Rock drawings in the Ancient Copper Mines of the Arabah - new aspects of the region's history

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Introduction

During our extensive surveys of the Negev, the Western Arabah Valley and the Sinai Peninsula (1959-1990), we observed and recorded a huge number of rock drawings along ancient travel routes, at camping sites and in settlement areas, around cult sites and burial centers, as well as in regions of ancient mining. I have always wondered why the majority of these rock drawings seemed to be basically of the same style - engraved into the rockfaces by the same pure linear technique[1] - with chronology-related differences mainly in their material-cultural and socio-economic details as well as in the change-over from extinct to newly domesticated/introduced items of fauna and flora. The historical significance of this stylistic congruity over several thousand years has not ever been properly considered in the literature dealing with rock art, probably because of a common fundamental 'bias' in the methodology of the investigation of rock drawings: the isolation of the rock drawings from the settlements, work and cult sites, and their archaeology[2]. In most of the publications dealing with rock art, the authors used almost exclusively methods of stylistic typology and analogy, which often left basic problems, like dating, unsolved and open to guesswork. In our surveys we integrated the rock drawings into the settlement history and emphasized not the, often minor, differences of style and subject-matter, but the fundamental stylistic congruity of most of the rock drawings - which we now understand as evidence for the continuity of the pastoral lifestyle of the indigenous population of these arid regions during several thousands of years[3]. Seen this way, the rock drawings are complementary to the archaeology of the settlements, in fact, the stylistic and thematic continuity shown by the rock drawings provide a clear indication for the continuity of settlement in the region by the same indigenous people even during periods not yet identifiable by archaeological remains[4].

Once we understood the interconnection between the rock drawings and the settlement history, our attention was drawn to the relatively small number of obviously intrusive rock drawings, which seemed to represent datable historical events of importance. The most obvious intrusive groups of rock drawings were left behind by Sinai-Arabah Copper Age Early Phase[5] (appr. Chalcolithic - Early Bronze I) miners and settlers and, at a much later time, by Pharaonic expeditions to the turquoise and copper mining regions of Sinai and the Arabah. The integration of these rock drawings into the settlement story, as 'told' by archaeology and ancient monments, provided essential historical data to the history of the Sinai Peninsula and the Arabah (Rothenberg & Bachmann in preparation).

Most areas of ancient mining in the Arabah and Sinai showed groups of rock drawings by the indigenous people, but the rock engravings, mostly of quite different styles and themes, left behind by intrusive groups of miners, are historically the most significant. In the following we deal with two groups of such intrusive rock drawings, found by us in the mining region of the Arabah, one, at a site in the Arabah, north of Timna, of Copper Age date and related to copper smelting sites; the second, located inside the copper mines of Timna, dated to the Egyptian New Kingdom. Both groups of engravings, very different in style and contents from the traditional indigenous rock drawings of the Arabah, have been previously published (Rothenberg 1972), but a recent detailed and comprehensive reconsideration of the survey material, in preparation of the final publication of our Arabah and Sinai surveys, have led to a revised interpretation - first published here.

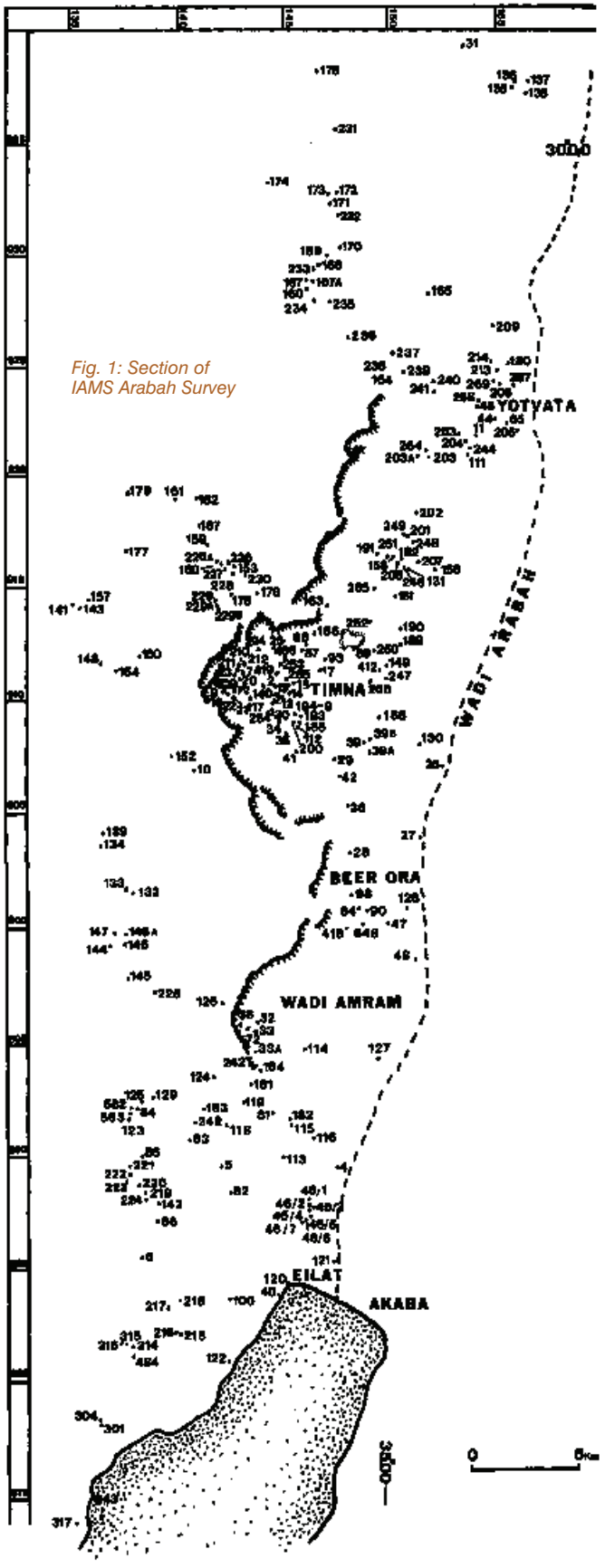


Fig. 1: Section of IAMS Arabah Survey

Fig. 2: Rock drawings in prehistoric shrine in Wadi Odem (Site 191)

Early rock drawings in a prehistoric shrine, Sinai-Arabah Copper Age dwellings and smelters, and 'Desert Kites' in the Southern Arabah - and the Palette of Egypt's King Narmer of Dynasty 0.

1. North of the Timna Valley (Fig. 1), a small, isolated hill of 'Middle White Sandstone', which in the Arabah is the copper ore bearing rock, was conspicuous because of its grey-white colour and its unusual shape. Located at the head of shallow Wadi Odem[6], it was about 10 m high and was cut by small gullies into several pillar-like blocks of smooth, roundish appearance. Three low, semi-circular, semi-detached enclosures were build against this rock formation (Site 191), the middle one enclosing the entrance to a narrow, man-wide canyon in between the two central 'pillars'. Inside these enclosures a number of pottery sherds were found[7] which could be dated to the three Phases of the Sinai-Arabah Copper Age[8] (approx. Chalcolithic[9]-Early Bronze I; Early Bronze II-III, Early Bronze IV {MB I or EB/MB}) - 5th millennium to 2000 BC. Accordingly, we suggest a Chalcolithic date for the first phase of this site, which we see as a desert shrine used for centuries by the settlers of the mining villages nearby (see below). According to the ceramic evidence found in the shrine, and the date of the nearby settlements, this shrine was used as a cult site until the end of the S-A Copper Age, about 2000 BC.

The rockface within the enclosure walls, also inside the narrow canyon, was covered by numerous rock drawings (Fig. 2) in different styles. Differences in the grade of the patination of the drawings indicated that they were made during a rather extended period of time, *i.e.* not only during the Copper Age but also in much more recent times.

The earliest drawings, deep inside the narrow canyon, represent a strange pair of anthropomorphic figures, perhaps the divinities worshipped here (right side of fig. 2). The figure at the right, 55 cm high, is reminiscent of the geometric character of the Chalcolithic frescoes of Teleilat el-Ghassul (NEAEHL 510). Possibly female, it has concentric circles on top of its head[10], drawn as three short incisions, and is crowned by two horns. The figure to its left, 45 cm high, perhaps a male, has the same style head with three short, deep lines but no further emblems. It appears that both figures have wings attached below the shoulder. Next to these two 'winged' figures are several human figures with emphasized, large hands, perhaps also icons of supernatural beings. The strangeness of this group of figures is rather outstanding, compared with the rock drawings known to us from the region, and their location, deep inside the rock fissure, seems indicative of the importance attached to these figures by the 'artists'.

A second group of engravings, also unique to this site, is located outside the canyon (left side of fig. 2). Here, five engravings, ca. 100 cm high, show ostriches in an almost abstract technique, the exaggerated, upright, long necks with a mere indication of the head. The birds are represented from three different sides at a sophisticated level of abstract realism, giving the very essence of the bird's form and movement, and nothing more. The ostrich on the right is drawn front view, its legs as one strong line; the bird to its left is drawn in profile, with the body beautifully carved out in relief and the two legs given as two short lines with emphasized feet. The third bird has an unusually long neck; its wings are strongly drawn upwards and its two legs represented by two parallel strokes - this is obviously an ostrich in movement, drawn from the rear. The details of the body of the fourth ostrich are not quite clear; the fifth is again drawn in profile, its body damaged by later drawings. The five birds are not drawn on the same plane but more as if a flock of dispersed birds was caught unawares by the 'artist'.

Patina-wise and by their dominant location, these two groups of drawings are the earliest at the site, and we suggest that they were drawn at the time the S-A Copper Age Early Phase (Chalcolithic) shrine was established. We relate the 'tree-of-life' to the S-A Copper Age Late Phase (Early Bronze IV)[11], others may date to the S-A Copper Age Middle Phase (Early Bronze II-III). A number of drawings, mostly of geometric style, seem to be Bedouin engravings, some ancient, others fairly recent. It appears that this extraordinary, isolated early shrine attracted the desert nomads of many periods who encamped and buried nearby, and also carried on the ancient tradition of rock engravings here, perhaps with a similar 'magic' intent. The latter is indicated by the conspicuous fact that the Bedouin only engraved on the wall of the early shrine individual, iconic features and not any of the Bedouin narrative rock drawings so common in the Negev Highland, Sinai and the Arabah.

2. Most of the Arabah Valley is an inhospitable, arid region with rather poor soil, and our Arabah Survey map shows that there are very few sedentary habitation sites along the rift valley - with the exception of small groups of camping sites next to the few natural or man-made sources of water, and, foremost, dense clusters of settlements or sites of ancient copper production inside and around the copper mining valleys of the Southern Arabah. On top of most of the low hills along the western fringe of the southernmost Arabah, slag concentrations indicate small scale copper smelting of early dates. The shrine of the rock drawings in W. Odem was the westernmost of a cluster of ancient sites - habitation and copper smelting sites as well as 'desert kites' (see below) - located between the Timna Valley and the water-rich oasis of Yotvata[12] (see fig. 1).

It should be mentioned here, that, with the exception of a lone smelting site of the Late Pottery Neolithic Period (Rothenberg & Merkel 1995), and some very minor Chalcolithic smelting activities at the site of the Egyptian Mining Temple (Rothenberg 1988: 57), only New Kingdom smelting sites, based on obviously extraordinary logistics, were located inside the Timna and Amram Valleys. All earlier, pre- and protohistoric smelting took place in the Arabah Valley, on low hilltops and next to settlements, obviously to be nearer to water and wood. The pre-Egyptian settlements in the Arabah obviously served as the logistic hinterland, producing the nec-

Fig. 3: Chalcolithic dwelling in the Arabah

essary food, herding the animals, and housing the families of the early copper producers who had their smelting workshops nearer to the copper mines.

A cluster of sites[13], related to the Shrine of the Rock Drawings, spread immediately west of the shrine, over an area of about 4 km^2. This area was close to the springs and swamps of Yotvata ('Malchat Yotvata'), a rich source of water and wood. Only one of the many sites, Site 201A, could be excavated by us[14], the others were dated by surface pottery finds and by their architecture[15]. A number of sites could not be dated more accurately than 'S-A Copper Age', pending future exploration by excavations.

Sinai-Arabah Copper Age Early Phase (appr. Chalcolithic-Early Bronze I)

There were several S-A Copper Age Early Phase groups of round and oval enclosures (Fig. 3), probably tented dwellings. This settlement represented the only purely domestic centre of this period in the region and was, according to the pottery, connected with the nearby Shrine of the Rock Drawings. There was no copper smelting connected with any of these dwellings, though S-A Copper Age Early Phase pottery was found among the slag at Site 201F, a widely dispersed area of unidentifiable structures north of the S-A Copper Age Middle Phase hill-smelter Site 201/A2. In this area, copper was apparently smelted during several phases of the S-A Copper Age. We should mention here that the major S-A Copper Age Early Phase copper smelting activities took place at sites much nearer to the Timna Valley and not near any dwelling sites of that period. See f.i. the 5th millennium BC smelter Site 39[16] (Rothenberg & Tylecote 1978; Rothenberg & Merkel 1998) and smelters of this period on hilltops outside the Timna Valley[17].

Sinai-Arabah Copper Age Middle Phase (appr. Early Bronze II-III)

At least two sites, dated to the S-A Copper Age Middle Phase, were identified in this cluster, Site 201A and Site 15[18]. Substantial copper smelting took place at Site 201A, some of it close to the actual dwellings. The dwellings were one- room-buildings, rectangular with rounded corners, 5 x 7 m, the entrance at the centre of one of the longer sides. Sometimes small storage structures were attached on the outside. It was typical Early Bronze Age II architecture, *i.e.* 'broadhouses' of a type common in the region (Kempinski & Reich eds. 1992: chapts 7 & 9), also well-known from excavations of EB II settlements at Nabi Salah in South Sinai (Beit-Arieh 1974) and a number of other sites found in our Sinai Surveys. The building technique here, however, was quite primitive and we may assume that the style of architecture had spread into the region but that there was no direct connection between the South Arabah and the 'Canaanite' EB II region in the north, as f.i. 'Canaanite' Arad. Some of the pottery found at Site 201A was also very similar to the local pottery of Nabi Salah (and the Sinaitic hole-mouth pottery of Arad) though there was no Aradian ('Canaanite') pottery at Site 201A - or any of the other settlements of this period in the South Arabah.

Copper smelting slag was found dispersed at the northern edge of the settlement, but mainly on top and on the slopes of the mountain to the north (Site 201A/2-3), which was a centre of copper smelting of this period, in fact the only smelting site of the S-A Copper Age Middle Phase in the Southwestern Arabah. The slag was tapped slag and its characteristics presented the picture of an advanced extractive metallurgy. The fact that Egyptian pottery was found at the site, and the discovery of a very similar smelting site of the same period in Southern Sinai, Site 590, may indicate the Egyptian origin of this more advanced technology (Rothenberg 1999: 82-84).

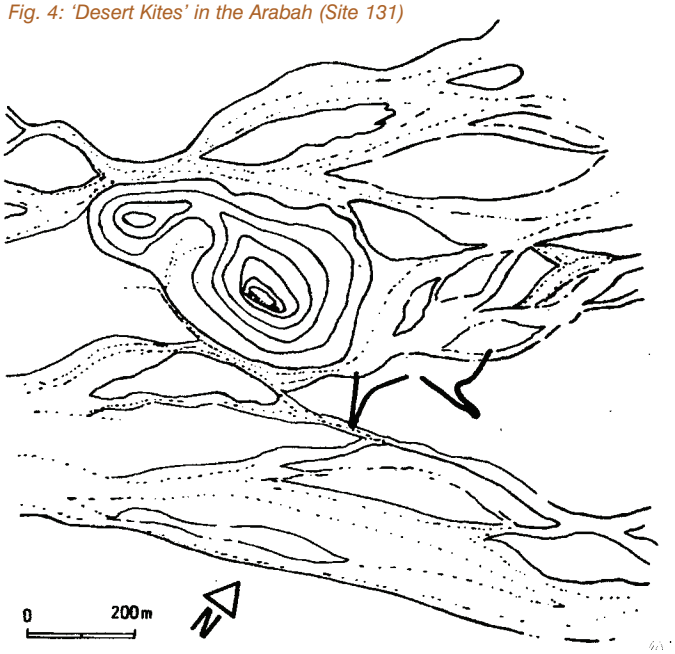
Sinai-Arabah Copper Age Late Phase (appr. Early Bronze Age IV)

In the northern part of the site cluster west of the Shrine of the Rock Drawings was a very extensive and continuous spread of dwellings, similar to a widespread Bedouin encampment, which we recorded in our survey as Sites 248 and 249. The pottery collected at these sites was similar to the pottery sherds of the S-A Copper Age Late Phase, found in the Shrine. There was quite a variation in the details of the architecture of these sites, many showing several construction and destruction phases, but the dominant type was the 'classical' EB IV (EB/MB) dwelling, well-known from the Early Bronze Age IV settlements of the Negev and Central Sinai (Cohen 1981; Clamer & Sass 1980): either individual circular enclosures, probably used as pens for the flocks, with smaller, circular dwellings attached at the outside or groups of several such semi-detached 'units'. There were also circular buildings with a stone-build 'vestibule' protecting the entrance, a feature still used by the Bedouin of the region.

There was no copper smelting at Sites 248 or 249 - or at any of the other dwelling sites of this period in the Arabah. The S-A Copper Age Late Phase copper mining and smelting took place at sites in the estuary of Wadi Timna (Site 149), at the fringe of the Arabah Valley, and was in fact the earliest 'industrial' plant properly organized for a continuous and efficient production on a scale so far unknown from any other prehistoric smelting site in the region[19].

3. At the east end of the site cluster, somewhat isolated from the dwellings, were two structures of a peculiar design, Site 131 (Figs. 4-5), known as 'desert kites' (Meshel 1974; 1980)[20]. A 'desert kite' is a structure of two long walls, meeting at an angle of appr. 30°, forming, thereby, a triangle with an open base. At the apex of the two walls was a tower-like, round structure. It is now almost generally accepted, that the 'desert kites' were built as traps for gazelles and other animals.

Fig. 4: 'Desert Kites' in the Arabah (Site 131)



The two 'desert kites' of Site 131 were adjacent structures, the east wall of one of them and the west wall of the other almost touched each other, forming thereby a single unit. The length of the walls was 150 – 203 m, the openings between the walls 125 and 168 m, together enclosing between their long open arms a wide stretch of land, approx. 300 m. At the apex of one of the 'kites', a tumulus had been built on top of the original structure; several more tumuli had been built close by. The tumuli were reminiscent of burials of the Early Bronze Age IV (EB/MB) in the Negev mountains.

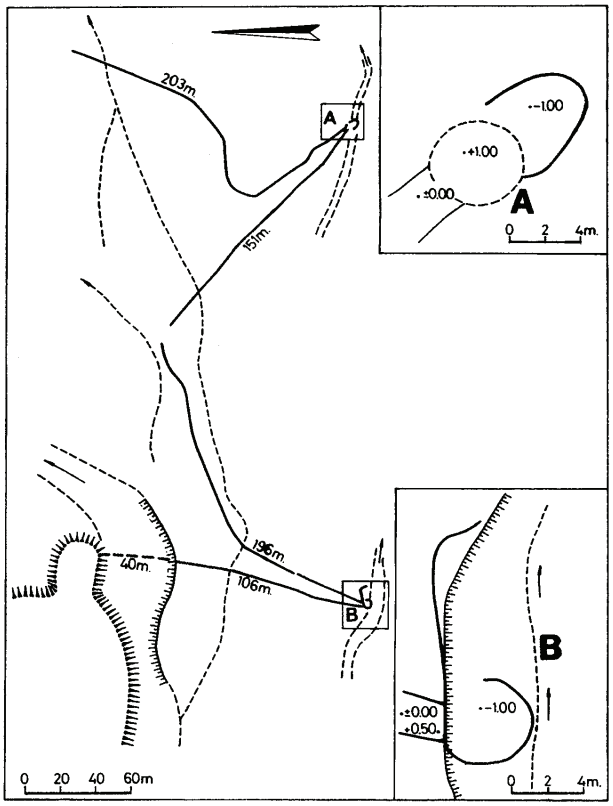


Fig. 5: Plan of 'Desert Kites' in the Arabah (Meshel 1974)

At the time of the discovery of the Arabah 'desert kites' of Site 131, we collected some pottery sherds and flint objects on the surface, especially around the apex of both 'kites', which were dated to the Chalcolithic Period (Rothenberg 1972: 53). At a later visit to the site we collected some more pottery sherds, some of which were dated to the S-A Copper Age Late Phase. During our Arabah Survey of 1982[21] we revisited Site 131 and found some more sherds, including sherds of the S-A Copper Age Middle Phase.

Another 'desert kite', Site 156[22], was located further to the east. Its arms were 114 and 137 m long, the open side 111 m. The whole structure was badly disturbed in ancient times and most of its building stones had been removed, apparently in order to build a semi-attached group of dwellings at its apex and also about 20 m further away. There were also several burial tumuli on top of the walls and next to the 'kite', also reminiscent of the EB IV burials of the region. The site was badly disturbed by recent digging and only a few pottery sherds and flint objects of the S-A Copper Age Late Phase were found, which we relate to the later dwellings and burial tumuli. The stratigraphy of the surviving structures of Site 156 clearly shows that the 'kite' was earlier than the EB IV dwellings and burial tumuli[23].

The identification of the pottery and the stratigraphy of Sites 131 and 156 strongly suggested a S-A Copper Age Early Phase (Chalcolithic) date for the construction of the 'desert kites' in the Arabah. During this period, the Shrine of the Rock Drawings, the group of dwellings and the 'desert kites' formed a unique settlement set up which was to go on into the S-A Copper Age Late Phase. It appears that at some stage of the S-A Copper Age Late Phase, perhaps following the influx of a wave of newcomers to the region, this set up started to fold up - the 'kites' were no longer used for hunting but served as burial grounds - and we may assume that the Shrine as well as the dwellings were also soon abandoned. At that time - which we are not yet able to date accurately - prehistoric copper smelting in the Arabah had also come to a standstill, to be renewed only by Egyptian New Kingdom mining expeditions at the end of the 14th century BC.

4. The first 'desert kites' were discovered and published by the R.A.F. pilots F.L. Maitland (1927) and G.C. Rees (1929), flying over the desert region east and northeast of Amman. Rees reported that he observed at least three chains of 'kites', each some 20 miles in length (Rees 1929: 397), though there were also some isolated 'kites', like the 'kites' of the Arabah, in this region. The date and purpose of the 'kites' in the Syrian Desert have been for long a subject of intensive discussions (Dussaud 1929: 144-163; Kirkbride 1946: 1-5; Yadin 1955: 1-10; Rothenberg 1967: 290; Meshel 1974: 129-143; 1980: 265-288). The problem of dating the 'desert kites' was enhanced by the fact that there was evidence for the use of 'desert kites' still at the beginning of this century (Meshel 1974: 141). Until our investigations of the 'kites' in the Arabah - which established by pottery and stratigraphy their origin in the S-A Copper Age Early Phase (Chalcolithic) - the problem of the date of the 'desert kites' had remained unsolved, and only lately was their function as hunting traps more widely accepted.

Y. Yadin (1955) published an original interpretation of some enigmatic signs on the Narmer Palette, one of the most important documents from the very beginning of recorded history in Egypt (Fig. 6). Most of the contents of the palette is a record of the unification of Egypt, King Narmer being clearly depicted on the palette as the ruler of both Upper and Lower Egypt. However, the lowest field on the reverse side of the palette, separated from the upper part by a horizontal line, was, according to Yadin, "the earliest record of Egypt's military penetration into Asia", *i.e.* the record of "Narmer's domination of two main highways between Egypt, Syria and Mesopotamia: the 'sea road' and the 'king's way'… The former cuts its way through the most fortified part of Palestine, the latter through the less inhabited and much less fortified plateau of Trans-Jordan" (Yadin 1955: 10). Yadin reaches this conclusion by the assumption that the figures of the two naked men with long hair and Semitic features in the lowest field on the palette represent subjugated enemies of Egypt, which were identified by the two signs above the two figures: the sign above the figure on the left "is recognized by all who have dealt with the subject to represents the plan of a rectangular fortress.... namely, the area of Palestine, already fortified in this period". The sign on the right represents a 'desert kite' which identifies "the land of the kites", *i.e.* "the region which lies near the highway between Trans-Jordan, Syria and Mesopotamia". This latter conclusion is based on the distribution of the 'desert kites' as known at the time, and the assumption that "nothing of the kind (*i.e.* 'desert kites') has been discovered anywhere else in Asia or Africa".

Yadin, by a somewhat circular argument, dated the 'kites' "to at least the beginning of the third millennium BC and possibly to the later half of the fourth millennium", a date (EB IB) that would fit the identification of a 'desert kite' on the Narmer palette (Yadin 1955: 10). It seems difficult to accept such a dating argument, and this for the simple reason that the types of 'kites', especially those which appear as huge chains in Jordan, vary from place to place, and apparently also within the same area, and were most likely built during different periods. We do, however, agree with Yadin's date of the Chalcolithic-Early Bronze I period for the earliest construction of 'desert kites', and this in the light of the archaeological evidence which we found at the 'kites' of the Arabah.

Yadin's rather clever interpretation, identifying the sign on the Narmer palette as a 'desert kite', will now have to be considerably changed in the light of recent discoveries of many more 'desert kites' over a very wide region, from the

Fig. 6: Reverse of the Narmer Palette. Detail of Reverse.

vicinity of Homs in Syria to Qasr el-Azraq and further east and northeast in the desert of Jordan, down to the Arabah and further on to South Sinai. We may assume that more 'desert kites' will be discovered by surveys in so far unexplored desert regions of the Near East and North Africa. Obviously, the conclusion by Yadin that we are dealing with a record of an "Egyptian military penetration into Asia" is no longer acceptable in the light of the present distribution map (Meshel 1980: 284) of the 'desert kites' (Fig. 7), the newly established terrain of the 'desert kites'. Narmer could not possibly have campaigned over such huge areas[24] - Yadin, based on his interpretation of additional symbols on the Narmer palette (Yadin 1955: 10-16), extended the area of Namer's military expeditions even as far as Mesopotamia.

We would suggest to identify the two naked men, and their identifying signs on the palette, not as subjugated countries but as subjugated people from the neighbouring fertile regions, people from the rectangular fortresses, as well as from the arid desert areas characterized by the 'desert kites'. The latter must have been the nomadic pastoral people often depicted as the subjugated Asiatic enemy on early Egyptian pictorial records. Whether these were military expeditions into the neighbouring countries or punitive actions against intruding groups of people on Egyptian territory, is a question still to be answered by archaeologists and historians. It is of considerable interest that the two men with Semitic characteristics were depicted on the palette as running away, because our Sinai Surveys provided the evidence for a gradual takeover of the Peninsula by Egyptian mining expeditions to the turquoise and copper mines. Starting in pre- and early dynastic times in West and Southwest Sinai - the indigenous, local inhabitants, the 'desert kite' people, were pushed out, their settlements destroyed or abandoned - Pharaonic Egypt became active in East Sinai, including the mining sites in the Arabah, only at the time of the New Kingdom. At that time most of the indigenous 'desert kite' people had already been destroyed or pushed out of Sinai into the territories across the Arabah, probably into Syria, Jordan and Arabia.

Notes

1. We proposed to date this group of rock drawings from the late Early Bronze Age to fairly recent times. During early periods of prehistory, 6th-4th millennium BC, especially in the Negev mountains but also in the Arabah, hunting scenes were not linear engraved but fully pecked onto the rockface, which created more dynamic, realistic representations than the linear engravings. However, the linear type engravings represent the largest and dominant group of rock drawings in the region - closely related to extensive habitation remains.

2 Many of the well-known publications of rock art of different regions were entirely based on photographs provided by the archaeologist who performed the fieldwork and recorded the rock drawings (f.i. Anati 1968; Winkler 1938-9). Others surveyed exclusively for rock art and did not relate to any archaeological data (f.i. Lutz 1995).

3 Rothenberg & Glass 1992 on the chronological aspects of the existence of an autochthonous, pastoral population in the Arabah and Sinai.

4 See f.i. Finkelstein 1995: 101. Finkelstein in his discussion of the 'gaps' in the archaeological evidence of the regions under consideration here, does, however, not take in consideration the rock drawings of these regions.

5 Since the common chronological terminology of the Levant or Egypt was not really applicable to the early cultures of Sinai and the Arabah, we proposed phase- rather than period-related chronological concepts: the Sinai-Arabah Copper Age - Early, Middle and Late Phase. These phases reflect the slow technological and cultural development in this region (Rothenberg & Glass 1992).

6 Wadi Odem, Israel G.R. 14979166, Survey Site 191. In our first publication of this site (Rothenberg 1972: 54) we related it to Nahal (wadi) Quleb, the shallow wadi at the south side of the rock formation.

7 The walls were badly disturbed by Bedouin camping and there was no proper stratigraphy left for excavation. We cleared the disturbed ground down to virgin soil and collected the sherds and several flint tools.

8 In our first publication (Rothenberg 1972: 54-62) the pottery was dated to the Chalcolithic Period but this date had to be revised after the petrographic investigation of all our pottery finds (Rothenberg & Glass 1992 c.f. note 3).

9 The Sinai-Arabah Copper Age Early Phase started in the Late Pottery Neolithic Period (Rothenberg & Glass 1992; Rothenberg & Merkel 1995) but no pottery sherds of this period were found at this site.

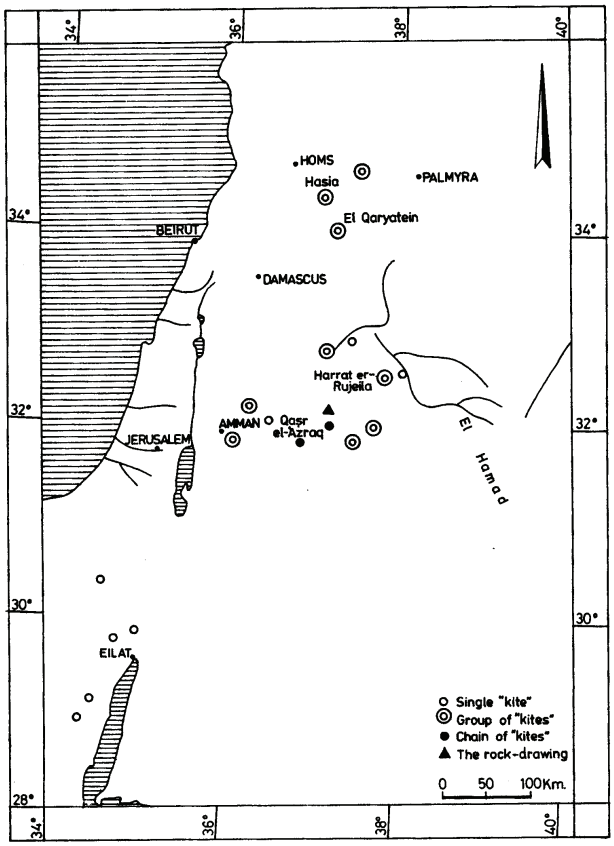
10 The patina of these concentric circles seems somewhat lighter and E. Anati suggested that they are a later addition (Anati 1981: 41). However, further inspection of the drawing by our team showed that the difference in the patina is caused by the many circular incisions and depends on the changing light conditions at the time of inspection. After several inspections of the site, we concluded that the whole drawing represents one graphic unit made by one and the same hand.

11 The tree-of-life is an intrusive icon probably of Mesopotamian origin and is unique in the Arabah. It will need further research to be certain about its dating and symbolic function.

12 Yotvata is a modern Kibbutz at the ancient site of ad-Dianam on the Peutinger map of the fourth century AD, its former name Ein Ghadyan. It is the richest source of water in the Arabah, surrounded by large tracks of arable land. Due to its high watertable there is very extensive grazing land and very large forests of acacia trees, both extensively exploited by the ancient settlers and miners. According to the finds in our excavations in Timna and the Arabah, it seems certain, that the water and acacia trees, perhaps also palm trees, of Yotvata, were a major source of fuel for the ancient copper smelters of the Arabah, including the Egyptian New Kingdom mining expeditions to Timna.

13 More than a hundred structures were dispersed over this area and recorded in detail by our survey. In the present paper we shall outline the characteristics

Fig. 7: Distribution of 'Desert Kites' (Meshel 1974).



of the settlements of each period, the detailed survey report is in preparation (Rothenberg & Bachmann in preparation).

14 At Site 201A, Israel grid 15109175, two dwellings A1 and A7, were excavated in 1967 by the Arabah Expedition (Dir. Prof. Beno Rothenberg). The final excavation report will be published in forthcoming Researches in the Arabah Vol. 3:1-2.

15 The survey sites will be published in Rothenberg & Bachmann (in preparation). For a preliminary report see Rothenberg 1999.

16 Site 39 was an early Chalcolithic smelting site with a smelting furnace separated from the workshop which included also two round habitation buildings. Site 39 is actually in this respect an exception, so far unexplained. (Rothenberg & Tylecote 1978).

17 These sites will be published in the final report of the Arabah Surveys (Rothenberg & Bachmann eds. in preparation).

18 Site 151 was a solitary hill somewhat south of our site cluster. On its top we found some crushed slag which appeared to be early and was definitively not of the tapped type. However, petrographic study of the sherds, found among the slag, indicated a S-A Copper Age Middle Phase date.

19 The mine, Site 250, and the smelter, Site 149, were excavated in 1984, and again in 1990 (Rothenberg 1999: 84-86; Rothenberg & Shaw 1990).

20 Site 131, Israel Grid 15129150, was discovered by the present author in 1960 (Rothenberg 1967: 290; 1972: 53). The plan of the site published here was first published by Meshel 1980: fig 7.

21 In 1982 we reinvestigated all sites discovered during our first surveys (Rothenberg 1962; 1967; 1972) in the light of the data produced by our excavations. Unfortunately, many of the sites had been ransacked by a local archaeologist who never published his finds. All the pottery finds of this survey and most of the pottery of our previous surveys were petrographically investigated by Jonathan Glass (Glass in Rothenberg & Bachmann in preparation). The dates of the pottery in Rothenberg & Glass 1992 relate mainly to the pottery of the 1982 survey.

22 Site 156, I.G. 15249160, was also much disturbed by a local archaeologist, cf note 21. It was first published by Meshel 1980: 271, fig. 8.

23 Meshel (1974: 141, fig. 11) published a plan of 'kites' in northeastern Jordan which showed several building stages, strengthening the assumption that 'kites' were in use for thousands of years, probably build and re-build during the ages.

24 It should be mentioned here, that Yadin himself raised the question whether the Narmer palette should be taken as unequivocal evidence of such events (Yadin 1955: 16).

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Forging Folklore - About Iron in Early Jewish Folklore

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'Metal and Metallurgy in the Jewish Sources, from the Hebrew Bible to Maimonides', is a joint project of IAMS and the Department of Hebrew and Jewish Studies, UCL, by Prof. Beno Rothenberg and Dan Levene. These ancient sources cover about 2000 years of Jewish life in Ancient Israel and the Diaspora, and this is the first attempt to identify and understand metal-related technologies from the book of Genesis to the medieval commentaries of the Biblical and Talmudic texts in the light of modern archaeo-metallurgy. Our study of the Jewish texts is accompanied by a review of contemporary texts of many languages as well as related archaeological finds and their analytical investigation. This unique study of the realia in the ancient Jewish sources is concerned with metallurgical as well as linguistic problems of terminology and techniques. Although the nature and ultimate purpose of these sources is religious, the texts are anchored to a large extent in the physical and social world and lifestyle of those who created this literature. Our objective is the reconstruction of this realia, an objective which demanded the gradual development of a new and complex research methodology. Several years of study resulted in the reconstruction of most of the base metal technologies in use during these 2000 years and also contributed so far untapped knowledge about social and economic/trading aspects - and early folklore, related to metal. We have created a very extensive and detailed data base and several publications, in periodicals as well as a comprehensive volume, are in press and in preparation. In the following pages we present a 'sample' of Jewish early folklore concerned with iron as well as the status of the blacksmith in Jewish life of this era.

In Genesis 4, the generations which followed Adam and Eve are listed. Lamech, the fifth generation from Cain had three sons. His first wife's two sons are described as 'the ancestor of those who dwell in tents and amidst herds' (Genesis 4:20) and 'the ancestor of all who play the lyre and the pipe' (Genesis 4:21). Their half-brother, the son of Lamech's second wife, was Tubal Cain the 'forger of all implements of copper and iron' (Genesis 4:22), *i.e.*, the first metal-smith and therefore the ancestor of all metalworkers. It is interesting that this account of the appearance of the various crafts, ending with metallurgy, reflects a Neolithic technological environment, at the very beginning of material culture. Obviously, iron was not part of the innovations of the Neolithic period, which saw the