were probably oriented towards the sunrise during other seasons. The dominance of the general eastern orientation is similar to that of the masseboth, and is close in percentage (72.1% in masseboth). However, within the general east, many more sanctuaries face the winter sunrise (E-SE) than did the masseboth.

![Diagram of orientations]

Nineteen sanctuaries (15.8%) form another distinctive group that face SE. These cannot be related to sunrise in any season, but they are similar in orientation to that of most temples in Mesopotamia (Lenzen 1955, Heinrich 1982), to a considerable number of Egyptian temples (Badawi 1954 Figs. 21-33, 1966:39-40, etc.), to south Arabian temples (Doe 1983:115-250) and even to the Ka’aba (Hawkins & King 1982). Martini (1932) showed through both Akkadian texts and astronomy, that this orientation was toward the rising points of certain stars on specific dates, as was the case also in Egyptian temples (Michalowski 1970:15-16). Other orientations are rare, and only four sanctuaries are presently unexplained.

Much like masseboth, and built temples in general, the open sanctuaries are oriented so that their cultic focal elements (the elongated cell, massebah, platform, etc.) face the rising sun, or a rising star, and are perceived as absorbing their radiation. When the congregation stands inside or in front of a sanctuary, people face the cultic focus, turning their backs towards the sacred direction (see Ch. 4).

### B. Related Cult Structures

A variety of structures show similarities or affinities with the open sanctuaries. Some are larger enclosures, others are smaller installations. Although they deserve thorough attention, the present state of research permits only preliminary presentation.

1. **Cult enclosures** are mainly known to date from the Judean Desert and from the Jordan Valley. Initially they appear similar to animal pens, but are associated with ancient roads, with burial grounds and are usually much larger. Therefore, several scholars recognized them as cult enclosures. The northernmost group is at ‘Ala Safat, on the eastern side of the Jordan River, where 13 enclosures were recorded by Stekelis (1961:53-62) next to a large Chalcolithic-EB I burial ground of tumuli and dolmens. Most are circular in shape and contain various features such as stone cells and platforms (Fig. 5:54). Stekelis (1935:67-8) also published a circular, star-like enclosure from the Chalcolithic burial ground of Adeimeh, south of Tuleilat Ghassul (Fig. 5:55.2), and two additional enclosures were studied in the Chalcolithic burial ground of Bab edh-Dhra’ (Clark 1979:69-71; McCreery 1978:155, 158, and here Fig. 5:55, No. 3).

In the Judean Desert, a Chalcolithic enclosure 37x27 m, built on the cliff above the “Treasure Cave” of Nahal

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3. While no orientation was attributed to circular open sanctuaries, it may be possible to determine the orientation of the some stone platforms. At Har Karkom (Nos. 17-19), they are considered as facing east. Stone cells are built on their eastern side, serving as a cultic focus. If the congregation was standing on the platform, the platforms’ orientation was west. However, the platforms surface is very rough, uncomfortable for standing on, and it could have been perceived as a Bamah (High Place) or an altar, on which common people were not permitted to step (see e.g. Ex. 20:26). Therefore, it is assumed that the congregation stood east of the platforms looking westward, and hence the platforms’ orientation was to the east. This is also the case with the platform of Nahal Qatsra (No. 13, Fig. 5:45) where a large broad massebah is set on the eastern side, facing east, and the platform of Nahal Paran (No. 42), where the massebah is set in the center and faces east.

4. Seemingly, another principle and parallelism exists between the orientation of most open sanctuaries, most Mesopotamian temples and many Egyptian ones; the corners of these temples are considered as oriented to the cardinal directions (e.g. Frankfort 1954:5, 52; Badawi 1966a:76,78,81,116). However, closer examination reveals that identifying this trait as a principle is incorrect, for two main reasons: first, only accurate square buildings could obey this rule, but most temples and open sanctuaries are rectangular. Therefore, only two diagonal corners could be oriented toward two opposite cardinal directions, and even this situation is rare. Secondly, Martini already demonstrated that at least several Mesopotamian temples were oriented to the rising point of specific stars on certain dates, based on Akkadian texts and astronomical data. In many cases the direction was indeed southeast.
Mishmar (Fig. 5:55, No. 8) was studied by Bar-Adon (1980:12-13), who also recorded at least 20 others in the survey of the Judean Desert (Bar-Adon 1972: Sites 18, 80, 82-85, 88, 90, 120, 131, 154, 162, 177, 185, 195, and here Fig. 5:55, Nos. 4-7, some sites contain more than one enclosure). Two individual enclosures were built near the stone alignments at the foot of Ma’aleh Tsurim, in the southern Judean Desert (Figs. 5:55, No. 9; 5:56).

The largest enclosure of this group was discovered by Conder (1889:99) near Wadi Jideid, northeast of the Dead Sea (Fig. 5:55, No. 1). It is intersected by a straight wall, an element found in other enclosures, stone platforms and in circular open sanctuaries (Figs. 5:43, 45, 49, 50, 55, Nos. 3.4).

2. Small platforms are mostly circular 1.7-3.5 m in diameter, but are sometimes also square or rectangular. They are found next to larger circular platforms (Har Karkom and Mitspeh Sayarim (Nos. 19, 55, Fig. 5:44), next to open sanctuaries (Har Shani VI and Wadi Zalaqa 312, Nos. 69, 118) or independently (Sedeh Boqer and Mitspeh Sayarim, Figs. 5:46, 47). In four of the five mentioned here, masseboth were set within the platform, and except for their small size they do not differ otherwise from the larger platform of Nahal Qatsra and Nahal Paran (Nos. 13, 42), which also have masseboth.

3. Circular installations are found in various forms, built with single or double lines of stones, usually vertically set, but sometimes laid horizontally. They are 2-5 m in diameter, and their inner space is sometimes carefully paved with flagstones. They are found next to circular open sanctuaries ('Uvda 131, Fig. 5:48), or next to circular open sanctuaries (Ma'aleh Shaharuth, Nos. 52, 53). Similar, well built installations, with a broad massebah in each, were also found in habitation sites at Beidha (Kirkbride 1968, Pl. 28a), in Wadi Fuqia in Sinai (Rothenberg 1974, Pl. 5) and in a cult and burial site at el-Minieh in Jordan (Conder 1889:10-12). A circular structure in the site of 'Uvda 19, excavated by E. Eisenberg (1980b), also belongs to this group. It is ca. 3.5 m in diameter and contains several elements: a pavement on the western side, a sunken altar and three individual masseboth (Fig. 4:45).

4. Oval or elongated chambers. At Ma’aleh Shaharuth, three such structures were found in a cluster of cult installations and circular open sanctuaries. One is 7.0x4.2 m, intersected by a line of thin flagstones set vertically (Figs. 5:53). A small circular cell and pavement are attached to the narrow ends. A massebah is incorporated in the western wall, 63 cm high, facing E-NE, and two stone “drums” placed on the southern end, but not in situ (Figs. 5:52, 53). These are ca. 40 cm in diameter, and although they are weathered, it is clear they were carefully and accurately carved, with a concentric knob and depression on the top. Following the “drum” from 'Ein Gedi, I suggested (see above) that they served as bases for some cult objects. Four meters to the south, was a circular cell of the previous group (above, No. 3) 2.5 m in diameter, with a flagstone pavement covering its western half. Two similar installations in the site are smaller (4.4 and 3.1 m long), and are also accompanied by partially paved circular installations.

Elongated chambers are exemplified here by an installation at Nahal Botem (Fig. 5:65). It is 6.2x1.5 m, oriented W-NW - E-SE. The eastern end is semi-circular, and paved with flagstones. A large stone slab on the western end, 95 cm long, is possibly a fallen massebah. Matching fragments of a well-shaped limestone bowl were found next to the installation (Fig. 5:129). These structures are actually another version of installations with “eyed masseboth” as described in Ch. 4, which should also be taken into consideration within the present complex of cult installations.

5. “Ladders” are installations built either of small flagstones vertically set into the ground, or of fieldstones laid on the surface. They are usually ca. 1.5 m wide with their lengths varying between a few meters and 78 m, and they are intersected by perpendicular stone lines that create a chain of square cells. A row of smaller cells is attached to one of the long sides; in some of them small masseboth were set. Often “ladders” are attached to circular open sanctuaries (Table 15, Nos. 2-8, 14, 15, 44; Figs. 5:39-42, 57, 59), but they are also found individually next to ancient roads (Fig. 5:58). Observation of the sites show that the long “ladders” were not constructed in one stage, rather, cells were added from time to time, perhaps during ceremonies. Based on their style and workmanship, “ladders” are related to the installations with “eyed masseboth”, as well as to stone alignments (see below). Another version of the “ladders” are alignments of short stone “bars” built perpendicularly to the long axis. One example at Har Hadav, southern Negev, is 28.7 m long, consisting of 23 “bars”, each built of five stones. On the eastern end, the alignment is connected to a tumulus (Fig. 5:60). A similar arrangement near Nahal Naqarot was found by Y. Israel (pers. comm., and see Fig. 5:59). It is 43 m long, built next to a “crenelation” line, to another alignment and to a circular open sanctuary with a “ladder”.

6. Stone alignments are common in the desert, especially in association with burials. In Wadi ‘Aradeh, eastern Sinai, a tumuli field is accompanied by seven stone alignments, 10-20 m long; some are connected to tumuli or directed at them (Fig. 5:61). In the Elilat burial site, one alignment, 6m long, is directed to the side of a tumulus (Fig. 5:62). Many alignments were documented by Haiman (1989a) in Ramat Barnea, the western Negev Highlands (Fig. 5:63), and they are also observed in tumuli fields at Har Tsayad and near Giv'at Tsafit, in the eastern Negev Highlands.

5. The term “Jacob’s Ladder” has been given to these installations by Y. Israel (see Israel & Nahleli 1998:150).
Similar phenomena were published from the Arabian Peninsula and the Sahara Desert, referred to below. Masseboth are sometimes found associated with these alignments: a triad in Ramat Barne’a (Fig. 4:32) and another triad in a paved cell in an alignment’s center near ‘Ein Yarqa, central Sinai (Fig. 5:35). More elaborate alignments were built at the foot of Ma’aleh Tzurim (Naqb Buweb), in the southern Judean Desert. They were first surveyed by Frank (1934:278) and again by Rothenberg (1967a:121-123), who both noticed eight structures 5-40 m long and ca. 1.5 m wide, massively built as elongated cells. In fact, the site contains ten alignments, 5.1-42.6 m long, and are roofed by stone slabs (Figs. 5:64-66).

They are all built in a north-south direction, probably dictated by the topography, and in three of them, a large tumulus is incorporated on the northern end. Ash spots are discernible around them, as well as Chalcolithic-EB pottery sherds and MB II sherds of straight sided cooking pots (Fig. 5:124). These alignments recall five other, even more monumental constructions, at Kubur Bani Israil, near Hizmeh, in the Judean Hills (Conder & Kitchener 1883:101). These are well-built of large stones, up to 58 m long and 6 m wide, divided inside into rectangular cells and evenly roofed by large stone blocks (Fig. 5:67). While visiting the site I collected MB II pottery sherds.

Some alignments reach lengths of hundreds and even thousands of meters. In the Judean Desert, seven large alignments were recorded by Bar-Adon (1972, Sites 92, 98b,e, 108, 131, 135, 156, 159); their lengths are 1200, 300, 350, 1400, 700, 400 and 2900 m long respectively (Figs. 5:68, 69), but there are also short ones, in Sites 136 and 156. Several of these lines are actually built as large “ladders” and are connected to circular structures on both ends (Fig. 6:68 and Bar-Adon 1972:129); one also intersects a circular enclosure 34 m in diameter (Fig. 5:69). At Har Mirbats, in the northern Negev, Kochavi (1967-71-73) recorded an alignment at least 270 m long, with a tumulus built on one end, on a hilltop. The longest alignment in the desert surrounding the Levant is the “K Line” in the western Negev Highlands (Evenari et al. 1958; Haiman 1999b). It is 4600 m long, but was not built as a continuous line. A circular structure is built on one end, a tumulus on the other and another tumulus is incorporated in the line 800 m from the first (Fig. 5:70).

Typically, long alignments were built in a very straight line, ignoring the topography, with one or both ends reaching a hilltop. An extreme example is Site 159 in the Judean Desert (Bar-Adon 1972:136), in which a 2.9 km line crosses two deep wadis.

7. “Crenelations” are lines of stone cairns, built along ancient roads, often adjacent to tombs of various types, open sanctuaries and masseboth. Usually they are built on hilltops, where they recall crenelations on fortification walls, but sometimes they are built next to roads, either parallel or perpendicular to them (Figs. 5:39-41, 58, 59, 71-76). To date, I have examined ca. 140 crenelation sites in the Negev and eastern Sinai, but many more still await examination. The cairns are ca. 1 m in diameter and 50 - 80 cm high, with gaps of 1-2 m between them. The shortest line is three cairns (In Nahal Shaharut, eastern ‘Uvda Valley) and the longest personally known consists of 80 cairns (in Wadi Hesi, eastern Sinai, Fig. 5:51). The numbers of cairns in lines differ greatly and no pattern is observed; most common are lines of 10-20 cairns. In most cases, the cairns are ruined, apparently by treasure hunters through the ages, but some could have collapsed during earthquakes. However, when they are well-preserved they exhibit careful construction with selected stones laid radially in even courses. As a result, their general shape is cylindrical (Fig. 5:73). In rare cases, another version of crenelations is found, as a line of masseboth on a hilltop (Fig. 5:76), similar to a line described by Petrie (1906:63-64). In only part of these sites were artifacts collected, usually small numbers of flint flakes and tools, including scrapers, and rarely, pottery sherds of later periods.

Several interpretations were applied to the crenelations. Palmer (1871:355-6) described them in northwestern Sinai as rows of altars. This initially seems plausible, since a black discoloration is often observed inside the cairns (Fig. 5:74). However, no signs of conflagration were found in any of the several cairns that I dismantled (and then reconstructed) in three different crenelation lines in Nahal Shaharut. Instead, the discoloration could be a result of oxidation of the stone surface, caused by the presence of some organic matter (S. Ilani, pers. comm.). Musil (1908:181-2) described a cluster of cairn lines in Nahal Shaharut (Wadi ad-Dhil) as “makwan”, meaning cairns memorializing tragic events, such as an assault on a caravan with casualties. Makwan cairns are very common along the desert roads, but they are very different from crenelation cairns. They are built of small rocks, just next to the trails, and are conical in shape. Woolly & Lawrence (1915:41) corrected Palmer’s observation and interpreted the cairn lines as memorial cairns, built next to tombs. Other researchers (Conder 1885:213-214; Petrie 1906:63-64; Wilson 1906:28-29) described a contemporary Arab custom of building cairn lines. They are called Kanatir or Shehadat (i.e. “witnessing cairns”) built in honor of revered deceased during visitsations to their tombs, but not necessarily next to them. These descriptions seem to conform with the ancient remains, and thus, the following scenario can be suggested:

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6. During my own visits to the site I re-documented these alignments according to several criteria: a GPS accurate grid reference, azimuth, measurements, adjacent features and surface artifacts. One of the alignments was cut by a bulldozer.

7. In the 1970s and early 1980s I heard from Bedouins in Sinai that they still used to add small rocks to makwan cairns when they passed by, as a gesture of condolence and solidarity with the victims, even if unknown.
Honored persons were sometimes buried in distinctive locations next to ancient roads, so that their tombs were visited and their names commemorated by a larger number of people, and more frequently. The tombs to which the crenelations are attached were built with attention and emphasis on appearance, whether they were tumuli, nawamis or tombs in rock shelters (Figs. 5:71, 180). Visitation to the tombs took place periodically (annually ?), and the repeated pilgrimages created trails leading to them, which are still clearly visible today. During these visitations, new commemoration cairns (\emph{\textit{š}Ôěû"

Gen. 31:47) were erected, followed by their consecration with libation of blood, oil or milk. These kinds of libations are well known from various written sources (Robertson-Smith 1889:229-235; Haran 1968 with references).\footnote{As the visitations persisted, the cairn line became longer. Probably, additional symbolism was applied to these lines (see below).}

8. “Plaza” sites. This name has been given by Anati to sites that consist of circular structures arranged in a larger circle, 20-60 m in diameter. The structures usually seem to be the base of huts (Fig. 5:181), sometimes stone cairns or tombs were built instead (Fig. 5:182), and in some sites a combination of both is found. These sites are fairly common in the desert. For example, 24 have been recorded to date in the Eilat area (including ‘Uvda Valley), seven were found near Har Tsuri’az (Fig. 5:6) and about 30 were recorded by Anati (1987, 2001:91-99) around Har Karkom.

The cultic interpretation of these sites is not assured. In support, they are built adjacent to ancient roads, and are usually limited or devoid of domestic-type artifacts. In several sites I collected tabular scrapers, a find often repeated by Anati (1987:51, 55, 101, etc.), who also found a concentration of 35 scrapers in Site HK 241 (1993:46). But presently, no further indications for the sites’ nature are known. Several options were suggested by Anati (ibidem.) such as guard sites, markets or cult sites. Eddy & Wendorf (1999:81-82, 254-273) excavated a “plaza” site in eastern Sinai and termed it a village, dated by \textit{14C} to the late 5th millennium B.C. (see Table 1:45). However, they emphasized the rarity of flint and hearths, and the total lack of pottery, grinding stones or metallurgical remains. The date of this site conforms with that suggested by Avni (1992, Site 251) to a surveyed “plaza” site near Har Saggi. A “plaza” site excavated by Eisenberg (1980a) in ‘Uvda Valley yielded only a few pottery sherd s, one tabular scraper and a few beads. He dated the site to the EB general, and the \emph{tumulus} in the center, to the EB IV. Another site excavated by R. Cohen (1999:227-8) near Har Harif was dated to the EB IV although it did not yield any artifacts.

Summary of Cult Installations

The installations described above are representative of a widespread phenomenon in the desert, which has rarely attracted attention; hundreds of them still await documentation and study. Their suggested cultic interpretation is based on their close association with ancient roads (see Ch. 6), their co-occurrence with tombs, open sanctuaries and \emph{masseboth}, their shared elements and features with the open sanctuaries, and their symbolic, “non-functional” nature. Two basic forms are dominant in these installations, circles and lines, and the recurring connection of both also bear interest (Avner & Avner 1999).

C. Excavation of Open Sanctuaries

Excavations took place in ten open sanctuaries. In some, only major features were excavated, such as the elongated cell or circular installation, while in others the courtyard was excavated to a depth of 10-20 cm in an attempt to discover installations, hearths or artifacts. All excavated sediments were sifted through a 4 mm mesh.

1. ‘Uvda Valley 6

The site comprises a rhomboid courtyard 11.5x12.6 m, while the western corner is cut by an elongated cell (Fig.

\footnote{See also ample references in articles collected under “Sacrifice” in Hastings (ed.), Encyclopedia of Religion and Ethics  Vol. XI (1920) 1-39.}

\footnote{The site was discovered during the ‘Uvda Valley survey (Avner 1979, 1982a) and was the first to be suggested as an open-air sanctuary. According to the original plan of the access road to the ‘Uvda Airbase, this site, and eight others, were to be destroyed. After negotiation with the Israel Air Force, the road plan was changed and the sites were secured. During the ‘Uvda excavation campaign (February 1980) the site was excavated by O. Yogev (1983). Here, wall and installation numbers follow Yogev’s report. The “stone drawings” (see below) were discovered by me in March 1982 during conservation works at the site, and excavated by Yogev and myself. In December 1988 the sanctuary and the “stone drawings” were heavily damaged by army tanks, and restored in March 1991 with the help and support of the ‘Uvda Airbase personnel (Avner 1991a). I am grateful to the Israel Air Force for their concern and support. My own additions to the site are numbered in sequence with Yogev’s. Following Yogev’s death, in 1987, I received the site's material from the IAA for further treatment and publication.}
When discovered, the southern and western perimeters (W. 613, 614) were fairly intact and built of a double line of stones, laid in one course. The eastern and northern perimeters (W. 617, 618) were mostly missing, due to stone robbery for an adjacent Nabatean tent camp. The elongated cell was filled with field stones. Behind it (i.e. to the west) were two piles of stone blocks. In the southern pile, stones were lying in order, as a fallen pillar, while in the other stones were somewhat scattered. Surface finds included Chalcolithic to MB II pottery sherds and flint (Fig. 5:125).

Excavation (by Yogev) revealed five vase-shaped stone installations in the courtyard, built into the ground, ca. 80 cm across at the rim and ca. 30 cm deep; three of them were directly in front of the elongated cell (Figs. 5:77-79). All installations contained ash, and their stones bore heavy discoloration, resulting from repeated fires. These installations, are similar to those found in masseboth sites and are interpreted as sunken altars (see Ch. 4 and below). They were built at different levels so that the rim of installation 605 is 26 cm higher than that of 615. The latter was dated by three 14C determinations to the mid 6th millennium B.C., as was a fourth date from ostrich egg-shells (Table 1:20)\(^9\). It seems, therefore, that these sunken installations were built at different times, as the sanctuary's floor gradually rose\(_2\) and they indicate a long duration of the use of the site. An additional sunken installation (620, Fig. 5:81) was discovered outside the sanctuary during the restoration work, next to the “stone drawing”, and a similar, smaller one (621), was uncovered just west of W. 113.

The elongated cell is generally similar to those of open sanctuaries of Type 1 but much shorter, only 4.0 m long and at maximum 1.7 m wide (Fig. 5:79). It is built of vertically set stone slabs, 8-18 cm thick and up to 41 cm high, filled by field stones. Yogev (1983:119) described the cell as a base of a built and closed chamber, with a small peep-hole. This interpretation cannot be accepted for two main reasons. One is that the cell’s stone slabs are too narrow to support any superstructure; second is that all elongated cells, in 55 open sanctuaries of Type 1 are filled with field stones, not as debris from standing walls, but as an intentional, ordered fill (see below).

In the cell’s center a group of 17 small masseboth was found, 7-27 cm high and standing up-right, protected by four larger stones arranged as a rhomboid (Figs. 5:79, 80). Since their number is unparalleled in any masseboth site, and they stand detached, they cannot be interpreted as representing deities, but rather as ancestral masseboth (see Ch. 4). The occurrence of small masseboth in the cell’s center is paralleled by the discovery of three masseboth in an elongated cell excavated by Rothenberg at ‘Ain Yarqa, central Sinai (Fig. 5:35). Accordingly, the elongated cell can best be understood as a cultic focus, or even as a “holy of holies”. Further, the perfect state of preservation of the masseboth gives additional argument for the ordered nature of the cell’s fill.

East of the sanctuary, a row of stone images was found, depicting 16 animals, each ca. 1.5 m long. These will be described below together with similar finds from other open sanctuaries. The associated artifacts will also be addressed in a separate section.

2. Har Shani X

The site was part of a cluster of 13 open-air sanctuaries built next to a junction of ancient roads, at the foot of Har Shani (Fig. 5:11), 17 km N-NW of Eilat. An additional sanctuary and a group of tumuli tombs are built on the mountain top. The sanctuaries of this cluster do not conform with the more common Types 1 and 2, but are still identified as open sanctuaries (see above).

Open sanctuary X (Figs. 5:82-84) was excavated just before construction of the Eilat-'Uvda road planned over it (Avner 1982e). Surface finds included retouched flint flakes ("ad hoc" tools), Chalcolithic pottery fragments with a textile imprint on the base, small “Midianite” sherds of the late 2nd millennium B.C., the upper part of a Late Kingdom Egyptian Ushabti figurine and pottery sherds of later periods (Figs. 5:121, 122, 127, 130).

The courtyard is almost square, 10.5x10.0 m, with the corners oriented close to the cardinal directions, surrounded by an incomplete single line of field stones laid in one course. Part of the stones were laying on surface and bore uneven patination, indicating recent disturbance. On the northeastern side was a stone cell 4.2x2.6 m. The courtyard was excavated to a depth of 10 cm (except for L. 10 which was excavated 25 cm deep), to a reddish virgin soil. Following are the principle findings of the excavation:

In the eastern corner (L. 1 and underlaying L. 10) three stages were distinguished, despite the shallow nature of the site. The earliest is two “walls” (W. 7, 8) forming a corner, built of one course of fist-size stones, some were set vertically (Fig. 5:89). The tops of these stones were ca. 10 cm below surface. This technique recalls the demarcation of sanctuary courtyards at Wadi Zalaqa 314 and 315 and the “stone drawings” (see both below). Similar remains were

\(^9\) Installation 615 was only partially excavated by Yogev, who found the perimeter stone collapsed inward. During the preservation work which I conducted in the site in 1981, I excavated it and discovered the charcoal at its bottom.
also recorded during the survey in all sanctuaries of the Har Shani cluster, but without excavations no pattern could be observed. Next to W. 7 and at its base level, a polished elongated quartz pebble, 12.2x5.5 cm was found (Fig. 5:127.7). The second stage is a large hearth 100x80 cm (No. 1), its top was only 2 cm below surface and the bottom 25 cm deep, partially paved by small flagstones. Besides ash and charcoal, it contained a sea-shell fragment, a few Nabatean and Late Roman sherds, fragments of a steatite bowl and a glass fragment. The third stage was that of the visible walls remains (W. 1, 2), which lay partially on top of the hearth. It is interesting to note that the later walls nearly overlap the small stone lines of the earliest stage.

In the southern corner, a cluster of three installations was found. One is an incomplete simple stone circle (L. 4) 1.3 m in diameter, and two basins built of thin flagstones on both sides (L. 5, L. 6). These were partially exposed on surface, but are earlier than the stone circle. Most of their perimeter flagstones were found collapsed outward, lying on top of support stones, and their bottoms (75x70 and 55x39 cm) were paved, also by flagstones (Figs. 5:85-87). Unlike other similar installations, they did not show any sign of conflagration, so they probably served as some kind of basins.

Excavation of the stone cell (L. 8) only revealed a pavement of small rocks, 150x70 cm, which was partially visible before excavation.

Twelve meters south of the sanctuary another large hearth was excavated (L. 9, Fig. 5:88). It was 110 cm across and 32 cm deep, filled with clean ash and charcoal, with a few burnt bone fragments, some goat dung and glass fragments. Both large hearths (Loci 1 and 9), are atypical of desert habitations of any period. Rather, they should be understood in a cultic context.

Two radiometric dates, from the hearth of L. 1 and from charcoal scattered in L. 8 were from the mid 6th century A.D. 1, and it is therefore apparent that most remains in the site are late, mainly Nabatean-Byzantine. From the original stage (Chalcolithic-EB), the small rock “walls” are probably the only remains. Despite that the later walls overlap the older ones, no pattern can be suggested for the earlier stage. The same can be concluded for the other sanctuary in the cluster, unless future excavation reveals substantial early remains. The nature of the site, the artifacts and the large hearths, indicate non-domestic, symbolic use. Presumably the sacred character of the site persisted during most periods represented by the finds.

Following the dig the sanctuary stones were removed from the new road’s route, for future reconstruction.

3. Eilat I

The sanctuary is one of two adjacent ones (22 m apart), situated on a hill at the southeastern edge of the Eilat burial ground, near Tumulus XX and the ancient road later known as “Darb alHajj” (Fig 10:17, and Avner in press 1). Both sanctuaries were excavated before construction commenced on the hill 2, and were then removed and restored next to the other restored tumuli. Prior to the excavation, two incomplete stone lines were discernible, forming the northern and southern sides of the courtyard with a square-shaped installation in the center. The western boundary was mostly missing due to erosion while the eastern limit was covered by a fill from a modern gravel road. Excavation included exposure of the walls, digging the courtyard area to a depth of 10-25 cm, to a reddish virgin soil, and excavation of the central installation.

The excavation exposed a courtyard 14.4x12.5 m surrounded by “walls” of one course and one line of stones (Figs. 5:90, 91). The general appearance is less esthetic than most known open sanctuaries due to the uneven size of the stones and their less uniform arrangement. Possible images, made of small stones, were found on both sides of the central installation (Loci 3 and 6), somewhat recalling the “stone drawings”, but with no clear pattern.

The central installation is square in shape (1.75x1.6 m), unlike most others in sanctuaries of Type 2 which are circular. Inside, the top of a disintegrating stone was visible, 40x36 cm and 8 cm above the surface, with its natural layers set vertically. At its base, 18 cm below surface, the stone was supported by four small rounded rocks (Figs. 5:92, 93, and cf. Fig 5:5:99). In light of the occurrence of single masseboth within circular installations in other open sanctuaries, and the vertical orientation of the stone layers, this fragmented stone can also be identified as a massebah, facing E-NE (i.e. toward the winter sunrise). In front were the remains of a small rock pavement, 80x50 cm. Two meters south of the sanctuary, a stone alignment was uncovered, 3.6 m long, built of a single line and single course of stones. It recalls the stone alignments found in association with tombs and open sanctuaries (see above).


12. The sanctuaries were discovered by B. Gamlieli during excavation of the tombs, in 1989. They were excavated in 1995 with the participation of Rina Feldman-Avner, Kenneth Atkinson, Maxine Kronick, Barbara Esmond and Shlomit Atzmon.
4. Elilat II

This is a small sanctuary, located 22 m northeast of Sanctuary I. It was disturbed by mechanical equipment, but the rough contour of small rocks could still be observed on surface. There were several scattered stones of various sizes on the southeastern side, among them, the top of a vertical stone slab, protruded a few centimeter above the surface.

During a shallow excavation of the sanctuary’s contour (L. 1) several more stones from the lines were exposed, revealing an incomplete rectangle and an additional squarish cell on the northwestern side, altogether 7.7x3.3 m (Figs. 5:94, 95). Excavation of the stone scatter on the southeast (L. 2) resulted in the discovery of a depression filled with many small masseboth, 10-36 cm high.

The masseboth cache was excavated in two stages. The first, to a depth 40 cm, exposed 69 small masseboth and two larger ones, ca. 70 cm long (Figs. 4:37, 5:95). They were all of limestone, most were fallen, but 11 were still standing vertically or tilted. The soil was hard and compact, very different from the soft gravely soil outside the depression. Below the two larger stones, a flat-topped stone was found, 28x22 cm, set horizontally in the ground, with two narrow depressions in the ground on its NW side. These were most probably the “negatives” of the two larger stones, indicating they also were masseboth, while the flat topped stone could have served as an offering table. Following documentation, the masseboth were numbered and then reset in an attempt to reconstruct the general look of the original site. This was done according to criteria deduced from the standing ones: tops narrower than the bases, and the darker patinated sides facing E-SE.

After removal of the masseboth excavation continued, revealing 28 additional small masseboth, five of which were standing upright. They included two groups, of three and five, arranged symmetrically according to size (Fig. 5:96).

Several details were observed during the excavation: 1. All masseboth were natural and unshaped, selected from the immediate vicinity of the hill’s surface. Prior to collection, their upper side was patinated, and when set in the sanctuary this darker side was oriented toward the sunrise. 2. The depression, 2 m in diameter and 60 cm deep, was prepared for the sole purpose of setting the masseboth. The depth and perimeter were clearly identified by the difference between the hard fill of the depression and its hard yellowish bottom, which contrasted with the surrounding soft reddish silt and gravel. The hardness of the bottom and fill could have been caused by some libation poured repeatedly over the masseboth, a well-known custom (see below). 3. Although the masseboth were excavated in two technical stages, they comprise one cache, resulting from the gradual addition of masseboth over a long period of time. However, some order of events could be observed. One massebah was found laying horizontally, 15 cm below the base of the southeastern “wall” of the sanctuary (Fig. 5:97). This indicates that the sanctuary’s contour is comparatively late, built when most masseboth were already present in the cache. 4. The sanctuary’s contour is schematically anthropomorphic, with the head pointing northwest toward the winter sunset, similar to the position of all skulls and all stone pillows, which were found on the western side of the site’s tombs (see App. 1). The masseboth, on the other hand, face the winter sunrise, similar to the general eastern orientation of the larger masseboth incorporated in the tombs (see Ch. 4, Appendix 1, and Avner in press 1). 5. The combination of the group, two larger masseboth and 97 small ones, is similar to the group of Ma’aleh Shaharut (two larger and 67 smaller, Figs. 4:53-55). In Ch. 4 I have suggested that in these combinations, the larger masseboth represented deities, while the smaller ones represented ancestors.

The only artifact found in the two sanctuaries was a rectangular hard limestone saddle-quern, 34x18x12 cm, uncovered near the eastern perimeter of Sanctuary I. Hence, the sanctuaries’ date is only deduced from the finds and the 14C dates of the burial ground, 6th-5th millennia B.C. (See Table 1:39 and Appendix 1). However, the frequent association of burials, open-air sanctuaries and ancient roads in other sites may support this indirect dating.

Before construction of the new buildings, both sanctuaries were removed and restored (August 1996) next to the restored tombs (Fig. 4:39).

5-7. Wadi Radadi

The site contained three pairs of sanctuaries of a consistent pattern which recur in several sites (see below), with a Type 1 sanctuary on the left and Type 2 on the right (Nos. 86-88, Figs. 5:18-22). In each pair only the circular installation of Type 2 sanctuary was excavated:

In Pair I, the installation was found built with four courses of vertical stone masonry, to a depth of 55 cm (Fig. 5:98). The inner diameter measured 80 cm, and it was surrounded by a partially disturbed outer ring of stones, 1.8 m in diameter. The inside of the installation was intentionally filled with stones of various sizes and by wind-blown silt. No finds were recovered.
In Pair II, the circular installation was built into the ground with vertically set stones creating a nearly complete circle 1.4 m in diameter and 28 cm deep. Two of the stones were found inclined inward and were reset after excavation. A single broad massebah with a tapered head was found within the installation, supported by four small rocks around the base (Fig. 5:99). The upper half of the installation was filled with medium size stones mixed with silt and gravel, and the lower half with fine silt, almost free of any gravel. The upper half of the massebah was patinated, while the bottom was light in color. Apparently, some time after construction of the installation, including the massebah, the lower half was covered by silt, while the upper half remained exposed and enabled patination. Also, the upper stone fill seems intentional, before final abandonment of the sanctuary. Six flint flakes and a few spots of brown clay were found on the bottom of the installation.

In Pair III, the circular installation was found disturbed, with only a few stones remaining in situ, and it was filled with fine silt. The virgin soil was reached at a depth of 35 cm in the center (Fig. 5:100). No finds were recovered.

8. Wadi Zalaqa 306.

The site contains one sanctuary and the remains of two circle chains, 60 m and 18 m long. The sanctuary has a slightly curved elongated cell, 8.2 m long and ca. 1 m wide, built of vertically set stones and filled with field stones. The contour of a rectangular courtyard was poorly preserved, 12.8x6.6 m, made of an incomplete line of cobbles (Figs. 5:101, 102).

During the dig the elongated cell (L. 1) was first excavated. It was found filled by even sized field stones, ca. 30 cm across, laid in order and uniformly to its full length (Fig. 5:103); the spaces between them were filled by wind-blown fine silt. A trench on the southwestern end of the elongated cell (L. 3) showed that the large stone closing the cell was vertically set 22 cm lower than the base of the adjacent stones, while the head was level with them (Fig. 5:105). In the cell’s center, a small vase-shaped installation was uncovered, made of five flagstones inserted into the ground, of which one had totally disintegrated. The installation’s rim was 2-4 cm above the cell’s bottom (virgin soil), the base was 22 cm below, filled by fine silt (Fig. 5:106). On both sides of the installation, a few artifacts were found: a flint scraper, five flint flakes and a few fragments of animal bones. A small semi-circular stone cell built in the courtyard against the elongated cell (L. 5) yielded five flint flakes.

9. Wadi Zalaqa 309

The sanctuary is built on an elongated hilltop, in a row of tumuli tombs. (Fig. 5:32). It is ca. 4x8 m, made of one course of cobbles, which were either moved or naturally shifted, but the rectangular shape was still clear (Figs. 5:107). In front of the sanctuary, on the east, was a well preserved stone circle, 1 m inner diameter.

The sanctuary’s courtyard (L. 1) was excavated to a depth of only 5 cm where the virgin soil was reached, a yellow silt mixed with rocks and cobbles. Only three flint flakes were found during the dig.

The stones of the circular installation in the sanctuary’s front (L. 2) were laying at surface level. Excavation showed that its bottom was originally dug 20 cm below surface, and later filled with wind-blown fine silt.

Following the excavation we restored the sanctuary by rearranging the stones, in an attempt to obtain its original appearance. Due to the amount of stones, and their position, the sanctuary’s perimeter was made of a double line of comparatively large cobbles, with a few circular cells incorporated in the eastern wall (Fig. 5:108). The sanctuary’s date most probably accords with the \(^{14}C\) dates of the adjacent tumuli tombs, i.e. mid 5th millennium B.C., and somewhat later (Table 1:63).

10. Wadi Zalaqa 315

The sanctuary consists of an elongated cell, 9.2 m long, a tumulus tomb in the cell’s center, 3 m in diameter and 0.96 m, and a courtyard 17.0x7.5 m. The courtyard’s perimeter was gently demarcated by small flagstones set vertically into the ground and almost completely preserved. At the tumulus foot was a semi-circular cell covered by medium size stones, probably originating from the cover of the tomb, and the rounded top of massebah was visible, leaning back to the tumulus. In front of the courtyard is a circular stone cell, 1.5 m in diameter, and a curved stone line 6 m long (Figs. 5:109, 111)
The sanctuary was excavated, with the following results:

1. The elongated cell is built in courses of medium and large stones; three courses were preserved in place, but debris indicates an original height of five. Large stones closing both ends of the cell, were preserved in two and three courses, 80 cm high. Excavation of the elongated cell (Loci 4, 5) and the outer, back area (L. 6) showed that the cell was built of fairly leveled courses. Attention was paid to the outside appearance of the cell, by placing the stones’ straighter side facing outward. The cell’s fill was laid in an orderly manner, with large, elongated stones at the bottom and medium-size stones above. The space between the stones was filled with wind-blown, fine sand and silt.

2. Within the tumulus (L. 3) a fill of medium size stones and fine silt was excavated. The burial cell was well built in an oval shape, 80x65 cm, and on the bottom a single fragment of a human skull was found, 50x44 mm. This find reoccurred in three other tombs in eastern Sinai (Avner in press 2).

3. The semi-circular cell attached to the tumulus, 1.7 m in diameter, was built of comparatively large and long stones, set on their long, narrow sides; three were found in situ while five others had fallen. Following removal of the covering stones, the standing massebah was exposed, 71 cm tall, as well as two additional flat stones, 64x47 and 77x32 cm (Fig. 5:12). These stones could be either a trio of massebah or a pair with an offering table.

Within the courtyard (Locus 1), debris from the elongated cell was first removed. When the front side of the elongated cell was fully exposed, it became evident that it was built as one unit with the tumulus, with integrating courses of stones (Fig. 5:113). The courtyard was then excavated to a depth of only 5 cm, revealing the inner face of the small flagstones of the courtyard’s perimeter. With the exception of only a few stones, these “walls” were complete (Fig. 5:110). No artifacts were found in the courtyard.

Following the dig a limited restoration was undertaken, in which the elongated cell was restored to 3-4 courses, about 3/4 of its original height, and fallen stones of the semi-circular installation were reset (Fig. 5:112).

Summary of Data from Excavated Open Sanctuaries

Although excavations in open sanctuaries were limited, they emphasize several points:

1. Courtyards are modestly marked by only one course of stones, usually of medium size, but sometime by small ones or even by small flagstone set vertically into the ground.

2. The elongated cells of Type 1 sanctuaries reflect a great investment in the selection, collection and transportation of large stones from some distances. They were carefully built, either by vertically set stones or by orderly laid courses. Stones closing the cells’ sides are most commonly large and vertically set. The cells’ inner spaces were filled with even, medium-sized stones, laid uniformly. In addition to masseboth incorporated in the center of the cells’ front, as documented in surveyed sanctuaries, masseboth may be found inside the cells as well. The vase-shaped installation found in the center of a sanctuary at Wadi Zalaqa (Fig. 5:106) may be a smaller version of an installation found in the Eilat burial ground. This contained the remains of a tree trunk that probably served as a sacred wood, the biblical Asherah (see Fig. 10:22, Appendix 1). Tumuli may be integrally incorporated with the elongated cell, as in Wadi Zalaqa 315, or added to it. The find of one skull fragment in the tumulus of this sanctuary, which reoccurred in three additional independent tumuli, seems to reflect a symbolic act. Most probably, it connects the sanctuaries of Type 1b (containing the tombs) with the cult of the dead. This connection was also found in the sanctuary of 'Uvda 6, where the group of detached masseboth in the elongated cell probably represented ancestors.

3. The circular stone installation in the center of Type 2 sanctuaries is common. The three excavated circles at Wadi Radadi present three possible situations. One is that nothing is found inside, as in pair III. Second, that a massebah was set in it, as in Radadi pair II, in Makhtesh Ramon Pair IV (Fig. 5:5), in the Eilat sanctuary I (although this installation is square), and in two unexcavated sanctuaries at Nahal Qadar (Nos. 58, 59). The third option is represented by the circular installation of Pair I which is too narrow and too deep to contain a massebah. Instead, it could have contained a sacred tree trunk, similar to A. Mazar’s suggestion (2000) reconstructing a living tree in the central, circular installation of the ‘Ein Gedi Chalcolithic sanctuary. In the desert open sanctuaries, where water is less available a tree trunk seems more logical than a living tree, set vertically in the same manner as a massebah, as it was found in the Eilat burial ground.13

4. Basins, hearths or altars were rarely observed in the surveyed open sanctuaries, but they were uncovered in two excavated ones. Therefore, further excavations may enlarge their number. In general, they are identical to those found in the excavations of masseboth sites.

Despite the shallow nature of the open sanctuaries, the limited excavations did contribute additional features and information concerning their functions and significance.

13 The Mishna (‘Avodah Zarah 3:7) mentions three alternatives for Asherah: a living tree, a cut-down tree, and a wooden statue.
D. Finds and Dates

Artifacts are not always found in open sanctuaries and in related cult installations, whether on the surface or during excavations. Clearly, they are less common than in habitation sites. Nevertheless, the accumulated data supply three main groups of finds: flint and pottery, natural objects (stones of special colors and forms, sea-shells and fossils) and miscellaneous. Exceptional is the sanctuary cluster at Har Shani, where a comparatively large number of finds of several periods were collected from the surface.

1. Flint and Pottery

Tabular and non-tabular scrapers are the most common flint tools, found in 21 different sanctuaries (Figs. 5:115, 117-119). A trio of tabular scrapers were found hidden in a rock crevice next to the sanctuary of Nahal Seguv (No. 60); one of them is large, 16.4x12.8 cm. Together, other sanctuaries yielded tens of scrapers. Tabular scrapers, sometimes in piles, were found in cult and burial contexts in several sites in the southern Levant (see references in Ch. 4). Their role could be both utilitarian, as part of the sanctuaries’ equipment, or symbolic, as offerings. Other flint tools, found in lower numbers, are borers and blades (Fig. 5:119) and more rarely, adzes (Fig. 5:116), dated to the 5th-6th millennia B.C. (see Ch. 2). A well-shaped basalt axe from Har Tsuri’az X (Fig. 5:116) is dated to the 6th-5th millennia B.C. (Barkai, pers. comm.). Hammer stones were also found in several sanctuaries; in two of them (Wadi Radadi II and Har Tsuri’az XII) large and globular hammer stones were found, ca. 10 cm in diameter (Fig. 5:15).

Notable is the occurrence of unretouched flint flakes in several excavated sanctuaries (3-6 cm across); since they were also found in masseboth sites, it seems that they were laid in a symbolic manner. This is especially clear in two cases. In Wadi Radadi II a group of six flakes was found at the bottom of the central, circular installation, next to the massebah. In Wadi Zalaqa 306, five flakes were found next to the vase-shaped installation at the bottom of the elongated cell. Also, flint flakes were found near the animal “stone drawings” of ‘Uvda 6 during the excavation.

An intriguing phenomenon is Paleolithic flint implements found in open sanctuaries (Fig. 5:120). Since these tools were found in at least 12 sanctuaries and in one masseboth site (Give’at Shehoret, Fig. 4:95), they do not seem accidental. Rather, it is possible that Paleolithic tools were visible to the ancients on the desert surface, at least as they are today, recognized as ancient tools and brought to the sanctuaries as offerings.

Pottery is more rare in open sanctuaries than flint; several examples will be mentioned. In the stone alignments of Ma’aleh Tsurim, pottery included Chalcolithic sherds, fragments of hole-mouth jars (Chalcolithic-EB), fragments of MB II straight-sided cooking pots (Fig. 5:124)15 and the so-called “Negebite ware”. Chalcolithic-EB sherds of hole-mouth jars were collected in both circular sanctuaries of Har Badad, in several sanctuaries in the Eilat area, and in Ras elNaqeb. Chalcolithic, or even LN (Wadi Raba) fragments of a jar base with a textile imprint were found at Har Shani (Fig. 5:122, and see e.g. Koeppel 1940, Pl. 84:13, North 1961, Pl.11, Nos. 8658, 8705; Anati et al. 1973, Pl. 26; Amiran et al. 1978, Pl. 94; Garfinkel 1999:142, 271). The open sanctuary of ‘Uvda 6 yielded Chalcolithic and Early Bronze Age pottery sherds, as well as fragments of an MB II cooking pot (Fig. 5:125). Hand made pottery with a black core and straw temper was found in several sites (Ma’aleh Tsurim, Har Badad and Har Shani). Usually this pottery is identified as Iron Age “Negev ware”, however, their roots were much older, at least from the EB II (Haiman & Goren 1992).

Pottery of later periods is sometimes also found in open sanctuaries. A rim fragment of an Iron Age II cooking pot was found at Har Tsuri’az VII, and in the sanctuary of Ras alNaqeb. The sanctuary cluster of Har Shani yielded a variety of pottery sherds, including Late Bronze-Early Iron Age fragments of the three types common in Timna’ Valley (“regular”, “Negebite” and “Midianite”, cf. Rothenberg 1970:105-111, 152-163), as well as Nabatean, Late Roman and Early Islamic sherds (Fig. 5:121).

2. Natural Objects

In several open sanctuaries rocks of unusual forms and colors were found. For example, the cluster of sanctuaries at Har Shani yielded a collection of colorful sandstones and flint, globular hematite nodules, rounded quartz pebbles, quartz and quartzite phallic-shaped rocks and sea shells and fossils (Fig. 5:127). Sea-shells were also found in the sanctuary of Ras alNaqeb, Jebel Hashem eTaref and in the cult installation near ‘Ein Netafim (Fig. 5:126). At Har


15. This type of cooking pot is also dated sometimes as MB I (EB IV), but not on secure grounds. It is not found in “clean” assemblages of EB IV, and has not been found to date in any EB IV site in the Negev (see discussion and references in Avner in press 1).
Tsuri’az picturesque globular flint nodules were collected (Fig. 5:127), and in the pair of sanctuaries at Har Yehoahaz a number of white, translucent crystals of calcite were found, as well as fragments of a fossilized tree (Fig. 5:128). Stones of unusual shapes, minerals, sea-shells and fossils were quite common in masseboths sites (see Ch. 4) and in the Eilat burial ground (App. 1 and in press 1). They were also found in other Near Eastern cult sites, such as Çatal Hüyük (Mellaart 1967:187, Pl. 56, 69), Beidha (Kirkbride 1966:30, Pl. 17b) and the Timna’ sanctuary (Rothenberg 1988, Pls. 152-155). Their recurrence in cult and burial sites indicate that they were brought as offerings.

3. Miscellanies

A broken limestone bowl, fragmented but almost complete, was found on the surface of an elongated cult installation at Nahal Botem (Fig. 5:129). Its exposed sides suffered weathering, but other parts show a very smooth surface. The bowl is oval shaped, 21.5 x16.0x7.5 cm and 3.3 cm deep, carved with a step around the walls and with four rounded knobs. No direct parallel for this bowl is known to me, but it relates to two groups of hard sandstone bowls. One is from Risqeh, undated by Kirkbride (1969:192), and one from the Eilat burial ground (Appendix 1), dated to the 6th and 5th millennia B.C. The bowls are oval, rectangular and square, well shaped and smoothed, and some are decorated by carving. Fragments of well-shaped stone bowls found in several burial and cult sites in the Eilat area and Sinai (see e.g. Fig. 4:100) seem to form one tradition with those of Risqeh, Eilat and Nahal Botem. Three fragments of a hard sandstone pallet with a carved decoration were found in the excavation of an elongated cell at Jebel Hashem alTaref (Eddy & Wenddorf 1999:189, 191). The sanctuary was dated by $^{14}$C to the 6th millennium B.C. (see below), and the pallet seems to belong to the same tradition and cultural sphere.

In a circular platform with massebah, near Sedeh Boqer (Fig. 5:46), a 6.0 cm long fragment of a basalt fenestrated pedestalled bowl was found (Fig. 5:130) dated to the Chalcolithic period (Van den Brink et al. 1999, with references).

In a poorly preserved circular cult installation near ‘Ein Netafim, northwest of Eilat, a group of clay objects was found (by M. Shemtov, and see Holzer & Avner 2000). They include a female figurine with raised arms ("orante" position) 16.4 cm tall, fragments of animal figurines, altar-like square objects 3.5x5.0x5.5 cm, miniature bowls 3-4 cm in diameter and some sea-shells (Fig. 5:131). Their date is unclear, but similar figurines were found in EB I tombs at Bab edh-Dhra’ (Ludwig 1989) and in predynastic Egypt (Pettie 1920, Pl. 3).

In Sanctuary VI at Har Tsuri’az, three fragments of alabaster juglets were found. Their date is questionable since the wall seems straight, a possible indication of a later date, in the Persian period, 5th-4th centuries B.C. (Brandel 1992:469-470).

4. Radiometric Dating

Only a few direct $^{14}$C dates are presently available from open sanctuaries, but they do help in attributing the phenomenon to periods and cultures. The first two dates have been retrieved from the lower sunken installation in the sanctuary of ‘Uvda 6. The calibrated results, around the mid 6th millennium B.C. were discredited at the time (1982) by most excavators of the ‘Uvda operation, since no human presence in the desert at this period was believed (see Ch. 8). However, an additional sample of charcoal from the same installation confirmed the first results, and a fourth date retrieved from ostrich egg-shells from the site also followed the others (Table 1:20).

A similar date (ca. 5545 B.C.) was obtained from a sea-shell from Sanctuary XVII at Jebel Hashem alTaref. This result was repeated by a sample of charcoal excavated in Sanctuary VIII by Eddy & Wendorf (1999:280-281), while another sample from that sanctuary was ca. 5110 B.C., some 430 years later (Table 1:47). A date of ca. 4330 B.C. was obtained on a sea-shell found in the sanctuary of Ras alNaqeb (Table 1:44).

Indirect $^{14}$C dates were retrieved from elements built adjacent to open sanctuaries. The two sanctuaries of Eilat most probably share the ten $^{14}$C dates of the burial ground, ca. 5400-4200 B.C. (Table 1:39). The sanctuary of Wadi Zalaqa 309, which is built in a cluster of tumuli tombs (Figs. 5:32, 108) share the dates of two of them, ca. 4530 and 4230 B.C. (Table 1:63).

According to the presently available radiometric dates (from five sites only), the open sanctuaries appeared in the mid 6th millennium B.C. and continued to the late 5th millennium. The Flint and pottery, however, indicate continuity

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16. Kirkbride dated the Risqeh site to shortly before the 1st century B.C., based on Thalmudic inscriptions on tombs. However, she noted the occurrence of much earlier finds, such as flint arrowheads ("Haparsa" type) and flint tabular scrapers, as well as a $^{14}$C date ca. 4900 B.C. (see Table 1:42). In a personal conversation (Jerusalem, March 1983), she agreed that the site should be dated according to the finds and the $^{14}$C, not according to the inscriptions. During my visit to the site (April 1996), I noticed that the tumuli were built from the sites’ stones and are obviously later. Since the stone bowls, other artifacts and $^{14}$C dates are paralleled in Risqeh and in the Eilat burial site, they seem to be contemporaneous. Fragments of similar sandstone bowls were also found in several masseboths and tumuli tombs.
of use through the 4th and 3rd millennia B.C. The random occurrence of later pottery sherds in some open sanctuaries cannot testify yet for a later use of the sites. At one site, however, Har Shani, there are additional indications for a long duration: the Egyptian Ushabti figurine fragment (Fig. 5:132), the two 6th century A.D. ^14C dates from the non-domestic, large hearths, and the amount and variety of later period pottery sherds.

In general, the finds from open sanctuaries obviously differ from those of habitation sites, and are similar to finds from masseboth sites and burials. Most of them can be seen as offering objects.

E. Special Features

1. Chains of Circles and Lines

These features mainly accompany clusters of open sanctuaries, but also some masseboth sites and individual open sanctuaries. The circles are ca. 1.5 m in diameter, built of one course and one line of globular stones, with spaces of 3-5 m between them. Poor remains of three chains of circles, 76-125 m long, are discernible behind three pairs of open sanctuaries (out of four) at Makhtesh Ramon (Fig. 5:2), and well preserved circles are found around sanctuary X at Har Tsuri’az. Some are randomly scattered, others are arranged in chains up to 240 m long. Two short chains, 60 m and 18 m long, were built next to sanctuary 306 in Wadi Zalaqa. In the sanctuary cluster of Wadi Radadi, one pair is accompanied by two chains of circles, 115 and 170 m long, and one pair is accompanied by a chain of alignments 150 m long. These alignments are 3-5 m long, slightly curved and built of a double lines of stones (Figs. 5:18, 22). A short chain of alignments, 30 m long, was built next to a massebah at Nahal Shani (Table 11- 1:78).

The best example of circle chains is in Jebel Hashem alTaref, where 8 chains were found, up to 700 m long and ca. 170 circles (Figs. 5:23, 29). Here, the chains present a broad strip of scattered stones, in which the inner side of the arched chain consists of well-preserved circles, and only partially preserved circles on the outer perimeter. Indeed, one can see that the circles were moved inward four times, closer to the sanctuaries. Eddy & Wendorf (1999:67-69) described the circle chain of Jebel Hashem alTaref, and a 400 m long chain next to a pair of sanctuaries near Jebel Hamra (ibid., Pp. 36, 39). They interpreted them as the remains of temporary huts for soldiers or for lower class people (ibid., p. 124), despite their small size and the lack of logic in arranging huts in chains hundreds of meters long.

Circles and alignments accompany sanctuaries and other cult sites in several ways. Circles of 1-1.5 m in diameter were built in front of 42 sanctuaries of Types 1 and 2, and in the center of most sanctuaries of Type 2. Circle chains are also found next to masseboth. A short line 25 m long was built next to a masseboth shrine at ‘Uvda Valley Site 19 (Table 11- 3:35), and a chain 300 m long was built next to a cluster of masseboth groups at Har Tsuri’az. Also, masseboth were set inside individual circles (Table 11- 1:22, 1:78, 1:84, 2:41; Figs. 5:37, 99). Stone alignments next to open sanctuaries are less common than circles, but they were found in front of Sanctuaries 314 and 315 in Wadi Zalaqa, and lines of detached stones were built in front of Sanctuaries X and XI at Har Tsuri’az (Fig. 5:9). A chain of alignments was also built next to massebah in Nahal Shani (Table 11- 1:78).

Chains of circles are known outside the Negev and Sinai. A 350 m chain was documented in the Judean Desert (Bar-Adon 1972:126, Site 117), and in the Arabian Peninsula (Zarins et al. 1981:29). Excavations in these circles revealed various interred objects, including camel bones, human phalange bones, an alabaster vessel and a copper point.

Since chains of circles and lines are attached to cult sites and not to habitations, they should be viewed as symbolic elements, and since they were moved or rebuilt from time to time, it is possible that they were constructed during ceremonies. Also, it should be noted that the elongated cells and the circular installations are the characteristic elements of sanctuary Types 1 and 2, and that the various types of cult installations also consist of lines and circles. Therefore, it is possible that lines and circles both inside and outside the sanctuaries share a close symbolism.

2. Stone Drawings

Stone drawings are figures made of small stones vertically set into the ground. To date, they have been found in seven sanctuaries at Jebel Hashem alTaref (three are poorly preserved), two additional ones are on the mountain top, and the largest near the sanctuary of ‘Uvda 6. Poor remains of stone drawings were also observed in several locations: next to an open sanctuary of Har Tsuri’az XVI (No. 36); next to a cluster of masseboth groups at Har Tsuri’az; in a site near Kibbutz Yahel; next to a masseboth site southwest of ‘Uvda Valley (Table 11- 3:19) and by an ancient road in Wadi Zalaqa, eastern Sinai. The technique of these drawings is also shared by the installations with “eyed” masseboth (see Ch. 4), by some of the “ladder” installations (see above) and in the courtyards demarcating Sanctuaries 314, 315 in Wadi Zalaqa (Fig. 5:110).
At Jebel Hashem al'Taref, the drawings were made next to the southern corner of Type 1 sanctuaries (with an elongated cell). The drawing of Sanctuary I is geometric, presenting a rectangle 3.2x1.5 m, intersected into two equal squares.

The stone drawing of Sanctuary VII (Figs. 5:134, 135) is comparatively well preserved (although not cleared by excavation), but the figure itself is unclear. Looking from the south one may see an ibex with large curved horns, probably with the remains of previous figures. The drawing of sanctuary VIII (Figs. 5:136, 137) is more complex and enigmatic, consisting of several straight and curved double lines. Based on comparisons with drawings from sanctuaries XIV and XVII, it seems that the drawing includes fragments of animal figures. The drawing of sanctuary XIV (Figs. 5:138-139) presents two headless animals with long straight tails, one above the other, while a third animal is less well preserved. Additional fallen stones probably belong to figures from previous stages of construction.

The drawing from Sanctuary Pair XVII is better preserved, presenting nine animals facing in various directions. All have large heads, and with one exception (No. 2), all have a large eye made of a dark stone. Two animals (Nos. 1 and 4) have a short tail pointing upward, while three others (Nos. 5, 7 and 8) have a longer tail. It is not clear whether the differences in the tails’ shapes are anatomical or a matter of different stages of preservation.

The animals’ identity is questionable. The general appearance somewhat resembles lions, with a large head, but those with no tail do not fit this identification. In Figure 7, the forelegs are longer, as is the case with hyenas. Another possibility is that the animals were intentionally devoid of a clear identity, since in rock art of various periods, characteristic features of animals are usually emphasized (large curved horns for ibex, long straight horns for oryx, long tails for foxes and wolves, etc.), and the identity of the animals at ‘Uvda 6 is also clear. It is possible, therefore, that this drawing presents mysterious, mythological animals.

The drawings on the mountain top are built near a group of 18 large tumuli tombs. One (Figs. 142-144) consists of two double circles and two connecting arches of single lines, made of carefully selected small flagstones. The larger circle is 2.6x2.8 m and the smaller is 1.50 m in diameter. This figure recalls numerous female figurines from the ancient Near East, including the more angular shaped “violin” figurines (Figs. 5:145, 146), as well as a natural sandstone nodule found in the masseboth shrine of Wadi Watir (Fig. 4:96). In technique it also recalls larger circular installations from the Sahara Desert (Fig. 5:179). Most probably, the figure represents a fertility goddess (with, her head pointing east), and her presence in the burial context is not surprising (see discussion in Avner in press 1 and Appendix 1).

The second drawing on the mountain top is a double circle, 4.0 m in diameter, with a sort of animal head on the southern side, but facing east. The circle resembles the body of the first drawing, while the head somewhat resembles the animal head or mask of a human relief figure on a Neolithic jar from ‘Ein El Jarba (Kaplan 1969:15).

The stone drawing of ‘Uvda 6 is built 10 m east of the sanctuary (Figs. 5:77, 149). It comprises 16 animals, most of which are incomplete, with fragments of three additional ones (Figs. 5:150, 151). During the excavation (see Note 9) we noticed the dark stones within the animals too late, but once noticed, the animals’ identity as leopards became clear. The dark stones represent the leopard’s spots and the raised tail is the leopard’s “logo” in ancient art and in reality (Fig. 5:153, and cf. Tell ‘Uqair, Sandars in Moorey 1979, Fig. 41). One animal is the exception, most probably an oryx, with straight long horns and a tail (Fig. 5:152).

This drawing is the largest known to date (14.8 m long) and the richest in details, that permit some interpretations. All the leopards face east and southeast, towards the rising sun, mainly in winter, which is perceived as radiating fertility and prosperity (see Ch. 4). The oryx is the only one that faces the west, towards the world of the dead, and is depicted headless, i.e. dead. Most probably, the leopards, as hunters, symbolize life and fertility, since they bring prey to the cubs and enable the growth of the family. The oryx, as prey, naturally symbolize death. These symbolisms appear in various manifestations worldwide. For example, in the wall paintings of Çatal Hüyük scenes concerning life and fertility were painted on western walls, i.e. facing east, while scenes relating to death were painted on eastern walls, i.e. facing west (Mellaart 1967:104).

Another aspect of symbolism may be seen in the southern end of the drawing at ‘Uvda 6, where leopards cubs are twice depicted mounted on adults’ backs (Figs. 5:154, 155). This theme is known in ancient art from various locations and periods (Fig. 5:156). In the case of anthropomorphic figurines, Nos. 4, 6 and 8 are females, and according to Neumann (1974:142) pairs of goddesses depicted in this manner symbolize the continuity of fertility, transmitted from mother to daughter.

Beyond the basic symbolism, it is possible that the animals of ‘Uvda 6 actually represented deities, for the following reasons:

1. Representation of gods in animal forms was very common in the ancient Near East (see e.g. Van Buren 1945; Goff 1963; Hart 1986; Black & Green 1992).

17. I’m grateful to N. Goring-Morris and A. Gopher for measuring and drawing this scene in the field.
2. As described, all leopards face between east and southeast, much like the dominant sacred orientations of both desert masseboth and open sanctuaries. The western orientation of the oryx can also be understood as a sacred orientation, following the orientation of broad masseboth that relate to death symbolism (see Ch. 4).

3. Gods, and sometimes ancestors, were often presented with large eyes, that see everything. In the animal stone drawings, stones that represent the eyes were not always preserved, but where they were, they possess most of the head’s area. The eye’s size is especially emphasized in the animal in the scene’s center.

4. Frequent artistic presentations of leopards in cultic context, for example, at Çatal Hüyük (Mellaart 1967:112-111, 118-121) and in the Tell ‘Uqair temple (Sanders in Moorey 1979, Fig. 41), indicate adoration and even worship of the animal. In addition, in various periods and sites in the Near East, priests are depicted wearing leopard skin. This was especially common in ancient Egypt, beginning in the Gerzean culture (e.g. Capart 1905:55-6, 212-222, Figs. 162, 163; Kantor 1944, Fig. 8) and in later times. At Çatal Hüyük, human figures wearing leopard skins and dancing around large deer were also interpreted by Mellaart (1967:175) as priests in a hunting ritual. Possibly, the leopard skin was perceived as endowing the priest with the animal’s divine power during a ceremony.

5. The depiction of leopard cubs on the back of adults was compared above to other artistic presentations, including human figures or figurines (Fig. 5:156). Although several scholars have denied the cultic interpretation of human figurines (e.g. Ucko 1968; Moorey & Fleming 1984; Bailey 1994), a consensus is building, that generally, figurines did represent deities. Therefore, the similarity in theme between the mounted leopards and mounted human figurines also supports the identification of the leopards as representing deities.

Other artistic occurrences of leopards attract further interpretation of the stone drawings. A figurine from Çatal Hüyük, shows a broad woman (a goddess) sitting on a couch flanked by leopards, and probably giving birth (Fig. 5:157, No. 1). A figurine from Haçilar shows a broad woman (a goddess) sitting on a leopard’s back and nursing a leopard cub (Fig. 5:157, No. 2). Both figurines connect the leopards with female fertility. This connection continued with the 2nd and 1st millennia B.C. presentations of goddesses standing on the backs of felines (mainly lions), or the animals serve as their attributes (e.g. ANEP 470-474; Hestrin 1987b: Puech 1995), while gods stand on bulls (e.g. ANEP 500, 501, 531, 534). Still in the Hellenistic period, a figurine from Maresha, much like the figurine from Haçilar, shows a woman (goddess) sitting on leopards and nursing a human-leopard baby (Fig. 5:157, No. 3). It seems, therefore, that the stone drawing of ‘Uvda concerns female fertility.

Based on the fragments of three animals in ‘Uvda and on the incomplete condition of some of the leopards, one can assume that the figures were made during ceremonies, reusing stones of previous figures. This recalls again Çatal Hüyük, where the plaster pair of leopards was re-painted over 100 times, most probably as part of a ritual (Mellaart1967:112-113).

To date, stone drawings have been documented at only two sites, but they are not so isolated. Poorly preserved drawings were found at five additional sites (see above) and a large drawing was published (with no interpretation) from the Arabian Peninsula (Zarins et al. 1980, Pl. 8, and see here Fig. 5:172). The incisions of animal and human figures on the pavement east of the Megiddo XIX sanctuary (Loud 1948, Pl. 271-282) also seem to belong to this phenomenon.

The impression is that the stone drawings in general reflect a rich symbolic complex, probably even a well established mythology, which is mostly incomprehensible to us today.

F. Pairs of Sanctuaries in the Desert and the Sown

1. Desert Pairs of Sanctuaries

Two types of sanctuaries statistically predominate, Type 1 (n=55) and Type 2 (n=56). The first is rectangular, with an average length/width ratio of 1:2.1, and is characterized by the elongated cell on its back side. The second is usually closer to a square shape, with an average length/width ratio of 1:1.3, characterized by the circular installation in the center.

These two well-defined types often occur individually, but also appear in pairs in a consistent pattern. To date, 25 pairs have been documented in the Negev and Sinai, at six different sites. All are built so that the Type 2 sanctuary is located on the right of Type 1 sanctuary (in the beholder’s eye). No pair stands vice versa (Figs. 5.4, 9, 16, 19, 20, 28, and see plans of all pairs in Fig. 5:158). Usually, the Type 2 sanctuaries are smaller than those of Type 1, and slightly set back.

18. For more symbolism of the “eye” of see e.g. Mallowan 1947:205-210; Crawford 1957.
19. Ermann 1894:297; Griffith 1900, Pl. 16; Smith 1949:283, Pl. 36b; Mysliwiec 1985:Pl. 10:1, 2; Faulkner 1993:51.
Since the pattern is consistent, it must represent some concept, which prompts interpretation on a symbolic level.\(^{21}\) Since these sanctuary types are well defined and different from each other, it may be reasonable to assume that one was built for a male deity and the other for a female. If this is correct, the left side, Type 1, seems a better candidate for a male one, and the right one for the female, for the following reasons:

1. Placing the larger sanctuary to the left resembles the position of 90% of masseboth pairs (37 out of 41). Most pertinent is the type with the narrow and taller stone on the left (in the beholder’s eye) and the shorter and broader on the right (Table 11-2:20-31). It should be remembered that from the point of view of the gods in the stones, or in the sanctuaries, the smaller stands to the left of the larger i.e. the female sanctuary is on the male’s left. This is the dominant order of pairs observed in ancient art, as is also expressed in the Biblical passages: "His left arm is under my head, and his right hand hugs me" (Song of Songs 2:6, 8:3).

2. As mentioned before, the elongated cell is the characteristic element in the Type 1 sanctuaries, while in Type 2 the circular installation is the characteristic. Both elements are also very common in other stone structures in all desert areas of the Near East, and they recur in various ways: in chains of circles and lines associated with the sanctuaries, in the cult installations, and in independent stone structures, sometimes of immense dimensions. These basic forms also recur together in combinations. For example: the circular sanctuaries with “ladders” (Table 15:2, 5-8, 14, 15, 44, Figs. 5:59-42), in installations of “eyed” masseboth attached to circles (Fig. 4:15), as stone alignments with circular tumuli in Type 1 sanctuaries (Table 14:22, 25, 26, etc.), in independent tumuli with alignments, and in tumuli and nawamis tumbs with crenelation lines (see further figures and references in Avner & Avner 1999). Interestingly, the same forms and combinations are common in desert petroglyphs, in world rock art as well, and in ethnographic material (ibid.). All these lead to their interpretation as bearing symbolic meaning, so that the elongated cell, or alignment, is suggestive of a male symbol, while the circle is the female symbol (ibid.). Thus, these two elements may support the identification of the ‘left’ Type 1 open sanctuary as dedicated to a male god, and the ‘right’ sanctuary to a goddess. This would correlate with the left/right order found in pairs of masseboth. Further, the repeated connection between circles and the lines may explain why in the sanctuary pairs, the ‘right’ Type 2 sanctuary is usually set back in comparison with the other. This position aligns the circular installation with the elongated cell (Figs. 5:4, 9, 158), and ensures the symbolic bond between these elements.

3. Pairs of sanctuaries were quite common in the Near East beginning in the Neolithic period, at Çatal Hüyük (Mellaart 1967:117-122) and Haçilar (Mellaart 1970:30-37). In some later pairs, inscriptions indicate that they were built for pairs of deities, such as two Assyrian pairs of temples for Sin and Shamash (Haller & Andrea 1955:82). Furthermore, in some temple pairs, features, artifacts or inscriptions helped to identify the ‘left’ sanctuary as a male one and the ‘right’ as female. In the EB twin temples of Beyçeçultan XVI-XIV, sockets in the floor, incorporated in circular installations, were found in each of the ‘right’ side temple and interpreted as a base for a sacred wooden post (Lloyd & Mellaart 1962:36-55).\(^{22}\) At Emar (Tell Meskene, Syria), a pair of MB-LB temples was safely identified as built for a pair of deities, on the basis of written documents found in them. The ‘left’ temple, which is higher and somewhat larger, was dedicated to Ba’al, and the ‘right’ one to ‘Ashtar (Margueron 1995:130-132). At Qatna, Syria, the small LB sanctuary in the palace consisted of a courtyard and a pair of shrines; the ‘left’ contained an installation with a massebah, and the ‘right’ one contained the remains of a tree trunk, also identified as an Asherah (du Mensil du Buisson 1935, 75-111, Pl. 28-33).\(^{23}\) Other twin temples will be discussed below.

Additional types of pairs occur in open sanctuaries and cult installations, including five circular pairs and two pairs of stone platforms (Fig. 5:159), and another pair, at Har Yehoahaz (Fig. 5:159.6), consisting of two Type 2 sanctuaries, in which the smaller is built to the larger’s ‘right’, as is the order in the regular pairs. If the basic symbolic interpretation of the sanctuaries’ forms is valid, these sanctuaries can be understood as built for pairs of goddessess. Interestingly, ‘female’ pairs were also quite common in masseboth (Table 11-2:3-19), and pairs of goddesses appear in ancient mythology and art throughout the Near East (Avner in press 1, with references).\(^{24}\) On the other hand, no pair of ‘male’ sanctuaries was found, and only two ‘male’ pairs of masseboth were recorded (Table 11-2:1-2).

\(^{21}\) For the “license” to interpret mute archaeological remains see Ch. 4, Section G, and Note 13.

\(^{22}\) Despite this identification of the socket, Lloyd & Mellaart (1962:32) suggested that the ‘left’ sanctuary was the one dedicated to the goddess, based on the discovery of female figurines only in this shrine, where the wooden pillar was missing. Another interpretation, by Yakar (1974), suggests that both shrines served the pairs of deities, the “right” one for their life aspects, and the “left” one for their chthonic aspects.

\(^{23}\) The massebah was actually not found in the ‘left’ shrine during the excavation, but a mud-brick installation was interpreted by the excavator as the representation of the god (du Mensil du Buisson 1935:108). It was found in the nearby Nin-Egal Temple (55 cm tall) where it was relocated at a later stage (ibid. p. 75). Mettinger (1995:120) offered a logical suggestion, to reconstruct a similar massebah in this ‘left’ shrine, next to the mud-brick installation, which actually served as an altar.

\(^{24}\) See also the pairs of goddesses and pairs of ‘female’ sanctuaries in Malta (Bonanno 1987; Stoddart et al. 1993).
2. Additional Symbolism in Open Sanctuaries

The suggested identification of male and female symbols may shed some light on additional features of the open sanctuaries:

1. While pairs of open sanctuaries are quite common, one site, Har Tsuri’az X, presents a triad, with one ‘male’ and two ‘female’ sanctuaries (Table 14:30, Fig. 5:160). Possibly, this group began as a regular pair, and at some stage the third sanctuary was added, with a somewhat larger space in between. In any case, it seems that these sanctuaries served a triad of deities.

2. In some sanctuaries, a probable combination of symbols of both sexes is observed. In ten sanctuaries (Har Tsuri’az I, IX, X, XIII, XV; Hashem alTaref VI, VIII, IX, XIX and Wadi Zalaqa 313), a broad massebah was attached to the elongated cell. This may mean that a female symbol was annexed to a male one. A similar composition is possible also in Wadi Zalaqa 306, if the interpretation of the vase-shaped installation as a base for a sacred wood is correct (see above). Another combination is possible in Type 1c sanctuaries, with an elongated cell and a semi-circular courtyard. Although only five sanctuaries of this type have been discovered to date (Hashem alTaref XXII; Wadi Zalaqa 311-314, Nos. 113, 116-120; and Fig. 5:33), they demonstrate some intention. The semi-circular courtyard may be perceived as a ‘female’ symbol, which joins the ‘male’ elongated cell. The above examples indicate that a pair of deities could have been worshipped in one sanctuary. This recalls the situation in Beyçesultan, where female figurines were found in the ‘left’ shrines, which lacked the sacred woods, and Yakar’s interpretation of these twin shrines (see above, and Note 22).

Further complexity is found in the site of Har Tsuri’az IX (No. 29). On one hand, it is a regular pair of sanctuaries, but on the other, the elongated cell of the ‘left’ sanctuary was originally divided into three sections, and three semi-circular platforms were built in front of them (Fig. 5:161). In addition, a large, broad globular massebah was attached to the central elongated cell, bearing late petroglyphs (Fig. 5:162). On an additional rock laying next to the massebah, an old, patinated petroglyph shows three schematic human figures, of which the central is the larger (Fig. 5:163). Since this combination of figures is similar in proportions to that of the three sections of the sanctuary, it is possible that the petroglyph was actually meant to depict a triad of deities worshiped in the sanctuary.

If the interpretations suggested here are correct, the simple open sanctuaries may bear various levels of symbolism. This should not be surprising, since complex, multi-leveled symbolism is quite characteristic of traditional societies (e.g. Turner 1967; Jung 1968; Eliade 1978, 1995; Parmentier 1994).

3. Chalcolithic and EB Paired Sanctuaries in the Southern Levant

Several Chalcolithic and EB buildings in the Levant are identified as pairs of sanctuaries, others are under dispute, or overlooked. Their occurrence is interesting in light of the repeated pattern of the desert sanctuary pairs. At first, the sanctuaries will be briefly described, with some comments. Numbers of sanctuaries in this list refer to those in Fig. 5:164, arranged in typological order.

1. Tulaylat Ghassul. Only a brief text and a general plan have been published (Hennessy 1982; Ottoson 1980, and see the new excavations, Bourke 1996). Presently, the building’s identification as a sanctuary is based on the schematic ground-plan and on artifacts such as fenestrated pedestal bowls, a kernos and figurine fragments. The two buildings inside the temenos are built perpendicular to each other. The ‘left’ is larger and more elongated while the ‘right’ one is smaller, but gains some emphasis from a broad stone pavement at the front.

2. ‘Ein Gedi. There is no argument about the function of the larger building, but the ‘right’, smaller building has remained uninterrupted. In my opinion it may well be a sanctuary as well. Ussishkin (1980:8) described in detail the architectural emphasis given to it: the pavement in front (parallel to that of Ghassul), the well-built threshold, the step and the doorjams, and the white plaster covering the entire floor. Although no cultic focus was found in the building, these elements indicate the importance of the building, more than expected if it was built for other uses. The circular installation in the courtyard was interpreted by A. Mazar (2000) as an installation for a sacred tree, the Asherah.

3. Gilat. The ground-plan presents again two perpendicular rooms, the ‘left’ one is larger and longer (Alon & Levy 1989, and in press). The architecture quality is equal in both rooms (mud-brick superstructure on a base of large cobbles), while the ‘right’ room contained a brick platform, 1.7x 0.6x0.3 m. Plenty of cult objects were found in both rooms, most are unpublished as yet.

4. Hartuv. Two main halls were excavated. The largest was at least 15 m long (the dotted line in Fig. 5:164. 4 is my own conjecture, assuming that the doorway was in the center of the front wall). It was identified as a sanctuary, with an alignment of masseboth (Mazar & Miroschedji 1996:11-13). The smaller hall is perpendicular to the first and gained architectural emphasis, especially in the monumental doorway. From the main hall’s doorway, only one side
has been preserved, but it is obviously far less impressive. According to the excavators (ibid., p. 13), this hall must have been of a special importance, but its function is unclear. In my opinion, the repeated pattern of the perpendicular hall with architectural emphasis on the entrance, makes it possible that this was a sanctuary as well.

5. ‘Arad. Amiran et al. (1978:38-41,1980:8-9) described a sacred precinct, consisting of three elements (Fig. 5:165): a main pair of sanctuaries (here No. 7), a small pair (here No. 10) and a “ceremonial hall” with an additional service building (here No. 5). This identification of the complex, and specifically the main pair, was rejected by Yeivin (1973:164-166) and by Mazar 1990:126. In my judgment, the complex could have contained three pairs of sanctuaries, addressed here separately according to their typology.

The “ceremonial hall” was so termed due to its large dimensions (ca. 12.0x6.6 m) but it could well be a sanctuary for the following reasons: 1. It faces east, towards a large courtyard, atypical for habitation quarters in the town. 2. A platform is built against the back wall, toward the doorway, much as in the sanctuaries of ‘Ein Gedi, Gilat and Megiddo (Nos. 2, 3, 6). 3. On the doorway’s left side is a monolithic basin, set in a special compartment. Its location resembles that of the row of four basins in the twin temple of Byblos (Fig. 5:164, No. 11). 4. The “service room” is built to the ‘right’ side of this hall and perpendicular to it, with the remains of a wall connecting them and creating a unit of two buildings and a large courtyard, within the general complex. Their arrangement is similar to that of ‘Ein Gedi.

6. Megiddo XIX. Both halls are aligned, with a storeroom in between, while the ‘left’ hall is the larger. The halls open eastward, onto a plastered courtyard. Remains of a platform was found attached to the back wall of each of them; the platform of the ‘left’ hall is the larger (Loud 1948:64-67). Attempts to reconstruct the courtyard (Dunayevsky & Kempinski 1973; Epstein 1973) yielded different suggestions, and the renewed excavation (Finkelstein et al. 2000:50-55, 72-73, Level J-3) confirmed Epstein’s reconstruction, which is also adopted here.25

7. ‘Arad. The main pair of sanctuaries consists of two aligned halls, with an additional chamber in between, and another, perpendicular chamber on the right side of each. Amiran (above) already mentioned arguments for this interpretation, some of which will be repeated here, with additions: 1. Both halls are larger (10.2x5.1 and 8.0x5.5 m) than the largest dwelling houses in the town (7.3x5.1 m, Amiran et al. 1978:14). Their doorways are much wider than any dwelling house door, and they open eastward, onto a large courtyard. Such courtyards were not found in the habitation quarters. 2. In both Strata II and III, the halls’ floor level was either equal to the courtyard, or up to 47 cm higher, (ibid., Pls. 190, 191). In dwelling rooms, on the other hand, floors are lower than the courtyards (ibid., p. 15). 3. A massebah was found in situ in the ‘left’ hall (ibid., p. 41, Pl. 164), and an almost identical one was found fallen in the ‘right’ hall (ibid., p. 40, Pl. 159b). 4. The platform and basin attached to the ‘left’ hall are quite unique in their shape and workmanship (contra Yeivin 1973:164-166). 5. Similar pairs of buildings were not found in the habitation quarters. On the other hand, the general arrangement of the halls is the same as that of Megiddo XIX, with a storeroom between them; the location of the entrance to this room is the different element. 6. Among the finds in the ‘left’ sanctuary was a large stone seal with a pair of eyes (Amiran et al. 1978, Pl. 116:2). Eyes are often found in ancient art in cultic context (Crawford 1957, with ample examples and references). Also, the many carbonized barley grains found in the ‘left’ hall were carefully selected, undamaged and clean, and their average size was larger than the others in the site, 6.37 mm long against 5.9 mm (Hopf in Amiran et al. 1978:66). This recalls the selection of suitable cattle, “without blemish” for sacrificial purposes (Lev 1:3,10, etc.).

8. Gezer. This building was first identified by Macalister (1902:321) as a sanctuary, dated to the “First Semitic Period” (=EB). Later (1912:198-9) he described it as a habitation building, but still mentioned the possibility of its being a sanctuary. The building was not included in later discussions on ancient sanctuaries, but it may very well be a sanctuary, for two main reasons: 1. In both publications the excavator emphasized the special quality of masonry of the building, which is different from that of any other building in the site in this period. 2. The two parallel lines on the eastern side of the halls represent two different stages of the building (Macalister 1902:321). No openings were mentioned, but from the building’s plan it is self-evident that they faced east, toward the courtyard. The general arrangement is similar to that of Megiddo XIX, especially with the circular installation in the courtyard, which also recalls that of ‘Ein Gedi.

9. Megiddo XV. The pair of sanctuaries is part of a triad (Loud 1958:78-84), but their tight proximity, their position asides from the third and in a different orientation, make it possible to see them as a pair of equal-sized megara.

25. Epstein’s reconstruction is adopted with two amendments. One is that the eastern wall of the courtyard (Wall D) is moved somewhat eastward, following the direction of the remains of this wall, so that the circular installation does not interrupt the assumed entrance. Second, Epstein’s plan barely shows the difference in the thickness between the back walls of both halls (see below).
10. 'Arad. The small pair of sanctuaries was identified as such by Amiran et al. (1980:9) due to its resemblance to the larger pair, the two altars (or platforms) built in the courtyard, and a foundation offering found under the ‘left’ room. It may be added that, similar to the others discussed above, this pair also faces the east, toward a courtyard.

11. Byblos. The plan presented here is of Temple XIII, the first stage (EB) of a much larger sacred complex (Dunand 1958:632-648, Pls. 21-63) and stratigraphically analyzed by Saghieh (1983: 3-25, 119-121). The building consists of two equal-sized square halls, facing S-SE toward a courtyard. Next to the doorway of the ‘left’ room is a row of four basins is built.

The assemblage of sanctuary plans in Fig. 5:165 shows three groups. In the first (Nos. 1-5), the ‘right’ sanctuary is smaller than the ‘left’ and set approximately perpendicular to it. In the second (Nos. 6-8), the ‘right’ sanctuary is still the smaller, but both sanctuaries are aligned. In two of the three (Nos. 6 and 7), an additional small room is built between the two halls. The third group (Nos. 9-11) includes equal sized sanctuaries set aligned. Interestingly, several characteristics of these buildings are shared by the desert pairs of open sanctuaries:

1. Sanctuaries of both areas are based on the “broad room” plan. The only exception is the pair of Byblos (No. 9) in which both halls are square. No “long room” was found in either region (besides Open Sanctuary II at Eilat, which is anthropomorphic).
2. In both regions most sanctuaries in pairs are set aligned, while the perpendicular, built sanctuaries, form a distinct group.
3. Built platforms are found in several ‘left’ sanctuaries in the Levant (Ein Gedi, ‘Arad “ceremonial hall”, Megiddo XIX and XV (Nos. 2, 5, 6, 9). In Megiddo XIX, the ‘right’ sanctuary also has a small platform, and Gilat is the exception by having a platform in the ‘right’ room. Similar to the main group, in ten pairs of the desert open sanctuaries, the ‘left’ sanctuaries have platforms or stone cells, while in four others a massebah is set attached to the center of the elongated cell (Fig. 5:158).
4. In two built-up sanctuaries, the back wall of the ‘left’ hall is thicker than that of the ‘right’ one. In Megiddo XIX the back wall of the ‘left’ sanctuary is 40 cm thicker (Loud 1948:61), and in the ‘Arad main pair the back wall of the ‘left’ sanctuary is 70 cm thicker (Amiran et al. 1978:38, Pl. 191). In both pairs, the back wall was built as one unit, and therefore the difference may well be intentional. This recalls the situation in the desert pairs, where the elongated cell is the dominant element of the ‘left’ sanctuary and is lacking in the ‘right’ one. Hence, the thicker wall of the built-up sanctuaries could have borne similar symbolism to that of the desert elongated cells.
5. The circular installation in the temples of ‘Ein Gedi, Megiddo XIX and Gezer is reminiscent of the circular installations in the ‘right’ desert sanctuaries. Their specific functions may not be the same, but their original symbolism could have been similar.

It should be pointed out that the desert pairs of sanctuaries appeared in the mid 6th millennium B.C., while the built-up pairs in the southern Levant are dated to the 4th and 3rd millennia B.C., 1500-2000 years later. Also, the triad of sanctuaries of Har Tsuri’az X is dated by finds to the 6th-5th millennia B.C. (Fig. 5:116). The triad of Megiddo XV is dated to the EB III (Finkelstein et al. 2000:73), as was the triad of Byblos XIV (Saghieh 1983:117, 122), and the possible triad at Tel Zeiraqun is dated to the EB in general (Ibrahim & Mittmann 1987).

F. Geographical Distribution of Open Sanctuaries and Cult Installations

Open sanctuaries of the types discussed here have rarely been published from neighboring deserts, and the present knowledge of their distribution is far from complete (even in the Negev). The common sanctuary Types 1 and 2 have not been found to date in the Judean Desert, but related cult installations were recorded, mainly the long stone alignments mentioned above, up to 2.9 km long, and circular enclosures (Figs. 5:55, 56, 64-70). Open sanctuaries of Types 1 and 2 were orally reported from north-central Sinai (by B. Sass and C. Clamer) and from southeastern Jordan (by P. Wilke and L. Quintero). A Type 2 sanctuary was published from upper Egypt (Rose 1996:11) and a similar one, but lacking the central circular installation, was recorded in southwestern Saudi Arabia (Zarins et al. 1980, Pl. 10b). However, a large variety of similar sites and installations were reported from the neighboring deserts.

In the Arabian Peninsula, there are several features also known from the Negev and Sinai: rectangular and circular enclosures, marked on the surface by cobbles or boulders, and combinations of both; large circular enclosures, up to 50 m in diameter, often associated with tumuli tombs and with several types of elongated cells or stone alignments; circular enclosures with “ladders”; stone alignments, tens or hundreds of meters long, associated with enclosures and burials; many “crenelations” attached to tombs (Figs. 5:166-175, 180); at least one large stone drawing (Fig. 5:172); and circular and rectangular stone platforms.
One cobble structure from southwestern Arabia is a close parallel to an open sanctuary in the Judean Desert (Figs. 5:173, 174) although larger. An elongated cell, of a type usually termed “trough” in the Arabian survey (Fig. 5:168), seems to be connected to a rectangular courtyard, and actually creates a Type 1 open sanctuary. Stone alignments, hundreds or thousands meter long are also reported from southern Jordan (Fuji 2002:45-47).

In the Sahara Desert several types of stone alignments and enclosures are found. The latter are built of one or two lines of cobbles, field stones or lines of vertically set flagstones. They include circular and rectangular enclosures, some open on one long side; concentric circles of small flagstones (cf. Bar-Adon 1972, Site 120); stone platforms of various shapes, and “crenelations” (Figs. 5:176-179). In both the ‘Arabian desert and the Sahara, the combination of lines and circles often recur, as in the Negev.

Currently, the dates suggested for these structures in both the Arabian Peninsula and the Sahara desert are quite broad, from the 5th millennium B.C. to the coming of Islam, based on surface finds and some radiocarbon dates (Bibby 1973:52; Zarins et al. 1979:21, 1980:18-19, 1981:28, 30; Whalen et al. 1981:51; Tillner 1981:14, 20; Milburn 1983:257-8; 1996a). In the Negev, their occurrence was somewhat earlier, the 6th millennium B.C. (see above), and they do not exceed the 2nd millennium B.C.

As to interpretation, the surveyors of Saudi Arabia usually refrained from interpreting these sites, as did Zarins in correspondence (1985). However, he briefly stated that large circles and alignments were generally connected to funerary cult (Zarins et al. 1980:25). Similarly, a general ritual explanation was given to the sites in South Arabia (Doe 1983:74) as in the Sahara Desert (Tillner 1981:14-15, 21; Milburn 1983:253), and also, their cosmic orientations were related to burial cult (Faleschini 1995; Gauthier & Gauthier 1999). In light of the accumulating material from the Negev and Sinai, the cultic explanation of these sites in both deserts is sound, but still deserves further documentation and interpretation.

This brief survey of the limited published material shows that open sanctuaries and related installations are widely distributed over the entire desert zone of the Near East, with great similarities over large distances, forming a cultural koine, with local variations. The quantitative extent of these structures is far from being recognized, but the results of the unsystematic, limited survey in the Negev indicate that numerous sites still await discovery.

G. Summary

At first, interpretation of the structures discussed here as open-air sanctuaries (Avner 1982f, 1984) was not readily accepted (colleagues’ personal comments), and still recently several alternative interpretations were offered. To date, I believe, the accumulated data is sufficient to support the initial interpretation, and several points can be summed up:

1. The open-air sanctuaries form a large and consistent phenomenon. They are very different from contemporary habitations in their ground-plans, the symbolic nature of their low construction, and their attached and adjacent features (masseboth, basins, chains of circles and lines, stone drawings). They are poor in domestic artifacts but sometimes contain special objects. Their association with ancient roads, burials and “crenelations” also sustain their cultic interpretation.

2. Open sanctuaries display a clear pattern of orientation. They face the sunrise, mainly in winter, similar to the masseboth, while some sanctuaries most probably face certain rising stars on specific dates.

3. A single sanctuary can contain 50-400 people according to its size (120 sq m on average, at least two persons per 1 sq m, over 2/3 of the courtyard’s area) while clusters of sanctuaries could serve thousands of people. In both cases this means that they were built for larger populations that can be imagined in their immediate vicinity (excluding ‘Uvda Valley, where a large population lived). Most probably they indicate congregational events, concerning distant groups, while in the clusters of sanctuaries even pilgrimage events could have taken place, already by the 6th millennium B.C. Pilgrimages to the desert are well known in later periods, but the open sanctuary clusters may serve as their earliest indication. Presently there is no indication whether pilgrims arrived from the desert only, or from the fertile zones as well.

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27. See e.g. Tillner 1981; Milburn 1983; 1996 a,b; Baistrocchi 1986; Faleschini 1995; Camps 1997; Gauthier & Gauthier 1999.

28. Eddy & Wendorf (1999:124) speculated that the elongated cells at Jebel Hashem alTaref were dams for agricultural water control, permanent houses for chiefs, while the chains of circles (1.2-1.5 m each) were temporary huts of the lower classes, or that they were the dwellings of army officers, while the foot soldiers lived in the small circles. Following their excavation at Jebel Hashem el Taref they wrote (1999:192): “It is possible that this site may have been an open-air sanctuary, but there is no real evidence to support this conclusion. Only the absence of evidence of any domestic activity implies a ‘cultic’ function”. On the other hand, following their excavation in a desert-kite, they suggested (1999:180) that this was a cult installation.
4. Despite their simple, minimalistic appearance, open sanctuaries do bear special interest. They display intention and esthetic emphasis by the selection of stones and the methods of placement. They reflect a rich vocabulary of symbols and even a mythological complex, which are barely accessible to us today. Their consistency in design and features indicates firm ideas, and perhaps a well-established religious belief, with pairs and triads of gods, as was also demonstrated by groups of masseboth. Many types of cult sites, and the religious ideas that they represent, were shared by desert populations over very large distances.

5. Several characteristics and features are common to open sanctuaries and to the built temples of the southern Levant: the broad-room plan, the occurrence of pairs and triad of sanctuaries, the position of the smaller, ‘female’ sanctuary on the beholder’s right side, the elongated cells of Type 1 open sanctuaries and the thick back wall of the ‘left’ sanctuaries in the pairs of Megiddo and ‘Arad, the stone drawings of the open sanctuaries and the “picture pavement” of Megiddo.

Interestingly, all these characteristics are first found in the desert and then further north, two or three millennia later. Based on our present knowledge, this implies that the ‘humble’ desert people may have preceded those of the sown in some religious ideas. Also interesting is that the same result has been received from the study of masseboth (Ch. 4) and from a study of burial customs (App. 1).

This conclusion does not imply that the peoples of the fertile lands did not have religious-philosophical creativity. On the contrary, recent discoveries in religious aspects of the Levant’s Neolithic and Chalcolithic cultures are fascinating, but it seems now that the desert populations also made a substantial contribution.
CHAPTER 6. ANCIENT ROADS

Many studies address ancient roads in the desert, mainly in an attempt to identify biblical and Roman roads. Ancient routes were often conjectured, connecting major sites or fortresses, with no reliance on surface remains. While in some Nabatean-Roman roads, the physical remains were surveyed and documented (e.g. Meshel & Tsafrir 1974, 1975; Kloner 1996; Ben-Daviv 2001, 2002), little attention was paid to prehistoric-early historic use of roads, or to the question how old a road could be? Another example of a misconception regarding the roads is the near consensus that no ancient road, or no important road, ever passed through the 'Araba Valley from north to south (Karmon 1968; Rothenberg 1971:220; Meshel 1979:298,302; Bowersock 1983:179; Parker 1986:6), based on historical and geographical arguments. However, the remains of several major longitudinal roads are clearly visible on the surface, on the eastern side of the 'Araba Valley (Raikes 1979; Smith et al. 1994:479) and the western side, including 24 Roman milestones found near Kibbutz Yahel, the only inscribed ones known to date in the Negev (Avner 1989c, 1997b; Avner & Roll 1997).

During the passed 30 years I have walked along many desert trails, in the southern Negev, in the Negev Highlands and in eastern Sinai, and learned three basic facts. One is that the desert is immensely rich with trails, which are conspicuously visible from the surface, but are especially clear from the air. Second, they can be safely dated at least to the 6th millennium B.C., and third, most trails are not local, but are actually sections of a large and long-range network. The latter two points are exemplified by a trail map of the Eilat region (Fig. 6:1).

The first hint for the antiquity of the trails is the many cult sites built adjacent to them, including ca. 60% of masseboth locations, all open sanctuaries, all crenelation lines, and many other cult installations. Especially important are the clusters of sanctuaries built next to road junctions, which could accommodate large congregations and are dated as early as the mid 6th millennium B.C. (see Ch. 5 and Fig. 5:1). In addition, from almost every desert trail I collected flint and pottery sherds that indicate a long history of use, actually over a full span of the last ten millennia (Figs. 6:2, 3). The antiquity of the roads is well connected with the broad distribution of copper ore from the 'Araba Valley in the Levant, and even Egypt, beginning in the Early Neolithic (Hauptmann 2000:166-188, with references) and the distribution of Red Sea shells over the Levant, and even Europe, beginning at least in the Epipaleolithic and continuing in later periods (Goring-Morris 1989; D. Bar-Yosef 1989, 1999; Reese 1991a,b). The roads’ antiquity is also connected to the occurrence of artifacts from Mesopotamia and Anatolia in the Eilat burial ground in the 6th-5th millennia B.C., including faience and glazed steatite beads, a lump of realgar (AsS) and an imported copper bead (see Ch. 3 and App. 1).

Ancient roads are very ‘efficient’ in their routes, and represent an intimate knowledge of the desert topography. On flat terrain, where no modification of the surface is needed, they appear as a band of parallel narrow trails. In the case of major roads, such as Darb Ghazza, Darb alShawi–Darb elHajj, and roads in the ‘Araba Valley, the band of trails reaches up to 200 m wide (Figs. 6:4-6); others are only 10-50 m wide (Figs. 6:7, 8). The width of the trails’ band does not necessarily reveal the road’s importance. This is exemplified by the Negev section of the “Incense Road”, which served the large scale Nabatean trade from South ‘Arabia to the Mediterranean (Pliny, Naturalis Historia XII 32:63-65; Meshel & Tsafrir 1974, 1975). In some sections this road is well marked by margin stones and milestones, but in others, only a narrow band of trails is found, 10-20 m wide (Figs. 6:12, 13). These sections are totally indistinguishable in appearance from hundreds of other desert roads (cf. Figs. 6:7, 8). Therefore, the comparatively narrow bands of trails should not be seen as local, especially since they usually parts of a long range system of roads (Figs 6:1).

When the trails approach a topographical obstacle, they join together to form a narrow, winding path, a Naqb in ‘Arabic (Figs. 6:9, 10). Here modification of the roads is often observed, where labor was invested to clear rocks from the path, build retaining walls (Fig. 6:11), and sometimes even cut the rock. On rare occasions the work can be dated, as Nabatean or later, but it can be assumed that such labor was needed at least from the time when animals were first harnessed for carrying goods, i.e. in the 4th millennium B.C. (see Ch. 2).

A brief survey of the subject can be summarized as follows:

1. Ancient roads can be clearly identified on the desert surface, and studied. They can be dated by artifacts, collected directly from the trails, and by dating adjacent sites, mainly cult and burial. The present state of the survey demonstrates that all trails visible today (excluding some modern hiking trails leading to high lookout points) are
actually ancient. More so, it seems that the entire network of roads was well established in the desert, at least by the 6th millennium B.C., to which several cult and burial sites are presently dated (see Table 1). The Nabateans, the Romans and others could only improve the roads by cutting and building the harder, winding paths, by demarcating margins or paving some flat sections, but no new routes were left for them to “invent”. They actually followed the same trails that were previously used for millennia. The road network served international, ‘down the line trade’ already in prehistoric times.

2. The large numbers of cult sites along the ancient roads imply that when the ancients traveled through the desert their survival was threatened, they were exposed to dangers of want of water, food and shelter, and they frequently appealed to the gods for protection (cf. Gen. 28:20-22). Also, the many cult sites indicate an intensive movement of people along the roads during the discussed periods, the 6th-3rd millennia B.C. As described in Ch. 5, the clusters of open-air sanctuaries in roads junctions may indicate the emergence of pilgrimage to the desert, both by desert populations and distant groups.

3. The ancient roads form an important factor in the cultural and economic picture of the desert’s past, and the fact that they are rarely noticed or mentioned in archaeological surveys eliminates an essential element from the past scenario of the area.

Today, many ancient roads are damaged or have been destroyed by modern activity. Present-day asphalt roads are most commonly built over the ancient routes, and many unpaved roads often ruin the ancient ones, due to ignorance (Fig. 6:14). As a result an important part of the ancients’ heritage is gradually but surely disappearing from the desert landscape.
CHAPTER 8. THE DESERT PALEOCLIMATE

Introduction

Climate changes may bear significant influence on any human society, and this is especially true in the desert where the ecosystem is more fragile than in other regions. Any change in the water balance (between precipitation and potential evaporation) may affect the carrying capacity of the area. The settlement scenario in the desert, as described in Chs. 2 and 9 raises the question whether the past climate was similar to that of the present, or different. Several studies in the past associated gaps in settlement to climatic deterioration. For example, a "hiatus" in settlement was described during the Late Neolithic in the southern Levant, explained by a severe and long period of desiccation (de Voux 1966; Perrot 1968; Moore 1973,1982; Mellaart 1975; Kenyon 1979). During such periods, the desert would have been drastically affected, and almost no human presence should be expected. However, the intensive farming in Uvda Valley, and the increase in the number of sites during the 6th-5th millennia B.C. (and later) seem to indicate otherwise (see Tables 2a and b). Hence, the knowledge of the past climate is essential for understanding the past settlement pattern in the desert.

The first attempts to describe a sequence of climate changes in the Near East were made by Huntington (1912, 1924). Based on the available historical and archaeological information, in his first book he established a sequence from the 4th millennium B.C. to the early 20th century A.D. He related times of better climate to periods of political and cultural flourishing, and times of drought to "dark ages" and cultural crises. In his second book, he included descriptions of current climate changes, and their impact on various societies and cultures. Huntington’s theory was rejected by most scholars (e.g. Albright 1949:250f; Reifenberg 1955:22-23; Glueck 1968:7-12, 209-210, 1970:33-44, 184; Evenari et al. 1971:327), and references to his works are few. Still today several scholars assume that the past climate of the Negev was similar to the present (e.g. Finkelstein & Perevolotsky 1980:80; Henry 1992:137; Liphschitz 1996, 1998, 2001), or that only minor fluctuations occurred (Finkelstein 1995:35).

Numerous studies on paleoclimates were published during the last decades and continue to be, from various disciplines (geomorphology, oceanography, paleo-botany, paleo-zoology, isotope studies, astronomy, etc.). Discrepancies in the results are revealed, sometimes even within the same field of research. The main problems are the difficulties in the precise dating of climatic phases and in identifying short term fluctuations. Therefore, in order to obtain as reliable a picture as possible, a compilation of studies from the different disciplines is needed. Here, only a selection of the studies will be addressed, mainly from the Negev, Sinai and the surrounding deserts. In most paleoclimatic researches radioactive dates are referred to as uncalibrated B.P., but here, all dates are calibrated B.C. (following OxCal 3.4, Ramsey 2000).

A. Data from the Negev and Sinai

Paleobotanical and paleozoological data from the Negev and Sinai are presently inconsistent. Most wood remains from Neolithic to EB are of species common in the area today, such as acacia, tamarisk, Atlantic pistacio and white broom, with rare occurrences of European olive. These appear to indicate no major differences in the vegetation and climate in comparison to the present (Liphschitz 1986, 1996, 1998). Pollen samples present a different picture. In the PPNB site of D1, near Sede-Boker, arboreal pollen comprised 8% of the profile, including olive, pine, and almond, which beside a few almonds, do not grow naturally in the Negev today. The non-arboreal pollen included 24% wild cereal (Gramineae) and sedge (Cyperaceae) (Horowitz in Marks 1976:66; Horowitz 1979:248). The latter indicate more water sources in the near vicinity than today, or even a constant water flow in Nahal Zin. Differences appear within a group of nearby Chalcolithic sites. Sites D60 and D62 yielded 8% arboreal pollen, with juniper, tamarisk and white broom, while the others (D61, 168-86 5A-1) contained 3% arboreal pollen, mainly of olive and oak (Horowitz, 1979:249). The Neolithic and Chalcolithic pollen samples seem to reflect a wetter climate than at present. Weathering patterns of endolithic lichens on stones in ancient Negev sites of various periods represent species of lichen associated with more rainy zones during the 8th-5th millennia B.C., which disappeared in the 4th millennium B.C. (Danin 1985). This study suggests a considerably wetter climate in the Negev during the Early and Late Neolithic, with desiccation during the Chalcolithic to the present level. Since then, no major changes occurred. Measurements of oxygen and carbon isotopes in land snails from the northern Negev showed low a ratio of $^{18}$O and $^{13}$C between 9000-2000 B.C., due to an increase in rainfall and a southward shift of $C_4$ type vegetation on which the snails subsisted. During the period of 5500-2000 B.C. the desert vegetation ($C_4$) shifted somewhat north, but it was still 20 km south of its present limit (Goodfriend et al. 1986; Goodfriend 1988, 1991). According to this research a rise in $^{18}$O ratio (i.e. desiccation) to the present value occurred ca. 1900 B.C.
Fauna in the PPNB site of D1 in the Negev Highlands included some cattle bones (Bos primigenius) and a red deer (Dama mesopotamica), which according to Marks (1976:351-353) imply the existence of groves along the wadis, and an average annual precipitation of approximately 200 mm, double that of today.

Identification of wood remains from ‘Uvda Valley generally indicate desert vegetation similar to the present, but with some differences. Five main species were used for combustion: tamarisk, Atlantic pistacio, white saxaul and white broom (Liphschitz 1986, 2001). The same species were repeated in charcoal samples from Site 96 (4th-3rd millennia B.C.),2 recently analyses by Liphschitz (to be published), with the dominance of Atlantic pistacio. Tamarisk is found today around ‘Uvda Valley only near modern water seeps, and only five pistacia trees currently grow in the entire southern Negev. Tamarisk also dominated the charcoal samples from the Eilat burial site (13 of 21, 62%, Baruch in Avner, in press 1), but is absent today in the vicinity. This implies that in the past, the water table in both ‘Uvda and the Eilat burial site, was high enough to support the tamarisk. Additional possible indications of a better climate in 4th-3rd millennia B.C. ‘Uvda Valley are the initial results of pollen analyses from ‘Uvda 96 (by B. Tay May and L. Cummings), including sedge (Cyperus and Scirpus spp.), water plants that may indicate the presence of a spring or springs, which no longer exist today. These are attended by sweet water molluscs (Melanopsis buccinoidea) of widespread terrace aggradation, 4-5 m high, was dated to the Chalcolithic period, at Siqmim, and in Nahal Be’er Sheva’, Nahal Besor and Nahal Nizzana. This occurred simultaneously with the deposition of loess, which is also associated with a wetter regime (Goldberg 1986, 1994; Goldberg & Bar-Yosef 1982, 1990; A. Rosen 1986). In Nahal Ressimim, the Negev Highlands, sedimentation was dated to the second half of the 4th millennium B.C. (Goldberg & Bar-Yosef 1990). The same studies, however, dated the accumulation of sand dunes in the Mediterranean coast and in the northwestern Negev to the Neolithic and Chalcolithic periods, as well as erosion in some wadis. Both phenomena indicate phases of aridity. Possibly, the contradicting data implies some fluctuation of conditions during the Chalcolithic-EB I.

In PPNB, Chalcolithic and EB sites, in southern Sinai, all analyzed charcoal samples were from tree species present today (i.e. acacia, tamarisk, Persian pistacio, palm, jujub and poplar), implying a past climate similar to the present (Liphschitz 1998). However, in PPNB pollen samples of oak and olive were also identified, neither of which grow there naturally today (Horwitz in Bar-Yosef 1981b). A pollen sample from the EB site of Nebi Saleh, also in southern Sinai, yielded 2% oak, 2% pine, 36% wild cereal and 12% cultivated cereal (Beit-Arieh 1977:148). Oak, as mentioned, is absent today in southern Sinai, pine is only artificially grown near a few monasteries, while wild cereal is not grown at all. Thus, the pollen sample from Nebi Saleh may indicate a moister climate in the early 3rd millennium B.C. The ancient fauna was also richer than expected. A bone implement made of a cow pelvis (found in a namus tomb near Ain Hudra (Bar-Yosef et al. 1977:78), and onager bones were found in a desert kite excavated in Wadi Jenah (Goren and Tchernov pers. comm.). Both sites are dated to the 4th millennium B.C. and these animals probably indicate steppe vegetation, richer than that found in the area today. About 50 desert kite sites were recorded in southern Sinai (5th-3rd millennia B.C.), most of them are located in areas with extremely poor contemporary vegetation. In the past, however, they must have been built in areas rich enough in vegetation to attract the gazelles and justify their construction efforts (Perevolotzky & Baharav 1987).

Geomorphological research in the Negev and Sinai carried out in archaeological sites and ancient alluvial terraces, identified a few periods of sedimentation, implying a higher amount of rainfall. At Nahal Issaron, in ‘Uvda Valley, sedimentation was after the PPNB occupation, from 6000 B.C. and later (see ref. below). In the northern Negev a phase of widespread terrace aggradation, 4-5 m high, was dated to the Chalcolithic period, at Siqmim, and in Nahal Be’er Sheva’, Nahal Besor and Nahal Nizzana. This occurred simultaneously with the deposition of loess, which is also associated with a wetter regime (Goldberg 1986, 1994; Goldberg & Bar-Yosef 1982, 1990; A. Rosen 1986). In Nahal Ressimim, the Negev Highlands, sedimentation was dated to the second half of the 4th millennium B.C. (Goldberg & Bar-Yosef 1990). The same studies, however, dated the accumulation of sand dunes in the Mediterranean coast and in the northwestern Negev to the Neolithic and Chalcolithic periods, as well as erosion in some wadis. Both phenomena indicate phases of aridity. Possibly, the contradicting data implies some fluctuation of conditions during the Chalcolithic-EB I.

I. In Eastern Sinai (Site 40), a layer of red paleosol was dated to the late 6th millennium B.C. by 14C determinations retrieved from a hearth (Eddy & Wendorf 1999:63, 132-3, and see here Table 1:51). This implies a higher regularity of steady rains, that allow oxidation of iron deep in the soil, rather than random and abrupt showers that create flash floods, as it occurs in an arid climate.

Several studies addressed the Holocene fluctuation of the Dead Sea water level. Begin et al. (1985) described a comparatively stable water level during the Holocene, ca. 400 m. Neev and Hall (1977) dated sediments that indicated a high water level from 8000 to 5800 B.C., a lower level from 5000 to 3000 B.C., and another high level stage in the 3rd millennium B.C. Goodfriend et al. (1986) presented discovery of salt-coated land snails near Qumran, at an elevation of -280 m, dated ca. 5700 B.C. This indicates a rise of the Dead Sea level by 120 m above present, which implies a major increase in rainfall in the drainage system of the lake in the 6th millennium. Frumkin et al. (1991, 1994), based on the level and size of caves near the southern Dead Sea, and on dated wood remains from the caves, showed a 120 m higher level of the Dead Sea from 8000 to 5900 B.C., a decrease to the present level in the mid 6th millennium, another rise of 100 m from 4000 to 2800 B.C., and then a drop during the 3rd millennium to the lowest level ca. 2300 B.C. In both phases of decrease, the southern basin of the Dead Sea dried out.

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2. Charcoal samples from the same layer have been submitted for 14C dating.

3. The water plant pollen and sweet water molluscs do not necessarily indicate nearby water sources, since they could have been brought to the sites by man.
A study in the Soreq Cave, based on $^{13}$O and $^{13}$C rates in stalagmites and stalactite rings, presented a complete sequence of climate changes during the last 300,000 years. Ample of Th/U datings permitted high resolution of defining fluctuation in rainfall (Bar-Matthews et al. 1997, 1998, the latter address the last 7000 years). The site is located in the Mediterranean Zone, some 100 km north of the Negev Highlands, but it is relevant to a much broader area. The results are as follows: During the 8th to 4th millennia B.C. the rainfall was higher than at present. A comparatively dry period occurred around 6200 B.C. and during the Late Neolithic a gradual desiccation took place, but these periods were still wetter than present. The desiccation reached its maximum at ca. 4800 B.C., still somewhat wetter then present, while the Chalcolithic period was considerably wetter. The Early Bronze Age experienced frequent fluctuations, with a gradual decrease in rainfall during the EB I-II and two sharp dry episodes in 3200 and 2800 B.C. (which are not recognized archaeologically). The EB III was comparatively wet, followed by a dry episode which occurred in 2300 B.C. and a recovery of rainfall above the present level in the EB IV. Interestingly, a climatic crisis in the late 3rd millennium B.C., addressed in many studies (see below), appear here as less significant. From ca. 2000 B.C. the rainfall was generally similar to the present, with comparatively limited fluctuations. The present average annual rainfall in the Soreq Cave area is 500 mm, and the calculated past precipitation, based on the $^{13}$O and $^{13}$C isotope rates, suggest a fluctuation of ±100 mm, i.e. ±20%.

B. Data from Other Near Eastern Deserts

1. The Arabian Peninsula

   The Rub al Khali, today a virtually sterile "sand ocean" in the central ‘Arabian peninsula, contains remains of ancient fossil lakes. Layers of organic material and sweet water shells from various depths have been dated radiometrically to the 8th-6th millennia B.C., indicating wet periods, (McClure 1976). A Neolithic population lived around the lakes until the end of the 3rd millennium B.C. and subsisted on herding and agriculture. Finds from these sites included bones of wild ox, several antelope species and ostrich egg shells, which testify that savannah vegetation characterized this area (Zarins et al. 1980:19-21, 1981:20; Edens 1982, with refs.). A similar settlement pattern is revealed in the Nefud desert, with Neolithic settlements (8th-3rd millennium B.C.), attended by rich fauna depicted in rock art (Garrard et al. 1981, Zarins 1982). Indications of a wetter climate have been observed in other parts of the Arabian peninsula. Alluvial sedimentation in terraces of Wadi Dawasir, central Arabia, swamp sedimentations in Juba Oasis and Wadi Lahi, and travertine sedimentation in Ein Qanas, the al Hesa Oasis, have all been dated to the 8th-5th millennia B.C. (Garrard et al. 1981; Oates 1982). In the Tihama Plain, southwestern Saudi Arabia, playa (Sabhka) sediments were dated to the 5th-3rd millennia B.C., surrounded by Neolithic sites (Zarins & Al-Badr 1986). Geomorphological research in the same area indicated water flow from wadis which created the playa from 4800 to 3200 B.C., simultaneous with the rise of the Red Sea level by 2-3 m. Thereafter, the flow ceased and the sea level gradually decreased to the present level (Marcológica & Palmieri 1992). On the eastern side of the peninsula an extensive settlement of the ‘Ubeidian culture spread from Mesopotamia, from the mid 5th to mid 4th millennium B.C. A wetter climate is the primary explanation for this expansion (Oates 1982; Zarins et al. 1982). A multi-disciplinary compilation of data, combined with series of $^{13}$C dates from various sites, also indicates a wetter climate in the ‘Arabian peninsula during the 8th-4th millennia B.C. (Sanlaville 1992).

   Deep sea cores and the dating of carbon-rich layers (sapropels) in the Red Sea indicate a large inflow of fresh water with organic material carried by floods and rivers from 9000 to 3800 B.C., which is explained by a northward shift of the African monsoon belt (Taviani 1995). Detailed research on the changes in the reproduction rates of small seashells (Pteropodeae) in Red Sea sediments has indicated changes in the temperature and salinity of sea water, implying the following climate changes: a comparatively dry period between 9600 and 8900 B.C., a wet period between 8900 and 6600 B.C., a comparatively wet period between 6600-5200 B.C., a gradual desiccation between 5200 and 3000 B.C., but still wetter than today, and a dry period with maximum desiccation around 2750 B.C. Then, a gradual improvement occurred, towards the present climate (Almogi-Labin et al. 1991).

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2. Northern Africa

In upper Egypt, in presently arid and uninhabited areas, several lakes existed from the late 8th millennium B.C. to the late 6th millennium B.C., followed by some decrease in the second half of the 6th millennium (Roberts 1982). Renewed research in lake remnants of Gilf Kebr, supported by 43 radiometric dates from sediments, showed that the lake reached its maximum during the 5th millennium B.C. It was surrounded by comparatively rich semi-desertic flora and fauna, as well as Neolithic sites. In the early 4th millennium B.C. the sand dune that had dammed the lake was breached, the lake ceased to exist, but the Neolithic settlement continued until 2900 B.C. (Schon 1989) or until 2500 B.C. (Kröpelin 1987). In the Nile Delta two short phases of some decrease of sedimentation were identified, ca. 6300 and 5400 B.C. Between them, and later, a red paleosol had accumulated, indicating an increase of rainfall in lower Egypt. A gradual reduction in Nile sedimentation is marked throughout the 3rd millennium B.C. (Butzer 1975, 1998; Hassan 1997). In the Fayum Basin the lake level was higher than today, up to 20 m, from 7400 to ca. 5000 B.C. With minor decreases in level after 6000 B.C., a short deep decrease ca. 4100 B.C., and a low level during most of the 3rd millennium B.C. (Hassan 1997; Butzer 1998).

In the fossil lakes of the Sahara, a wet phase has been dated between 7500-5900 B.C. (Street & Grove 1979; Nicholson & Flohn 1980; Petite-Maire et al. 1997). Pollen analysis of the fossil lakes in Sudan pointed to a northeasterly shift of the monsoon belt by 500 km from its present location between 10000 and 3000 B.C. (Kutzbach & Street-Perrott 1985), or up to latitude 22° (Ritchie & Haynes 1987). In the Libyan desert pluvial periods were determined by 18O rates and 14C dates of underground water bodies, around 7400 B.C. and from 6500 to 3200 B.C. Two peaks of wetness were identified around 7400 and 3800 B.C. and a short, comparatively dry phase, ca. 5500 B.C. Since ca. 2000 B.C. the climate has remained as dry as today. The pluvial periods are explained by a northward shift of the monsoon belt (Edmunds & Wright 1979). Support of the Sahara scenario is found in a study of oxygen isotope rates, fauna and sapropelitic sediments in 47 deep sea cores in the Mediterranean, north of Libya (Fontugne et al. 1994). The results indicate a substantial flow of sweet water into the Mediterranean between 8000-2500 B.C., with a maximum inflow from 8000 to 6800 B.C. This study proposes that one or more rivers existed in Libya and contributed sweet water to the Mediterranean. A moderate rise of 18O rates in sea shells is observed during the 4th-3rd millennia B.C., i.e. a gradual reduction in the sweet water over this time-span (Fontugne et al. 1994). Many rock drawings dated to the “pre-pastoral Neolithic” (8th-7th millennia B.C.), present tropical fauna, followed by numerous drawings of herd animals (Lothe 1958, 1961; Hays 1975; Muzzolini 1994, 1995, Ch.1). Pollen analyses from the Hojar Heights, in the central Sahara, a very arid area today, have shown a mixed Mediterranean and tropical vegetation between 6000-2300 B.C.; and across the Sahara, many Neolithic sites existed from the 8th millennium until the end of the 3rd millennium B.C. (Camps 1994, 1995; Edmunds & Wright 1979).

C. Synthesis of Data

1. The 8th-4th Millennia B.C.

The studies referred to here are only a small selection from a larger and ever growing body of researches. Discrepancies are mainly due to difficulties in precise and uniform dating of climatic phases, and insufficient resolution of defining the climatic phases. Nevertheless, there is a wide range of correlation between studies in different fields and different regions, and a dominant line does emerge:

From the 8th to the end of the mid 4th millennium B.C. the prevailing climate in the Near Eastern deserts was somewhat wetter than today, with increased precipitation. Large areas were favored by the monsoon (see below) while others remained deserts, but with more water sources and richer flora and fauna. Several studies indicated a slightly higher average temperature (mainly in winter), and higher relative humidity than today, implying a lower rate of evaporation. Between 6000-4300 B.C. there were comparatively dry intervals, mainly in the 6th millennium, but they were short and still moister than the present. Gradual desiccation began in the mid 4th millennium B.C., continued to develop in the 3rd millennia B.C., along with frequent fluctuations (see below).

It should be remembered that in a desert environment, even minor changes in rain and evaporation rates would have a significant impact on the carrying capacity, particularly if 20% more rainfall, as calculated in the Soreq Cave, is applied to the desert during the wetter periods. More so, several studies have proposed a northward shift of the African monsoon belt during the Neolithic and Chalcolithic periods (Gat & Magaritz 1980; Roberts 1982; Kutzbach & Street-Perrott 1985; Goldberg & Rosen 1987; Goldberg 1994), and a northeastern shift of the Indian monsoon (Zarins 1992; Sanlaville 1992) covering most the Arabian Peninsula as far as northern Hejaz. According to Simmons (1997), the monsoon rains heavily affected southern Jordan and caused destructive floods. Another theory suggests local summer rains across the Near East until the early 6th millennium B.C. (El Moslimani 1994). If indeed occasional monsoon trajectories reached the Negev and Sinai, then a single summer rain could have significantly improved the carrying capacity and living conditions in the region. It could have eased the most crucial problem of living in the desert, the availability of drinking water for man and animal, from both natural sources and man-made reservoirs (see Ch. 2).
2. The Climate of the 3rd Millennium B.C.

During the 3rd millennium B.C. most indications of a better climate disappeared, and it seems that gradual desiccation occurred. The Dead Sea level was sharply lowered, reaching its minimum in the late 3rd millennium B.C. (Frumkin et al. 1991, 1994). In Tel Aviv excavations, an accumulation of sand was observed on top of Early Bronze remains, an indication of desiccation (Ritter-Kaplan 1984). In the northern Negev and the southern Shefelah of Israel, the fine bedding of silt on flood plains ceased (A. Rosen 1997). In the northern Near East lake levels decreased (Roberts 1982), and in the Euphrates Valley and the Persian Gulf, no indications were found for the previous increased flow of the rivers (Al Asfour 1978; Luz 1982). In the Nile Delta, the sedimentation rate significantly decreased, and the lake level in the Fayum Basin decreased (Butzer 1975, 1998; Hassan 1997). The Sahara lakes began to dry around 2500 B.C. (Street & Grove 1979; Gasse 1980), and on the Hojar Heights, the tropical and Mediterranean elements disappeared from the pollen spectra (Hays 1975; Camps 1975; Aliman 1982). The climatic scenario received from the $^{18}$O and $^{13}$C curve of the Soreq Cave is somewhat different. It does indicate decreased rainfall during the first four centuries of the 3rd millennium, but also an increase of rain from ca. 2600 to 2300 B.C., followed by another decrease (Bar-Matthews et al. 1998).

For the late 3rd millennium B.C., worldwide and extensive accumulating data points to an abrupt climatic crisis which occurred sometime between 2300 and 2200 B.C. An ashy dust layer identified in north Syrian sites was first interpreted as a result of a major volcanic eruption, that created a “volcanic winter” (Weiss 1997; Courty & Weiss 1997). Now, based on the composition of the dust layer, the possibility of asteroidal impact is being examined, that perhaps struck somewhere in northern Syria (Courty 1998; Peiser 1998). Although currently there is no agreement on the exact nature of this crisis, it is widely agreed that an abrupt climate change was one of the major contributing factors for the drastic political and socio-economical changes, at least in large parts of Asia and Africa. In the Near East, the Old Kingdom of Egypt disintegrated (Bell 1971; Hassan 1997; Butzer 1997). In Israel, the EB III city state system collapsed (e.g. Dever 1980; Mazar 1990:141-143; Butzer 1997), a similar process occurred in Mesopotamia (Weiss et al. 1993), and Anatolia passed severe social disorder (Yakar 1976).

Immediately thereafter, wetter signs appear again for a short time. On the Coastal Plain of Israel and in the Jordan Valley, sweet water marshes caused clay sedimentation dated ca. 2000 B.C. (Neev 1980), and the $^{18}$O, $^{13}$C curves of the Soreq Cave show a short, sharp increase in rainfall in 2100 B.C. In Egypt, the Nile reached an unusually high level around 2000 B.C. (Butzer 1997; Hassan 1997) and a new but short stage of flooding was identified in the dried lakes of Upper Egypt (Roberts 1982). From the early 2nd millennium B.C. the climate was similar to that of the present, with more moderate fluctuations. (see e.g. Bar-Matthews et al. 1998).

**Summery**

The growing amount of data is persuasive enough to accept that climate changes did occur in the past, and did affect human societies. Basically, 90 years ago Huntington was correct. Still missing is a higher resolution and accuracy of dating the climate phases, and the relations or correlations between various events in different regions. Due to the higher sensitivity of the desert ecological system, it is expected that climate changes had a significant effect on desert societies and on the settlement pattern. Nevertheless, climate changes alone did not dictate the desert’s fate; the response of human societies could also be a factor (A. Rosen 1997; Rosen & Rosen 2001). Both elements will be addressed in the following chapter.

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5. See the various articles in Dalfes et al. (eds.) 1997, and Peiser et al. (eds.) 1998, with syntheses of data and ample references, some of the articles are referred here.

CHAPTER 8. THE DESERT PALEOCLIMATE

Introduction

Climate changes may bear significant influence on any human society, and this is especially true in the desert where the ecosystem is more fragile than in other regions. Any change in the water balance (between precipitation and potential evaporation) may affect the carrying capacity of the area. The settlement scenario in the desert, as described in Chs. 2 and 9 raises the question whether the past climate was similar to that of the present, or different. Several studies in the past associated gaps in settlement to climatic deterioration. For example, a “hiatus” in settlement was described during the Late Neolithic in the southern Levant, explained by a severe and long period of desiccation (de Voux 1966; Perrot 1968; Moore 1973,1982; Mellaart 1975; Kenyon 1979). During such periods, the desert would have been drastically affected, and almost no human presence should be expected. However, the intensive farming in ‘Uvda Valley, and the increase in the number of sites during the 6th-5th millennia B.C. (and later) seem to indicate otherwise (see Tables 2a and b). Hence, the knowledge of the past climate is essential for understanding the past settlement pattern in the desert.

The first attempts to describe a sequence of climate changes in the Near East were made by Huntington (1912, 1924). Based on the available historical and archaeological information, in his first book he established a sequence from the 4th millennium B.C. to the early 20th century A.D. He related times of better climate to periods of political and cultural flourishing, and times of drought to “dark ages” and cultural crises. In his second book, he included descriptions of current climate changes, and their impact on various societies and cultures. Huntington’s theory was rejected by most scholars (e.g. Albright 1949:250f; Reifenberg 1955:22-23; Glueck 1968:7-12, 209-210, 1970:33-44, 184; Evenari et al. 1971:327), and references to his works are few. Still today several scholars assume that the past climate of the Negev was similar to the present (e.g. Finkelstein & Perevolotsky 1980:80; Henry 1992:137; Lipschitz 1996, 1998, 2001), or that only minor fluctuations occurred (Finkelstein 1995:35).

Numerous studies on paleoclimate were published during the last decades and continue to be, from various disciplines (geomorphology, oceanography, paleo-botany, paleo-zoology, isotope studies, astronomy, etc.). Discrepancies in the results are revealed, sometimes even within the same field of research. The main problems are the difficulties in the precise dating of climatic phases and in identifying short term fluctuations. Therefore, in order to obtain as reliable a picture as possible, a compilation of studies from the different disciplines is needed. Here, only a selection of the studies will be addressed, mainly from the Negev, Sinai and the surrounding deserts. In most paleoclimate researches radioactive dates are referred to as uncalibrated B.P., but here, all dates are calibrated B.C. (following OxCal 3.4, Ramsey 2000).

A. Data from the Negev and Sinai

Paleobotanical and paleozoological data from the Negev and Sinai are presently inconsistent. Most wood remains from Neolithic to EB are of species common in the area today, such as acacia, tamarisk, Atlantic pistacio and white broom, with rare occurrences of European olive. These appear to indicate no major differences in the vegetation and climate in comparison to the present (Lipschitz 1986, 1996, 1998). Pollen samples present a different picture. In the PPNB site of D1, near Sede-Boker, arboreal pollen comprised 8% of the profile, including olive, pine, and almond, which beside a few almonds, do not grow naturally in the Negev today. The non-arboreal pollen included 24% wild cereal (Gramineae) and sedge (Ciperaceae) (Horowitz in Marks 1976:66; Horowitz 1979:248). The latter indicate more water sources in the near vicinity than today, or even a constant water flow in Nahal Zin. Differences appear within a group of nearby Chalcolithic sites. Sites D60 and D62 yielded 8% arboreal pollen, with juniper, tamarisk and white broom, while the others (D61, 168-86 5A-1) contained 3% arboreal pollen, mainly of olive and oak (Horowitz, 1979:249). The Neolithic and Chalcolithic pollen samples seem to reflect a wetter climate than at present. Weathering patterns of endolithic lichens on stones in ancient Negev sites of various periods represent species of lichen associated with more rainy zones during the 8th-5th millennia B.C., which disappeared in the 4th millennium B.C. (Danin 1985). This study suggests a considerably wetter climate in the Negev during the Early and Late Neolithic, with desiccation during the Chalcolithic to the present level. Since then, no major changes occurred. Measurements of oxygen and carbon isotopes in land snails from the northern Negev showed low a ratio of $^{18}$O and $^{13}$C between 9000-2000 B.C., due to an increase in rainfall and a southward shift of $C_3$ type vegetation on which the snails subsisted. During the period of 5500-2000 B.C. the desert vegetation ($C_4$) shifted somewhat north, but it was still 20 km south of its present limit (Goodfriend et al. 1986; Goodfriend 1988, 1991). According to this research a rise in $^{18}$O ratio (i.e. desiccation) to the present value occurred ca. 1900 B.C.

1. Lipschitz (ibidem) distinguishes between macro and micro climatic changes. The latter are not represented in the dendroarchaeological studies, while the wood remains identified in archeological sites in the Negev from PPNB to the Early Islamic period do not show any change in the vegetational landscape throughout these periods.
Fauna in the PPNB site of D1 in the Negev Highlands included some cattle bones (*Bos primigenius*) and a red deer (*Dama mesopotamica*), which according to Marks (1976:351-353) imply the existence of groves along the wadis, and an average annual precipitation of approximately 200 mm, double that of today.

Identification of wood remains from ‘Uvda Valley generally indicate desert vegetation similar to the present, but with some differences. Five main species were used for combustion: tamarisk, Atlantic pistacio, white saxsaul and white broom (Liphschitz 1986, 2001). The same species were repeated in charcoal samples from Site 96 (4th-3rd millennia B.C.), recently analyses by Liphschitz (to be published), with the dominance of Atlantic pistacio. Tamarisk is found today around ‘Uvda Valley only near modern water seeps, and only five pistacia trees currently grow in the entire southern Negev. Tamarisk also dominated the charcoal samples from the Eilat burial site (13 of 21, 62%, Baruch in Avner, in press 1), but is absent today in the vicinity. This implies that in the past, the water table in both ‘Uvda and the Eilat burial site, was high enough to support the tamarisk. Additional possible indications of a better climate in 4th-3rd millennia B.C. ‘Uvda Valley are the initial results of pollen analyses from ‘Uvda 96 (by B. Tay May and L. Cummings), including sedge (*Cyperus* and *Scirpus* sps.), water plants that may indicate the presence of a spring or springs, which no longer exist today. These are attended by sweet water molluscs (*Melanopsis buccinoidea* of widespread terrace aggradation, 4-5 m high, was dated to the Chalcolithic period, at Siqmim, and in Nahal Be’er Sheva’, Nahal Besor and Nahal Nizzana. This occurred simultaneously with the deposition of loess, which is also associated with a wetter regime (Goldberg 1986, 1994; Goldberg & Bar-Yosef 1982, 1990; A. Rosen 1986). In Nahal Resisim, the Negev Highlands, sedimentation was dated to the second half of the 4th millennium B.C. (Goldberg & Bar-Yosef 1990). The same studies, however, dated the accumulation of sand dunes in the Mediterranean coast and in the northwestern Negev to the Neolithic and Chalcolithic periods, as well as erosion in some wadis. Both phenomena indicate phases of aridity. Possibly, the contradicting data implies some fluctuation of conditions during the Chalcolithic-EB 1.

Geomorphic research in the Negev and Sinai carried out in archaeological sites and ancient alluvial terraces, identified a few periods of sedimentation, implying a higher amount of rainfall. At Nahal Issaron, in ‘Uvda Valley, sedimentation was after the PPNB occupation, from 6000 B.C. and later (see ref. below). In the northern Negev a phase of widespread terrace aggradation, 4-5 m high, was dated to the Chalcolithic period, at Siqmim, and in Nahal Be’er Sheva’. Nahal Besor and Nahal Nizzana. This occurred simultaneously with the deposition of loess, which is also associated with a wetter regime (Goldberg 1986, 1994; Goldberg & Bar-Yosef 1982, 1990; A. Rosen 1986). In Nahal Resisim, the Negev Highlands, sedimentation was dated to the second half of the 4th millennium B.C. (Goldberg & Bar-Yosef 1990). The same studies, however, dated the accumulation of sand dunes in the Mediterranean coast and in the northwestern Negev to the Neolithic and Chalcolithic periods, as well as erosion in some wadis. Both phenomena indicate phases of aridity. Possibly, the contradicting data implies some fluctuation of conditions during the Chalcolithic-EB 1.

Several studies addressed the Holocene fluctuation of the Dead Sea water level. Begin et al. (1985) described a comparatively stable water level during the Holocene, ca. 400 m. Neev and Hall (1977) dated sediments that indicated a high water level from 8000 to 5800 B.C., a lower level from 5000 to 3000 B.C., and another high level stage in the 3rd millennium B.C. Goodfriend et al. (1986) presented discovery of salt-coated land snails near Qumran, at an elevation of -280 m, dated ca. 5700 B.C. This indicates a rise of the Dead Sea level by 120 m above present, which implies a major increase in rainfall in the drainage system of the lake in the 6th millennium. Frumkin et al. (1991, 1994), based on the level and size of caves near the southern Dead Sea, and on dated wood remains from the caves, showed a 120 m higher level of the Dead Sea from 8000 to 5900 B.C., a decrease to the present level in the mid 6th millennium, another rise of 100 m from 4000 to 2800 B.C., and then a drop during the 3rd millennium to the lowest level ca. 2300 B.C. In both phases of decrease, the southern basin of the Dead Sea dried out.

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2. Charcoal samples from the same layer have been submitted for 14C dating.

3. The water plant pollen and sweet water molluscs do not necessarily indicate nearby water sources, since they could have been brought to the sites by man.
A study in the Soreq Cave, based on $^{18}$O and $^{13}$C rates in stalagmites and stalactite rings, presented a complete sequence of climate changes during the last 300,000 years. Ample of Th/U datings permitted high resolution of defining fluctuation in rainfall (Bar-Matthews et al. 1997, 1998, the latter address the last 7000 years). The site is located in the Mediterranean Zone, some 100 km north of the Negev Highlands, but it is relevant to a much broader area. The results are as follows: During the 8th to 4th millennia B.C. the rainfall was higher than at present. A comparatively dry period occurred around 6200 B.C. and during the Late Neolithic a gradual desiccation took place, but these periods were still wetter than present. The desiccation reached it maximum at ca. 4800 B.C., still somewhat wetter then present, while the Chalcolithic period was considerably wetter. The Early Bronze Age experienced frequent fluctuations, with a gradual increase in rainfall during the EB I-II and two sharp dry episodes in 3200 and 2800 B.C. (which are not recognized archaeologically). The EB III was comparatively wet, followed by a dry episode which occurred in 2300 B.C. and a recovery of rainfall above the present level in the EB IV. Interestingly, a climatic crisis in the late 3rd millennium B.C., addressed in many studies (see below), appear here as less significant. From ca. 2000 B.C. the rainfall was generally similar to the present, with comparatively limited fluctuations. The present average annual rainfall in the Soreq Cave area is 500 mm, and the calculated past precipitation, based on the $^{18}$O and $^{13}$C isotope rates, suggest a fluctuation of ±100 mm, i.e. ±20%.

B. Data from Other Near Eastern Deserts

1. The Arabian Peninsula

The Rub al Khali, today a virtually sterile “sand ocean” in the central Arabian peninsula, contains remains of ancient fossil lakes. Layers of organic material and sweet water shells from various depths have been dated radiometrically to the 8th-6th millennia B.C., indicating wet periods, (McClure 1976). A Neolithic population lived around the lakes until the end of the 3rd millennium B.C. and subsisted on herding and agriculture. Finds from these sites included bones of wild ox, several antelope species and ostrich egg shells, which testify that savannah vegetation characterized the area (Zarins et al. 1980:19-21, 1981:20; Edens 1982, with refs.). A similar settlement pattern is revealed in the Nefud desert, with Neolithic settlements (8th-3rd millennium B.C.), attended by rich fauna depicted in rock art (Garrard et al. 1981, Zarins 1982).

Indications of a wetter climate have been observed in other parts of the Arabian peninsula. Alluvial sedimentation in terraces of Wadi Dawasir, central Arabia, swamp sedimentations in Juba Oasis and Wadi Lahi, and travertine sedimentation in Ein Qanas, the al Hesa Oasis, have all been dated to the 8th-5th millennia B.C. (Garrard et al. 1981; Oates 1982). In the Tihama Plain, southwestern Saudi Arabia, playa (Sabkha) sediments were dated to the 5th-3rd millennia B.C., surrounded by Neolithic sites (Zarins & Al-Badr 1986). Geomorphological research in the same area indicated water flow from wadis which created the playa from 4800 to 3200 B.C., simultaneous with the rise of the Red Sea level by 2-3 m. Thereafter, the flow ceased and the sea level gradually decreased to the present level (Marcolongo & Palmieri 1992). On the eastern side of the peninsula an extensive settlement of the ‘Ubeidian culture spread from Mesopotamia, from the mid 5th to mid 4th millennium B.C. A wetter climate is the primary explanation for this expansion (Oates 1982; Zarins et al. 1982). A multi-disciplinary compilation of data, combined with series of $^{13}$C dates from various sites, also indicates a wetter climate in the ‘Arabian peninsula during the 8th-4th millennium B.C. (Sanlaville 1992).

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4. MacDonald (2001), under the title of climate changes in Jordan, actually summarized paleoclimatic studies from Israel.
2. Northern Africa

In upper Egypt, in presently arid and uninhabited areas, several lakes existed from the late 8th millennium B.C. to the late 6th millennium B.C., followed by some decrease in the second half of the 6th millennium (Roberts 1982). Renewed research in lake remnants of Gilf Kebir, supported by 43 radiometric dates from sediments, showed that the lake reached its maximum during the 5th millennium B.C. It was surrounded by comparatively rich semi-desertic flora and fauna, as well as Neolithic sites. In the early 4th millennium B.C. the sand dune that had dammed the lake was breached, the lake ceased to exist, but the Neolithic settlement continued until 2900 B.C. (Schon 1989) or until 2500 B.C. (Kröpelin 1987). In the Nile Delta two short phases of some decrease of sedimentation were identified, ca. 6300 and 5400 B.C. Between them, and later, a red paleosol had accumulated, indicating an increase of rainfall in lower Egypt. A gradual reduction in Nile sedimentation is marked throughout the 3rd millennium B.C. (Butzer 1975, 1998; Hassan 1997). In the Fayum Basin the lake level was higher than today, up to 20 m, from 7400 to 6000 B.C., a short deep decrease ca. 4100 B.C., and a low level during most of the 3rd millennium B.C. (Hassan 1997; Butzer 1998).

In the fossil lakes of the Sahara, a wet phase has been dated between 7500-5900 B.C. (Street & Grove 1979; Nicholson & Flohn 1980; Petite-Maire et al. 1997). Pollen analysis of the fossil lakes in Sudan pointed to a northward shift of the monsoon belt by 500 km from its present location between 10000 and 3000 B.C. (Kutzbach & Street-Perrott 1985), or up to latitude 22° (Ritchie & Haynes 1987). In the Libyan desert pluvial periods were determined by 18O rates and 14C dates of underground water bodies, around 7400 B.C. and from 6500 to 3200 B.C. Two peaks of wetness were identified around 7400 and 3800 B.C. and a short, comparatively dry phase, ca. 5500 B.C. Since ca. 2000 B.C. the climate has remained as dry as today. The pluvial periods are explained by a northward shift of the monsoon belt (Edmunds & Wright 1979). Support of the Sahara scenario is found in a study of oxygen isotope rates, fauna and sapropelic sediments in 47 deep sea cores in the Mediterranean, north of Libya (Fontugne et al. 1994). The results indicate a substantial flow of sweet water into the Mediterranean between 8000-2500 B.C., with a maximum inflow from 8000 to 6800 B.C. This study proposes that one or more rivers existed in Libya and contributed sweet water to the Mediterranean. A moderate rise of 18O rates in sea shells is observed during the 4th-3rd millennia B.C., i.e. a gradual reduction in the sweet water over this time-span (Fontugne et al. 1994). Many rock drawings dated to the “pre-pastoral Neolithic” (8th-7th millennia B.C.), present tropical fauna, followed by numerous drawings of herd animals (Lohte 1958, 1961; Hays 1975; Muzzolini 1994, 1995, Ch.1). Pollen analyses from the Hojar Heights, in the central Sahara, a very arid area today, have shown a mixed Mediterranean and tropical vegetation between 6000-2300 B.C.; and across the Sahara, many Neolithic sites existed from the 8th millennium until the end of the 3rd millennium B.C. (Camps 1958, 1961; Hays 1975; Muzzolini 1994, 1995, Ch.1). Pollen analyses from the Hojar Heights, in the central Sahara, a very arid area today, have shown a mixed Mediterranean and tropical vegetation between 6000-2300 B.C.; and across the Sahara, many Neolithic sites existed from the 8th millennium until the end of the 3rd millennium B.C. (Camps 1975; Hays 1975, 1992; Aliman 1982; Petite-Marie et al. 1997).

C. Synthesis of Data

1. The 8th-4th Millennia B.C.

The studies referred to here are only a small selection from a larger and ever growing body of researches. Discrepancies are mainly due to difficulties in precise and uniform dating of climatic phases, and insufficient resolution of defining the climatic phases. Nevertheless, there is a wide range of correlation between studies in different fields and different regions, and a dominant line does emerge:

From the 8th to the end of the mid 4th millennium B.C. the prevailing climate in the Near Eastern deserts was somewhat wetter than today, with increased precipitation. Large areas were favored by the monsoon (see below) while others remained deserts, but with more water sources and richer flora and fauna. Several studies indicated a slightly higher annual average temperature (mainly in winter), and higher relative humidity than today, implying a lower rate of evaporation. Between 6000-4300 B.C. there were comparatively dry intervals, mainly in the 6th millennium, but they were short and still moister than the present. Gradual desiccation began in the mid 4th millennium B.C., continued to develop in the 3rd millennium B.C., along with frequent fluctuations (see below).

It should be remembered that in a desert environment, even minor changes in rain and evaporation rates would have a significant impact on the carrying capacity, particularly if 20% more rainfall, as calculated in the Soreq Cave, is applied to the desert during the wetter periods. More so, several studies have proposed a northward shift of the African monsoon belt during the Neolithic and Chalcolithic periods (Gat & Magaritz 1980; Roberts 1982; Kutzbach & Street-Perrott 1985; Goldberg & Rosen 1987; Goldberg 1994), and a northeastern shift of the Indian monsoon (Zarins 1992; Sanlaville 1992) covering most the Arabian Peninsula as far as northern Hejaz. According to Simmons (1997), the monsoon rains heavily affected southern Jordan and caused destructive floods. Another theory suggests local summer rains across the Near East until the early 6th millennium B.C. (El Moslimani 1994). If indeed occasional monsoon trajectories reached the Negev and Sinai, then a single summer rain could have significantly improved the carrying capacity and living conditions in the region. It could have eased the most crucial problem of living in the desert, the availability of drinking water for man and animal, from both natural sources and man-made reservoirs (see Ch. 2).
2. The Climate of the 3rd Millennium B.C.

During the 3rd millennium B.C. most indications of a better climate disappeared, and it seems that gradual desiccation occurred. The Dead Sea level was sharply lowered, reaching its minimum in the late 3rd millennium B.C. (Frumkin et al. 1991, 1994). In Tel Aviv excavations, an accumulation of sand was observed on top of Early Bronze remains, an indication of desiccation (Ritter-Kaplan 1984). In the northern Negev and the southern Shefelah of Israel, the fine bedding of silt on flood plains ceased (A. Rosen 1997). In the northern Near East lake levels decreased (Roberts 1982), and in the Euphrates Valley and the Persian Gulf, no indications were found for the previous increased flow of the rivers (Al Asfour 1978; Luz 1982). In the Nile Delta, the sedimentation rate significantly decreased, and the lake level in the Fayum Basin decreased (Butzer 1975, 1998; Hassan 1997). The Sahara lakes began to dry around 2500 B.C. (Street & Grove 1979; Gasse 1980), and on the Hojar Heights, the tropical and Mediterranean elements disappeared from the pollen spectra (Hays 1975; Camps 1975; Aliman 1982). The climatic scenario received from the $^{18}O$ and $^{13}C$ curve of the Soreq Cave is somewhat different. It does indicate decreased rainfall during the first four centuries of the 3rd millennium, but also an increase of rain from ca. 2600 to 2300 B.C., followed by another decrease (Bar-Matthews et al. 1998).

For the late 3rd millennium B.C., worldwide and extensive accumulating data points to an abrupt climatic crisis which occurred sometime between 2300 and 2200 B.C. An ashy dust layer identified in north Syrian sites was first interpreted as a result of a major volcanic eruption, that created a “volcanic winter” (Weiss 1997; Courty & Weiss 1997). Now, based on the composition of the dust layer, the possibility of asteroidal impact is being examined, that perhaps struck somewhere in northern Syria (Courty 1998; Peiser 1998). Although currently there is no agreement on the exact nature of this crisis, it is widely agreed that an abrupt climate change was one of the major contributing factors for the drastic political and socio-economical changes, at least in large parts of Asia and Africa. In the Near East, the Old Kingdom of Egypt disintegrated (Bell 1971; Hassan 1997; Butzer 1997). In Israel, the EB III city state system collapsed (e.g. Dever 1980; Mazar 1990:141-143; Butzer 1997), a similar process occurred in Mesopotamia (Weiss et al. 1993), and Anatolia passed severe social disorder (Yakar 1976). Immediately thereafter, wetter signs appear again for a short time. On the Coastal Plain of Israel and in the Jordan Valley, sweet water marshes caused clay sedimentation dated ca. 2000 B.C. (Neev 1980), and the $^{18}O$, $^{13}C$ curves of the Soreq Cave show a short, sharp increase in rainfall in 2100 B.C. In Egypt, the Nile reached an unusually high level around 2000 B.C. (Butzer 1997; Hassan 1997) and a new but short stage of flooding was identified in the dried lakes of Upper Egypt (Roberts 1982). From the early 2nd millennium B.C. the climate was similar to that of the present, with more moderate fluctuations. (see e.g. Bar-Matthews et al. 1998).

**Summary**

The growing amount of data is persuasive enough to accept that climate changes did occur in the past, and did affect human societies. Basically, 90 years ago Huntington was correct. Still missing is a higher resolution and accuracy of dating the climate phases, and the relations or correlations between various events in different regions. Due to the higher sensitivity of the desert ecological system, it is expected that climate changes had a significant effect on desert societies and on the settlement pattern. Nevertheless, climate changes alone did not dictate the desert’s fate; the response of human societies could also be a factor (A. Rosen 1997; Rosen & Rosen 2001). Both elements will be addressed in the following chapter.

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5. See the various articles in Dalfes et al. (eds.) 1997, and Peiser et al. (eds.) 1998, with syntheses of data and ample references, some of the articles are referred here.

CHAPTER 8. SETTLEMENT PATTERN IN THE DESERT

Introduction

The first attempt to build an overall occupational history of the desert was made by N. Glueck (1935, 1961, 1968, 1970) who recorded ca. 1,000 sites in the Negev (see Baron 1978, 1981). His basic outline was the distinction between periods of settlement and gaps. The first was characterized by permanent settlement and agriculture, whereas during the latter only a sparse bedouin population roamed the area, destroying existing cultural remains and leaving no traces of their own (Glueck 1935:183; 1968:11-12, 127; 1970:11-12, 65). The periods of settlement he identified were the Chalcolithic (almost totally restricted to the Beer Sheva Basin), the Middle Bronze I, the Iron Age II, and the Hellenistic-Roman-Byzantine, with some continuation into the Ummayad period. The periods of gaps in settlement were the Early Bronze through Late Bronze, the Iron Age I, the Persian period and the time-span from the 8th century A.D. to present (Table 17).

In numerous subsequent studies scholars adopted Glueck’s “up and down” pattern (e.g. Reifenberg 1955; Rothenberg 1967b; Evenari et al. 1971; Baron 1981). During the 1960s, Rothenberg conducted a survey along the southern ‘Araba Valley and the Eilat area, in which he recorded 216 sites (Rothenberg 1967a, 1970:7; Rothenberg and Cohen 1968), including those discovered earlier by A. Musil, F. Frank and N. Glueck. The periods of settlement he identified were the Chalcolithic, the Iron Age I (mainly related to copper production), the Nabatean, Roman, Byzantine and the Middle Ages, with gaps between them (Table 18). Forty-nine sites were undated. Generally, Rothenberg’s pattern was similar to that of Glueck, but with four differences: 1. The Chalcolithic period, almost absent in Glueck’s survey south of the Beer Sheva Basin, was a highly intensive settlement period in Rothenberg’s survey; 2. From the MB I, one of the most intensive periods in Glueck’s survey, Rothenberg found only one site (with two others questionable). Indeed, the same type of sites were attributed by both scholars to different periods; 3. The Iron Age I settlement (later found to begin in the LB II) was not identified by Glueck; 4. Rothenberg did not relate any site to the Early Islamic period, while Glueck described some continuity from the Byzantine to the Ummayad period. Rothenberg has published several corrections to his historical line (see Ch. 1), but maintained that the southern Negev was uninhabited during most of prehistory and history.

The Negev Emergency Survey, begun in 1979, opened a new chapter in the Negev research. It was launched in preparation for the redeployment of the IDF from Sinai, headed by Eitan (1979) and Cohen (1988). The survey primarily concentrated in the Negev Highlands, eventually covered only ca. 30% of the Negev area but contributed some 11,000 sites previously unknown; ca. 100 sites were excavated. To date, nine “maps” were published, covering 90 sq km, ca. 12% of the Negev area.1 The ample new information basically confirmed Glueck’s “up and down” view, with one major difference. The EB II emerged as the most intensive settlement period in the desert, excluding the Byzantine-Early Islamic (Table 19).

Another survey began in 1982 by Anati in the Har Karkom area, where 821 sites were recorded in an area of 200 sq km, (Anati 2001:162). The predominant period of settlement is termed “Bronze Age Complex” (BAC) which includes the Chalcolithic and EB. Only very few sites were identified as Neolithic, and no sites were dated to the 2nd and 1st millennia B.C. (Table 20).2

Despite differences in the survey results, most scholars agree that the desert was inhabited only in certain periods, and various explanations have been suggested for the “up and down” phenomenon. Most popular is that relating archaeological remains to the initiative of strong polities in the neighboring fertile lands, or even that settlers from outside the desert were those who left behind these remains.3

Rosen (1987b, 1994:22-24) presented the clear “up and down” settlement pattern in the survey of Makhtesh Ramon, but pointed at four different factors that affected the settlement history. In his analysis, the external influence was only one factor, along with climatic changes, the general developments in the Near East and internal developments. A more complex explanation for the desert settlement history was offered by Finkelstein. Based on the concept that nomads always lived in the desert but usually did not leave any remains, he suggested two different models. One is that

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2. The survey of the Har Karkom area is not yet published, but principle results appeared in many publications (e.g. Anati 1986, 1987, 1993, 2001); they mainly emphasize the identification of Har Karkom as Mount Sinai, and date the exodus to the 4th-3rd millennia B.C. The “BAC” concept is briefly presented as a working hypothesis, although two pottery phases were identified (EB II and MB II, and three different peoples are assumed to have lived in the area (Anati 1986:88-100). No discussion was published to support the “BAC” concept and terminology.

the desert nomads prospered simultaneously with the prosperity in the fertile lands, combined with a political vacuum in the south. This situation enabled the desert tribes to take control of the Arabian trade and of the copper production and trade, which contributed to their economy and political power. Their prosperity encouraged them to shift to sedentism, resulting in archaeological remains in the desert (Finkelstein 1988; Finkelstein & Pervolotsky 1990). The other model is that nomadic populations shifted to sedentism, and left archaeological remains when the neighboring fertile lands were under crisis. This forced them to become farmers and produce the grain they usually acquired by trade with the settled populations (Finkelstein 1989, 1990). In another publication (1995) Finkelstein attempted to combine both theories.

Another common concept is that the desert populations were always migrants or intruders. Rothenberg (1969:28-30, 1970:15, 1971a:62, 1973:35) described a Chalcolithic invasion into Sinai from the northeastern Fertile Crescent through southern Jordan, thus accounting for the ingenuity of the southern Sinai Chalcolithic civilization. The EB II population of southern Sinai was assumed to have migrated from ‘Arad (Amiran et al. 1973; Beit-Arieh 1974, 1981a,b, 1983), but also from Arabia (Beit-Arieh 1986:52); the EB population of ‘Arad and the Negev Highlands migrated from Sinai (Govrin 1990; Haiman 1992b:102). Cohen (1999:11-12) related the EB settlement remains to a population that arrived from north or west, with developed material culture and technology. The EB IV population migrated from Central Asia (e.g. Kenyon 1966:14; Lapp 1966:100-113; Kochavi 1967:250-256; Mazar 1968:68); Aharoni (1978:80) described the MB I (=EB IV) population of the Negev as refugees from the north, while Cohen (1983) saw them as penetrating from Sinai.

Surveys in the southern Negev (south of Makhtesh Ramon and down to Eilat), which is environmentally harsher than the Negev Highlands (see Ch. 1), revealed a different pattern of settlement. In addition to the 216 sites recorded by Rothenberg, my own surveys were aimed at areas selected for civilian development and military use. They were published only briefly, but the major issues which emerged have been discussed in some depth. To date, 1650 sites have been recorded in the southern Negev, and they continue to be discovered. Surprisingly, the Eilat region (from the ‘Uvda Valley to Eilat) is the richest in archeological sites in the southern Negev, despite being the most arid. Approximately 1500 sites have been recorded to date in an area of 1200 sq km, of which only 7% enjoyed a detailed archaeological survey (including Timna Valley, by Rothenberg).

The settlement pattern emerging from surveys and excavations in the southern Negev, seem to challenge the above mentioned concepts of desert settlement history. It presents a continual occupational sequence during the last 10,000 years, from PPNB to present, with no gaps at all. Before discussing the chronological framework, four main points should be stressed:

1. In the southern Levant deserts, true nomadism was never practiced. Instead, populations were basically semi-nomadic and unlike full nomads, who relied on herding alone, they subsisted on a complex economy. They sometimes altered their mode of life, whether towards more mobility or more sedentism, in response to climate changes (see Ch. 7) or political changes (Marx 1992, 1996; Khazanov & Bar- Yosef 1993:461-2; cf. Helms 1982; Hanbury-Tenison 1989; Finkelstein 1995, and see further discussion in Ch. 2). One of the preconditions for true nomadism, except in rare cases, is a pack animal that can carry baggage hundreds of kilometers twice a year. In the Negev and Sinai deserts it could only be the camel (e.g. Khazanov 1986:99-102) which was not yet domesticated in the 6th-3rd millennia B.C. (see Ch. 2). Semi-nomads always leave remains, and even true nomads leave remains (e.g. Cribb 1991; Rosen 1992), but since we are not discussing true nomadism in the Negev and Sinai, the debate on this point is irrelevant.

2. During the 6th to 4th millennia B.C. (Late Neolithic through EB I) no strong polity can be envisioned in neighboring fertile lands, that could be responsible for the archaeological remains in the desert. Therefore the desert remains belong to the indigenous population. Since the theories relating desert archeological remains to foreign initiatives are invalid for these periods, their validity for later periods is also challenged.

3. The presently compiled data on the paleoclimate (Ch. 7) points to somewhat milder conditions than today during the 8th-4th millennia B.C. In contrast to previous theories, there was no climatic reason for any settlement gap. If indeed monsoonal trajectories occasionally penetrated the area, then a single summer rain a year could have had a significant influence on the carrying capacity of the desert. The gradual desiccation of the 3rd millennium B.C. is in sharp contrast to the contemporary climax of settlement in the desert, and even the global climatic crisis ca. 2300 B.C. did not force the population to evacuate the desert (see below).

4. Reconstruction of the past settlement picture is largely based on archaeological surveys. In the Negev and Sinai they indeed yielded large numbers of sites, but still, only small parts of the area have been systematically studied.

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4 Avner 1979, 1982a, 1989a,b,c, 1993a, 1997a,b,c; in press 6, Avner & Naor 1978; Avner & Roll 1996.
surveyed, and the overall settlement picture is far from complete. Especially crucial is the correct dating of the surveyed sites, and in my opinion, this is always problematic in the desert. For example, the specific attribution of hundreds of sites in the Negev Highlands to the EB II was unjustified. The emphasis on this period was at the expense of the preceding and following periods, and on the account of the reliability of historical reconstruction (see below). After excavations of tens of sites in the Negev Highlands, only nine $^14$C dates are currently available from the 6th -3rd millennia B.C., six of which fall within the 3rd millennium B.C. On the other hand, 71 dates from the southern Negev, 31 dates from southern Jordan and 79 dates from Sinai present a very different picture, one of a complete sequence of settlement throughout this time-span, with no gaps (Tables 1, 2a). The sites represent a wide range of activities, and in some areas, even permanent settlements (see Ch. 2).

5. Due to difficulties in typological dating of desert sites, radiometric dates are essential, despite limitations of the method. Radiocarbon results from the desert are often questioned (orally) for three main arguments: A. Wood is better preserved in a desert environment and an undeterminable period of time may have elapsed from the tree’s death until it was burned. B. Due to the better preservation, wood may have been repeatedly reused before burning. C. Charcoals samples may originate from the core of tree trunks, which yield dates tens or even hundreds of years prior to the tree’s death. In my opinion and experience, this is not necessarily the case, for the following reasons: A. Combustible material is never common in the desert, and therefore, any available wood is collected when found, and soon consumed. B. The third argument may be valid, but in my own excavations I selected bush remains and twigs for $^14$C dating. Consequently, the $^14$C dating of desert sites is presently more reliable and objective than the typologically-based dating.

The unavoidable preliminary conclusion is that the theories regarding the settlement pattern of the Negev and Sinai demand serious reevaluation. The following discussion will be based on the Near Eastern archaeological periodization, although it is not easily applicable to the desert history (see Ch. 1). For the sake of the discussion, Calibrated $^14$C dates are attributed to periods “mathematically”, with references to Tables 1, 2a and 2b.

A. The Neolithic Period

1. The Pre-Pottery Neolithic B

Sites of the PPNNB (ca. 8000-6000 B.C.) are known from all desert areas of the Levant. Some 20 sites were recorded in the Negev Highlands, but in some architectural remains are limited or absent. Two habitation sites with architectural remains were excavated in the western Negev Highlands, Abu Salem and ‘Ein Qudis I (Gopher et al. 1995, 1998; the latter in Sinai), and another, Masad Mazzal, in the northern ‘Araba Valley (Taute 1981). In eastern ‘Uvda Valley seven PPNNB sites were recorded during the survey, three were stone built habitation sites, others were flint workshops and camp sites (Avner 1979, 1982a). Another habitation site is near ‘Ein Ketura, north of ‘Uvda (Avner and Naor 1978). Neolithic material was also found in two caves in the Eilat Mountains (Avner 1982b) and in a camp site in Timna’ Valley (Eshel 1990). Two of the ‘Uvda Valley sites were excavated: one in Nahal Re‘uel (Site 20, Ronen et al. 2001) and the other at the mouth of Nahal ‘Issaron (Site 14, Goring-Morris and Gopher 1983, 1987, and see further details on both sites in Ch. 2). Another large site was recorded near Be‘er ‘Adah (Avner 1997a), probably dated to the terminal PPNNB and LN. In southern Sinai one site had already been excavated by Currelly (in Petrie 1906:240) and an extensive study of the PPNNB began in 1975, with the excavation of four additional sites. An intriguing PPNNB $^14$C date should be mentioned, retrieved from the copper of Timna’ S 27 (Table 1, 34). Circumstantial evidence supports the possibility that mining of copper ore took place before the coming of metallurgy (see Ch. 3).

In southern Jordan PPNNB sites were first discovered in the 1960s, the most significant site to be excavated was Beidha (Kirkbride 1960, 1966, 1968a,b). Several additional sites were discovered in the following decades (Kirkbride 1978; Raikes 1980; Henry 1982:438-40), but since the late 1980s a new picture began to emerge with the discovery and excavation of a series of large well-built permanent villages, with orthogonal two story buildings. The differences between these sites and those of the Negev and Sinai are remarkable. The latter are small (up to 500 sq m, Fig. 2:6) built of compact circular architecture for one extended family, with no signs of plant or animal domestication (see Ch. 2). The former represent a higher level of social organization and an economy which included domesticated plants and animals. The differences are most probably due to the different ecology of both zones (see Ch. 1). However, a “desert type” site was also discovered and excavated north of Petra (Kaltsian et al. 2002).

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5. For further problems in $^14$C dating of archaeological deposits see e.g. Bar-Yosef & Kra 1994:5-7.


2. The Late Neolithic

Sites of the Late Neolithic (6000-4500 B.C.) were scarcely recognized in the desert until quite recently. In the Negev Highlands only two sites were known, one is Qadesh Barne'a 3 in Sinai (Bar-Yosef 1987a; Table 1:4) and the other, a small site on Har Harif- E22Hch 1 (Marks 1969; Florenbaker 1997; Table 1:7). Only three additional small sites were recorded during the last two decades (Lender 1990, Sites 51, 349; Avni 1992, Site 251). In southern Sinai, a single LN site has been recorded, at Wadi Jiba' (Gopher 1985:166-168). Nevertheless, the desert was not devoid of human presence and activity during this period.

In the Negev, a number of sites were dated to the Late Neolithic by both artifacts and 14C. At the Nahal ‘Issaron site (‘Uvda 14), Stratum B is dated to this period (Goring-Morris and Gopher 1987:18; see here Ch. 2 and Table 1:29), and in two additional sites of ‘Uvda Valley (Sites 7 and 9) lower strata were dated to the late 6th millennium B.C. (Table 1:21, 25), with “Haparsah” and transversal arrowheads. No architecture is attributed as yet to these strata due to the limited probes. In another site, ‘Uvda 124/IV, Wadi Raba sherds were found within layers of the 4th-3rd millennium B.C., and the flint blades also hint for the LN stage, presently visible in a single wall (Khalaili in Avner in press 7).

Late Neolithic occupation was also found in three cult sites in ‘Uvda Valley. An early 6th millennium B.C. 14C date derived from a hearth at the foot of a broad ‘massebah’ in Site 9 (=124/XVII, Table 1:22, second date) coordinates with ‘Haparsa’ points from the probes in the adjacent courtyard. Later use of the shrine continued to the end of EB IV (see Ch. 4). A similar situation was found in the open sanctuary of ‘Uvda 6, with four 14C dates in the mid 6th millennium (Table 1:20), while surface finds indicate continuation of use until MB II (see Ch. 5). Another ‘masseboth’ site, ‘Uvda 151, is dated to the end of the LN (Table 1:26 and see Ch. 4). Also important is the dating of the Eilat burial ground by a series of ten 14C dates (see Appendix 1; Table 1:39), nine from hearths and one from the remains of unburned sacred wood (Fig. 10:22). They indicate some 1200 years of use of the site, from mid 6th to the second half of the 5th millennium B.C.

In eastern Sinai, three habitation sites excavated by Kozloff and three sites excavated by Eddy & Wendorf are also dated by 14C as LN (Table 1:46, 48, 50, 51, 54, 55), and two additional sites (Table 1:49, 52) are dated to the transition from LN to Chalcolithic. In most of these sites Chalcolithic and EB occupation was also indicated by the 14C dates. Another habitation site near ‘Ein Um Ahmad and an adjacent namus tomb excavated by Goren (unpublished) were also dated to the turn of the LN, with continuation into the Chalcolithic (Table 1:59, 60, 63). “Haparsa” points discovered in the site of Jebel Guna 50 (Bar-Yosef et al. 1986, Fig. 11) also indicate LN occupation, although most material is of the following periods. Open sanctuaries of the Jebel Hashem al-Taref cluster were dated to the mid and late 6th millennium B.C. (Avner 1984, Eddy & Wendorf 1999:280, and see Table 1:47); the ‘masseboth’ shrine of Wadi Daba’ya was dated to the early 5th millennium (Table 1:65). A 14C date of the early LN is interesting, retrieved from a turquoise mine at Jebel ‘Adideh in southwestern Sinai (Table 1:69).

In southern Jordan the largest and best known LN site is Tel Wadi Faynan, with an 8 m high accumulation of cultural sediment and nine 14C dates, almost all within the 6th millennium B.C. (Table 1:13). During the surveys of Wadi el-Hasa and the northern ‘Araba Valley about 30 sites were dated to the Late Neolithic and Chalcolithic periods, half were cautiously recorded as Late Neolithic-Chalcolithic. In the later building phase (Nissen et al. 1991:21-23), and a similar situation was also discovered further south in ‘Ayn el-Jammam (Waheeb & Fino 1997:216-217). A large Neolithic-Chalcolithic site, more than one acre in area, has been observed near Wadi Ram by Stanley Price & Garrard (1975), and the nearby unique site of Risqeh should also be dated as LN (see Ch. 4, Note 19 and Table 1:42).

Until quite recently most of the period was considered a profound gap in settlement in the southern Levant in general, due to a prolonged period of desiccation (Moore 1973:37-41,1982:16,25; Mellaart 1975: 67-69), when the desert was almost totally uninhabited (Moore 1973:65). A severe crisis in settlement at the end of PPNB-PPNC is still general, due to a prolonged period of desiccation (Moore 1973:37-41,1982:16,25; Mellaart 1975: 67-69), when the desert was almost totally uninhabited (Moore 1973:65). A severe crisis in settlement at the end of PPNB-PPNC is still accepted today12. However, the LN sites mentioned here, mostly discovered in recent years, and the accumulation of 14C dates (Table 2) forges the LN in the desert to emerge from darkness. The discovery of LN strata underneath later ones, makes it probable that the settlement distribution of the period in the Negev, Sinai and southern Jordan was more

10 I prefer the term “Late Neolithic” over “Pottery Neolithic”, since recognized PN pottery is seldom found in desert sites, and the life-span of local pottery is still unclear (see below).

11. ‘Tumuli’ tombs were traditionally dated to the EBIV (MBI) though with no justification. Chalcolithic tumuli were already excavated in the 1930s by Stekelis (1935, 1961), and later near Bab edh Dhra’ (Clark 1979), and an EBII date has been suggested for tumuli in the Negev Highlands (Haiman 1989a,b). 14C dates of the 5th millennium were obtained from tumuli in Wadi Zalaqa, eastern Sinai (Table 1:63), and now the dates from Eilat show that this type of burial had already appeared in the desert in the mid 6th millennium B.C.
intensive than is believed today. At least in the southern Negev and eastern Sinai, numbers of sites and population increased from the PPNB to LN.

This view may be seen as too revolutionary. However, it is interesting that similar phenomenon is also observed in eastern Jordan, in the Azraq basin (Baird et al. 1992:1), in the Harra (Betts 1998:159) and in the ‘Arabian peninsula where a “population explosion” is described in this period (Zarins 1998:187). It is hard to imagine a reason for the increase in the number of sites other than the introduction of grazing and agriculture into the desert.

3. The Chalcolithic period (4500-3600 B.C)\(^{13}\)

The intensive Chalcolithic settlement of the Beer Sheva Basin is well known (see Ch. 4), but further south Chalcolithic sites are few and small. The impression is that the “Be’er Sheva’ culture” hardly penetrated the Negev Highlands (e.g. Gophna 1979:207; Cohen 1981:9). Indeed the period is somewhat elusive in the Negev, due to the rarity of recognized Chalcolithic artifacts. The present lack of definite Chalcolithic copper industry in both the Faynan area and Timna’ Valley (see Ch. 4) only enhance this impression. Nonetheless, the desert was not deserted at all during this time.

In the western Negev Highlands, Rosen (1984a) excavated the site of Kvish Harif, with a Late Neolithic-Early Chalcolithic flint assemblage, and a single Chalcolithic 14C date (Table 1:6). Another site, in Nahal Mitman, was excavated by Haiman and Rosen (1985; Haiman 1986, Site 25), who dated it to the Chalcolithic on the basis of core tools and transversal arrowheads. Two other surveyed sites were similarly dated by core tools (Haiman 1993a, Site 196; Rosen 1994, Site16); and 13 additional surveyed sites were attributed to this period without confidence and with no characteristic finds; most of them contain limited or no architecture.\(^{14}\) Cohen (1999:15-36) listed a total of 16 Chalcolithic sites surveyed by various teams in the entire Negev Highlands, (including sites mentioned here), but noted that more sites are yet unpublished. These are settlement sites with architecture, but one is actually the open sanctuary cluster of Makhtesh Ramon (=Ramat Saharonim), erroneously described as a settlement. Near Ein Yahav, in the northern ‘Araba Valley, a large Chalcolithic camp site was recorded by Beit-Arieh and Gophna (1977), 500x200 m, and additional sites containing flint adzes were discovered by G. Ragolski (unpublished) in the central ‘Araba. (cf. Ch. 4, and Fig. 2:67).

In fact, the real number of Chalcolithic sites in the Negev Highlands may be much higher than recognized today. Surveyed sites were often dated as EB II, even if they contained core tools,\(^\text{15}\) which are actually only dated to the LN and Chalcolithic (see Ch. 2). Moreover, it will be demonstrated below that the most common artifacts used in the Negev Highlands survey as indicators of EB II specifically, or the EB in general, had a much longer life-span, from LN to EB III and EB IV.

In the southern Negev and eastern Sinai, archaeological remains and \(^{14}\)C dates indicate Chalcolithic occupation in several sites. In ‘Uvda Valley, several habitation sites yielded core tools, in Site 57 Chalcolithic fragments of pottery and stoneware were collected during the survey (Fig. 2:24), and habitation Site 4 is dated by \(^{14}\)C to the late 5th millennium B.C. (Table 1:18). On Yotvata Hill, a core of a compacted earth rampart previously attributed to the Iron Age fortress (Meshel 1990:20, 38) is now dated by \(^{14}\)C to the Early Chalcolithic and associated with Chalcolithic copper industry (Table 1:30, Ch. 3, and Meshel 1993:1518). The rampart (160 m long, 5 m wide at the base and preserved to 1.5 m high) is built on the southwestern side, the only access to the hill top. It represents a fairly large scale communal effort, somewhat unexpected for the period in this region. In Timna’ Valley, despite the present difficulties in unequivocally identifying Chalcolithic copper industry, habitation Site 39a, which contained copper nodules and slag, was dated by \(^{14}\)C as Early Chalcolithic (Table 1:35, and see Ch. 3). Three out of the ten dates from the Eilat burial ground (Table 1:39) also fall within the Chalcolithic period, which indicate that burial and cult continued in the site from the LN. A few Ghassulian and Be’er Sheva’ pottery sherds were also found in the open-air sanctuaries of ‘Uvda 6 and Har Shani (see Ch. 5) and in two excavated desert kites (Holzer & Avner 2000 and in press).

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12. Rollefson & Köhler-Rollefson (1989) described a human induced environmental crisis, created by over-exploitation of the area surrounding the large PPNB-C villages. Others (Nissen 1993; Simmons 1997) described the crisis as induced by a combination of both human and climatic changes.

13. For the dates of the period see Weinstein 1984; Gilead 1994b; Burton & Levy 2001. The beginning of Chalcolithic may be considered even earlier if the Wadi Raba culture and the Qatifian are regarded as Chalcolithic rather than LN (Joffe & Dessel 1995).


In eastern Sinai, several cult sites were dated as Chalcolithic, mainly on the basis of $^{14}$C: an open sanctuary with tumuli clusters at Ras alNageb (Table 1:44; Table 14:90); a shrine of masseboth in Wadi Watur (Table 1:58 and Fig., 4:97); the site Wadi Sa’al, with two masseboth shrines (Table 11- 7:2, 9:2) where a Chalcolithic jar handle was found among other related finds (Fig. 4:103); Wadi Zalaqa, a complex containing a habitation site,15 tumuli tombs, two open sanctuaries and two masseboth shrines, was dated as Early Chalcolithic (Table 1:63, and Chs. 4 and 5). Additional sites are actually associated with this complex, including tent camps, stone built dwellings and cult and burial sites (Fig. 5:32). Other cult and burial sites in eastern Sinai are generally dated by flint to the 5th-3rd millennia B.C. (Hermon in Avner in press 2). In five sites excavated by Kozloff (in Rothenberg & Glass 1992) west of Eilat, in Sinai, Chalcolithic dates were retrieved (among LN and EB dates, Table 1:48, 49, 54, 55), and a similar situation was found in three of the sites excavated by Eddy and Wendorf (1999:279-231) in the same region (Table 1:45, 50, 53).

The 22 clusters of nawamis tombs in Sinai, and the adjacent habitation sites, were at first generally dated to the Chalcolithic and EB I (Bar-Yosef, et al 1977, 1983, 1986; Goren 1998; Arad Ayalon n.d.). However, both artifacts and $^{14}$C dates indicate that they were mainly Chalcolithic, with some continuation into the EB I (Table 1:59-62, 70)14. A desert kite in Wadi Jenah, eastern Sinai, excavated by A. Goren (unpublished) yielded several dozen microlunates which are mainly dated to the Chalcolithic period (See Ch. 2, Note 19). In southwestern Sinai, a habitation site near Serabit el-Khadim excavated by Beit-Arieh (1980) was also dated by finds as Chalcolithic, with continuation into the EB I (see below). An additional site surveyed by Beit-Arieh was dated by $^{14}$C (Table 1:71) to the late 5th millennium B.C. More than 50 desert-kites discovered in eastern Sinai (Meshel 1980; Perevolotzky and Baharav 1987) are generally dated to the 5th-3rd millennia B.C.

As mentioned above, many sites in central and southern Sinai were dated by Rothenberg (1969, 1970, 1971a, 1974) to this period, and later were defined as the “Eilatian” and “Timnian” (see Ch. 1). Major sites of this group in southern Sinai, excavated by Beit-Arieh, proved to be EBII, but in my opinion even this correction demands amendment (see below).

In southern Jordan, the Chalcolithic is also elusive due to the rarity of recognized ‘Be’er Sheva’-Gassulian artifacts (Genz 1997; Papalas et al. 1997). In the surveys of Wadi elHasa and the northern ‘Araba Valley, 21 sites were dated as Chalcolithic (MacDonald 1988:128-137, 1992:27-32, 53-61), but only a few yielded diagnostic Chalcolithic pottery sherds or flint, and most did not contain architectural remains. Other sites were defined as Late Neolithic-Chalcolithic, or Chalcolithic-EB I, due to the same difficulty in dating. In the Wadi Faynan area, the site of Fidan 4 was initially identified as Chalcolithic but proved to be EB I when excavated (see Ch. 3 and Table 1:10). However, one $^{14}$C date from Tel Wadi Faynan is clearly Chalcolithic, and another is during the transition from LN to Chalcolithic (Table 1:13). The survey of the Petra area also yielded several Chalcolithic or EB I sites (Linder and Zeitzer 1990), as did another partly excavated site south of Petra (Hart 1987). Sites in the area of Jebel Queisa and Jebel eJill, typically consisting of stone built circular courtyards and circular rooms, are described as seasonal camps for pastoral extended families (Henry 1995: Ch. 15). The sites were attributed to the “Timnian” industry, which ranges from the Late Neolithic to EB (see Ch. 1). A single $^{14}$C date from Site J 24 (Table 1:32) could be either Late Neolithic or Early Chalcolithic (Henry 1995:361, 1992). Several similar sites in the vicinity were identified as Chalcolithic (Jobling 1981:108-9). Some sites are up to 150 m in diameter, unexpectedly large for this region, and one is even 250x400 m. Another large “Neolithic-Chalcolithic” site, more than one acre in area, was observed further south near Wadi Ram (Stanley Price & Garrard 1975).

Most important for the Chalcolithic settlement picture are two large sites near Aqaba, Tel alMagass, and Tel Hujeirat alGhuzlan. The former extends over 3000 sq m, and the latter is 2-3 times larger. Their size and the depth of cultural sediment (ca. 5 m) are quite surprising in light of the environment, and the excavated finds indicate permanent villages subsisting on agriculture, grazing, copper industry and the manufacture of sea shell ornaments. The sites were initially dated to the Chalcolithic period (Khalil 1987, 1992, 1995), later corrected to Late Chalcolithic-EB I (Khalil & Eichmann 1999), but now, a series of $^{14}$C dates from these sites starts with ca. 4100 Cal. B.C., while the lower strata are not dated as yet (Görsdorf 2002, and see here Table 1:40,41). Nineteen additional Chalcolithic-EB sites were recorded in a survey of the southeastern ‘Araba Valley; in some, pottery and flint adzes attest to Chalcolithic occupation (Smith et al. 1997:51-56).

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14. Pottery is rare in the nawamis tombs, but see a Chalcolithic churn neck from ‘Ein Hudera (Bar Yosef et al. 1977:80, Fig. 4:11).
4. The Early Bronze I-III Periods (ca. 3500-2300 B.C.)\(^\text{17}\)

In the Negev Highlands, some continuation was suggested from the Chalcolithic to EB I and from EB II to EB III (Dever 1980:3; Cohen & Dever 1981:74; Cohen 1986:240, 244, 1999:76, 78), however, these ideas were based on conjectured parallelism with the history of 'Arad and Tel Halif, not on specific finds. Indeed, no EB I or EB III sites were identified. In Sinai, as mentioned above, there was some continuation of nawamis tombs from Chalcolithic to EB I, but again, no EB I or EB III sites were recognized. On the other hand, numerous EB II were identified in the Negev Highlands (Table 19), and a system of large EB II settlements was studied in southern Sinai (see below).

In fact, the study of the Early Bronze Age in the Negev and Sinai has undergone an interesting process of evolution. At first, EB II occupation was identified among the southern Sinai sites (Amiran, et al. 1973; Beit-Arieh 1974, 1977, 1978, 1981a, 1983, 1989), previously defined as Chalcolithic by Rothenberg (1969, 1970). Shortly afterwards, EB II finds were identified among the Chalcolithic artifacts of Tel Esdar in the northeastern Negev, and in MB I sites (Cohen 1978, 1981:IX, 1985:IX, 1986:119, 215). The overall distribution of sites, however, was very limited at that time. When additional sites were found near Kadesh Barnea and in ‘Uvda Valley, they were marked as isolated spots on the map and interpreted as road stations connecting the town of ‘Arad with its related settlements in southern Sinai (Cohen 1978; Beit-Arieh and Gophna 1981). Additional sites, when discovered in the Negev Highlands, were still attributed to ancient roads (Amiran et al. 1980:14; Cohen 1985:IX, 1986:277-8).

The full intensity of EB II settlement was first revealed through the Negev Emergency Survey, when hundreds of sites were dated to this period and many were excavated (see Fig. 7:3). A comprehensive settlement picture has been constructed, explaining the phenomenal florescence of desert settlement as initiated by ‘Arad. This town was described as a Canaanite polity and administrative center that colonized southern Sinai in order to monopolize the copper resources of the region, and thereby influenced the rest of the desert area (Amiran et al. 1973; Beit-Arieh 1974, 1981a,b, 1983, 1984a:39-41). Accordingly, the abandonment of desert sites was assigned to the end of EB II, after some 300 or 400 years of prosperity, as a result of the fall of ‘Arad (Beit-Arieh 1981:134, 1983:48; Amiran 1986; Haiman 1986:16; Amiran and Gophna 1989). Alternatively, the settlement demise was related to an Egyptian conquest of Sinai (Rothenberg and Ordentlich 1979; Cohen 1986:244), although this is only evident in southwestern Sinai, in the area of the turquoise mines. The discovery of an EB III settlement at Tel ‘Ira, in the Be’er Sheva’ Basin, was considered the “southernmost in the country” (Beit-Arieh 1991), and only emphasized the void in the Negev and Sinai after the fall of ‘Arad.

However, a closer look shows that the Negev and Sinai were not deserted at all either before nor after the EB II. In the southern Negev, several sites were defined as EB I. A habitation site south of Yotvata excavated by Meshel and Sass was ascribed to this period by pottery and a sherd of an Egyptian alabaster jar (Meshel 1990:17-19, 1993:1517-18). In Ma’aleh Shaharut, east of ‘Uvda Valley, a tomb with masonry similar to that of the nawamis tombs was excavated in a rock shelter (Avner 1986, and here Figs. 10:11, 12). Inside, parts of a red slipped, well burnished jug with an incision on its shoulder was found (Fig 7:6) which has close parallels to EB I jugs of Bab edh-Dhra tombs (Schaub in a rock shelter ( Avner 1986, and here Figs. 10:11, 12). Inside, parts of a red slipped, well burnished jug with an incision on its shoulder was found (Fig 7:6) which has close parallels to EB I jugs of Bab edh-Dhra tombs (Schaub 1981:Figs.19:3,11). Two EB I jars were discovered, one in ‘Uvda Valley Site 10 (Fig. 2:25) and another with a cup in a rock shelter tomb in Nimra Valley, south of Timna’, dated to the very beginning of the EB I (Sebbane & Avner 1993, and see Fig. 3:27). This tomb is most probably related to a nearby copper production site 300 m away (See Ch. 3). Mine T in Timna’ should also be mentioned as probably belonging to this period (see Ch. 3). In a habitation site near Darb Ghaza, in Sinai, 15 km northwest of Eilat, fragments of an Egyptian jar were found (Avner and Naor 1978), dated by R. Amiran to EB I. Twenty one \(^\text{14}C\) dates from ten different excavated sites (see Table 2)\(^\text{18}\) in all regions discussed here fall within the EB I time-frame. In the two villages near ‘Aqaba, Tel Magass, and Tel Hujeirat el-Ghuzlan, occupation continued, with the wide range of activities, including a large scale copper production (see above and in Ch. 3).

In southern Sinai, one of the only two \(^\text{14}C\) dates from the EB II sites excavated by Beit-Arieh falls within the transition from Chalcolithic to EB I (Table 1:73), and the Chalcolithic site near Serabit alKhaidim (Beit-Arieh 1980) also contained a Dynasty I Egyptian vessel, i.e. EB I (Braun 1989, Note 56). Dynasty I Egyptian vessels were found in the nawamis fields at Wadi Sawawin and Wadi H’bar (Arad-Ayalon unpublished, Pls. E and B in the sites’ chapters, respectively)\(^\text{19}\), and a fragment of an EB I jar was found in the habitation site of Jebel Guna 25 (Bar-Yosef et al. 1986: 149). All these indicate that an EB human occupation in Sinai was not unique to the EB II alone.

In the surveys of Wadi Hasa and the northern ‘Araba Valley, 43 sites were identified as EB I on the basis of pottery, in addition to sites which were dated as Chalcolithic-EB I or EB I-III (MacDonald 1988:155-161, 1992:61-66). It is now clear that the large habitation site of Fidan 4 in the Faynan area, which contains copper industry remains, should be dated to the EB I, rather than to the Chalcolithic (see Ch. 3).

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\(^{17}\) See the suggestion of Golani & Segal (2002) to date the beginning of EB I at 3700/3800 B.C.

\(^{18}\) Further discussion on the EB I see in Sebbane & Avner 1993 and in Sebbane et al. 1993.

\(^{19}\) I thank M. Sebbane for the references to publications of parallel Egyptian pottery. Since the nawamis finds were not published (by Goren or Arad-Ayalon), the matter is not discussed further herein.
The unavoidable conclusion is that the desert cultural characteristics of previous periods simply continued to the EB II, and even later. Although it is difficult to know how many of the Negev Highland sites were actually occupied during the EB II (ca. 3000-2650 B.C.), it seems that it was indeed a period of settlement expansion. Indications for this are: the intensification of copper production in the Faynan area, and probably in Timna Valley and southern Sinai as well (see Ch. 3); the fact that almost all excavated sites in ‘Uvda Valley rendered either some ‘Aradian pottery sherds or $^{14}$C dates within the EB II time-frame (Table 1, 2a); the comparatively high number of $^{14}$C dates in this period, 8.0 per century (Table 2b); and the richness of ‘Aradian pottery in the southern Sinai EB sites (see references below). Nevertheless, the glamour of the settlements in this period is somewhat dimmed by the fact that the desert was not deserted before (as discussed above) or after. As to the EB III, it is true that the “classic” ceramic indicators of the period are not found in the desert, but clues for the real EB III settlement scenario are found in two main sources. One is that during this period the number of $^{14}$C dates per century from desert sites exceeded that of the EB II, and reached the highest level (Table 2b). Secondly, during the EB III, copper production in the Faynan area also peaked (Levy et al. 2002), and it must have influenced the rest of the surrounding desert. The impression is that this “missing” period was actually the climax of settlement in the desert, and that the material culture and pottery (see below) of the EB II simply continued into the EB III.

The finds and $^{14}$C dates mentioned above are the results of only limited research achieved to date, in both surveys and excavations. Therefore, they only hint at more intensive human presence and activity in the desert. If human societies did live in the desert during the EB I and EB III, it means that also in the EB II no external intervention was necessary to “cause them to exist” or “become visible”. More so, ‘Arad can be seen as a town which emerged from the desert culture, as suggested by Govrin (1990) and by Finkelstein (1991, 1995, Ch. 7), and as proposed for the large EB I desert towns of Syria and eastern Jordan (Helms 1982; Hanbury-Tenison 1989).

In my opinion, the common reconstruction of the history of the desert, especially in the 3rd millennium B.C., was incorrect, and the question is what mislead scholars in their studies? It seems that several factors were not considered in depth:

1. The typological basis for dating desert sites. While dating of southern Sinai sites as EB II is considered well based on ‘Aradian pottery, in the rest of the desert area this pottery is rarely found (see the Negev Highlands survey publications in Note 1 and Saidel 2002:188-192). The attribution of sites to the EB II was based mainly on two common finds, ‘hole-mouth’ sherds and tabular scrapers, even when some finds suggested other periods as well (see above). Today, however, enough evidence exists to show that the two principle artifacts used for dating these sites had a longer range than previously believed, and therefore emphasis exclusively on the EB II period is unjustified.

Hole-mouth cooking pots appear in ‘Uvda Valley sites with early $^{14}$C dates such as 4200 B.C. at Site 4 (Table 1:18) and even 5370 B.C. at Site 7 (Table 1:21). In the excavation of a massebah shrine 124/XVII, next to Site 9, hole-mouth sherds were recovered in large numbers from all depths of the section (70 cm deep, see Table 3 and Fig. 2:23), beginning only 4 cm above a hearth dated by $^{14}$C ca. 5800 B.C. (Table 1:25, first date). In another massebah shrine, ‘Uvda 124/IV, many hole-mouth sherds were found with LN Wadi Raba sherds (Table 3 and Fig. 2:23). In southern Jordan they were found in Site J 24 with $^{14}$C dates of 4620 B.C. (Table 1:32). According to the above data, it is not impossible that the arkaose-ware hole-mouth cooking pots already appeared in the desert during the 6th millennium.

The later occurrence of the hole-mouth jars is no less interesting. The same “EB II” rim shapes are found in an EB III context (Beit-Arieh 1991, Figs. 6-8) and they extended into the EB IV, sometimes with variations in the rim shapes (e.g. Cohen and Dever 1981, Fig.11). However, their petrographic composition and manufacturing technique continued, alongside the use of carbonate temper that already appears earlier (Porat 1989:180). In ‘Uvda Site 166 the same “EB II” shaped rims of hole-mouth cooking pots have been found with $^{14}$C dates ca. 2330 and 2050 B.C. (Table 1:28), without any sign of later penetration or contamination of the site.” The conclusion is that the so-called EB II hole-mouth cooking pot, as the dominant or only pottery type in desert sites, was actually in use for some 3000 years. Rarely are other types of pottery found next to hole-mouth sherds, but they demonstrate their longevity: LN Wadi Raba sherds, Chalcolithic “Beer Sheva” sherds, EB “‘Aradian”, or EB IV “Southern family” pottery.

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20. In a recent article, Beit Arieh (2002) responded to Finkelstein’s view on the origin of ‘Arad, by emphasizing the Canaanite cultural elements of the town. However, these could have been easily adopted during a quick settlement process. Although I generally accept Finkelstein’s description, one point should be revised, the development of the “Aradian house” from the nomads’ rectangular tent (Finkelstein 1995:82). Almost 100% of the thousands of tent remains in the desert are circular, 3-5 m in diameter (see Ch. 2). This is true of the earliest identified tent remains (5th-4th millennia B.C.), the Nabatean and even the Mamlukian tents (see Ch. 2). Therefore, no rectangular tents could have served as an archetype for the “Aradian house”. The term “Aradian” for this house may be misleading since all characteristics (the broad plan, sunken floor, benches and pillar bases) had already appeared during the Chalcolithic in the Near East (e.g. Porat 1987; Epstein 1998), and they only reached their final stage of evolution in the EB urban culture.

21. In 1977 B. Kozloff showed me the flint and pottery from his excavations in eastern Sinai, which included quantities of hole-mouth sherds. The excavations were never published, but the $^{14}$C results were published by Rothenberg & Glass (1992), and they are included in Table 1. Some of the sites are dated to the 6th and 5th millennia B.C., but currently it is difficult to know whether the earlier deposits contained pottery or not. The chronological discussion of Rothenberg & Glass (1992) is not informative as to the emergence of the desert pottery.
The duration of tabular scrapers was even longer. They appeared as early as the beginning of LN\textsuperscript{22} and all types known in the EB are already present at least in the Chalcolithic (McConaughy 1979:216; Rosen 1983a, 1986, 1997:71-80). Tabular scrapers are found in excavated sites in conjunction with \textsuperscript{14}C dates of the 6th and 5th millennium B.C., such as the burial site in Eilat where more than 40 well shaped examples were dated between 5400-4200 B.C. (Table 1:39 and Appendix 1). In the Risqeh site, east of Aqaba, they are dated \textit{ca}. 4900 B.C. (Table 1:42) and in the southern Jordan Site J 24 - \textit{ca}. 4620 B.C. (Table 1:32). In Tell Sabi Abyad, northern Syria (where they are termed “tile knives”), they first appeared in Level 6, 5900-5200 Cal. B.C. (Copeland 1996:315, Figs. 4.9, 4.16, 4.18; Verhoeven 1999:158). As a late occurrence of these tools, Kozloff (1973:40) and Rothenberg (1974:19) saw them as typical for the MB I sites (\textit{\ae}EB IV) of central Sinai, but basing their dating on survey alone is problematic. In ‘Uvda 17, however, four out of nine tabular scrapers were found in EB IV loci, three in EB II loci, and two on the surface (Rosen 2001:111). Also in ‘Uvda 166, tabular scrapers were found with “typical EB II” assemblages such as crescent-shaped blades and hole-mouth sherds, but with clear EB IV \textsuperscript{14}C dates (see above). These examples indicate that the typical finds in desert sites can only generally date them to the 6th-3rd millennia B.C.; for more specific dating, other dating methods are essential.

2. The duration of an individual site. Desert sites were commonly believed to be “short lived and a passing phenomenon” (Haiman 1986:16), “seasonally used for only several years” (Haiman 1989b:185) and having a “brief life-span” (Beit-Arieh 1982:155, 1986:51). Indeed, the occupational span of desert sites cannot be deduced from the finds or from cultural sediments. Rather, detailed series of \textsuperscript{14}C dates are necessary, but these are not yet available from either the Negev Highlands or from most of Sinai. Limited and incomplete series of dates are presently available from the southern Negev and eastern Sinai, but they already demonstrate a much longer period of settlement than previously believed. In Site 124/IV six dates from a single room range from \textit{ca}. 3000 to 2650 B.C., a span of 350 years (Table 1:22, first six dates). This room intersects earlier remains that include 5th-4th millennia material (Avner in press 7). In Site 9, six dates from two upper strata range from \textit{ca}. 3200 to 2700 B.C., a span of 500 years (Table 1:25), while the lower is dated by artifacts to the 5th-6th millennia (see Ch. 2). In Site 16 three dates range from \textit{ca}. 3500 to 2850 B.C., a span of 650 years (Table 1:23). No occupational gaps could be identified in the sections excavated at these sites, but a continuous living level with some architectural changes and repairs. In Site 17, the lower stratum yielded two dates, \textit{ca}. 3000 and 2700 B.C. and the upper stratum yielded one date, \textit{ca}. 2400 B.C. The excavator (Beit-Arieh 1989:195) described first a gap of settlement between the two strata, corresponding to the “missing” EB III. In the site itself, however, no gap in the stratigraphy is discernible, and in the recent, final publication of the site (Beit Arieh 2002), no gap is mentioned. In two cult sites in ‘Uvda Valley a general span of 4000 years was found. One is \textit{a massebah} shrine (‘Uvda 124/XVII) adjacent to Site 9 (see Ch. 4 and Avner in press 7), and the other is the open sanctuary of ‘Uvda 6 (see Ch. 5). In the Eilat burial ground, ten \textsuperscript{14}C dates cover a span of 1200 years, from \textit{ca}. 5400 to 4200 B.C (Table 1:39). In eastern Sinai, several sites rendered 3-5 \textsuperscript{14}C dates which spread over hundreds or even 2000 years (Table 1:43, 48, 49, 54, 55). One site (Table 1:50) rendered nine dates, the first three may represent an occupation period from \textit{ca}. 5150 to 4200 B.C., the following four dates may represent another period from \textit{ca}. 2800 to 2200 B.C., and the last two may indicate periods of settlement during the early and late 2nd millennium B.C.

It is true that \textsuperscript{14}C series may represent a longer settlement span than that occurred in reality (Buck et al. 1994; Gilead 1994:3; Solow 1997). However, since in most of these sites the number of dates in the series are limited, it can be claimed that they actually present only part of the true settlement sequence. A good example for this argument is the site of Nahal ‘Issaron (‘Uvda 14). Here, five charcoal samples were first analyzed, a large number of dates for desert sites at that time, and they indicated two short periods of occupation. One \textit{ca} 7000 B.C. for Stratum C, and the other \textit{ca} 5400 B.C. for Stratum B (Goring-Morris & Gopher 1983:160). However, when 30 more samples were later analyzed from the site (Carmi et al. 1994), a range of 4500 years was received, from \textit{ca}. 8200 to 3700 B.C, with only short gaps (see Fig. 2:7). If the radiocarbon range is longer than the real life-time of a given site, the span of Nahal ‘Issaron would be “only” 3500-4000 years, still much longer than most scholars would expect to find in a desert site. I do not argue that the sites under discussion were occupied every night, or even every year throughout their life-time. Certainly, gaps in settlement, unseen in excavated sections were possible, sometimes even for several years if a long period of drought occurred. However, for the larger, historical and cultural picture, the unexpected longevity of desert sites is significant, and it must influence our notions regarding desert culture and populations. One point still disturbs the scenario of the long duration of desert sites, the low rate of cultural sedimentation, usually not more than one meter. This question must be addressed in future excavations.

3. The date of southern Sinai sites. The large sites excavated by Beit-Arieh (1977, 1978, 1981a, 1982) certainly coexisted with ‘Arad III-I (\textit{ca}. 3000-2650 B.C); their establishment and abandonment were commonly attributed to the rise and fall of ‘Arad (Amiran et al. 1973, Amiran 1986; Amiran and Gophna 1989; Beit-Arieh 1974, 1981a,b, 1983; Haiman 1986:16). However, they could have existed earlier and later for the following reasons:

\textsuperscript{22} The earlier date, \textit{ca}. 2330 B.C. was retrieved from a hearth overlain by the room’s southern wall, while the later date was taken from another hearth, 30 cm higher, Therefore the site is safely dated as EB IV. (The excavation of the site is yet unpublished, but see Fig. 2:10).

\textsuperscript{23} Yeivin & Olami 1979, Fig. 14; Noy 1977, Figs 7:12, 8:7:8; Garrard et al. 1985, Fig. 13a, 1987, Fig. 12c; Betts 1988, Fig. 15:2; McCartney 1992, Figs. 14, 15; Rosen 1997:75.
A. Below the buildings’ walls, layers of ash were discovered, interpreted as a means of insulation from cold for the rooms (Beit-Arieh 1977:9, 50, 83). Similar phenomenon was also found in 'Uvda Valley sites, but here, these layers were clearly defined as earlier than the visible architectural strata. Since in three of the 'Uvda sites (Nos. 4, 7 and 9) the ash layers were dated by \(^{14}\)C and artifacts to the 6th and 5th millennia B.C. (Table 1:18, 21, 25), a similar case could have occurred in the Sinai sites.

B. Only two \(^{14}\)C dates were published from the excavated EB sites of southern Sinai. One, from Sheikh ‘Awad (Table 1:72) falls within the EB II, but the other, from Sheikh Muhsen (Table 1:73) is 500 years earlier than the establishment of the town of ‘Arad, and actually falls in the transition from Chalcolithic to EB I.

C. Hole-mouth cooking pots from Sinai, the Negev and ‘Arad were all produced of the same specially selected Sinaitic clay with arkose temper. This fact was used as evidence of the link between ‘Arad and southern Sinai during the EB II (e.g. Amiran, et al. 1973). However, the same clay had already been used during the EB I (Porat 1989:183), pointing to an earlier occupation of the southern Sinai, before ‘Arad was a town that could have colonized southern Sinai. In ‘Uvda, as described above, this type of pottery probably appeared as early as the 6th millennium B.C. Also, \(^{14}\)C dates from additional sites from Beit-Arieh’s survey in southern Sinai indicate early Chalcolithic occupation (Table 1:72) similar to that near Serabit alKhadem (Table 1:68).

D. A number of hole-mouth rim types published by Beit-Arieh (1977, Figs. 1:5, 6; 5:14, 18; 6:7, 17, 18; 7:7, 10, 11, 19, 25; 1986, Figs. 12:5, 6) are unparalleled in other stratified EB II sites. On the other hand, they are similar to hole-mouth rims published as EB III-IV (Cohen 1986, Figs. 22, 26, 43, 55, 71; Richard and Boraas 1984, Figs. 18:1–4; Beit-Arieh 1991, Figs. 7:16, 8:5). Thus, they hint at a later occupation of the sites, after the fall of ‘Arad. Another possible indication for later use is a bronze awl from the Nebi Salah site (containing 1.15% tin, Lupo in Beit-Arieh 1977:166) which was unlikely to appear before the EB IV.

The above considerations point to a longer duration of the southern Sinai sites than previously believed, probably similar to the situation in 'Uvda Valley.

4. The nature of the southern Sinai settlement. The many “Aradian” broad rooms found in southern Sinai sites were used as one of the arguments supporting the ‘Aradian origin of the architecture and population of this region. However, a closer look at the architecture of the southern Sinai sites shows that almost all excavated rooms have rounded corners and even curved walls which point to their local, circular architectural origin (and see Note 20). This tradition long preceded the orthogonal one, coexisted with it, and continued in later periods (see Ch. 2 and Figs. 2:3, 8-18). The circular shaped architecture is the primary and natural one for any human society, while the orthogonal one is the result of constraints from the transition to large permanent settlements (Wachman 1959; Flannery 1972; Saidel 1993), although circular architecture does not necessarily mean temporary settlement (see Ch. 2, Note 47). Therefore, the two examples presented by Beit-Arieh (1981b:Fig. 3) to prove a resemblance between ‘Aradian and south Sinai rooms conversely emphasizes the differences between them, and highlights the local, indigenous nature of the Sinai sites. Even if there was an ‘Aradian influence on the southern Sinai architecture, it does not necessarily mean an ‘Aradian population. Similarly, a typical “Aradian house”, again with rounded corners, excavated in a 3rd millennium site in southern Yemen (di Maigret et al. 1988) does not imply ‘Aradian colonization in that country.

5. The copper sources of southern Sinai were commonly considered to be the motivation for the existence of EB sites and the ‘Aradian settlement in that region. In Ch. 3. I discussed the metallurgical data from Sinai and showed that this was unlikely.

In my opinion, the above discussion, and the faunal and floral data published by Beit-Arieh (1977:140-148), lead to the conclusion that the southern Sinai sites were permanent villages of shepherds and farmers, and this is why, for example, domesticated cereal reached 12% of the pollen profile (ibid. p.148). There is no reason to view the population of these villages as non-indigenous, rather, they were part of a broader settlement and cultural phenomenon of the desert. The connection between these villages and ‘Arad must still be explained.

The overall picture of EB I-III in the Negev and Sinai is settlement expansion in the desert, and population growth. The climax of settlement could have been during the EB II, contemporary with ‘Arad, but it could have also been during the EB III, as is reflected from the significant increase of \(^{14}\)C dates (see above and Table 2b). Interestingly, the EB settlement expansion occurred in the desert during a period of fluctuating climate, with a gradual, general desiccation (see Ch. 7), and during a period of some population decline in the fertile zone (Gophna & Portugali 1988:16). Possibly, the cultural base and the “wisdom of living” which the desert inhabitants gradually developed, enabled them to formulate solutions for the increasing aridity. If so, they may present a case in which a climatic change is not determinative by itself, but the human initiative also effects history (cf. A. Rosen 1997; Rosen & Rosen 2001).
4. The Early Bronze Age IV (ca. 2300-2000 B.C.)

While previous theories posited a cultural break and the invasions of Amorites or others into the Levant (e.g., Kenyon 1979, Ch. 6; Lapp 1966:100-113; Kochavi 1967:250-256; Mazar 1968:67) recent studies emphasize indigenous processes and cultural continuity (Thompson 1974; Dever 1980, 1998; Prag 1974, 1985; Richard 1980, 1987a,b, 1990; Richard & Boraas 1984, 1988; Finkelstein 1989, 1995; Palumbo 1990). In this respect it would have been correct to include the following discussion within the previous section, but it has been separated for convenience only.24

In the Negev Highlands, 253 sites were attributed to this period in the nine published survey maps (Table 18) and others are known in the rest of the area (Haiman 1996; Cohen 1999:84-90). Twenty nine sites, mainly large ones, have been excavated (Kochavi 1967; Cohen & Dever 1981; Cohen 1999:90-229). In central and northern Sinai, several hundred additional sites were dated to this period (Rothenberg 1969:38, 1970:22, 1973:32-34, 1979:120; Clamer and Sass 1977; Oren and Yekutieli 1990). In southern Sinai, however, only one EB IV site has been noted (Beit-Arieh 1981:134), but in light of the above discussion, this may now be better understood as the only site in which recognizable EB IV sherds have been found to date. The large numbers of sites in the Negev Highlands, northern and central Sinai and in ‘Uvda Valley, is pronounced in contrast to the desolation of EB cities and the possible reduction in the number of other settlements in the fertile country to the north (e.g., Gophna & Portigliati 1988:16; Dever 1998). Interestingly enough, southern Jordan permanent settlements, even fortified ones, were established during this period on the desert fringe (Richard 1986, 1987a, 1990; Richard & Boraas 1984, 1988).

A wide range of settlements is found in the Negev Highlands, from small ephemeral sites to large permanent villages, covering up to 5 acres. The latter probably served as base-camps for the smaller sites (Haiman 1996; Cohen 1999:284). The material culture primarily reflects that of herdsmen, who were also engaged in agriculture and copper trade (Palombo 1990:53; Haiman 1996:16-20; Cohen 1999:290-291). The hordes of copper ingots discovered in these sites (Cohen 1999:262-265; Segal & Roman 1999), the large scale copper production in the Faynan area, and some copper production in Timna Valley, certainly influenced the settlement pattern and the economy of the population in the Negev (see here Ch. 3).

In ‘Uvda Valley, remains of this period were identified in 9 out of 22 excavated habitation sites, two of which were published (Reich 1990; Beit-Arieh 2001). All continued earlier occupations (unlike Beit-Arieh 1989:195, and see above), and a similar situation was discerned in the excavated threshing floor (see Ch. 2) and in massebah shrine 124/XVII (see Ch. 4 and Avner in press 7). An attempt to study the transition from EB I-III to EB IV faces considerable difficulties since recognizable EB IV sherds were usually scarce and sometimes mixed with earlier layers that also contain some ‘Aradian sherds (as in Site 9). Differences in the quality of architecture may sometimes be identified, when EB IV masonry seems poorer than the former, but this criterion may also be misleading and requires a better dating of the various sites and stages. Flint assemblages could potentially provide another identification tool, but to date little is known about the EB IV flint industry (Gilead 1973; Rosen 2001). It is commonly accepted that fan scrapers did not continue into the EB IV (Rosen 1997a:75), but as mentioned above, even this is not assured. An attempt to define the EB IV flint assemblages in the ‘Uvda sites was based on statistical differentiation, on a general decrease in the quantity of knapping, and on associated pottery sherds (Rosen 1983a:138-143). In the recent publication of the flint from ‘Uvda 17, no distinction was possible between the flint assemblages of the EB II and the EB IV strata (Rosen 2001:109, 118). Indeed, the EB IV flint technologically simply continued the traditions of previous periods, as was also the case in Transjordan (Richard 1980:12,22; 1987a:38; Richard and Boraas 1984:83).

The 14C dates from EB IV sites do not eliminate the confusion, since only some correlate well with the period and finds. At the EB IV site of Har Dimon (Table 1:1) two of the three dates appear slightly too early, and one falls within the EB I, which was not identified in the excavation (Nahliali & Tahal 1993; Cohen 1999:91-94). At ‘Ein Ziq (Table 1:2) two out of four dates fall within the time frame of the period, one at the very end of EB II and another is earlier by some 100 years. In Wadi Mushabi 103 (Table 1:3) a single date does concur with expectations. In Yotvata 6 (Table 1:31), one of two dates agree, but the other is some 250 years earlier. In ‘Uvda 17 (Table 1:24), one date from the upper stratum is also slightly earlier, and in ‘Uvda 9 (Table 1:25) the upper stratum is safely attributed to this period (see Ch. 2), but the 3 dates from this stratum (the last three) are too early by 170-600 years. In ‘Uvda 166, all finds are identical with those of any other EB level in the valley (fan scrapers, crescent shaped blades and hole-mouth sherds), while the two 14C dates are the only EB IV indication; one was even retrieved from a hearth beneath the room’s wall.

24 Various scholars viewed the period in a different light, and accordingly termed it differently: Middle Bronze I (Albright 1932; B. Mazar 1968), Intermediate Bronze Age (Lapp 1966; Kochavi 1967; Amiran & Kochavi 1985; Finkelstein 1995), Intermediate EB-MB (Kenyon 1957), EBIV-MBI (Dever 1970; A. Mazar 1990), and Early Bronze IV (Wright 1937; Dever 1980, 1998; Richard 1987a, Richard & Boraas 1988). At least in the desert more continuity than change is apparent between the EB I-III and this period, and therefore, I prefer the term EB IV.
Altogether, the finds and $^{14}$C dates point to a marked continuity from the previous periods to EB IV, and presently these periods can hardly be distinguished from the former. With the rarity of the “southern family” pottery south of the Negev Highlands, much work is still needed before we have better means to identify EB IV sites or levels. This may probably account for the impression that EB IV population never inhabited southern Sinai.

Despite the difficulties in defining the transition to EB IV, we may attempt, with appropriate caution, to reconstruct the processes that occurred ca. 2300 B.C. It appears that fewer sites were inhabited. Most of the square and rectangular rooms were abandoned, and mainly circular rooms were used, including those that had previously existed, as well as additional ones. Contacts between various areas probably decreased so that the pottery typical for the Negev Highlands is rare in the southern Negev and almost totally absent in southern Sinai. Flint use decreased, probably due to the increased use of metal and the appearance of bronze. The decrease in the percentage of sickle blades may indicate a decline in agriculture and the increased importance of grazing. Such changes would be compatible with the socioeconomic changes that took place in other parts of the country. However, the overall picture of settlement and continuity is still remarkable in light of the significant changes in settlement pattern in the fertile country to the north. The late 3rd millennium climatic crisis could be a dominant cause for these changes (see Ch. 7), however, it seems that the desert population adjusted and endured the crisis better than other societies in the Near East.

Here, ca. 2000 B.C., we conclude the description of the settlement sequence in the desert, but not before noting that at least in the southern Negev the archaeological remains and $^{14}$C dates demonstrate a full occupational sequence up to modern times. The Middle and Late Bronze Ages, generally considered as totally missing in the Negev, are presently covered by finds and by 26 $^{14}$C dates (not included in Table 1), and the first millennium B.C. is currently covered by 18 dates, mostly from the 10th-9th centuries B.C. Copper production and other activities continued in the region throughout these periods, and thereafter.

5. Summary

The radiometric and artifactual data outlined above give rise to several general conclusions:

1. The desert is quite rich with archaeological remains, but despite the 11,000 sites added to the Negev inventory during the last 25 years, there are still large unexplored areas, and many more sites are to be discovered, both here and in Sinai. Nevertheless, it is clear that the multitude of remains were not left behind by “nomads who did not leave remains”. The sites discussed in Chs. 2-5 and in App. 1 represent a wide range of activities and skills, as well as a rich spiritual domain. Since no dominant foreign power can be conceived of during most of the 6th-3rd millennia time-span, theories attempting to explain these remains as dependent on outside initiatives are unwarranted.

2. In contrast to expectations based on the environmental conditions in the area and commonly accepted ideas, there were no gaps in settlement in the southern Negev from the Early Neolithic through the EB IV (and beyond). To date, this sequence is derived mainly from the southern Negev and eastern Sinai sites. However, it seems that the principle difference between this region on one hand, and the Negev Highlands and the rest of Sinai on the other, does not lie in the settlement pattern. Rather, it lies in the number of $^{14}$C dates retrieved from the sites, and their implications. With ongoing research, I believe that more of the settlement “gaps” in these parts of the desert will be also eliminated.

3. The duration of habitation, industrial, cult and burial sites in the desert, as demonstrated by $^{14}$C dates, is often far longer than expected, by hundreds and even thousands of years. Even if these sites were not inhabited each and every year, the results are still highly significant for studying the culture, for a better appreciation of the desert remains, and for reconstruction of the desert past.

4. The desert architectural remains and artifacts represent an indigenous population, neither intrusive nor migrants from outside. The similarity in habitation, cult and burial sites over a long period of time and large desert areas speaks for a broad cultural “koine”, with local variations. At the same time, commercial and cultural exchange always existed between the desert and the sown.

5. Since the desert was less effected by military and political events, at least during the discussed periods, cultural changes took place in a different mode and rhythm than in the fertile country. It is thus difficult to apply to the desert the chronological framework commonly used in the archaeology of the Near East. Attempts to construct a separate chronology for the desert, as presented in Ch. 1, are as yet unsatisfactory. At the present state of research, despite the 11,000 newly recorded sites, we have to admit that we do not yet know the desert’s past well enough to establish a reliable chronological table. Therefore, for the present it would be more appropriate to use unspecified terms such as “4th millennium” or even “6th-3rd millennia B.C.”, hoping to define cultural processes, innovations and regional sub-cultures with better precision in the future. A tentative evolutionary outline for the desert during these periods will be presented in the summary chapter.
CHAPTER 8. SUMMARY

The archaeological remains of the desert described and discussed in the previous chapters reflect a cultural picture different from that usually related to desert societies. Instead of a brief life-span of individual sites, and long gaps in the general settlement history, we find extended use of various types of sites, and in the broader sense, a complete occupational sequence, from the PPNB to EB IV and beyond (Tables 1, 2). Instead of invasions or migrations into the desert, a homogeneous, indigenous culture is revealed, and foreign initiatives are no longer necessary to account for the desert archaeological remains. To date, the complete settlement sequence is mainly derived from the southern Negev, but I believe this accords with the other regions in the desert as well.

The core of this work consists of four selected aspects of the material and spiritual culture of the desert population: agriculture, copper production, massseboth sites and open-air sanctuaries (Chs. 2-5). Ancient roads were briefly described in Ch. 6, burial was abstracted to App. 1, and paleoclimate was discussed in Ch. 7. In each of these elements there is still much to study, but an interim summary of the data permits an assessment of the role played by the desert population in the cultural processes of the ancient Near East.

Considering the southern Negev desert environment, the settlement picture of ‘Uvda Valley is quite unexpected. The inhabitants’ economic base was intensive farming, mainly of barley and wheat and probably also legumes and fruit trees. Grazing, copper production and trade formed additional ingredients of the economy. The desert conditions enabled preservation of the archaeological agricultural elements better than in other regions. Hence, ‘Uvda Valley presently provides several important finds: the two earliest examples of stone ard-shares in the Near East (and actually in the world, Fig. 2:37), the earliest indications of an animal drawn threshing sledge (Figs. 2:57, 59, 60), the earliest and largest concentration of threshing floors (Fig. 2:47), and the earliest example of woven sheep wool (Fig. 9:16), all of which are generally dated to the 4th millennium B.C. While the earth embankments of ‘Uvda Valley are not yet well dated, those of Nahal Paran (Figs. 2:78, 79) probably present the earliest preserved example of the skillful management of soil and water for flood-based farming. The impact of farming and grazing on the ‘Uvda Valley population was remarkable. The PPNB settlement, represented by three stone-built habitation sites, evolved to at least 154 habitations of the 6th-3rd millennia B.C. The presently (limited) available data attests to a gradual and constant growth of the population, indicating that farming and grazing were both successful and sustainable. During the 3rd millennium B.C. the valley’s inhabitants could have numbered some 3000 people, and reached a much higher population density than that of Negev Highlands (see Ch. 2). In general, the archaeological remains in the valley reflect a society that combined an intimate knowledge of the environment with skills and initiative.

Our knowledge of the early history of copper production still suffers from lacunae and confusion. In Timna’ Valley the dating of early metallurgy remains in question, and the technological line of development is not yet clear. Nevertheless, it seems that copper was indeed produced by the 5th-4th millennia B.C. in Timna’ Site 39 and on the Yotvata Hill. In the Faynan area sites initially dated to the Chalcolithic period were eventually revealed to be mainly EB I, however, the finds from one large site, Wadi Fidan 51 (15.5 hactrar), are indeed Chalcolithic. The unequivocal identification of copper ore from Tell Abu Matar, Bir Safadi and Shiqmim as originating from the Faynan area also attests to Chalcolithic copper mining. Most important is the intensive copper industry at Tell alMagass and Hujeirat alGhuzlan, two large villages near ‘Aqaba which are safely dated now as Chalcolithic and EB I. These sites imply broader activities in the southern ‘Araba, including copper mining, smelting, casting and trade. Also, these sites demonstrate the deep involvement of the desert tribes in the production of copper from its early steps.

As to the Nahal Mishmar copper hoard, and the similar finds in 14 additional sites, all indications favor the local manufacture of these objects. The technological and artistic achievements reflected in this hoard is presently unparalleled anywhere in the Chalcolithic Near East. The new 14C dates of the mat in which the hoard was wrapped, ca. 4400 B.C., are quite surprising, and are only slightly later than the earliest appearance of true metallurgy in the Near East. The source of the alloyed copper used for the production of the prestige objects remains unknown. Arsenic copper ore is available in southern Sinai, and the Eilat region, but copper ore with arsenic and antimony or nickel are not found. Alloyed copper was probably imported from Anatolia, Iran or Azerbijan, either in the form of ore, or as metal, as indicated by the ingot fragment from Bir Safadi. The ingot fragment, and the alloyed copper prills recently discovered in the Be’er Sheva’ Basin sites, suffice a significant support for the local nature of the prestige, alloyed copper industry. Although copper objects were discovered in some Chalcolithic sites in central and northern Israel (Palmahim, Give’at Oranim and Peqi’in Cave), the vast majority of copper artifacts and industry remains are found in the south.

During the EB, the scale of copper mining and production greatly increased, most probably due to the increased demand in Canaan and in Egypt. Although evidence is mainly available from the Faynan area, the few 14C dates from Timna’ Valley (Tables 8, 9) indicate that the true scale of copper mining and production in the southern ‘Araba remains to be discovered. The continuation of intensive copper production at Tell alMagass and Hujeirat alGhuzlan in the EB I, certainly attests to a considerable scale of copper mining and production in the southern ‘Araba, during one of the “missing” periods in the desert. Also in Sinai, the actual scale of copper production still waits to be revealed. The copper industry continued to expand in the Faynan area during the EB III, another “missing” period in the desert, when the production of bar ingots began, and continued through the EB IV. The discovery of copper objects in Negev and Sinai sites indicate that their inhabitants were involved in copper production and trade throughout the Early Bronze
Age. The number of copper objects found in the north greatly increased during the EB, but the industrial remains are limited, restricted to melting and casting. The larger scale industry, with the technologically more complex smelting process, was located in the south and was probably controlled by the desert tribes. Generally, it may be said that prospecting and mining the ore, as well as smelting technology, formed part of the material culture and economy of desert societies for millennia.

The abundance of cult sites in the desert is remarkable, but their full extent is far from known. This is demonstrated by the numbers of masseboth sites and open-air sanctuaries presented in Tables 11 and 14, and more so by the recent discovery of tens of intriguing cult installations around Nahal Roded. Even with the present limited state of research, the study of cult sites offers valuable insights into the spiritual world of the desert population. In order to extract cultural information from these, an interpretive work was necessary. As mentioned, the 207 masseboth locations collected in Table 11 are only a sample of what the desert actually contains, but they can serve as a base for some analysis. A general distinction may be suggested between the stones representing deities and those representing the ancestral spirits. The former type of masseboth presents a theological characteristic of desert people, different from their neighbors. While in the fertile lands people naturally shaped their gods by hand, in human or animal form, in the desert gods were represented by unhewn stones shaped by nature, not by man. Gods were perceived as abstract, non-figurative. Several millennia later this very perception of god is found in Judaism, in the Nabatean religion and in Islam, all with desert roots. In addition, the earliest presently known masseboth are from the desert (Fig. 4:109), they became very common by the 6th millennium B.C. and prevailed through much later periods in much larger numbers than in the rest of the Near East. It may be said, therefore, that originally masseboth mainly developed as a desert cultural element, and only later, in the 2nd millennium B.C. did they become common in the fertile lands as well.

Another general distinction emerged through the study, between narrow stones for gods and broad stones for goddesses. Following this, repetitive groups of stones could be defined, with fixed numbers and combinations of shapes (Table 12). Based on later written sources and artistic materials, these stone groups could be “deciphered” as “organic” groups of deities known from ancient Near Eastern mythologies. Interestingly enough, these simple standing stones represent a rich and well established religious world, with a variety of deity groups forming a complex pantheon. While in the fertile lands similar complex pantheons are identified ca. 3000 B.C. with the rise of the city states, it was already apparent in the desert in the 6th millennium B.C. We may understand why desert people developed religious creativity (see below) yet, it is difficult to understand how they developed their pantheon image to a higher level of complexity than their own social structure.

The 156 open-air sanctuaries collected in Table 14 are also only part of a much wider phenomenon. Nevertheless, they still form a consistent group that permits analysis. Open-air sanctuaries are modest and simply constructed, but bear considerable interest. They were built according to several repeating designs (Table 15). As in masseboth, their different basic forms suggest distinction between sanctuaries for gods and for goddesses, while symbolic installations help identify their representation (elongated cells in the “male” sanctuaries and circular cells in the “female” ones). Since both dominant types of sanctuaries consistently recur in pairs of fixed combinations, they attest to a prevailing concept of pairs of deities, which was also common among masseboth groups. One triad of sanctuaries (Fig. 5:160) indicates a concept of triads of deities, also paralleled in many triads of masseboth, of several different combinations (Table 12).

Interestingly, the pairs and the triad of open-air sanctuaries appeared in the desert two or three millennia before they were built in the fertile zones. In addition, several elements and properties of Chalcolithic and EB built sanctuaries also first appeared in the desert open-air sanctuaries. Features attached to the open-air sanctuaries, especially the “stone drawings” (Figs. 5:134-155), hint again at the rich symbolic, mythological world of desert societies.

Depending on their size, individual open-air sanctuaries could accommodate tens or hundreds of congregants. This may mean that they served as communal gathering places, and could be one of the reasons they were built next to ancient roads. Clusters of sanctuaries, which were built next to road junctions, could even accommodate up to thousands of people, far beyond the population size of their vicinity. This may indicate congregational events involving distant groups, or even pilgrimage events, already by the 6th millennium B.C. This, in turn, implies a higher level of social organization of the desert population than can be otherwise deduced.

The theme of burial, briefly addressed in App. 1, presents a series of innovations in mortuary practices, that reflect additional aspects of spirituality. These innovations, with the rich “vocabulary” of life symbols, probably indicate a new, cyclical perception of life and death, unlike the prevailing ideas of eternal death. Several millennia later, the cyclical concept of life and death is found in Judaism and Christianity, and in some forms in other religions as well.

If the above interpretations are correct, then the desert peoples appear as vanguards in the three components of spiritual domain addressed here. Although they were undoubtedly materially inferior to their neighbors, they seem to have had the power to influence the people of the sown lands in the realms of religion and philosophy. The question is, what made them so influential in this domain? A possible answer is that the desert populations lived with a high degree of uncertainty, particularly in regard to rainfall, and were therefore more dependent on the forces of nature, i.e. the gods. This generated higher religious activity and creativity, thereby an established religion which eventually empowered them to influence other societies.
Cultural processes occurred in the desert in a different way and rhythm than in the fertile country. While cultural changes are well defined in the north, the desert culture seems quite constant during the 6th-3rd millennia B.C., with fairly homogeneous flint knapping technology, pottery, architecture, cult and burial sites. The presently available data seems to be insufficient to establish a chronological-cultural division in the desert during the 6th-3rd millennia B.C., or to identify sub-cultures. At present, it is preferable to consider this span as one period, or a single cultural entity.

Nevertheless, the desert societies did evolve during this period. Despite the limited knowledge at hand, and the lack of precise dating of major innovations, it is still worthwhile to offer a general, tentative line of cultural developments in the desert, as a base for future amendment:

During the PPNB, comparatively small numbers of extended families lived in the region, in compact “bee-hive” shaped dwelling sites, and subsisted on hunting and gathering. Those who lived in the ‘Araba Valley and southern Negev were also engaged in copper ore exploration and trade for artistic and cosmetic use, and in the trade of sea shells and semi-precious stone beads. Those who lived in western Sinai traded turquoise as well. Possibly, their search for minerals was already involved with real mining (see Ch. 3, Note 9, Table 9:1 and Table 1:69).

During the 6th and 5th millennia B.C., herding and agriculture were gradually adopted by the desert populations, probably influenced by the aftermath of the final PPNB-PPNC environmental crisis. These brought about major cultural changes. The compact “bee hive” sites were replaced by “courtyard sites”, and with the rise of pastoralism, corrals and tent camps appeared, as well as predatory traps to protect the herds. The tabular scraper became common in the desert, manufactured in several centers (Har Qeren, Har Karkom, Jebel ‘Egma, Jaf Basin), and also traded in the north. The appearance of hole-mouth vessels was most probably related to the rise of agriculture. During this time the new complex economy was established, mainly based on herding but combined with agriculture, trade and other crafts. The life-style which developed with this economy was one of “semi-nomadism” or “enclosed nomadism”, which means seasonal movement of short distances of tens of kilometers (unlike the hundreds in true nomadism). Stone-built habitation units, usually for one extended family, served as base-camps occupied from late autumn to spring, while temporary built sites and tent camps served for summer grazing. As a result of the new economy, the desert population was able to better exploit the carrying capacity of the region, and significantly increase their numbers. This is evident from the dramatic increase of habitation sites from PPNB to the following periods (see above), and from the increase in the number of \(^{14} \text{C}\) dates in the Negev and Sinai (Tables 1, 2, excluding southern Jordan). Hunting played a limited role in the economy of the Negev population, who owned limited numbers of arrowheads and only about 14 desert kites. In southern Sinai, hunting was somewhat more important, arrowheads were more common and about 50 desert kites are recorded.

Already at the beginning of the process described above, many cult sites were established throughout the desert, including masseboth sites which became abundant since the early 6th millennium B.C., open-air sanctuaries and a variety of cult installations (since the mid 6th millennium B.C.). Cemeteries appeared as a new institution (ca. 5500 B.C.), which besides spiritual implications, also bore a territorial message. Tumuli tombs represent one of the significant innovations in burial customs, followed by the impressive novamis tombs (ca. 4700 B.C.). The florescence of cult sites was simultaneous with the changes in material culture, it must have been associated with it, but the precise connection between the two must still be studied.

During the 5th millennium B.C. copper metallurgy appeared as an important innovation. The desert population, previously well-acquainted with the geology of minerals, became expert in copper prospecting, mining and smelting, and benefited from the metal’s commercial value. As mentioned above, the early steps of metallurgy in the desert are not yet clear, however, local skill must have served as the infrastructure for the spectacular copper hoard from Nahal Mishmar, as early as the mid 5th millennium B.C.

Another important process transpired during the 5th-4th millennia B.C., namely the “Secondary Product Revolution”, which brought about the harnessing of animals for labor, the processing of milk into preservable products, and the use of wool. Harnessing animals prompted the invention of the plough (beginning with the ard), and from excavations in ‘Uvda Valley, we can now add the invention of the animal-drawn threshing sledge. The influence of these innovations on desert societies is demonstrated by their continuous population growth up to the climax in the 3rd millennium B.C.

Naturally, the relative importance of herding and agriculture differed from place to place. In some areas, such as ‘Uvda Valley and southern Sinai, the environment permitted an emphasis on agriculture, and parts of the habitations developed into permanent settlements. Nevertheless, local variations do not necessarily mean cultural differentiation. People in various regions of the desert could have shared similar flint tools, pottery, architecture, cult sites and burial customs, and speak the same language. In general, the desert culture can be seen as indigenous and durable, one that evolved internally but was also involved in the cultural processes of the broader Near East.

In conclusion, the previous chapters and the summary demonstrate that the simple archaeological remains of the desert actually reveal a rich and complex cultural picture. To date, only a small portion of them have been studied, or briefly documented, and I deeply believe that they still have much to tell us. Until recently, the desert was benevolent in preserving its ancient treasures. Now, however, desert sites are rapidly disappearing due to army training, development projects, and the lack of protection. Some of the sites mentioned in this work do not exist any more, and others are damaged. It is difficult to tell how many of these sites will still be available for studying or visiting in the coming years.
STUDIES IN THE MATERIAL AND SPIRITUAL CULTURE OF THE NEGEV AND SINAI POPULATIONS DURING THE 6TH-3RD MILLENNIA B.C.

Abstract of a Ph.D. dissertation, by U. Avner

The study compiles several themes derived from archaeological surveys and excavations which I conducted in the southern Negev and eastern Sinai since 1977. Some concern the subsistence strategies and material culture of the desert inhabitants, others deal with their spiritual world. Commonly, these two fields are studied separately, but here they have been integrated in an attempt to receive a broader cultural picture.

Desert archaeological remains differ from those of the sown land. Usually they are smaller, contain less cultural sedimentation and less artifacts, and many of them represent a single period of settlement. Since the surveys of N. Glueck during the 1930s, a historical notion has been widely accepted that the desert was only inhabited in relatively short periods, with longer gaps in settlement, and that the settlement periods were mainly due to outside initiatives. Vast archaeological surveys carried out in the Negev from 1979 to 1984 and published during the 1990s supported this concept. For example, they demonstrated an almost total lack of archaeological remains from the Late Neolithic to Early Bronze Age I (ca. 6000-3000 B.C.), an abrupt settlement fluorescence in the desert during the EB II (3000-2650 B.C.), followed by another period void of remains, the EB III (2650-2300 B.C.). The settlement fluorescence over the desert was attributed to the prominence of ‘Arad, and their abandonment to the fall of ‘Arad.

The results of my own research in the southern Negev and Sinai present a different picture. A compiled list of 14C dates, for example, from my excavations and those of others (184 dates within the 6th-3rd millennia B.C.) reveals a complete sequence of settlement in periods previously perceived as absent in the desert.

The study of the material ingredients of the desert culture has provided unexpected results. In some desert areas an advanced agriculture developed since the 6th millennium B.C. Presently, this is best exemplified by the archaeological remains of ‘Uvda Valley. Here hundreds of ancient sites were recorded on the eastern side of the valley, from which ample agricultural equipment was found, including hundreds of sickle blades, hundreds of grinding stones, silos, and the botanical remains of barley, wheat, olive and others. Two stone ard tips are the earliest known to date in the world, c.a. 4000 B.C. In addition, a surprising concentration of 32 ancient threshing floors was discovered, the largest and oldest concentration known to date in Israel and beyond. The excavation of one threshing floor yielded the earliest indication of use of an animal-drawn threshing sledge, in the 4th millennium B.C. While in most of the desert area grazing was the main source of subsistence, in ‘Uvda Valley agriculture was probably the primary branch of the economy.

A survey of studies concerning the evolution of copper production indicates that, despite lacunae in our knowledge, the desert societies were directly involved in copper mining, smelting and trade from the incipient stages of metallurgy, in the 5th millennium B.C., and they continuously developed mining and smelting technologies. Their control of the copper resources, mainly along the ‘Araba Valley, supplied an important economical and political benefit.

The settlement scenario as revealed in the southern Negev and eastern Sinai arises the question whether the past climate was similar or different than the present. A survey of studies from various fields of research indicates that until the 4th millennium B.C. the climate was somewhat moister than today. During the 3rd millennium B.C. a gradual desiccation occurred, with frequent fluctuations, but this is the period when the desert settlement reached its climax. A global climatic crisis occurred around 2300 B.C., but even this did not cease the human presence and activity in the desert, and in fact, numerous sites in the Negev and northern Sinai are dated to the EB IV. Only a change of life-style was required, with more emphasis on grazing and mobility and a lower reliance on agriculture.
In the field of spiritual culture, sites of masseboth (standing stones) and open air-sanctuaries were addressed. A total of 207 masseboth locations have been recorded and cataloged to date and 15 were excavated. These sites contain either individual masseboth or groups of repeated numbers and consistent characteristics. Based on a comparative study of later ancient written sources, archaeological research and anthropological material, it is suggested that most masseboth in the desert represented individual or known groups of deities, and others represented ancestors. The earliest masseboth in the desert are dated to the 11th millennium B.C., while from the 6th millennium B.C. they greatly increased. At present, the documented number of desert masseboth locations is double that of the rest of the Near East, although the study area comprises only 1% of the Near East area. This may serve as one indication that masseboth were mainly a desert cultural element, which only later, around 2000 B.C., became common in the fertile zones as well. The study of open air-sanctuaries, of which 154 were recorded and 10 excavated, also revealed a rich spiritual world of the desert societies. Several ideas represented in their ground-plans and attached features are later found in built sanctuaries farther north.

All open sanctuaries and a large portion of masseboth locations were built next to ancient roads. A survey of the roads showed that as early as the 6th millennium B.C. the road map of the desert was well established. People, goods and ideas traveled on these roads, connecting distant regions. In later periods, road sections were occasionally improved, mainly on widening ascents, but not much was left to add to the road map.

Burial was only briefly addressed, but this field too demonstrates major innovations in funerary customs in the desert, which preceded their appearance in the fertile zones. Analysis of the rich symbolism represented by the tomb's construction, adjacent cult installations, offerings and mortuary practices suggest that a new perception of life and death may have developed in the desert in the 6th millennium B.C., which is later also found in other cultures and religions.

The general picture reflected from the desert remains is that during the 6th millennium B.C. a new cultural complex developed. While until that time desert societies subsisted on hunting and gathering, they now lived on the production of food, mainly grazing and agriculture, and somewhat later, also on copper production and trade. These continued to develop, and during the 5th-4th millennia B.C. several innovations were adopted, i.e. harnessing animals for labor, the plough (ard) and the threshing sledge. These developments found expression in the constant growth of the desert population, reaching a climax in the 3rd millennium B.C. Simultaneously and related to the new material culture, there was a major development in the spiritual domain, represented in the multiple masseboth sites, the appearance of open-air sanctuaries and the new burial customs.

It may be said that the desert inhabitants developed an indigenous, independent culture, well adapted to its environment, which also maintained cultural and economical relations with the sown lands. These developments occurred during periods which were, until recently, commonly believed to be "missing" in the desert.
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-120.


Fig. 2:1. The Drainage System and Natural Water Sources of 'Uvda Valley.
Fig. 2.2. Map of Surveyed Ancient Sites in 'Uvda Valley
(due to map scale, not all sites are shown)
2.3. 'Uvda Valley from west, before construction of the airbase.

2.4. 'Uvda Valley from southwest, vegetation coverage.

2.5. N. Re’uel site ('Uvda 20), plan of the excavated area (Ronen et al 1999).

2.6. An aerial photograph of N. 'Issaron site ('Uvda 14) from west, excavated by Goring-Morris and Gopher.


2.8. N. 'Issaron, a paved bin or oven, with grinding stones on the left.

2.9. Histogram of radiometric dates from the site of Nahal 'Issaron, Strata C and B (Carmi et al. 1994:395).

2:11. ‘Uvda 100, the remains of a tent camp, from northeast.

2:12. ‘Uvda 124/IV, a rectangular room with a stepped entrance on the east, a paved granary on the lower left and other installations.

2:13. ‘Uvda 166, a single room site, from south, excavated by Avner.

2:14. An aerial photograph of ‘Uvda 17, excavated by Beit-Arieh. The rectangular room belongs to the earlier, EB II stage, the rest is EB IV.

2:15. ‘Uvda 16 from west, with a paved granary in the center, excavated by Yogev.


2:17. An aerial photograph of ‘Uvda 19, from east, the lower room is a shrine with masseboth. Excavated by Eisenberg.

2:18. An aerial photograph of ‘Uvda 4, partially excavated by Eisenberg.

2:19. An aerial photograph of ‘Uvda 21, from west, partially excavated by Eisenberg.

2:20. An aerial photograph of ‘Uvda 9, from west. The square rooms and two courtyards on both sides are EB I-III, the rooms around the southern courtyard and the additional oval courtyard are EB IV. The installation to the right is a shrine with massebah. Excavated by Amiran, Arnon, Ilan and Avner.
2:21. 'Uvda 102, a larger variation of medium size sites.

2:22. 'Uvda 121, corral on low ground, from north.

2:23. 'Uvda 37, corral in a rock shelter, from south.

2:24. Hole mouth rims from Site 124/XVII (massebah): Phase 2 (second lowest): No. 9; Phase 3: No. 8; Phase 4 (upper): Nos. 1-7. Nos. 7, 8 are cooking pots (arkose group), all others are jars (shell groups).

2:25. Hole mouth rims from Site 124/IV (massebah). Phase 3 (lowest): Nos. 3, 4; Phase 2: No. 2. Phase 1 (upper): No. 1. No. 1 is a cooking pot (arkose group), Nos. 2, 3 are jars (shell group), No. 4 is a Wadi Raba jar.
2:26. Chalcolithic pottery sherds and a stone vessel fragment from 'Uvda 57.

2:27. Chalcolithic or early EBI jar from 'Uvda 10, 39 cm high, excavated by Eitan.


2:29. Hole-mouth jar (left) and hole-mouth cooking pot (right) from 'Arad (Amiran et al. 1978, Pl. 109).

2:30. Flint tools from 'Uvda sites:
1. backed blade (124/IV),
2-6. macrolunates (124/IV, 124/XVII, 166),
7. Canaanean blade (124/IV),
8-11. tabular scrapers (25, 166, 124/XVII),

2:32. Wooden adzes and ploughs from Pre-Dynastic and Early Dynastic Egypt (Petrie 1917, Pl. 68).


2:34. 'Uvda 9, a trio of grinding stones as found in the southern courtyard.

2:35. 'Uvda 124/IV, lower grinding stones: 1. large and rectangular; 2. small and oval.
2:36. 'Uvda 149, a stone hoe.


2:38. Agricultural-botanical remains from 'Uvda Valley: 1- olive pits; 2-6- domesticated barley; 7- domesticated wheat. Nos. 1-4 from site 96; Nos. 5-7 from site 150a (Ma’aleh Shaharut).

2:39. 'Uvda 124/IV, a possible oil production installation: 1. anvil; 2. hammer stone; 3. mortar; 4. built basin.

2:40. 'Uvda 16, a paved granary, excavated by Yogev.
2:41. ‘Uvda 99, a group of three threshing floors, from west.

2:42. ‘Uvda 56, an aerial photograph of three threshing floors and silos on beaten soil, from west.

2:43. N. Yaham, southern Negev, an ancient and recent Bedouin threshing floor with three silos, from north.

2:44. N. Yaham, hay in the Bedouin granary (the lower right in Fig. 42).

2:45. Be’er Sheva’ Valley (1979), Bedouin threshing by trampling.


2:47. Distribution map of threshing floors in eastern ‘Uvda Valley.
2:48. 'Uvda 96, an aerial photo from north:
1. perimeter of first cleared rock surface; 2. flint workshop;
3. circular threshing floors; 4. circular structures.

2:50. 'Uvda 96 during the first excavation, an aerial photo from east:
1. perimeter of older cleared area and excavated rock surface (L. 7);
2. flint workshop; 3. circular threshing floor; 4. silos.

2:51. 'Uvda 96. The excavated earlier cleared rock surface,
with Wall 2 built on top, from northwest.

2:52. 'Uvda 96, L. 7 from south: 1. earlier cleared rock
surface; 2. living level (L. 7b); 3. stone dump (L. 7a).
2:53. Plan of the northern threshing floor in 'Uvda 96 after the recent excavation season (based on initial plan by I. Vatkin, with the addition of elements by U. Avner).
2:54. 'Uvda 96 after the second excavation, from north. No. 1 is a section of the stone dump left unexcavated.

2:55. 'Uvda 96, the excavated area of the northern threshing floor, with the flint workshop (L. 11) in the center.

2:56. 'Uvda 96, the flint workshop (L. 11, W. 11) built on top of the earlier cleared rock surface and cutting W. 7. On the right, a section of the stone dump left unexcavated. Photo from north.

2:57. 'Uvda 96, scraper-like flint tools from L. 21: 1, 2. heavy duty; 3-5. elongated; 6-8. transversal-heavy duty.
2:58. Flint sledge from Cyprus (Crawford 1935, Pl. 1).

2:59. Micro-wear on a macrolunate flint blade from 'Uvda 166, with longitudinal, one-direction striation, additional striae in other directions, “comet-shaped” shallow depressions and plucking depressions. Analysis and photo by P. Anderson & Chabot (X200).

2:60. 'Uvda 96, cereal phytolith cut perpendicular to the fibers. Analysis and photo by P. Anderson (X100).

2:61. 'Uvda 96, flint “teeth”, probably for sledge.

2:62. 'Uvda 96, a trio of grinding stones from L.

2:63. Pottery sherds of hole-mouth jars and cooking pots

2:64. 'Uvda 96, fragment of a wooden tool from L. 14b (=7b).

2:65. 'Uvda 96, flint microlunates from Loci 7b and 11b.

2:66. ‘‘Uqfi’, a sledge pole, 1.5 m long (Avitsur 1966, Fig. 11).

2:68. Chalcolithic adze from a threshing floor in N. Eloth, Negev Highlands.

2:69. Threshing by animal trampling in Late Kingdom Egypt (Thebes Tomb wall painting, Wreszinski 1923, Taf. 234).

2:70. Eastern ‘Uvda Valley, White Saxaul growth outside the wadi channels.


2:73. Eastern ‘Uvda Valley, a broad slow flood (January 1982).


2:75. Eastern ‘Uvda Valley, remains of embankment, an aerial photo from northwest.
2:76. Northern 'Uvda Valley, an aerial photo of embankment remains.

2:77. Northern 'Uvda Valley, an aerial photo of embankment remains.

2:78. Nahal Paran, an aerial photo of limans, from west.

2:79. Nahal Paran, liman ground plan.


2:81. 'Uvda 123, a small terrace (one of four), 0.6 m high.

2:82. 'Uvda 124/VI, the remains of two water dams (out of five).

2:83. 'Uvda 78a, a habitation site in a depression with rain water, from south.

2:84. 'Uvda 135, rock cut water well.
2:85. ‘Uvda 135, section of rock cut water well.

2:86. N. Yitro, eastern ‘Uvda Valley, Bedouin storage in a cave, including a wooden plough pole, two iron plough tips, two iron sickles, a wooden pitchfork and millstones.

2:87. An aerial photograph of Bedouin granaries in northern ‘Uvda Valley (1 of 4 concentrations), each originally 2 m deep.

2:88. An aerial photograph of shallow Bedouin granaries in N. Gerzi, northwest of ‘Uvda Valley, each 3 m in diameter.

2:89. ‘Uvda 9, massive stone masonry.

2:90. ‘Uvda 21, a survey ground plan (prior to partial excavation by E. Eisenberg, c.f. Fig 2:18), with definitions of areas.
Fig. 3:1. Location of Copper Mines and Production Sites Refered in Ch.3.

x Copper Mine
# Habitation with Copper Production

Abu Matar
Bir Safadi
Nevatim

NEGEV

Faynan

SINAI

'Uvda Valley
Yovvata
Timna
Be'er Ora
'Etzion
Roded
Tell Magass

W. Khairig
J. Um Rina
Bir Basib

Watiya
Sheikh Muhsain
Nabih Saleh
W. Remti
W. Tar

Gulf of Suez

Galilat bay

0 50 Km
Fig. 3.2. Map of Copper Mines and Smelting Sites of Various Periods in the 'Araba Valley*

* The map is based on the following sources: Abu 'Ajamich 1988; Rothenberg 1990; Hauptmann 2000, and the writer's surveys.
Fig. 3:3. Map of Copper Mines and Production Sites in the Faynan (Hauptmann 2000:63)

Fig. 3:4. Map of Copper Mines and Production Sites in Timna' Area (Rothenberg 1990:2)
3:5. Qalb Ratiye, Faynan, the entrance to an ancient mine.


3:7. Stone digging tools from Faynan mines (Nos. 1-3, Hauptmann & Weisgerber 1987, Fig. 4) and from Fidan 4 (No. 4, Adams & Genz 1995, Fig. 2).

3:8. Timna’ Site 42, a natural cavity with carved entrance.

3:9. Basalt digging axe from Timna’ Site 42 (Rothenberg 1972, Fig. 5).

3:10. Timna’ Area T, a section of copper mine, in sandstone.

3:12. Timna' Mine S27, two periods and two methods of mining.

3:13. Timna' Mine S10, a broad shaft mined with a digging axe.


3:15. 'Etzion, open-air copper mine in igneous rock.

3:16. N. Roded, open-air copper mine in sandstone.

3:17. N. Roded, fragment of flint digging axe.

3:18. Be'er Ora Hill, open-air copper mine in limestone.

3:20. Be’er Ora, hammer stones, and a grinding stone fragment (upper left).

3:21. Be’er Ora mine, stones and clay lumps from smelting furnaces, with slag and glaze attached.

3:22. Be’er Ora mine, flint and pottery from surface, including crucible fragments (bottom center) and clay rod fragments (bottom right).

3:23. Faynan 9 smelting site, copper nodules (bottom), solid slag (right) and clay rod fragments (left).


3:25. Timna’ Site 39b, copper smelting furnace remains, excavated by Rothenberg.

3:26. Slag mass with copper prills, results of a laboratory experiment reconstructing a Chalcolithic smelting process (courtesy of M. Bamberger).

3:27. N. Nimra, an EB Ia jar and cup from a rock shelter tomb (Sebbane & Avner 1993).
3:28.  N. Nimra, a copper ingot, probably EB I.

3:29.  Timna’ smelting Site 149 from west, with a low wall, anvils and mortars (excavated by Rothenberg).

3:30.  N. Mishmar hoard, selected objects (photo-Israel Museum, Jerusalem).


3:32.  Copper bead from the Eilat burial site.

3:33.  Copper awls from 'Uvda Valley sites (1-5) and Samar desert-kite (6).


3:35.  Molds for casting copper bar ingots from Kh. Hanra Idan (Levy et al. 1999).
3:36. Histogram of calibrated, mean value $^{14}$C dates from copper mines and production sites in the southern `Araba (Calibration based on OxCal 3.4, Ramsey 2000; for references see Table 5).

3:37. Histogram of calibrated $^{14}$C dates from copper mines and production sites in the Faynan area (Hauptmann 2000:64, Calibration based on Calib 3, Stuiver & Reimer 1993.)
4:1. Orientation breakdown of desert masseboth (N=202); 1 mm represents one masseboth location.

4:2. 'Uvda 105a, a single narrow stone.

4:3. N. Ashalim 20, a single broad stone.

4:4. 'Ein Qetura, southern Negev, a pair of narrow stones.

4:5. Har Saguv, southern Negev, a pair of broad stones.

4:6. W. Qebileh, eastern Sinai, a pair with a taller narrow stone and shorter broad stone.

4:7. Mitspe Sayarim, southern Negev, a pair with a taller broad stone and shorter narrow stone.
4:30. W. Mara, eastern Sinai, a tomb with seven masseboth on the eastern perimeter.

4:31. W. Aradeh, eastern Sinai, a tomb with a pair of masseboth and additional ones on both sides.


4:33. Har Tsuri’az, a broad massebah in an open sanctuary.

4:34. Har Tsuri’az, a pair of masseboth in an open sanctuary.

4:35. ‘Uvda 6, a group of 17 masseboth in an open sanctuary (excavated by O. Yogev).

4:37. Eilat open sanctuary II, a cache of 99 masseboths.

4:38. Eilat open sanctuary II, the masseboth after removal for restoration.


4:40. 'Uvda 69, masseboth as found, from east.

4:41. 'Uvda 69, the back side of the masseboth, from west.

4:42. 'Uvda 69, additional masseboth from the front cell.

4:43. 'Uvda 69 after resetting the tilted masseboth.

4:44. 'Uvda 6 plan.
4:45. ‘Uvda 19, installation with three detached masseboth, excavated by E. Eisenberg (1980b) the pavement is partially restored.

4:46. ‘Uvda 19, a sunken altar, excavated by E. Eisenberg.

4:47. ‘Uvda 124/IV, a broad massebah, a basin and grinding stones (dark spots are animal dung).


4:49. ‘Uvda 124/XVII, a broad massebah and platform, before excavation.

4:50. ‘Uvda 124/XVII, the massebah after excavation (grinding stones are rearranged).
4:22. Eilat Tomb V, an anthropomorphic massebah within the tomb.

3:23. Eilat Tomb V, a pair of broad masseboth on the eastern perimeter.

4:24. Eilat Tomb XV, a broad massebah on the eastern side.

4:25. Eilat Tomb XVII, a pair of broad masseboth on the eastern perimeter, and a single stone within the cell.


4:27. Bir Sawaneh, eastern Sinai, a tomb with a triad (the left massebah is tilted), and an additional pair in front.

4:28. W. Zalaqa 301, eastern Sinai, a tomb with a triad of masseboth on the eastern perimeter.

4:29. W. Zalaqa, Tomb II, a single broad massebah on the eastern perimeter (found tilted forward).
4:15. Har Argaman II, installation with "eyed" masseboth.

4:16. Har 'Amram, Eilat Mountains, buried "eyed" massebah.


4:18. Eilat Tomb I, a pair of fallen broad masseboth.

4:19. Eilat Tomb I, a pair of broad masseboth, reset.

4:20. Eilat Tomb III, a pair of broad stones on the eastern perimeter.

4:21. Eilat Tomb IV, two single stones, in the center and in the doorway.
4.64. Bir Sawaneh plan.

4.65. W. Watir plan.

4.66. W. Zalaqa 301, as found.

4.67. W. Zalaqa 301, from the back, the stones are facing Mount Ras alQalb.

4.68. W. Zalaqa 301 during excavation, with a basin on the left.

4.69. W. Zalaqa 301 after resetting the stones.

4.70. W. Zalaqa 301 plan.
4:71. W. Zalaqa 307 as found.


4:73. W. Zalaqa 307 after resetting the left stone.

4:74. W. Zalaqa 307 from the back, with a pair of masseboth standing behind the main group.

4:75. W. Zalaqa 307, an installation with a massebah and an offering bench in front of the main group of masseboth.

4:76. W. Sa'al I as found.

4:77. W. Sa'al I, a hearth with a small stone platform in front of the masseboth.

4:78. W. Sa'al I, after excavation and resetting two stones.
4:51. 'Uvda 124/XVII, section of excavation.

4:52. 'Uvda 124/XVII plan.

4:53. 'Uvda 151 as found, from northwest.

4:54. 'Uvda 151 after excavation and resetting the stones, from northeast.

4:55. 'Uvda 151, plan of restored situation.
4:56. Samar, southern 'Araba Valley, installation with a fallen broad massebah.

4:57. Samar, after resetting the massebah (support stones are original).

4:58. Give'at Shehoret, a pair of stones after mending, with an offering table in front.

4:59. N. Shehoret, a broad massebah with circular installations.

4:60. Bir Sawaneh, eastern Sinai, a triad of stones as found.


4:62. W. Watir, eastern Sinai, a triad of stones as found.

4:63. W. Watir, after excavation.
4:8. Har Tsuri'az, southern Negev, a triad with a narrow central stone.

4:9. Be'erotaim, Negev Highlands, a triad with a broad central stone.

4:10. Har Tsuri'az, southern Negev, a triad with a shorter central stone.

4:11. Ras alQalb, eastern Sinai, a row of detached multiple masseboth (some are fallen).

4:12. Ma'aleh Yitro (Úvda 69b), triad of "eyed" masseboth.

4:13. Har Argaman I, Eilat Mountains, installation with "eyed" masseboth.

4:14. Har Argaman II, massebah with a natural "eye".
4:79. W. Sa'al I, a sunken altar.

4:80. W. Sa'al I from the back, at a winter sunrise (December 12, 1981).

4:81. W. Sa'al I plan.

4:82. W. Sa'al II as found, the central massebah is tilted.

4:83. W. Sa'al II after resetting the central massebah.

4:84. W. Sa'al II from the back, with a row of support stones.

4:85. W. Sa'al II, a built hearth.
4:86. W. Sa'al 2 plan.

4:87. W. Daba'iyyah, five masseboth as found.

4:88. W. Daba'iyyah after resetting the tilted massebah, from east (2.05 m high).

4:89. W. Daba'iyyah plan.

4:90. 'Uvda 69, a silver pendent before cleaning.

4:91. 'Uvda 124/IV, selection of flint blades.

4:92. 'Uvda 124/IV, fragment of "Wadi Raba" hole-mouth jar.
4:93.  'Uvda 124/XVII, flint scraper and a crescent shaped blade.

4:94.  'Uvda 151, coarse and regular adzes.

4:95.  Give’at Shehoret, Mid-Paleolithic hand-axe.

4:96.  W. Watir, a fossil and sandstone nodule.


4:98.  W. Watir, dentalium and small conches.


4:100.  W. Watir, a fragment of sandstone bowl.

4:102. W. Sa'al 1, a granite grinding bowl.

4:103. W. Sa'al 1: 1. tabular scraper; 2. jar handle; 3. fragment of shell bracelet.

4:104. W. Daba'iyyah, a fragment of shell bracelet.

4:105. A typical section of masseboth shrine.


4:109. Rosh Zin, the massebah, reset.

4:114. Allahah, a crude massebah with the portrait of a storm god (Wooley 1955, Pl. 64c).

4:115. Allahah, massebah bearing the symbol of a storm god (Von Oppenheim 1962, Pl. 38).


4:111. Beidha, southern Jordan, Natufian or Early Neolithic massebah (Kirkbride 1968, Pl. 24a).


4:110. Abu Salem, Negev Highlands, a possible Harifian massebah incorporated in a wall.

4:118. 'Arad, massebah with possible representation of Tamuz (Amiran 1971, Pl. 15).


4:120. 'Uvda 142 (N. Shaharut), an engraved broad massebah in a rock-shelter tomb.

4:121. Orientation breakdown of Near Eastern masseboth (N=49; 2 mm represents one masseboth location).

4:122. Callanish, Scotland, a circle of menhirs, attached to a menhir avenue and alignments.

4:123. Rantepau, Sulawesi (Indonesia), menhir avenue.

4:124. Buri, Sulawesi (Indonesia), a circular field of menhirs.

4:125. Los Millares, Spain, a 3rd millennium "passage grave" with adjacent installation of small masseboth (Leisner 1943:Taf. 18:5).
4:126. Suaya, Sulawesi, an ancestral shrine in a burial cave, with small masseboth and offerings of water and cigarettes.

4:127. Kotilola, Irian Jaya (Indonesia), an ancestral shrine with small masseboth in a cult cave.

4:128. N. 'Oded Site, Negev Highlands, a triad of Byzantine masseboth, the right stone is broken (Rosen & Avni 1997, Figs 4.20).

4:129. N. 'Oded Site, a triad of masseboth in an Early Islamic open-air mosque (Avni 1997, Figs 4.26).

4:130-132. Sahara desert, present day worship of a triad of masseboth in an open-air mosque (National Geographic TV program, 2000).
4:133. Nahal Roded, an oval installation paved with small lime flagstones.

4:134. Nahal Roded, anthropomorphic stone image, only the neck is carved (found fallen).

4:135. Nahal Roded, anthropomorphic limestone image as found, carved all over.

4:136. Nahal Roded, the stone image re-set.


4:139. Nahal Roded, fragments of a stone object with an elongated groove and a carved snake.
Fig. 5:1. Map of Open-Air Sanctuaries Sites, and Main Ancient Roads*

* Due to map scale not all sites are presented.
5:21. W. Radadi cluster, a fallen massebah in Sanctuary Pair II.

5:22. W. Radadi cluster, a stone alignment next to Sanctuary Pair I.

5:164. Pairs of built sanctuaries in the southern Levant.

2. 'Ein Gedi (Ussishkin 1980:6).
5. 'Arad (Amiran et al. 1980:8).
7. 'Arad (Amiran et al. 1980:8).
9. Megiddo XIV (Loud 1984, Fig. 180).
10. 'Arad (Amiran et al. 1980:8).
5:165. Arad, an Early Bronze complex of sanctuaries (Amiran et al. 1980:8). Numbers refer to those in Fig 5:164.

5:166. Yabrin, eastern Saudi Arabia, large circular enclosure (50 m) associated with tumuli and elongated cells (Bibby 1973, Fig. 51).

5:167. Southwestern Saudi Arabia, a circular enclosure with tumuli and stone alignments (Zarins et al., 1980, Pl. 5).


5:170. Dibba, southeast Arabia, a circular enclosure (6 m) with two "ladders" (Doe 1983:72).

5:172. Southwestern Saudi Arabia, a large stone drawing (Zarins et al. 1980, Pl. 8).

5:173. alGhażlaniya, Judean Desert, a circular open sanctuary with two rectangular cells.

5:174. Southwestern Saudi Arabia, a circular open sanctuary with two rectangular cells (Zarins et al. 1980, Pl. 8).

5:175. Rawdah, Oman, a circular enclosure 26 m in diameter (Doe 1983:69).

5:176. Central Sahara Desert, a stone platform, up to 390 m across (Tillner 1981:17).

5:177. Sahara Desert, cobble circles (10-15 m) and a rectangular rock enclosure (Tillner 1981:16).

5:178. Southern Sahara desert, platform-shaped tomb, with a section below (Milburn 1996a, Fig. 3).

5:179. Atakur, central Sahara Desert, cobble circle; the inner double circles are made with vertically set stones (Tillner 1981:15).
5:180. Southwestern Saudi Arabia, crenelation line with 'namus' tomb (Zarins et al. 1980, Pl. 30).

5:181. 'Uvda 12, a 'plaza' site with 6 circular structures and a later tumulus tomb, an aerial photo from W. Excavated by Eisenberg (1980a).

5:182. N. Girzi, a 'plaza' site consisting of 10 cairns and small circular cells, from E.
5.6. Map of Har Tsuri'az sites; open sanctuaries are numbered.

5.7. Har Tsuri'az Sanctuary XXI, an aerial photo from W; note the ancient road at the top.

5.8. Har Tsuri'az Sanctuary XXI, from NE; note the dark gravel fill.

5.9. Har Tsuri'az Sanctuary XI, an aerial photo from SE, after robbery of the courtyards' stones.

5.10. Har Tsuri'az Sanctuary XX, an aerial photo from S., note the dark gravel fill.
5:43. Har Karkom (Anati's Site 426), two of four stone platforms, an aerial photo from N.

5:44. Mitspeh Sayarim, a circular and a rectangular platform.

5:45. N. Qatsra, a circular platform with a line in the center and a broad massebah, from E.

5:46. Sedeh Boqer, a circular platform with a broad, split massebah, from S.

5:47. Mitspeh Sayarim, a small platform with a massebah and a petroglyph, from E.

5:48. N. Shaharut, a circular installation next to masseboth, from E.

5:49. Mitspeh Sayarim, a circular open sanctuary with a line in the center.

5:50. Ma'aleh Shaharut, a circular open sanctuary with a line in the center and a shaped stone "drum".
5:36.  N. Qadar, an open sanctuary with two fallen masseboth, in the center and on the east; from E-SE.

5:37.  N. Qadar, a fallen massebah in front of the sanctuary.

5:38.  N. Betamim, a natural stone basin in the open sanctuary.

5:39.  Har Badad, a circular open sanctuary with a "ladder" and crenelation line; an aerial photo from S.

5:40.  N. Neqarot, a circular open sanctuary with the remains of three "ladders" and crenelation lines; some trails of an ancient road pass through the site. An aerial photo from S.

5:41.  N. Hatseva, three circular open sanctuaries, a "ladder", three tombs on a platform and crenelation line; the ancient road is visible next to the site. An aerial photo from SE.

5:42.  N. Hatseva, three circular open sanctuaries with a "ladder" and three tombs on a platform (crenelation line is to the right).
5:2. Map of Machtesh Ramon cluster of open sanctuaries; dotted arches denote remains of circle chains.

5:3. Machtesh Ramon cluster of open sanctuaries, an aerial photo from S.

5:4. Machtesh Ramon cluster, Pair of Sanctuaries I, from NE.

5:5. Machtesh Ramon cluster, massebah in a circular installation, in Pair of Sanctuaries IV (excavated by Y. Israel).
5:33. W. Zalaqa 311, a semi-circular open sanctuary (Type 1c), note the large stone on the cell's left side.

5:34. W. Zalaqa 311, a semi-circular cell with a fallen massebah.

5:35. 'Ein Yaqqa, central Sinai, an elongated cell with a triad of masseboth in the center (Rothenberg 1979a:110).

5:12. Har Shani cluster, Sanctuaries I-III, from NE.


5:14. Darb Ghaza cluster, Sanctuary III, from SE.
5:24. Hashem alTaref cluster, the elongated cells of Sanctuaries VII-XV, from E.

5:25. Hashem alTaref cluster, Sanctuary XII, with a platform and a double line of stones marking the courtyard.

5:26. Hashem alTaref cluster, Sanctuary XIV, a triple line of stones surrounding the courtyard.

5:27. Hashem alTaref cluster, 'right' side Sanctuary of Pair IV, the courtyard is marked by a double line of stones.

5:28. Hashem alTaref cluster, Pair of Sanctuaries X, from NE.

5:29. Hashem alTaref cluster, a chain of circles surrounding Pair of Sanctuaries XI.

5:30. Hashem alTaref cluster, Sanctuary XXI intersecting circle chain surrounding Sanctuary XX; from NE.

5:31. Hashem alTaref cluster, Sanctuary XX, a large stone set on the elongated cell's edge.
5:149. 'Uvda 6 open sanctuary, with the stone drawing, after being damaged and then restored, from E-SE.

5:151. 'Uvda 6, the stone drawing after being damaged and restored, from S-SW; small rocks represent missing stones.

5:152. 'Uvda 6, stone drawing of an oryx.

5:153. 1- restoration of 'Uvda 6 leopard; 2- leopard, (photo- B. Shalmon); 3- leopards on painted plaster from Çatal Hüyük (Mellaart 1975:111).

5:150. 'Uvda 6, ground plan of stone drawing, dotted stones denote reconstruction.
5:154. 'Uvda 6, the southern end of the stone drawing, small animals mounted on adult backs. Small rocks represent missing stones.

5:155. 'Uvda 6, restoration of stone drawing, leopard cub mounted on an adult's back.

5:156. Examples of a youngster carried by an adult: 1- Çatal Hüyük, 6th millennium B.C. (Mellaart 1967:120); 2- Eridu, clay figurine, 4th millennium B.C. (Amiet 1977:350); 3- Laristan, bronze figurine, 8th century B.C. (Kozloff 1981:27); 4- Tell Braq, stone figurine, 4th millennium B.C. (Mallowan 1947:26); 5- Cyprus, stone figurine, 4th millennium B.C. (Crouwel 1978, Pl. IV:11); 6- Cyprus, 3rd millennium B.C., stone figurine (Ekschmitt 1968, No. 11); 7- Har Karkom, petroglyph, date unknown; 8- Kh. Tanur, Nabatean, 1st century A.D., Nike carrying Tiche (Glueck 1965, Pl. 48). Nos. 2, 3, 5 and 6 are drawn (by the writer) from the originals.

5:157. Figurines of women (goddesses, head restored) sitting on leopards: 1- Çatal Hüyük (Mellaart 1967:184); 2- Haçilar (Mellaart 1970, Fig. 228); 3- Hellenistic figurine from Maresha (Kloner 1987).
Pairs of open sanctuaries, from north to south.
5:159. Other pairs of open sanctuaries in desert sites.

5:160. Har Tsuri'az X, a triad of open sanctuaries, aerial photo from E.

5:161. Har Tsuri'az IX pair of sanctuaries, the 'left' sanctuary, divided to three sections, view from E.

5:162. Har Tsuri'az IX, a broad massebah in the central platform, with a late petroglyph.

5:163. Har Tsuri'az IX, a petroglyph next to the massebah.
5:121. Pottery sherds from Har Shani cluster of sanctuaries: 1- Chalcolithic and EB; 2- Late Bronze-Early Iron Age; 3- Nabatean and Roman; 4- Byzantine-Early Islamic.

5:122. Har Shani Sanctuary X, Chalcolithic jar base with textile imprint (28 x 15 mm).

5:123. Har Tsuri’az VI, Chalcolithic sherd of hole-mouth jar.


5:126. Red Sea shells: 1-4 from 'Ein Netafin cult installation (Tridacna maxima, Anandra antiquata, Atactodea striata, Cenitum ceareuleum); 5 from Ras alNaqeb open sanctuary (Cerithium ceareuleum, dated ca. 4330 Cal. B.C).

5:127. Finds from Har Shani sanctuary cluster: 1- colored flint; 2- hematite nodules; 3- quartz pebbles; 4- fossil shells; 5- sea-shells; 6- colored sandstone; 7- elongated quartz pebble; 8- shaped quartzite stone.

5:128. Finds from various open sanctuaries: 1-4- stones of unique forms from Har Tsur'az; 4- from N. Qedar; 6- fossil wood from Har Yehoahaz; 7- calcite crystals from Har Yehoahaz.

5:129. N. Botem cult installation, a limestone bowl.

5:130. Sedeh Boqer cult installation, fragment of Chalcolithic basalt fenestrated pedestaled bowl.

5:131. 'Ein Netufim cult installation, clay objects and sea-shells (discovered by M. Shemtov).


5:133. Har Tsur'az Sanctuary VI, fragments of alabaster vessels.


5:140, 141. Hashem alTaref XVII stone drawing.
5:142. Jebel Hashem alTaref, a stone drawing, from W.

5:143. Jebel Hashem alTaref, the same stone drawing, from E.

5:144. Jebel Hashem alTaref, restoration of the stone drawing.

5:145. Late Neolithic stone figurine from Greece (Ucho 1968, Pl. 67).

5:146. Chalcolithic "violin" figurine from Gilat (after Alon & Levy 1989, Fig 7).

5:147. Jebel Hashem alTaref, additional stone drawing, from N.

5:51. Ma’aleh Shaharut, the stone "drum" in the circular open sanctuary.

5:52. Ma’aleh Shaharut, stone "drums" next to an installation with massebah (below).

5:53 Ma’aleh Shaharut, an installation with massebah and two stone "drums".

5:55. Desert enclosures: 1- W. Jideid (Conder 1988:99); 2- Adeimeh (Stekelis 1935:67-8); 3- Bab edh-Dhrin (Clark 1988:69-71); 4-7- Judean Desert (Bar-Adon 1972:106-120); 8- N. Mishmar (Bar-Adon 1980:12); 9- Ma'aleh Tsurim (measured by the writer). The intersecting line in No. 4 is complete, based on my observation in the site.

5:56. Ma'aleh Tsurim, an enclosure ca. 50 x 60 m, an aerial photo, from W.
5:57. N. Neqarot, a "ladder" 72 m long with a circular open sanctuary (discovered by Y. Israel, measured by Avner).

5:58. N. Hatseva, a 'ladder' (discovered by L. Enmar, measured by Avner), 21 m long with crenelation line.

5:59. Darb Sultan (N. Neqarot), a circular sanctuary, a "ladder", a "bar" line and an additional stone alignment next to the ancient road (discovered by Y. Israel, measured by the writer).

5:60. Har Hadav, a "bar" line attached to a tumulus tomb, from W. (discovered by G. Ragolski).

5:61. W. Aradeh, eastern Sinai, a section of tumuli field with alignments; an aerial photo, from S.

5:62. Eilat Burial Ground, a stone alignment directed at a tomb, during excavation.

5:63. Ramat Barne'â, a tumuli field with alignments (Haiman 1989a:21).

5:64. Ma'aleh Tzurim, Stone Alignment III, from S.

5:65. Nahal Botem, an elongated stone chamber (discovered by M. Shemtov)
5:66. Ma'aleh Tsurim, a section in Stone Alignment I.

5:67. "Kubur Bani Israil" near Hizmeh, one of five monumental stone alignments.

5:68. Judean Desert, a section of a stone alignment 1400 m long, built as a "ladder" and connecting to a circular structure (Bar-Adon 1972:124).

5:69. Judean Desert, a stone alignment 700 m long, connecting to a tumulus on the hilltop, crossing a circular enclosure, and connecting to another circular structure (c.f. Bar-Adon 1972, Site 131), an aerial photo from SE.

5:70. Three sections of the "K Line" in the Negev Highlands, 4600 m long, connecting to two tumuli tombs and a circle (Evenari et al. 1958:266).

5:71. N. Shaharut, crenelation line on a cliff-top, with a tomb in a rock shelter to the right.

5:72. N. Shaharut, a tomb in a rock shelter next to the crenelations (the front wall collapsed).
5:73. N. Shaharut, a cairn in crenelation line.

5:74. N. Shaharut, a collapsed cairn with black discoloration.

5:75. W. Hasi, eastern Sinai, collapsed crenelation line with 80 cairns and a tumulus (unseen).

5:76. Ras alKalb, eastern Sinai, masseboth line as a version of crenelations.

5:77. Plan of 'Uvda 6 open sanctuary (sanctuary measured by M. Feist, stone drawings by I. Vatkin).
5:78. 'Uvda 6 after partial reconstruction of the walls, from E.

5:79. 'Uvda 6, the elongated cell and built hearths; the pavement in the cell, the pillar behind it and Hearth 615 have been restored.

5:80. 'Uvda 6, the masseboth in the elongated cell’s center.

5:81. 'Uvda 6, Hearth 620 next to the stone drawings.

5:82. Har Shani open sanctuary X before excavation, from N.

5:83. Har Shani X during excavation, from W.

5:84. Plan of Har Shani X.
5:85. Har Shani X, basin of L. 5 as uncovered.


5:89. Har Shani X, "Walls" 7 and 8 of the earlier stage, built of small rocks.

5:90. Eilat Sanctuary I after excavation, from E-NE.

5:91. Plan of Eilat Open Sanctuary I.
5:92. Eilat Open Sanctuary I, the central installation with the remains of massebah.

5:93. Eilat Open Sanctuary I, the base of disintegrating massebah, supported by small rocks.

5:94. Plan of Eilat Open Sanctuary II with the upper level masseboth; darker stones are standing.

5:95. Eilat Open Sanctuary II during excavation, from E-SE.

5:96. Eilat Open Sanctuary II, lower level of masseboth.

5:97. Eilat Open Sanctuary II, a horizontal massebah below W. 3.
5:98. W. Radadi I, the central installation in the 'right' sanctuary.

5:99. W. Radadi II, installation with massebah in the 'right' sanctuary.

5:100. W. Radadi III, an empty installation in the "right" sanctuary.


5:102. W. Zalaqa 306, the elongated cell as discovered, from S-SW.

5:103. W. Zalaqa 306, the elongated cell during excavation.

5:104. W. Zalaqa 306, the elongated cell after excavation.

5:105. W. Zalaqa 306, the large stone closing the cell's side.

5:106. W. Zalaqa 306, a "vase" shaped installation in the elongated cell.
5:107. W. Zalaqa 309 as discovered, from SE.

5:108. W. Zalaqa 309 restored, from SW.

5:109. W. Zalaqa 315 as discovered, from SE.

5:110. W. Zalaqa 315, the courtyard is marked by small stones vertically set.

5:111. Plan of W. Zalaqa 315 open sanctuary.

5:112. W. Zalaqa 315, the elongated cell, the tumulus and the semi-circular cell with masseboth.

5:113. W. Zalaqa 315, the tumulus’ courses are incorporated with those of the elongated cell.

5:114. W. Zalaqa 315 after excavation, with partial restoration of the elongated cell and the stone line in front.
5:115. Flint from Har Tsuri'az Open Sanctuaries XVI, XII and IV: 1 and 3- tabular scrapers; 2- large hammerstone.

5:116. Tools from Har Tsuri'az: 1- basalt axe from Trio of Sanctuaries X; 2- an adze from Sanctuary VIII.

5:117. Flint tools from 'Uvda Valley: 1- tabular scraper from 'Uvda 6; 2- side scraper from 'Uvda 6; 3- fine-retouched blade from 'Uvda 53c.

5:118. Three tabular scrapers from N. Seguv open sanctuary.

5:119. Selected flint tools from Har Shani cluster of sanctuaries: 1- tabular scraper; 2, 3- retouched blades; 4, 5- borers.

5:120. Lower and Middle Paleolithic flint tools from Har Tsuri'az Sanctuaries V, VII, XVIII: 1 and 3- choppers; 2- hand axe.
5:15. Darb Ghaza cluster, Open Sanctuaries IV and III, from SE.

5:16. Darb Ghaza cluster, Pair of Sanctuaries VI, from SW.

5:17. Darb Ghaza cluster, a natural stone basin in Sanctuary I.


5:19. W. Radadi cluster, Pair of Sanctuaries I, from N-NE.

5:20. W. Radadi cluster, Pair of Sanctuaries II, from S; note the fallen massebah.
Fig. 6:1. Map of Ancient Roads in the Eilat Area*

* The map presents only roads which were explored by the writer, at least in parts, excluding those in Jordan.
The base map was prepared by the Survey of Israel, all rights reserved.
6:2. Finds from the 'Araba road (G.R. 16549664): 1- flint tools, including Early Neolithic blades, a tabular scraper fragment and ad-hoc tools (6th-3rd mill. B.C.); 2- Chalcolithic and EB pottery sherds; 3- MB II cooking pot sherd; 4- "Negev ware" sherd (Iron Age ?); 5- Nabatean and Late Roman sherds; 6- Early Islamic sherds; 7- "Ghaza ware" of recent centuries.

6:3. Finds from two collection points on Ma'aleh Shaharut (G.R. 15239243, 15249236): 1- flint tools, including Early Neolithic blades, bi-facial, three fragments of tabular scrapers; 2- Chalcolithic- EB I sherds; 3- LB-IA sherds ("Midianite" at the bottom); 4- Nabatean and Late Roman sherds; 5- Byzantine and Early Islamic sherds.

6:4. Darb Ghaza (G. R. 12539082), a band of trails ca. 150 m wide, from south.

6:5. Darb alHajj (G.R. 11768972), a band of trails ca. 200 m wide, from east.

6:6. Western 'Araba Valley (G. R. 16549664), a band of trails ca 67. N. Girzi, southern Negev, a band of trails 20 m wide, from 150 m wide, from south.
6:8. N. ‘Orqan, southern Negev, a band of trails ca. 40 m wide, from east.

6:9. N. Qedar, southern Negev, bands of trails gathering toward a winding path, from west.

6:10. Ma‘aleh Shaharut, one of six winding paths leading from the Yotvata Oasis to ‘Uvda Valley and Darb Ghaza, from north.

6:11. Ma‘aleh Zugan, one of six winding paths leading from the Yotvata Oasis to ‘Uvda Valley and Darb Ghaza, from west.

6:12. Machtesh Ramon, the Nabatean "Incense Road" seen as a regular band of trails, ca. 20 m wide, from south.

6:13. Har Badad, the Nabatean "Incense Road" seen as a regular band of trails, ca. 15 m wide, an aerial photo from NW.

6:14. N. Hatseva, an ancient road cut by a modern one, an aerial photo from north.

10:2. Western 'Uvda Valley, a stone "bed" for primary burial, 20 cm below surface (Avner, unpublished).


10:4. Wadi Zalaqa, eastern Sinai, a tumulus tomb surrounded by vertically-set stones, next to an open-air sanctuary (the latter restored, Avner 1984).

10:5. Jebel Guna, eastern Sinai, ring-shaped tumuli tombs, an aerial photo.


10:7. Nahal Paran, southern Negev, two tumuli tombs connected by a stone alignment.

10:8. Wadi Hajjaj, eastern Sinai, part of the Nawamis "village", an aerial photo from west (excavated by Bar-Yosef et al. 1977).

10:9. Wadi Hajjaj, a single Namus tomb as preserved.

10:11. Ma'aleh Shaharut I, an EB I tomb in a rock shelter, an aerial photo from east.

10:12. Ma'aleh Shaharut I, an EB I tomb in a rock shelter, the top right side is partially restored (Avner 1986).

10:13. Ma'aleh Shaharut IV, an MB II tomb in a rock shelter, the remains of a flagstone roof supported by a wooden beam.


10:15. Ma'aleh Shaharut tombs: cut and shaped dentalium beads from Tomb I (left), faience, sea-shells and bone beads from Tomb V (right).

10:17. Map of the Eilat Burial ground; empty triangles denote temporary graves, filled triangles denote tumuli tombs.

10:18. Eilat Tumulus XV, skeletal remains of a mother and a child in a flexed position, with a stone pillow on the western end of the cell.

10:19. Eilat Tumulus V, an anthropomorphic massebah with a "nest" of six skulls.

10:20. Eilat Tumulus V after reconstruction, with masseboth on the eastern perimeter and within the cells, from northeast.

10:21. Eilat Tumuli IV and V, from west, surrounded by hearths.

10:22. Eilat, the remain of sacred wood in a stone installation (front wall removed).

10:23. Eilat, flint arrowheads from Tombs IV, VI, XV.

10:26. Eilat Tumulus VI, a pile of 31 tabular scrapers on a pavement surrounding the tomb.

10:27. Eilat, a shell bowl and a coral fragment from Tumulus VI, and other sea-shells.

10:25. Eilat Tumulus VI, fragments of decorated sandstone.


10:29. Sea-shell beads from Tumulus V, industrially manufactured in standardized sizes (scale in millimeters, photo by Tsila Sagiv).

10:30. Eilat, faience and glazed talcos-steatite beads from Tumulus V (scale in millimeters, photo by Tsila Sagiv).
Table 1. Late Neolithic to EB IV B.C. $^{14}$C Calibrated Dates from Southern Jordan, Negev and Sinai, from North to South$^1$

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1. Calibration based on OxCal 3.4 (Ramsey 2000), 1 Sigma- 68.2% confidence. Mean values were calculated for the preparation of the histogram only. Dates from these sites, which are out of the range referred here, are not included in this list.

Sites where excavators are not mentioned in the references are as follows: Har Dimon- G. Tal; Mushabi 103- Sass & Klemmer; Hagamal Site- Rosen; Feidan 8- Adams; Faynan 9- Adams; Feidan 4- Adams & Genz, Adams & Levy; Hamra Iftan- Adams; Barqa al Hatiye- Fritz; 'Uvda 4- Eisenberg; 'Uvda 6- Yoyev; 'Uvda 7- Sass & Goren; 'Uvda 16- Yoyev; 'Uvda 9- Amiran, Arnon, Ilan and Avner; Yotvata Hill- Meshel; Yotvata 6- Meshel & Sass; Ras el Naqeb- Avner; Hashem el Taref XVII- Avner; Hashem el Taref 650, 317, 317a, W. Kyke 649, W. Malha 332, Themed 699- Kosloff; Ein Abu Rugum- Sass; W. Watir- Avner; ‘Ein Um Ahmed- Goren; W. Zalaqa- Avner; W. Dab’iyia- Goren, Avner; Serabit el Khadim- Beit Arieh; J. ‘Adeideh- Goren; Abu Khalil- Goren; Sinai 1130/3- Biet-Arieh; Sheikh ‘Awad- Biet-Arieh. For the location of sites see Map 1.
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2. The first two dates from the massebah at ‘Uvda 9 (124/XVII) were retrieved from the same hearth, at the base of the massebah. The first and the earlier date is considered erroneous.
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### Table 2a. Histogram of Calibrated B.C. Dates, Late Neolithic to EB IV, from the Negev, Sinai and Southern Jordan, from North to South*

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* Each spot represents the mean value of one or more calibrated dates, based on OxCal 3.4 (Ramsey 2000). For the location of sites see Map 1.
Table 2b. Numbers of $^{14}$C Dates in the Negev, Sinai and Southern Jordan per Century in Each Period (an arbitrary division, based on Table 1).

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Table 3. Occurrence of Hole-Mouth Pottery Sherds in ‘Uvda Valley Sites 124/IV and 124/XVII (masseboth installations), According to Petrography Groups and Phases (1 = lowest).

(Weight= grams, number= sherds).

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<th>Begs No.</th>
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<th>Arkose group number weight</th>
<th>Shell group number weight</th>
<th>Total weight</th>
<th>Ark. % wht</th>
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Table 4. Flint Tools from 'Uvda Valley Excavated Sites (summerized from Rosen 1983a:138-237)
The table does not include flint collected during the site’s survey. In some sites not all
flint was collected during the excavation. Total figures are recalculated from Rosen’s data.

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<td>Total</td>
<td>64640</td>
<td>19910</td>
<td>155</td>
<td>16145</td>
<td>442</td>
<td>3776</td>
<td></td>
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</tr>
</tbody>
</table>
### Table 7. Chalcolithic Copper Finds in Relation to Copper Cult Objects*

<table>
<thead>
<tr>
<th>Site</th>
<th>Crowns</th>
<th>Standards</th>
<th>Mace heads</th>
<th>Axes</th>
<th>Chisels</th>
<th>Awls</th>
<th>Varia</th>
<th>Total</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>N. Mishmar Cave 10</td>
<td>1</td>
<td>124</td>
<td>261</td>
<td>1</td>
<td>15</td>
<td>1</td>
<td>18</td>
<td>430</td>
<td>Bar-Adon 1980</td>
</tr>
<tr>
<td>Ze’elim Cave</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Aharoni 1961</td>
</tr>
<tr>
<td>N. Makuch Cave 1</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>11</td>
<td>3</td>
<td>Patrich 1988, 1989</td>
</tr>
<tr>
<td>Sandal Cave</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>Eshel &amp; Zissu 2000</td>
</tr>
<tr>
<td>N. Mikhmash Cave 3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>Eshel &amp; Zissu 1999</td>
</tr>
<tr>
<td>N. Lahat</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Perrot 1955</td>
</tr>
<tr>
<td>Kh. Matar Cave 3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>9</td>
<td>15</td>
<td>37</td>
<td>Eldar &amp; Baum. 1985</td>
</tr>
<tr>
<td>Shiqmim</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>23</td>
<td>1</td>
<td>37</td>
<td>Shalev 1992</td>
</tr>
<tr>
<td>N. ‘Ashan Cave 3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>Cohen 1976</td>
</tr>
<tr>
<td>N. Lachish Cave 3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>Shalev 1992</td>
</tr>
<tr>
<td>Palmahim Cave 3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>Gophna &amp; Liphsch.1980</td>
</tr>
<tr>
<td>Giv’at Oranim 3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>8</td>
<td>Orev &amp; Scheftelowitz1999</td>
</tr>
<tr>
<td>Giv’at Oranim 3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>8</td>
<td>Yanai, pers. comm.</td>
</tr>
<tr>
<td>N. Qanah Cave 3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>Gopher &amp; Tzuk 1996</td>
</tr>
<tr>
<td>Peqi’in Cave 3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>Gal et al. 1997</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>139</td>
<td>280</td>
<td>22</td>
<td>28</td>
<td>33</td>
<td>48</td>
<td>568</td>
<td></td>
</tr>
</tbody>
</table>

* The list includes complete, damaged and fragmented objects, only from sites in which prestige artifacts of the N. Mishmar types were found; six scepters from N. Mishmar are included here in the standards, and "awls" include here pins as well. For additional references to Safadi see also Perrot 1968, for Shiqmim see also Shalev & Northover 1987. I thank Patrich, Scheftelowitz, Yanai and Shalev for the unpublished information. Analyses and further information on the finds from N. Makuch Cave, N. Lahat, N. ‘Ashan and N. Lachish see in Shalev 1992:26-33.

### Table 8. List of Bar Copper Ingots Found in Each Site:

<table>
<thead>
<tr>
<th>Site</th>
<th>Complete bars</th>
<th>Segmented bars</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tell Lachish</td>
<td>2</td>
<td>3</td>
<td>Tufnell et al. 1958:74-5, Pl. 21</td>
</tr>
<tr>
<td>Hebron Hills</td>
<td>21</td>
<td></td>
<td>Dever &amp; Tadmor 1976</td>
</tr>
<tr>
<td>Har Yeruham</td>
<td>18</td>
<td>1</td>
<td>Kochavi 1963, 1968, 1969</td>
</tr>
<tr>
<td>Har Tsayad</td>
<td>-</td>
<td>6</td>
<td>Cohen 1999:96-98, 262-3, Fig. 58</td>
</tr>
<tr>
<td>Be’er Resisim</td>
<td>1</td>
<td>1</td>
<td>Cohen 1999:205, 262-3, Fig. 139b</td>
</tr>
<tr>
<td>Mashabei Sadah</td>
<td>-</td>
<td>1</td>
<td>Cohen 1999:118, 262-3</td>
</tr>
<tr>
<td>Rekhes Nafha 396</td>
<td>1</td>
<td></td>
<td>Saidel 2002:57, Pl. 14:10</td>
</tr>
</tbody>
</table>
Table 9. Histogram of $^{14}$C Dates from Copper Mines and Production Sites in the Southern ‘Araba*

<table>
<thead>
<tr>
<th>1. Timna’ S 27</th>
<th>2. Timna’ 39</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Tell Magass</td>
<td>6. Timna’ 30</td>
</tr>
<tr>
<td>7. Timna’ 2</td>
<td>8. Timna’ S28</td>
</tr>
<tr>
<td>11. Timna’ 200</td>
<td>12. Timna’ S18</td>
</tr>
<tr>
<td>15. N. Amram</td>
<td>16. Timna’ 39b</td>
</tr>
<tr>
<td>17. Be’er Ora (28)</td>
<td></td>
</tr>
</tbody>
</table>

* For the earlier dates see Tables 1 and 2, for the later see Avner & Magness 1998:57. Each spot represents the mean value of one or more calibrated dates, based on OxCal 3.4 (Ramsey 2000).

Table 10. Histogram of $^{14}$C Dates from Copper Mines and Production Sites in Faynan Area*

(Hauptmann 2000:64)

* Dates are calibrated, based on Calib 3 (Stuiver & Reimer 1993)
Table 11. Catalogue of Late Neolithic to Early Bronze *Masseboth* in the Negev, Sinai and the Judean Desert

<table>
<thead>
<tr>
<th>Site/Location</th>
<th>Max. height</th>
<th>Orientation</th>
<th>In/Next to</th>
<th>Attached items</th>
<th>Ref/Found by</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:1 N. Ashalim (16)</td>
<td>56 cm</td>
<td>E-SE</td>
<td>ancient road, cult and burial site</td>
<td>circular cell</td>
<td>Y. Israel, U. Avner, G. Ragolski</td>
<td></td>
</tr>
<tr>
<td>1:2 N. Ashalim (24)</td>
<td>89 cm</td>
<td>E</td>
<td>ancient road, cult and burial site</td>
<td>offering bench</td>
<td>Y. Israel, U. Avner, G. Ragolski</td>
<td>incorporated in a stone alignment, with other <em>masseboth</em></td>
</tr>
<tr>
<td>1:3 N. Ashalim (28 I)</td>
<td>47 cm</td>
<td>E</td>
<td>ancient road, cult and burial site</td>
<td></td>
<td>Y. Israel, U. Avner, G. Ragolski</td>
<td>aligned with two other single <em>masseboth</em>, ca. 1 m apart</td>
</tr>
<tr>
<td>1:4 Be’erotaim (2)</td>
<td>97 cm</td>
<td>E-NE</td>
<td>habitation</td>
<td>small semi-circular cell in the front, circular room at</td>
<td>T. Gini</td>
<td></td>
</tr>
<tr>
<td>1:5 Har Karkom 7</td>
<td>57 cm</td>
<td>E</td>
<td>habitation</td>
<td>remains of semi-circular cell</td>
<td>Anati (unpublished)</td>
<td></td>
</tr>
</tbody>
</table>

Single Narrow Stones
1:6  Site/Location: Har Karkom 214b  
G.R.: 12419669  
Max. height: 50 cm  
Orientation: E  
In/Next to: habitation  
Attached items: stone basin, natural rock pavement  
Ref/Found by: Anati 1993:58  
Ref. to Figs:  
Notes:  

1:7  Site/Location: N. Karkom  
G.R.: 12959759  
Max. height: 47 cm  
Orientation: E-NE  
In/Next to: ancient road  
Attached items: small circular cell  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes: in a cluster of masseboth groups and cairns  

1:8  Site/Location: N. Karkom  
G.R.: 12959759  
Max. height: 45 cm  
Orientation: S  
In/Next to: ancient road  
Attached items: offering bench  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes: in a cluster of masseboth groups and cairns  

1:9  Site/Location: Har Tsuri'az  
G.R.: 13779694  
Max. height: 48 cm  
Orientation: E  
In/Next to: ancient road  
Attached items: offering bench, circular cell  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes: aligned with other masseboth groups  

1:10  Site/Location: N. Tsihor  
G.R.: 14399582  
Max. height: 64 cm  
Orientation: E-SE  
In/Next to: ancient road  
Attached items:  
Ref/Found by: H. Ginat  
Ref. to Figs:  
Notes: the stone bears late petroglyphs, with light colored p
1:11 Site/Location: N. Girzi
G.R. 14539414
Max. height: 38 cm
Orientation: N
In/Next to: tent camp
Attached items:
Ref/Found by: U. Avner
Ref. to Figs:
Notes:

1:12 Site/Location: ‘Ein Qetura
G.R. 15579372
Max. height: 18 cm
Orientation: E
In/Next to: ancient road
Attached items: pavement
Ref/Found by: U. Avner
Ref. to Figs:
Notes: in a cluster of 6 small masseboth groups

1:13 Site/Location: ‘Uvda 105a
G.R. 14749288
Max. height: 102 cm
Orientation: E
In/Next to: tent camp
Attached items: cairn
Ref/Found by: U. Avner
Ref. to Figs: 4:2
Notes: found broken in half, the top roughly shaped

1:14 Site/Location: ‘Uvda 135
G.R. 15059264
Max. height: 84 cm
Orientation: E
In/Next to: habitation
Attached items:
Ref/Found by: U. Avner
Notes: incorporated in a wall

1:15 Site/Location: ‘Uvda 166
G.R. 14599278
Max. height: 67 cm
Orientation: E
In/Next to: habitation
Attached items: circular cell
Ref/Found by: U. Avner
Ref. to Figs:
Notes:
1:16 Site/Location: 'Uvda 162a
G.R. 14729278
Max. height: 34 cm
Orientation: ?
In/Next to: “crenelations”
Attached items: 
Ref/Found by: U. Avner
Ref. to Figs: 
Notes: flint, roughly shaped, found fallen

1:17 Site/Location: Ma'aleh Zugan
G.R. 14969221
Max. height: 39 cm
Orientation: E
In/Next to: ancient road
Attached items: 
Ref/Found by: U. Avner
Ref. to Figs: 
Notes: set on top of a cairn

1:18 Site/Location: N. Raham
G.R. 14248986
Max. height: 64 cm
Orientation: E
In/Next to: tent camp
Attached items: opened circular cell
Ref/Found by: U. Avner
Ref. to Figs: 
Notes: 

1:19 Site/Location: N. Roded
G.R. 14198918
Max. height: 16 cm
Orientation: SE
In/Next to: cult installation
Attached items: offering bench
Ref/Found by: U. Avner
Ref. to Figs: 
Notes: 

1:20 Site/Location: N. Roded
G.R. 14198918
Max. height: 26 cm
Orientation: E
In/Next to: stone alignment
Attached items: offering bench, remains of small circular cell
Ref/Found by: U. Avner
Ref. to Figs: 
Notes: 
<table>
<thead>
<tr>
<th>Site/Location:</th>
<th>N. Roded</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.R.</td>
<td>14158913</td>
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<tr>
<td>Max. height:</td>
<td>32 cm</td>
</tr>
<tr>
<td>Orientation:</td>
<td>?</td>
</tr>
<tr>
<td>In/Next to:</td>
<td>cult installation</td>
</tr>
<tr>
<td>Attached items:</td>
<td></td>
</tr>
<tr>
<td>Ref/Found by:</td>
<td>U. Avner</td>
</tr>
<tr>
<td>Notes:</td>
<td>roughly carved, anthropomorphic, found fallen</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site/Location:</th>
<th>W. Zalaqa 307</th>
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</thead>
<tbody>
<tr>
<td>G.R.</td>
<td>08888239</td>
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<tr>
<td>Max. height:</td>
<td>26</td>
</tr>
<tr>
<td>Orientation:</td>
<td>E</td>
</tr>
<tr>
<td>In/Next to:</td>
<td>burial and cult site</td>
</tr>
<tr>
<td>Attached items:</td>
<td>circular cell</td>
</tr>
<tr>
<td>Ref/Found by:</td>
<td>U. Avner</td>
</tr>
<tr>
<td>Ref. to Figs:</td>
<td>4:75</td>
</tr>
<tr>
<td>Notes:</td>
<td>in front of five masseboth</td>
</tr>
</tbody>
</table>

<table>
<thead>
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<th>Site/Location:</th>
<th>W. Zalaqa 312</th>
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</thead>
<tbody>
<tr>
<td>G.R.</td>
<td>08838242</td>
</tr>
<tr>
<td>Max. height:</td>
<td>34 cm</td>
</tr>
<tr>
<td>Orientation:</td>
<td>S</td>
</tr>
<tr>
<td>In/Next to:</td>
<td>ancient road and open sanctuary</td>
</tr>
<tr>
<td>Attached items:</td>
<td>pavement, cairn</td>
</tr>
<tr>
<td>Ref/Found by:</td>
<td>U. Avner</td>
</tr>
<tr>
<td>Ref. to Figs:</td>
<td></td>
</tr>
<tr>
<td>Notes:</td>
<td></td>
</tr>
</tbody>
</table>

**Single Broad Stones**

<table>
<thead>
<tr>
<th>Site/Location:</th>
<th>upper N. Dragot</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.R.</td>
<td>18871177</td>
</tr>
<tr>
<td>Max. height:</td>
<td>127 cm</td>
</tr>
<tr>
<td>Orientation:</td>
<td>E-NE</td>
</tr>
<tr>
<td>In/Next to:</td>
<td>habitation</td>
</tr>
<tr>
<td>Attached items:</td>
<td></td>
</tr>
<tr>
<td>Ref/Found by:</td>
<td>U. Avner</td>
</tr>
<tr>
<td>Ref. to Figs:</td>
<td></td>
</tr>
<tr>
<td>Notes:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site/Location:</th>
<th>N. Ashalim (11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.G.R.</td>
<td>18170519</td>
</tr>
<tr>
<td>Max. height:</td>
<td>59 cm</td>
</tr>
<tr>
<td>Orientation:</td>
<td>E-SE</td>
</tr>
<tr>
<td>In/Next to:</td>
<td>ancient road, cult and burial site</td>
</tr>
<tr>
<td>Attached items:</td>
<td>pavement</td>
</tr>
<tr>
<td>Ref/Found by:</td>
<td>Y. Israel, U. Avner, G. Ragolski</td>
</tr>
<tr>
<td>Ref. to Figs:</td>
<td></td>
</tr>
<tr>
<td>Notes:</td>
<td></td>
</tr>
</tbody>
</table>
1:26 Site/Location: N. Ashalim (17)
C.G.R. 18170519
Max. height: 92 cm
Orientation: E
In/Next to: ancient road, cult and burial site
Attached items: stone cell
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Notes:

1:27 Site/Location: N. Ashalim (20)
C.G.R. 18170519
Max. height: 62 cm
Orientation: E
In/Next to: ancient road, cult and burial site
Attached items: offering bench, circular cell
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Notes: the stone found tilted forward

1:28 Site/Location: N. Ashalim (22)
C.G.R. 18170519
Max. height: 128 cm
Orientation: E-NE
In/Next to: ancient road, cult and burial site
Attached items: additional smaller masseboth
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Notes: found fallen forward

1:29 Site/Location: N. Ashalim (23)
C.G.R. 18170519
Max. height: 89 cm
Orientation: E
In/Next to: ancient road, cult and burial site
Attached items: offering bench
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Notes: found tilted forward

1:30 Site/Location: N. Ashalim (25)
C.G.R. 18170519
Max. height: 43 cm
Orientation: E
In/Next to: ancient road, cult and burial site
Attached items: semi-circular cell, offering bench
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Notes:
1:31 Site/Location: N. Ashalim (28 II)
C.G.R. 18170519
Max. height: 48 cm
Orientation: E
In/Next to: ancient road, cult and burial site
Attached items:
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Ref. to Figs: aligned with two other single masseboth, ca. 1m apa

1:32 Site/Location: N. Ashalim (28 III)
C.G.R. 18170519
Max. height: 46 cm
Orientation: E
In/Next to: ancient road, cult and burial site
Attached items:
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Ref. to Figs: aligned with two other single masseboth, ca. 1m apa

1:33 Site/Location: N. Ashalim (terrace)
G.R. 18190525
Max. height: 210 cm
Orientation: E-SE
In/Next to: habitation
Attached items: circular courtyard
Ref/Found by: U. Avner, G. Ragolski
Ref. to Figs: large boulder supported by stone platform

1:34 Site/Location: Be’erotaim
G.R. 09840221
Max. height: 82 cm
Orientation: E-SE
In/Next to: habitation
Attached items: rectangular cell, offering bench
Ref/Found by: T. Gini
Ref. to Figs: notes:

1:35 Site/Location: Be’erotaim (3)
G.R. 10010223
Max. height: 82 cm
Orientation: S
In/Next to: habitation, tumuli field
Attached items: circular cell
Ref/Found by: T. Gini
Ref. to Figs: notes: attached to a habitation unit
1:36 Site/Location: Har Aricha
G.R. 12730074
Max. height: 78 cm
Orientation: N-NE
In/Next to: threshing floor
Attached items: semi circular cell
Ref/Found by: U. Avner and G. Ragolski
Notes:

1:37 Site/Location: N. Nitzana
G.R. 11479922
Max. height: 47 cm
Orientation: W
In/Next to: cult installation
Attached items: remains of semi-circular cell
Ref/Found by: Haiman 1999:66
Notes:

1:38 Site/Location: N. Nitzana
G.R. 11509925
Max. height: 93 cm
Orientation: E-SE
In/Next to: threshing floor
Attached items: semi-circular cell
Ref/Found by: Haiman 1999:68
Notes:

1:39 Site/Location: Har Ramon
G.R. 11489904
Max. height: 93 cm
Orientation: E
In/Next to: cult and burial
Attached items: offering bench
Ref/Found by: Cohen 1999:225
Notes: interpreted as a habitation site by the excavator

1:40 Site/Location: Har Ramon
G.R. 11449909
Max. height: 70 cm
Orientation: E-NE
In/Next to: habitation
Attached items: semi-circular cell, offering bench
Ref/Found by: U. Avner and G. Ragolski
Notes:
1:41 Site/Location: Har Ramon
G.R. 11469910
Max. height: 69 cm
Orientation: E-SE
In/Next to: habitation
Attached items: semi-circular cell
Ref/Found by: U. Avner and G. Ragolski
Ref. to Figs: 
Notes:

1:42 Site/Location: Har Ramon
G.R. 11439910
Max. height: 77 cm
Orientation: NE
In/Next to: habitation
Attached items: 
Ref/Found by: U. Avner and G. Ragolski
Ref. to Figs: 
Notes:

1:43 Site/Location: Pitam Passage
G.R. 13039962
Max. height: 140 cm
Orientation: W-SW
In/Next to: ancient road
Attached items: semi-circular cell
Ref/Found by: U. Avner
Ref. to Figs: 
Notes: adopted natural boulder

1:44 Site/Location: Har Karkom 7
G.R. 12519686
Max. height: 46 cm
Orientation: SE
In/Next to: habitation
Attached items: offering bench
Ref/Found by: E. Anati
Ref. to Figs: 
Notes: unpublished

1:45 Site/Location: N. Karkom
G.R. 12959759
Max. height: 32 cm
Orientation: E
In/Next to: ancient road
Attached items: offering bench
Ref/Found by: U. Avner
Ref. to Figs: 
Notes: in a cluster of masseboth groups and cairns
1:46 Site/Location: N. Karkom
G.R. 12959759
Max. height: 35 cm
Orientation: E
In/Next to: ancient road
Attached items: offering bench
Ref/Found by: U. Avner
Ref. to Figs: in a cluster of masseboth groups and cairns
Notes:

1:47 Site/Location: Har Tsuri’az
G.R. 13779694
Max. height: 54 cm
Orientation: E
In/Next to: ancient road
Attached items: additional smaller masseboth
Ref/Found by: U. Avner
Ref. to Figs: Notes:

1:48 Site/Location: Har Tsuri’az
G.R. 13829699
Max. height: 32 cm
Orientation: E
In/Next to: ancient road
Attached items: circular stone platform
Ref/Found by: U. Avner
Ref. to Figs: Notes: near a structure with a triad of masseboth (3:5)

1:49 Site/Location: Har Tsuri’az
G.R. 13969714
Max. height: 31 cm
Orientation: W
In/Next to: open sanctuary
Attached items: pavement
Ref/Found by: U. Avner
Ref. to Figs: Notes:

1:50 Site/Location: Har Tsuri’az
G.R. 13779706
Max. height: 62 cm
Orientation: W
In/Next to: ancient road
Attached items: semi-circular cell
Ref/Found by: U. Avner
Ref. to Figs: Notes:
<table>
<thead>
<tr>
<th>Site/Location:</th>
<th>W. ‘Araba</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.R.</td>
<td>16559694</td>
</tr>
<tr>
<td>Max. height:</td>
<td>45 cm</td>
</tr>
<tr>
<td>Orientation:</td>
<td>S</td>
</tr>
<tr>
<td>In/Next to:</td>
<td>ancient road, tent camp, tombs</td>
</tr>
<tr>
<td>Attached items:</td>
<td>curved wall behind the massebah</td>
</tr>
<tr>
<td>Ref/Found by:</td>
<td>U. Avner</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site/Location:</th>
<th>Qa’ al Sa’idin</th>
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<tbody>
<tr>
<td>G.R.</td>
<td>15609495</td>
</tr>
<tr>
<td>Max. height:</td>
<td>78 cm</td>
</tr>
<tr>
<td>Orientation:</td>
<td>E</td>
</tr>
<tr>
<td>In/Next to:</td>
<td>ancient road</td>
</tr>
<tr>
<td>Attached items:</td>
<td></td>
</tr>
<tr>
<td>Ref/Found by:</td>
<td>U. Avner</td>
</tr>
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<table>
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<tr>
<th>Site/Location:</th>
<th>Yahel</th>
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</thead>
<tbody>
<tr>
<td>G.R.</td>
<td>16129415</td>
</tr>
<tr>
<td>Max. height:</td>
<td>47 cm</td>
</tr>
<tr>
<td>Orientation:</td>
<td>E-SE</td>
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<tr>
<td>In/Next to:</td>
<td>habitation</td>
</tr>
<tr>
<td>Attached items:</td>
<td>additional small massebah</td>
</tr>
<tr>
<td>Ref/Found by:</td>
<td>U. Avner</td>
</tr>
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</table>

<table>
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<tr>
<th>Site/Location:</th>
<th>Neot Semadar</th>
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<tbody>
<tr>
<td>G.R.</td>
<td>15189404</td>
</tr>
<tr>
<td>Max. height:</td>
<td>52 cm</td>
</tr>
<tr>
<td>Orientation:</td>
<td>SE</td>
</tr>
<tr>
<td>In/Next to:</td>
<td>ancient road</td>
</tr>
<tr>
<td>Attached items:</td>
<td>semi-circular cell, a pair of masseboth behind</td>
</tr>
<tr>
<td>Ref/Found by:</td>
<td>A. Holzer</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site/Location:</th>
<th>N. Gerzi</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.R.</td>
<td>13589279</td>
</tr>
<tr>
<td>Max. height:</td>
<td>36 cm</td>
</tr>
<tr>
<td>Orientation:</td>
<td>SW</td>
</tr>
<tr>
<td>In/Next to:</td>
<td>tent camp, tumulus</td>
</tr>
<tr>
<td>Attached items:</td>
<td>offering bench</td>
</tr>
<tr>
<td>Ref/Found by:</td>
<td>U. Avner</td>
</tr>
</tbody>
</table>

Notes:
- a small stone cell built behind the massebah
- a pair of larger stones behind
1:56 Site/Location: N. Gerzi
G.R. 13589279
Max. height: 42 cm
Orientation: NW
In/Next to: tent camp, tumulus
Attached items: offering bench
Ref/Found by: U. Avner
Notes:

1:57 Site/Location: 'Uvda 105a
G.R. 14709289
Max. height: 52 cm
Orientation: W
In/Next to: tent camp
Attached items:
Ref/Found by: U. Avner
Ref. to Figs:
Notes:

1:58 Site/Location: 'Uvda 124/IV
G.R. 14649287
Max. height: 59 cm
Orientation: E-SE
In/Next to: habitation
Attached items: basin, two trios of grinding stones
Ref/Found by: U. Avner
Ref. to Figs: 4:47
Notes: excavated

1:59 Site/Location: 'Uvda 124/XVII
G.R. 14639283
Max. height: 121 cm
Orientation: W
In/Next to: habitation
Attached items: hearths, trios of grinding stones, stone platform
Ref/Found by: U. Avner
Ref. to Figs: 4:50
Notes: excavated

1:60 Site/Location: 'Uvda 142
G.R. 15009259
Max. height: 74 cm
Orientation: E-SE
In/Next to: rock shelter tomb
Attached items:
Ref/Found by: Avner 1993:168-9
Ref. to Figs: 4:120
Notes: rock drawing on the stone face
1:61 Site/Location: Ma'aleh Shaharut
G.R. 15249246
Max. height: 47 cm
Orientation: W
In/Next to: ancient road
Attached items: 
Ref/Found by: U. Avner
Ref. to Figs: 
Notes: 

1:62 Site/Location: Ma'aleh Shaharut
G.R. 15039247
Max. height: 120 cm
Orientation: NE
In/Next to: ancient road
Attached items: 
Ref/Found by: U. Avner
Ref. to Figs: 
Notes: 

1:63 Site/Location: 'Uvda west
G.R. 13769277
Max. height: 70 cm
Orientation: W-SW
In/Next to: tent camp
Attached items: rectangular cell
Ref/Found by: U. Avner
Ref. to Figs: 
Notes: natural flint boulder

1:64 Site/Location: Mitspeh Sayarim
G.R. 13509268
Max. height: 90 cm
Orientation: E
In/Next to: corral
Attached items: rectangular cell, remains of pavement
Ref/Found by: U. Avner
Ref. to Figs: 
Notes: natural flint boulder

1:65 Site/Location: Mitspeh Sayarim
G.R. 13229201
Max. height: 18 cm
Orientation: E
In/Next to: tent camp
Attached items: pavement
Ref/Found by: U. Avner
Ref. to Figs: 
Notes: rock drawing of a line and circle at the foot of the m
1:66 Site/Location: Mitspeh Sayarim
G.R. 13449242
Max. height: 47 cm
Orientation: N
In/Next to: ancient road, cairn
Attached items: offering bench
Ref/Found by: U. Avner
Notes:

1:67 Site/Location: Mitspeh Sayarim
G.R. 13249204
Max. height: 39 cm
Orientation: W
In/Next to: tent camp
Attached items: circular cell, offering bench
Ref/Found by: U. Avner
Notes:

1:68 Site/Location: Samar
G.R. 15249158
Max. height: 64 cm
Orientation: E
In/Next to: habitation
Attached items: semi-circular cell
Ref/Found by: U. Avner, A. Holzer
Notes: excavated, found fallen

1:69 Site/Location: N. Meteq
G.R. 14249150
Max. height: 58 cm
Orientation: S
In/Next to: tent camp
Attached items: semi-circular cell
Ref/Found by: M. Shemtov
Notes:

1:70 Site/Location: N. Meteq
G.R. 14199145
Max. height: 46 cm
Orientation: W
In/Next to: tent camp
Attached items: offering bench
Ref/Found by: M. Shemtov
Notes: the stone is naturally split
1:71 Site/Location: N. Meteq
G.R. 14219141
Max. height: 48 cm
Orientation: E-SE
In/Next to: tent camp
Attached items: offering bench, semi-circular cell
Ref/Found by: M. Shemtov
Ref. to Figs:
Notes:

1:72 Site/Location: N. Betamim
G.R. 13979082
Max. height: 48 cm
Orientation: S
In/Next to: tent camp
Attached items: open circular cell
Ref/Found by: U. Avner
Ref. to Figs:
Notes:

1:73 Site/Location: N. Botem
G.R. 13889137
Max. height: 42 cm
Orientation: SE
In/Next to: “Plaza” site
Attached items: circular cell
Ref/Found by: M. Shemtov
Ref. to Figs:
Notes: natural anthropomorphic stone

1:74 Site/Location: Har Saguv
G.R. 13549054
Max. height: 52 cm
Orientation: E
In/Next to: tent camp
Attached items: offering bench
Ref/Found by: U. Avner
Notes:

1:75 Site/Location: N. Shani
G.R. 13648898
Max. height: 42 cm
Orientation: E-NE
In/Next to: tent camp
Attached items: circular cell
Ref/Found by: M. Shemtov
Ref. to Figs:
Notes: stone basin 9 m to the south
<table>
<thead>
<tr>
<th>Site/Location</th>
<th>Max. height</th>
<th>Orientation</th>
<th>In/Next to</th>
<th>Attached items</th>
<th>Ref/Found by</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>N. Shani</td>
<td>21 cm</td>
<td>W</td>
<td>camp and burial</td>
<td></td>
<td>M. Semtov</td>
<td></td>
</tr>
<tr>
<td>N. Shani</td>
<td>23 cm</td>
<td>N</td>
<td>camp and burial</td>
<td>circular cell</td>
<td>R &amp; U. Avner</td>
<td></td>
</tr>
<tr>
<td>N. Shani</td>
<td>92 cm</td>
<td>E</td>
<td>ancient road</td>
<td>offering bench, circular cell</td>
<td>U. Avner</td>
<td>adjacent to a chain of stone alignments</td>
</tr>
<tr>
<td>Be’er Orah</td>
<td>98 cm</td>
<td>W</td>
<td>habitation and tents</td>
<td></td>
<td>M. Shemtov</td>
<td></td>
</tr>
<tr>
<td>N. Shehoret</td>
<td>48 cm</td>
<td>NE</td>
<td>ancient road</td>
<td>offering bench, circular cell</td>
<td>U. Avner</td>
<td></td>
</tr>
</tbody>
</table>
1:81 Site/Location: Shehoret Hill  
G.R. 14668897  
Max. height: 24 cm  
Orientation: W  
In/Next to: tent camp  
Attached items: offering bench, two circular installations  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes:  

1:82 Site/Location: N. Roded  
G.R. 14208919  
Max. height: 28  
Orientation: E  
In/Next to: cult site  
Attached items: open circular cell  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes:  

1:83 Site/Location: Eilat  
G.R. 14358851  
Max. height: 47 cm  
Orientation: E  
In/Next to: open air sanctuaries, tumuli  
Attached items: remains of circular cells in front and behind the mas  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes: found fallen and damaged by mechanical equipment  

1:84 Site/Location: W. Fuqiah  
G.R. 97508872  
Max. height: ~50 cm  
Orientation: W  
In/Next to: habitation  
Attached items: circular cell, pavement  
Ref/Found by: Rothenberg 1974:26-7, Pl. 5  
Ref. to Figs:  
Notes: another massebah buried below the pavement
Pairs of Narrow Stones

2:1 Site/Location: ‘Ein Qetura
G.R. 15579372
Max. height: 33 cm
Orientation: S
In/Next to: ancient road
Attached items: offering bench
Ref/Found by: U. Avner
Ref. to Figs: 4:4
Notes:

2:2 Site/Location: Mitspeh Sayarim
G.R. 13229201
Max. height: 33 cm
Orientation: E
In/Next to: cult site
Attached items: offering bench
Ref/Found by: U. Avner
Ref. to Figs:
Notes: the stones found tilted forward

Pairs of Broad Stones

2:3 Site/Location: N. Ashalim (2)
C.G.R. 18170519
Max. height: 67 cm
Orientation: E
In/Next to: ancient road, cult and burial site
Attached items: offering bench
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Ref. to Figs:
Notes: left stone tilted forward

2:4 Site/Location: N. Ashalim (13)
C.G.R. 18170519
Max. height: 32 cm
Orientation: E-SE
In/Next to: ancient road, cult and burial site
Attached items: small circular cell, additional small masseboth
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Ref. to Figs:
Notes:

2:5 Site/Location: N. Ashalim (19)
C.G.R. 18170519
Max. height: 52 cm
Orientation: E-NE
In/Next to: ancient road, cult and burial site
Attached items: remains of circular cell
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Ref. to Figs:
Notes:
2:6 Site/Location: N. Ashalim (33)
C.G.R. 18170519
Max. height: 78 cm
Orientation: E-NE
In/Next to: ancient road, cult and burial site
Attached items: offering bench, additional smaller masseboth
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Ref. to Figs:
Notes: left stone found fallen

2:7 Site/Location: Har Ramon
G.R. 11459912
Max. height: 51 cm
Orientation: N-NE
In/Next to: threshing floor
Attached items: remains of circular cell
Ref/Found by: U. Avner and G. Ragolski
Ref. to Figs:
Notes:

2:8 Site/Location: Har Ness
G.R. 11199765
Max. height: ~30 cm
Orientation: W
In/Next to: habitation
Attached items: circular cell
Ref/Found by: G. Avni
Ref. to Figs:
Notes: unpublished, but photographed by Avni. Avni (1992) mentions a group of 5 masseboth in the same site, with further information. At present the site is inaccessible.

2:9 Site/Location: N. Pehami
G.R. 12439447
Max. height: 68 cm
Orientation: N
In/Next to: tent camp, ancient road
Attached items: circular cell
Ref/Found by: U. Avner
Ref. to Figs:
Notes:

2:10 Site/Location: Har Tsur’az
G.R. 13969697
Max. height: 65 cm
Orientation: E
In/Next to: tent camp
Attached items: circular cell
Ref/Found by: U. Avner
Ref. to Figs:
Notes:
2:11 Site/Location: ‘Uvda 31a
G.R. 14999367
Max. height: 104 cm
Orientation: E
In/Next to: cult site
Attached items: offering bench, additional smaller masseboth
Ref/Found by: U. Avner
Ref. to Figs:
Notes: with many attached small masseboth (see M:7)

2:12 Site/Location: Mitspeh Sayarim
G.R. 12399247
Max. height: 49 cm
Orientation: E
In/Next to: ancient road
Attached items: offering bench
Ref/Found by: U. Avner
Ref. to Figs:
Notes: right stone damaged and fallen

2:13 Site/Location: Mitspeh Sayarim
G.R. 13219217
Max. height: 19 cm
Orientation: W
In/Next to: ancient road
Attached items: offering bench
Ref/Found by: U. Avner
Ref. to Figs:
Notes:

2:14 Site/Location: Mitspeh Sayarim
G.R. 13599281
Max. height: 48 cm
Orientation: E
In/Next to: tent camp
Attached items: offering bench, pavement
Ref/Found by: U. Avner
Ref. to Figs:
Notes:

2:15 Site/Location: N. Meteq
G.R. 14199145
Max. height: 43 cm
Orientation: E
In/Next to: tent camp
Attached items: offering bench
Ref/Found by: M. Shemtov
Ref. to Figs:
Notes: incorporated in a stone alignment and a tumulus, de\(\) top of left stone
2:16 Site/Location: N. Betamim
C.G.R. 13789111
Max. height: 45 cm
Orientation: W
In/Next to: tent camp
Attached items: circular cell, small additional masseboth
Ref/Found by: M. Shemtov
Ref. to Figs:
Notes: attached to another circular cell

2:17 Site/Location: Har Saguv
G.R. 13549059
Max. height: 38 cm
Orientation: W
In/Next to: ancient road
Attached items: pavement
Ref/Found by: U. Avner
Ref. to Figs: 4:5
Notes:

2:18 Site/Location: Har Saguv
G.R. 13549058
Max. height: 34 cm
Orientation: W
In/Next to: ancient road
Attached items: pavement
Ref/Found by: U. Avner
Ref. to Figs:
Notes:

2:19 Site/Location: N. Roded
G.R. 14258914
Max. height: 37 cm
Orientation: SE
In/Next to: tent camp
Attached items: circular cell
Ref/Found by: M. Shemtov
Ref. to Figs:
Notes:
Pairs of Narrow (taller) and Broad (shorter) Stones

2:20
Site/Location: N. Ashalim (32)
C.G.R.: 18170519
Max. height: 62 cm
Orientation: E-NE
In/Next to: ancient road, cult and burial site
Attached items: offering bench
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Ref. to Figs: left stone found fallen

2:21
Site/Location: N. Ashalim (34)
C.G.R.: 18170519
Max. height: 74 cm
Orientation: E
In/Next to: ancient road, cult and burial site
Attached items: offering bench, additional smaller masseboth
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Ref. to Figs:
Notes:

2:22
Site/Location: N. Ashalim (36)
C.G.R.: 18170519
Max. height: 60 cm
Orientation: E-SE
In/Next to: ancient road, cult and burial site
Attached items: offering bench, additional smaller masseboth
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Ref. to Figs:
Notes:

2:23
Site/Location: N. Karkom
G.R.: 13999721
Max. height: 49 cm
Orientation: E
In/Next to: ancient road and tomb
Attached items: offering bench, circular cell
Ref/Found by: U. Avner
Ref. to Figs:
Notes:

2:24
Site/Location: Paran
G.R.: 16779755
Max. height: 57 cm
Orientation: E
In/Next to: ancient road, tent camp
Attached items: opened semi-circular cell
Ref/Found by: U. Avner
Ref. to Figs:
Notes: left stone found fallen, three small masseboth set in
2:25 Site/Location: Har Tsuri’az  
G.R. 13779694  
Max. height: 47 cm  
Orientation: E-SE  
In/Next to: ancient road  
Attached items: offering bench, additional smaller masseboth  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes: aligned with other masseboth groups

2:26 Site/Location: Har Tsuri’az  
G.R. 13779694  
Max. height: 37 cm  
Orientation: E-SE  
In/Next to: ancient road  
Attached items: offering bench, circular cell  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes: aligned with other masseboth groups

2:27 Site/Location: N. Meteq  
G.R. 14199145  
Max. height: 64 cm  
Orientation: S-SW  
In/Next to: tent camp and tomb  
Attached items: additional small masseboth  
Ref/Found by: M. Shemtov  
Ref. to Figs:  
Notes: the masseboth are set next to a tomb connected to a ... alignment, with another pair of masseboth (No. 2:15

2:28 Site/Location: Shehoret Hill  
G.R. 14658903  
Max. height: 55 cm  
Orientation: E  
In/Next to: habitation  
Attached items: offering bench  
Ref/Found by: U. Avner  
Ref. to Figs: 4:58  
Notes: excavated, found naturally split, but in place

2:29 Site/Location: N. Roded  
G.R. 14198923  
Max. height: 32 cm  
Orientation: NW  
In/Next to: ancient road  
Attached items: offering bench (?), semi-circular cell behind the mas  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes:
2:30 Site/Location: W. Zalaqa 310  
G.R.: 08898239  
Max. height: 92 cm  
Orientation: E  
In/Next to: ancient road and burial site  
Attached items: semi-circular cell built on a platform  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes: sandstone blocks, brought from some distance

2:31 Site/Location: W. Qebileh  
G.R.: 08327422  
Max. height: 75 cm  
Orientation: E  
In/Next to: ancient road  
Attached items: offering bench  
Ref/Found by: U. Avner  
Ref. to Figs: 4:6  
Notes:  

Pairs of Broad (taller) and Narrow (shorter) Stones

2:32 Site/Location: Horkania  
G.R.: 18501159  
Max. height: 76 cm  
Orientation: E  
In/Next to: habitation  
Attached items: remains of a semi-circular cell  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes: left stone found fallen

2:33 Site/Location: N. Ashalim (1)  
C.G.R.: 18170519  
Max. height: 60cm  
Orientation: E  
In/Next to: ancient road, cult and burial site  
Attached items: smaller masseloth  
Ref/Found by: Y. Israel, U. Avner, G. Ragolski  
Ref. to Figs:  
Notes: right stone found fallen, attached to a circular structure, 5 m across

2:34 Site/Location: N. Ashalim (24A)  
C.G.R.: 18170519  
Max. height: 76 cm  
Orientation: E  
In/Next to: ancient road, cult and burial site  
Attached items: offering bench  
Ref/Found by: Y. Israel, U. Avner, G. Ragolski  
Ref. to Figs:  
Notes: incorporated in a stone alignment, with other massel
<table>
<thead>
<tr>
<th>Site/Location:</th>
<th>N. Ashalim (27)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.G.R.</td>
<td>18170519</td>
</tr>
<tr>
<td>Max. height:</td>
<td>44 cm</td>
</tr>
<tr>
<td>Orientation:</td>
<td>E</td>
</tr>
<tr>
<td>In/Next to:</td>
<td>ancient road, cult and burial site</td>
</tr>
<tr>
<td>Attached items:</td>
<td>small circular cell</td>
</tr>
<tr>
<td>Ref/Found by:</td>
<td>Y. Israel, U. Avner, G. Ragolski</td>
</tr>
<tr>
<td>Ref. to Figs:</td>
<td>the pair is backed by a larger boulder</td>
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</table>

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<thead>
<tr>
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<tbody>
<tr>
<td>C.G.R.</td>
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</tr>
<tr>
<td>Max. height:</td>
<td>52 cm</td>
</tr>
<tr>
<td>Orientation:</td>
<td>E-NE</td>
</tr>
<tr>
<td>In/Next to:</td>
<td>ancient road, cult and burial site</td>
</tr>
<tr>
<td>Attached items:</td>
<td>additional smaller maseboth</td>
</tr>
<tr>
<td>Ref/Found by:</td>
<td>Y. Israel, U. Avner, G. Ragolski</td>
</tr>
<tr>
<td>Ref. to Figs:</td>
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<tr>
<td>C.G.R.</td>
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<tr>
<td>Max. height:</td>
<td>65 cm</td>
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<tr>
<td>Orientation:</td>
<td>E-SE</td>
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<tr>
<td>In/Next to:</td>
<td>ancient road, cult and burial site</td>
</tr>
<tr>
<td>Attached items:</td>
<td></td>
</tr>
<tr>
<td>Ref/Found by:</td>
<td>Y. Israel, U. Avner, G. Ragolski</td>
</tr>
<tr>
<td>Ref. to Figs:</td>
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</tbody>
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<table>
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<tr>
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<tbody>
<tr>
<td>C.G.R.</td>
<td>18170519</td>
</tr>
<tr>
<td>Max. height:</td>
<td>55 cm</td>
</tr>
<tr>
<td>Orientation:</td>
<td>E</td>
</tr>
<tr>
<td>In/Next to:</td>
<td>ancient road, cult and burial site</td>
</tr>
<tr>
<td>Attached items:</td>
<td>offering bench, pavement</td>
</tr>
<tr>
<td>Ref/Found by:</td>
<td>Y. Israel, U. Avner, G. Ragolski</td>
</tr>
<tr>
<td>Ref. to Figs:</td>
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<table>
<thead>
<tr>
<th>Site/Location:</th>
<th>Be’erotaim</th>
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<tbody>
<tr>
<td>C.G.R.</td>
<td>09990225</td>
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<tr>
<td>Max. height:</td>
<td>72 cm</td>
</tr>
<tr>
<td>Orientation:</td>
<td>W</td>
</tr>
<tr>
<td>In/Next to:</td>
<td>tumuli field</td>
</tr>
<tr>
<td>Attached items:</td>
<td>offering bench</td>
</tr>
<tr>
<td>Ref/Found by:</td>
<td>U. Avner</td>
</tr>
<tr>
<td>Ref. to Figs:</td>
<td></td>
</tr>
</tbody>
</table>

Notes: left stone found fallen forward
2:40  Site/Location: Mitspeh Sayarim  
G.R. 13239201  
Max. height: 36 cm  
Orientation: W  
In/Next to: tent camp  
Attached items:  
Ref/Found by: U. Avner  
Ref. to Figs: 4:7  
Notes:  

2:41  Site/Location: N. Roded  
G.R. 14208912  
Max. height: 42 cm  
Orientation: N  
In/Next to: mountain top  
Attached items: circular cell  
Ref/Found by:  
Ref. to Figs:  
Notes: right stone found fallen  

**Triads With a Taller, Narrow Central Stone**

3:1  Site/Location: N. Ashalim (12)  
C.G.R. 18170519  
Max. height: 82 cm  
Orientation: E-SE  
In/Next to: ancient road, cult and burial site  
Attached items: offering bench  
Ref/Found by: Y. Israel, U. Avner, G. Ragolski  
Ref. to Figs:  
Notes: central and left stones tilted forward, right stone fall  

3:2  Site/Location: N. Ashalim (14)  
C.G.R. 18170519  
Max. height: 50+cm  
Orientation: E-SE  
In/Next to: ancient road, cult and burial site  
Attached items: remains of small semi-circular cell  
Ref/Found by: Y. Israel, U. Avner, G. Ragolski  
Ref. to Figs:  
Notes:
3:3  Site/Location: N. Ashalim (East)  
C.G.R.: 18390513  
Max. height: 88 cm  
Orientation: E  
In/Next to: ancient road, cult and burial site  
Attached items: offering bench, remains of a semi-circular cell  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes:  

3:4  Site/Location: Be’erotaim  
G.R.: 09930230  
Max. height: 79 cm  
Orientation: NW  
In/Next to: tumuli field  
Attached items: small semi-circular cell, larger rectangular cell  
Ref/Found by: T. Gini  
Ref. to Figs:  
Notes: right stone found fallen  

3:5  Site/Location: Har Tsuri’z  
G.R.: 13829696  
Max. height: 96 cm  
Orientation: E  
In/Next to: ancient road  
Attached items: offering bench (?)  
Ref/Found by: U. Avner  
Ref. to Figs: 4:8  
Notes: incorporated in a rectangular structure  

3:6  Site/Location: N. Karkom  
G.R.: 12959759  
Max. height: 52 cm  
Orientation: E  
In/Next to: ancient road  
Attached items: offering bench (?)  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes:  

3:7  Site/Location: ‘Ein Qetura  
G.R.: 15579372  
Max. height: 30 cm  
Orientation: E  
In/Next to: ancient road  
Attached items: pavement, additional massebah on the right  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes: one of 6 groups
3:8 Site/Location: Shehoret Hill
G.R. 14668906
Max. height: 38 cm
Orientation: E
In/Next to: tent camp
Attached items: offering bench
Ref/Found by: U. Avner
Ref. to Figs: 
Notes: stone pavement behind the masseboth

3:9 Site/Location: Bir Sawaneh
G.R. 09408394
Max. height: 138 cm
Orientation: E
In/Next to: habitation
Attached items: offering bench, semi-circular cell
Ref/Found by: U. Avner
Ref. to Figs: 4:61
Notes: additional semi-circular cell behind the masseboth

3:10 Site/Location: Mitspeh Sayarim
G.R. 13229201
Max. height: 34 cm
Orientation: N
In/Next to: tent camp
Attached items: offering bench, additional massebah
Ref/Found by: U. Avner
Ref. to Figs: 
Notes: adjacent to a stone platform

Triads with a Larger, Broad Central Stone

3:11 Site/Location: N. Ashalim (5)
C.G.R. 18170519
Max. height: 56 cm
Orientation: E
In/Next to: ancient road, cult and burial site
Attached items: offering bench
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Ref. to Figs: 
Notes:

3:12 Site/Location: N. Ashalim (15)
C.G.R. 18170519
Max. height: 48 cm
Orientation: E-SE
In/Next to: ancient road, cult and burial site
Attached items: semi-circular cell
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Ref. to Figs: 
Notes:
3:13 Site/Location: N. Ashalim (35)
C.G.R. 18170519
Max. height: 54 cm
Orientation: E-NE
In/Next to: ancient road, cult and burial site
Attached items:
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Ref. to Figs:
Notes:

3:14 Site/Location: N. Ashalim (38)
C.G.R. 18170519
Max. height: 54 cm
Orientation: E-SE
In/Next to: ancient road, cult and burial site
Attached items: additional smaller masseboth
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Ref. to Figs:
Notes:

3:15 Site/Location: Be’erotaim
G.R. 09870227
Max. height: 87 cm
Orientation: SE
In/Next to: cult and burial
Attached items: pavement
Ref/Found by: T. Gini
Ref. to Figs: 4:9
Notes: incorporated in a rectangular, low structure

3:16 Site/Location: Har Makbir
G.R. 14609868
Max. height: 29 cm
Orientation: E
In/Next to: ancient road
Attached items:
Ref/Found by: U. Avner and G. Ragolski
Ref. to Figs:
Notes: central and right stones found fallen

3:17 Site/Location: Har Tsuri’az
G.R. 13779694
Max. height: 33 cm
Orientation: E-SE
In/Next to: ancient road, cult and burial site
Attached items: offering bench, circular cell
Ref/Found by: U. Avner
Ref. to Figs:
Notes: aligned with other masseboth groups
3:18 Site/Location: Biq'at Sayarim
G.R. 13419172
Max. height: 63
Orientation: W
In/Next to: ancient road
Attached items: offering bench, rectangular cell, additional small massa
Ref/Found by: M. Shemtov
Ref. to Figs: left stone found fallen
Notes:

3:19 Site/Location: N. Biq'ataim
G.R. 13789243
Max. height: 45 cm
Orientation: E
In/Next to: ancient road
Attached items: stone hearth, remains of stone drawing
Ref/Found by: U. Avner
Ref. to Figs: Notes:

3:20 Site/Location: N. Botem
G.R. 13899116
Max. height: 50 cm
Orientation: E
In/Next to: ancient road
Attached items: M. Shemtov
Ref/Found by: Ref. to Figs: left stone found fallen
Notes:

Triads with Three Narrow Stones
3:21 Site/Location: N. Broqah
G.R. 12419767
Max. height: 162 cm
Orientation: E
In/Next to: ancient road
Attached items: additional smaller masseboth (?), small circular cell
Ref/Found by: U. Avner
Ref. to Figs: all three found fallen
Notes:

3:22 Site/Location: 'Uvda 148
G.R. 15039245
Max. height: 120 cm
Orientation: E
In/Next to: habitation
Attached items: U. Avner
Ref/Found by: Ref. to Figs: all three found fallen
Notes:
3:23 Site/Location: Har Yehoahaz  
G.R.: 13878922  
Max. height: 114 cm  
Orientation: E  
In/Next to: ancient road  
Attached items: additional smaller masseboth  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes: all stones found fallen

Triads with a Shorter Central Stone

3:24 Site/Location: N. Ashalim (21)  
C.G.R.: 18170519  
Max. height: 68cm  
Orientation: E  
In/Next to: ancient road, cult and burial site  
Attached items: offering bench  
Ref/Found by: Y. Israel, U. Avner, G. Ragolski  
Ref. to Figs:  
Notes: left and right stones found fallen

3:25 Site/Location: Be’erotaim  
G.R.: 09930229  
Max. height: 61 cm  
Orientation: E-SE  
In/Next to: burial  
Attached items: offering bench, remains of rectangular cell, cupmari  
Ref/Found by: T. Gini  
Ref. to Figs:  
Notes:

3:26 Site/Location: Har Tsuri’az  
G.R.: 13779694  
Max. height: 50 cm  
Orientation: E-SE  
In/Next to: habitation  
Attached items: 4:10  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes: aligned with other masseboth groups

3:27 Site/Location: Har Tsuri’az  
G.R.: 13779694  
Max. height: 29 cm  
Orientation: E  
In/Next to: ancient road  
Attached items: circular cell  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes: aligned with other masseboth groups
3:28 Site/Location: Yahel
G.R. 16129415
Max. height: 47 cm
Orientation: E
In/Next to: habitation
Attached items: additional small massebah
Ref/Found by: U. Avner
Ref. to Figs:
Notes:

3:29 Site/Location: 'Uvda 31a
G.R. 14999367
Max. height: 108 cm
Orientation: E-NE
In/Next to: cult site
Attached items: offering bench, additional small masseboth
Ref/Found by: U. Avner
Ref. to Figs:
Notes: aligned with other masseboth groups

3:30 Site/Location: 'Ein Qetura
G.R. 15579372
Max. height: 28 cm
Orientation: E
In/Next to: ancient road
Attached items: pavement
Ref/Found by: U. Avner
Ref. to Figs:
Notes: in a cluster of 6 masseboth groups

3:31 Site/Location: W. Watir
G.R. 10378367
Max. height: 121 cm
Orientation: E-SE
In/Next to: habitation
Attached items: circular cell, pavement
Ref/Found by: U. Avner 1993:171
Ref. to Figs: 4:63
Notes: additional cell behind the masseboth
**Other Triads**

3:32  
Site/Location: Be’erotaim  
G.R.: 09800222  
Max. height: 41 cm  
Orientation: E  
In/Next to: habitation  
Attached items:  
Ref/Found by: T. Gini  
Ref. to Figs:  
Notes:  

3:33  
Site/Location: N. Haspas  
G.R.: 12449765  
Max. height: 76 cm  
Orientation: N (?)  
In/Next to: ancient road  
Attached items: remains of rectangular cell  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes: adjacent to a cairn line (“crenelations”)  

3:34  
Site/Location: N. Karkom  
G.R.: 12959759  
Max. height: 34 cm  
Orientation: NE  
In/Next to: ancient road  
Attached items:  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes: in a cluster of masseboth groups and cairns  

3:35  
Site/Location: ‘Uvda 19  
G.R.: 14639333  
Max. height: 64 cm  
Orientation: -  
In/Next to: habitation  
Attached items: paved benches, sunken altar, circle chain  
Ref/Found by: Eisenberg 1980  
Ref. to Figs: 4:45  
Notes: excavated by E. Eisenberg  

3:36  
Site/Location: ‘Uvda 69b  
G.R.: 15319309  
Max. height: 28 cm  
Orientation: E  
In/Next to: cult installation  
Attached items: remains of an elongated cell, made of flagstones  
Ref/Found by: U. Avner  
Ref. to Figs: 4:12  
Notes: with perforations
3:37 Site/Location: ‘Uvda 96  
G.R. 14719298  
Max. height: 13 cm  
Orientation: E(?)  
In/Next to: threshing floor  
Attached items:  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes:

3:38 Site/Location: ‘Uvda 100  
G.R. 14679296  
Max. height: 72 cm  
Orientation: E  
In/Next to: tent camp and ancient road  
Attached items:  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes: all three stones found fallen

Symmetric Five Stones

5:1 Site/Location: Har Karkom 221b  
G.R. 12259697  
Max. height: 92 cm  
Orientation: S  
In/Next to: cult site  
Attached items:  
Ref/Found by: Anati 2001:112  
Ref. to Figs:  
Notes: right stone found fallen

5:2 Site/Location: W. Daba’iyeh  
G.R. 06727995  
Max. height: 205 cm  
Orientation: E  
In/Next to: habitation  
Attached items: offering bench, semi-circular cell  
Ref/Found by: A. Goren  
Ref. to Figs: 4:88  
Notes: additional cell behind the masseboth, excavated by U. Avner (1984, 1993c, in press 2)

5:3 Site/Location: W. Qebileh  
G.R. 08207425  
Max. height: 76 cm  
Orientation: E  
In/Next to: ancient road  
Attached items: semi-circular cell, additional smaller masseboth  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes:
Other Five Stones

5:4  Site/Location: N. Karkom  
G.R.: 12959759  
Max. height: 57 cm  
Orientation: E-NE  
In/Next to: ancient road  
Attached items: offering bench, opened semi-circular cell  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes: set in a cluster of masseboth groups, right stone tilte

5:5  Site/Location: N. Karkom  
G.R.: 12959759  
Max. height: 52 cm  
Orientation: E  
In/Next to: ancient road  
Attached items:  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes: in a cluster with the previous groups

5:6  Site/Location: ‘Ein Qetura  
G.R.: 15579372  
Max. height: 37 cm  
Orientation: E  
In/Next to: ancient road  
Attached items: offering bench  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes: in a cluster of 6 masseboth groups

5:7  Site/Location: Mitspeh Sayarin  
G.R.: 13239201  
Max. height: 24 cm  
Orientation: W  
In/Next to: tent camp  
Attached items:  
Ref/Found by: U. Avner  
Notes:  

5:8  Site/Location: W. Zalaqa  
G.R.: 08888239  
Max. height: 68 cm  
Orientation: E  
In/Next to: habitation and burial  
Attached items: offering bench  
Ref/Found by: U. Avner  
Ref. to Figs: 4:71  
Notes: a pair of masseboth behind the five, many smaller on both ends, a circular cell with massebah in front
5:9 Site/Location: W. Hajjaj
G.R. 09148055
Max. height: 28 cm
Orientation: SE
In/Next to: ancient road and nawamis field
Attached items:
Ref/Found by: U. Avner
Ref. to Figs:
Notes:

Symmetric Seven Stones

7:1 Site/Location: N. Pehami
G.R. 12509441
Max. height: 57 cm
Orientation: E
In/Next to: ancient road
Attached items:
Ref/Found by: U. Avner
Ref. to Figs:
Notes:

7:2 Site/Location: Wadi Sa'al
G.R. 08397977
Max. height: 133 cm
Orientation: E-SE
In/Next to: tent camp
Attached items: semi-circular cell, paved hearth, sunken altar
Ref/Found by: U. Avner (1984, 1993c, in press 2)
Ref. to Figs: 4:78
Notes: excavated, two stones tilted, other fallen

Other Seven Stones

7:3 Site/Location: N. Gorfan
G.R. 18551210
Max. height: 59 cm
Orientation: E
In/Next to: habitation
Attached items:
Ref/Found by: U. Avner
Ref. to Figs:
Notes:

7:4 Site/Location: N. Ashalim (3)
C.G.R. 18170519
Max. height: 68 cm
Orientation: E
In/Next to: ancient road, cult and burial site
Attached items: remains of semi-circular cell
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Ref. to Figs: Notes: central stone found tilted forward, right stone fallen
Notes:
7:5 Site/Location: N. Ashalim (6)
C.G.R. 18170519
Max. height: 42 cm
Orientation: E
In/Next to: ancient road, cult and burial site
Attached items: offering bench
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Ref. to Figs:
Notes: five stones found tilted or fallen forward

7:6 Site/Location: N. Ashalim (7)
C.G.R. 18170519
Max. height: 34 cm
Orientation: E
In/Next to: ancient road, cult and burial site
Attached items: offering bench
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Ref. to Figs:
Notes:

7:7 Site/Location: N. Ashalim (22A)
C.G.R. 18170519
Max. height: 102 cm
Orientation: E
In/Next to: ancient road, cult and burial site
Attached items: offering bench
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Ref. to Figs:
Notes: first, third and fourth stones from left found fallen forward

7:8 Site/Location: Har Tsuri'az
G.R. 13779694
Max. height: 51 cm
Orientation: E
In/Next to: ancient road
Attached items: semi-circular cell
Ref/Found by: U. Avner
Ref. to Figs:
Notes: aligned with other masseboth groups

7:9 Site/Location: ’Ein Qetura
G.R. 15579372
Max. height: 47 cm
Orientation: E
In/Next to: ancient road
Attached items: small semi-circular cell, offering bench
Ref/Found by: U. Avner
Ref. to Figs:
Notes: in a cluster with other masseboth groups, right stone backward
7:10 Site/Location: 'Uvda 31a  
G.R. 14999367  
Max. height: 52 cm  
Orientation: E  
In/Next to: cult site  
Attached items:  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes: in a cluster with other masseboth groups

7:11 Site/Location: 'Uvda 69  
G.R. 15299313  
Max. height: 113 cm  
Orientation: E  
In/Next to: ancient road  
Attached items: offering bench, semi-circular cell, additional smaller  
Ref/Found by: U. Avner (1984, 1993c, in press 7)  
Ref. to Figs: 4:43  
Notes: excavated, two broad masseboth are set behind the g

7:12 Site/Location: Har Yedidyah  
G.R. 14138911  
Max. height: 44 cm  
Orientation: N  
In/Next to: cult site  
Attached items: pavement, semi-circular cell  
Ref/Found by: L. Enmar  
Ref. to Figs:  
Notes:

7:13 Site/Location: W. Mara  
G.R. ~ (unpublished, southern Sinai)  
Max. height: ~70 cm  
Orientation: E (?)  
In/Next to: habitation  
Attached items: offering bench  
Ref/Found by: Rothenberg 1973, Fig 2  
Ref. to Figs:  
Notes: the masseboth lean on a rock

7:14 Site/Location: W. Zalaqa 301  
G.R. 09138257  
Max. height: 62 cm  
Orientation: E  
In/Next to: habitation  
Attached items: stone basin  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes:
Symmetric Nine Stones

9:1 Site/Location: Har Tsurī'az
G.R. 13779706
Max. height: 70
Orientation: E
In/Next to: ancient road
Attached items: semi-circular cell, stone basin
Ref/Found by: U. Avner
Ref. to Figs:
Notes: near an open sanctuary and tumuli

9:2 Site/Location: W. Sa'āl
G.R. 08397977
Max. height: 127 cm
Orientation: E-SE
In/Next to: tent camp
Attached items: small semi-circular cell
Ref/Found by: U. Avner
Ref. to Figs: 4:83
Notes: excavated, central stone found tilted forward

Other Nine Stones

9:3 Site/Location: N. Ashalim (4)
C.G.R. 18170519
Max. height: 72 cm
Orientation: E
In/Next to: ancient road, cult and burial site
Attached items: remains of small semi-circular cell
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Ref. to Figs:
Notes: central stone and second from right found tilted forward

9:4 Site/Location: N. Ashalim (8)
C.G.R. 18170519
Max. height: 72 cm
Orientation: E
In/Next to: ancient road, cult and burial site
Attached items: offering bench
Ref/Found by: Y. Israel, U. Avner, G. Ragolski
Ref. to Figs:
Notes: the forth from left stone found tilted, two right stone
9:5  
Site/Location: N. Ashalim (9)  
G.R. 18170519  
Max. height: 64 cm  
Orientation: E-NE  
In/Next to: ancient road, cult and burial site  
Attached items: offering bench  
Ref/Found by: Y. Israel, U. Avner, G. Ragolski  
Ref. to Figs:  
Notes: the central stone found fallen forward

9:6  
Site/Location: Har Tsuri‘az  
G.R. 13779694  
Max. height: 42 cm  
Orientation: E  
In/Next to: ancient road  
Attached items: offering bench, remains of semi-circular cell  
Ref/Found by: U. Avner  
Ref. to Figs:  
Notes: aligned with other groups of masseboth
**Multiple Stones**

M:1  
**Site/Location:** Har Aricha  
**G.R.:** 12720074  
**Max. height:** 69 cm  
**Orientation:** NE  
**In/Next to:** threshing floor  
**Attached items:**  
**Ref./Found by:** Haiman 1991a:58  
**Ref. to Figs.:**  
**Notes:** 15 masseboth

M:2  
**Site/Location:** Har Ramon  
**G.R.:** 11359906  
**Max. height:** 68 cm  
**Orientation:** E  
**In/Next to:** cult installation  
**Attached items:**  
**Ref./Found by:** Haiman 1999a:78, 2000:26-7  
**Ref. to Figs.:**  
**Notes:** at least 13 masseboth

M:3  
**Site/Location:** Har Ramon  
**G.R.:** 11529903  
**Max. height:** 102 cm  
**Orientation:** E  
**In/Next to:** cult installation in a habitation site  
**Attached items:**  
**Ref./Found by:** Cohen 1999:225-6  
**Ref. to Figs.:**  
**Notes:** at least 14 masseboth, interpreted as a habitation site excavator
M:4 Site/Location: ‘Ein Qetura
G.R. 15579379
Max. height: 60 cm
Orientation: E
In/Next to: ancient road
Attached items: cairn, other masseboth and “crenelations”
Ref/Found by: Y. Golan
Ref. to Figs: Notes: 16 masseboth, 7 are fallen

M:5 Site/Location: ‘Uvda 31a
G.R. 14999366
Max. height: 97 cm
Orientation: E-NE
In/Next to: cult site
Attached items: Ref/Found by: U. Avner
Ref. to Figs: Notes: arranged in a circle and line, in a cluster with other...­

M:6 Site/Location: ‘Uvda 31a
G.R. 14999366
Max. height: 108 cm
Orientation: E
In/Next to: cult site
Attached items: offering bench
Ref/Found by: U. Avner
Ref. to Figs: Notes: a triad (see # 3:27), with many additional masseboth in a cluster with other groups

M:7 Site/Location: ‘Uvda 31a
G.R. 14999366
Max. height: 102 cm
Orientation: E-NE
In/Next to: cult site
Attached items: offering bench
Ref/Found by: U. Avner
Ref. to Figs: Notes: a broad pair (see # 2:11), with many additional mas in a cluster with other groups

M:8 Site/Location: ‘Uvda 31a
G.R. 14999366
Max. height: 76 cm
Orientation: -
In/Next to: cult site
Attached items: Ref/Found by: U. Avner
Ref. to Figs: Notes: arranged in a circle, in a cluster with other groups
M:9  
Site/Location: ‘Uvda 151  
G.R.: 14989238  
Max. height: 111 cm  
Orientation: -  
In/Next to: seasonal camps  
Attached items: stone basin, hearth, offering bench (?)  
Ref/Found by: U. Avner  
Ref. to Figs: 4:54  
Notes: excavated, 69 stones, only eight found standing up

M:10  
Site/Location: ‘Uvda 131  
G.R.: 14919266  
Max. height: 52 cm  
Orientation: E  
In/Next to: ancient road  
Attached items: offering bench  
Ref/Found by: U. Avner  
Ref. to Figs: 4:11  
Notes: 16 detached stones, eight found standing

M:11  
Site/Location: Ras el Qalb  
G.R.: 09388334  
Max. height: 87 cm  
Orientation: E  
In/Next to: ancient road, on a hilltop  
Attached items:  
Ref/Found by: Avner 1984  
Ref. to Figs: 4:11  
Notes: 16 detached stones, eight found standing

M:12  
Site/Location: W. Shalal  
E.G.R.: 981-879  
Max. height: ca. 250 cm  
Orientation: ?  
In/Next to: burial site  
Attached items:  
Ref/Found by: Rothenberg 1974:21  
Ref. to Figs:  
Notes: Nine detached stones, all fallen, based on photograph

M:13  
Site/Location: W. Fuqia  
E.G.R.: 972-890  
Max. height: ca. 250 cm  
Orientation: E  
In/Next to: habitation, burial  
Attached items:  
Ref/Found by: Rothenberg 1979:117-18  
Ref. to Figs:  
Notes: seven detached stones, all fallen
M:14
Site/Location: Wadi Mara
G.R. ? (southern Sinai)
Max. height: ~ 90 cm
Orientation: E
In/Next to: ancient road
Attached items: rectangular cell
Ref/Found by: Z. Meshel
Notes: only photographed, by Meshel, at least 18 stones

M:15
Site/Location: Muyat Ramaliya
G.R. 05947986
Max. height: 145 cm
Orientation: E
In/Next to: habitation
Attached items:
Ref/Found by: U. Avner
Ref. to Figs:
Notes: at least 34 stones arranged in a circle, only four are
Table 12. Types and Groups of Desert *Masseboth* (drawings are schematic)

<table>
<thead>
<tr>
<th>Type Description</th>
<th>n</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single narrow stones</td>
<td>23</td>
<td>11.1%</td>
</tr>
<tr>
<td>Single broad stones</td>
<td>61</td>
<td>29.5%</td>
</tr>
<tr>
<td>Pairs of narrow stones</td>
<td>2</td>
<td>1%</td>
</tr>
<tr>
<td>Pairs of broad stones</td>
<td>17</td>
<td>8.2%</td>
</tr>
<tr>
<td>Pairs of narrow and broad stones</td>
<td>12</td>
<td>5.8%</td>
</tr>
<tr>
<td>Pairs of broad and narrow stones</td>
<td>10</td>
<td>4.8%</td>
</tr>
<tr>
<td>Triads of narrow stones</td>
<td>10</td>
<td>4.8%</td>
</tr>
<tr>
<td>Triads with a broad central stone</td>
<td>10</td>
<td>4.8%</td>
</tr>
<tr>
<td>Triads with narrow central stone</td>
<td>3</td>
<td>1.4%</td>
</tr>
<tr>
<td>Triads with smaller central stone</td>
<td>8</td>
<td>3.9%</td>
</tr>
<tr>
<td>Other triads</td>
<td>7</td>
<td>3.4%</td>
</tr>
<tr>
<td>Symmetric five stones</td>
<td>3</td>
<td>1.4%</td>
</tr>
<tr>
<td>Other five stones</td>
<td>6</td>
<td>2.9%</td>
</tr>
<tr>
<td>Symmetric seven stones</td>
<td>2</td>
<td>1%</td>
</tr>
<tr>
<td>Other seven stones</td>
<td>12</td>
<td>5.8%</td>
</tr>
<tr>
<td>Symmetric nine stones</td>
<td>2</td>
<td>1%</td>
</tr>
<tr>
<td>Other nine stones</td>
<td>4</td>
<td>1.9%</td>
</tr>
<tr>
<td>Multiple stones</td>
<td>15</td>
<td>7.2%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>207</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
## Table 13. Catalogue of Masseboth in the Near East, 11th to 3rd Millennia B.C.

**Natuian**

1. **Site, Location:** Rosh Zin  
   **Orientation:** SE  
   **In/Next to:** habitation  
   **Number of stones:** 1  
   **Max. height:** 118 cm  
   **Attached items:** pavement, favisa, cup-marks  
   **Reference:** Henry, in Marks 1976:321, Fig. 11:4  
   **Notes:** the stone is shaped, upper part found fallen

**Harifian**

2. **Site, Location:** Abu Salem  
   **Orientation:** S  
   **In/Next to:** habitation  
   **Number of stones:** 1  
   **Max. height:** 78 cm  
   **Attached items:** a stone slab with cup-marks (offering table?)  
   **Notes:** incorporated in a circular room’s wall, facing the entrance, it's identity as massebah is questionable

**Early Neolithic**

3. **Site, Location:** Qermez Dere (RA D-A)  
   **Orientation:** varying from stage to stage  
   **In/Next to:** habitation (cult room?)  
   **Number of stones:** 4,3,2, detached  
   **Max. height:** ca. 110 cm  
   **Attached items:** basin, hearth, skulls  
   **Reference:** Watkins 1990, 1992a, b  
   **Notes:** stone cores coated with clay and plaster (shaped)

4. **Site, Location:** Qermez Dere (RAF)  
   **Orientation:** W  
   **In/Next to:** habitation (cult room?)  
   **Number of stones:** 2, detached  
   **Max. height:** ca. 100 cm  
   **Attached items:** pavement  
   **Reference:** Watkins 1990, 1992a, b  
   **Notes:** stone cores coated with clay and plaster, all shaped and detached

5. **Site, Location:** Çayönü (Flagstone Build.)  
   **Orientation:** S (+?)  
   **In/Next to:** ceremonial building  
   **Number of stones:** 2+1  
   **Max. height:** ?  
   **Attached items:** pavement  
   **Reference:** Özdogan 1999:46  
   **Notes:** at least one partially carved

6. **Site, Location:** Çayönü (plaza)  
   **Orientation:** ?  
   **In/Next to:** sacred paved space  
   **Number of stones:** x, detached  
   **Max. height:** ca. ? cm  
   **Attached items:** pavement  
   **Reference:** Özdogan 1998:592, Fig. 7a,b, 8; 1999:50  
   **Notes:** broken and buried under the next stage

7. **Site, Location:** Çayönü (Skull Building)  
   **Orientation:** S (?)  
   **In/Next to:** burial  
   **Number of stones:** 2, detached  
   **Max. height:** ca. 120 cm  
   **Attached items:** pavement  
   **Reference:** Özdogan 1998:592, Fig. 7a,b, 8; 1999:50  
   **Notes:** buried under the next stage

8. **Site, Location:** Kfar Hahoresh (L. 1155)  
   **Orientation:** N  
   **In/Next to:** burial & cult  
   **Number of stones:** 3  
   **Max. height:** 120 cm  
   **Attached items:** plastered floor, hearth  
   **Reference:** Goring-Morris 2000, Fig. 5, and pers. comm.  
   **Notes:** one tilted, two fallen

9. **Site, Location:** Kfar Hahoresh (L. 1212)  
   **Orientation:** ?  
   **In/Next to:** burial & cult  
   **Number of stones:** 1  
   **Max. height:** ca. 30 cm  
   **Attached items:** burial, plastered floor  
   **Reference:** Goring-Morris, pers. comm.  
   **Notes:**

10. **Site, Location:** Kfar Hahoresh (L. 1304)  
    **Orientation:** S  
    **In/Next to:** burial & cult  
    **Number of stones:** 1  
    **Max. height:** ?  
    **Attached items:** skull nest  
    **Reference:** Goring-Morris, pers. comm.  
    **Notes:**

11. **Site, Location:** Kfar Hahoresh (W. 5551)  
    **Orientation:** SE  
    **In/Next to:** burial & cult  
    **Number of stones:** 1  
    **Max. height:** ca. 150 cm  
    **Attached items:** rectangular stone cell, hearth  
    **Reference:** Goring-Morris, pers. comm.  
    **Notes:** broken, bottom in situ, incorporated in a cell
12. Site, Location: ‘Atlit Yam
   In/Next to: shrine
   Number of stones: 7, detached
   Max. height: 210 cm
   Orientation: NW
   Attached items: stone slab with cupmarks, offering bench (?)
   Reference: Galili et al. 1999
   Notes: roughly shaped, arranged in an open circle, three stones
   found fallen. Presently the site is 12 m below sea level

13. Site, Location: ‘Atlit Yam
   In/Next to: shrine
   Number of stones: 3, detached
   Max. height: 180 cm
   Orientation: ?
   Attached items: -
   Reference: Galili et al. 1999
   Notes: two stones are roughly shaped in human form

14. Site, Location: ‘Ain Ghazal
   In/Next to: sanctuary
   Number of stones: 3
   Max. height: ca. 70 cm
   Orientation: E
   Attached items: hearth, altar, pavement
   Notes: one stone tilted

15. Site, Location: Jericho
   In/Next to: sanctuary
   Number of stones: 1
   Max. height: 45 cm
   Orientation: E
   Attached items: stone base
   Reference: Kenyon 1957:59; Tushingham 1952, Pl. 5
   Notes: the stone is shaped, with a depression on the top,
   found fallen, originally set in a niche.

16. Site, Location: es-Sifiya
   In/Next to: habitation
   Number of stones: 1
   Max. height: ca. 40 cm
   Orientation: S
   Attached items: burials
   Reference: H. Mahasneh 2000
   Notes: the stone is shaped, with a depression on the top

17. Site, Location: Beidha
   In/Next to: habitation
   Number of stones: 1
   Max. height: 60 cm
   Orientation: ?
   Attached items: clay pavement, large basin
   Reference: Kirkbride 1968a:92
   Notes: the stone is shaped, the Natufian date is questionable

18. Site, Location: Beidha
   In/Next to: habitation/open space
   Number of stones: 1
   Max. height: ca. 60 cm
   Orientation: E
   Attached items: pavement, large basin
   Reference: Kirkbride 1968:93-96, Pl. 28a
   Notes: in a circular installation

19. Site, Location: N. Re’uel (‘Uvda 20)
   In/Next to: habitation
   Number of stones: 2 (?)
   Max. height: 80 cm
   Orientation: S
   Attached items: -
   Reference: Ronen 2001:119-120
   Notes: found fallen, published as one massebah, but photographs
   (Ronen et al. 2001, Fig. 6) show two stone slabs

Late Neolithic

20. Site, Location: Haçilar (SW)
    In/Next to: sanctuary
    Number of stones: 1
    Max. height: ?
    Orientation: E
    Attached items: -
    Reference: Mellaart 1970:30-31
    Notes: the stone is set in a niche

21. Site, Location: Haçilar (NE)
    In/Next to: sanctuary
    Number of stones: 1
    Max. height: ?
    Orientation: S
    Attached items: burial under the floor
    Reference: Mellaart 1970:30-31
    Notes: the stone is set in a niche

22. Site, Location: Ha-Goshrim
    In/Next to: habitation
    Number of stones: 6, detached
    Max. height: ca. 30 cm
    Orientation: N
    Attached items: clay pavement
    Reference: Getzove 1999
    Notes:

23. Site, Location: ‘Ain Ghazal
    In/Next to: public building/sanctuary
    Number of stones: 2 (?)
    Max. height: ca. 60 cm
    Orientation: N
    Attached items: -
    Reference: Rollefson 2000:182-3
    Notes: one is a possible massebah, combined of two stones

24. Site, Location: Risqeh
    In/Next to: cult site
    Number of stones: multiple
    Max. height: ca. 150 cm
    Orientation: -
    Attached items: large ash spot, with artifacts
    Reference: Kirkbride 1969
    Notes: arranged in a circle, most stones are either roughly
    shaped or well-sculptured into human forms
<table>
<thead>
<tr>
<th>Site, Location:</th>
<th>Rasm Harbush</th>
<th>Orientation:</th>
<th>ca. 60 cm</th>
<th>Notes:</th>
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<tr>
<td>In/Next to:</td>
<td>habitation</td>
<td>Attached items:</td>
<td>offering bench, pillar figure</td>
<td></td>
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<tr>
<td>Number of stones:</td>
<td>3</td>
<td>Reference:</td>
<td>Epstein 1988:35</td>
<td></td>
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<tr>
<td>Max. height:</td>
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<td>Notes:</td>
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<table>
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<th>Give’ataim (Cave 2)</th>
<th>Orientation:</th>
<th>50 cm</th>
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<td>In/Next to:</td>
<td>burial cave</td>
<td>Attached items:</td>
<td>ossuaries</td>
<td></td>
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<tr>
<td>Number of stones:</td>
<td>1</td>
<td>Reference:</td>
<td>Sussman &amp; Ben-Arieh 1966</td>
<td></td>
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<tr>
<td>Max. height:</td>
<td></td>
<td>Notes:</td>
<td>the stone is shaped, found fallen</td>
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<table>
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<tr>
<th>Site, Location:</th>
<th>Give’ataim (Cave 7)</th>
<th>Orientation:</th>
<th>6x1</th>
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<td>Attached items:</td>
<td>ossuaries</td>
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<tr>
<td>Number of stones:</td>
<td>6x1</td>
<td>Reference:</td>
<td>Sussman &amp; Ben-Arieh 1966</td>
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<tr>
<td>Max. height:</td>
<td>78 cm</td>
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<table>
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<tr>
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<th>Benei Braq</th>
<th>Orientation:</th>
<th>48</th>
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<tr>
<td>In/Next to:</td>
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<td>Attached items:</td>
<td>ossuaries, pavement</td>
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<tr>
<td>Number of stones:</td>
<td>1</td>
<td>Reference:</td>
<td>Kaplan 1963:302</td>
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<td>Max. height:</td>
<td></td>
<td>Notes:</td>
<td>the stone is shaped</td>
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<table>
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<tr>
<th>Site, Location:</th>
<th>Ben Shemen (Cave 502)</th>
<th>Orientation:</th>
<th>1+1</th>
<th>Notes:</th>
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<td>In/Next to:</td>
<td>burial cave</td>
<td>Attached items:</td>
<td>ossuaries</td>
<td></td>
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<tr>
<td>Number of stones:</td>
<td>1-1</td>
<td>Reference:</td>
<td>Perrot &amp; Ladiray 1980</td>
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<tr>
<td>Max. height:</td>
<td>80+ cm</td>
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<th>Ben Shemen (Cave 506)</th>
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<th>1</th>
<th>Notes:</th>
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<td>In/Next to:</td>
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<td>Attached items:</td>
<td>ossuaries</td>
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<tr>
<td>Number of stones:</td>
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<td>Reference:</td>
<td>Perrot &amp; Ladiray 1980</td>
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</tr>
<tr>
<td>Max. height:</td>
<td>?</td>
<td>Notes:</td>
<td>the stone is shaped, found fallen</td>
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<table>
<thead>
<tr>
<th>Site, Location:</th>
<th>Ben Shemen (Cave 510)</th>
<th>Orientation:</th>
<th>1+1</th>
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<tr>
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<td>burial cave</td>
<td>Attached items:</td>
<td>ossuaries</td>
<td></td>
</tr>
<tr>
<td>Number of stones:</td>
<td>1-1</td>
<td>Reference:</td>
<td>Perrot &amp; Ladiray 1980</td>
<td></td>
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<tr>
<td>Max. height:</td>
<td>122 cm</td>
<td>Notes:</td>
<td>the stone is shaped, found fallen</td>
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<td>burial cave</td>
<td>Attached items:</td>
<td>ossuaries</td>
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<tr>
<td>Number of stones:</td>
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<td>Reference:</td>
<td>Van den Brink &amp; Gophna 1996</td>
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</tr>
<tr>
<td>Max. height:</td>
<td>122 cm</td>
<td>Notes:</td>
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<th>Give’at Oranim</th>
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<td>In/Next to:</td>
<td>habitation caves</td>
<td>Attached items:</td>
<td>?</td>
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<tr>
<td>Max. height:</td>
<td>?</td>
<td>Notes:</td>
<td></td>
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<table>
<thead>
<tr>
<th>Site, Location:</th>
<th>Kissufim (L. 510)</th>
<th>Orientation:</th>
<th>S-SW</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>In/Next to:</td>
<td>Burial</td>
<td>Attached items:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of stones:</td>
<td>3</td>
<td>Reference:</td>
<td>Goren &amp; Fabian, in press</td>
<td></td>
</tr>
<tr>
<td>Max. height:</td>
<td>31 cm</td>
<td>Notes:</td>
<td>all stones are shaped, one found fallen</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Site, Location:</th>
<th>Kissufim</th>
<th>Orientation:</th>
<th>1x4</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>In/Next to:</td>
<td>burial</td>
<td>Attached items:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of stones:</td>
<td>1-4</td>
<td>Reference:</td>
<td>Goren &amp; Fabian, in press</td>
<td></td>
</tr>
<tr>
<td>Max. height:</td>
<td>80 cm</td>
<td>Notes:</td>
<td>all stones are shaped, moved by bulldozer.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site, Location:</th>
<th>Gilat (Area D, Strata 2B-C)</th>
<th>Orientation:</th>
<th>1 (+1?)</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>In/Next to:</td>
<td>sanctuary (Room 1)</td>
<td>Attached items:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. height:</td>
<td>? cm</td>
<td>Notes:</td>
<td>stone is shaped, found with other cult objects</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site, Location:</th>
<th>Gilat (Area D, Stratum 2C)</th>
<th>Orientation:</th>
<th>1</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>In/Next to:</td>
<td>sanctuary (plaza)</td>
<td>Attached items:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. height:</td>
<td>70 cm</td>
<td>Notes:</td>
<td>stone is shaped, with two cupules in the base</td>
<td></td>
</tr>
</tbody>
</table>
38. Site, Location: Gilat (Area J, Stratum 2C)  
Orientation: ?  
In/Next to: sanctuary (courtyard)  
Number of stones: 1  
Max. height: 33 cm  
Attached items:  
Notes: in a row of 12 low, detached stones

39. Site, Location: Gilat (Area Y, Stratum 2C)  
Orientation: ?  
In/Next to: sanctuary (open space)  
Number of stones: 3  
Max. height: 37 cm  
Attached items: cult installation, grainaries  
Notes: stones are shaped

40. Site, Location: Tell Abu Matar  
Orientation: ?  
In/Next to: habitation  
Number of stones: 1  
Max. height: 35 cm  
Attached items:  
Reference: Perrot 1995:171  
Notes: curved in a phallic shape

41. Site, Location: Nevatim  
Orientation: ?  
In/Next to: habitation  
Number of stones: 1+1+x  
Max. height: 88 cm  
Attached items: cult installation, grainaries  
Reference: Gilead & Fabian 2001:73, 75, Pl. 6  
Notes: the stones are shaped, found fallen

42. Site, Location: Shiqmim  
Orientation: ?  
In/Next to: burial  
Number of stones: 1  
Max. height: ?  
Attached items:  
Reference: (Alon & Levy 1989:183)  
Notes:

43. Site, Location: W. Aheimar  
Orientation: ?  
In/Next to: ?  
Number of stones: ?  
Max. height: ca. 200 cm  
Attached items: rock platform  
Notes: basalt monoliths, originating 65 km away

44. Site, Location: W. Aheimar  
Orientation: ?  
In/Next to: ?  
Number of stones: 3  
Max. height: ?  
Attached items: rock platform  
Reference: Smith et al. 1997:55  
Notes:

45. Site, Location: Tel Chuera  
Orientation: -  
In/Next to: outside city, near a temple  
Number of stones: 16  
Max. height: 300 cm  
Attached items: pavement  
Reference: Moortgat 1958  
Notes: the stones are roughly shaped, arranged with spaces in two lines, most are fallen

46. Site, Location: Mari  
Orientation: -  
In/Next to: temple courtyard  
Number of stones: 1  
Max. height: 150 cm  
Attached items:  
Reference: Parrot 1967:24-26  
Notes: the stone is well shaped, found fallen

47. Site, Location: Beycesultan XVII  
Orientation: W  
In/Next to: temple  
Number of stones: 1  
Max. height: ?  
Attached items: hearth/altar  
Reference: Lloyd & Mellaart 1962:32-3  
Notes: the massebah is built of mudbricks and plastered

48. Site, Location: Beycesultan XIV-XVI  
Orientation: W  
In/Next to: pairs of temples  
Number of stones: 24+2 detached  
Max. height: 75 cm  
Attached items: hearth/altar, sacred wooden pillar  
Reference: Lloyd & Mellaart 1962:36-55  
Notes: the masseboth are built of plastered mudbricks

49. Site, Location: Byblos  
Orientation: W  
In/Next to: temple’s gate, courtyard XV  
Number of stones: 1  
Max. height: ca. 170 cm  
Attached items: stone base  
Reference: Dunand 1958:895, Fig. 1007; Saghiieh 1983, Pl. IV  
Notes: well shaped as an obelisk, found fallen

50. Site, Location: Byblos  
Orientation: E  
In/Next to: temple’s gate, courtyard XV  
Number of stones: 1  
Max. height: ca. 60 cm  
Attached items:  
Reference: Dunand 1958: 895, Pl. XLIII:1  
Notes: shaped as an obelisk, stands to the left of a closed gate
<table>
<thead>
<tr>
<th>Site, Location</th>
<th>Orientation</th>
<th>In/Next to</th>
<th>Number of stones</th>
<th>Max. height</th>
<th>Attached items</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Byblos</td>
<td>E</td>
<td>cella of temple VIX</td>
<td>1</td>
<td>?</td>
<td>stone basin, offering bench</td>
<td>shaped as an obelisk</td>
</tr>
<tr>
<td>Beit Yerah</td>
<td>E</td>
<td>city gate</td>
<td>1</td>
<td>120 cm</td>
<td>offering bench</td>
<td></td>
</tr>
<tr>
<td>Biq'at Kinarot</td>
<td>-</td>
<td></td>
<td>1x30~</td>
<td>120 cm</td>
<td>large perforated anchor</td>
<td></td>
</tr>
<tr>
<td>Migdal Ha’emeq</td>
<td>?</td>
<td>habitation</td>
<td>1</td>
<td>ca. 70 cm</td>
<td>depression on the top</td>
<td></td>
</tr>
<tr>
<td>Tel ‘Ashir</td>
<td>?</td>
<td>open cult site</td>
<td>1x16+</td>
<td>126 cm</td>
<td>large flat stones (offering tables?), hearths</td>
<td></td>
</tr>
<tr>
<td>N. Refa’im (Area 100)</td>
<td>S-SE</td>
<td>habitation</td>
<td>1</td>
<td>ca. 30 cm</td>
<td>attached to a cabinet wall</td>
<td></td>
</tr>
<tr>
<td>N. Refa’im (Area 1100)</td>
<td>S-SE</td>
<td>habitation</td>
<td>1</td>
<td>ca. 25 cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N. Refa’im (Area 1000)</td>
<td>S-SW</td>
<td>habitation</td>
<td>5</td>
<td>ca. 50 cm</td>
<td>detached and filled in by smaller fieldstones</td>
<td></td>
</tr>
<tr>
<td>Hartuv</td>
<td>N</td>
<td>open cult site</td>
<td>multiple</td>
<td>120 cm</td>
<td>pavement, offering bench</td>
<td></td>
</tr>
<tr>
<td>Jebel Qu’aqir</td>
<td>SE</td>
<td>burial site</td>
<td>1+*</td>
<td>?</td>
<td>additional small masseboth</td>
<td></td>
</tr>
<tr>
<td>‘Amman (O)</td>
<td>?</td>
<td>dolmen field</td>
<td>1</td>
<td>150 cm</td>
<td>cave</td>
<td></td>
</tr>
<tr>
<td>‘Amman (N)</td>
<td>?</td>
<td>-</td>
<td>1</td>
<td>ca. 400 cm</td>
<td>cave</td>
<td></td>
</tr>
<tr>
<td>Al Marajim</td>
<td>SE</td>
<td>habitation</td>
<td>1</td>
<td>180 cm</td>
<td>a broad menhir</td>
<td></td>
</tr>
<tr>
<td>‘Amman (O)</td>
<td>?</td>
<td>dolmen field</td>
<td>1</td>
<td>150 cm</td>
<td>a broad menhir, cupmark at the top</td>
<td></td>
</tr>
<tr>
<td>‘Amman (N)</td>
<td>?</td>
<td>-</td>
<td>1</td>
<td>ca. 400 cm</td>
<td>found fallen, depression on the front</td>
<td></td>
</tr>
</tbody>
</table>
65. Site, Location: ‘Amman (J)  
In/Next to: -  
Number of stones: 1  
Max. height: ca. 200 cm  
Orientation: ?  
Attached items: Conder 1889:26  
Reference: Conder 1889:26  
Notes: a broad menhir

66. Site, Location: ‘Amman  
In/Next to: -  
Number of stones: 1  
Max. height: 160 cm  
Orientation: ?  
Attached items: Conder 1889:26  
Reference: Conder 1889:26  
Notes:

67. Site, Location: Al Mushakker  
In/Next to: Attached items:  
Number of stones: 1  
Max. height: 270 cm  
Orientation: ?  
Attached items: Conder 1885:263  
Reference: Conder 1889:234  
Notes: hewn depression in the front

68. Site, Location: W. Kefrein  
In/Next to: dolmen  
Number of stones: 1  
Max. height: 170 cm  
Orientation: E  
Attached items: Conder 1889:233  
Reference: Conder 1889:233  
Notes: depression in the front

69. Site, Location: Tell Mataba  
In/Next to: dolmen field  
Number of stones: 1  
Max. height: 130 cm  
Orientation: ?  
Attached items: Conder 1889:234  
Reference: Conder 1889:234  
Notes: hewn depression in the front

70. Site, Location: N of Hesban  
In/Next to: dolmen field  
Number of stones: 1  
Max. height: 160 cm  
Orientation: ?  
Attached items: Conder 1889:167  
Reference: Conder 1889:167  
Notes: a broad menhir

71. Site, Location: Madowerat El ‘Al  
In/Next to: caves  
Number of stones: 1  
Max. height: 200 cm  
Orientation: ?  
Attached items: Conder 1889:18  
Reference: Conder 1889:18  
Notes:

72. Site, Location: Muntar el Mushakker  
In/Next to: -  
Number of stones: 2  
Max. height: 150 cm  
Orientation: ?  
Attached items: Conder 1889:197  
Reference: Conder 1889:197  
Notes:

73. Site, Location: Mount Nebo  
In/Next to: dolmen group  
Number of stones: 4  
Max. height: 170 cm  
Orientation: E  
Attached items: Conder 1889:203  
Reference: Conder 1889:203  
Notes: arranged in rectangle, the main stone is a broad menhir

74. Site, Location: ‘Ain Minyeh  
In/Next to: -  
Number of stones: 7x1, separated  
Max. height: 110 cm  
Orientation: E  
Attached items: Conder 1889:10-12  
Reference: Conder 1889:10-12  
Notes: 7 individual monuments, partially preserved

75. Site, Location: Um Zuwetina (al Megheirat)  
In/Next to: dolmens  
Number of stones: 3++  
Max. height: ca. 200 cm  
Orientation: ?  
Attached items: Conder 1889:214; Glueck 1934:33, 47  
Reference: Conder 1889:214; Glueck 1934:33, 47  
Notes: three menhirs surrounded by a circle of menhirs

76. Site, Location: Um Zuwetina (al Megheirat)  
In/Next to: dolmen field  
Number of stones: multiple  
Max. height: ca. 200 cm  
Orientation: -  
Attached items: Conder 1889:214; Glueck 1934:33, 47  
Reference: Conder 1889:214; Glueck 1934:33, 47  
Notes: arranged in large circle 300 yds across, most stones are fallen

77. Site, Location: Um Zuwetina (al Megheirat)  
In/Next to: dolmen field  
Number of stones: multiple  
Max. height: ?  
Orientation: E (?)  
Attached items: Conder 1889:214; Glueck 1934:33, 47  
Reference: Conder 1889:214; Glueck 1934:33, 47  
Notes: a N-S row, on the E edge of the site, most stones are fallen

78. Site, Location: Um Zuwetina (al Megheirat)  
In/Next to: dolmen field  
Number of stones: multiple  
Max. height: ca. 200 cm  
Orientation: E (?)  
Attached items: Conder 1889:214; Glueck 1934:33, 47  
Reference: Conder 1889:214; Glueck 1934:33, 47  
Notes: three N-S rows, between the last two locations, most stones are fallen
79. Site, Location: Um Zuwetina (al Megheirat)  
In/Next to: dolmen field  
Number of stones: multiple, detached  
Max. height: ca. 200 cm  
Orientation: -  
Attached items:  
Reference: Conder 1889:214; Glueck 1934:33, 47  
Notes: a N-E row, on the south edge of the site, most stones are fallen

80. Site, Location: Um Zuwetina (al Megheirat)  
In/Next to: dolmen field  
Number of stones: multiple, detached  
Max. height: ca. 200 cm  
Orientation: -  
Attached items:  
Reference: Conder 1889:214; Glueck 1934:33, 47  
Notes: many more menhirs in the site, some arranged in circles, most stones are fallen

81. Site, Location: Hajr el-Mansub  
In/Next to:  
Number of stones: 1  
Max. height: 270 cm  
Orientation: SE  
Attached items:  
Reference: Conder 1889:186; Glueck 1934:47  
Notes: horizontal groove in the front

82. Site, Location: Kh. Iskander  
In/Next to: outside a town  
Number of stones: multiple  
Max. height: 400 cm  
Orientation: -  
Attached items:  
Reference: Glueck 1939:128  
Notes: many circles of menhirs, most are fallen

83. Site, Location: Kh. Iskander  
In/Next to: outside a town  
Number of stones: 2, detached  
Max. height: 300 cm  
Orientation: ?  
Attached items:  
Reference: Glueck 1939:128-9  
Notes:

84. Site, Location: Bab adh-Dra’a  
In/Next to: outside a town  
Number of stones: 7, detached  
Max. height: 440 cm  
Orientation: E(?)  
Attached items: enclosure  
Reference: Mallon 1924; Albright 1924a; Körber 1994  
Notes: all stones are fallen, excavated by Körber

85. Site, Location: Kh. Tuqwa  
In/Next to: tumuli  
Number of stones: 1  
Max. height: ?  
Orientation: E(?)  
Attached items: tomb  
Reference: Mallon 1924:451  
Notes:

86. Site, Location: Lejjun  
In/Next to: outside a town  
Number of stones: 18, detached  
Max. height: ca 150 cm  
Orientation: ?  
Attached items:  
Reference: Brunnow & Domasjewski 1905:38; others found in a nearby quarry  
Notes:

87. Site, Location: Ader  
In/Next to: outside a town  
Number of stones: 4, detached  
Max. height: 450 cm  
Orientation: ?  
Attached items: cave  
Reference: Mallon 1924:454; Albright 1924a, 1934  
Notes: three stones are fallen

88. Site, Location: Ader  
In/Next to: sanctuary  
Number of stones: 1  
Max. height: ?  
Orientation: ?  
Attached items: altar  
Reference: Mallon 1924:454; Albright 1924a:10; others excavated by Albright (1934)  
Notes:

89. Site, Location: Abu ’Ajarem  
In/Next to:  
Number of stones: 1  
Max. height: ?  
Orientation: ?  
Attached items:  
Reference: Musil 1926:16  
Notes:

90. Site, Location: Hadra Minwa  
In/Next to:  
Number of stones: 2  
Max. height: 210 cm  
Orientation: ?  
Attached items:  
Reference: Musil 1926:16  
Notes:

91. Site, Location: ‘Arad  
In/Next to: sanctuary (L. 1849)  
Number of stones: 1  
Max. height: 75  
Orientation: E  
Attached items:  
Reference: Amiran et al. 1978:40  
Notes: the stone is shaped

92. Site, Location: ‘Arad  
In/Next to: sanctuary (L. 1831)  
Number of stones: 1  
Max. height: 43 cm  
Orientation: E  
Attached items:  
Reference: unpublished  
Notes: excavated by Amiran
<table>
<thead>
<tr>
<th>Site/Location:</th>
<th>Fidan 4</th>
<th>Orientation:</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>In/Next to:</td>
<td>habitation</td>
<td>Attached items:</td>
<td></td>
</tr>
<tr>
<td>Number of stones:</td>
<td>48, detached</td>
<td>Reference:</td>
<td>Levy &amp; Adams (unpublished)</td>
</tr>
<tr>
<td>Max. height:</td>
<td>35 cm</td>
<td>Notes:</td>
<td>excavated</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site, Location:</th>
<th>Saqqarah</th>
<th>Orientation:</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>In/Next to: pyramid base</td>
<td>Attached items:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of stones:</td>
<td>2 detached</td>
<td>Reference:</td>
<td>Lauer 1936 I:190, Fig. 212, Pl. 103</td>
</tr>
<tr>
<td>Max. height:</td>
<td>100 cm</td>
<td>Notes:</td>
<td>well shaped</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site, Location:</th>
<th>Meydum</th>
<th>Orientation:</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>In/Next to: burial</td>
<td>Attached items:</td>
<td>offering bench, basin, stone bases</td>
<td></td>
</tr>
<tr>
<td>Number of stones:</td>
<td>2 detached</td>
<td>Reference:</td>
<td>Petrie 1892:8; Rowe 1931:32</td>
</tr>
<tr>
<td>Max. height:</td>
<td>420 cm</td>
<td>Notes:</td>
<td>well shaped</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site, Location:</th>
<th>Abydos</th>
<th>Orientation:</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>In/Next to: royal burial</td>
<td>Attached items:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of stones:</td>
<td>1</td>
<td>Reference:</td>
<td>Quirke 1992:63</td>
</tr>
<tr>
<td>Max. height:</td>
<td>110 cm</td>
<td>Notes:</td>
<td>well shaped, with the serekh of Seth-Peribsen, 2880B.C.</td>
</tr>
</tbody>
</table>
Table 14. Catalogue of Open-Air Sanctuaries in the Negev, Sinai and the Judean Desert
(from north to south)

1. Site: Al Ghazlaniyah
   G.R. 18491159
   Dimensions: 6.4 x 9.2 m
   Orientation: NW
   Attached items: a pair of masseboth
   Found by/Ref: U. Avner
   Ref. to Map: 5:173
   Notes: built of rounded small stones

2. Site: N. Zalzal (61a)
   C.G.R. 12390389
   Dimensions: 4.8, 3.9 m; "ladder" - 11.2 m
   Orientation: -
   Attached items: "ladder"
   Adjacent elements: 3 tumuli on a platform; crenelations
   Found by/Ref: Cohen 1985:1-6, 14
   Ref. to Map: 4:61a
   Notes: appears twice in Cohen's survey, as Site 4:61a and as Site 19

3. Site: N. Zalzal (61b)
   C.G.R. 12390389
   Dimensions: 5.8 m; "ladder" - 2.4 m
   Orientation: -
   Attached items: "ladder"
   Adjacent elements: 3 tumuli on a platform; crenelations
   Found by/Ref: Cohen 1985:1-6, 14
   Ref. to Map: 4:61b
   Notes: appears twice in Cohen's survey, as Site 4:61b and as Site 19

4. Site: N. Zalzal (62)
   C.G.R. 12390389
   Dimensions: 6.6 m; "ladder" - ca. 7 m
   Orientation: -
   Attached items: "ladder"
   Adjacent elements: 3 tumuli on a platform; crenelations
   Found by/Ref: Cohen 1985:1-6, 14
   Ref. to Map: 4:62
   Notes: appears twice in Cohen's survey, as Site 4: 62 and as Site 19
5 Site: N. Zalzal (59)
C.G.R. 12410391
Dimensions: ca. 4.0 m; "Ladder"- ca. 6.6 m
Orientation: -
Attached items: "ladder"
Adjacent elements: tumuli, crenelations
Found by/Ref: Cohen 1985:6
Ref. to Map:
Ref. to Figs:
Notes: not found at the site, plan after Cohen (ibid.)

6 Site: N. Hatseva
C.G.R. 15550191
Dimensions: 12.8, 8.1 m; "ladder"- 46.0 m
Orientation: -
Attached items: "ladder"
Adjacent elements: a platform with tumuli, crenelations
Found by/Ref: M. Ron, L. Enmar
Ref. to Map: 5:41, 42
Ref. to Figs: part of the larger sanctuary has a double line, filled with flint gravel
Notes:

7 Site: Darb alSultan
G.R. 16500067
Dimensions: 11.2 m; "ladder"- .16.2 m
Orientation: 12.8
Attached items: "ladder"
Adjacent elements: additional line and two circles, crenelations, stone alignments
Found by/Ref: Y. Israel
Ref. to Map:
Ref. to Figs:
Notes:

8 Site: N. Neqarot
G.R. 15309983
Dimensions: -
Orientation: -
Attached items: crenelations, stone lines, remains of 3 "ladders" and a circular installation
Adjacent elements: -
Found by/Ref: Y. Israel
Ref. to Map:
Ref. to Figs: 5:40
Notes:
9 Site: Makhtesh Ramon I  
C.G.R. 14360034  
Dimensions: 21.8 x 8.4; 10.8 x 9.9  
Orientation: E-SE; E-SE  
Attached items: semi-circular cells  
Adjacent elements: remains of a circle chain, tumuli  
Ref. to Map:  
Ref. to Figs:  
Notes:  

10 Site: Makhtesh Ramon II  
C.G.R. 14360034  
Dimensions: 25.0 x 12.7; 12.3 x 9.1 m  
Orientation: E-SE; E-SE  
Attached items: semi-circular cell  
Adjacent elements: remains of a circle chain, tumuli  
Ref. to Figs:  
Notes:  

0 10 M.
11 Site: Makhtesh Ramon III  
C.G.R. 14360034  
Dimensions: 28.3 x 14.4; 7.2 x 8.1 m  
Orientation: E-SE; E-SE  
Attached items: semi-circular cells  
Adjacent elements: remains of a circle chain, tumuli  
Ref. to Map:  
Ref. to Figs:  
Notes: the right sanctuary is discernible by a fill of dark gravel only

12 Site: Makhtesh Ramon IV  
C.G.R. 14360034  
Dimensions: 22.7 x 10.0; 9.9 x 8.9  
Orientation: E-SE, E-SE  
Attached items: semi-circular cell, massebah  
Adjacent elements: remains of a circle chain, tumuli  
Ref. to Map:  
Ref. to Figs:  
Notes:  

13 Site: N. Qatsra  
C.G.R. 15999954  
Dimensions: 7.3 m  
Orientation: E  
Attached items: massebah  
Adjacent elements: stone lines  
Found by/Ref: U. Avner  
Ref. to Map:  
Ref. to Figs: 5:45  
Notes: the platform is crossed by a stone line
14 Site: Har Badad
C.G.R. 14810006
Dimensions: 8.3 m; "ladder"- 18.0 m
Orientation: -
Attached items: "ladder"
Adjacent elements: crenelations
Found by/Ref: Avner 1984:123; Israel & Nahlieli 1998
Ref. to Map:
Ref. to Figs:
Notes:

15 Site: Har Badad
C.G.R. 14790006
Dimensions: 14.8 m; "ladder"- 12.0 m
Orientation: -
Attached items: "ladder"
Adjacent elements: crenelations
Found by/Ref: Avner 1984:123; Israel & Nahlieli 1998
Ref. to Map:
Ref. to Figs: 5:39
Notes:

16 Site: N. Ramon
C.G.R. 13610015
Dimensions: 17.0 x 7.3 m
Orientation: E-SE
Attached items:
Adjacent elements:
Found by/Ref: U. Avner
Ref. to Map:
Ref. to Figs:
Notes: all stones are rounded

17 Site: Har Karkom
C.G.R. 12469724
Dimensions: 16.0 x 10.6; 6.2 x 5.4 m
Orientation: E (?)
Attached items:
Adjacent elements:
Found by/Ref: Anati 1986, Figs. 165-167
Ref. to Map:
Ref. to Figs: 5:43
Notes: in a cluster of four platforms

18 Site: Har Karkom
C.G.R. 12469724
Dimensions: 15.0 x 14.4 m
Orientation: E (?)
Attached items:
Adjacent elements:
Found by/Ref: Anati 1986, Figs. 165-167
Ref. to Map:
Ref. to Figs: 5:43
Notes: in a cluster of four platforms
19 Site: Har Karkom  
C.G.R. 12469724  
Dimensions: 16.0 x 14.5 m  
Orientation: E (?)  
Attached items:  
Adjacent elements:  
Found by/Ref: Anati 1986, Figs. 165-167  
Ref. to Map:  
Ref. to Figs:  
Notes: in a cluster of four platforms

20 Site: N. Yaham  
G.R. 14769756  
Dimensions: 6.6 x 5.7 m  
Orientation: S-SE  
Attached items: semi-circular cell  
Adjacent elements:  
Found by/Ref: U. Avner  
Ref. to Map:  
Ref. to Figs:  
Notes: the courtyard is filled with flint and lime gravel

21 Site: Har Tsuri'az I  
C. G.R. 13989716  
Dimensions: 14.7 x 11.7 m  
Orientation: E-SE  
Attached items: a broad massebah in the elongated cell  
Adjacent elements:  
Found by/Ref: Avner 1997a  
Ref. to Map: Fig. 5:6  
Ref. to Figs:  
Notes: in a row of 6 sanctuaries (I-VI)

22 Site: Har Tsuri'az II  
C.G.R. 13989716  
Dimensions: 20.1 x 9.8 m  
Orientation: E-SE  
Attached items: two tumuli tombs built in the elongated cell  
Adjacent elements:  
Found by/Ref: Avner 1997a  
Ref. to Map: Fig. 5:6  
Ref. to Figs:  
Notes: the left tumulus is later than the sanctuary

23 Site: Har Tsuri'az III  
C.G.R. 13989716  
Dimensions: 14.1 x 8.2 m  
Orientation: E-SE  
Attached items: a circular installation in the elongated cell  
Adjacent elements:  
Found by/Ref: Avner 1997a  
Ref. to Map: Fig. 5:6  
Ref. to Figs:  
Notes: in a row of 6 sanctuaries (I-VI)
Site: Har Tsuri’az IV
C.G.R. 13989716
Dimensions: 15.5 x 8.9 m
Orientation: E-SE
Attached items: in a row of 6 sanctuaries (I-VI)

Site: Har Tsuri’az V
C.G.R. 13989716
Dimensions: 11.4 x 7.0 m
Orientation: E-SE
Attached items: a tumulus tomb in the elongated cell
Adjacent elements: in a row of 6 sanctuaries (I-VI)

Site: Har Tsuri’az VI
C.G.R. 13989716
Dimensions: 16.1 x 10.4 m
Orientation: E-SE
Attached items: a pair of masseboth and a double tumulus in the elongated cell
Adjacent elements: in a row of 6 sanctuaries (I-VI)

Site: Har Tsuri’az VII
G.R. 13959714
Dimensions: 12.4 x 11.1 m
Orientation: E-SE
Attached items: stones were taken for adjacent Beduin tombs

Site: Har Tsuri’az VIII
G.R. 13969714
Dimensions: 13.6 x 9.6
Orientation: E-SE
Attached items: a broad massebah to the south (Table 11-1:49)
Adjacent elements: stones were taken for adjacent tumulus
29 Site: Har Tsuri’az IX  
G.R.: 13949713  
Dimensions: 18.0 x 9.8; 12.5 x 11.1 m  
Orientation: E-SE, E-SE  
Attached items: a broad *massebah* in front of the elongated cell, and a rock drawing next to it  
Adjacent elements:  
Found by/Ref.: Avner 1997a  
Ref. to Map: Fig. 5:6  
Ref. to Figs: 5:161-163  
Notes: the elongated cell is divided into 3 parts, with 3 semi-circular cells. Some stones were taken for adjacent Bedouin tombs.

30 Site: Har Tsuri’az X  
G.R.: 13929712  
Dimensions: 21.2 x 8.9; 21.0 x 11.9; 15.2 x 10.9 m  
Orientation: E-SE, E-SE, E-SE  
Attached items: *massebah* in the elongated cell, an oblique line of stones in front of the left sanctuary  
Adjacent elements: many stone circles around  
Found by/Ref.: Avner 1997a  
Ref. to Map: Fig. 5:6  
Ref. to Figs: 5:160  
Notes: the right sanctuary is filled with dark flint gravel
31 Site: Har Tsuri’az XI
G.R. 13969709
Dimensions: 15.5 x 8.8; 9.3 x 8.3 m
Orientation: E, E
Attached items: a tumulus tomb on the elongated cell, an oblique line of stones in front of the left sanctuary
Adjacent elements: Avner 1997a
Ref. to Map: Fig. 5:6
Ref. to Figs:
Notes: stones of the right sanctuary were robbed several years ago

32 Site: Har Tsuri’az XII
G.R. 13969707
Dimensions: 19.2 x 10.2 m
Orientation: E-SE
Attached items:
Adjacent elements: Avner 1997a
Ref. to Map: Fig. 5:6
Ref. to Figs:
Notes: the circular cell and massebah in the courtyard are later

33 Site: Har Tsuri’az XIII
G.R. 13869702
Dimensions: 18.0 x 7.6 m
Orientation: E
Attached items: a tumulus and massebah in the elongated cell
Adjacent elements: Avner 1997a
Ref. to Map: Fig. 5:6
Ref. to Figs:
Notes: stones were taken for adjacent Bedouin tombs

34 Site: Har Tsuri’az XIV
G.R. 13839712
Dimensions: 16.0 x 9.1; 11.9 x 10.0 m
Orientation: E-SE, E-SE
Attached items:
Adjacent elements: remains of stone drawing, tumuli and nawamis tombs
Found by/Ref: Avner 1997a
Ref. to Map: Fig. 5:6
Ref. to Figs:
Notes: most stones were taken for the adjacent tombs
35 Site: Har Tsuri'az XV  
G.R.: 13729705  
Dimensions: 14.8 x 9.2 m  
Orientation: E  
Attached items: massebah in the elongated cell  
Adjacent elements: a shrine with 9 masseboth and a single massebah (Table 11-9:1, 1:50)  
Found by/Ref: Avner 1997a  
Ref. to Map: Fig. 5:6  
Ref. to Figs:  
Notes: most stones were taken for the habitation site built on top of the sanctuary

36 Site: Har Tsuri'az XVI  
G.R.: 13779701  
Dimensions: 7.4 x 6.7 m  
Orientation: E-NE  
Attached items: remains of stone drawing, remains of circle chain  
Adjacent elements: a small house model  
Found by/Ref: Avner 1997a  
Ref. to Map: Fig. 5:6  
Ref. to Figs:  
Notes:

37 Site: Har Tsuri'az XVII  
G.R.: 13789702  
Dimensions: 8.0 x 6.8 m  
Orientation: E-SE  
Attached items: stone cells, masseboth  
Adjacent elements:  
Found by/Ref: Avner 1997a  
Ref. to Map: Fig. 5:6  
Ref. to Figs:  
Notes:

38 Site: Har Tsuri'az XVIII  
G.R.: 13779696  
Dimensions: 15.0 x 11.0 m  
Orientation: E-SE  
Attached items:  
Adjacent elements:  
Found by/Ref: Avner 1997a  
Ref. to Map: Fig. 5:6  
Ref. to Figs:  
Notes:

39 Site: Har Tsuri'az XIX  
G.R.: 13759694  
Dimensions: 7.9 x 5.2 m  
Orientation: N  
Attached items: remains of a stone circle and a line  
Adjacent elements:  
Found by/Ref: Avner 1997a  
Ref. to Map: Fig. 5:6  
Ref. to Figs:  
Notes:
40 Site: Har Tsuri’az XX  
G.R. 13899694  
Dimensions: 12.2 x 10.0 m  
Orientation: E-SE  
Attached items: stone circle and 4 stone lines, rock drawing with a circle and a line  
Adjacent elements:  
Found by/Ref: Avner 1997a  
Ref. to Map: Fig. 5:6  
Ref. to Figs: 5:10  
Notes: the courtyard is filled with dark gravel

41 Site: Har Tsuri’az XXI  
G.R. 13529716  
Dimensions: 11.3 x 8.2 m  
Orientation: SE  
Attached items: large stone circle  
Adjacent elements:  
Found by/Ref: Avner 1997a  
Ref. to Map: 5:6  
Ref. to Figs: 5:7, 8  
Notes: the courtyard is filled with flint gravel

42 Site: N. Paran  
G.R. 13839699  
Dimensions: 5.6 x 5.1 m  
Orientation: E  
Attached items: massebah  
Adjacent elements: structure with a triad of masseboth  
Found by/Ref: U. Avner  
Ref. to Map:  
Ref. to Figs:  
Notes:  

43 Site: N. Paran  
G.R. 13859673  
Dimensions: 10.4 x 7.6 m  
Orientation: E-SE  
Attached items:  
Adjacent elements:  
Found by/Ref: U. Avner  
Ref. to Map:  
Ref. to Figs:  
Notes:  

44 Site: N. Demama  
G.R. 15849685  
Dimensions: 7.0, "ladder" 12.0, alignment 6.6 m  
Orientation: -  
Attached items: "ladder", circular tomb (?), stone alignments  
Adjacent elements: additional circular sanctuary, crenelations, a tomb  
Found by/Ref: G. Ragolski  
Ref. to Map:  
Ref. to Figs:  
Notes:  
45 Site: N. Demama
G.R. 15849685
Dimensions: 6.1 m
Orientation: -
Attached items: additional circular open sanctuary, rectangular cult installation, stone circle
Adjacent elements: -
Found by/Ref: G. Ragolski
Ref. to Map: -
Ref. to Figs: -
Notes: -

46 Site: N. 'Aqalton
G.R. 15389688
Dimensions: 8.2 x 6.7 m
Orientation: SE (?)
Attached items: remains of a “ladder”
Adjacent elements: elongated cult installation, stone alignment, crenelations, tumulus
Found by/Ref: G. Ragolski
Ref. to Map: -
Ref. to Figs: -
Notes: most stones are weathered

47 Site: N. Shita
G.R. 16449504
Dimensions: 5.4 m
Orientation: -
Attached items: -
Adjacent elements: many stone cairns
Found by/Ref: U. Avner
Ref. to Map: -
Ref. to Figs: -
Notes: over the Jordanian border since 1995

48 Site: ‘Uvda 53c
G.R. 14769322
Dimensions: 10.7 x 9.3 m
Orientation: E-SE
Attached items: -
Adjacent elements: -
Found by/Ref: B. Gamlieli
Ref. to Map: -
Ref. to Figs: -
Notes: -

49 Site: ‘Uvda 100 (6)
G.R. 14679297
Dimensions: 12.2 x 11.2 m
Orientation: E-SE
Attached items: 17 small masseboth in the elongated cell, 5 sunken, built hearths in the courtyard
Adjacent elements: animal stone drawings
Found by/Ref: U. Avner, Yogev 1983
Ref. to Map: -
Ref. to Figs: 5:77-81
Notes: excavated by Yogev & Avner
50 Site: ‘Uvda 71
G.R. 15089306
Dimensions: 20.1 x 16.4 m
Orientation: NW (?)
Attached items:
Adjacent elements:
Found by/Ref: U. Avner
Ref. to Map:
Ref. to Figs:
Notes:

51 Site: ‘Uvda 147
G.R. 15039247
Dimensions: 34 m
Orientation: -
Attached items: stone cells, cult installations
Adjacent elements: masseboth
Found by/Ref: U. Avner
Ref. to Map:
Ref. to Figs:
Notes:

52 Site: Ma’aleh Shaharut 11:2
G.R. 15109242
Dimensions: 8.4; 4.6 m
Orientation: -
Attached items: fallen massebah, stone alignment, cult installations
Adjacent elements: water well, spring, additional sanctuaries
Found by/Ref: M. Markus, U. Avner
Ref. to Map:
Ref. to Figs:
Notes:
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<th>Ma’aleh Shaharut 11:4</th>
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<td>15109242</td>
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<td>Dimensions:</td>
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<td>Orientation:</td>
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<tr>
<td>Attached items:</td>
<td>well-shaped stone “drum”, massebah, cult installations</td>
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<tr>
<td>Adjacent elements:</td>
<td>water well, spring, additional sanctuaries</td>
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<tr>
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<td>M. Markus, U. Avner</td>
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<td>Ref. to Figs:</td>
<td>5:50, 51</td>
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<td>Dimensions:</td>
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<td>Orientation:</td>
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<tr>
<td>Attached items:</td>
<td>crenelations</td>
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<td>Adjacent elements:</td>
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<td>Found by/Ref:</td>
<td>U. Avner</td>
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<tr>
<td>Notes:</td>
<td>the courtyard is filled with flint gravel</td>
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<td>13139211</td>
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<tr>
<td>Dimensions:</td>
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<tr>
<td>Attached items:</td>
<td>rectangular platform</td>
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<tr>
<td>Adjacent elements:</td>
<td>remains of circle chain</td>
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<td>5:44</td>
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<tr>
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<td>Dimensions:</td>
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<tr>
<td>Attached items:</td>
<td>stone line in the center</td>
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<tr>
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<td>masseboth</td>
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<td>Ref. to Figs:</td>
<td>5:49</td>
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<tr>
<td>Notes:</td>
<td>stones were originally laid with spaces</td>
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<td>Dimensions:</td>
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<tr>
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<td>masseboth</td>
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<td>Ref. to Figs:</td>
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<tr>
<td>Notes:</td>
<td>stones were originally laid with spaces</td>
</tr>
</tbody>
</table>
58 Site: N. Qadar
G.R. 13579219
Dimensions: 7.1 x 6.3 m
Orientation: E-SE
Attached items: a fallen massebah in the stone circle
Adjacent elements: tomb and cairns
Found by/Ref: L. Enmar
Ref. to Map:
Ref. to Figs:
Notes: most stones are scattered

59 Site: N. Qadar
G.R. 13629232
Dimensions: 9.0 x 7.5 m
Orientation: E-SE
Attached items: single fallen masseboth in both circular installations
Adjacent elements:
Found by/Ref: U. Avner
Ref. to Map:
Ref. to Figs: 5:36, 37
Notes:

60 Site: N. Saguv
G.R. 13669103
Dimensions: 11.9 x 10.0 m
Orientation: SE
Attached items: single fallen masseboth in both circular installations
Adjacent elements:
Found by/Ref: U. Avner
Ref. to Map:
Ref. to Figs:
Notes:

61 Site: N. 'Eteq
G.R. 13689049
Dimensions: 11.0 x 9.8 m
Orientation: SE
Attached items:
Adjacent elements:
Found by/Ref: U. Avner
Ref. to Map:
Ref. to Figs:
Notes:

62 Site: N. Betamim
G.R. 13939081
Dimensions: 7.3 x 8.9 m
Orientation: E
Attached items: stone basin
Adjacent elements:
Found by/Ref: M. Shemtov
Ref. to Map:
Ref. to Figs: 5:38
Notes:
63 Site: Meishar Se’ifim  
G.R.: 13619014  
Dimensions: 19.5 x 16.5 m  
Orientation: -  
Attached items: cairns, tombs (?)  
Adjacent elements: massebah  
Found by/Ref.: U. Avner  
Ref. to Map:  
Ref. to Figs:  
Notes:  

64 Site: Har Shani I  
C.G.R.: 13609006  
Dimensions: 14.9 x 8.2 m  
Orientation: -  
Attached items:  
Adjacent elements:  
Found by/Ref.: A. Naor & U. Avner  
Ref. to Map: 5:11  
Ref. to Figs:  
Notes: in a cluster of 13 open sanctuaries  

65 Site: Har Shani II  
C.G.R.: 13609006  
Dimensions: 12.2 x 12.5 m  
Orientation: -  
Attached items:  
Adjacent elements:  
Found by/Ref.: A. Naor & U. Avner  
Ref. to Map: 5:11  
Ref. to Figs:  
Notes: in a cluster of 13 open sanctuaries  

66 Site: Har Shani III  
C.G.R.: 13609006  
Dimensions: 10.2 x 10.4 m  
Orientation: -  
Attached items:  
Adjacent elements:  
Found by/Ref.: A. Naor & U. Avner  
Ref. to Map: 5:11  
Ref. to Figs: 5:12  
Notes: in a cluster of 13 open sanctuaries  

67 Site: Har Shani IV  
C.G.R.: 13609006  
Dimensions: 15.5 x 13.8 m  
Orientation: -  
Attached items:  
Adjacent elements:  
Found by/Ref.: A. Naor & U. Avner  
Ref. to Map: 5:11  
Ref. to Figs:  
Notes: in a cluster of 13 open sanctuaries
68 Site: Har Shani V  
C.G.R. 13609006  
Dimensions: 13.6 x 9.6 m  
Orientation:  
Attached items: quartzite anvil  
Adjacent elements: oval installation (2.5 x 1.5 m)  
Found by/Ref: A. Naor & U. Avner  
Ref. to Map: 5:11  
Ref. to Figs:  
Notes: in a cluster of 13 open sanctuaries

69 Site: Har Shani VI  
C.G.R. 13609006  
Dimensions: 11.4 x 8.9 m  
Orientation:  
Attached items: built-up square basin, grinding stone  
Adjacent elements: stone platform (2.0 x 2.1 m)  
Found by/Ref: A. Naor & U. Avner  
Ref. to Map: 5:11  
Ref. to Figs:  
Notes: in a cluster of 13 open sanctuaries

70 Site: Har Shani VII  
C.G.R. 13609006  
Dimensions: 13.7 x 9.2; 6.2 x 5.6  
Orientation:  
Attached items:  
Adjacent elements:  
Found by/Ref: A. Naor & U. Avner  
Ref. to Map: 5:11  
Ref. to Figs:  
Notes: in a cluster of 13 open sanctuaries

71 Site: Har Shani VIII  
C.G.R. 13609006  
Dimensions: 10.3 x 9.0  
Orientation:  
Attached items:  
Adjacent elements:  
Found by/Ref: A. Naor & U. Avner  
Ref. to Map: 5:11  
Ref. to Figs:  
Notes: in a cluster of 13 open sanctuaries

72 Site: Har Shani X  
C.G.R. 13609006  
Dimensions: 11.4 x 13.3 m  
Orientation: SW (?)  
Attached items: built-up basins, hearths  
Adjacent elements: large hearth 10 m south  
Found by/Ref: A. Naor & U. Avner, Avner 1982e.  
Ref. to Map: 5:11  
Ref. to Figs: 5:82-89  
Notes: excavated, in a cluster of 13 open sanctuaries
73 Site: Har Shani (mountain top)
G.R. 13549009
Dimensions: 7.8 x 5.6 m
Orientation: E
Attached items:
Adjacent elements:
Found by/Ref: U. Avner
Ref. to Map: 5:11
Ref. to Figs:
Notes:

74 Site: Har Yehoahaz
G.R. 13848925
Dimensions: 10.6 x 10.4; 7.4 x 5.8 m
Orientation: SE; E-SE
Attached items: massebah, basin, cult installations,
Adjacent elements:
Found by/Ref: M. Shemtov
Ref. to Map: 5:11
Ref. to Figs:
Notes:

75 Site: Give'at Shehoret
G.R. 14688908
Dimensions: 17.4 x 15.2 m
Orientation: -
Attached items:
Adjacent elements: tumulus, masseboth shrine
Found by/Ref: U. Avner
Ref. to Map:
Ref. to Figs:
Notes:

76 Site: Eilat
G.R. 14358852
Dimensions: 14.4 x 12.5 m
Orientation: E-NE
Attached items: massebah in the center (broken)
Adjacent elements: stone alignment, tumuli
Found by/Ref: B. Gamlieli; Avner in press 1
Ref. to Map:
Ref. to Figs: 5:90-93
Notes: excavated, removed and restored
77 Site: Eilat
G.R. 14358852
Dimensions: 10.1 x 3.8 m
Orientation: E-SE
Attached items: cache with 99 small masseboth
Adjacent elements: tumuli
Found by/Ref: B. Gamlieli; Avner in press 1
Ref. to Map: 5:94-97
Ref. to Figs: 5:94-97
Notes: excavated, removed and restored

78 Site: Darb Ghaza I
C.G.R. 13008964
Dimensions: 18.8 x 8.0 m
Orientation: E-SE
Attached items: tumulus, stone basin
Adjacent elements: 3 circular tent bases
Found by/Ref: A. Naor & U. Avner; Avner 1984
Ref. to Map: 5:13
Ref. to Figs: 5:17
Notes:

79 Site: Darb Ghaza II
C.G.R. 13008964
Dimensions: 14.0 x 8.2; 10.2 x 9.8 m
Orientation: E-SE, E
Attached items: stone platform
Adjacent elements: cairn, circle chain
Found by/Ref: A. Naor & U. Avner; Avner 1984
Ref. to Map: 5:13
Ref. to Figs: 5:14
Notes: the courtyards are filled with dark gravel

80 Site: Darb Ghaza III
C.G.R. 13008964
Dimensions: 12.4 x 8.6 m
Orientation: E-SE
Attached items: circle chain
Adjacent elements: stone platform
Found by/Ref: A. Naor & U. Avner; Avner 1984
Ref. to Map: 5:13
Ref. to Figs: 5:14
Notes: the courtyard is filled with dark gravel

81 Site: Darb Ghaza IV
C.G.R. 13008964
Dimensions: 16.7 x 7.6 m
Orientation: SE
Attached items: 3 stone platforms
Adjacent elements: circle chain
Found by/Ref: A. Naor & U. Avner; Avner 1984
Ref. to Map: 5:13
Ref. to Figs: 5:15
Notes: the courtyard is filled with dark gravel
82

Site: Darb Ghaza V
C.G.R. 13008964
Dimensions: 14.9 x 7.2; 11.9 x 10.6 m
Orientation: S-SE; SE
Attached items: pair of masseboth in the elongated cell, 3 stone cells on the left sanctuary’s edge
Adjacent elements:
Found by/Ref: A. Naor & U. Avner; Avner 1984
Ref. to Map: 5:13
Ref. to Figs:
Notes: the courtyards are filled with dark gravel

83

Site: Darb Ghaza VI
C.G.R. 13008964
Dimensions: 18.5 x 11.0; 16.0 x 10.0 m
Orientation: SE; SE
Attached items: semi-circular cell in the left sanctuary
Adjacent elements: circle chain
Found by/Ref: A. Naor & U. Avner; Avner 1984
Ref. to Map: 5:13
Ref. to Figs: 5:16
Notes: the courtyards are filled by dark gravel

84

Site: Jebel Hammra (Sinai 65)
Estimated G.R. 125-896
Dimensions: ca. 12.5 x 8.0; 6.0 x 6.0 m
Orientation: E-SE; E-SE
Attached items:
Adjacent elements: circle chain
Found by/Ref: Eddy & Wendorf 1999:36, 39
Ref. to Map:
Ref. to Figs:
Notes: details are conjectural based on partial publication

85

Site: Jebel Hammra (Sinai 61)
Estimated G.R. 124-895
Dimensions: ca. 10.5 x 7.0 m
Orientation: E-SE
Attached items:
Adjacent elements: circle chain
Found by/Ref: Eddy & Wendorf 1999:36, 38
Ref. to Map:
Ref. to Figs:
Notes: details are based on a small-scale plan
Site: W. Radadi I
C.G.R. 13708926
Dimensions: 17.2 x 9.9; 14.0 x 9.8 m
Orientation: E-SE; E-SE
Attached items: circular cell in the right sanctuary
Adjacent elements: tombs, alignments chain
Found by/Ref: A. Nusbaumer & U. Avner; Avner 1984
Ref. to Map: 5:18
Ref. to Figs: 5:19
Notes: destroyed in 1995 by a new road

Site: W. Radadi II
C.G.R. 13708926
Dimensions: 19.0 x 9.6; 10.8 x 7.7 m
Orientation: SE; E-SE
Attached items: circular cell in the right sanctuary
Adjacent elements: tombs, circle chain
Found by/Ref: A. Nusbaumer & U. Avner; Avner 1984
Ref. to Map: 5:18
Ref. to Figs: 5:20
Notes: destroyed in 1995 by a new road

Site: W. Radadi III
C.G.R. 13708926
Dimensions: 15.8 x 10.4; 9.3 x 7.2 m
Orientation: E-SE; E-SE
Attached items: circular cell in the right sanctuary,
tumulus in the left sanctuary
Adjacent elements: tumulus in the left sanctuary
Found by/Ref: A. Nusbaumer & U. Avner; Avner 1984
Ref. to Map: 5:18
Ref. to Figs: 5:20
Notes: destroyed in 1995 by a new road
89 Site: W. Buyuti
G.R. 12738844
Dimensions: 15.9 x 10.4 m
Orientation: S-SE
Attached items: semi-circular cells
Adjacent elements: tumuli
Found by/Ref: U. Avner
Ref. to Map:
Ref. to Figs:
Notes:

90 Site: Ras alNaqeb
G.R. 13598898
Dimensions: 25.8 x 12.8 m
Orientation: E
Attached items: semi-circular installations,
tumuli, circular cells, masseboth
Adjacent elements: tumuli, circular cells, masseboth
Found by/Ref: U. Avner
Ref. to Map:
Ref. to Figs:
Notes:

91 Site: Darb alHajj
G.R. 11578982
Dimensions: 15.4 x 14.3 m
Orientation: -
Attached items: cairns
Adjacent elements: circle chain, tent camp
Found by/Ref: U. Avner
Ref. to Map:
Ref. to Figs:
Notes:

92 Site: J. Hashem alTaref I
C.G.R. 11478974
Dimensions: ?
Orientation: E-SE
Attached items: stone drawing
Adjacent elements: stone drawing
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol
Ref. to Map: 5:23
Ref. to Figs:
Notes: turned into habitation unit
93 Site: J. Hashem alTaref II  
C.G.R. 11478974  
Dimensions: 14.5 x 10.6 m  
Orientation: E-SE  
Attached items:  
Adjacent elements:  
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol  
Ref. to Map: 5:23  
Ref. to Figs:  
Notes:  

94 Site: J. Hashem alTaref III  
C.G.R. 11478974  
Dimensions: 11.9 x 9.5 m  
Orientation: SE  
Attached items: stone circle  
Adjacent elements:  
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol  
Ref. to Map: 5:23  
Ref. to Figs:  
Notes: damaged in 1995  

95 Site: J. Hashem alTaref IV  
C.G.R. 11478974  
Dimensions: 16.5 x 8.0; 11.0 x 10.0 m  
Orientation: E-SE; E-SE  
Attached items:  
Adjacent elements: circle chain  
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol  
Ref. to Map: 5:23  
Ref. to Figs: 5:27  
Notes: damaged in 1995  

96 Site: J. Hashem alTaref V  
C.G.R. 11478974  
Dimensions: 15.5 x 10.2; 11.0 x 10 m  
Orientation: E; E-SE  
Attached items: later cairns  
Adjacent elements: circle chain  
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol  
Ref. to Map: 5:23  
Ref. to Figs:  
Notes: damaged in 1995
97 Site: J. Hashem alTaref VI
C.G.R. 11478974
Dimensions: 27.0 x 12.0; 11.8 x 8.2 m
Orientation: SE; SE
Attached items: massebah
Adjacent elements: remains of stone drawing, circle chain
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol
Ref. to Map: 5:23
Ref. to Figs:
Notes: damaged in 1995

98 Site: J. Hashem alTaref VII
C.G.R. 11478974
Dimensions: 20.0 x 9.0; 11.5 x 9.0 m
Orientation: E-SE; SE
Attached items: massebah
Adjacent elements: stone drawing
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol
Ref. to Map: 5:23
Ref. to Figs:
Notes: damaged in 1995

99 Site: J. Hashem alTaref VIII
C.G.R. 11478974
Dimensions: 16.0 x 10.0; 11.8 x 8.2 m
Orientation: E-SE; E-SE
Attached items: massebah, semi-circular cell
Adjacent elements: stone drawing
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol
Ref. to Map: 5:23
Ref. to Figs:
Notes: damaged in 1995
100 Site: J. Hashem alTaref IX  
C.G.R.: 11478974  
Dimensions: 21.0 x 9.5; 11.8 x 8.2 m  
Orientation: E-SE; E-SE  
Attached items: massebah  
Adjacent elements: circle chain  
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol  
Ref. to Map: 5:23  
Ref. to Figs:  
Notes: damaged in 1995

101 Site: J. Hashem alTaref X  
C.G.R.: 11478974  
Dimensions: 18.0 x 8.5; 14.0 x 9 m  
Orientation: E-SE; E-SE  
Attached items: remains of stone drawing  
Adjacent elements: circle chain  
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol  
Ref. to Map: 5:23  
Ref. to Figs: 5:28  
Notes: damaged in 1995

102 Site: J. Hashem alTaref XI  
C.G.R.: 11478974  
Dimensions: 18.0 x 8.7; 12.0 x 9.0 m  
Orientation: E-SE; E-SE  
Attached items: semi-circular cells  
Adjacent elements: circular cells, circle chain  
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol  
Ref. to Map: 5:23  
Ref. to Figs: 5:29  
Notes: damaged in 1995

103 Site: J. Hashem alTaref XII  
C.G.R.: 11478974  
Dimensions: 18.0 x 10.0 m  
Orientation: E-SE  
Attached items: stone cell and platform  
Adjacent elements:  
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol  
Ref. to Map: 5:23  
Ref. to Figs: 5:25  
Notes: damaged in 1995
104 Site: J. Hashem alTaref XIII
C.G.R. 11478974
Dimensions: 19.0 x 9.6 m
Orientation: E-SE
Attached items: stone cells
Adjacent elements: circle chain
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol
Ref. to Map: 5:23
Ref. to Figs:
Notes: damaged in 1995

105 Site: J. Hashem alTaref XIV
C.G.R. 11478974
Dimensions: 19.5 x 8.7 m
Orientation: E-SE
Attached items: massebah, stone cells
Adjacent elements: stone drawing, circle chain
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol
Ref. to Map: 5:23
Ref. to Figs: 5:26
Notes: damaged in 1995

106 Site: J. Hashem alTaref XV
C.G.R. 11478974
Dimensions: 14.5 x 9.0 m
Orientation: SE
Attached items: two masseboth (originally a triad?)
Adjacent elements: circle chain
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol
Ref. to Map: 5:23
Ref. to Figs:
Notes: damaged in 1995, opening in the cell is later than construction

107 Site: J. Hashem alTaref XVI
C.G.R. 11478974
Dimensions: 8.7 x 8.3 m
Orientation: SE
Attached items: circular cells
Adjacent elements: circle chain
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol
Ref. to Map: 5:23
Ref. to Figs:
Notes: damaged in 1995

108 Site: J. Hashem alTaref XVII
C.G.R. 11478974
Dimensions: 20.5 x 11.0; 8.6 x 7.8 m
Orientation: E
Attached items: stone drawing, circle chain
Adjacent elements: stone drawing, circle chain
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol
Ref. to Map: 5:23
Ref. to Figs:
Notes: damaged in 1995, tumulus tomb is later
109 Site: J. Hashem alTaref XVIII
C.G.R. 11478974
Dimensions: 20.0 x 12.0; 8.3 x 6.8 m
Orientation: E-SE; E-SE
Attached items:
Adjacent elements: circle chain
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol
Ref. to Map: 5:23
Ref. to Figs:
Notes: damaged in 1995

110 Site: J. Hashem alTaref XIX
C.G.R. 11478974
Dimensions: 20.5 x 12; 13.0 x 9.3 m
Orientation: E-SE; E-SE
Attached items:
Adjacent elements:
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol
Ref. to Map: 5:23
Ref. to Figs:
Notes: damaged in 1995

111 Site: J. Hashem alTaref XX
C.G.R. 11478974
Dimensions: 15.7 x 8.0 m
Orientation: E-SE
Attached items:
Adjacent elements: circle chain
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol
Ref. to Map: 5:23
Ref. to Figs: 5:31
Notes: damaged by later graves, damaged in 1995

112 Site: J. Hashem alTaref XXI
C.G.R. 11478974
Dimensions: 16.0 x 11.5 m
Orientation: E-SE
Attached items:
Adjacent elements:
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol
Ref. to Map: 5:23
Ref. to Figs: 5:30
Notes: intersecting a circle chain, damaged in 1995
113 Site: J. Hashem alTaref XXII
G.R. 11458980
Dimensions: 15.4 x 11.1 m
Orientation: E-SE
Attached items: tumulus, rows of small stone installations
Adjacent elements:
Found by/Ref: Avner 1984, A. Nusbaumer, M. Eshkol
Ref. to Map: 5:23
Ref. to Figs: 
Notes: destroyed in 1995

114 Site: W. Zalaqa 306
G.R. 08878241
Dimensions: 12.8 x 6.6 m
Orientation: E-SE
Attached items:
Adjacent elements: two circle chains
Found by/Ref: U. Avner
Ref. to Map: 5:32
Ref. to Figs: 5:101-106
Notes:

115 Site: W. Zalaqa 309
G.R. 08888240
Dimensions: ca. 8 x 4 m
Orientation: E
Attached items: stone circles
Adjacent elements: tumuli, masseboth
Found by/Ref: Avner 1984, Pl. 20:1
Ref. to Map: 5:32
Ref. to Figs: 5:107, 108
Notes:

116 Site: W. Zalaqa 311a
G.R. 08848242
Dimensions: 21.8 x 12.5 m
Orientation: E-NE
Attached items: semi-circular cell
Adjacent elements: massebah, additional sanctuary
Found by/Ref: U. Avner
Ref. to Map: 5:32
Ref. to Figs: 5:33
Notes:

117 Site: W. Zalaqa 311b
G.R. 08848242
Dimensions: 5.4 x 4.5 m
Orientation: E-NE
Attached items: massebah
Adjacent elements: additional sanctuary
Found by/Ref: U. Avner
Ref. to Map: 5:32
Ref. to Figs: 
Notes:
118 Site: W. Zalaqa 312
G.R.: 08838242
Dimensions: 20.2 x 11.6 m
Orientation: E
Attached items: massebah, tumulus, stone cells
Adjacent elements: tent remains, platform with massebah
Found by/Ref.: U. Avner
Ref. to Map: 5:32
Ref. to Figs:
Notes:

119 Site: W. Zalaqa 313
G.R.: 08798242
Dimensions: 26.0 x 12.4 m
Orientation: E
Attached items: tumulus, stone cells
Adjacent elements: tumuli, tent remains
Found by/Ref.: U. Avner
Ref. to Map: 5:32
Ref. to Figs:
Notes:

120 Site: W. Zalaqa 314
G.R.: 08778248
Dimensions: 18.4 x 9.1 m
Orientation: S-SE
Attached items: tent camp
Adjacent elements: circular cell, stone line
Found by/Ref.: U. Avner
Ref. to Map: 5:32
Ref. to Figs:
Notes: the courtyard is marked by small flagstones, vertically set

121 Site: W. Zalaqa 315
G.R.: 08778249
Dimensions: 17.0 x 9.2 m
Orientation: E-SE
Attached items: tumulus, semi-circular cell, masseboth
Adjacent elements: circular cell, stone line
Found by/Ref.: Avner 1984, Pl. 21:3
Ref. to Map: 5:32
Ref. to Figs: 5:109-113
Notes: the courtyard is marked by small flagstones, vertically set
122 Site: W. Mara
G.R. 07728008
Dimensions: 30.2 x 13.0 m
Orientation: SE
Attached items:
Adjacent elements: tumuli, hut remains
Found by/Ref: U. Avner
Ref. to Map:
Ref. to Figs:
Notes: the courtyard was cut by a bulldozer

123 Site: W. Aradeh
G.R. 07758012
Dimensions: 11.5 x 2.5 m
Orientation: SE
Attached items: tumulus, stone cell
Adjacent elements: tumuli, habitation sites
Found by/Ref: U. Avner
Ref. to Map:
Ref. to Figs:
Notes: the elongated cell is preserved to 90 cm high, no remains of a courtyard
### Table 15. Open-Air Sanctuary Types

<table>
<thead>
<tr>
<th>Type</th>
<th>Count (n)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1</td>
<td>55</td>
<td>35.7%</td>
</tr>
<tr>
<td>Type 2</td>
<td>56</td>
<td>36.3%</td>
</tr>
<tr>
<td>Type 3</td>
<td>40</td>
<td>26.1%</td>
</tr>
<tr>
<td>Misc</td>
<td>3</td>
<td>1.9%</td>
</tr>
</tbody>
</table>

Total: 154 (100%)
**Table 17.** Number of Sites per Period in the Negev Survey of N. Glueck
After Baron 1981.

<table>
<thead>
<tr>
<th>B.C./A.D.</th>
<th>Period</th>
<th>Number of Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>+1100~</td>
<td>Early Islamic</td>
<td>(?)</td>
</tr>
<tr>
<td>+630</td>
<td>Byzantine</td>
<td>311</td>
</tr>
<tr>
<td>+330~</td>
<td>Nabat-Roman</td>
<td>236</td>
</tr>
<tr>
<td>0</td>
<td>Nabat-Hellen</td>
<td>141</td>
</tr>
<tr>
<td>300~</td>
<td>Persian</td>
<td></td>
</tr>
<tr>
<td>586</td>
<td>Iron Age II</td>
<td>112</td>
</tr>
<tr>
<td>1000</td>
<td>Iron Age I</td>
<td>32</td>
</tr>
<tr>
<td>1200</td>
<td>Late Bronze</td>
<td></td>
</tr>
<tr>
<td>1550</td>
<td>Middle Bronze</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>Early Bronze IV</td>
<td>115</td>
</tr>
<tr>
<td>2300</td>
<td>Early Bronze III</td>
<td></td>
</tr>
<tr>
<td>2650</td>
<td>Early Bronze II</td>
<td>5</td>
</tr>
<tr>
<td>3000</td>
<td>Early Bronze I</td>
<td>5</td>
</tr>
<tr>
<td>3600</td>
<td>Early Bronze I</td>
<td>5</td>
</tr>
<tr>
<td>Period</td>
<td>Number of Sites</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------</td>
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<tr>
<td>Chalcolithic</td>
<td>43</td>
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</tr>
<tr>
<td>Late Neolithic</td>
<td>11</td>
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<tr>
<td>Early Neolithic</td>
<td>9000</td>
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<tr>
<td>4500</td>
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<tr>
<td>6000</td>
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<td></td>
</tr>
<tr>
<td>9000</td>
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</tbody>
</table>

**Table 18. Number of Sites per Period in the Southern Negev Survey of B. Rothenberg**

After Rothenberg 1967b

<table>
<thead>
<tr>
<th>B.C./A.D.</th>
<th>Period</th>
<th>Number of Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>1100~</td>
<td>Early Islamic</td>
<td>11</td>
</tr>
<tr>
<td>630</td>
<td>Byzantine-</td>
<td>48</td>
</tr>
<tr>
<td>330~</td>
<td>Roman</td>
<td>6</td>
</tr>
<tr>
<td>0</td>
<td>Nabatean</td>
<td>3</td>
</tr>
<tr>
<td>300~</td>
<td>Persian</td>
<td></td>
</tr>
<tr>
<td>586</td>
<td>Iron Age II</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>Iron Age I</td>
<td></td>
</tr>
<tr>
<td>1200</td>
<td>Late Bronze</td>
<td>51</td>
</tr>
<tr>
<td>1550</td>
<td>Middle Bronze</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 19. Number of Sites per Period in the Negev Highlands Emergency Survey

<table>
<thead>
<tr>
<th>B.C./A.D.</th>
<th>Period</th>
<th>Number of Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>+1100~</td>
<td>Byzantine – 958 Early Islamic</td>
<td>958</td>
</tr>
<tr>
<td>+330~</td>
<td>Roman</td>
<td>111</td>
</tr>
<tr>
<td>0</td>
<td>Nabatean</td>
<td>154</td>
</tr>
<tr>
<td>300~</td>
<td>Persian</td>
<td>4</td>
</tr>
<tr>
<td>586</td>
<td>Iron Age II</td>
<td>250</td>
</tr>
<tr>
<td>B.C./A.D.</td>
<td>Period</td>
<td>Number of Sites</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>+1100~</td>
<td></td>
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</tr>
</tbody>
</table>

Table 20. Number of Sites per Period in the Har Karkom Survey of E. Anati