Reprint

Address

NEO-LITHICS
c/o Gary O. Rollefson
'Ain Ghazal Research Institute
Pragelatostr. 20
D - 64372 Ober-Ramstadt
tel./fax 0049 6154 53642
e-mail: gorikr@t-online.de

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NEO-LITHICS 1/97

A Newsletter of Southwest Asian Lithics Research

map by the *Tübingen Atlas of the Near East*

Editorial

As NEO-LITHICS 1/97 issues in the fourth year of its publication, you will all note that it has changed considerably since the 1/94 version emerged three years ago. In that initial copy of NEO-LITHICS, the editorial noted several reasons why a newsletter of its kind was necessary, including its functions as a forum for exchanging views about current lithics analysis and interpretation, and how these factors might be improved, as well as the ability to communicate with unconventional rapidity the preliminary results of field and laboratory research dealing with those immediately preceding processes that led to the emergence of the Neolithic phenomenon and how lithics manufacture changed during the revolutionary Neolithic period.

NEO-LITHICS 1/94 was five pages long. It laid out a plan, perhaps naively hopeful, of exchanging information concerning consensus standards of lithics techno-typological description. In this regard, the ideals expressed at the Berlin Workshop in 1993 were not met with overwhelming success. Working groups set up in Berlin did meet, sometimes with considerable enthusiasm and vigor, but there seems to be a perceptible decay of continuing interest in reaching the goals assigned to the original working groups.

But despite this unfortunate development, the role of NEO-LITHICS as a vehicle for speedily communicating field work and laboratory research has been very successful, as comments from many of you have already demonstrated. Another source of evident approval of the utility of NEO-LITHICS is the considerable increase of subscriptions. And finally, the success of NEO-LITHICS is revealed in the change from the five pages of 1/94 to this issue's 25 pages.

We don't want to belabor the number of pages: page counts are, in fact, underrepresentative of the role of NEO-LITHICS since we have asked people to be frugal with the length of the articles they send us. Perhaps a better measure of the usefulness of NEO-LITHICS has been the number of researchers and projects that have responded to our appeals. Moreover, it has become obvious that Neo-Lithics became a forum for the younger colleagues presenting their first reports on their research.

Due to the persistent and even increased level of Neolithic and late Epipaleolithic research, we are now considering increasing the number of issues from twice to three times a year. We are also pondering a relaxation of the length limits of the contributions, since some kinds of articles need more space to develop hypotheses and test implications.

Whether we continue to publish twice a year or three times, one thing is clear: the popularity of NEO-LITHICS as a publication outlet means we are going to have to increase the size of the newsletter in terms of overall print pages per year. This inevitably will lead to increased publication and distribution costs, which in turn will require an increase in the subscription costs. Currently the twice-annually issues cost 12 German Marks or $8 US, and we would predict that these figures would increase by at least 50% in case of three issues per year.. We encourage all of you to express your opinions to the editors by fax, email or letter.

Finally, we would like to express our thanks to Prof. Dr. Stefan Karol Kozłowski, who is stepping down from the editorial board due to the pressures of other academic duties, in which we extend our best wishes.

We appreciated the computer help we received from Reinder Neef for this issue, who had to make exciting experiences with our diskette, for which we apologize. Above all, we would like to thank Bernd Müller-Neuhof (Free University of Berlin) for his considerable help in making this issue of NEO-LITHICS appear on time.

Gary O. Rollefson and Hans Georg K. Gebel

The 1996 Excavations at Tell Sabi Abyad II, A Later PPNB site in the Balikh Valley, N- Syria

Marc Verhoeven
Rijks Museum van Oudheden

Tell Sabi Abyad II is located in the upper part of the Balikh Valley, about 30 km south of the Syro-Turkish border. The site is one of a group of four tells dating back to the 7th and 6th millennia bc (uncalibrated). Apart from Tell Sabi Abyad II, the cluster of prehistoric mounds consists of two Pottery Neolithic mounds (Sabi Abyad I and IV) and one PPNB mound (Sabi Abyad III). The excavations at Tell Sabi Abyad I (since 1986) have largely dealt with sixth millennium strata of occupation (cf. AKKERMANS 1996, AKKERMANS and VERHOEVEN 1995). So far, two campaigns of archaeological investigation (1993 and 1996) have been undertaken at Tell Sabi Abyad II. The investigations at the site focus on chronology and typology of artefacts, settlement organisation and subsistence of the local PPNB society.

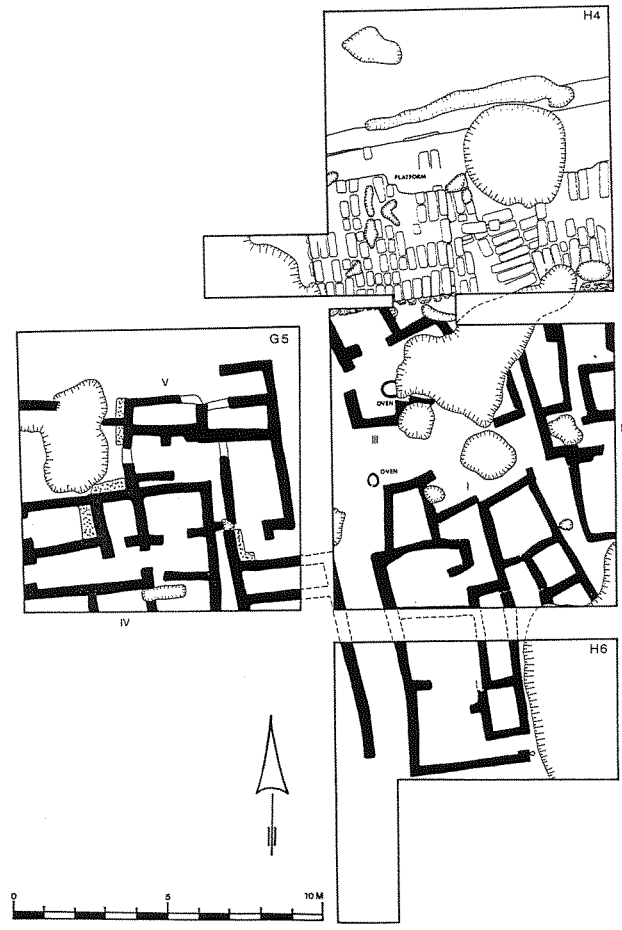

Fig. 1 Plan of the upper Level 3 architecture (benches are stippled, the thresholds in building V are indicated by two lines).

Tell Sabi Abyad II is a small and low oval mound, measuring ca. 4.5 m high and about 1 ha at its base. In 1993 three north-south oriented 9x2 m trenches (H5, H6 and H7) were laid down from the top of the tell towards the south in order to investigate the stratigraphic sequence of the mound. In 1996 the areas of excavation were enlarged in order to obtain insight into settlement structure and to enlarge the artefact assemblages.

In chronological terms it is clear that Tell Sabi Abyad II dates from the late 7th millennium, or later Pre-Pottery Neolithic. In the chronological framework of the Balikh Valley the PPNB is represented by the Balikh I phase, tentatively dated at ca. 7,500-6,100/ 6,000 bc. (AKKERMANS 1993: 111). At present three radiocarbon dates are available. The earliest level of occupation (Level 8) has been dated at 8,530 ± 60 bp (GrN-21319). The intermediate and top levels (Levels 5 and 3A) have been dated at 8,190 ± 60 (GrN-22273) and 7,950 ± 50 bp (UtC-4907) respectively.

Eight main phases or levels of occupation have been distinguished. The architecture at the site is represented by rectangular buildings constructed of large slabs of pisé. These structures each consisted of numerous small to very small rooms. In addition, ovens and pits were encountered. Here I will briefly discuss one of the most interesting phases, i.e. Level 3, which has been excavated over an area of ca. 300 m^2 (Fig. 1). The buildings (nos. I to V) were generally preserved to a height of 50 cm and oriented NNW-SSE. A characteristic feature is the irregular appearance of the structures; it seems that the buildings

were not erected according to strict rules, but in a flexible and 'organic' fashion. The walls, simply founded on earth, were built of large orange-brown pisé slabs measuring ca. 45x35/30x7/8 cm. The floors in the buildings consisted of tamped loam. Occasionally plaster was observed on the walls. The ca. 50-75 cm wide doorways were generally marked by small buttresses. In some instances buttresses were found at the corner of walls or along the face of walls. In Building V low thresholds were present in the door openings. Many small chambers, however, gave no evidence of doorways. Most likely these small areas were accessible from an opening high up in the wall or, more likely, from the roof. Two small *tannur*-like ovens were found: one in Room 1 of Building I and another in the open area between Buildings II and III. The lack of other household features (such as bins), the absence of doorways at floor level, and the small size of many of the rooms suggests that many of the chambers served for storage.

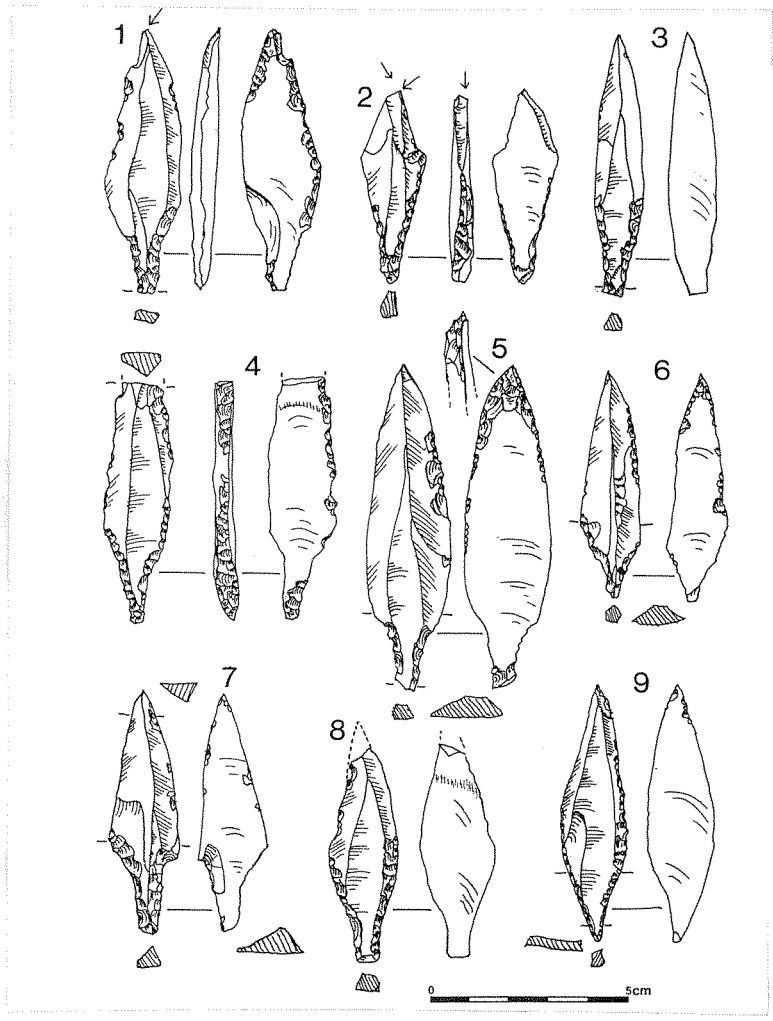

Fig. 2 Selection of Byblos arrowheads.

Most interesting was the discovery of a large platform directly north of the Level 3 architecture. This platform measured at least 10x7 m and it was minimally 60 cm high. It was built of alternating layers of large (0.75 to 1.00 m long, 30/40 cm wide, 20 cm thick) grey and orange-brown bricks or slabs. Interestingly, the alternating layers of orange and grey-coloured bricks were oriented differently; the grey slabs were oriented NNW-SSE, whereas the orange slabs were oriented NEE-SSW. Perhaps the platform was an elevated and open area, reserved for special activities, but for the moment the function of this feature remains enigmatic.

Flint and obsidian artefacts were found in considerable numbers. Various sorts of fine-grained flint were used to make a variety of tools. Skillfully retouched Amuq points mainly appeared in the upper levels, but Byblos points were found in all levels (Fig. 2). Among the other flint implements were truncated pieces, scrapers (endscrapers, steep scrapers and double scrapers), borers, burins, notched pieces, denticulates, composites, and blades with fine and abrupt retouch (COPELAND n.d.). Moreover, a fair number of lustered sickle elements were found, many of them with bitumen (used to glue the implement to the sickle haft) still attached to them (COPELAND and VERHOEVEN 1996).

The obsidian artefacts mainly consisted of unretouched and fractured blades and bladelets, in addition to a few truncated pieces, scrapers, borers, notch/denticulates and pieces with fine and abrupt retouch. So-called corner-thinned blades (NISHIAKI 1990) were found in considerable numbers.

Flint cores, by-products and debitage were relatively scarce. The presence of hammerstones, one naviform core and the large numbers of flint blades (made by unipolar and bipolar techniques), however, suggests that the knappers used a technology similar to the one seen at many other PPNB sites in northern Mesopotamia (COPELAND n.d.). The obsidian was imported, most likely from the Bingöl area in Turkey. Actually, we have some indications of how the obsidian arrived at the site. In the fill of a building in one of the earliest levels, a bundle of complete obsidian blades, up to 15 cm in length, was found. The blades were tightly fitted to each other and they had been struck from the same large, core. Presumably, then, obsidian arrived as bundles of blades, perhaps wrapped in small sacks of leather or textile.

Lorraine Copeland has distinguished three industrial phases at Sabi Abyad II (COPELAND n.d.). The phases are stratigraphically successive and the lithic assemblages show typological developments. As a main trend, the upper phases show more sophisticated techniques than the lower phases. Pressure-flaking (on arrowheads), for instance, was attested only in the upper Phase 3. It is also in this phase that Amuq points first appear. Furthermore, the amount of arrowheads, like the corner-thinned blades, decreases upwards.

On typo-chronological grounds, the lithic industry of Sabi Abyad II can be compared with Tell Assouad (Levels VIII-VII) and Tell Damishliyya (Levels 1 and 2), which represent the other two excavated PPNB sites located in the upper part of the Balikh Valley (AKKERMANS 1988, M.-C. CAUVIN 1972). Outside the Balikh basin, Sabi Abyad II seems to be contemporary with Bouqras (P.A. AKKERMANS 1983), Abu Hureyra 2B and 2A (MOORE 1975), the late PPNB levels of Halula (Ferrer *et al.* 1996) on the Middle Euphrates, and Çayönü (large room), Gritille and Gürcütepe in Anatolia (cf. SCHMIDT 1995).

From the various areas of excavation large numbers of other artefacts were recovered: fragments of grinders and grinding slabs, stone bowls, whiteware, stone beads, bone awls, etc. Furthermore, a number of human and animal figurines of unbaked clay and of limestone were recovered. The most exciting of these figurines were three small anthropomorphic figurines of soft white limestone. Two types of these figurines appeared. The first type is represented by a masterly carved figure of a corpulent woman (3x3.6 cm). The person is sitting on her knees, her feet are folded under her buttocks and her hands rest upon her thighs (Fig. 3-1). The head of the figure is missing. The fracture was not fresh; perhaps the head was purposely broken off in antiquity. The figurine resembles some of the statuettes of Çatal Hüyük dated around 6,000 b.c. (MELLAART 1967).

The second type of figurines consists of two small and very stylized human heads made of soft limestone (Fig. 3- 2,3). Of both objects the head is irregularly rounded and the face is flattened. No facial features are indicated apart from the eyes, which are represented by two small holes. On the upper part of the neck of the largest statuette a number of shallow incisions are present. Perhaps these incisions indicate a necklace. It is suggested that these heads were originally fastened to a body of clay or wood; they cannot stand by themselves. A similar figurine was earlier recovered from aceramic Tell Assouad, situated about 15 km northwest of Sabi Abyad II (CAUVIN 1972).

The plant husbandry of Sabi Abyad II largely consisted of crop plants. The cereals are represented by einkorn, emmer, hardwheat/ bread wheat and hulled barley. Lentils represented the only pulse crop. Linseed (or flax) was remarkably well represented. Flax may have been used for its oleaginous seeds or for its fibres. Apart from crop plants various weed taxa such as goat-face grass, rye-grass and sun rose, have been identified (VAN ZEIST and DE ROLLER n.d.).

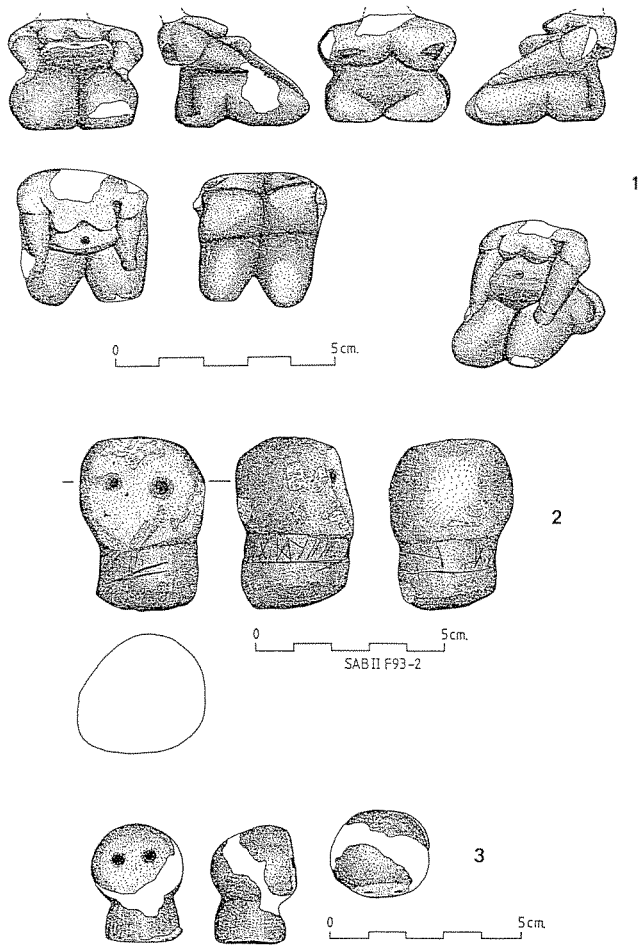

Fig. 3 Human figurines of white limestone.

The animal bones revealed that ovicaprid husbandry (with a presumably loose control over the herd) was well-established. Incipient domestication of cattle and pigs is suggested by the osteometric data. Gazelle was the main hunting game, but hunting does not seem to have been a major activity. Chronologically speaking, the animal bones indicate a diversification of subsistence strategies from the earliest to the latest phases at Sabi Abyad II. The proportions of cattle, pigs and wild animals gradually increased towards the end of the occupation of Tell Sabi Abyad II (VAN WIJNGAARDEN-BAKKER and MALIEPAARD n.d.).

Acknowledgments

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The Neolithic Strata of Tell Jenin, North West Bank, Palestine

Ghattas J. Sayej, University of Bergen

Introduction

The site of Tell Jenin is located in the center of the modern Palestinian city Jenin, at an elevation of 147-152 m a.s.l. (SALEM n.d.: 32). This city is located in the north of West Bank, 100 km north of Jerusalem, with an average rainfall of 500 mm annually (EZZUGHAYYAR *et al.* 1996: 1, ORNI and EFRAT 1966: 105-14). It seems that the choice of the location of Tell Jenin was based upon two criteria; firstly, it has nearby water resources (MILLER 1980: 331-5), and secondly, it was surrounded by fertile agricultural soil (GLOCK 1992: 679).

The following analyzed lithic artifacts were recovered in the preceramic strata of Tell Jenin excavated in the 1981-83 seasons by the Institute of Archaeology of Bir Zeit University under the leadership of the late Prof. Albert Glock. During the excavations charcoal samples were collected, but none of these samples have been C-14 dated due to the small size and the poor quality of the samples. The dating of the ceramic layers was based on the analysis of pottery sherds, and I have attempted to date the preceramic layers of this site based on three criteria: a) lithic types and techniques, including chronological markers, b) the absence of pottery, and c) a comparative study with other contemporaneous sites.

Excavations and Stratigraphy

The excavations at Tell Jenin were an archaeological salvage project. The excavated areas were restricted to places where new buildings were to be constructed, which caused several problems in the recovery of archaeological material. During this process,

four areas were excavated at the Tell, and each area was given a different number. Seven excavation seasons were organized between the years 1977 and 1984. The first three seasons took place in Areas I, II and III, while the remaining seasons took place in Area IV. The most extensive excavations took place in the last area, which was divided into ten strata (SALEM n.d.: 49-51). All of these strata were renamed after the completion of the excavation process as follows:

I	Natural soil.
II	Pre-Pottery Neolithic (8300-5750 BC).
III	Early Bronze Age I A (3150-3050 BC).
IV	Early Bronze Age I B (3050-2950 BC).
V	Iron Age I A (1200-1150 BC).
VI	Early Byzantine period (AD 324-451).
VII	Late Byzantine period (AD 451-640).
VIII	Ummayad period (AD 640-900).
IX	Ottoman (AD 1516-1917).
X	20th century.

During the classification of the lithic artifacts, I found Neolithic remains within the first two strata and in the first phase of Stratum III, varying in depth from 4.5 m in stratum III to 7.5 m in Stratum I. Based on stratigraphy and the presence/absence of pottery, I divided this area into two parts; the preceramic and the ceramic layers. The preceramic layers include Stratum I, II and Phase Ia of Stratum III, while the ceramic layers start at Phase Ib, the upper layer of stratum III, and continue up to the present.

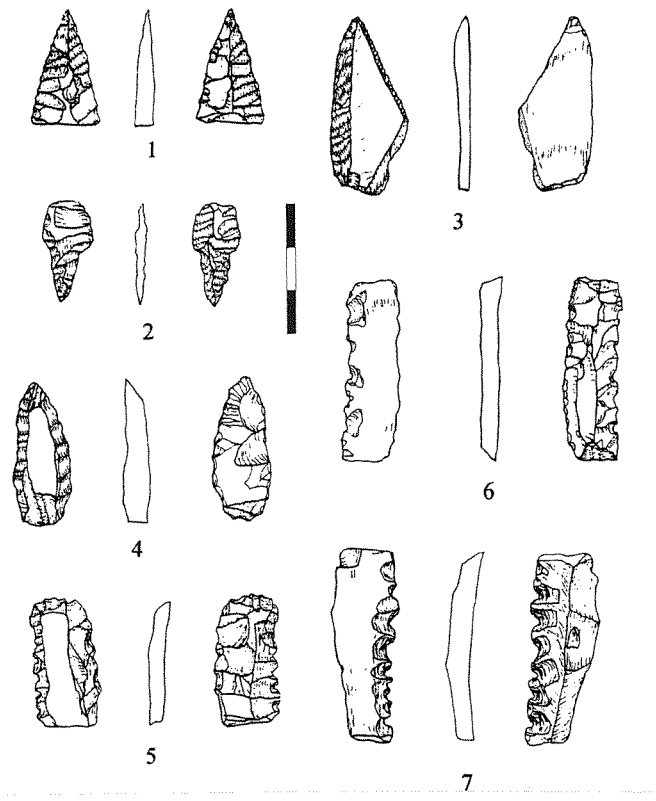

Fig. 1. Chipped lithic artefacts from Tell Jenin: 1-3 points/ arrowheads, 4 micropoicon, 5-7 denticulated sickles

The excavated area at Area IV is quite limited: 9 x 11 meters, compared to the size of the tell itself, which is 40,000 m^2. In spite of this, the recovered material presents typological and technological features that are comparable with other well known assemblages in the southern Levant.

Lithic Typology

Within the preceramic layers there are only 1,797 lithic artifacts, consisting of 153 (8.51%) standardized tools, 170 (9.46%) non-standardized retouched tools, and 1,474 (82.03%) pieces of debitage. The last group consists of 1,303 (88.28%) chips, 69 (4.81%) cores, 18 (1.22%) secondary flakes, 3 (0.20%) cortex or primary flakes, 55 (3.73%) blades; 10 (0.68%) bladelets, and 16 (1.08%) microblades. Except for one piece of Anatolian obsidian, the only raw material from the preceramic layers is local flint.

The typological analysis shows the number and the percentage of the standardized retouched tools to be as follows: scrapers 46 (14.24%), engraving tools 31 (9.60%), points/arrowheads 30 (9.29%), notches 15 (4.64%), denticulates 13 (4.02%), backed tools 10 (3.10%), multi-purpose tools 4 (1.24%), celts/picks 3 (0.93%), and burin 1 (0.31%).

The non-standardized retouched tools include: retouched flakes 87 (26.93%), retouched blades 44 (13.62%), retouch/utility wear bladelets 25 (7.74%), retouch/utility wear microblades 10 (3%), and core rejuvenation flakes 4 (1.24%). A division between the retouched standardized tools and the non-standardized tools has been made in order to present the chronological markers and the typical tool types of these preceramic layers.

I selected the pressure flaking technique among the arrowheads (Fig. 1: 1-3) as a chronological marker for the PPNB period (cf. BAR-YOSEF 1981, BURIAN and FRIEDMAN 1979, CAUVIN 1968, CROWFOOT PAYNE 1983, GOPHER 1989, KOZLOFF 1972/3, MORTENSEN 1970) and denticulated sickle blades (Fig. 1:5-7) as a chronological marker for PNA period (cf. BURIAN and FRIEDMAN 1979, CAUVIN J. 1968, CAUVIN, M.-C. 1983, MOORE 1973, STEKELIS 1972). These and other standardized retouched tools (Fig. 1:4) were compared to other contemporaneous sites in the southern Levant and used as one way of dating the site.

I chose several key sites in the southern Levant such as Beidha (KIRKBRIDE 1966, MORTENSEN 1970), Jericho (CROWFOOT PAYNE 1983, KENYON 1970), Tell 'Ali (GARFINKEL 1994) and 'Ain Ghazal (e.g. ROLLEFSON *et al.* 1992, 1994) to be compared with Tell Jenin. The comparison was principally based on specific tool types and certain technological and chronological attributes that are considered to be significant for distinguishing the PPNB and the PNA periods. This kind of lithic analysis can, in general, present a better understanding of the Neolithic communities in the southern Levant (GOPHER 1989a: 43-4), and clarify the chronological framework of the preceramic layers of Tell Jenin.

Based on this comparative study, it seems likely that Strata I and II of Tell Jenin belonged to an industry of the PPNB period. Other standardized lithic tools such as denticulated sickles, which have mainly been found within Phase Ia of Stratum III, that nominally belong to the industry of the PNA period. The last collection was unaccompanied by pottery that is also indicative of the PNA period; in addition, some typical PPNB arrowheads are present within this phase. Under these circumstances, and based on a comparative analysis, it appears that the combination of lithics typical of both the PPNB and PNA periods, as well as the absence of pottery in one layer, is interpreted as representing a transition phase (the PPNC period). Therefore, Phase Ia of Stratum III, probably represents a part of the PPNC period (6,000-5,5000 bc).

Acknowledgment

This paper is a summary of my unpublished Master's thesis, which has been submitted under the supervision of Prof. Randi Haaland, to the Institute of Archaeology, University of Bergen, Norway, Spring 1997. I would like to acknowledge my debt to the Director of the Institute of Archaeology at Bir Zeit University, Dr. Khaled el-Nashef, for providing the institute's facilities during my classification and analysis.

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A New Pre-Pottery Neolithic Site in Central Anatolia : Musular

Mihriban Özbaşaran, University of Istanbul

Field work on a new pre-pottery Neolithic site, Musular, in Central Anatolia was started in 1996 by the Prehistory Section of the University of Istanbul in collaboration with the Directorate of the Aksaray Museum.

Musular is located on the west side of the Melendiz river, in the volcanic area north of Melendiz and Hasandağ mountain ranges. It is close to the well-known site of Aşikli Höyük, which lies on the east bank. The site measures ca. 220 x 120 m and is located on the slope of a natural rock formation.

The 1996 season started with a systematic surface collection, and a total area of 12,000 m^2 was sampled. The preliminary results suggest that the pre-pottery settlement lies in the north of the area, and probably an EBA settlement in the south.

The settlement is heavily disturbed, especially by ploughing. A modern water channel constructed by the villagers cuts the eastern part of the settlement. A section made on this channel about 16 m long, showed three levels with a total depth of 0.70 m, of which the first is the mixed surface soil, and the following two the PPN lying directly on the natural rock. Two test trenches exposed remains of various architectural features, including a hearth and a small pavement, as well as a human skeleton of a 25-30 year-old man lying in a flexed position. The finds both from the surface collection and the excavation display samples of finely worked bone industry, ground stone and chipped stone industry. The chipped stone industry of Musular is mainly of obsidian. It is being studied by Nur Balkan-Atlı in collaboration with D. Binder, C. Deraprahamian and M.-C. Cauvin, to whom we are deeply grateful.

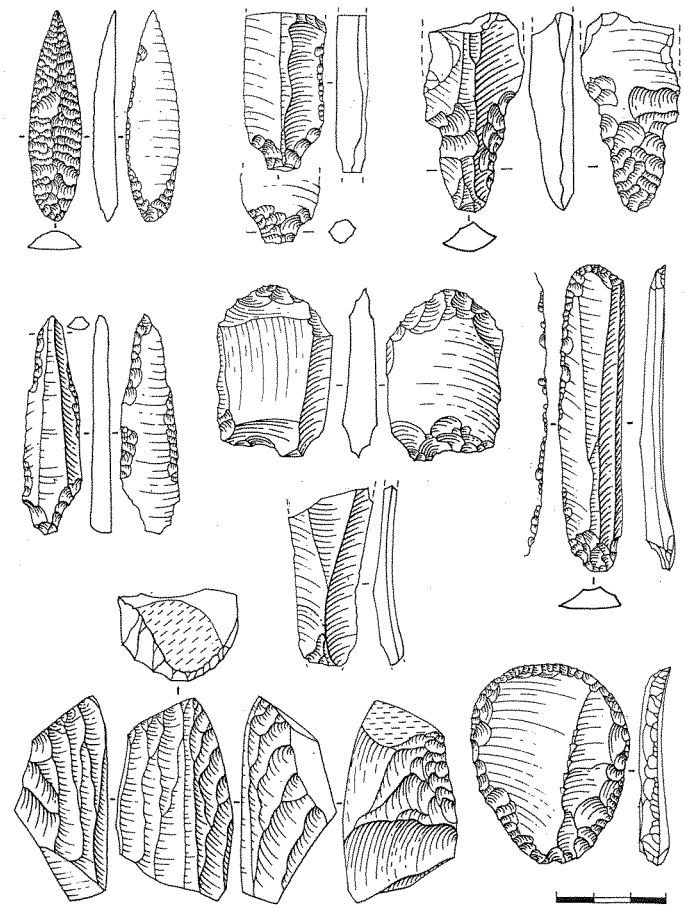

Fig. 1. Selection of artifacts from Musular <drwgs. by C. Deraprahamian>.

The preliminary results of the lithic industry indicate the following:

1. Obsidian is transported to Musular in the form of blocks or tablets.
2. The *chaine-opératoire* is completed at the site.
3. Cores are very small and show use until complete exhaustion.
4. The main aim seems to produce blades, most probably to obtain projectiles.
5. The extraction of blades is from the two opposite striking platforms.
6. It is interesting to note that the very limited amount of flint found was brought to the site as finished tools, mostly blades. They show silica sheen.
7. The typological characteristics show that scrapers are abundant and mostly on flakes and lateral blades. They are followed by projectile points, most of which are pressure flaked and unifacially retouched, as well as some with inverse retouch. Splintered pieces are quite frequent. Burins are few and there are no microliths (BALKAN-ATLI n.d.).

To conclude, the PPN settlement of Musular with its interesting finds and well-developed obsidian technology seems to be an important site in Central Anatolia that is later than the PPN Aşikli Höyük. Further excavations and the ongoing work and analyses on the material will hopefully reveal important results for Musular itself as well as the chronological development of Central Anatolia.

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BALKAN-ATLI N.
n.d. The *Aceramic Neolithic of Central Anatolia: Recent Finds in the Chipped Stone Industry.* (In press)

Excavations at Chogha Bonut, an Aceramic Neolithic Site in Lowland Susiana, Southwestern Iran

Abbas Alizadeh, Chicago Univ., The Oriental Institute

It is becoming increasingly apparent that the prevailing paradigm of the Hilly Flanks of the Fertile Crescent can no longer explain the processes of domestication of animals and plants and the adoption of sedentary life in the ancient Near East. Increasing numbers of sites with evidence of domesticated cereals and/or animals, and permanent large sites with no evidence of domesticated species in regions not suspected to be the locus of the domestication of wheat and barley requires a revision of the popular model. Combined recent archaeological and climatological evidence, as well as improved techniques in C14 dating, offer a new framework within which processes of domestication of wild species of animals and cereals and sedentarization of human communities in the Near East may be interpreted to include 'anomalies' not fitting in the prevailing paradigm. The excavation of Chogha Bonut was undertaken in part to test the validity of the new emerging picture of the Neolithic Revolution in the Near East.

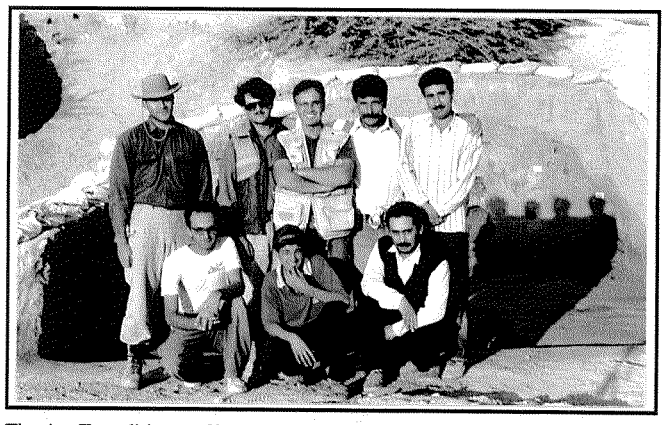

Fig. 1. Expedition staff members: (standing from left to right) Hamidreza Tabrizian, Farhad Jafary, Abbas Alizadeh, Hasan Rezvani, Gabriel Nokandeh; (sitting) Abbas Moqadam, Qoli (village boy), Behrooz Omrani. (Messrs. Faroukh-Ahmadi and Kargar are absent).

The political upheavals in Iran in 1978-79 interrupted the process of momentous discoveries of the beginning of village life in lowland Susiana. The Oriental Institute excavations at Chogha Mish (DELOUGAZ and KANTOR 1996) not only provided a long uninterrupted sequence of prehistoric Susiana, but also yielded evidence of cultures much earlier than what had been known, pushing back the date of human occupation of the plain for at least one millennium. Helene Kantor and Pinhas Delougaz' excavations at Chogha Mish, the largest early fifth millennium site in lowland Susiana, added the Archaic period to the already well-established Susiana prehistoric sequence. The sophistication of the artifacts and architecture of even the earliest phase of the Archaic period showed that there must have been a stage of cultural deve-lopment antecedent to the successful adaptation of village life in southwestern Iran, but surveys and excavations had failed to reveal such a phase in that region.

Fig. 2. Map of southwestern Iran showing the location of Chogha Bonut.

As is common in the field of archaeology, it was not until 1976 that evidence for an earlier, formative stage of the Archaic Susiana period was accidentally discovered. In that year, news of the destruction of a small mound some 6 km to the west of Chogha Mish reached Kantor, who at that time was working at Chogha Mish. The destruction of the site was stopped and two seasons of salvage excavations were carried out under Kantor's supervision. That site was Chogha Bonut, which was destined to make a major contribution to the prehistoric sequence of Susiana, thereby increasing our knowledge about the formative stages of the initial village life in southwestern Iran. Unfortunately, the socio-political upheaval of 1978-79 reached even the little village of Qale Khalil, where Kantor's dig house was located. The house was ransacked and all the expedition's belongings were either robbed or destroyed. The archaeological materials from the salvage dig at Chogha Bonut along with much of the archival materials were perhaps the greatest loss.

From Kantor's report, I knew Chogha Bonut displayed what she called the "Formative" stage of the lowland Susiana phase, and that the site might contain an even earlier aceramic phase of the initial colonization of Susiana in the 8th millennium bc. Hoping to substantiate Kantor's claim and thereby increase our understanding of the processes of the initial colonization of lowland Susiana, we secured a permit and began work on 26 September 1996. I would like to thank Mr. Seraj al-Din Kazeroni, the Head of the Iranian Cultural Heritage Organization (CHO) and his Research Deputy, Mr. Jalil Golshan, for their enthusiastic support of the project.

Save for a few occasions, we did not hire local workers, as the operation was delicate and I was accompanied by enough individuals to take care of various responsibilities. I had with me Messrs. Gabriel Nokandeh, Abbas Moqadam, Hamidreza Tabrizian, and Farhad Jafary, four brilliant and eager graduate students of archaeology at Tehran University. Messrs. Hasan Rezvani, Bahman Kargar, Omrani and Farukh-Ahmadi were four representatives of CHO (Fig. 1). They were instrumental in the smooth operation of the dig, particularly Mr. Rezvani. I thank all of them.

Fig. 3. Chogha Bonut, looking west, Square M10 in the right foreground.

Chogha Bonut is probably the oldest lowland village in southwestern Iran (Fig. 2). It is a small mound; in its truncated and artificially rounded state, it has a diameter of ca. 50 m and is 5 m high (Fig. 3). From Kantor's excavations, we knew that the site was perhaps first occupied sometime in the 8th millennium bc before the invention of pottery. The site continued to be occupied for much of the 7th millennium bc, until the beginning of the Archaic 1 period (the earliest period attested at Chogha Mish, some 6 km to the east), when it was deserted for at least one millennium. Then, sometime in the 5th millennium (Late Middle Susiana)[1], it was reoccupied and remained inhabited into the early 4th millennium (Late Susiana 2), when it was deserted once again. Except for Ali Kosh, located in the Deh Luran plain north of Susiana, all very early aceramic Neolithic sites in Iran are located in the Zagros mountains. These early aceramic sites are informative about the beginning of village life in southwestern Iran, but almost all these villages were occupied after the domestication of some species of cereals and animals had already been well under way.

Some scholars believe that southwestern Iran, particularly the highland, was cold, dry and mostly uninhabited between

11,000 to 9,000 bc, and that the domestication of animals and particularly cereals took place not in the mid-altitude of the Zagros mountains but in the oases in the Levant (MCCORRISTON and HOLE 1992, HOLE n.d., MOORE and HILLMAN 1992). When this sudden spell of cold and dry weather gradually came to an end by 8,000 bc, the uninhabited regions of the Near East were colonized by groups of people who already were practicing a mixed economy of food producing and food gathering. If this was the case, then one would expect to find such sites in warmer areas, more suitable for practicing agriculture in lower rather than higher altitudes. Chogha Bonut with its reported aceramic deposit was an ideal site to investigate this problem.

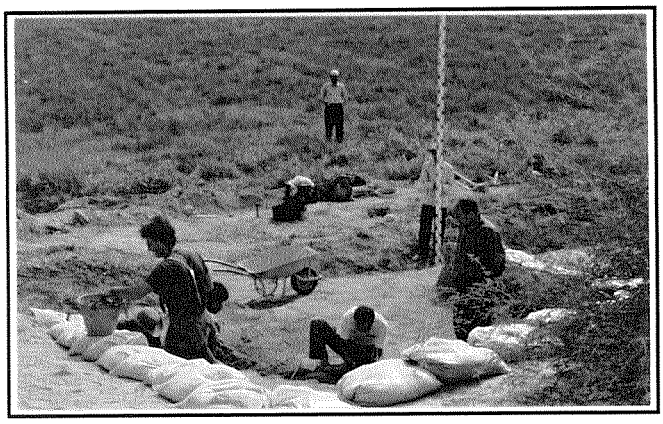

Fig. 4. Chogha Bonut. Excavation at Square M10, looking east.

Our special interest in Chogha Bonut was its aceramic deposit that would make it unique among the early sites in large alluvial plains in Iran. Since the Archaic and later periods were known from Chogha Mish and Tuleii, northwest of Chogha Mish, we were eager to reach the basal levels during our excavations. This proved to be a difficult task; Chogha Bonut has been bulldozed and churned up twice. In addition, two seasons of excavation by Kantor had produced a large amount of debris that had been dumped over the slopes of the mound, but the exact location was unknown to us. Finally, eighteen years of rain and trampling by farmers, pastoralists, and their animals made it difficult to distinguish, without excavation, the disturbed and undisturbed areas of the mound.

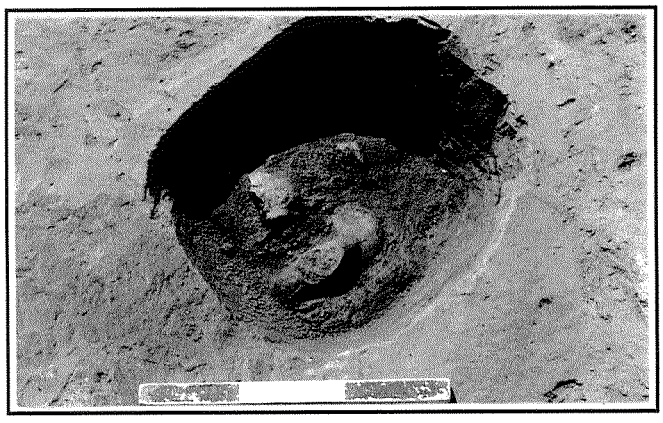

Fig. 5. A round hearth in Square M10.

At the base of the mound, we tested three areas and, though all showed signs of heavy disturbance, we decided the eastern sector of the mound, with its numerous ashy lenses visible right above the surrounding plain, would be the best spot to reach the lowest levels. In our 5 x 5 m trench we reached undisturbed layers after removing about one meter of bulldozed debris (Fig. 4). From the beginning we encountered aceramic layers accumulated in an area that seemed to have been an open court. Here we found successive surfaces with layers of alternating ash and clay. These surfaces were furnished primarily with roughly round- and oval-shaped hearths, and most contained fire-cracked rocks (Fig. 5), very typical of the fire pits of the early Neolithic period. We found no solid architecture, but the presence of fragments of straw-tempered mudbrick indicated to us that mudbrick architecture existed elsewhere in the mound. We excavated this area to virgin soil that was only about 80 cm below modern surface, a surprisingly small accumulation of sediment in at least 9,000 years, especially compared to the Iranian central plateau. A sample of organic ash from this basal deposit yielded a calibrated date of 7295 BC (Beta-104552).

Since we opened our trench at the lowest possible slope of the mound, it could not give us a profile of the stratigraphy of Chogha Bonut from the aceramic phase to the beginning of the Archaic 1 period. To develop this profile, we opened a stratigraphic trench one meter south of our main trench, and excavated it to virgin soil. It was here that we found several classes of pottery not previously known in Susiana. The earliest pottery is a soft, straw-tempered, strawface ware most certainly of the initial stage of pottery manufacture in lowland Susiana.

The most numerous artifacts at Bonut, as was expected, were flint tools and stone objects. The lithic industry at Bonut is advanced and the presence of various cores of high-quality flint, not found locally, indicates some sort of regional exchange. No obsidian was found in the aceramic layers. Although we did not find complete stone vessels and bracelets, the fragments illustrate the skill and sophistication of the early inhabitants of the Susiana plain. Numerous clay objects with either mat or cloth impression on one side indicate the use of clay tokens at this early stage of Susiana cultural development. The absence of stone mortars and large stone tools maybe the accident of discovery, since the area of excavation was rather small.

Our most precious and potentially more informative materials are the bones and carbonized seeds we collected from every layer and feature. The bones were never in good condition and they were often covered with a thick layer of salt crystals. We retrieved the seeds by dry sieving at the site and flotation in the camp. The floral and faunal samples are currently being analyzed by Dr. Naomi Miller and Professor Richard Redding. Once the results are in, we may be able to open a new chapter in the cultural evolution of southwestern Iran and shed more light on the processes of domestication of plants and animals and the place of lowland Susiana in the cultural development of the early Neolithic of the ancient Near East.

[1] For the explanation of this and other chronological terms used here see ALIZADEH in DELOUGAZ and KANTOR 1996: xxiii; ALIZADEH 1992.

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New Lithic Sites in Wadi Dhahr, Republic of Yemen

Heiko Kallweit
Institut für Ur- und Frühgeschichte, Univ. Freiburg

The Sites

During a research programme conducted by the author from 1993 - 1995 with the financial support from DAAD Bonn and DAI Sana'a, a number of new sites rich in lithic, ceramic and other small finds were found in the Wadi Dhahr, about 15 km north of Sana'a, the capital of Yemen[1]. The sites are situated at the mouth of the valley. Most of them are on the foot of slopes

and hills of Cretaceous sandstone, which is the uppermost geological layer in Wadi Dhahr. Fourteen of the sites are of greater interest because of their rich surface material and visible structures. All the sites are extremely endangered. The main reason for that is the cultivation of the slopes, which were used originally for grazing sheep and goats. Now the farmers use the newbuilt fields to cultivate qat (*Catha edulis*), an important luxury item for the market in Sana'a.

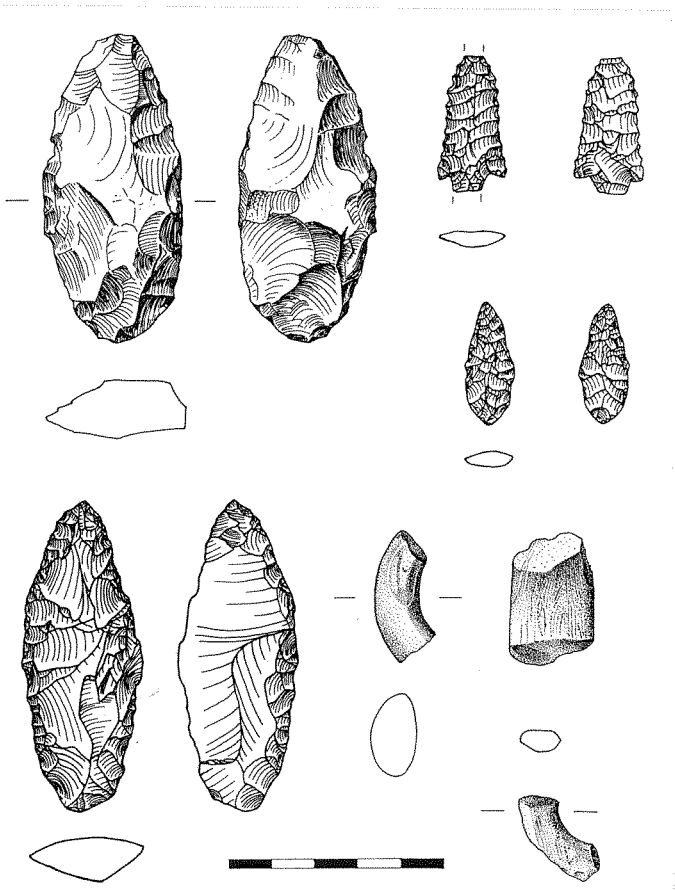

Fig. 1. Lithics and other small finds from Wadi Dhahr: Arrowheads (raw material obsidian and flint), two bifaces (made of basaltic stone), a knife (obsidian), and fragments of bracelets, probably made of jasper.

Surface Finds

Two sites yielded a lot of strongly silicified animal and human bone on the surface. One of the bones, a nearly complete femur, belonged to a juvenile male human. The animal material was mainly from cattle. According to the preserved bones, the individuals were big in size, so it was difficult to decide whether they were wild (*Bos primigenius*) or well-fed domesticated (*Bos taurus*) ones[2].

The lithics from the sites are morphologically very close to the so-called Ar-Rub Al Khali - "Neolithic", which was first described in that region by Christopher Edens (1982) and Francesco Di Mario (1989). The main characteristics of the Wadi Dhahr lithics are a high rate of bifacial forms, most of them stemmed and shouldered, very often winged arrow-points, and a wide range of raw material, with an emphasis on basalt and flint. Obsidian was only used in small quantities. The lithic collection includes more than 100 tools, 32 of them arrowpoints, and about 1000 pieces of debitage. Handles, rims or decorated pieces of ceramic were collected, drawn and studied. Shape, ware and decoration point to Chalcolithic Palestine and Egypt as closest parallels. The relation to the earlier dated finds from the north seems to be closer than to the pieces from Hawlan at-Tiyyal, dated by De Maigret (1990) to the second half of the third millennium BC to the early second millennium BC. Some pieces of Wadi Dhahr-ceramic showed traces of painting and engobe. A part of them were possibly wheel-made.

The Sondages at Akiya-1

The main result of the 1994 sondages at the site Akiya-1 was a sequence that yielded aceramic layers belonging to the Ar-Rub Al Khali - "Neolithic" covered by Bronze Age layers with ceramics of the same type as the surface material. The Bronze Age and the Neolithic layers in Akiya-1 were separated by a sterile layer of yellowish sandy sediment. Endscrapers, blades and worked flakes, mainly made of obsidian and flint, and some decoration elements like stone beads are the most important small finds from the Neolithic layer. In the northwestern wall of the sequence, a half-rounded structure made of sandstone was visible. Bone material of animals was rarely found and too small in size for analysis. The Bronze Age layer yielded a lot of potsherds, worked and unworked flakes of green volcanic raw material, some rings and bracelets from organic material (shell), a bracelet made of copper, the fragment of an anthropomorphic clay-figurine, many grinding stones and a large quantity of animal bones, mainly from small-sized sheep and goats, all of them domesticated. A fire-place from a site nearby Akiya-1 was dated by radiocarbon to 4950 ± 47 BP[3].

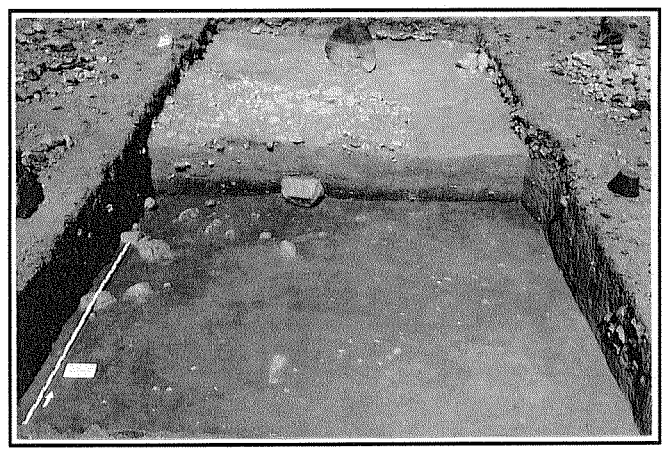

Fig. 2. Picture of the sequence during excavation at Ak-1.

Conclusion

The material from Wadi Dhahr leads to the conclusion that the valley was settled by cattle-breeding pastors during a phase of better ecological conditions, indicated by a dark humus layer in the sequence of Akiya-1. The vegetation cover in the Wadi Dhahr at that time should have been denser than at present. The radiocarbon date suggests that period as being in the early 4th millennium bc. This phase ended, marked by a sterile sandy layer. The following layer is dated by ceramics of a high technical standard to the early third millennium bc. As the preserved surfaces from sondages belonging to this period indicate, the ecological conditions tended to a present-day status of increasing aridity and soil deflation as a consequence of absent vegetation cover.

[1] The material was collected and studied for a Ph. D. thesis of the author and the supervision of Prof. Dr. Wilhelm Schüle, Institut für Ur- und Frühgeschichte Universität Freiburg (KALLWEIT n.d.).

[2] All of the bone material was studied by A. von den Driesch, Universität München. I thank her very much for her cooperation.

[3] The analysis was made by J.Görsdorf, C^{14}-Labor des DAI-Berlin, whom I would like to thank very much. Internal number of the sample: Bln 4724, Wadi Dhahr.

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Excavating Ba'ja, Greater Petra Area, Southern Jordan

Hans Georg K. Gebel (Seminar für Vorderasiatische Altertumskunde, FU Berlin) and
Hans-Dieter Bienert (German Protestant Institute of Archaeology, Dept. Amman)

On June 16th investigations will start at the Late PPNB settlement of Ba'ja, which first was explored by one of the authors (H.G.K.G.) in the framework of his project *Tübingen Atlas Palaeoenvironmental Investigations in the Greater Petra Area - Holocene Research* (GEBEL 1986, 1988, 1990, 1992; GEBEL and STARCK 1985) in 1984. The project will be carried out for the German Protestant Institute for Archaeology, Amman Dept. in collaboration with the Deutsches Archäologisches Institut, Orient- Abteilung (Prof. Dr. Ricardo Eichmann) in Berlin, and ex oriente e.V., a research association at the Seminar für Vorderasiatische Altertumskunde of the Free University of Berlin. Funding comes from the Evangelische Kirche in Deutschland (EKD), the Deutsche Forschungsgemeinschaft (Bonn), the Deutsches Archäologisches Institut, Orient- Abteilung (Berlin) and ex oriente (Berlin). The project is co-directed by the authors.

Encountering Ba'ja

The site was originally found in late summer 1983 by mountaineering members of Manfred Lindnerís team who came back with a "conspicuous stone", presented at that time in Nazals' Camp to H.G.K. Gebel. The piece was a typical LPPNB celt, prompting immediately plans to "check" the find spot the following year, described as difficult to access in the midst of the sandstone formations northnortheast of Beidha. More finds, such as Nabatean pottery, were reported from the area. Here, H.G.K. Gebel would like to thank Manfred Lindner and his team for their continuous information ovber years on his prehistoric findings in the area, which always are a substantial source of information for the prehistory of the Greater Petra Area (for Ba'ja area *cf.* also LINDNER 1996).

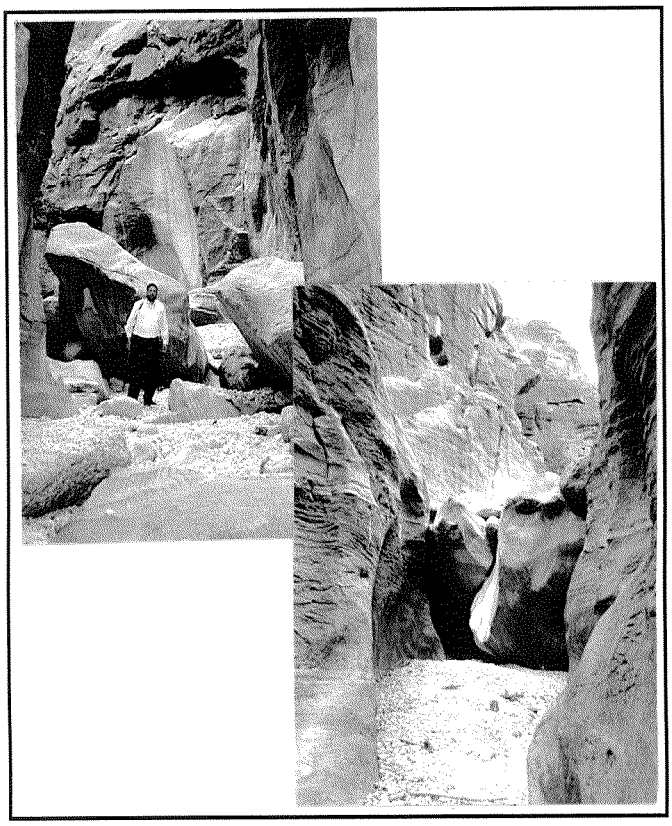

Fig. 1. Views inside the Siq al-Ba'ja (photos: H.-D. Bienert).

It took two forenoons in 1984 to locate the *siq* (gorge) through which the site had been reported to be accessable: in a tangle of sandstone formations dissected by gorges of every size, it was not easy to find the only one east of the Jabu Plain, which leads up to what was -up to then- only a promising spot. Several siqs were climbed unsuccessfully that time: Gebel and his team got stuck in several of the gorges with huge fallen rocks and dense vegetation of juniper and thorny stone oaks blocking the *siqs*. Eventually the access was found, although in this moment of approaching the site there was no trust in that "something could be up there": at three spots in the gorge (up to 70 deep with vertical walls, widths as narrow as 1.5 m!), which reaches the sites' intramontane steep slopes after a bit more than a kilometer, fallen sandstone blocks created barriers of up to 5 m height behind which gravel accumulations raise the *siqs*' bottom levels. Only mountaineering with the help of ropes for the baggage made it possible to cross them. There even would have been the chance to miss the site at this stage, because there was only one spot at which some Neolithic material eroded down from the site into the *siq*; we were lucky that despite exhaustion here attentiveness worked.

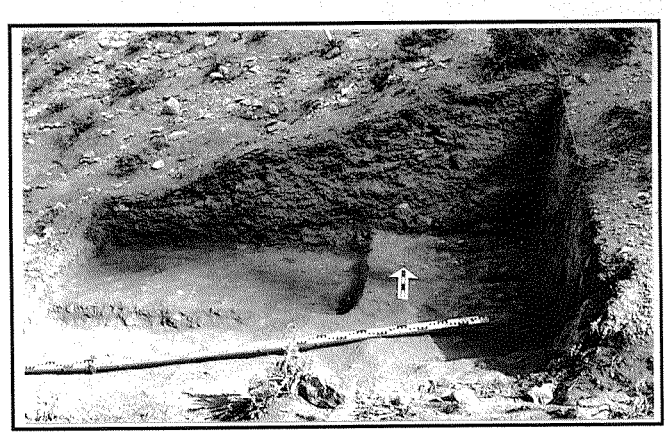

Fig. 2. Ba'ja: Sounding I of 1984 (photo: H.G.K. Gebel).

Following this track, we first found a 20° slope of *ca.* 100 x 15-40 m, littered with shaped wall stones, grinding slabs and manos, LPPNB chipped lithics and a lot of eroding ash layers at its deepest point (here the later Sounding I was excavated). Reaching the summit of this slope, a grand view opened on the central part of the site, which in shape and size is very much like an amphitheatre with slopes of 40-45°. Although the Late PPNB walls with their typical masonary were visible everythere on this shadowless surface of more than 10,000 m², it took days to understand that we really found an extremely large and well preserved settlement with an architecture similar to *pueblos*, densely built on steep-intramontane slopes in a naturally fortified setting. This all makes it quite clear why Diana Kirkbride did not have the chance to find Ba'ja, which on the map is just 6 km "around the corner"; the story also should make us humble about the chances to locate remains of a given period in the area.

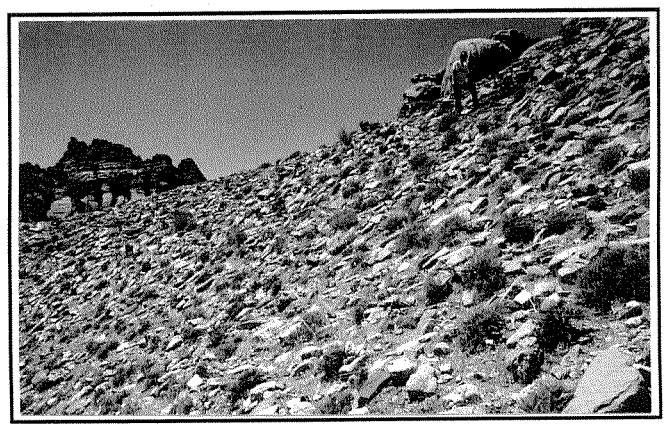

Fig. 3. Ba'ja: Central part of the settlement on the steep slope ("amphitheatre") covered with wall stones (photo: H.G.K. Gebel).

Behind the site, the *siq* continues for kilometers towards the steep slopes from the Arabian Plateau, an unexplored area covered by relict open juniper forests. Many larger and small sediment traps in the immediate site vicinity indicate that we may expect here preserved outliers of the main settlement, if the

Nabateans did not find them in their persistent search for attractive fields ...

In this 1984 exploration and its three soundings and systematic surface samplings the following colleagues participated: Suleiman Farajat, Matthias Starck, Angelika Müller, Eva Gebel-Martinetz, and Bassima Khoury. In 1985 the site was revisited with Hans-Joachim Pachur, Geomorphological Laboratory of the Free University of Berlin. Over the years members of the Basta team took the chance to see this extraordinary site, as well as Gary Rollefson, Karen Wright and Burton MacDonald. In August 1996 both the authors climbed to Ba'ja, and it was decided to present an excavation proposal to the Department of Antiquities, an excavation to be carried out under a joint directorship.

Site Information

Ba'ja is located at 35° 27' 45" E/30° 24' 55" N (1120-1160 a.s.l.; *ca.* 200 mm mean annual precipitation) some 11 km linear distance north of Wadi Musa/ Petra in the lands of the Amarin tribe. The site (300 m x 15-80 m) rests on an intramontane steep slope bordered by the Siq al-Ba'ja and nearly vertical rock formations in an unspoiled environment and a magnificent landscape. The site has no later layers than the LPPNB (late 7th mill.bc), despite Nabatean pottery on its surface.

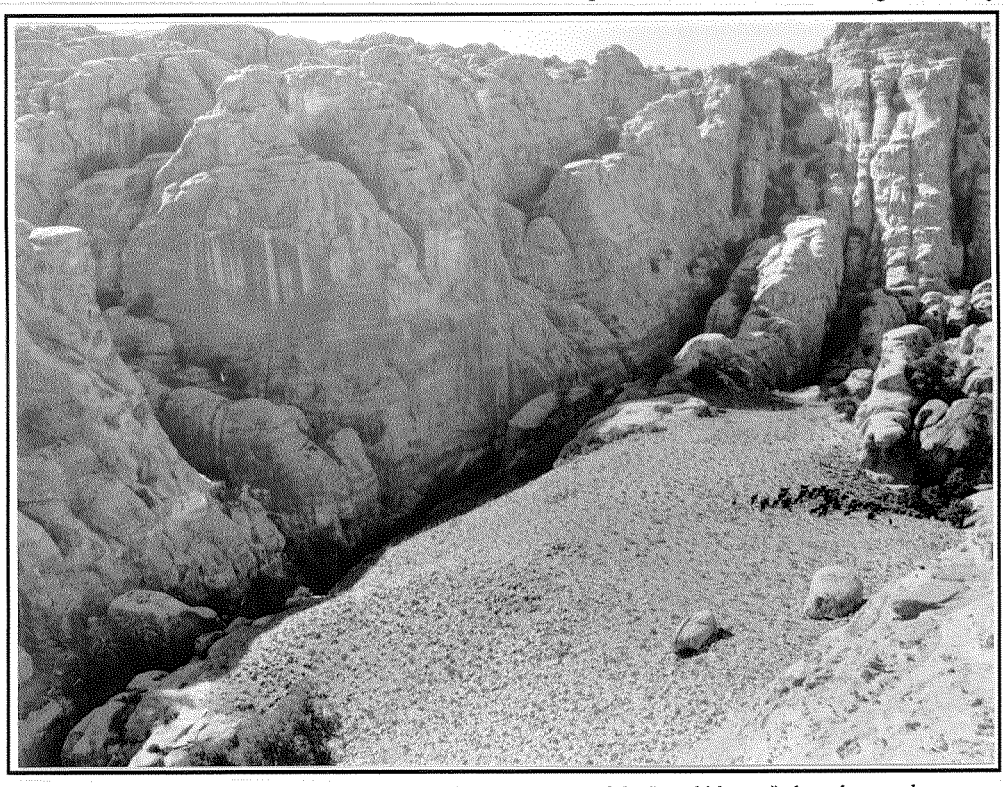

Fig. 4. Ba'ja: View of the settlement core area from ENE. Part of the "amphitheatre"-shaped steep slope can be seen on the left bottom, the *siq* (in the shadow) borders site on its left (photo: H.-D. Bienert).

From the surface (and one sounding) it is obvious that we are dealing with well preserved dense terraced housing, comparable to that of present-day villages in areas of similar settings. Rich cultural layers provide typical LPPNB industries with their evidence of specicialized labour and crafts, devoted to a substantial part to the production of prestige goods and its exchange. Hunted animals were goat/ sheep/ ibex, gazelle, hyrax, hare, wild cattle, an equid, and wild boar; domestic goat and sheep are also attested (Walter Söffner, pers. comm.). Carbonized pistacios were found as well as juniper and pistacio wood as fuel (Reinder Neef, pers. comm.).

Project Logistics

The site can be reached by four-wheel vehicles to the entrance of the Siq al-Ba'ja, but then climbing through the siq is necessary (20-30' with baggage). No other access has yet been found. A dig camp and a base camp have to be maintained in order to create a sufficient infrastructure and to ensure recreation possibilities for the team working under extreme conditions, among which are the shadowless "standing" heat of the intramontane setting, the waterless surroundings, and the permanent stress on oneís ankles. All drinking water has to be brought up for some 30-35 people, litre by litre. The archaeological staff will consist of 22 persons (from Germany, Jordan, United States, England, and Sweden), and the employment of up to 15 local workmen is planned. The first season is scheduled for 15 June until 20 July 1997, ending with an on-site discussion of the findings during a visit of the symposium participants on 24 July 1997 (see "Conferences and Meetings" in this newsletter).

Ca. 250 m² are planned to be opened in the terraced housing area at a spot where the steep slope becomes a more flatttish area at the sites' summit. In addition, this season will concentrate on working out a detailed site topography, recording all the architectural remains visible on surface and other features (distribution of groundstone, rock alterations, etc.).

Research Potential

While the material culture of the Late PPNB is rather well known, the phenomenon of the central settlements east of the Rift Valley ('Ain Ghazal, 'Ain Jammam, Basta, Sifiya, Shu'eib) itself has only become clear in the last decade as an outstanding feature in early Near Eastern sedentism. H.G.K. Gebel has proposes the terms *mega-village* or *mega-komoi horizon* for this phenomenon. However, along with Gary Rollefson, we feel there are justified reasons to discuss features related to this phenomenon as the earliest manifestation of proto-urbanism. We most likely are dealing with a chronologically isolated feature of its own in man's development up to city hierarchies, a failed early attempt at favoured spots in the semi-arid fringes with vast grazing and hunting hinterlands. Ba'ja flourished in this climax period of central settlements along the eastern Rift Valley, but its expansion clearly was limited by the spatial conditions of its protected setting and the natural limits of its catchments (GEBEL1992). Thus Ba'ja is so far the only example among the major central settlements that would allow us to study the conditions of growth and decline for such settlements under purely local conditions. Here, adaptions into extensive pastoralsim were limited, and thus information on the dynamics both for subsistence and demographic developments at the end of the PPNB may be expected to be clearer.

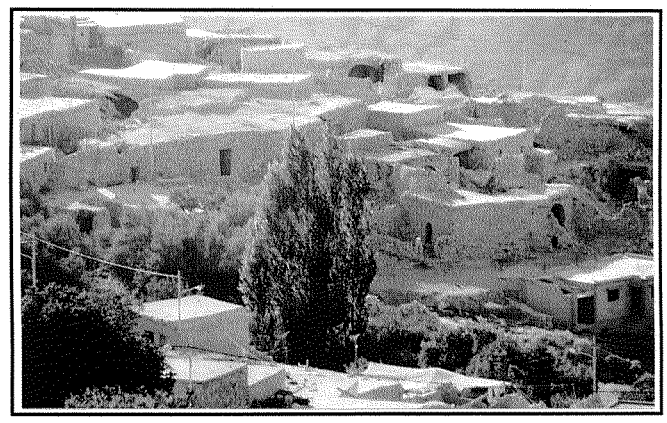

Fig. 5. Dana: Site of a present-day traditional village north of Wadi Musa (photo: H.G.K. Gebel).

Ba'ja may well be the sucessor settlement to nearby Beidha, which most likely was abandoned by the end of the Middle PPNB / Early Late PPNB. Reasons for giving up Beidha might have been the endangerment of the site from a developing western gully and/or the need for a protected setting. (Re-) occupations

in the post-PPNB, contemporary to the PPNC in the north, should not be excluded for both sites, as this is suggested by evidence from Basta and 'Ain Jammam.

Fig. 4. Ba'ja: Outcropping wall of a house (photo: H.-D. Bienert).

The advantage of a single-period site like Ba'ja, which only could grow vertically due to restricted space (well preserved multiple-roomed architecture rests on steep-slope terraces), is that it offers non-distorted insights into the internal settlement organization and its spatial crowding, and thus can give clearer evidence of the social organization of such Late PPNB communities. We expect that the site offers also more information on "core activities" at such settlements because of its limited possibilties of expansion. This may also shed a sharper light on the characteristic and distinct innovation capabilities of the period.

To approach all these questions, the following field work is planned to be carried out:

1) To work out a plan of the internal settlement organization on the basis of the exposed walls on the site surface. It includes the survey for outliers of the settlement in the surrounding rocks.

2) To expose the terraced architecture in an area of *ca.* 250 m^2, down to the first in situ floors.

3) To uncover representative palaeobiological samples in order to describe the subsistence system of the site.

4) To uncover representative samples of all classes of the material culture, including the identification of any possible specialized production of goods at Ba'ja, and/ or their distribution from here.

Acknowledgement: We thank our dear friend and colleague, Gary Rollefson, for editing the English of this contribution.

Fig. 5. Ba'ja: One of the typical grinding slabs with a mano found nearby (photo: H.G.K. Gebel).

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Lithic Industrial Behavior at 'Ain Ghazal: a Study of MPPNB Debitage Loci

Leslie Quintero, University of California - Riverside

Introduction

An interesting issue for PPNB research is whether naviform core-and-blade assemblages resulted from the work of a few specialists – flintknappers who produced tool blanks for use by other people in the community – or whether household members tended to produce their own cores and blanks for tools. Tool data are not particularly useful for this analysis, since many Neolithic tools are very informal and were constructed on a wide range of blanks, and cores, core-production flakes and spalls, and various forms of blades and blade-production "debris" were selected as tool blanks. Consequently, it is not readily apparent whether individual lithic subassemblages result from the reduction of cores and the creation of tool blanks at primary reduction loci, the curation of blanks for future use at secondary deposition loci, scavenging of tool blanks from ancient deposits, the industrial activities of specialists or nonspecialists, or merely the accumulation of debitage waste that was discarded at a "dumping" locus.

These concerns are addressed here with a comprehensive technological analysis of MPPNB debitage assemblages from 'Ain Ghazal, including individual debitage loci of core production, core reduction, and tool production. Specifically, 169 loci of reduction debitage were evaluated and nine were intensively studied in order to ascertain in what contexts naviform cores actually were produced and reduced at 'Ain Ghazal, and to understand what these and other lithic manufacturing data reveal about the organization of tool production at the townsite.

Pertinent technological attributes of lithic reduction activities will be discussed presently, but it is important to note here that reasonable assessment of these attributes depends initially on experiments in lithic replication. Consequently, replication experiments were conducted on naviform core production and reduction, other types of blade-core and flake-core production and reduction, and tool-production techniques used during 'Ain Ghazal's occupation in order to understand the technological origins of the resulting debitage.

Analytical Procedures and Rationale

For clarification, three sets of tasks structured this analysis. Briefly, these were (1) to identify the nature of the production at a locus, that is, whether it resulted from flake-core or blade-core production or reduction, or from tool production; (2) to differentiate primary production loci from secondary debitage deposits, or disposal areas; and, (3) to distinguish activity areas from workshop loci.

Production Loci. Core-, blank-, and tool-production activities were differentiated by comparisons to technological standards of expected categories of debitage derived from numerous replications. Technological debitage categories for the production of naviform cores and blades that were presented at the Berlin and Warsaw Workshops were used to evaluate the data (WILKE and QUINTERO 1994), as were general technological categories of reduction debitage that were established from experimental replication of a variety of other configurations of blade cores and flake cores. Technological debitage types and quantities were compared to expected normal frequencies of debitage types. Reduction products were inventoried, and missing components, if any, were identified. Loci also were studied for evidence of tool production, maintenance, and retooling. Most importantly, the pattern of

Table 1. 'Ain Ghazal MPPNB debitage distribution by locus.

Excavation Unit / Locus	3282 122[a]	3283 155[b]	3283 133[b]	3077 009[b]	3283 013[c]	3283 014[c]	3077 007[c]	3081 049[c]	3081 030[c]
Core Preparation									
Flakes (biface production)	1 004	175	540	229	460	233	196	169	30
Flakes (non-biface production[d])	152	46	260	90	304	136	58	49	134
Small flakes (0.5-1.5 cm)	1 774[e]	673	750	488	303	148	113	86	50
Flake fragments	1 666[e]	142	1251	982	721	282	378	112	134
Microdebitage (< 0.4 cm)	18 680[e]	800	0	0	0	0	0	0	0
Facetting flakes	58	16	68	38	85	10	38	53	14
Core-trimming flakes, back and lateral	6	0	3	0	4	0	1	0	0
Platform spalls, all types	104	33	68	20	93	19	15	39	18
Core Reduction and Maintenance									
Crested blades and fragments, all types	32	8	28	0	31	16	7	11	7
Initial blades and fragments, cortical	2	2	6	1	0	0	1	4	0
Intended blades, small blade(lets)	22	10	24	9	17	5	0	8	6
Hinge- and step-removal blades	21	11	26	5	10	2	5	16	2
Overshot blades	0	2	4	0	2	1	2	3	1
Profile-correction blades	15	4	11	8	53	11	11	6	0
Ridge-straightening blades	373	55	145	48	132	52	43	59	40
Platform-isolation elements	369	124	128	90	150	11	3	47	10
Core-platform preparation elements	75	57	93	103	82	12	15	14	0
Industrial waste blade fragments	582	177	454	155	444	154	81	74	67
Blank Production Waste									
Proximal blade fragment	132	39	134	36	104	36	30	107	35
Medial blade fragment	53	22	40	14	113	34	35	44	33
Distal blade fragment	8	15	19	9	91	21	10	19	29
Non-Huweijir Debitage									
Blades	0	1	2	1	6	0	3	0	4
Flakes	17	3	0	12	44	16	13	0	42
Other	0	0	6	0	0	0	0	19	0
Total Debitage	25 145	2 415	4 060	2 338	3 249	1 199	1 058	939	656
Tools and tool fragments[f]	122	48	132	59	315	146	373	185	226
Spalls, burin and chamfered bit[f]	29	16	32	4	197	31	21	69	40
Weight (gm.) Huweijir flint	9 438	4 363	9 881	3 827	10 409	4 460	4 906	3 751	3 432
Weight (gm.) Non-Huweijir flint	116	24	6	45	226	63	34	132	246
Total weight	9 554	4 387	9 887	3 872	10 635	4 523	4 940	3 883	3 678
Percent Huweijir flint	98.8	99.5	99.9	98.8	97.9	98.6	99.3	96.6	93.3
Cores, naviform	4	5	8	1	4	5	2	2	4
Cores, all other types	0	0	0	0	1	2	1	0	1

a - As noted in the text, Locus 122 is the only primary deposit of debris from naviform core preparation and reduction.
b - Loci with secondary deposits that are waste dumps of material from core production and reduction.
c - Loci with secondary deposits that are waste dumps of material from tool production.
d - As used here, the term "biface production" should be understood to include all types of "biface thinning" or "biface reduction" flakes that result from the forming of bifacial margins, as on naviform cores.
e - Estimates based on weighed sample.
f - Totals include items identified in debitage analysis and items identified in initial sorting of the collection. Weights of items removed in initial field sorting are not included here, but are minor.

attributes of each locus was evaluated in terms of its technological cohesiveness. That is, did the general character of a locus logically fit the expected debitage pattern of a given technological behavior?

The following very basic assumptions guided these analyses:
(1) technologically consistent patterns of core-production debitage attest to core production;
(2) technologically consistent patterns of core-reduction debitage give evidence for core reduction;
(3) tool-production loci generally are represented by debitage assemblages that are not strictly consistent with either core production or core reduction.

This last pattern obtains because tool blanks are likely to be selectively acquired, chosen from all of the constituents of a primary production deposit and from the residues of diverse core reductions, while the undesirable byproducts remain as primary reduction residues. Debris from tool production and retooling also should be present, perhaps as sectioned blade fragments, waste spalls, as errors or failures from tool production, or as broken or discarded tools, etc. It is a well-documented pattern that tools or tool elements that are hafted, such as sickle or knife blades, are likely to be replaced at tool manufacturing loci rather than where they were used, so that such discarded tools are expectable at tool-production loci (KEELEY 1982).

Primary and Secondary Deposits. Evidence of both secondary and primary deposits were considered, since secondary disposal of flintknapping waste was thought a likely occurrence within the town proper and possibly was a dominant behavior. Currently there is considerable support among debitage analysts for the usefulness of small debitage and microdebitage as major indicators of primary production activities. Ample experimental and archaeological data have demonstrated that this debitage is least likely to be removed from original depositional contexts by gleaning and cleaning (FLADMARK 1982; BEHM 1983). Caution clearly is necessary since human waste-disposal behavior and various postdepositional processes can affect the presence of microlithic material in some deposits. Nonetheless, the presence of microdebitage, especially when combined with technologically diagnostic small debitage, remains a reliable indicator of primary production residues and loci. In light of this fact, the most important criterion for loci selection was a high incidence of microdebitage and/or diagnostic small debitage that resulted from core production and reduction, such as core-platform preparation elements and blade-platform isolation elements. Additional production debitage from the manufacturing of cores, blanks, and tools also were important loci attributes.

Secondary deposits that are lithic disposal areas, or "dumps" of spent tools, blanks, and tool-production or core-reduction waste, in many cases can be distinguished from their primary counterparts on the basis of contextual data: waste pits of lithic trash, refuse in abandoned rooms, or debris inside structural interstices such as walls or under floors. Any of these deposits may be only lithic-reduction waste, but they also may contain other industrial debris, ash and charcoal, household trash, or even human burials, as at 'Ain Ghazal. These deposits are usually quite apparent.

Assessments of the content and contextual integrity of loci deposits also were guided by the following assumptions. Primary depositional residues are apt to contain the expected array of technologically diagnostic debitage of the same parent resource, those that have not been removed for use, so that the deposit is technologically intact or coherent. It is not unrealistic here to think in terms of "fresh" or unabused debitage. Lithic refuse dumps, on the other hand, often suffer from repeated use and abuse so that their assemblages tend to result from a mixture of flintknapping events, from a variety of resources, and from diverse flintknappers' efforts. Consequently,

they are less likely to reflect coherent reduction episodes. These are idealized standards, of course, and contextual and postdepositional data must be evaluated as well.

Various modes of lithic "dumping behavior" have been well studied, both archaeologically and ethnographically, so that while there is much variety, several important patterns are apparent. Not surprisingly, there is general concurrence that sedentism and dense populations encouraged disposal of debris. Living in villages and towns, therefore, or even in semi-mobile circumstances, probably sanctioned elimination of most knapping refuse from private and publicly used spaces. In contemporary situations when knapping debris is collected for disposal, the inconvenient or troublesome material that accumulates is collected and removed. Nonetheless, even when ground covers are used, very small flakes and microdebitage are likely to be overlooked or ignored, as among modern Lacandon, Tzeltal, and Chuj Maya (DEAL and HAYDEN 1987; CLARK 1991). In this case, the disposed material may be recognized by a shortage of micromaterial and the primary deposit may contain only microdebitage.

Knapping and disposal areas also may be contiguous, occupying essentially the same area. In this case, disposal pits may be excavated into or on the periphery of flintknapping floors and most of the debris incorporated into them, thus preserving microdebitage along with the larger knapping debris in pit features as discreet assemblages, secondary deposits within a primary location. One may expect such activity in flintknapping areas on the fringes of villages, as at Kfar HaHoresh, perhaps, where disposal space does not intrude into the principal living areas.

Activity Areas and Workshops. Central to this study was the differentiation of "chipping floors," or flintknapping activity areas, from lithic "workshop" residues. Following modern conventions, chipping floors reflect the common, unspecialized production of cores, tool blanks, and/or tools as a normal aspect of a subsistence-based, lithic economy. They equate with work places of individual flintknappers who produced lithic items for their own or familial use. Workshops, on the other hand, are areas where specialist flintknappers produced lithic products for use by non-family members of the community (CLARK 1986).

Since the realm of the specialist craftsperson includes the production of quantities of material for others, differential production and consumption rates have been used in some cases to identify workshop loci. Determining the scale of production can be problematic, however, even for large, well-documented deposits. Consequently, scale is unlikely to be a successful index of specialized workshops for nonurban sites, such as 'Ain Ghazal, where production may have been very modest and surpluses difficult to document.

The frequency of production localities within the larger population of debitage loci is more useful for discriminating between chipping floors and workshops in early Neolithic towns and was used in this analysis. Of importance here is whether core production and/or reduction were common activities that resulted in debitage generally dispersed throughout a site, perhaps as household-related chipping floors. Or, conversely, were production loci poorly represented or rare occurrences, suggesting that knapping activities were concentrated in a few areas only as one would expect workshop residues to be? It is also important to consider, however, that aggregates of nonspecialist flintknappers making use of a common knapping area could create infrequent, concentrated debitage deposits. Thus, the analysis included interpretations of loci character, and considered evidence for production standardization and flintknapping skill, in addition to the frequency of loci distribution.

MPPNB Debitage Loci

After evaluating the debitage from 169 MPPNB loci, nine were selected as most likely to be primary naviform core reduction areas and the debitage from these loci was extensively analyzed. Interpretations of loci character and debitage distribution analyses for the nine loci are presented in Table 1. Nearly all of the debitage (93.3% to 99.9%) is high-grade flint that most likely was mined locally from the nearby Wadi Huweijir flint mines (QUINTERO 1996).

Only one (Unit 3282, Locus 122) of the 169 loci appears to have been a primary deposit of debitage from production and reduction of naviform cores. This assessment is based on the intensity of both small debitage and microdebitage, as well as the abundance of all expected categories of core production and reduction debitage (Table 1). The deposit consisted of an extremely dense lens of flint debitage, approximately one-half meter thick, located in an exterior location that was not associated with any structures. The rarity of this locus, only one primary reduction area of all loci studied, supports the interpretation that this assemblage consists of residue from a lithic workshop. In addition to production and reduction of naviform cores, a small amount of tool production also occurred at this locus.

The remaining eight MPPNB loci represent two different types of activities. The three loci in the first group were all waste-disposal areas that contained naviform core-production and -reduction debris, and small amounts of tool-production debitage. All three loci (Unit 3283, loci 155 and 133; Unit 3077, Locus 009) were exterior disposal pits. The first two loci were excavated into the same location during different phases of the occupation, suggesting that this area was used, or reused, over a lengthy period.

The second set of loci contain debitage that is consistent with tool production, but not with the production and reduction of naviform cores. With one possible exception, all of these assemblages (Unit 3081, Locus 049; Unit 3283, loci 013 and 014; Unit 3077, Locus 007) were waste dumps that contained large amounts of tool-production debris. Since tool production need not generate very much microdebitage, it was difficult to distinguish primary tool-production areas from dumps of tool-production waste based on the presence of microdebitage. Therefore, contextual data were used for this purpose. The disposal localities were exterior pits, dumps behind walls, or floor fill in the interior of abandoned structures. One locus (Unit 3081, Locus 030) had an exterior provenience and dispersed deposit within a compacted soil lens and may have been a tool-production chipping floor. Nonetheless, internally, its constituents do not differ from the waste dumps of tool production-debitage.

The tool-production debitage at these loci is characterized by trimmed projectile point preforms, partially formed projectile points with manufacturing breaks, numerous burin spalls, chamfered piece bit-spalls, and abundant waste from sectioning blades. This last category of blank-production waste is dominated by proximal and distal blade fragments, most of which are proximal, bulbar ends that were detached just distally of the bulb. Blades were trimmed in a variety of manners: bending, or snapping off the proximal and distal ends; percussion sectioning by striking on the dorsal and sometimes on the ventral surfaces while the blades were supported on an anvil; controlling the break by notching and then bending; initiating perverse fractures, or angled breaks, with notching; and segmenting with burin blows. Some of the bending breaks certainly could be due to pre- or post-depositional breakage, as from trampling, but given their consistent morphology and size, and the larger pattern of trimmed blades that they clearly duplicate, it is likely that the majority were intentionally sectioned.

Retooling activities are evident, as indicated by the large numbers of broken used tool fragments, especially sickle blades, knife blades, awls/borers, and projectile points. Also, whole high-quality blades of tool-blank quality are essentially absent, as are most of the usable midsections of good blades. However, ridge-straightening blades, that are less desirable as tool blanks, are more common discards. Flakes, flake tools, and flake cores also occurred in low frequencies in the tool-production dumps. Notably, flake cores were absent from the workshop locus and from the loci containing naviform core reduction-debris.

Summary

From the large initial sample of 169 loci that were studied, only one MPPNB locus resulted from the primary deposition of naviform core-and-blade production debitage. The singular nature of this deposit, contrasted with the large number of loci of tool-production and core-reduction waste from throughout the MPPNB exposure of the townsite, strongly suggests that

naviform core reductions were executed at only a few locations in the community and probably by only a few flintknappers. It is argued here that these few were specialists who provided tool-production material for the rest of the community.

While it is possible that the core-and-blade production locus was a chipping area that was used by the general community, this alternative seems unlikely for several reasons. First, the standardized nature of the morphology of naviform cores and blades from MPPNB contexts in general and from this specific core-reduction locus strongly indicates that cores were produced and reduced by only a few individuals: flintknappers who were highly skilled. Independent analyses of other aspects of naviform core technology by recent research also support this interpretation, attesting to the difficulty of blade production that undoubtedly required the skills of specialists (QUINTERO and WILKE 1995).

Second, standardization also is apparent in the selective acquisition of thin nodules of flint from the Huweijir flint-mining locality that were transported back to the workshop area for reduction. It seems reasonable to conclude that if community households were responsible for production of their own cores and blades, there would be a greater variety of resources and of resource configurations represented at the core-reduction loci, even when the high quality of Huweijir flint is taken into account. At the naviform core-reduction locus, Huweijir flint was preferentially selected to an extreme degree (98.9%).

Third, tool production and disposal of the resulting lithic waste occurred throughout the site. In most cases these disposal areas are associated with structures that appear to be residences, suggesting that tools were manufactured, replaced, and/or repaired at people's homes. However, comparatively little tool production occurred at the primary reduction locus, or is represented at the three loci containing core-reduction debris. Comparing the numbers of tools per weight of deposit, the secondary deposits of tool-production waste and the possible chipping floor contained from two to six times the number of tools as the core-reduction locus. That blanks, but few tools, would be produced consistently by nonspecialist flintknappers at a common community flintknapping area seems counter to expected patterns of flintknapping behavior.

It is argued here that a more credible interpretation is that tool blanks were produced by specialists who reduced naviform cores at their workshop localities. They then provided tool-blank material to other community members who took it to their residences for their own tool-making and tool-repairing activities. Additionally, at these latter, widely dispersed loci, flake cores and non-naviform blade(let) cores occasionally were reduced for tool blanks, suggesting that community members produced some of their own tool blanks. Both the distribution pattern and the content of the MPPNB debitage loci from 'Ain Ghazal support this view.

This initial analysis of debitage loci from 'Ain Ghazal suggests that the lithic economy of the town was reliant upon a dual system in which both specialized and generalized flintknapping supported the production of stone tools during the MPPNB. A few individual craftspersons made and reduced naviform cores in order to supply tool-production material to other households in the community. These data reflect a florescent period of the Neolithic when 'Ain Ghazal townspeople were enjoying population increases and, undoubtedly, economic growth. Given this situation, it is not surprising that lithic production sites within the town give evidence for a varied and dynamic stone-tool economy, one that apparently included a reliance on specialist stoneknappers and production workshops. As the townspeople adjusted to a changing economy from the LPPNB on, the debitage loci are likely to disclose a very different economic situation. It will be interesting to see what these data reveal, and if the patterns observed in the debitage loci at 'Ain Ghazal are echoed by future studies of lithic-production loci at other Neolithic sites.

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Jerf el-Ahmar: The Chipped Stone Industry of a PPNA Site on The Middle Euphrates[1]

Mandy Mottram, Australian National University

Jerf el-Ahmar is situated 2km north of the Tishreen Dam, on the eastern side of the Euphrates River. Following its discovery in 1987 by T. McClellan, excavations were carried out in 1989 and 1993 by T. McClellan and M. Mottram. The site has been excavated by a joint Syrian-French team since 1995 (STORDEUR *et al.* 1996). Progress in construction of the Dam is expected to flood the site in 1998.

Located on the edge of the Euphrates flood plain, the site consists of two low mounds separated by a small gully. Excavations on the west mound (Area A) in 1989 revealed the remains of two rectilinear structures and an extensive refuse heap (MOTTRAM 1991). Expansion of these soundings in 1993 exposed parts of two further structures. In all, six occupation levels were identified. Also in 1993, excavation commenced on the east mound (Area C) where two more structures were uncovered. In addition, two small soundings (Area B and Square 3609) were opened beyond the main site. A C14 date of 9740 ± 60 BP has been obtained for the refuse heap in Area A, and one of 9810 ± 60 BP for Area C.2[2].

The Sample

Due to time constraints in the field, only a portion of the chipped stone from each season was analysed in detail. Nevertheless, the sample (over 12,000 pieces) examined to date gives a reasonable understanding of the chipped stone industry during the later stages of the site's occupation. The 1989 sample was analysed to describe the technology while the 1993 sample (Table 2) provides the basis for the tool typology. Significant results from these analyses are discussed briefly below.

Raw Material

Over 99% of the chipped stone artefacts from Jerf el-Ahmar are made of either flint or chert - predominantly a very fine-grained grey or brown nodular flint. The high incidence of cortical and sub-cortical pieces indicates that this material was obtained within a relatively short distance of the site.

Technology

Data from 1989 show that waste products of flint knapping form approximately 92% of the sample. Cores and core fragments account for just 1% of this figure, suggesting that

Table 1. Jerf el-Ahmar 1993: relative frequency and distribution of tool types.

AREA	AREA A										AREA C						TOTALS		
	Level 2		Level 3		Level 4		Level 6		TOTAL		Main Sounding		3609		TOTAL				
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	% Total
TYPE																			
FLINT TOOLS																			
Arrowheads	32	12.7	104	17.9	72	12.8	37	12.1	245	14.4	42	17.7	8	4.1	50	11.6	295	13.8	13.79
Adzes	4	1.6	8	1.4	5	0.9	2	0.7	19	1.1	5	2.1		0.0	5	1.2	24	1.1	1.12
Scrapers	47	18.7	148	25.5	235	41.7	67	21.9	497	29.2	36	15.2	84	43.5	120	27.9	617	28.9	28.83
Picks		0.0	3	0.5		0.0		0.0	3	0.2		0.0		0.0	0	0.0	3	0.1	0.14
Borers	5	2.0	18	3.1	26	4.6	13	4.2	62	3.6	17	7.2	9	4.7	26	6.0	88	4.1	4.11
Lustred Sickle E'ts	17	6.8	46	7.9	20	3.5	12	3.9	95	5.6	17	7.2	7	3.6	24	5.6	119	5.6	5.56
Presumed Sickle E'ts	8	3.2	9	1.5	9	1.6	1	0.3	27	1.6	7	3.0	2	1.0	9	2.1	36	1.7	1.68
Burins	2	0.8	10	1.7	6	1.1	8	2.6	26	1.5	5	2.1	6	3.1	11	2.6	37	1.7	1.73
Notch/ Denticulates	12	4.8	16	2.8	19	3.4	24	7.8	71	4.2	15	6.3	9	4.7	24	5.6	95	4.5	4.44
Truncated Pieces	9	3.6	11	1.9	10	1.8	7	2.3	37	2.2	5	2.1	1	0.5	6	1.4	43	2.0	2.01
Retouched Pieces	29	11.6	73	12.6	51	9.0	64	20.9	217	12.7	29	12.2	24	12.4	53	12.3	270	12.7	12.62
Utilised Pieces	86	34.3	128	22.0	105	18.6	69	22.5	388	22.8	56	23.6	41	21.2	97	22.6	485	22.7	22.66
Other		0.0	7	1.2	6	1.1	2	0.7	15	0.9	3	1.3	2	1.0	5	1.2	20	0.9	0.93
TOTAL	251		581		564		306		1702		237		193		430		2132		99.63
OBSIDIAN TOOLS																			
Arrowheads					1				1		1				1		2	25.0	0.09
Perforators/ Drills							1		1						0		1	12.5	0.05
Retouched Pieces							3		3						0		3	37.5	0.14
Utilised Pieces							1		1				1		1		2	25.0	0.09
TOTAL	0		0		1		5		6		1		1		2		8		0.37
TOTAL TOOLS	251		581		565		311		1708		238		194		432		2140		100.0

much of the primary flint reduction was carried out elsewhere on the site. Flake cores are most common and are mainly irregular. Blade/ bladelet cores are usually single platform. Bipolar 'naviform' cores are present, but relatively rare. Unretouched flakes and chips comprise 73% of the debitage in contrast to blades/ bladelets, which make up only 22%. This suggests a relatively high exploitation of blades to flakes.

Flint Tools

The majority (55%) of flint tools were made on blades. In Area C the proportion is as high as 69%, whereas in Square 3609 more of the tools were made on flakes. Preliminary microwear studies indicate that some tools had several uses over their lifetime (P. ANDERSON pers. comm.).

Arrowheads (Fig. 1:1-2, 5) are present in several distinct forms including El Khiam, Helwan and Mureybet types. There is also at least one example of
the Jordan Valley type (NADEL *et al.* 1991). In Area A a significant shift occurs in the percentages of different arrowhead types. Notched and notched-and-tanged types form over 70% of arrowheads in the earlier levels in contrast to around 24% tanged. However, the proportions are reversed in the later levels, where tanged types predominate.

Adzes (Fig. 1:11) are of the distinctive type already known from other PPNA sites in the Middle Euphrates Valley (CAUVIN J. 1978: 89(17); CAUVIN and STORDEUR 1978: 28-42). Several form types can be recognised, corresponding directly to the categories already described by M.-C. Cauvin for Mureybet (CAUVIN and STORDEUR 1978: 33, 37). In Area A adzes diminish in frequency over time, similar to the distribution at Mureybet.

Scrapers (Fig. 1:7-8) are the predominant tool type at Jerf el-Ahmar. The majority are made on thick flakes, generally struck from the finest quality flint. Endscrapers with a rounded edge are most prevalent, followed by endscrapers with an offset rounded edge and semi-circular scrapers. Scrapers are very common in Square 3609, where they comprise nearly 44% of all tools recovered. Together with the large quantity of faunal remains found here, this suggests some specialised activity was carried out in
this area.

Picks are rare at Jerf el-Ahmar, and so far have been found only in the refuse heap and other open activity areas in Area A. Both bifacial and unifacial types occur.

Borers (Fig. 1:10) are classified as either points, piercers or drills. Piercers are most numerous (47%) and have a tapering point which is separate from the rest of the piece. With 'points' the point is integral to the piece. Drills are characterised by a long straight point formed by abrupt or semi-abrupt direct or alternate retouch. Almost two-thirds of drills have an enlarged base, presumably to facilitate hafting.

Lustred Sickle Elements (Fig. 1:3-4) are blades with sickle gloss on one or both edges. The main type (31%) is the 'Mureybet' sickle element, distinguished by a point at one end and either a straight or oblique truncation at the other (CAUVIN and STORDEUR 1978: 69). Other types include backed blades, bitruncated blades and blades with flat, invasive retouch. Several examples indicate repeated refreshment of the edges.

Presumed sickle elements have the same morphology as lustred sickles but no edge gloss. Just over half are of the Mureybet type while backed and truncated pieces are also common.

Burins comprise only around 2% of tools from each of the two samples, the proportions remaining relatively low throughout. This is in contrast to Mureybet where, at around the same date, burin frequencies increase dramatically (CAUVIN and STORDEUR 1978:: 61).

Notch/Denticulates are flakes or blades with one or more lateral notches, or with regularly spaced denticulation. Notch diameters range between 5-14 mm, the majority clustering around 5-6 mm and 10-12 mm. A few blades have two opposed notches and may represent unfinished arrowheads.

Truncated Pieces (Fig. 1:6) are mostly blades or bladelets truncated at one or both ends. Some may have been intended as sickle elements. Significantly, this category includes two tool types more generally associated with the PPNA lithic industries of the southern Levant-the 'Hagdud' and 'Gilgal' truncations. The Hagdud truncation has been identified at several PPNA sites in the Jordan Valley and surrounding region, but has not been reported previously from the northern Levant (CAUVIN 1994: 281). The discovery of at least five examples at Jerf el-Ahmar may point to a greater degree of interaction between the two subregions than previously supposed. The function of these tools is not yet clear, however, it is likely they were used as transverse arrowheads or barbs. This is suggested by certain features they have in common with El Khiam points and by their resemblance to transverse arrowheads from both archaeological and ethnographic contexts (CLARK et. al. 1974). Gilgal truncations have been recorded at Gilgal III and Hatula in the Jordan Valley, and at Qermez Dere in northern Iraq (NOY 1994: 423, BETTS 1994: 196). So far, one example has been recorded at Jerf el-Ahmar. It has only one set of opposed notches.

Retouched pieces form a relatively large group which includes broken tools and otherwise unclassifiable retouched pieces. Utilised pieces are *aposteriori* tools created by the use of unprepared blanks. Utilised blades predominate and often have a

ragged edge damage similar to that seen on some sickle elements, suggesting use as cutting implements. Utilised flakes with convex edges were possibly used as scrapers. There are a few other tools (Fig. 1:9) which do not fit into any of the above categories. These include two large choppers, some knife or lance points, and various tools resembling thick awls.

Obsidian Tools

Obsidian occurs only rarely at Jerf el-Ahmar and is mainly of the pale grey or colourless type characteristic of the Çiftlik region of central Anatolia (RENFREW *et al.* 1966: 70; CAUVIN 1991: 5). Tools of obsidian account for less than 0.5% of all tools in the 1993 sample, numbering just eight pieces in total. All were made on narrow, parallel-sided blades or bladelets with tiny punctiform butts. While retouched and utilised pieces are the main types, two arrowheads and a perforator were also found.

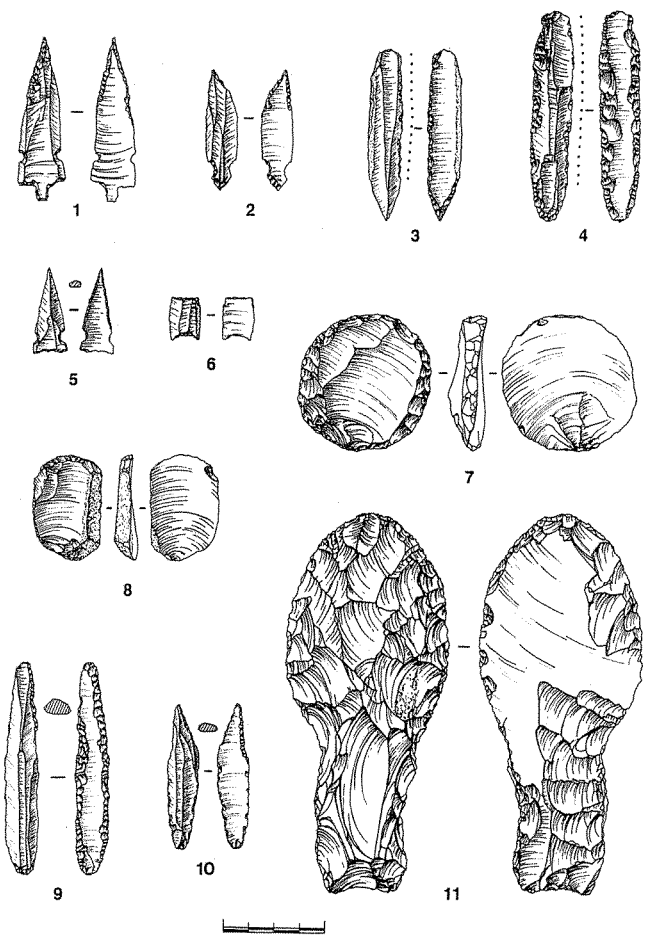

Fig. 1. Chipped stone artefacts from Jerf el-Ahmar: 1-2, 5 arrowheads, 3-4 sickle elements, 6 Hagdud truncation, 7-8 endscrapers, 9 awl, 10 piercer, 11 adze.

Conclusion

It is evident from these analyses that Jerf el-Ahmar had a highly developed chipped stone industry, favoured by local availability of high quality raw material. Clearly, similarities exist with Mureybet, but equally, there are distinctive features which should receive due recognition. The presence of Hagdud and Gilgal truncations and Jordan Valley Points indicates a greater interaction between regions during the PPNA than previously recognised. Together with the obsidian from Anatolia, this points to a long-established pattern of widespread trade in objects and ideas through northern Syria. In terms of relative chronology, the scarcity of naviform cores, the diminishing frequency of adzes, changes in the proportions of arrowheads, limited numbers of burins, and the presence of picks in lower Area A suggest a date equivalent to the end of Phase IIIA and beginning of Phase IIIB at Mureybet. This is borne out by the C14 dates.

The excavations at Jerf el-Ahmar have already provided many new insights on the PPNA in the Middle Euphrates region. Further study of the material from the 1989 and 1993 seasons, together with the results from the Syrian-French excavations, will add significantly to our understanding of regional developments during this important period.

[1] This article is a summary of aspects of a more comprehensive paper (MCCLELLAN and MOTTRAM) currently in preparation.
[2] Beta-71866; Beta-71870 CAMS-12974

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Here Are the Microliths: A Reply to "Where are the microliths?"

Avi Gopher and Ran Barkai
Institute of Archaeology, Tel Aviv University

The lithic assemblage of the PPNA site of Dhra', Jordan, is presented in a short Neo-Lithics paper by Kuijt (1996) followed by a discussion on "...Lithic technology and Neolithic chronology..." The paper relates to the finds of the 1994 season at Dhra' during which Kuijt excavated *Area I*, pushing the old exposed section (BENNETT 1980) half a meter inwards along nine meters in 1.0x0.5m units and 15 cm depth spits through the full depth of the site (all sediments sieved); and *Unit One*, a new area of some 7 m^2 about which details on excavation units are not mentioned and sieving was applied to 20 % of the sediments. We are not told whether 20% of each excavation unit or 20% of the area excavated.

Lithic analysis is presented on two levels: in a very general way, Kuijt notes that in ***Area I*** there were " ... el Khiam points, numerous awls/borers on flakes and *bladelets*, multiple adzes/chisels, and two large limestone picks... [and] conical and

pyramidal *bladelet* cores ..." In a more detailed way, the lithics of *Unit One* are described as including "... el Khiam points, borers, retouched flint pieces, several complete and fragmentary bifacial chisels, scrapers, sickle blades... ground stone adze..." A table is added in which a sample of 165 tools is presented, including over 50% points and some 18% borers. How many of these are on bladelets is a question in order here. Kuijt dates *Area I* to about 9950 bp using two C-14 determinations (uncalibrated) and *Unit One* to 9600 using one determination.

Based on these data, Kuijt offers insights into "... chronology and stone tool technology for PPNA village occupations in the southern Levant...", but actually he devotes most of his discussion to typological aspects and chrono-cultural subdivisions of the PPNA. Kuijt does not define the term "PPNA", and it is not clear if this is a general term representing a time unit or a it relates to Jericho and thus to the Sultanian only.

He opens his discussion with a summary of Crowfoot Payne's (1983) suggestion of an early phase with microlithic tools, the Khiamian, and a later phase, the Sultanian, from which microliths had effectively disappeared (KUIJT 1996:8). At this point in the paper the term microlith is replaced by the term lunate, and a paradox is presented in that Kuijt writes that lunates are missing from sites dated to the earliest stages of the PPNA such as Gilgal I, Gesher (both dated to *ca.* 10000 bp) but do appear in later sites of the PPNA such as Netiv Hagdud. Kuijt also adds the site of 'Ain Darat to these lacking lunates. However, there are several problems with Kuijt's summary:

a. While quoting Crowfoot Payne, both Kuijt and others tend to overlook the fact that she offers more than one scenario in her U.I.S.P.P (1976) paper as well as in the Jericho report (CROWFOOT PAYNE 1983) for the Khiamian - Sultanian issue.

b. A microlithic element, as Crowfoot Payne calls it, is not a synonym for lunates.

c. Gilgal and Gesher are mentioned as *the* earliest PPNA (both dated to 10000 bp) is in contradiction to Kuijt's own recent statements (e.g., KUIJT 1994).

d. There are indeed lunates in some of the sites at which Kuijt claims they are absent. At Gesher, surprisingly, lunates are mentioned in text, in figures and in tables amongst other microliths (GARFINKEL and NADEL 1989). At 'Ain Darat the description of microliths reads "... mostly retouched bladelets, a few backed pieces and some isolated lunates... " (GOPHER 1995), and in a later paper, to be published in the Warsaw Proceedings, the data are more detailed and illustrated. As for Gilgal I, the lithic assemblage has not been fully published, however personal observations suggest that even if no lunates are found, a microlithic element is surely present.

Kuijt comments on the Khiamian entity. Quoting Garfinkel and Nadel (1989) and Nadel (1990) he summarizes their view '... the presence and absence of *lunates and* microliths at PPNA settlements are a result of interassemblage variability and *differential sampling* of roughly contemporaneous PPNA settlements". Without acknowledging what has been quoted, as far as we could understand, Garfinkel and Nadel conclude that Gesher is a Sultanian site with bifacial tools, el Khiam points and microliths including *lunates*. In their view the Khiamian, in as much as it is not a post-depositional mixture in PPNA sites that have an earlier Natufian component – or in other words a "baby" of unsuccessful archaeological/stratigraphic parents – warrants no title and it can be seen as a part of Sultanian variability (further discussed in Nadel 1990).

Dealing with this issue and using his finds from 'Iraq ed-Dubb (KUIJT 1991;1994b), Kuijt (1996) makes the same claim again "... the presence of lunates at some PPNA settlements and not others is due to mixing of derived Natufian materials with those from the PPNA..." He goes on with an example of his own work at Iraq ed Dubb claiming that while "... *Modifying* the preliminary, pre-laboratory analysis of chipped stone... of 'Iraq ed Dubb... , detailed study of the spatial distribution of diagnostic artifacts indicates that Hagdud truncations... and el Khiam points come from the PPNA occupational levels... while the lunates are associated with Late Natufian..." Some comments on this:

a. There are PPNA settlements with no Natufian component that have microliths and lunates, such as Gesher, 'Ain Darat and Netiv Hagdud. Even Jericho may join here if we are ready to accept one of Crowfoot Payne's (1976; 1983) options for the three PPNA lunates, or we argue that these three backed lunates presented as derived from the Natufian together with other microliths (CROWFOOT PAYNE 1983:663) are not derived [Just for clarification, some details on this: Natufian in Jericho was only found in Area E I, II, V. The Natufian lunate originates in this area Stage I, Phase i. Two of the "derived PPNA Sultanian" lunates are from this area as well (Stages V and *VI,* Phases xxv and xxx-xxxa respectively) while a third "derived" lunate is from Trench I where no Natufian was found at all].

b. What does "Modifying" mean? Does it include a change in field observations too? Does it mean changing observed field stratigraphy? Are the plans and sections published in Kuijt *et al.* (1991) to be modified as well? Is the assemblage presented from floor 007 described as "...the diagnostic lithic materials recovered from floor Locus 007 include very small lunates, Hagdud truncations and el Khiam projectile points, all of which are recognized temporal indicators of the PPNA period..." Neolithic? Is the C-14 sample from below floor 007 (on floor 010?) dated to 9950 bp also to be modified? Kuijt goes even further in 1991 to say that "Interestingly, the majority of diagnostic stone tools recovered from below this structure (the one with floors 007 and 010) fit within the Early Neolithic period (Hagdud truncations, el Khiam points and very small lunates)..." Kuijt and his co-authors summarize their experience at the site saying that "... The 1990 excavations indicate that the majority of lithic material recovered represents a microlithic industry more similar to that of the Khiamian than to the Sultanian. Moreover, the presence... and a *well established microlithic and bladelet industry* all lend support to the chronological placement of this site in the PPNA period..." It seems that the Khiamian that was well in order in 1991 lost its "charm" from 1994/5 onwards.

One last point Kuijt (1991) notes is the absence of Hagdud truncations from Dhra', and in a general statement he relates this either to differential functional activities in PPNA sites, *archaeological sampling*, or technological adaptations in marginal areas. As has been shown by Nadel (1988;1994), Hagdud truncations appear in all types of Sultanian sites in various frequencies. It seems to us that at least a question about the Dhra' sample is in order here.

Summarizing Kuijt's arguments in his 1996 paper, he claims that microliths/lunates in PPNA assemblages are a result of Natufian contamination. PPNA assemblages without microliths/lunates are classified as Sultanian, and thus the Khiamian does not deserve a place in the record, being a mere archaeological failure/mistake.

The presence of microliths/lunates in PPNA sites with no Natufian substrata has already been noted. Furthermore, the production of microliths is an important industrial/ technological subsystem. It involves a whole sequence of choices and an established procedure for knapping bladelets and shaping them. The bladelet industry was clearly a major component of Epipaleolithic flint working. It continued through the early parts of the Neolithic period, coming to an end only in late PPNA, or if we wish, in the EPPNB. This mode of production had a long history in the Levant and should not be treated at the same level as a specific tool type. The absence of lunates does not imply an absence of microliths, nor bladelet production. Kuijt's data from Dhra' may support this argument as far as his dates and lithic descriptions go, namely the disappearance of the microlithic element late in the PPNA and not at its beginning. However field work, dates, and publication of analyzed material are necessary for better evaluation.

Other tool types relevant to the Khiamian - Sultanian issue, such as bifacials or sickle blades, ought to be discussed. For example, it is important to know whether the Dhra' bifacials have a working edge shaped by a transversal blow if the sickle blades include Beit Taamir knives.

References to other definitions of the Khiamian, such as those given by Bar-Yosef (1981) or Cauvin (1989) were not made. These could do much to clarify the issue, which was the center of Kuijt's paper. May we assume that this relates to the fact that Netiv Hagdud (major in causing Kuijt's paradox) and Mureybet are not involved in the discussion on Natufian-PPNA mixtures?

Finally, the modification of interpretation is in many cases a must and a duty of the researcher. However, basic data and facts,

especially archaeological field observations (which cannot be repeated), are not to be discarded easily. Modification of data cannot be offered as a simple solution for the issue under discussion without justification and defence of the modification. Without strong justification, such modification seems to be a cheap means of supporting a thesis, and a dangerous and problematic stage in the interpretative dialectic.

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* Italicized words are all by the authors of this paper.

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Transverse Grooved Stones and the Neolithisation of Eastern Europe

Klaus-Peter Wechler
Seminar für Ur- und Frühgeschichte,
Freie Universität Berlin

In terms of cultural connections in Neolithic and pre-Neolithic times, transverse grooved stones seem to be a very interesting group of artefacts. In their typical form they are about 10 cm long, roughly ovate in shape and plano-convex in section. On the convex face a deep, mostly concave groove runs across the short axis in the approximate center of the stone. Traces of use show that the groove is connected with the use of this stones. Transverse grooved stones are made of steatite or related types of non- or low-abrasive stone. These artefacts, often called "Poliroval'niki" in Russian and Ukrainian literature, are well known from the Neolithic and Eneolithic cultures of the steppe- and woodsteppe-zones of Eurasia (OKLADNIKOV 1966: 122). Information is widespread in the literature. Publications of D. Ja. Telegin (1968: 149) and V.N. Danilenko (1969, 10) also give general reference to similar findings in the Near East. I collected this material recently and found 51 published stations with transverse grooved stones in Eurasia and the Near East. In the Neolithic of Southeastern Europe this artefact type is absent. The Eurasian stations lie between the Southern Bug (Ukraine) in the west and the Minusinsk Basin (western Siberia) in the east. All the findings in the east seem to be rather young: a smaller part of them belongs to the Neolithic, but most of them to early metal ages.

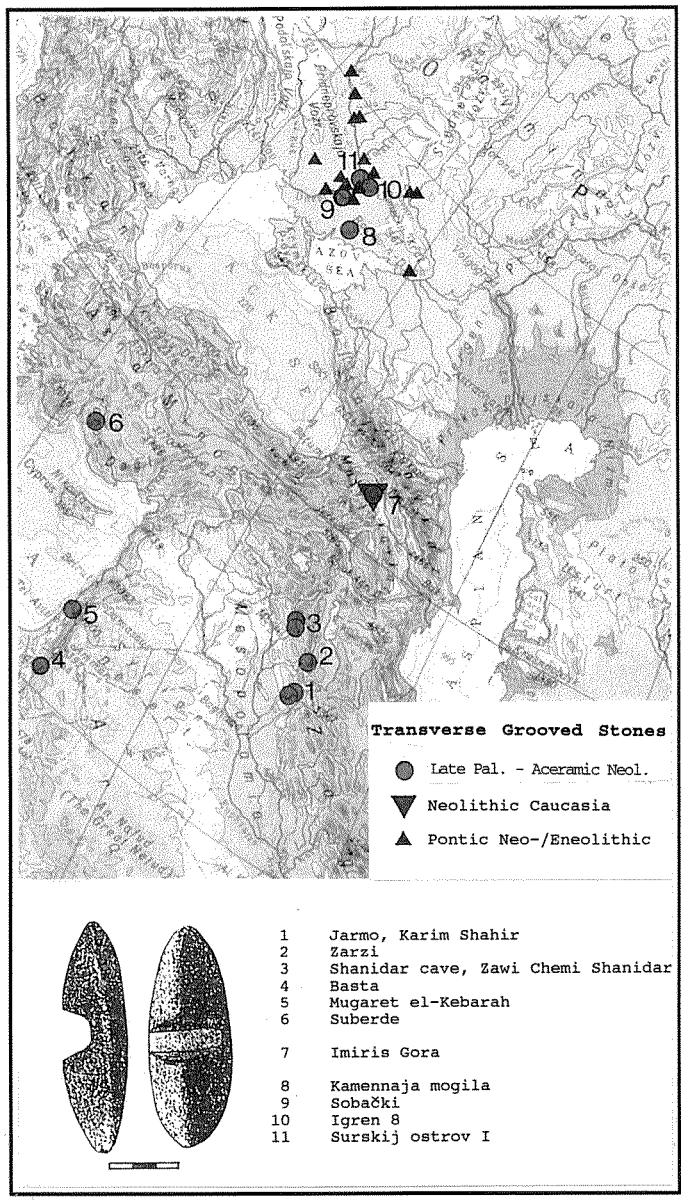

Fig. 1. Distribution of transverse grooved stone evidence in Eurasia.

The transverse grooved stones from pre-Neolithic (or better, pre-ceramic) contexts are interesting. In the study area they are only found in the Near East and in the Northern Pontic zone (Fig. 1). The Near Eastern pieces emerge in the late Upper Paleolithic (Zarzi layer B, Mugharet el-Kebarah layer B). Most of them belong to complexes of the Protoneolithic and the Aceramic Neolithic. In Jarmo they are also present in layers of the Ceramic Neolithic. The best information about transverse grooved stones from pre-ceramic contexts in the Northern Pontic comes from Igen 8 in the Dnepr region. There the fragments of such an artifact was found in a house pit of the Mesolithic Kukrek culture. The house is dated to the middle of the 8th millennium cal. BC (Bln-1798, 8550 ± 80 bp or 7470-7610 cal. BC). It means the complex is chronologically comparable to the Aceramic Neolithic of the Near East. The other Northern Pontic pieces are from aceramic layers of Surskijostrov I, Sobaki and Kamennaja Mogila, stations that in their flint are comparable to Igren 8.

What about the function of the transverse grooved stones ? The most complete discussion is given by R.L. and R.S. Solecki (1970: 836-838). Ethnographic parallels and traces of heat and

use wear show that transverse grooved stones were probably used for a heat treatment of arrow-shafts made of reed/ Phragmites. They were heated and used for the straightening of shafts of green reed. This means that these artifact were connected with a special technique for weapons, and not direct with a Neolithic economy. Otherwise the transverse grooved stones show the existence of connections, of a transfer of technology between the Near East and Eastern Europe - for a similar discussion on the basis of flint tools see L. Domaska (1990). Through such connections the adoption of Neolithic economy also seems possible, and this probably happened in the Kukrek culture. According to Danilenko (1969: 178, Tab. 1), 10.9 % of the mammals of the aceramic layers of Kamennaja Mogila are determined as sheep/goat. For a broader discussion, complete map and catalog of stations, see Wechler (1997). I would be grateful for more information about transverse grooved stones in the Near East.

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A Note on Lithic Implements for Stone Bowl Production

Klaus Schmidt
Institut für Ur- und Frühgeschichte, Heidelberg Univ.

Stone bowls are a well known from nearly all Neolithic sites in the Near East. But there are few studies about their production and few observations regarding the tools used in this process. So it seems possible, that a group of macrolithic tools used for this manufacture my not have been recognized.

The production of stone bowls is quite well known from Egyptian sites. The crescentic drill and its use have been intensively described as an important tool of this manufacture (HARTENBERG and SCHMIDT 1969, LAUER and DEBONO 1950, CANEVA 1970). From Hierakonpolis (QUIBELL and GREEN 1902: 17, 19, Pl. 32, 62), Buto (SCHMIDT 1988) and several other sites we know of stone bowl workshops. From the Old Kingdom onwards there are iconographic sources for stone, vessel production (e.g. CANEVA 1970). In the Near East there is some record of such tools, too (e.g., Ur: WOOLLEY 1956: 14 pl. 13; Uruk: EICHMANN 1991). There are the typological groups of "Scheiben- (plane), Linsen- (lenticular) Glocken- (bell-shaped) and Halbmondbohrer (crescent-borers)". But from PPN/PN sites with their huge amount of stone vessels, there are few records of any implements for their production (e.g., Jarmo: MOHOLY-NAGY 1983: 294, Fig. 132-7). As several macrolithic surface finds from LPPNB/PN Gürcütepe (SCHMIDT 1997) in southeastern Turkey clearly can be determined as tools for stone bowl production, the aim of this short note is to bring attention to these finds, which probably should exist in other PPN/PN sites. One artefact, made from basalt, can be determined as a "Linsenbohrer (lenticular borer)" (Fig. 2); the others, made from flint, do not fit well in the existing terminology, but are in some respects similar to "Scheibenbohrer" (Fig. 1) and "Halbmondbohrer" (Fig. 3).

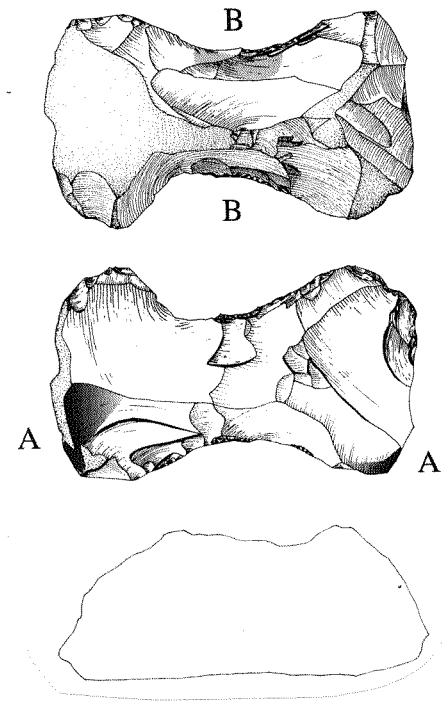

Fig. 1. Gürcütepe I: Silex drill. A abrasion and polish; B gloss, caused by a fork shank (scale 1:2).

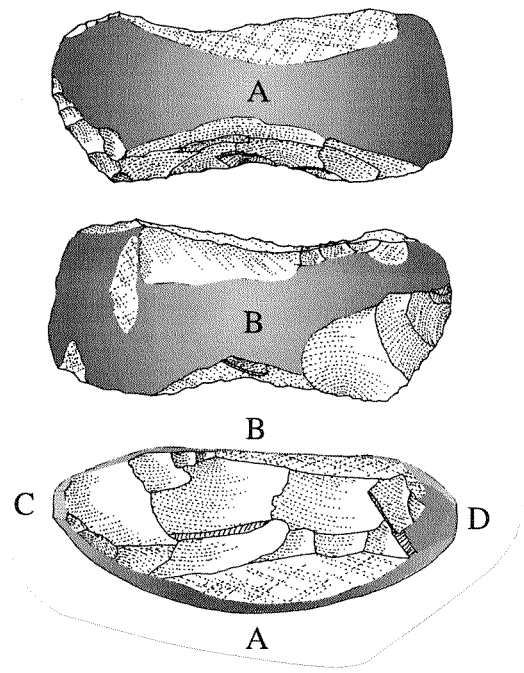

Fig. 2. Gürcütepe III: "Linsenbohrer", basalt. A-D abrasion and polish, four different stages of use (scale 1:2).

Fig. 3: see next page

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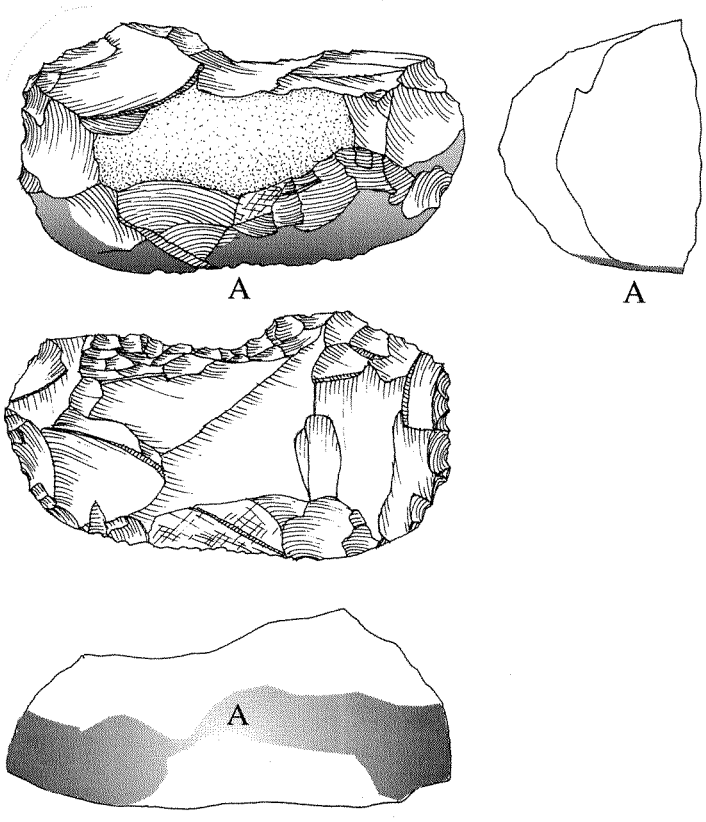

Fig. 3. Gürcütepe I: Silex drill. A abrasion and polish (scale 1:2)

A Further Note on the Blade:Blade Ratio as a Neolithic Phase Discriminator

Gary Rollefson, 'Ain Ghazal Research Institute

In a recent note to *Neo-Lithics* I proposed the use of the relative importance of naviform versus normal blade production as a means of distinguishing between LPPNB and PPNC collections (ROLLEFSON 1996), but it was not possible at that time to provide any statistical support for that proposal. Since then, samples from 'Ain Ghazal, particularly from the excavations in the East Field in 1995, have been examined, and the results are presented in Table 1. In addition to the blade:flake and blade:blade ratios, attention was also paid to the quality of the flint in the samples.

Table 1. Absolute counts and ratios of various characteristics of LPPNB and PPNC lithic collections from 'Ain Ghazal.

Phase	Blade	Flake	Ratio
LPPNB	2344	4002	37:63
LB/PPNC	550	980	36:64
PPNC	549	1186	32:68
	Naviform Blades	**Normal Blades**	**Ratio**
LPPNB	1501	355	81:19
LB/PPNC	177	212	46:54
PPNC	104	222	32:68
	Huweijir Flint	**Wadi Flint**	**Ratio**
LPPNB	1870	913	67:33
LB/PPNC	133	178	43:57
PPNC	115	137	46:54

Blade and flake counts and the resulting blade:flake ratio for the samples are presented in the upper third of Table 1. In this particular case, the distinctions between the LPPNB and PPNC samples are relatively strong, although this is not always the case in a large number of discrete loci. The comparison of the ratio of naviform to "normal" blades is presented in the middle of Table 1, and the contrast between the LPPNB and PPNC values is striking. This aspect of the industries appears to be of great value for making the distinctions between them.

It was noticed in the first excavations of PPNC layers at 'Ain Ghazal that there appeared to be a substantial decrease in the presence of high quality flint in the 6th millennium chipped stone material (ROLLEFSON 1990: 122-123). The lower third of Table 1 reflects the quality of the flint in the samples, although it is admitted that this property ("quality") involves a measure of subjectivity. The "Huweijir flint" refers to the excellent quality material, including purple-pink flint, that comes from outcrops and mines in the Wadi Huweijir a couple of kilometers north of 'Ain Ghazal (QUINTERO 1996), whereas "wadi flint" is a generic term for poorer quality material that comes from either rolled wadi cobbles or outcrops of poor quality cherts immediately around 'Ain Ghazal. Once again, there is a clear distinction in the abundance of high-quality Huweijir flint between the LPPNB and PPNC periods.

The presence of samples in Table 1 attributed to the LB/PPNC category iterates a problem in the attempt to isolate completely the real parameters of the PPNC Ghazalian industry using the deposits at 'Ain Ghazal. First, it should be recalled that there is no hiatus of occupation at 'Ain Ghazal, and therefore a true "transition" occurred that undoubtedly introduced the newer technotypological elements of the early 6th millennium while retaining, in a gradually diminished degree, the older traditional factors from the LPPNB period. Secondly, at 'Ain Ghazal the PPNC is always found overlying LPPNB deposits, and the persistent pit-digging by PPNC inhabitants brought large quantities of older artifacts onto PPNC surfaces, where they were mixed with PPNC materials. This mixing, which is not stratigraphically detectable, results in a dimension of *apparent* gradual transformation; indeed, much of the older material exposed in this way was reused by the later residents, becoming validly incorporated into the PPNC repertoire of discarded artifacts.

The answer for obtaining an "undiluted" definition of the early 6th millennium Ghazalian industry, then, most probably should be sought in archaeological settlements that were first founded at the beginning of the PPNC period, where deposits would not be contaminated unconsciously by the ancient residents.

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Transversal Burins from Nahal Zehora I, A Pottery Neolithic Site In Central Israel

Ran Barkai and Avi Gopher
The Institute of Archaeology, Tel Aviv University

Introduction

Nahal Zehora I is a single component Wadi Raba (late Pottery Neolithic) site in the Menashe hills, not far from Megiddo. The site was excavated in 1987 and 1990, exposing a total of 100 m^2 using 1x1 m grid and a 2.4 mm mesh for all sediments. The site yielded rich pottery and flint assemblages as well as some architectural remains and an assemblage of domesticated animals. The flints from the 1987 season were published (GOPHER and ORRELLE 1989), while the major

assemblage was studied recently (BARKAI 1996). It consists of 3,902 shaped tools, 1,292 of which are burins (33%). Other tool categories are retouched flakes and blades (38%), notches and denticulates (10%), sickle blades (6%) and bifacial tools (2%). Truncations, awls/borers, scrapers and varia appear in small numbers. Only a single transversal arrowhead was found.

Transversal burins from Nahal Zehora I

The most common tool type in the assemblage was the transversal burin, which constitutes 72% (923) of the total burin sample. The other burin types are: burin on a break (12%), burin on truncation (10%), dihedral burin (5%) and double burin (2%). Some of the transversal burins of the 1987 season at Nahal Zehora I were previously defined as chamfered pieces (GOPHER and ORRELLE 1989: 71). This definition related to 19 items and was based on the fact that the scar of the transversal blow was dorsal (visible on the dorsal face only) which was in accordance with the definition of similar pieces from Middle/Upper Paleolithic contexts (e.g. BERGMAN 1987, GORING-MORRIS and ROSEN 1989, NEWCOMER 1968-9). Most of the other burins (40/47) were classified as transversal burins (GOPHER and ORRELLE 1989: 71). Having had the opportunity to study the whole assemblage, we realized that the transversal blow, in most of the tools, removed equal parts of the dorsal and ventral faces and was perpendicular to the tool axis (not oblique as required for a chamfered piece definition NEWCOMER 1968-9: 300). We thus decided to classified all these items in the assemblage as transversal burins.

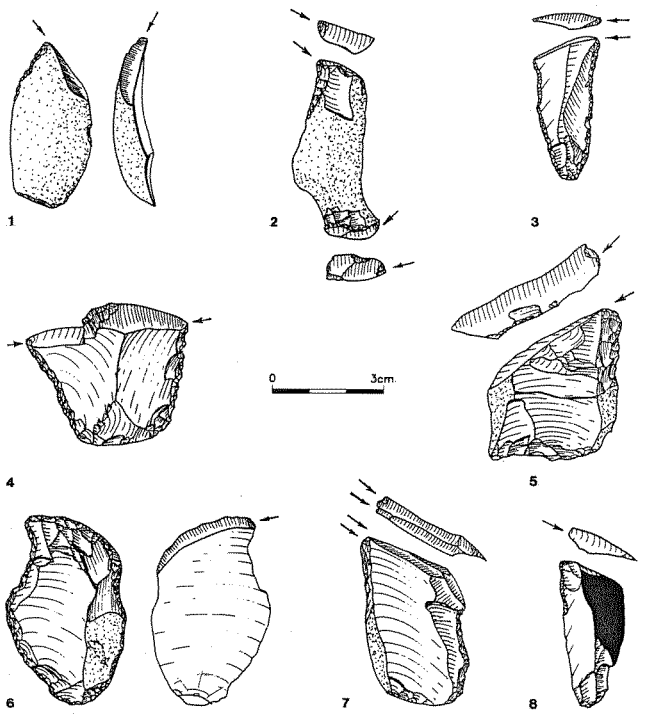

Fig. 1. Transversal burins from Nahal Zehora I.

Of the 923 transversal burins, 900 retaining the bulb of percussion were chosen for a detailed study and attribute analysis. In 98% of the cases the transversal blow was applied at the distal end. All the observations were conducted with the dorsal face toward the observer and the proximal end regarded as the lowermost part of the tool. The length and width measurements were taken from the ventral face. The flaking angle was measured in 5 degree intervals from the intersection point of the lateral striking platform and the flaked surface.

All the transversal burins were made on a high- to medium-quality flint, mainly brown or gray in color. Two-thirds (67%) of the burins were made on flakes and 33% on blades. A third (32%) of the burins were made on primary elements, 3% on core trimming elements and a single one was made on a bifacial thinning flake bearing polish (Fig. 1:8). Ten percent of the burins bear transversal blows on both ends (Pls. 1-2). The orientation of the transversal blow was identified by the negative of the bulb of percussion. Over two thirds (69%) of the transversal burins were flaked from the left side of the blank, 25% were flaked from the right hand side, 5% were flaked from both sides and the flaking orientation of *ca.* 1% of the burins could not be identified.

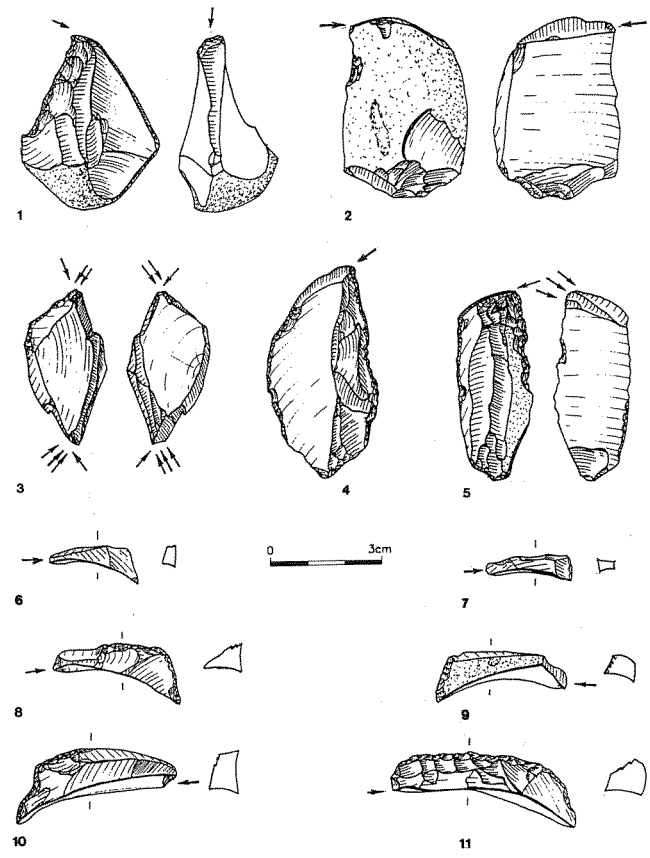

Fig. 2. Transversal burins and spalls from Nahal Zehora I.

The preparation of the side from which the blow was struck shows semi-abrupt to abrupt retouch. This retouch modifies the "striking platform" and enables a more accurate blow. Retouch on the opposite side was made in order to restrict the blow and determine the point were it should end. One can assume that the blow was carried out while the knapper held the piece in his/her hand and delivered the blow using a hammerstone, or by striking the piece against an anvil. The renovation of the "working edge" was carried out, in most cases, from the same side as the original blow. This enabled a long sequence of use and resharpening, exploiting the length of the blank from the same striking platform.

One of the most significant attributes of the transversal burins is the flaking angle. Over half (57%) of these burins were flaked at an angle between 80-100°, 32% at an angle between 60-80° and finally 11% at an angle between 40-60°. Thus selection of specific blanks was according to flaking angle. In making acute transversal burins (40-60°), blades were preferred; for blunt transversal burins (80-100°) flakes were preferred. Of the blunt burins 64% were made on flakes, as opposed to 43% of the acute burins; 28% of the blunt burins were made on blades, while in the acute burins blades constitute 49.5% (Diagr. 2).

Most of the transversal burins (72%) bear a single flaking scar. It is possible, however, that the last blow removed earlier scars. In 19.5% of the burins, scars of two transversal blows were observed; in 8.5% three blows were detected. In 41% of the cases only the side that was used as a striking platform was retouched. Another 43% show retouch on both sides, 8.5% bear a lateral notch that functioned as a striking platform for the transversal blow, and in 8% of the burins there is no identifiable modification before the transversal blow was applied. The study of flaking quality indicates that in 67% of the cases the transversal blow was carried out successfully, reaching from one side of the artifact to the other; in 13% of the burins the blow was only partially successful and did not reach the other side (Fig. 1:4). In some cases (18%) a "correction" blow was applied in order to remove the previous scar and shape the "working edge" in the desired manner (Fig. 1:7). The "correction" blow

was not a perfect solution since in some cases it did not remove the previous scar and did not reach the other end (Fig. 1:4).

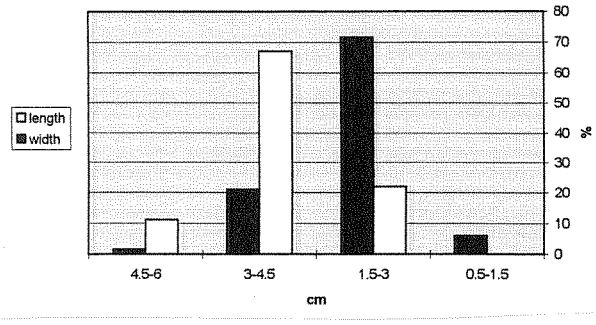

Diagramme 1. Transversal burins by length and width.

Length and width measurements are presented in Diagr. 1. Most of the transversal burins (89%) are less than 4.5 cm in length (note that the transversal blows necessarily shorten the blank, especially if there are recurring blows) and between 1.5-3 cm. in width (71.5%). Relating width measurements to flaking angles reveals that there are three distinct groups: 90% of the acute transversal burins measure in width between 1.5-3 cm., as opposed to 65% of the blunt and 76% of the burins that were flaked in a 60-80° angle. In addition, only 8% of the acute burins are wider than 3 cm., as opposed to 28% of the blunt burins and 18% of the burins flaked in 60-80° angle (Diagr. 3). This indicates the selection of relatively narrow blanks for acute angle transversal blow and wider blanks for blunt burins. The thickness of 55% of the transversal burins ranges between 0.5-1 cm., 31.5% ranges between 1-1.5 cm., 6% are thinner than half a centimeter, while the rest (7%) are thicker than 1.5 cm.. One fifth of the transversal burins show retouch that was made on the flaked surface after the transversal blow (Fig. 1:8; 2:5).

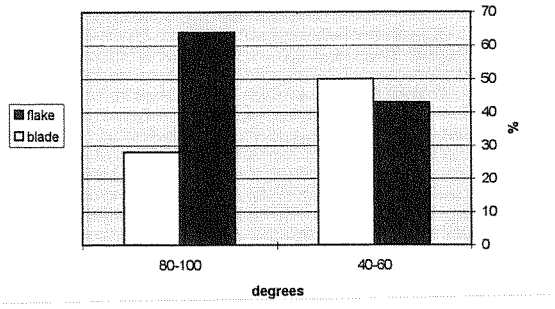

Diagramme 2: Blank types and flaking angles.

The differentiation between transversal burin spalls and spalls from other types of burins is not easy. The perpendicular blow removes a spall with a rectangular cross section (Fig. 2:6-11), as opposed to the rhombus cross section of the chamfered piece spall (see GOPHER 1989: Fig. 31). The transversal burin spalls are mostly arched in shape, have a square cross section and sometimes bear retouch on the striking platform, which was part of the retouched side. In some cases the transversal burin spalls bear retouched parts at the opposite side of the striking platform (Fig. 2:8-11). Secondary transversal burin spalls bear scars of previous flaking on their dorsal face (Fig. 2:6-10). Spalls of other types of burins (dihedral, on truncation, etc.) are usually elongated, having two ventral faces and a triangular cross section.

The Nahal Zehora I flint assemblage includes 814 burin spalls, and 675 of them were characterized as transversal burin spalls. The spalls and the burins were made of the same raw material. A majority (70%) of the spalls were flaked from the left side of the blank while 25% were flaked from the right hand side. Transversal burin spalls made on primary elements constitute 27% of the spalls. More than half of the burin spalls (53%) are secondary spalls that bear previous burin scars on the dorsal face.

Discussion

Since every third flint tool in the Nahal Zehora I assemblage is a burin, it is assumed that the burin played a major role in the activities carried out by the site's inhabitants. While the manufacturing techniques used in making the transversal burins are reconstructable using detailed attribute analysis and experimental flaking, the function of these tools remains unclear. The transversal burins are different from the other burin types, not only in terms of flaking techniques but also in shape of the "working edge". The transversal blow creates a rounded and abrupt edge, quite different from the sharp edge of other burins, created by the intersection of the flaked surface and the striking platform. In addition, in most of the burin types the "working edge" is located at a prominent location, while the curved and abrupt scar of the transversal burin resembles a scraper edge in appearance (see also GOPHER 1989: 68; GORING-MORRIS and ROSEN 1989: 35).

There is a clear preference for the use of flakes for the manufacture of transversal burins (67%) and for executing the burin blow from the left side (69% of the cases). Similar preference of the left side was indicated in the chamfered pieces from Jericho (86%, CROWFOOT PAYNE 1983: 694), Munhata (GOPHER 1989: 68) and Ksar Akil (NEWCOMER 1968-9: 299). This preference could be of functional and/or stylistic significance. In addition, it is possible that the flaking orientation is related mainly to the way the piece and the hammerstone were held in the knapper's hand, thus indicating the handedness of the tool maker.

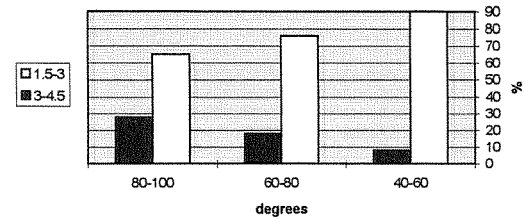

Diagramme 3: Flaking angles : width of transversal burins.

It might be argued that the acute burins (40-60°), which represent a minority of the transversal burins (11%), were made mostly on blades (49.5%) and have a sharp, prominent edge that could be assigned to the burin class. The blunt burins (80-100°, 57%) should be regarded as a different tool type, despite the fact that they were manufactured by a burin blow. Assuming that the tool's edge is significant for its use, it does not seem appropriate to include both types in the same category. The distinction between these two transversal burin types is based on blank selection, metric characteristic and flaking angle. The "edge" of the blunt burins looks similar, in some cases, to a "scraper edge", but the absence of retouch and use signs on this edge does not allow such definition.

The number of the transversal burin spalls (n = 675) is lower than the number of the burins themselves (n = 923). The mismatch is even more emphasized if we keep in mind that more than one spall was removed from some of the burins. Refitting experiments that lasted 50 hours turned out to be completely unsuccessful. No match was found between the burins and the spalls or among the spalls themselves. The fact that we do find burin spalls on site means that burins were manufactured and resharpened on site, but the mismatch in numbers and the unsuccessful refitting experience indicate that these tools went through additional episodes of resharpening, possibly off site. It is possible that the tools were used off site (or at an area of the site that was not excavated), where they were resharpened and than brought to the site and probably renovated again. Despite the fact that the *chaine opératoire* of this tool is not fully reconstructed, the large number of transversal burins and resharpening and renovating spalls of this tool indicate a frequent use.

In relation to the problem of function, a recent study by Barton and others (1996) suggests that there is a considerable functional diversity among stone artifacts reduced by burination. In addition to the engraving, scraping and cutting activities traditionally related to the burins, one should add the possibility of burins acting as cores for the production of spalls. They also suggest that the burin blow is a technological means for creating "working edges", like different kinds of retouch (Barton *et. al.* 1996). The perception that burins are not necessarily a single purpose tool type but the products of a specific technology that

were made for diverse functions may be helpful in understanding the wide chronological and geographical range of these tools.

Finally, "burin sites" are known in the southern Levant, mainly from Jordan (e.g. BETTS 1987, ROLLEFSON 1988). The nature, function and chronology of these sites is not yet completely reconstructed. It was argued recently by Rollefson (1995) that the changes in function of burins at 'Ain Ghazal corresponds to change in ecology and in environmental exploitation. Rollefson suggests that the intersite differences in burin indices represent different subsistence economies. Sites rich in burins are interpreted as representing pastorally oriented groups, while sites with low burin frequencies represent agriculturists. In addition, Rollefson suggests that transversal burins may be related to the exploitation of wood and/or woodland associated animals (1995: 516-7).

Nahal Zehora I is a "burin site" if we wish to call it so. The chronology and cultural assignment of the site are firmly based on a characteristic pottery repertoire and flint assemblage, including characteristic Wadi Raba sickle blades and bifacial tools (BARKAI 1996). The economy of Nahal Zehora I was based on agriculture and domesticated animals. However, the composition of the tool assemblage and the large number of burins makes this site unique (GOPHER n.d.).

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Recent Dissertations and Theses

➪ MILLER M.A.

1997 *Jewels of Shell and Stone, Clay and Bone: The Production, Function and Distribution of Aegean Stone Age Ornaments.* Boston, Boston University: Unpubl. doctoral dissertation.

This study is an exploration of the social and economic organization of the Aegean Neolithic through an examination of the systems of production, function, and distribution of personal ornaments. The broad geographical distribution of several ornament types, especially those manufactured from *Spondylus* shell, are evidence of long-distance trade in the Late Neolithic. This trade was perhaps controlled by emerging elites. By documenting evidence for craft specialization, social differentiation and long-distance trade in the Aegean Neolithic, and changes in the socio-economic system surrounding ornaments over time, this study challenges the traditional model of social organization in the Aegean Neolithic and posits a more dynamic, complex, and hierarchical society in its place.

➪ BARKAI R.

1996 *The Flint Assemblage From Nahal Zehora I, A Wadi Raba Site in the Menashe Hills: The Implications of a Technological and Typological Analysis.* Tel Aviv, Tel Aviv University: unpubl. M.A. Thesis (Hebrew with English summary).

The first comprehensive analysis of flint assemblage from a single component Wadi Raba site (Pottery Neolithic, Fifth Millennium B.C.) in central Israel. A detailed technological and typological study of the cores, tools and debitage, focusing on the manufacturing techniques and an attribute analysis of the major tool classes. The theoretical part of the thesis deals with innovation processes, technological change and cognitive aspects of the of the flint industry such as decision making, planning and executing abilities and technological choices. Email: barkaran@post.tau.ac.il

Notes and News

The next meeting of the Non-Formal Tools (NFT) Working Group will be held in Amman at the German Protestant Archaeological Institute on 26 July, 1997. Co-ordination: Gary O. Rollefson, address see cover (after 15 June c/o email: gpia@go.com.jo).

New Publications

➪ AKKERMANS P.M.M.G. (ed.)

1996 *Tell Sabi Abyad. The Neolithic Settlement* I-II. Istanbul, Nederlands Historisch-Archaeologisch Instituut.

➪ BAR-YOSEF O. and GOPHER A. (eds.)

1997 *Netiv Hagdud. Part I: The Archaeology of Netiv Hagdud.* Cambridge: American School of Prehistoric Research Bulletin 43. Paper; 280 pp., 62 line drawings, 74 halftones. Price: $45.

➪ TCHERNOV E.

1994 *Netiv Hagdud. Part II: The Fauna of Netiv Hagdud.* Cambridge, American School of Prehistoric Research Bulletin 44. Paper, 116 pp., 50 line drawings and maps. Price: $20.

(Note: Order BAR-YOSEF and GOPHER (eds.) and TCHERNOV from University Museum Publications, University of Pennsylvania Museum, 33rd and Spruce Streets, Philadelphia, PA 19104 USA. Phone: 215-898-4124; Fax 215-898-0657. Add postage and handling: minimum $3.50 or 5% of total order in USA; outside USA, add minimum $5 or 10%. Orders from individuals must be accompanied by payment in full; checks drawn on US banks or money orders in US currency, made out to "University of Pennsylvania". Visa/MasterCard gladly accepted).

➪ ROSEN S.A.

1997 Lithics After the Stone Age: A Hand-book of Stone Tools from the Levant. Altamira Press, Walnut Creek Calif., London, New Delhi.

The end of the Stone Age did mean the demise of lithic technology in the Levant, Egypt and the Near East. While generally neglected by archaeologists, stone tools regularly appear in strata dating over two millennia after the beginning of the Bronze Age. In this volume, Steven A. Rosen has produced the first in-depth analysis of this important corpus. For Near Eastern archaeologists, he provides a comprehensive typology and description of post-Neolithic tools -including subtypes, function, distribution, and chronology- allowing for easy identification of lithic materials found in excavations. For lithic specialists of all geographic regions, he offers insightful interpretative essays on the organization of production and

distribution, tool function, style, and the complex relationship between lithic and metal technology, providing an important comparative anthropological lens for th study of lithics. Over 100 illustrations.

Conferences and Meetings

Conference on "Anatolian Prehistory on the Crossroads of Eurasia and Africa"

Liège University, 28 April - 3 May, 1997

From 28 April to 3rd May 1997 a conference on "Anatolian Prehistory on the Crossroads of Eurasia and Africa" was held at the University of Liège/Luik. Beside papers on Paleolithic subjects, sessions about Karain, Öküzini, Umm el-Tlel and early Holocene cultures of southeastern Europe, there were several papers on the PPN. It started with a presentation of Michael Morsch, "Die Tonobjekte von Nevali Çori: neue Perspektiven in der figürlichen Plastik des Akeramischen Neolithikums", which focused attention to the nearly total lack of animal figurines and the existence of both female and male figurines in equal numbers at this site. K. Schmidt ("Ikonographische Befunde des vorderasiatischen Frühneolithikums (PPN) und ihre Deutungsmöglichkeiten") evaluated the interpretations of figurine finds of the PPN in the light of the new limestone sculptures of Göbekli Tepe. Stephan K. Kozłowski ("Neolithic Chipped Industries of Greater Mesopotamia") mapped the distribution of PPN lithic industries and traditions. Avi Gopher ("Notes on Cultural Contacts in the Neolithic Period: Anatolian Obsidian in the Levant") presented a PN site in Israel with a unusually high proportion of obsidian artefacts. Douglas Baird ("Late Pleistocene to Early Holocene Settlement on the Konya Plain") and Catherine Kuzuzuoğlu, Michel Fontugne and Moustafa Karabiyikoğlu ("Environmental Changes in Anatolia During the Holocene: Examples from the Konya Plain, Inner Anatolia") gave preliminary results of survey projects in the region of Çatal Hüyük. Nur Balkan-Atlı and Marie-Claire Cauvin ("Obsidian in the Neolithic in Central Anatolia. From Raw Material to Workshops and Settlements") presented new results from the atelier sites of Kaletepe and Ritlikeler. Jak Yakar ("The Question of Social Structure in Neolithic Anatolian Communities") undertook a theoretical analysis regarding questions of demographic development in the PPN. Synthesis contributions were given by Harald Hauptmann ("Zur Entwicklung und Funktion frühneolithischer Siedlungen") and M. Özdoğan ("Redefining the Neolithic in Anatolia in the View of Recent Excavations"), both emphasizing the importance of the large scale excavated sites of Çayönü and Nevali Çori in Upper Mesopotamia as well as the unexpected new perspectives given by sites like Göbekli Tepe. (Communicated by Klaus Schmidt)

Symposium on: Central Settlements in Neolithic Jordan

Wadi Musa/Petra, Jordan, 21-25 July 1997

A five-day symposium (Patronage: HRH Prince Raad), organized by Hans-Dieter Bienert and Hans Georg K. Gebel on behalf the German Protestant Institute for Archaeology (Amman) and *ex oriente*, Free University of Berlin will be held at the Mövenpick Hotel in Wadi Musa/Petra in Jordan from 21-25 July 1997. The symposium will concentrate on topics related to the human ecology, social organization, proto-urbanism, changes in subsistence economy, symbolism etc. of the Late PPNB mega-settlements east of the Rift Valley. It is aimed to help mutual and "fresh" understanding of this phenomenon only becoming more obvious the last years. Thus the policy of the organizers was to bring together only colleagues directly involved in the study of these sites. Field trips to the sites (Ba'ja, Beidha, Basta, 'Ain Jammam, es-Sifiya, Wadi Shu'eib and 'Ain Ghazal) will support the discussion. A special section is devoted to urgent restoration questions. (communicated by Hans Georg K. Gebel and Hans-Dieter Bienert)

Hereafter we publish the preliminary programme:

late 21st — **Registration in the Hall of the Petra Mövenpick Hotel**

18:00 — **Welcoming Addresses and Opening Lectures**
(chairman: Zeidan Kafafi)
Opening Address by H.R.H. Prince Raad
H.E. Ghazi Bishi: Opening Address on Behalf of the Department of Antiquities
H.E. Kamal Mahadin: Opening Address on Behalf of the Petra Regional Council
Hans-Dieter Bienert, Hans Georg K. Gebel, and Gary O. Rollefson: Proto-Urban Tribal Centers?
Hans J. Nissen: Proto-Urbanism, an Early Neolithic Feature?
Section Discussion

22nd — **Spatial Organization** (chairman: Hans J. Nissen)
Hamzeh M. Mahasneh: Spatial and Functional Features at es-Sifiya
Muhammad Najjar: Chronology and Complex Settlement Organization in the Southern Levantine PPNB : the Case of Ghuwair I
Muhammad Waheeb and Nazeh Fino: Evidence of Settlement Organization at 'Ain Jammam
Douglas Baird: Large Settlements - a View From The Arid Zone.
Zeidan Kafafi: The Collapse of the Late PPNB Settlement Organization: The Case of 'Ain Ghazal
Section Discussion

Social Organization (chairman: Gary O. Rollefson)
Brian F. Byrd: A Perspective on Large PPNB Settlements from the Small PPNB Community of Beidha
Gary O. Rollefson: Proto-Urbanism, a New Concept of Social Organization in the Early Neolithic
Hans-Dieter Bienert: Where are the dead?
Bo Dahl Hermansen: Patterns of Symbolism in the Late PPNB
Ian Kuijt: When the walls came down: Social Organization, Ideology and the End of the Aceramic Neolithic.
Leslie A. Quintero: Stratification of Labor and Economic Organization of Lithic Industries in Neolithic Central Settlements
Mujahed Muheisen: (Late PPNB Tool Kits at Basta, 'Ain Ghazal and Sifiya)
Section Discussion

23rd — **Excursion to 'Ain Jamam, Basta, Ba'ja, and Beidha**

24th — **The Human Ecology** (chairwoman/ chairman: Cornelia Becker and Reinder Neef)
Margit Berner and Michael Schultz: The Anthropology of the Late PPNB Population of Basta
Michael Schultz, Margit Berner, and Tyede H. Schmidt-Schultz: Morbidity and Mortality of the Late PPNB Population of Basta
Alan Simmons: Regionalism During the Neolithic. The Case of Diversity in Jordan
Cornelia Becker: Ecological Implications of Hunting in the PPNB Pastoralism
Hans Georg K. Gebel: Core and Corridor Areas for the Spread of Large Complex Settlement Organization in Jordan
Ilse Köhler-Rollefson: The Late PPNB Environment as Viewed from Faunal Remains at the Major Sites
Reinder Neef: Palaeoenvironment During the PPNB, and its Exploitation
Phil Wilcke, Leslie A. Quintero, and Giles Waines: The Emergence of Domestic Cereals in PPN Economies As Seen From the Sickle Blade Data and Replicative Studies
Section Discussion

Symposiums' General Discussion
(chairmen: Hans Dieter Bienert and Hans Georg K. Gebel)

The Post-Excavation Fate: Brainstorming Session on Restoration Measures (chairman: H.E. Ghazi Bishi))

after 'isha — **Traditional Bedu Meal in the Siq Umm al-Hiran (near Beidha/ Ba'ja)**

25th — **Excursion to as-Sifiya, Wadi Shu'aib, and 'Ain Ghazal**

evening — **Good-Bye Reception and Drinks at the German Protestant Institute for Archaeology, Amman**

List of participating colleagues: Douglas Baird, Cornelia Becker, Margit Berner, Hans-Dieter Bienert, H.E. Ghazi Bishi, Brian F. Byrd*, Bo Dahl Hermansen*, Ricardo Eichmann, Suleiman Farajat, Nazeh Fino, Helge Fischer, Hans Georg K. Gebel, Khaleed Abu Ghaneima, Frank Hole*, Zeidan Kafafi, Ilse Köhler-Rollefson*, Ian Kuijt, H.E. Kamal Mahadin, Hamzeh M. Mahasneh, H.E. Peter Mende, Inge and Peder Mortensen, Mujahed Muheisen, Bernd Müller-Neuhof, Muhammad Najjar, Reinder Neef, Margreth and Hans J. Nissen, G.F. Pedotti, Nabil Qadi*, Leslie A. Quintero, H.R.H. Prince Raad, Gary O. Rollefson, Ziad al-Sa'ad*, Tyede H.Schmidt-Schultz, Michael Schultz, Ahmed Al-Shiyyab, Alan Simmons, Muhammad Waheeb, Giles Waines*, Phil Wilcke

** not yet decided to come (in person)*

The meeting calendar 1998 is going to get pretty tight:

3rd Workshop on PPN Chipped Lithics Industries, 1998 (Venice)

Isabella Caneva is currently organizing the *3rd Workshop on PPN Chipped Lithics Industries (1998)* and will mail the first circular to prospective participants soon. Please note that the meetings will be held in Venice, and not in Rome as originally planned. (communicated by Klaus Schmidt)

1st International Congress on the Archaeology of the Near East, 18-23 May, 1998 (Rome)

A *1st International Congress on the Archaeology of the Near East* is going to be held at the University of Rom "La Sapienza" during the late spring of 1998, organized by Manfred Bietak, Bartel Hrouda, J.-C. Margueron, Paolo Matthiae, Roger Moorey, Ingolf Thuesen, Maurtits van Loon, and Irene Winter. It will cover the Neolithic to Alexander the Great, from Anatolia to Arabia/Iran to the Mediterranean. The scientific commitee of the congress propose the following themes to the colleagues:

1) Problems of chronology and technology during the Bronze- Age
2) Memory of the past and transmission of images in the artistic and architectural traditions
3) Change and crises: archaeological Realities and interpretative models
4) Excavation and survey activities in the nineties.

Contacts: Secretary of Congress, Dr. Frances Pinnock, Via Palestro 63, I-00185 Rome, tel. 0039 6 4466611, fax 0039 6 4940582, e-mail: licaane@axrma.uniroma1.it.

VIIth Conference on the History of and Archaeology of Jordan, June 1998 (Copenhagen)

The *VIIth Conference on the History of and Archaeology of Jordan* will be held from 14th-19th of June, 1998 in Copenhagen, organized by the University of Copenhagen, Dept. of Biblical Exegesis. The title of the conference is: Jordan by the Millennia. Contacts: e-mail: strange@teol.ku.dk

Deadline for the coming issue of NEO-LITHICS 2/97 is **November 15th, 1997.**

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Publications in Preparation :

Stefan K. Kozlowski and Hans Georg Gebel (eds.), *Neolithic Chipped Stone Industries of the Fertile Crescent, and their Contemporaries in Adjacent Regions.* Studies in Early Near Eastern Production, Subsistence, and Environment 3, 1996. (appears 1997)

Hans Georg Gebel, Zeidan Kafafi, and Gary O. Rollefson (eds.), *The Prehistory of Jordan II: Perspectives from 1996.* Studies in Early Near Eastern Production, Subsistence, and Environment 4, 1997. (appears 1997)

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