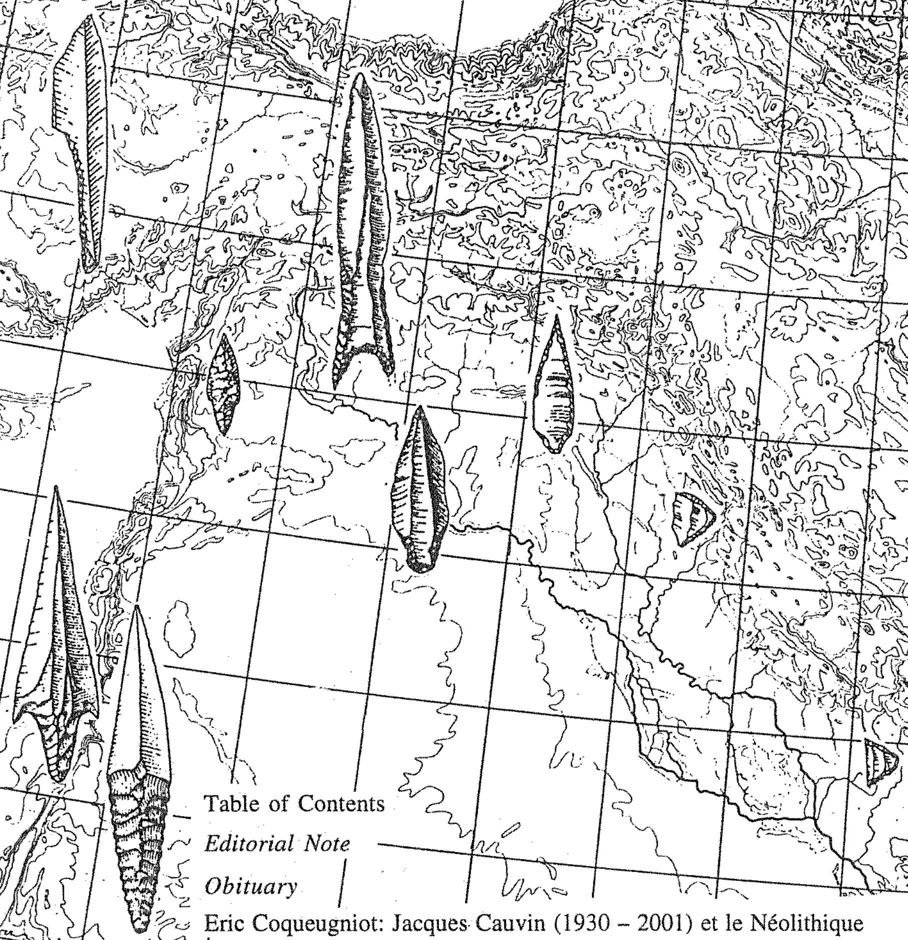

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NEO- LITHICS 1/02

A Newsletter of Southwest Asian Lithics Research

Editorial

These are sad days and it is difficult to write an editorial. Whether near home or with our hearts turned to the East, we attempt work with sincere difficulties due to the stress we suffer from the daily news we receive from the southern Levant. Archaeological research is closely linked to political developments, and we can experience this in many official and personal relationships we have. The frustration, the apparent hopelessness, the danger of misunderstanding and misinterpretation make most of us very quiet these days. Contacts seem nearly paralyzed. Our research community shares a mutual interest that must remain a constantly available seed of future exchange. If understood in this way and nursed in these times[1], our field may help to maintain a substratum of reconciliation. We want to emphasize this aspect of our responsibility as scholars.

H.G.K. Gebel and G.O. Rollefson

[1] see e.g. the recent astonishing development and philosophy of the SESAME-Project in experimental science and applications that brought together so many researchers from region (HGKG).

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Deadline for the coming issue of *Neo-Lithics* is **15th Nov., 2002** (next deadline: 1st May, 2003)

Please, note that the text of contributions should be send as an email attachment directly to Gary O. Rollefson (rollefgo@whitman.edu; Dept. of Anthropology, Whitman College, Walla Walla, WA, 99362 USA).
Illustrations should be sent separately by snailmail to H.G.K. Gebel (Free University of Berlin, Hüttenweg 7, D-14195 Berlin, Email: hggebel@zedat.fu-berlin.de). Only hardcopy illustrations are accepted for publication. Please, do limit bibliographies of contributions.

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Jacques Cauvin (1930-2001) et le Néolithique du Levant Nord

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Jacques Cauvin est décédé le 23 décembre 2001, mais il avait en fait quitté la scène scientifique dès juillet 2000. C'est en effet à cette date qu'il a été brutalement frappé par un accident de santé dont il n'a malheureusement pas pu se remettre. Avec lui c'est une grande figure de la préhistoire orientale qui a disparu.

Philosophe de formation, il s'est très tôt intéressé à la préhistoire à la fois sous l'angle de la culture matérielle et sur la question de la naissance des religions. Elève de André Leroi-Gourhan, il a participé à ses premières fouilles préhistoriques à Arcy sur Cure. Quelques années plus tard, en 1958, c'est Francis Hours, un autre émule de A. Leroi-Gourhan, qui l'a fait venir au Liban et l'a recommandé à Maurice Dunand afin qu'il étudie les industries lithiques néolithiques de Byblos et qu'il assume la fouille d'une partie de ces niveaux. Ces recherches ont constitué le noyau de sa thèse d'Etat sur *Les outillages néolithiques de Byblos et du littoral libanais* (Paris 1968). Ce travail monumental et fondateur était pionnier car au delà des analyses métriques et morpho-typologiques des outils, J. Cauvin s'est largement penché sur la question de la finalité, de la fonction, de ces artefacts et il a tenté pour chaque période une "*interprétation ethno-économique de l'outillage*" une approche palethnologique dans la lignée de son maître A. Leroi-Gourhan. Parallèlement à cette étude de la culture matérielle, sa formation initiale de philosophe l'a conduit à orienter sa thèse complémentaire sur les *Religions néolithiques de Syro-Palestine* (1972). Parallèlement à ces recherches doctorales, grace à l'introduction de M. Dunand, J. Cauvin entreprit ses premières prospections dans la Beqa'a libanaise et en Syrie du sud (sondage à Taibé), puis après l'achèvement de sa thèse, il effectua une prospection dans la Jezireh syrienne suivi d'une fouille à tell Assouad.

C'est alors que Maurits van Loon, spécialiste de l'Age du Bronze, mais en charge des fouilles de Mureybet, lui proposa de prendre sa suite sur ce site du Moyen Euphrate. Au cours de quatre campagnes de fouilles (1971-1974), J. Cauvin mit en évidence une longue séquence allant du Natoufien récent au "PPNB moyen". Une approche pluridisciplinaire de ce site et la clarté de l'esprit de synthèse de Jacques Cauvin lui ont alors permis de mettre en place sa vision de la Néolithisation. Même si cette fouille n'aura pas été publiée de son vivant (il y a travaillé jusqu'à son accident de santé), Mureybet est devenu le site de référence pour le néolithique précéramique du Levant nord. Il l'a en effet amplement présenté à la fois dans un article synthétique magistral publié dès 1977 (*Annuals of the American School of Oriental Research*), puis dans ses divers ouvrages. Mureybet fut ainsi le laboratoire de ses théories sur la Néolithisation et de son postulat d'une émergence du néolithique dans ce seul foyer, avant une diffusion hors de la zone nucléaire du Moyen Euphrate.

L'hypothèse alors généralement admise était que la domestication des céréales et des animaux était le produit du stress environnemental et de la pression démographique. Montrant que l'environnement naturel de Mureybet était alors favorable et que la densité de population restait faible, J. Cauvin a affiné ce qui allait devenir l'axe majeur de sa pensée, selon lequel la culture et l'initiative humaine étaient les seuls moteurs de la Néolithisation. Il a alors affirmé que la révo-lution néolithique était le fruit d'une mutation mentale, la "*révolution des symboles*" (avec une dualité femme/taureau) qui serait une prémisse à la domestication... Pour J. Cauvin, loin d'être un frein, c'est donc la religion qui aurait été le moteur du développement!

Lorsque la mise en eau du barrage de Tabqa interrompit les études à Mureybet (et sur le tell voisin de Cheikh Hassan), J. Cauvin se posait la question de "*la sortie du Jardin d'Eden et* [de] *la néolithisation du Levant*" (Cahiers de l'Institut Catholique de Lyon, 17 [1986]). Aussi son attention se porta-t-elle d'une part vers le "désert" au sud, d'autre part vers l'Anatolie au nord.

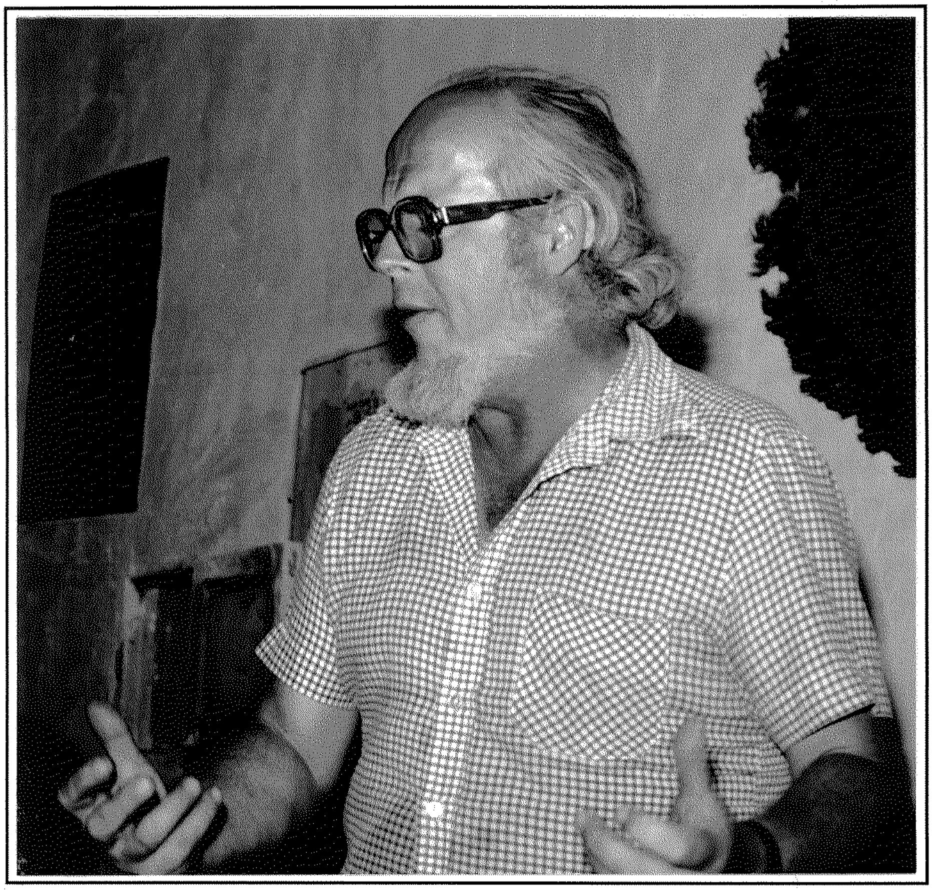
A partir de 1978, J. Cauvin et son équipe ont ainsi entrepris l'étude de la cuvette d'el Kowm dans la steppe syrienne, une région inoccupée durant les premières phases du néolithique précéramique. Conscient de l'importance des périodes an-ciennes, il faisait venir des environnementalistes et des spécialistes du paléolithique (P. Sanlaville, S. Muhesen, F. Hours, J.-M. Le Tensorer, E. Boëda) pour étudier les nombreux sites acheuléens et moustériens découverts. L'équipe formée autour de Jacques et Marie-Claire Cauvin étudiait pour sa part les sites immédiatement antérieurs à la phase de néolithisation (campement kébarien géométrique de Nadaouiyeh 2) et ceux correspondant à la re-colonisation de la région au "PPNB final" (el Kowm 2, Qdeir I), avec un village construit et un site temporaire spécialisé dans le débitage du silex, deux sites dont la complémentarité illustrait la coexistence de sédentaires et de nomades.

Par ailleurs, la construction d'un barrage sur le Haut Euphrate turc conduisit Jacques Cauvin et Olivier Aurenche à fouiller, à partir de 1979, le village de Cafer Höyük où J. Cauvin reconnut les diverses étapes d'un "PPNB du Taurus", prémisse à la diffusion du néolithique vers le reste de l'Anatolie centrale puis l'Europe.

Ebauchées dans son manuel de 1978, ses idées sur la primauté de l'idéologie sur l'économie dans le processus de néolithisation ont été largement développées dans son ouvrage de réflexion publié en 1994, puis complété en 1997 et de-puis- lors traduit en diverses langues, l'anglais étant la dernière en date en 2000. Pour lui, la "révolution des symboles" a précédé la mutation socio-économique, même s'il n'explicite ni la cause de cette mutation mentale, ni la réalité de son antériorité sur le début d'un long processus de domestication des céréales et des animaux.

L'approche scientifique de Jacques Cauvin, sa méthode et sa pensée, ses théories, n'ont jamais laissé indifférent. Ainsi, il a toujours eu des admirateurs et des détracteurs. Sa vision des religions primitives et de la Néolithisation a notamment attiré les critiques de Alain Testart (1) puis de Jean Perrot (2), la discussion restant, du fait de la langue utilisée, très franco-française et somme toute relativement confidentielle. La traduction en anglais, en 2000, de "*Naissance des divinités...*" par Trevor Watkins a relancé le débat dans le monde anglo-saxon où la primauté est souvent donnée soit aux contraintes environnementales et à la pression démographique (3), soit aux facteurs sociaux (4). Jacques Cauvin ne peut plus répondre au débat désormais ouvert autour de ses thèses mais n'est ce pas un de ses plus grands mérites que d'avoir amené les chercheurs de tout horizon à réfléchir, à chercher pour les uns les preuves, pour les autres les failles d'un raisonnement, failles que les nouvelles découvertes mettront immanquablement en lumière ? Ce n'est pas ici le lieu de confronter et de faire le bilan des théories de J. Cauvin et de celles de ses détracteurs, de confronter ses hypothèses avec les nouvelles découvertes (notamment en Anatolie et dans la région d'Urfa à Göbekli, ainsi qu'au Levant sud avec la question du PPNB ancien) mais la science ne sortira qu'enrichie du débat qu'il a suscité.

Bien au delà de l'homme de terrain, c'est le penseur que la préhistoire orientale à perdu avec lui, celui qui voulait nous obliger à réfléchir, à interpréter, et non pas simplement observer, classer, trier.



Jacques Cauvin: el-Known 1980.
(photo: E. Coqueugniot)

Publications majeures de Jacques Cauvin (une bibliographie intégrale est pub-liée dans *Paléorient* 27/2):

CAUVIN J.

1968 *Les outillages néolithiques de Byblos et du littoral libanais*. Fouilles de Byblos IV; Paris, Maisonneuve.

1972 *Religions néolithiques de Syro-Palestine. Documents*. Librairie d'Amérique et d' Orient. Paris, Maisonneuve.

1977 Les fouilles de Mureybet (1971-1974) et leur signification pour les origines de la sédentarisation au Proche-Orient. *Annual of the American Schools of Oriental Research* 44: 19-47.

1978 *Les premiers villages de Syrie-Palestine du IXè au VIIè millénaire avant J.C.* Maison de l'Orient, diff. de Boccard: Lyon.

1994 *Naissance des divinités - Naissance de l'agriculture. La Révolution des symboles au Néolithique*. Paris, CNRS (2nde éd. 1997, translated 2000: *The Birth of the Gods and the Origins of Agriculture* [trad. T. Watkins]). Cambridge, Cambridge University Press).

Endnotes

(1) Testart, 1998. Révolution, révélation ou évolution sociale - À propos du livre de Jacques Cauvin : Naissance des divinités, Naissance de l'agriculture. *Les Nouvelles de l'Archéologie* 72 : 25-29.
(2) Perrot J., 2000. Réflexions sur l'état des recherches concernant la Préhistoire récente du Proche et du Moyen-orient. *Paléorient*, 26/1: 5-27.
(3) Voir les réactions de O. Bar Yosef, G. Rollefson et I. Hodder dans *Cambridge Archaological Journal* 2001 (11/1) : 105-121, de K. Wright dans *Antiquity* 2001 (75): 619-621.
(4) Voir notamment la théorie concernant le rôle des festins et des réunions collectives dans Hayden B., 1995 (A new overview of domestication. *In* T.D Price. and A.B. Gebauer (eds.),: *Last Hunters-First Farmers*: 273-299 Santa Fe, School of American Research Press) ou dans l'ouvrage de M. Dietler and B. Hayden (eds.), 2001 (*Feasts - Archaeological and ethnographical perspectives on food, politics, and power.* Washington, Smithsonian Institution Press).

Towards a Methodology of Neolithic and Chalcolithic Bifacial Tool Analysis

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Flint axes, chisels, adzes and other bifacial tools were used in the southern Levant for a period of approximately 7000 uncalibrated years (12,000 – 5,200 b.p.). These stone tools went through changes in shape and properties during this period.

Following a detailed work carried out recently, 2,448 bifacial tools from 24 different sites were systematically analyzed, covering the Late Epipaleolithic (Natufian), Pre-Pottery Neolithic, Pottery Neolithic and Chalcolithic periods (Barkai 2000).

Based on that study, I would like to propose a methodology towards a systematic analysis of flint bifacial tools designed mainly for Neolithic and Chalcolithic assemblages from the southern Levant. I believe it could be of assistance in analyzing bifacial tools on a much wider geographical and chronological scale.

Table 1: A comparison between relative frequencies and absolute numbers of bifacial tools, arrow heads and sickle elements in published reports (from Belfer Cohen 1988; Nadel 1997; Lechevallier 1978; Barkai and Gopher 1999; Gilead et al.1995). Column 1: Site and period/culture phase; column 2: Bifacial tools index; column 3: n, bifacial tools; column 4: n, arrowheads, column 5: n, sickle elements; column 6: ratio of bifacial tools to arrowheads; column 7: ration, bifacial tools to sickle elements.

Site , Ph/CP	BTI	B	A	S	B:A	B:S
Hayonim cave (Natufian)	1.60%	66		123		0.5:1
Netiv Hagdud (PPNA)	3.00%	151	120	162	1.2:1	0.9:1
Beisamoun (PPNB)	8.44%	51	67	129	0.8:1	0.4:1
Nahal Zehora I (Wadi Raba PN)	2.25%	88		239		0.4:1
Grar (Chalcolithic)	3.88%	44		166		0.3:1

I hope that the methodology and categories presented below will be used for the benefit of creating more systematic, comparable site reports and will assist other researchers studying Neolithic and Chalcolithic lithic assemblages. Bifacial thinning flakes and polished bifacial debitage were described elsewhere (Barkai 1999). It must be kept in mind, though, that variability exists between the different assemblages, tool types, morphological categories, and therefore in every assemblage some of the tools will not fit precisely the following categorization system. In order to avoid "squeezing" these tools into formal categories, a flexible approach was adopted using as many sub-categories as possible, as well as using the categories "other" or "unidentified" when necessary. The proposed methodology is as detailed as possible in order to fit most assemblages and in order to provide a large set of observations for systematic classification. In any case, minute differences in definitions can not be avoided since such complex observations would naturally have an aspect related to the observer and will thus not be fully formalized.

Most of the reports present a general index of "curated" and "expedient" (*ad hoc*) tool types. Since bifacial tools are usually represented in very low percentages it therefore could be claimed that they played only a minor role in Neolithic-Chalcolithic tool kits. It is my contention that "curated" tools such as bifacial tools should be compared to other "curated" tool types, such as arrowheads and sickle blades and not to "expedient" tool types such as retouched

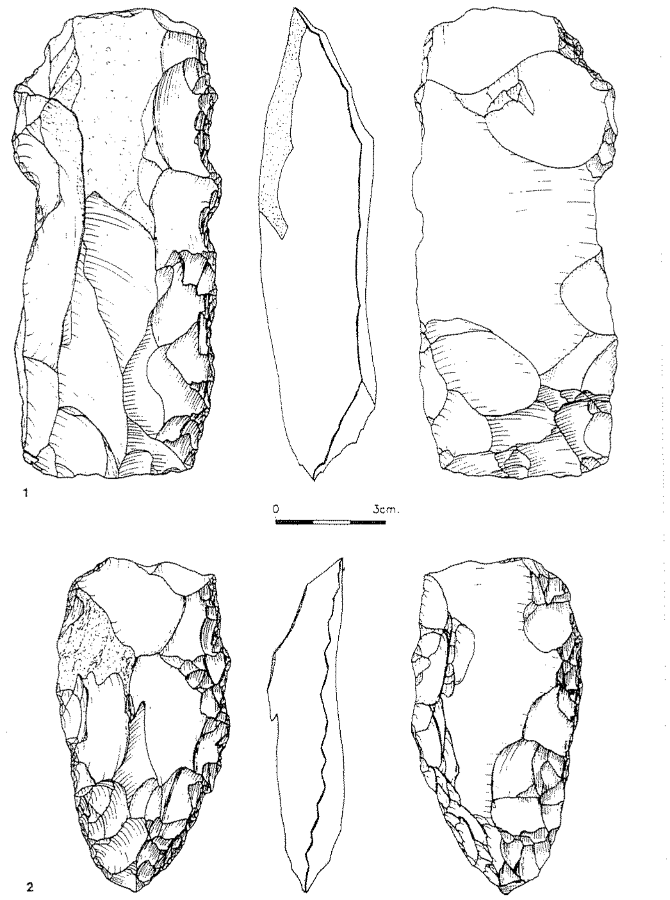

Fig. 1. Axe roughouts from EPPNB Nahal Lavan 109.

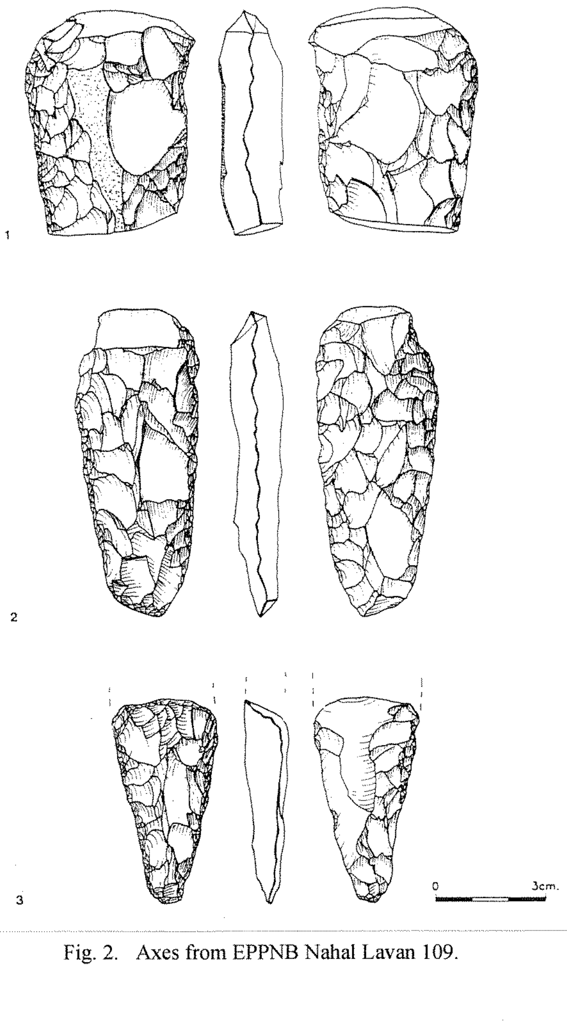

Fig. 2. Axes from EPPNB Nahal Lavan 109.

flakes or notches and denticulates. A restricted index, comparing the absolute numbers of bifacial tools, arrowheads and sickle blades reveals the major place for bifacial tool types in Neolithic and Chalcolithic tool kits. According to published reports of different sites, bifacial tools, arrows and sickles appear in very similar numbers throughout the Holocene (Table 1, based on the assumption that at least from the PPNB onwards several sickle elements were inserted into a single sickle).

1

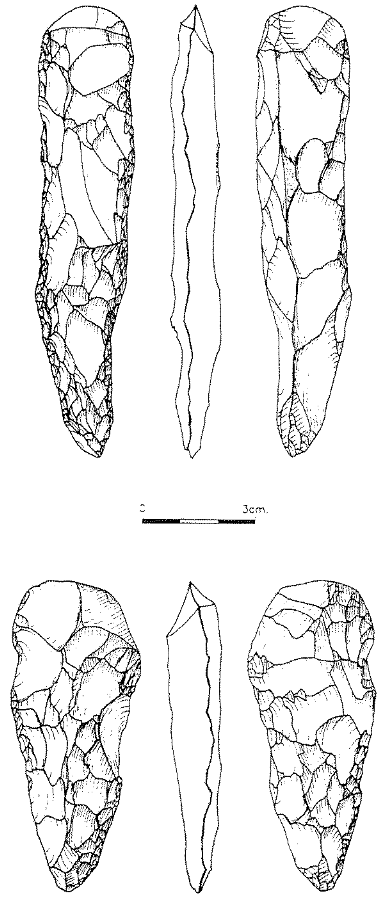

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Fig. 3. Chisel and axe from EPPNB Nahal Lavan 109.

In many cases most bifacial tools were found broken and therefore were limited for detailed attribute analysis and comparative studies. In most of the published reports no details regarding the state of preservation (complete or broken) of bifacial tools were presented. The importance of information extracted from broken bifacial tools is in the

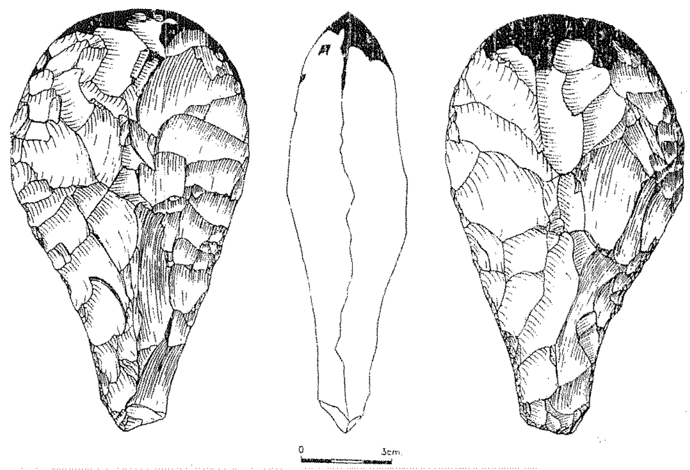

Fig. 4. Axe from PPNB Beisamoun.

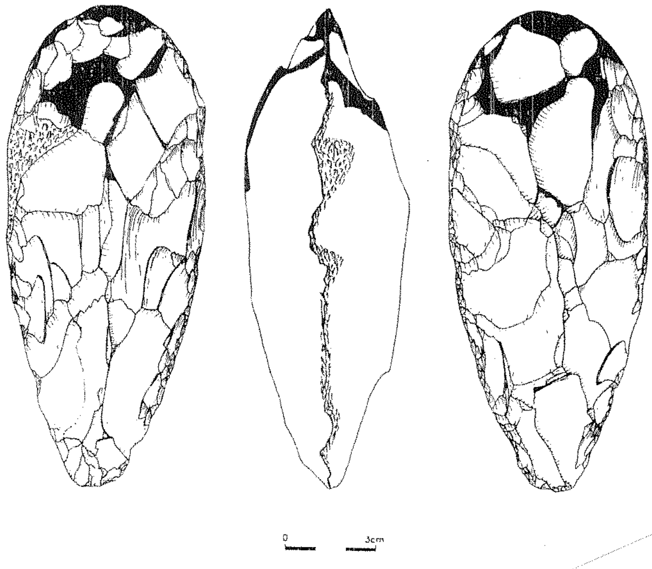

Fig. 5. Axe from PPNB Beisamoun.

ability to reconstruct the nature of the activities carried out using those tools and the possible causes of breakage. Large numbers of broken bifacial tools could indicate massive and intensive work and/or the use of non-homogeneous raw material. Broken bifacial tools were discarded at most sites due to breakage that occurred because of misuse, manufacture failures or maintenance errors both at the site itself or away from the site in an activity area related to it. In the second case, parts of bifacial tools were probably brought back to the site with the haft for retooling (attaching a new tool to the haft) in order to use the raw material for different purposes. The presence of complete bifacial tools at different sites is extremely helpful in

1

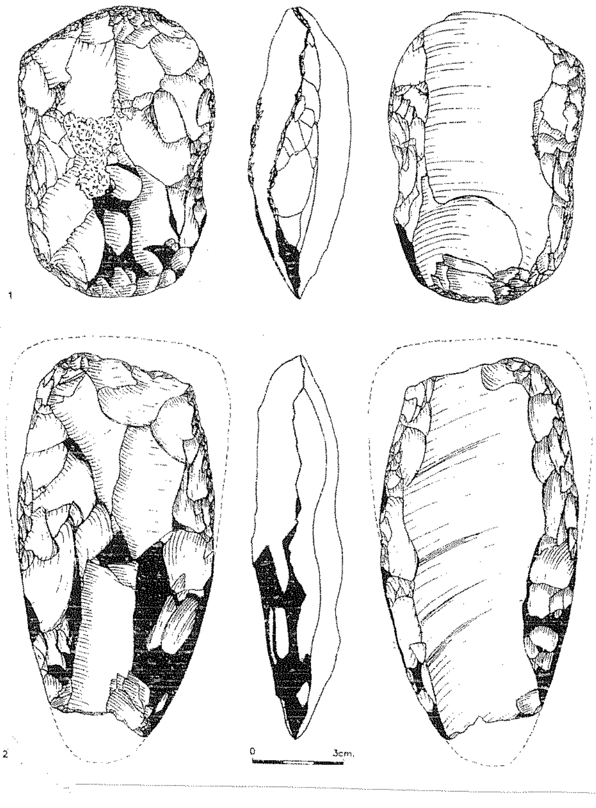

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Fig. 6. Axes from PPNB Beisamoun.

reconstructing the activities carried out. A major effort was invested in understanding why complete tools were discarded. This led to a division of complete bifacial tools into complete and perfect (usable) and complete but non-perfect tools. The complete and perfect tools are bifacial tools with no sign of breakage, damage or any other flaw. The reason for discarding these tools could not be deciphered, and many of the complete and perfect tools seem to be usable or even unused. It is suggested that these complete and perfect bifacial tools, which are mostly polished, were intentionally abandoned for social reasons, since polished bifacial tools played a role both as important working tools and as social and/or personal symbols (Barkai 2000).

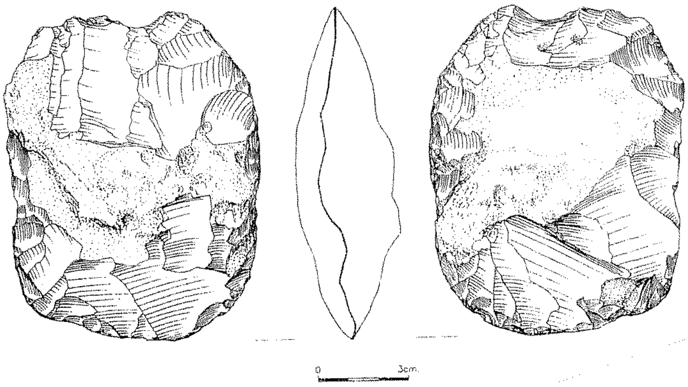

Fig. 7. Axe roughout from PN Nahal Zehora II.

The complete but non-perfect tools are bifacial tools that are not broken, but are not usable due to certain damage or flaws. These tools were discarded because of a damaged working edge (mostly small flakes removed from the sharp edge itself or some battering on the cutting edge); unsuccessful repair (failure in trying to fix, maintain or resharpen the tool); unsuccessful shaping (failure in manufacture); and raw material problems. It was realized that differences in frequencies of discard causes of complete but non-perfect bifacial tools could reflect different activities, such as the difference between a woodworking site (with many damaged cutting edges) and a workshop site (with high percentages of unsuccessfully shaped and repaired tools).

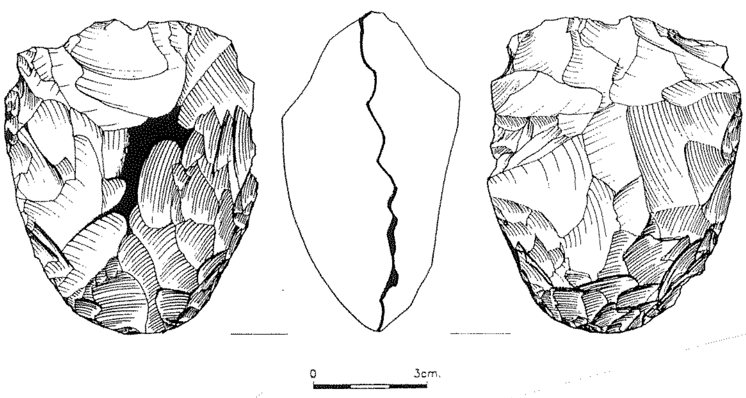

Fig. 8. Axe from PN Nahal Zehora II.

Another advantage of the analysis of complete bifacial tools, both perfect and non-perfect, is the possibility to reconstruct the actual size and weight of these tools, and therefore length and weight measures were taken solely from complete bifacial tools.

The bifacial tools, from all sites, were studied according to the following criteria:

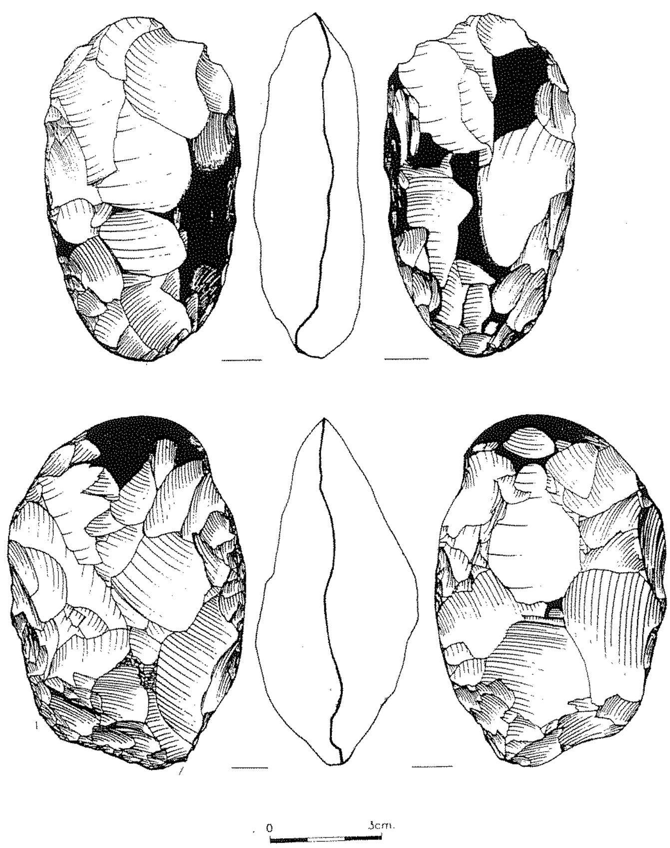

Fig. 9. Axes from PN Nahal Zehora II.

Tool type

The classification was mostly based on the crossection and cutting edge width of the tool in the case of axes, adzes and chisels. Other parameters were used in the classification of the rest of the types (see some similar definitions in Cooney and Mandal 1998:10-11, Gilead *et al.* 1995:258-9, Gopher 1989:108, Rosen 1997:93).

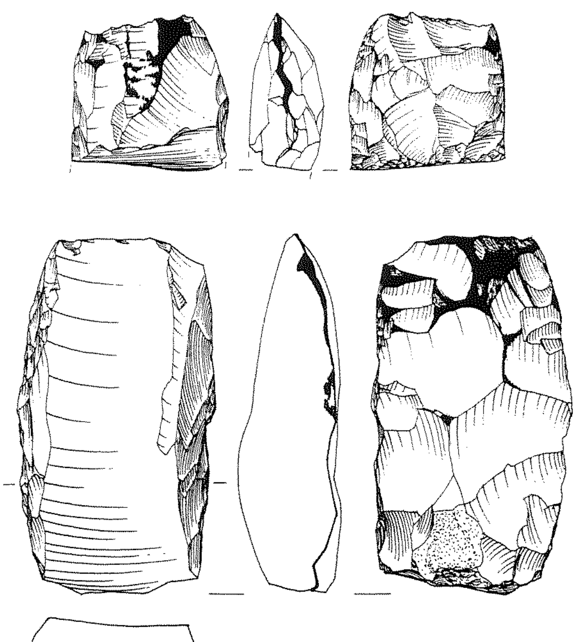

Fig. 10. Adzes from PN Nahal Zehora II.

Axe – shaped by bifacial flaking; lenticular cross section; cutting edge shaped by bifacial flaking, transversal blow or polish and is wider than two cm (Figs. 2; 3:2; 4-6; 8; 9). In many cases the cutting edge is slightly round and the general shape of the tool resembles an almond (Figs. 4-5). Some of the axes are more symmetrical then others, meaning that in some cases the two faces of the tool are equally curved (Figs. 4; 8) while in others the symmetry is not perfect (Figs. 2; 9). Archaeological, ethnographical and functional studies support the assumption that axes were hafted with their working edge positioned parallel to the haft (see Barkai 2000 for details).

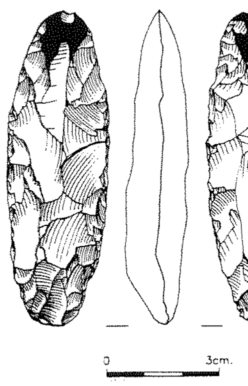

Fig. 11. Chisel from PN Nahal Zehora II.

Adze – Bifacially shaped tools with plano-convex cross section. The ventral face is mostly flat and the dorsal face is curved, trapezoidal or triangular in section. Working edges are often shaped by bifacial flaking and polish, while the use of transversal blows appears in rare cases. Usually, cutting edge width exceeds 2 cm. In shape, most of the adzes were designed as long trapezes or triangles (Figs. 10; 14-15). Adzes were hafted with their cutting edge positioned perpendicular to the haft, as a hoe (*cf.* Barkai 2000 for details).

Chisel - shaped by bifacial flaking. Varied cross sections were indicated: lenticular, angular, plano-convex, triangular, trapezoidal or rhomboid. The cutting edges are mostly shaped by bifacial flaking, polish or transversal blows. The working edge width does not exceed, in most cases, 2 cm. The original proposal by Cauvin to distinguish between axes, adzes and chisels according to their working edge widths (Cauvin 1968:136) was confirmed in my study. The ratios between length and cutting edge width and between cutting edge width and thickness further supports the 2 cm classification limit for chisels, although in some cases chisels working edges were found to be up to 2.4 cm. wide. Chisels are usually long and narrow (Figs. 1; 11-12).

Roughout (preform) - rough and coarse bifacial tools, often only partially worked by bifacial flaking. The cutting edge is either partially shaped or unshaped, and most of these tools seem to be discarded before the production process was completed (Figs. 1; 7; 13).

Heavy duty tool – large and massive bifacial tools fully shaped or partially shaped by bifacial flaking. These tools are not standardized and do not resemble any other bifacial tool type in terms of shape or manufacturing technique. In some cases bifacial tools/roughouts that were discarded during initial stages of manufacture could be classified under this category

Pick – Mostly shaped by bifacial flaking on more than two facets of the tool (as trihedral). The working edge of the tool is pointed and relatively narrow while its base is wide and thick. The cross-section is usually triangular at the working edge and angular at the base. In some cases the bases were left unshaped

Other – Unclassified bifacial tools which do not fit any of the above categories, including broken and unidentifiable pieces.

Blank type

In many cases the original blank could not be identified due to intensive bifacial flaking. Blank categories used are flake (Figs. 2:2; 12:1,3,4), blade (Fig. 2:1), nodule (Figs. 7; 14:2) and unidentified (Figs. 2-5; 8-10).

Raw material properties

Raw material properties were classified into four levels of quality and homogeneity (1 being the best). The quality grading refers to the silicieousness of the piece while the homogeneity rating was classified according to the presence or absence of cracks, limestone inclusions, fracture planes etc.

Working edge shaping

The following cutting edge shaping strategies were indicated: transversal blow (Figs. 2:1,2; 3; 12:2); polish (Figs. 4-5; 9:1; 10-11; 12:3-6; 14); bifacial flaking (Figs. 7; 12:1); unifacial flaking; unshaped; broken/missing (Figs. 2:3; 6; 8; 9:1; 10; 15).

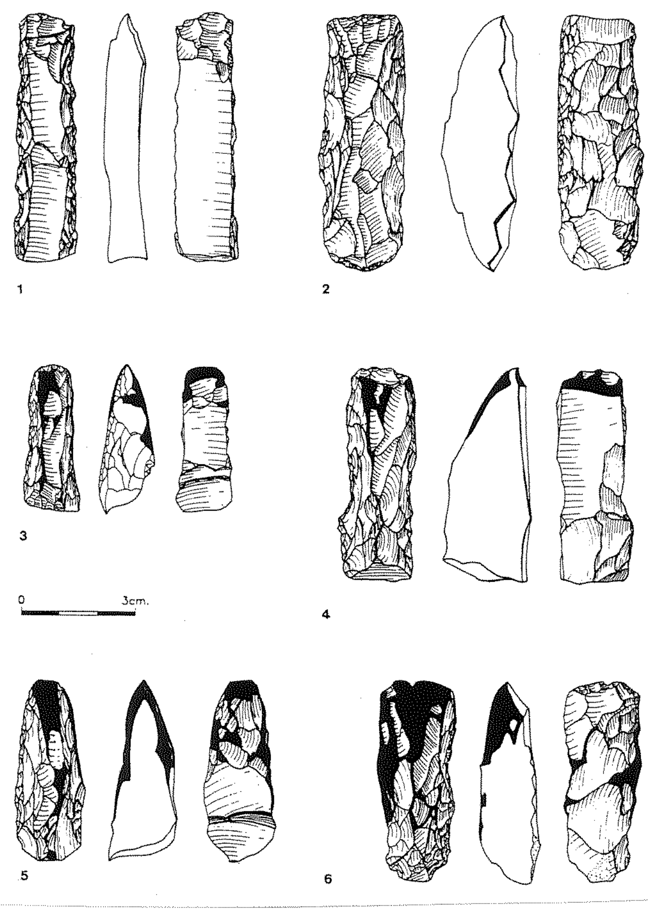

Fig. 12. Chisels from PN (Wadi Raba) Nahal Zehora I.

Body shaping

The following categories were used to describe the way the two faces of the bifacial tool were shaped: overall bifacial flaking (Figs. 2; 3; 12:2; 13; 14:1); partial bifacial flaking (Figs. 1; 7); bifacial flaking and polish (Figs. 4-6; 8-11; 12:5-6; 14:2; 15); unifacial flaking (Fig. 12:1-4); battering; post polish flaking (Figs. 4-6; 8-10).

Working edge shape

Rounded (Figs. 3-5); straight (Figs. 12:1-4; 14); pointed (Figs. 11; 12:5); irregular; missing (Figs. 6; 9:1; 15).

General shape of the bifacial tool

Round (Fig. 9); trapezoidal (Figs. 12:6; 13:2; 15); elongated trapeze (Figs. 2:2; 5; 14:2); triangular (Figs. 3:2; 4); rectangular (Figs. 1:1; 7); pointed (Figs. 11; 12:3,5); amorphous (Fig. 8).

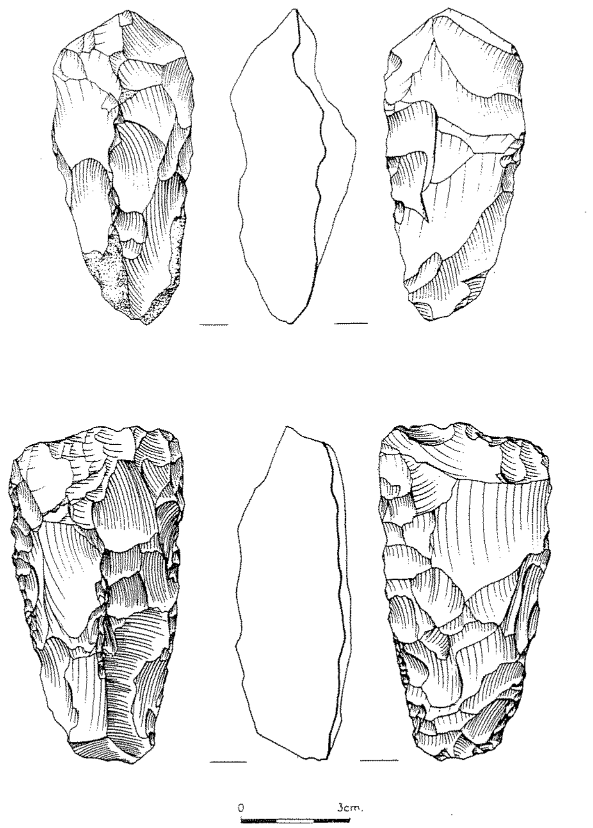

Fig. 13. Adze roughouts from Chalcolithic Giveat Haoranim.

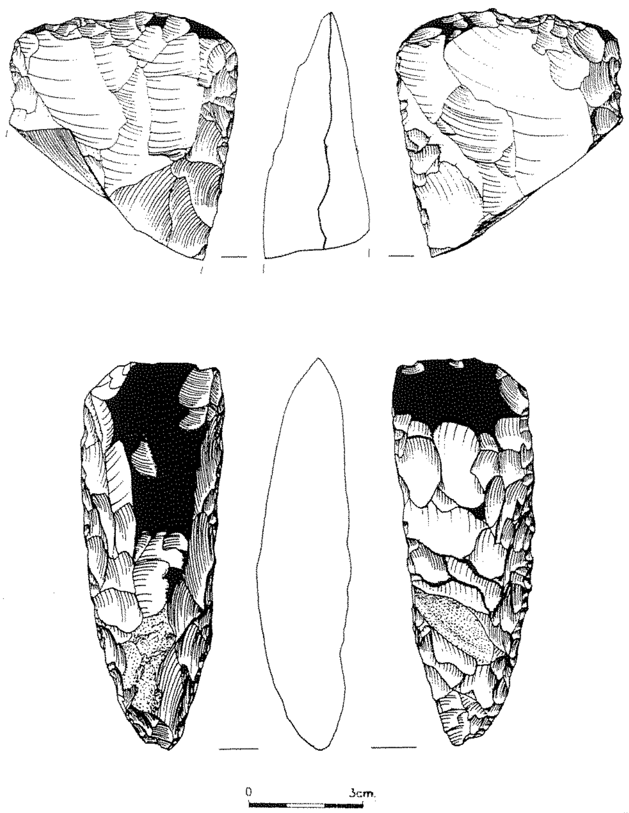

Fig. 14. Adzes from Chalcolithic Giveat Haoranim.

Cross sections

Lenticular (Figs. 2:1-2; 4-5; 8; 11); plano-convex (Fig. 10); mixed (lenticular and plano-convex, (Figs. 3; 7); triangular (Fig. 12:4-5); trapezoidal (Figs. 12:1,3; 14-15); angular; undetermined.

Bifacial ridge shaping

The technique used in shaping the bifacial side ridges of the tool: bifacial flaking (Figs. 2-3; 11); bifacial flaking and polish (Figs. 4; 6:2; 8; 15); unifacial flaking (Fig. 12:1); battering.

Uniformity of the bifacial ridges

Straight and continuous (Figs. 11; 14); curved; irregular and discontinuous (Figs. 2:1-2; 3; 5); mixed.

State of preservation

This category is intended to indicate whether the bifacial tool is complete or broken and the nature of the fragment. The suggested categories are: complete (Figs. 1; 2:2; 3-7; 9; 11; 12:1,2,6; 14:2); broken – base (Fig. 2:3); broken - working edge (Figs. 2:1; 10:1; 12:3,5; 14:1); broken – midpart.

Discard causes of complete bifacial tools

Assuming that breakage was the main reason for discarding non-complete bifacial tools, it seems essential to check what were the reasons for the abandonment of the complete ones. The most widespread causes were:

Unsuccessful repair: failed attempts to repair, reshape or resharpen the tool by bifacial flaking (Figs. 4; 9) or transversal blows (Figs. 2:2; 3:2). These attempts failed because of hinge or step fractures (Figs. 1; 3:2; 7; 9:2), over-shots (Fig. 2:2), the creation of blunt cutting edges or other knapping errors.

Unsuccessful shaping: failed attempts to shape the tool's volume by bifacial blows (Figs. 1; 7; 13) or failed attempts to shape the tool's cutting edge by transversal blows or bifacial flaking. Mainly roughouts were discarded because of unsuccessful shaping.

Cutting edge damage: Mainly unintentional flakings; battering or minor fractures at the working edge (Figs. 11; 12:1,3-5; 14).

Raw material problems: flaws, defects, cracks, fracture planes etc.

Unknown reasons: these tools were found in a perfect condition, without any flaw, damage or break. The reason for discarding these tools could not be deciphered (Figs. 3:1; 5).

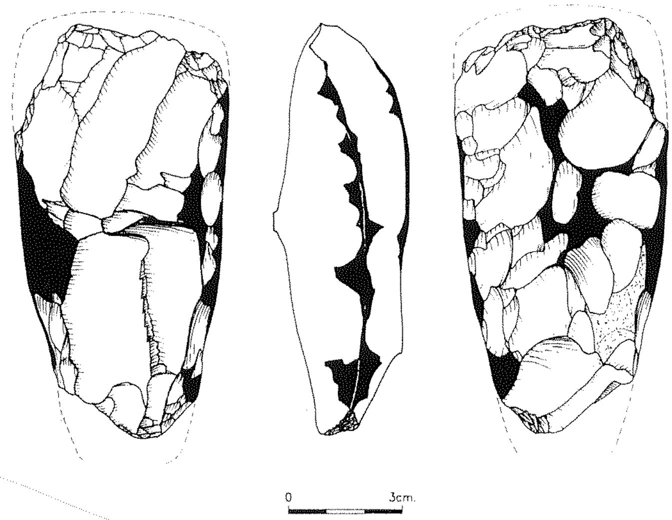

Fig. 15. Adze from Hagoshrim (surface collection, most probably Late PN- Chalcolithic).

Break type

Among the broken bifacial tools several break types could be indicated: straight break (Figs. 2:1; 12:4); bending break (Figs. 2:3; 12:3,5; 14:1); "hula" break (Figs. 6; 10 and see Barkai 2000); "other" break.

Repair and maintenance

Some of the bifacial tools bear indications of maintenance and repair activities that were carried out after the tool was damaged or defects emerged. The following maintenance categories were identified in the course of fixing the tools and putting them back to use: corrective transversal blows (Figs. 2:2; 3:2); corrective bifacial blows (Figs. 3; 4; 9:2; 14:2); post-polish flakings (Figs. 6; 8-9; 14-15); several phases of polihed surfaces (Figs. 4-5).

Later treatment

Some of the bifacial tools went through aditional phases of use after they ceased functioning as bifacial tools. These later phases of use are usually converting the bifacial tools into cores (Figs. 8; 9:1; 15), hammerstones, or other tool types.

Metric measurements

Length (complete tools only), thickness (cutting edge, midpart and base), and width (cutting edge, midpart and base).

Ratios

The ratio between length and working edge width and between working edge width and mid thickness.

Weight

Only complete bifacial tools were weighed.

Number of scars

Bifacial flaking scars, hinged flaking scar,s and midsection flaking scars were counted.

Working edge angle

The angle (in degrees) was measured at the middle of the cutting edge.

Bibliography

Barkai R.

1999 Resharpening and Recycling of Flint Bifacial Tools from the Southern Levant Neolithic and Chalcolithic. *Proceedings of the Prehistoric Society* 65:303-318.

2000 *Flint and Stone Axes as Cultural Markers: Socio-Economic Changes as Reflected in Holocene Flint Tool Industries of the Southern Levant.* Unpublished Ph.D. Thesis, Tel Aviv University. (in Hebrew).

Barkai R. and Gopher A.

1999 The Last Neolithic Flint Industry: A Study of Technology, Typology and Social Implications of the Lithic Assemblage from Nahal Zehora II, A Wadi Raba (Pottery Neolithic) Site in the Menashe Hills, Israel. *Journal of the Israel Prehistoric Society* 29:41-122.

Belfer-Cohen A.

1988 *The Natufian Settlement at Hayonim Cave.* Unpublished Ph. D. thesis, Hebrew University, Jerusalem.

Cauvin J.

1968 *Les Outillages Néolithiques de Byblos et du Littoral Libanais.* Fouilles de Byblos 4. Paris: Maisonneuve.

Cooney G. and Mandal S.

1998 *Irish Stone Axe Project.* Wordwell: Wicklow.

Gilead I., Hershman D. and Marder O.

1995 The Flint Assemblage from Grar. In: Gilead, I. (ed.): *Grar, A Chalcolithic Site in the Northern Negev*: 223-280. Beer Sheva: Ben Gurion University of the Negev Press.

Gopher A.

1989 *The Flint Assemblage of Munhata - Final Report.* Les Cahiers du Centre de Recherches Français de Jérusalem4. Paris: Association Paléorient.

Lechevallier M.

1978 *Abou Gosh et Beisamoun.* Deux gisements du VIIe millénaire avant l'ère Chrétienne en Israel. Mémoires et Travaux du Centre de Recherches Préhistoriques Français de Jérusalem 2. Paris: Association Paléorient.

Nadel D.

1997 The chipped stone industry of Netiv Hagdud. In: O. Bar-Yosef and A. Gopher (eds.), *An Early Neolithic Village in the Jordan Valley. Part I: The Archaeology of Netiv Hagdud*: 71-149. American School of Prehistoric Research Bulletin 43. Cambridge: Peabody Museum.

Rosen S.A.

1997 *Lithics After the Stone Age.* London: Altamira Press.

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Was the Hagdud Truncation a Hafted Micro-Adze?

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The small, bi-truncated blade segment known as the Hagdud Truncation has attracted considerable interest since it was first isolated and confirmed as a characteristic Pre-Pottery Neolithic A (PPNA) tool. Though it was first reported from the Lebanese cave site of Nacharini (Schroeder n.d.), the tool-type was later named for the eponymous PPNA site of Netiv Hagdud (Bar-Yosef *et al.* 1987). Since then, the Hagdud Truncation has been found in several Jordanian sites: to the east in the Azraq Basin at Jilat 7 where it may have extended into the Early PPNB (Garrard *et al.* 1994: 88) at 'Iraq ed-Dubb in the northern Jordan Valley (Kuijt *et al.* 1991), in southern Jordan at Wadi Feinan 16 (Mithen *et al.* 2000: 659; Pirie 2001: 6) and lastly on the Dead Sea Plain at Zahrat adh-Dhra' 2, or ZAD 2 (Edwards and Higham 2001; Edwards *et al.* 2001; Sayej 2001: 226-228).

Because of its small size and unusual shape, considerable speculation has arisen about the function of the Hagdud Truncation. Here we propose that the Hagdud Truncation was employed as a type of hafted micro-scraper or adze. The general idea is not particularly surprising, as the diminutiveness and delicacy of the tool render it comprehensible only as a hafted tool (Nadel 1994). Nor is the specific idea novel, since Noy (1994) suggested just such a function as adze-scraper for the related Gilgal Truncation. However, we advance this proposition because of the suggestive analogue provided by the 'Tula flake', or 'Tula adze', a hafted adze-scraper known archaeologically and ethnographically from arid Australia.

Before continuing, it is worth briefly reviewing other suggested functions for the Hagdud Truncation, since these venture in different directions than our own, which rests on evidence for re-sharpening. The truncations on the Hagdud Truncation occur in a variety of shape profiles, from convex and straight to concave. Especially when one of the truncations is straight or concave, the piece appears similar to the base of the El Khiam point, and so it might be supposed that the Hagdud Truncation was formed as a by-product of projectile point manufacture. But Nadel (1994; 1997: 111-112) showed that the Hagdud Truncation's length and width are consistently greater than the El Khiam point at Netiv Hagdud, making it unlikely to be directly related. Nadel suggested a variety of hafted reconstructions of the tool in use: as a transverse arrowhead, as an obliquely mounted point or barb, or as a subsidiary transverse barb hafted proximally to a projectile point (Nadel 1994; 1997: 112-115).

A key reason why Nadel (1997: 112) linked the function of the Hagdud Truncation with projectile points was the co-occurrence of both in similar amounts in various contexts at Netiv Hagdud. However, this pairing breaks down for some cases at a broader regional level. As Nadel (1994) pointed out, the distribution of PPNA projectile points extends farther in the Levant than do Hagdud Truncations. For example, the 1994 and the 2001 seasons of excavations at Dhra' produced 309 projectile points, or 18.3 % of the retouched total, but virtually no truncations of any kind (Goodale and Smith 2001: 2; Kuijt and Mahasneh 1998: 159). Thus, it might be objected that Hagdud Truncations were functionally coupled with projectile points only some of the time. More telling, though, is the case of ZAD 2, which has produced the opposite scenario: many Hagdud Truncations but negligible projectile points.

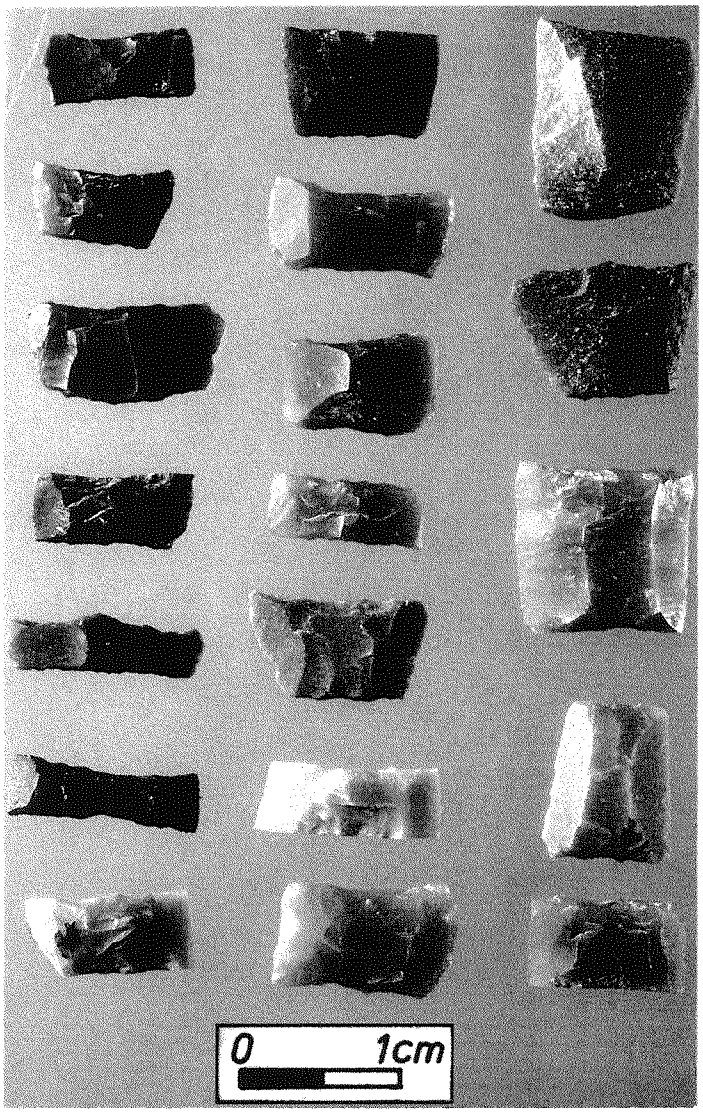

Fig. 1. Hagdud Truncations from ZAD 2.

The Hagdud Truncations at ZAD 2 (Fig. 1) number 61 specimens, or 4% of the recovered retouched tools, which forms so far the second largest absolute quantity recovered in the southern Levant after the 63 from Netiv Hagdud (Nadel 1997: 111). At ZAD 2, the Hagdud Truncations' distal and proximal truncations are formed by steep retouch. None of the specimens are burnt or show evidence of heat-treatment. Three specimens are partly broken. Flint was the only raw material used to produce them, with the colour mainly brown (45 specimens or 74%), followed by gray (11 specimens or 18%) and black (5 specimens or 8%).

The tools were shaped by either one or two sub-parallel distal and proximal truncations on a small bladelet segment, and may be classified into 6 sub-types:

Type	n
A. Double straight truncation	23
B. Straight-concave truncation	15
C. Double concave truncation	8
D. Single concave truncation	7
E. Single straight truncation	7
F. Concave-convex truncation	1

The mean dimensions are 1.00 cm for length, 0.85 cm for width, 0.18 cm for thickness and 0.14 grams for weight (Table 1, Fig. 2).

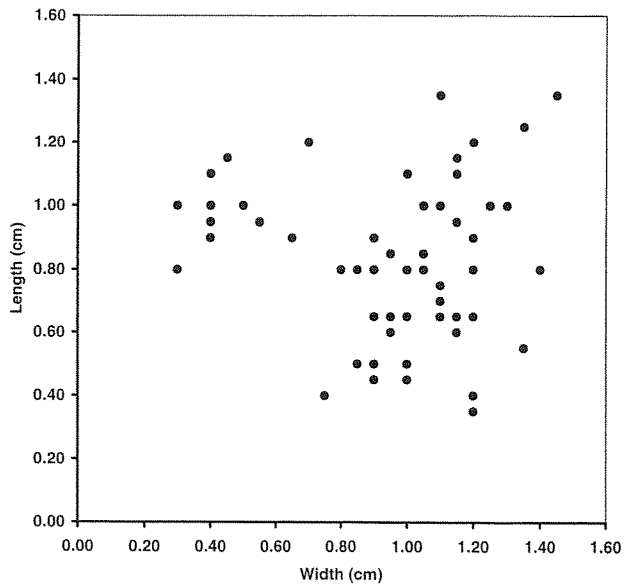

Fig. 2. Length and width distributions for ZAD 2 Hagdud Truncations.

The number of projectile points at ZAD 2 is low (11 specimens or 0.7% of retouched tools) and only one is an El Khiam point, so the ratio of Hagdud Truncations to projectile points is about 6:1, and even 10 out of the 11 are Jordan Valley points or atypical points. For El Khiam points, the ratio rises to 61:1, so that at ZAD 2 the Hagdud Truncation is apparently unconnected with the manufacture or operation of the El Khiam point. Of course, this same fact could be adduced in favour of the Hagdud Truncation's hafting as a substitute projectile point, but two things are against this. Firstly, the ZAD 2 Hagdud Truncations are very similar to those found in other sites where El Khiam points routinely accompany them, and so they were presumably used in similar ways. Secondly, it does not account for the peculiar length range of Hagdud Truncation assemblages - from longer to remarkably short -which looks to us suspiciously like a classic by-product of tool resharpening.

Re-sharpening and lithic reduction have become very in

Table 1. Descriptive statistics for size and weight of Hagdud

Type	N	Length (cm)			Width (cm)			Thickness (cm)			Weight (g)		
		Mean	S.D.	Range	Mean	S.D.	Range	Mean	S.D	Range	Mean	S.D.	Range
A	23	0.90	0.29	0.40-1.25	0.80	0.25	0.4-1.2	0.20	0.04	0.10-0.25	0.10	0.08	0.10-0.30
B	15	1.00	0.31	0.30-1.45	0.90	0.28	0.5-1.4	0.02	0.04	0.10-0.25	0.20	0.14	0.10-0.40
C	8	0.92	0.30	0.40-1.35	0.84	0.25	0.5-1.3	0.17	0.05	0.10–0.25	0.11	0.14	0.10-0.40
D	7	1.04	0.36	0.30-1.40	0.90	0.10	0.8-1.0	0.19	0.05	0.15–0..25	0.19	0.09	0.10-0.30
E	7	0.90	0.29	0.40-1.30	0.80	0.32	0.4-1.2	0.20	0.04	0.10-0.20	0.10	0.09	0.10-0.30
F	1	1.05	0	1.05	0.85	0	0.85	0.15	0	0.15	0.10	0	0.10
Total	61	1.00	0.30	0.30-1.50	0.85	0.25	0.40-1.40	0.18	0.04	0.10-0.25	0.14	0.1	0-0.4

fluential in explaining flaked stone tool morphology over the last two decades since Dibble's (1984, 1988) studies of Middle Palaeolithic scrapers. Resharpening is particularly common with tools such as scrapers, adzes and axes, which are used repetitively for the same purpose over long time periods. Indeed, a study was done on resharpening and morphological change in ethnographic scrapers from central Australia by Hayden (1981: 96) before Dibble's work, and it is to ethnographic and prehistoric Australia that we now turn to examine the Tula flake.

To be sure, the larger Tula flake (Fig. 3) is from an entirely different time and place than the Hagdud Truncation, but it is also characterized by widely variant lengths in a situation where it is clear that the length range results from re-sharpening. This is the factor that we believe links the two types in regard to function (or more strictly speaking, in regard to tool production and maintenance). Aboriginal use of the Tula flake was first noticed and described in Australia's extensive arid zone by ethnographers in the early twentieth century (Roth 1904; Horne and Aiston 1924). The type is also archaeologically attested in arid region sites dating between 2,700-3,600 BP (Mulvaney and Kamminga 1999: 248). The Tula adze or scraper (there is some issue over the range of functions for which it was employed) was a tool hafted in a wooden handle or spear-thrower. The manufacture of its working piece – the Tula flake – began with the dislodgment of a thick flake. The percussion blow was typically directed at an impact point well back on the core platform, producing a flake with a broad, plain, platform remnant and a characteristically pronounced bulb of percussion. The rounded bulb was favoured as it gave a symmetrical, bi-convex section that tapered to a thinner but still sturdy distal end. The proximal end of the flake was mounted either in a long wooden handle or into a leaf-shaped wooden implement known as a *woomera*. The woomera is a versatile piece of equipment operating both as a spear-thrower and an adze or scraper, which is conveniently suited to the needs of the highly mobile hunter-gatherers of the harsh Australian outback. The flake was hafted to the handle by spinifex (*Triodia* sp.) resin, and so the distribution of the Tula is coincident with the distribution of this desertic plant. The finished tool was ideal for working very dense Australian hard woods such as mulga (*Acacia aneura*, Kamminga 1984: 56).

The Tula flake was initially heavily retouched, particularly on the distal termination. As Holdaway and Stern (2002: 271) describe:

> "In plan view, this retouch followed the curvature of the bulb (a shape sometimes described as semi-discoidal). As an adze was progressively sharpened, the retouch removed more and more of the tool body, until the retouched edge almost abutted the platform. At this stage, no more retouch was possible and the slug would have been discarded."

The 'slug' refers to the exhausted Tula flake, which was periodically resharpened while in the haft along its distal projection, until sometimes only a thin nub of flake was left (Fig. 3). Just as Hagdud Truncation assemblages feature a variety of lengths, so do assemblages of Tula flakes. In one case from western Queensland, a storage pit was discovered containing a cache of stone tools (Hiscock 1988). The contents included fifty fresh and lightly retouched Tula flakes, which accompanied more worn Tulas and exhausted slugs found on the surface of the same site.

In our view, the Hagdud Truncation's wide range of lengths represent different stages of sharpening and tool exhaustion. According to this interpretation, the tool was trimmed on both terminations before its hafting and then the working end was progressively trimmed down while the tool was still mounted in the haft, until like an exhausted pencil lead, it was pulled out and discarded. In fact, some of the Hagdud Truncation 'slugs' are so short (0.3 cm in the most extreme case at ZAD 2, see Table 1) that it seems difficult to conceive of resharpening the tool other than when mounted in a haft, with one hand holding the haft and the other applying direct percussive force to the firmly supported working (distal) end projecting from the haft.

The lithic reduction sequence has also been controversially forwarded as an explanatory device for the morphology of Levantine Epipaleolithic microliths (Barton and Neeley 1996). While there are some persuasive examples of this, such as the production of obliquely-truncated backed bladelets from La Mouillah points (Al-Nahar 2000), these cases involved reductive steps in tool manufacture before hafting, not tool resharpening after hafting. This is what sets the tiny Hagdud Truncation apart from similarly sized microliths such as rectangles and trapezes: the distinct length series that characterizes the Hagdud Truncation, and notably the number of extremely short specimens. Microliths may be of differing sizes, but one doesn't see among them the same evidence of working down or exhaustion; they were predominantly used as short-term, high impact projectiles or barbs which were pulled out and replaced when damaged or blunted, rather than resharpened.

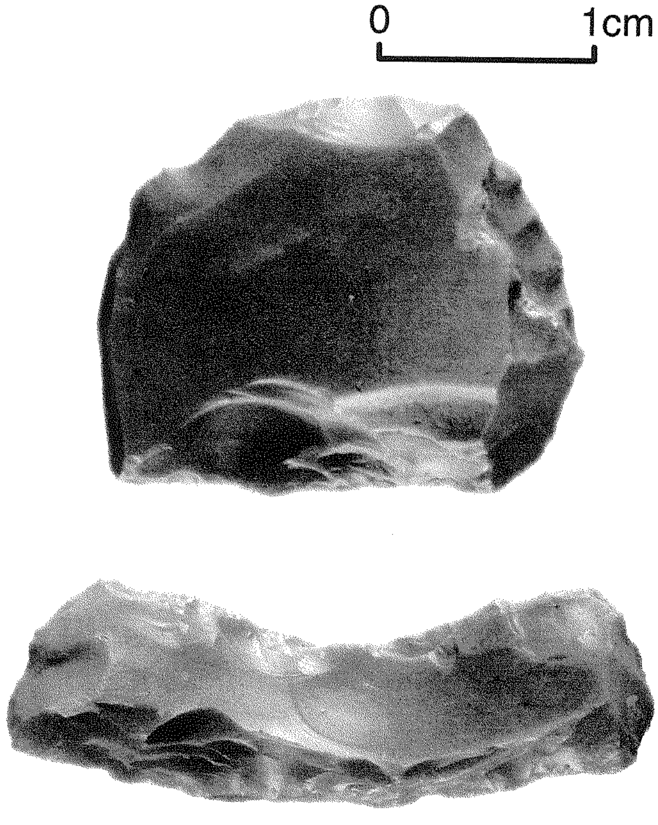

Fig. 3. A newly-made Tula flake (above) and an exhausted Tula 'slug' (below). Photographs courtesy of Simon Holdaway, Nicola Stern and La Trobe University.

Given its small size and gracility, and the frequent occurrence of concave truncations, we think it most likely that the Hagdud Truncation was used as a delicate micro-adze for finishing cylindrical shafts of wood or bone. Despite frequent resharpening, the working facets of some Tula flakes retain clear use-wear striae associated with scraping or planing (Kamminga 1984:74). It now remains to carry out use-wear analysis on the ZAD 2 Hagdud Truncations, in order to see whether a similar situation obtains. It is hoped that the potential exists for distinguishing a small adze from a projectile point or barb.

Bibliography

Al-Nahar M.
2000 *The Upper and Epipalaeolithic transition in the Southern Levant: microlith typology versus technology.* Unpublished doctoral dissertation. Tempe, AZ, Arizona State University.

Bar-Yosef O., Gopher A. and Nadel D.
1987 The "Hagdud Truncation" – a new tool type from the Sultanian industry at Netiv Hagdud, Jordan Valley. *Mitekufat Haeven* 20: 151-157.

Barton C.M. and Neeley M.P.
1996 Phantom cultures of the Levantine Epipalaeolithic. *Antiquity* 70: 139-147.

Dibble H.L.
1984 Interpreting typological variation of Middle Palaeolithic scrapers: Function, style, or sequence of reduction? *Journal of Field Archaeology* 11: 431-436.
1988 Typological aspects of reduction and intensity of utilization of lithic resources in the French Mousterian. In H. L. Dibble and A. Montet-White (eds), *Upper Pleistocene Prehistory of Western Eurasia*: 181-197. Philadelphia, University Museum, University of Pennsylvania.

Edwards P.C. and Higham T.
2001 Zahrat adh-Dhra' 2 and the Dead Sea Plain at the dawn of the Holocene. In A. Walmsley (ed.), *Australians Uncovering Ancient Jordan: Fifty Years of Middle Eastern Archaeology*:139-152. Sydney, University of Sydney.

Edwards P.C., Falconer S.E., Fall P.L., Berelov I., Davies C., Meadows J., Meegan C., Metzger M.C. and Sayej G. J.
2001 Archaeology and Environment of the Dead Sea Plain: preliminary results of the first season of investigations by the joint La Trobe University/ Arizona State University Project. *Annual of the Department of Antiquities of Jordan* 45: 135-157.

Garrard A., Baird D., Colledge S., Martin L. and Wright K.
1994 Prehistoric Environment and Settlement in the Azraq Basin: An Interim Report on the 1987 and 1988 Excavation Seasons *Levant* 26: 73-109.

Goodale, N. and S. Smith
2001 Pre-Pottery Neolithic A Projectile Points at Dhra', Jordan: Preliminary Thoughts on Form, Function, and Site Interpretation. *Neo-lithics 2/01*: 1-5.

Hayden B.
1981 *Palaeolithic reflections: Lithic technology and ethnographic excavations among Australian Aborigines.* Canberra, Australian Institute of Aboriginal Studies/ New Jersey, Humanities Press.

Hiscock P.
1988 A cache of tulas from the Boulia district, Western Queensland. *Archaeology in Oceania* 23: 60-70.

Holdaway S. and Stern N.
2002 *Written in Stone: decoding the Australian flaked stone record.* Melbourne, Museum Victoria (in press).

Horne G. and Aiston G.
1924 *Savage Life in Central Australia.* London, MacMillan.

Kamminga J.
1984 *Over the edge: functional analysis of Australian stone tools.* Occasional Papers in Anthropology No. 12. Brisbane, University of Queensland.

Kuijt I., Mabry J. and Palumbo G.
1991 Early Neolithic use of upland areas of Wadi el-Yabis: preliminary evidence from the excavations of 'Iraq ed-Dubb, Jordan. *Paléorient* 17/1: 99-108.

Kuijt I. and Mahasneh H.
1998 The Early Neolithic Occupation of Dhra', Jordan: Implications for the Jordan Valley as a Social, Economic and Ritual Focus. *Journal of Field Archaeology* 25/2: 153-162.

Mithen S., Finlayson B., Pirie A., Carruthers D. and Kennedy A.
2000 New Evidence for Economic and Technological Diversity in the Pre-Pottery Neolithic A: Wadi Faynan 16. *Current Anthropology* 41/4: 655-663.

Mulvaney J. and Kamminga J.
1999 *Prehistory of Australia.* Sydney, Allen and Unwin.

Nadel D.
1994 New symmetry of Early Neolithic tools: arrowheads and truncated elements. In H.G. Gebel and S.K. Kozlowski (eds.) *Neolithic Chipped Stone Industries of the Fertile Crescent*: 407-421. Berlin, ex oriente.
1997 The Chipped Stone Industry of Netiv Hagdud. In O. Bar-Yosef and A. Gopher (eds.), *An Early Neolithic Village in the Jordan Valley.* Part I: *The Archaeology of Netiv Hagdud*: 71-149. School of Prehistoric Research Bulletin 43. Cambridge, MA, Peabody Museum, Harvard University.

Noy T.
1994 Gilgal Truncation: a new type of tool from Early PPNA. In H.G. Gebel and S.K. Kozlowski (eds.), *Neolithic Chipped Stone Industries of the Fertile Crescent*: 423-426. Berlin, ex oriente.

Pirie A.
2001 Wadi Faynan 16 Chipped Stone: PPNA Variability at One Site. *Neo-Lithics* 2/1: 5-8.

Roth Walter R.
1904 Domestic implements, arts and manufactures. *North Queensland Ethnography Bulletin* 7: 1-34.

Sayej G.
2001 A new Pre-Pottery Neolithic A cultural region in Jordan: the Dead Sea basin. In A. Walmsley (ed.), *Australians Uncovering Ancient Jordan: Fifty Years of Middle Eastern archaeology*: 225-232. Sydney, University of Sydney.

Schroeder H. B.
n.d. "Nachcharini, a stratified post-Natufian camp in the Anti Lebanon Mountains." Paper presented at the Annual Meeting of the Society for American Archaeology (1977).

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Results From the First Season at Zahrat adh-Dhra' 2: a New Pre-Pottery Neolithic A Site on the Dead Sea Plain in Jordan

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Introduction and Setting

Until recently, Jordan lacked exemplars of the Pre-Pottery Neolithic A (PPNA) hamlets such as Jericho (Kenyon and Holland 1981) or Netiv Hagdud (Bar-Yosef and Gopher 1997), which are well-known elsewhere in the Levant. Now in short order we have three of them, oddly concentrated in the southeastern Dead Sea Basin. The sites are Dhra' (Kuijt and Mahasneh 1998), Wadi Feinan 16 (Finlayson *et al.* 2000, Mithen and Finlayson 2000) and the newest of them reported here, Zahrat adh-Dhra' 2 (or ZAD 2, Edwards *et al.* 2001; Edwards and Higham 2001; Falconer *et al.* 2001).

Here we present initial results from the first season of excavations at ZAD 2, conducted from November to December in 1999, as part of the 'Archaeology and Environment of the Dead Sea Plain' project (a joint La Trobe and Arizona State Universities project directed by Phillip Edwards, Steven Falconer and Patricia Fall). The area called Zahrat adh-Dhra' lies between the town of Mazra' and the Lisan Peninsula to the west, and the Jordan Valley margin some two kilometres to the east, on the hyperarid Dead Sea Plain. (Fig.1). The region's harsh climate is mitigated only by the major spring which rises at the Jordan Valley margin and feeds the Wadi adh-Dhra' that flows westward over the plain. In the past, as now, human settlement at Zahrat adh-Dhra' required effective harnessing of the spring waters for any attempt at sedentary farming and village life to be contemplated.

ZAD 2 is nestled against the much larger Middle Bronze Age site of Zahrat adh-Dhra' 1 (ZAD 1, Falconer and Berelov 2001; Berelov 2001). Both sites lie upon a deeply dissected landscape composed of the undated Dana Conglomerate Formation, composed of variously tilted blocks of red and white evaporites interbedded with massive alluvial chert seams (Khalil 1992: 40-41; Powell 1988: 93). The evaporites are highly saline and little vegetation grows there. This factor together with the low rainfall, high temperatures, and vividly coloured and faulted rock formations has produced a beautiful but stark and barren locale. However, the environs of the ZAD sites once offered broad flat plains, like the modern farmlands immediately to the south and the best-known ancient settlement in the region – the Early Bronze Age site of Bab adh-Dhra' (Rast and Schaub 1981 – rather than the deeply dissected badlands that characterise their immediate surroundings today. We know this, at least for the period of the Middle Bronze Age, by the deep incision of Wadi adh-Dhra' which has bisected the MB site of ZAD 1, sending boulders and buildings tumbling into its gorge from both banks.

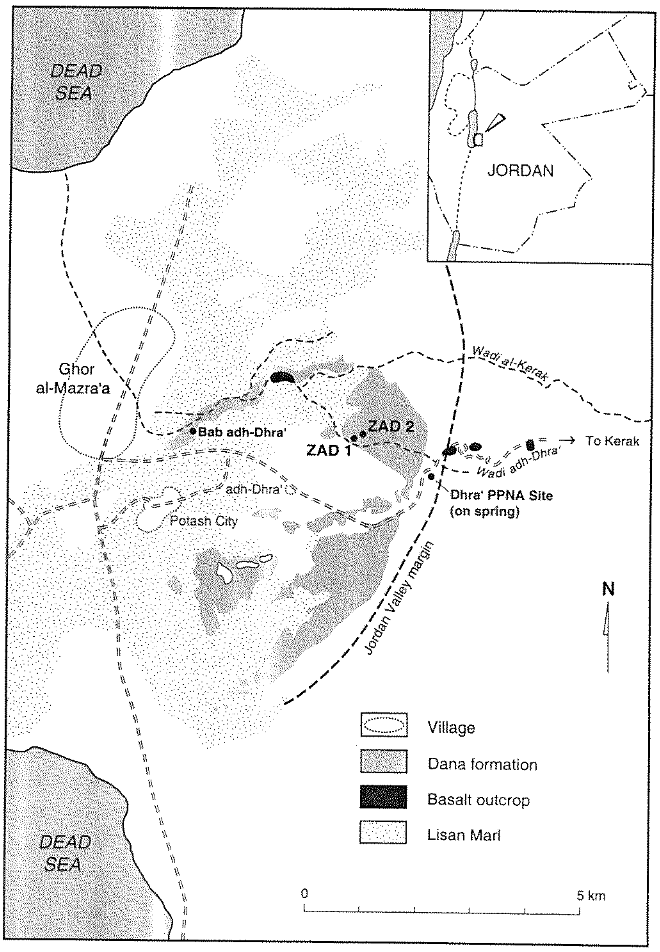

Fig. 1. The Pre-Pottery Neolithic A site of ZAD 2 on the Dead Sea Plain.

The PPNA Site of Zahrat adh-Dhra' 2 (ZAD 2)

Zahrat adh-Dhra' 2 lies on a promontory of land jutting southwest against a deep gully that separates ZAD 2 from ZAD 1 (Fig. 2). Whereas some of the site clearly has been truncated by erosion to the west, the surviving portion forms a low, roughly circular mound about two meters thick and 2,000 sq m in area. The site is littered by stone fragments and artefacts spread within a radius of about 50 m from the central and highest part of the mound. Seventeen curvilinear wall stubs emerge clearly through topsoil, and 12 pits resulting from clandestine excavations, surrounded by small hillocks of sediments, have been dug into the site. Thirty-five surface groundstone artefacts, including mortars, pestles, querns, handstones and a shaft straightener were found on the site's surface during the first season. Notable were five cup-hole mortars, made from large blocks of basalt, limestone and sandstone (Fig. 3).

The Excavations and the Architectural Remains

Excavation proceeded in three areas of the site: at Structure 1, which was visible in the cliff section on the western face of the site; at Structure 2 over a long curvilinear wall section; and at Structure 3 near the summit of the site (Fig. 2) in order to investigate the site's thickest deposits.

Squares D26 to F28 were chosen at a point on the gully cliff where the remains of the oval Structure 1 could be seen cutting the surface. Here, a dark organic sediment was also visible in section above the underlying natural basal sediments. The excavations revealed a curvilinear wall-section enclosing a semicircular dwelling. To the west of this wall the floor was stepped down about 30 cm. Outside to the east, a plastered floor formed the occupation surface at a higher level. The wall was well made with angular and oval stone fragments set into a lime mortar. Deeper excavations were continued in Square E 28 into an underlying series of ephemeral red and dark grey surfaces. The red sediment may be derived from the underlying natural Dana Formation calcarenite, and the dark patches are derived from hearths and organic waste.

Structure 2 (Squares J 22 – L 24) was excavated in order to elucidate the nature of a 6.5-metre long wall arc, first noticed protruding through topsoil. Excavations yielded a walled structure with a plastered floor and an interior hearth set with stones and plaster (Fig. 4). The wall curved from the northwest in Square J 22 to the southeast in Square K 24, and was well made with three courses and two rows of stones set firmly in a hard lime mortar. A second wall abutted the first in Square J 22 and curved away in the opposite direction, to the southwest. A small cairn of stones positioned in the interstices between the two walls near the south baulk of Square J 24 overlay some large fragments of a human cranium. Further excavation showed that this feature marked the position of a human skull, which was evident in the baulk section.

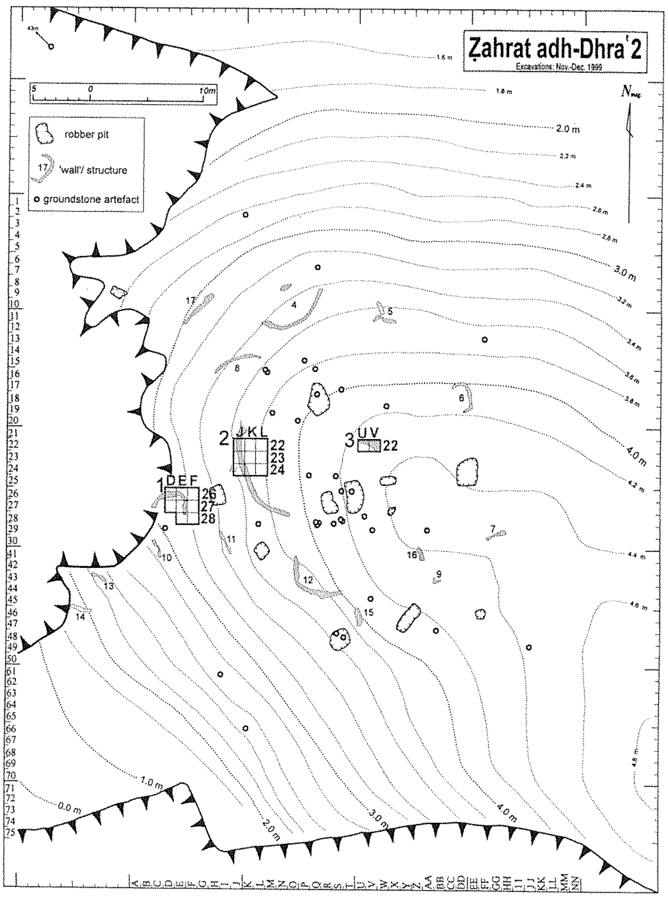

Fig. 2. ZAD 2 after the 1999 excavation season

Two squares (U 22 -V 22) were positioned at the summit of the mound in order to investigate the deepest deposits of the site. Though the excavation was not positioned over a visible structure, one (Structure 3) was duly found here. At Locus 2.1, about 40 cm below the surface, a hearth (F. 3) rich in charcoal was found associated with a floor. This capped a lower structure which consisted of a curvilinear wall stepped down to the north, curving east to west from Square V 22 to U 22, with the interior floored surface sunk 25 cm below the exterior one.

Chronology of Zahrat adh-Dhra' 2

Many characteristics of the ZAD 2 groundstone and flaked stone assemblages (below) indicate that the site belongs to the Pre-Pottery Neolithic A period (Enoch-Shiloh and Bar-Yosef 1997). A sequence of three radiocarbon dates from the two phases of occupation in Structure 3 (Table 1) confirmed this by yielding similar determinations of ca. 9,500 BP and a calibrated date range of 9,150 – 8,550 BC.

Table 1. AMS radiocarbon dates from ZAD 2.

Provenance	Date (uncal. BP)	Lab. Code	Calibrated date (95.4% prob.)
Structure 3, Sq. V 22, Loc. 3.1	9,490 50	OZE 605	9,150 – 8,650 BC
Structure 3, Sq. V 22, Loc. 7.2	9,440 50	OZE 606	9,150 – 8,550 BC
Structure 3, Sq. V 22, Loc. 7.2	9,470 50	OZE 607	9,150 – 8,600 BC

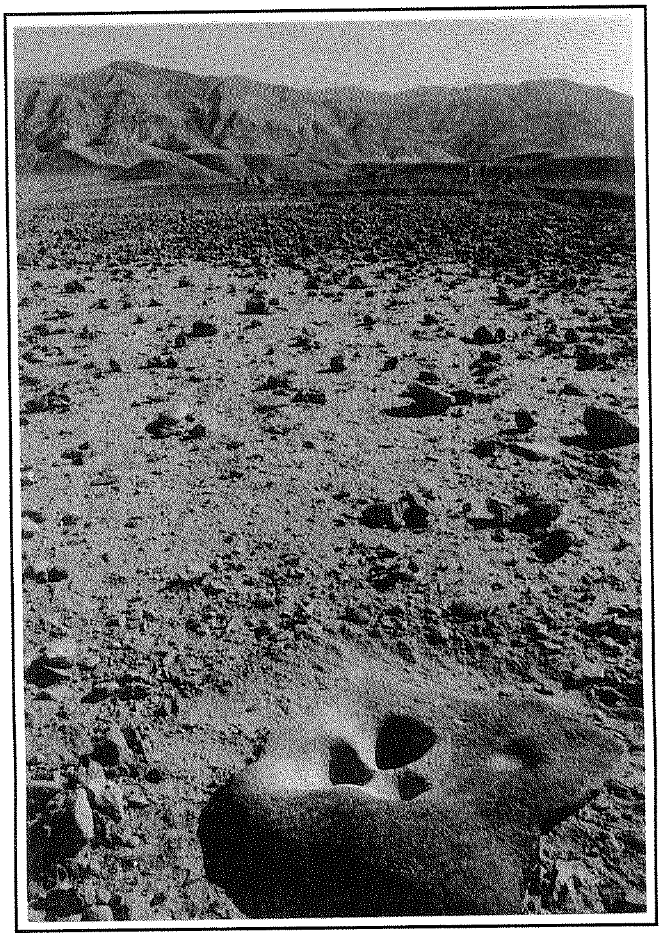

Fig. 3. Basalt cup-hole mortar on the surface at ZAD 2.

Local and Exotic Artefacts and Materials

Two broken, grooved basalt shaft straighteners were found, one from an occupation surface in Structure 1 and the other from Structure 2. Basalt outcrops intrude the Dana conglomerate and basalt can be found locally in the Wadi Kerak. Structure 1 also produced an incised fragment of burnt limestone with seven parallel notches carved in a shaped 'rim'. The most notable piece of *art mobilier* was a limestone plaque from Structure 2, incised with a geometric pattern of 15 vertical strokes pendant from a band of four parallel lines (Fig. 5). Short sections of two marine *Dentalium* sp. molluscs were discovered, and other exotic materials included obsidian flakes, fragments of green copper ore, and fragments of a hard green mineral.

The Flaked Stone Assemblage

A total of 52,899 lithics was recovered from the three structures excavated in the first season. A small number were burnt, probably due to incidental firing of lithics associated with hearths (3 pieces or 0.3 % among the tools and 2 pieces or 0.05% among the debitage). So far, evidence for heat treatment is very limited (2 pieces or 0.2 % among the tools and none among the debitage).

As for flint origins, the survey of 1994 in the region of ZAD 2 demonstrated that the massive veins of flint cobbles that occur 1.5 km east of the site were used through time as quarries (Edwards *et al.* 1998). Furthermore, the pebbles, which wash down Wadi adh-Dhra', are widely scattered over the ZAD 2 vicinity and undoubtedly supplied most of the flint used there. The existence of cortex on both cores and many flaked elements supports the idea that these cobbles provided the main source for flaking flint elements. A smaller number of flaked artefacts were produced from quartz (2 pieces or 0.2 % among tools), quartzite (1 piece or 0.1 % among tools) and obsidian (2 pieces or 0.2 % among tools and 2 pieces among the debris).

Table 2. ZAD 2 debitage and debris.

	Types	n	%
Debris	Chips	42,293	88.3
	Chunks	5,605	11.7
	Total	47,898	100.0
Debitage			
	Cores	236	6.0
	Flakes	2,870	72.8
	Blades	67	1.7
	Bladelets	742	18.8
	Core rejuv. flake	28	0.7
	Total	3,943	100.0

Lithic technology shows that the majority of the tools were struck from single-platform cores and manufactured mainly on bladelets (Table 2). At this stage, the site has produced many tool types (Table 3) such as borers, Hagdud truncations, bifacial tools (picks/axes), scrapers, notches, burins, and Beit Ta'amir knives, but surprisingly few points (no complete El Khiam points have yet been recovered). Moreover, the excavations did not recover any lunates,

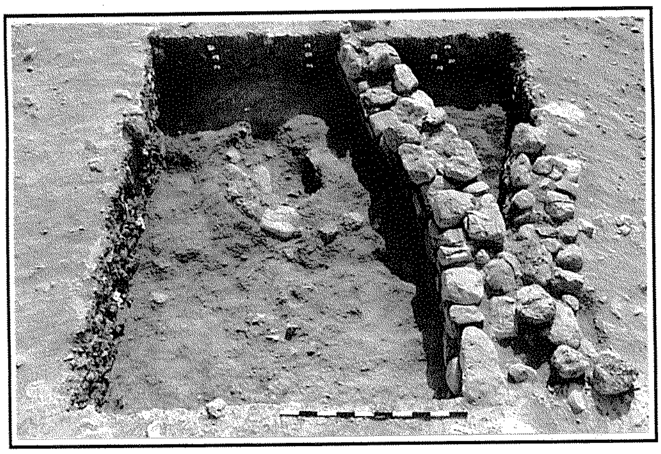

Fig. 4. View south over excavations in Structure 2, ZAD 2.

which are often considered to constitute one of the typical features of the early phase of the PPNA. The preliminary classifications as well as the existence of many curvilinear structures and the tight range of radiocarbon dates indicate that this site has one period of occupation dating to the late PPNA (Sayej 2001).

Table 3. ZAD 2 retouched lithics.

Types	n	%
Convex scrapers on flakes	37	3.3
Concave scrapers on flakes	7	0.6
Endscrapers on flakes	8	0.7
Side scrapers on flakes	18	1.6
Side scrapers on blades	2	0.2
Burins on flake	6	0.5
Burins on blades	1	0.1
Burins on bladelets	1	0.1
Retouched blades	49	4.4
Beit Ta'amir blades	2	0.2
Retouched bladelets	400	36
Backed bladelets	3	0.3
Projectile points	7	0.6
Hagdud truncations	25	2.2
Notches on bladelets	8	0.7
Notches on flakes	53	5
Retouched flakes	381	34.1
Backed flakes	15	1.3
Borers on bladelets	33	3
Borers on flakes	17	1.5
Picks	9	0.9
Axes	16	1.4
Hand axes	3	0.3
Multiple tools	9	0.7
Varia	6	0.3
Total	1,116	100

Archaeobotanical Remains

During the 1999 field season, 41 soil samples were processed by flotation in order to recover plant remains. Table 4 summarises the results, where the ubiquity of each taxon is shown; in other words, the number of samples containing that taxon, rather than the absolute number of items of that taxon found (Popper 1988). Major patterning within the assemblage appears to be explained by differential sampling and preservation. For example, practically all the rare taxa were found only in samples from Structure 1, presumably because three-quarters of the sediment processed came from this structure. Larger samples (in terms of the number of identifiable plant remains) contained the greatest range of taxa; smaller samples included only part of that range. Remains from contexts more than 0.5 m below the modern, deflated surface of the site were clearly better preserved than those in samples from closer to the surface, and this is reflected in a greater diversity of identifiable types. Conversely, indicators of bioturbation (snails, pellets and uncharred seeds such as *Aizoon hispanicum*) were more abundant in the upper levels.

Fig. 5. Incised limestone plaque from Structure 2 (Square K 22, Locus 2.1) at ZAD 2.

Table 4. Ubiquity of archaeobotanical taxa from ZAD 2.
Total number of samples (S) = 41. <U = ubiquitous = >59% - A = abundant = >29% - F = frequent = >10% - O = occasional = >2%- R = rare = single record>

Taxon	**# S**	**% S**	**structures**	**status**
snail shells	40	98	1, 2, 3	U
rodent/insect pellets	21	51	1, 2, 3	A
wood fragments	32	78	1, 2, 3	U
wheat grain, *Triticum* sp.	1	2	3	R
glume base (wheat), *Triticum* sp.	4	10	1, 3	O
wheat rachis internode, *Triticum* sp.	1	2	3	R
wild-type barley grain, *Hordeum* sp.	8	20	1, 3	F
domestic-type barley grain, *Hordeum* sp.	1	2	1	R
indeterminate barley grain, *Hordeum* sp.	5	12	1, 3	F
barley floret base, *Hordeum* sp.	19	46	1, 3	A
wild-type barley rachis internode, *Hordeum* sp.	6	15	1, 3	F
domestic-type barley rachis intern., *Hordeum* sp.	4	10	1	O
indeterminate barley rachis intern., *Hordeum* sp.	11	27	1, 3	F
[any barley grain]	12	29	1, 3	F
[any barley rachis internode]	14	34	1, 3	A
oat awn fragment, *Avena* sp.	8	20	1, 3	F
cereal grain fragments	25	61	1, 2, 3	U
cereal culm node	1	2	1	R
indeterminate floret base	2	5	1, 3	O
lentil, *Lens* sp.	6	15	1, 3	F
pea-type pulse, Papilionaceae (Vicieae)	8	20	1, 2	F
pulse fragments	31	76	1, 2, 3	U
Pistacia sp. nutshell fragments ('diagnostic')	23	56	1, 2, 3	A
Ficus sp. nutlets	27	66	1, 2, 3	U
Aizoon hispanicum seed [not carbonised]	38	93	1, 2, 3	U
Cerastium sp. seed	1	2	1	R
Silene sp. seed	1	2	1	R
Heliotropium sp. seed	1	2	1	R
Lithospermum type seed	3	7	1, 3	O
Chenopodiaceae seed	1	2	1	R
Carex type seed	1	2	1	R
small-seeded legume seed	1	2	1	R
Ornithogalum type seed	2	5	1	O
Malva sp. seed	1	2	3	R
Plantago sp. seed	5	12	1	F
non-cereal grass seeds	3	7	1, 3	O
grass seed fragments	10	24	1, 3	F

Four categories of ancient plant remains should be considered ubiquitous at ZAD 2 – cereal fragments, pulse fragments, fig nutlets and *Pistacia* shell fragments (non-diagnostic nutshell fragments occur in all but two samples). Two cereal species, barley and wheat, are apparently represented, although no complete, diagnostic grains were recovered. It was sometimes possible to assign a grain fragment to either wheat or barley. Chaff fragments of barley, and occasionally wheat, were also identified. There were at least two pulse species: lentil and a spherical variety akin to a very small pea.

The archaeobotanical assemblage from ZAD 2 appears as essentially a subset of those recovered at Netiv Hagdud (Kislev 1997), where remains were very well preserved, permitting the identification of seventy-five taxa, mostly to species level. Contrary to Hopf's (1983) interpretation of the PPNA plant remains from Jericho, the Netiv Hagdud remains do not support the contention that domestic varieties of wheat and barley were cultivated in the PPNA. Barley rachis internodes with domestic-type disarticulation scars made up only a small minority of the total, and it was shown experimentally that a similar percentage of 'domestic' types could be obtained by harvesting a crop of wild barley. The wheat grains found at Netiv Hagdud could apparently all be assigned to the wild ancestor of emmer, *Triticum dicoccoides*.

'Iraq ed-Dubb is the only PPNA site in Jordan with published archaeobotanical data (Neef 1997). Here, Colledge (2001) found what appeared to be domestic types of both wheat and barley, as well as large-seeded legumes (including lentil and fava bean), pistachio and walnut shells, fig seeds and several herbs that are potentially weeds of cultivation. The presence of straw components and domestic varieties of cereals suggested that the site depended to some degree on food production, supplemented by gathering and hunting.

The results of the first season at ZAD 2 lend some support to both views. Of the barley rachis internodes, the majority that could be determined are of the wild type, and the breakage pattern is not that typical of domesticated barley. Most of the grain fragments identified as barley are apparently of wild barley. On the other hand, some barley grain fragments are large enough to be of the domesticated variety, and one grain apex was identified as probable domestic einkorn wheat. On balance, the evidence obtained is more consistent with the interpretation of Netiv Hagdud, where it is postulated that wild varieties of cereals and pulses may have been collected or cultivated, than with the fully agricultural settlement suggested at Jericho.

One whole nutlet of *Pistacia* was recovered in Structure 3. It is very small – which is presumably why it was not broken open and consumed – but it appears to conform to *Pistacia atlantica*, with its "crater-like" hilum (Kislev 1997: 210). Most of the nutshell fragments found at ZAD 2 lack any distinguishing features, but a minority, recorded as 'diagnostic', include an angle that is consistent with the 'crater-like' hilum of *P. atlantica*. It appears that *P. atlantica* is the only nut type represented at ZAD 2, but its remains are ubiquitous. The tree probably formed a minor component of the natural vegetation of the Wadi Kerak, and perhaps of the Kerak plateau, before the advent of agriculture (Kürschner 1986).

Likewise, *Ficus* (fig) nutlets are commonly reported, from the Natufian onwards (Neef 1997). *Ficus pseudosycomorus* is native to southern Jordan, and occurs, for example, in sandstone gorges around Petra. As the same Mediterranean/ Saharo-Arabian transition zone extends northwards beyond Dhra' (Kürschner 1986), it is reasonable to assume that the tree would have grown within easy access of ZAD 2. Both *Ficus* (over 400 nutlets) and *Pistacia* (nearly 3000 fragments) may be over-represented, relative to the cereals and pulses, because of the large number of nutlets in each fig and the large number of woody nutshell fragments from each nut.

Faunal Remains

The first excavation season at ZAD 2 recovered 34 animal bones and bone fragments. These remains were found in an upper phase; consequently, they reflect heavy surface wear due to exposure. The identifiable large mammal species include *Capra* sp. and *Bos primigenius*. *Capra* is represented by a first phalange and an astragalus. Both fall within the parameters of size for domestic goats, but size alone is insufficient as a distinguishing marker. *Bos primigenius* is represented by a proximal rib fragment. Two phalanges represent a carnivore, possibly badger (*Meles meles*). One crab claw (*Potamon*) was also recovered. Many larger fragments could not be distinguished definitively as either *Capra* or *Gazella*. Gazelle remains occur frequently in PPNA sites in the southern Levant, so some of these bones may be from gazelles. Interestingly, however, the Dana-Faynan-Ghuwayr Early Prehistory Project has recovered from Site WF 16 an animal bone assemblage that features *Capra* but seems not to include *Gazella* (Finlayson *et al.* 2000).

Bibliography

Bar-Yosef O. and Gopher A. (eds.),
1997 *An Early Neolithic Village in the Jordan Valley Part I: The Archaeology of Netiv Hagdud*. School of Prehistoric Research Bulletin 43. Cambridge, MA, Peabody Museum, Harvard University.

Berelov I.
2001 Zahrat adh-Dhra' 1: Stranded on the Dead Sea Plain in the Middle Bronze Age. In A. Walmsley (ed.), *Australians Uncovering Jordan: Fifty Years of Middle Eastern Archaeology*: 165-72. Sydney, University of Sydney.

Colledge S.
2001 *Plant Exploitation on Epipalaeolithic and Early Neolithic Sites in the Levant*. British Archaeological Reports – International Series 986. Oxford: BAR.

Edwards P.C. and Higham T.
2001 Zahrat adh-Dhra' 2 and the Dead Sea Plain at the dawn of the Holocene. In A. Walmsley (ed.), *Australians Uncovering Ancient Jordan: Fifty Years of Middle Eastern Archaeology*: 139-152. Sydney, University of Sydney.

Edwards P.C., Falconer S.E., Fall P.L., Berelov I., Davies C., Meadows J., Meegan C., Metzger M.C. and Sayej G. J.
2001 Archaeology and Environment of the Dead Sea Plain: preliminary results of the first season of investigations by the joint La Trobe University/ Arizona State University Project. *Annual of the Department of Antiquities of Jordan* 45: 135-157.

Edwards P.C., Macumber P.G. and Green M.K.
1998 Investigations into the Early Prehistory of the East Jordan Valley: Results of the 1993/1994 La Trobe University Survey and Excavation Season. *Annual of the Department of Antiquities of Jordan* 42: 15-40.

Enoch-Shiloh D. and Bar-Yosef O.
1997 Salabiya IX. In O. Bar-Yosef and A. Gopher (eds.), *An Early Neolithic Village in the Jordan Valley Part I: The Archaeology of Netiv Hagdud*: 13-40. School of Prehistoric Research Bulletin 43. Cambridge, MA, Peabody Museum, Harvard University.

Falconer S. and Berelov I.
2001 Zahrat edh-Dhra (a) (ZAD 1). In S. Gibson and A. Negev (ed.), *Encyclopedia of Archaeology in the Holy Land*: 551. New York, Continuum.

Falconer S., Fall P. and Edwards P.
2001 Zahrat adh-Dhra'. In S.H. Savage, K.A. Zamora and D.R. Keller (eds.) Archaeology in Jordan. *American Journal of Archaeology* 105: 427-461.

Finlayson B., Mithen S., Carruthers D., Kennedy A., Pirie A. and Tipping R.
2000 Dana-Faynan-Ghuwayr Early Prehistory Project. *Levant* 32:1-26.

Hopf M.
1983 Jericho Plant Remains. In K. M. Kenyon and T. A. Holland (eds.), *Excavations at Jericho Volume V: The Pottery Phases of the Tell and Other Finds*: 576-621. Oxford, Oxford University Press.

Kenyon K. M. and Holland T. A.
1981 *Excavations at Jericho, Vol. III. The architecture and stratigraphy of the Tell*. London, British School of Archaeology in Jerusalem.

Khalil, B.
1992 *The Geology of the ar-Rabba area. Map Sheet no. 3152 IV*. Bulletin 22, Geology Mapping Division, Geology Directorate. Ministry of Energy and Mineral Resources / Natural Resources Authority. Amman, Hashemite Kingdom of Jordan.

Kislev M.E.
1997 Early Agriculture and Paleoecology of Netiv Hagdud. In O. Bar-Yosef and A. Gopher (eds.), *An Early Neolithic Village in the Jordan Valley Part I: The Archaeology of Netiv Hagdud*:

209-236. School of Prehistoric Research Bulletin 43. Cambridge, MA: Peabody Museum, Harvard University.

Kuijt I. and Mahasneh H.
1998 The Early Neolithic Occupation of Dhra', Jordan: Implications for the Jordan Valley as a Social, Economic and Ritual Focus, *Journal of Field Archaeology* 25/2: 153-162.

Kürschner H.
1986 A physiognomical-ecological classification of the vegetation of southern Jordan. In H. Kürschner (ed.), *Contributions to the Vegetation of Southwest Asia*: 45-80. Beihefte zum Tübinger Atlas des Vorderen Orients, Reihe A, Nr.24, Wiesbaden, Dr Ludwig Reichert Verlag.

Mithen S. and Finlayson B.
2000 WF16, A New PPNA Site in Southern Jordan, *Antiquity* 74: 11-12.

Neef R.
1997 Status and Perspectives of Archaeobotanical Research in Jordan. In H.G. Gebel, Z. Kafafi and G. O. Rollefson, (eds.), *The Prehistory of Jordan II. Perspectives from 1997*: 601-609. Studies in Early Near Eastern Production, Subsistence and Environment 4. Berlin, *ex oriente*.

Popper V.S.
1988 Quantitative methods in paleoethnobotany. In C. A. Hastorf and V. S. Popper, (eds.), *Current Paleoethnobotany Analytical Methods and Cultural Interpretations of Archaeological Plant Remains*: 53-71. London, University of Chicago Press.

Powell J. H.
1988 *The Geology of the Karak area. Map Sheet no. 3152 III.* Bulletin 8, Geological Mapping Division, Geology Directorate. Ministry of Energy and Mineral Resources / Natural Resources Authority. Amman, Hashemite Kingdom of Jordan.

Rast W.E. and Schaub R.T.
1981 The 1977 expedition to the southeastern Dead Sea Plain, Jordan. In W.E Rast and R.T. Schaub, (eds.), *The Southeastern Dead Sea Plain Expedition: An Interim Report of the 1977Sseason*: 1-6. Cambridge, MA: American Schools of Oriental Research.

Sayej G.
2001 A New Pre-Pottery Neolithic A Cultural Region in Jordan: the Dead Sea basin. In A. Walmsley (ed.) *Australians Uncovering Ancient Jordan: Fifty Years of Middle Eastern Archaeology*: 225-232. Sydney, University of Sydney.

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Shaqarat Mazyad – The Village on the Edge

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Introduction (LRK)

The Shaqarat Mazyad Neolithic Excavation and Survey Project is a salvage project kindly offered by the Department of Antiquities in Amman to The Carsten Niebuhr Institute of Near Eastern Studies, University of Copenhagen, Denmark. The project operates as a multi-level educational field school and is funded by The University of Copenhagen, Faculty of Humanities. Dr. Ingolf Thuesen is project director. In-field directors of the 1999 season were Dr. Lea Rehhoff Kaliszan and Dr. Charlott Hoffmann Jensen. The 2000 season was directed by Dr. Susanne Kerner, and the 2001 by Dr. Lea Rehhoff Kaliszan. In the first two seasons the excavation was supplemented by a survey in the immediate surroundings conducted by Bo Dahl Hermansen.

Environment and Previous Investigation in the Area (LRK)

The site of Shaqarat Mazyad is situated at 35°26'23" East/30°26'45" North in the sandstone mountain area ca. 13 km north of Petra. The vegetation in the area is dominated by stone oak and pistachio as well as shrubs and other minor herb plants (Gebel 1986: 299).

In 1964 D. Kirkbride encountered and surveyed the site for the first time during her work at Beidha. She proposed a dating within the MPPNB. H.G.K. Gebel revisited the site in 1984, conducted a systematic survey and made a small sounding there (Gebel 1988); he could confirm the date. Then, more recently, the area around the site was partly surveyed by M. Lindner.

Goals of the Excavation (LRK)

It is the intention to establish a chronostratigrapic framework of the site in order to relate it to other Neolithic sites in the area, including Basta, Ba'ja, and Beidha. These are sites that completely cover the whole PPNB sequence. Also it is the intention to make comparative analyses of archaeological structures and material remains from Shaqarat Mazyad and sites in or near Wadi Araba. The newly excavated Neolithic site of Wadi Fidan may be one such occupation of relevance to Shaqarat Mazyad. Thus it is one of our goals to evaluate the degree of sedentism at Shaqarat Mazyad. The site is very small, which makes it ideal to study types of intrasite spatial organization preceding the megasite phenomenon characteristic of the Late PPNB.

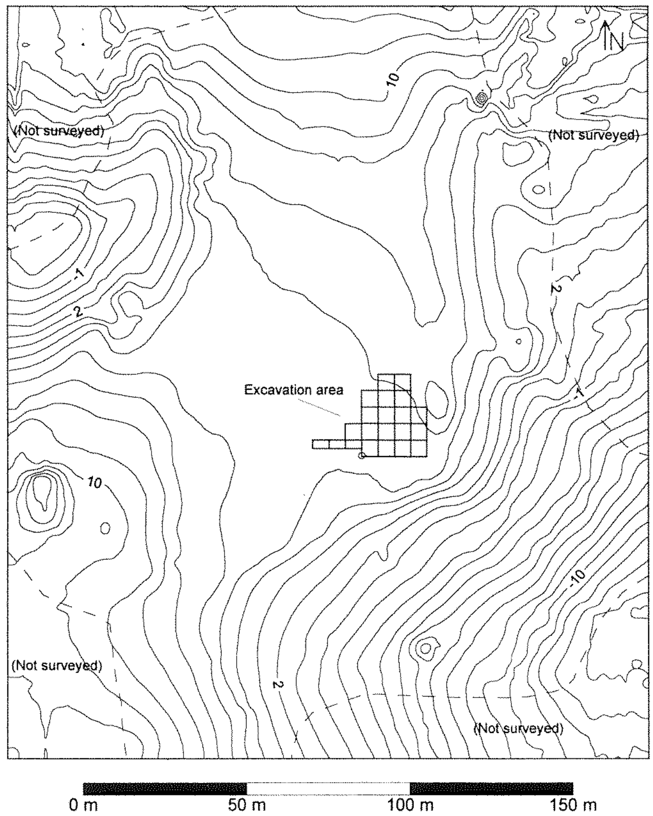

Fig. 1. Topographic map of Shaqarat Mazyad and its immediate surroundings. 1-meter contour intervals are indicated.

Topographic Survey (TBBS & MB)

Between 6-12 August, 2001, a topographic survey was carried out by Tim B. B. Skuldbøl and Mikkel Bille with the kind help of students. The aim of the survey was to map the archaeological site and its immediate surroundings. The survey area covered an area of approximately 0.04 km2 (ca. 200 m x 200 m) or 4 ha (Fig. 1).

The site is located at the southernmost part of a plateau that overlooked several wadis. Large topographic variation such as rock formations and steep slopes characterize the survey area. The largest difference in altitude was approximately 30 m.

The survey area is also marked by heavy use of the area. Conspicuous are the many modern features such as the road running north of the site created by a bulldozer. This continuous road construction caused some leveling disturbance of the site and may therefore have affected the measurements. Terracing of probably Nabataean date has disturbed the eastern and southern extension of the Neolithic site.

Stratigraphy (LRK, MLS, BM, AI)

The surface of the excavated area slopes slightly downhill from north to south and east to west. The general stratigraphic profile of the excavated area consists of three Neolithic building phases. The main building phase is erected on a compact yellow, silty layer. It is characterised by approximately circular structures (Fig. 2). Probably late in this phase several rebuildings have been undertaken at the site. These are mainly represented by minor alterations on the houses themselves as well as newly built shelter walls (for keeping animals?, e.g., north of buildings B and D, and south of buildings C and E). Also minor rooms were now filling out the space in between some of the original buildings (M and N).

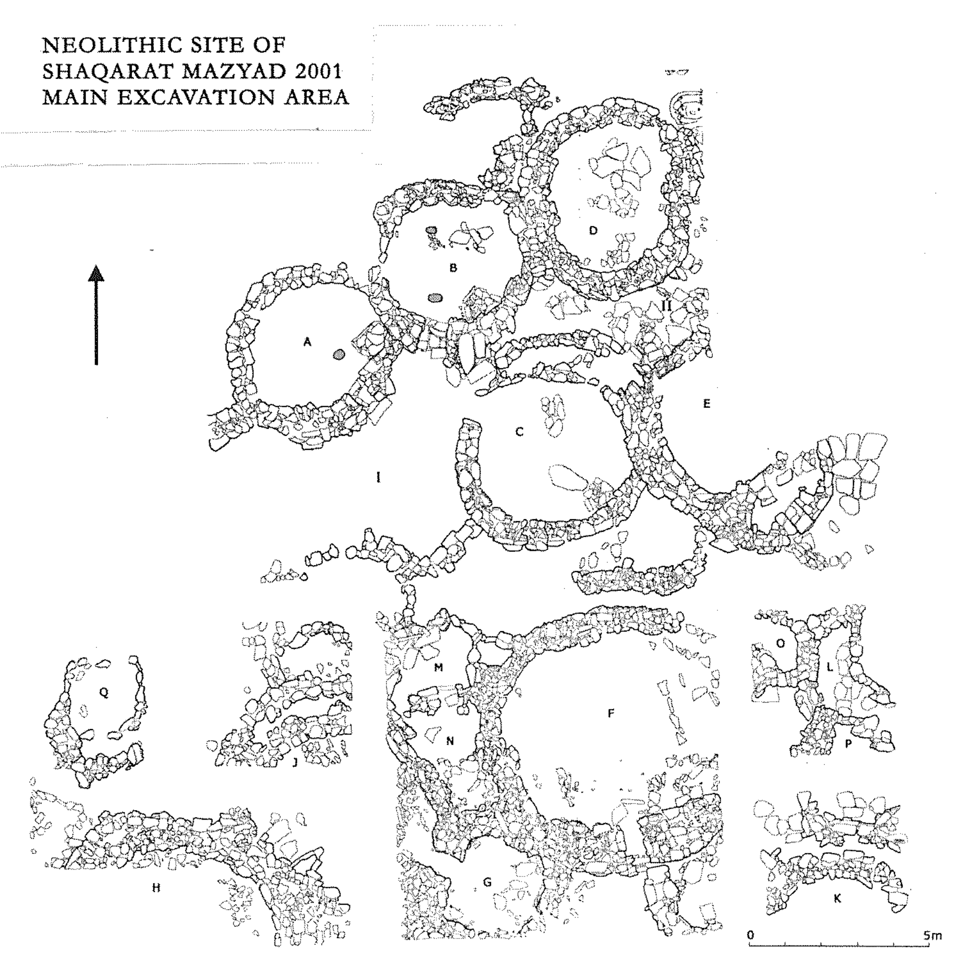

Fig. 2. Plan of the main excavation area after the 2001 season.

Following the main building phase is another one with additional structures that are mainly sub-rectangular. Two such buildings, east in the main excavation area, cut the existing walls of an earlier round posthole building. Another has partly destroyed the walls of two earlier buildings in the northern part of the excavation.

In the western part of the main trench, later buildings seem to be flimsier. Here they were made of only one row of rather large stones to create a very small oblong chamber, the use of which remains enigmatic, and a small semi-subterranean oval room. It is not yet clear how the westernmost late buildings relate to the easternmost late buildings stratigraphically.

Architecture (LRK)

The buildings of the main phase were constructed of roughly dressed sandstone and limestone blocks in various sizes. In a few walls mortar was used, though the quality seems to be low, as it does not really stick to the stones but appears more as a kind of filling. Structures are in general round and built together in a honeycomb fashion, with walls being ca. 0.65m thick.

Houses were constructed as post buildings, each having 10 or more wooden posts around which stones were piled up at a height of at least 1 m (Fig. 3). At least three buildings show alterations on part of the wall (C, E, J), thus creating an oblong cavity between the old and the new wall, perhaps for storage. Most buildings are 3.5-4.5 m in diameter. In several buildings the inner wall face was finished by a row of flat, upright stones (Fig. 3).

So far, only one of the completely excavated buildings seems to be clearly larger (about 7 m diameter). Another building, so far only partly uncovered to the southwest, may be of quite a large size as well (building H). Almost all buildings have only one entrance, which as a rule opens towards the south, though exceptions do occur. Entrances are mostly flanked on the outside by two upright flat stones (Fig. 4).

Floors and Installations

The five northernmost buildings (A-E) are all furnished with a very fine and good quality lime plaster (pink in colour, but not yet layered using cement-forming minerals as in Basta and 'Ain Ghazal), whereas the large building and those surrounding it so far do not show traces of genuine plaster. In general, only buildings from the earliest phase seem to have proper plaster floors.

Another characteristic of buildings A-E are their stone platforms in the northern part of the room. The platforms lie directly on top of the plaster floor. Until now they have been interpreted as working platforms, as many ground stone tools were found on or near them. Only one of the southern buildings has such a stone paved area (M). Here also numerous hand stones were found on the pavement.

Only two hearths have been identified, also in the northern buildings (Fig. 2 and 5). These are very small (30-40 cm in diameter) and round or oval in shape.

Storage facilities are almost absent except for one small room, less than 1x1m, which apart from a few pieces of chipped stone was empty (Fig. 2, east of room M). This storage room, together with the two minor rooms to the west of it, are clearly later than the adjacent buildings, which is seen in the way the walls are built up against these structures. There may even be a possibility that these rooms partly destroyed the continuation of building J's double wall turning to the east. It is unclear whether the two small rooms represent storage rooms as well. On the one hand their contents (see below), and the fact that the northern doorway was intentionally blocked, may point to the fact that they were. On the other hand, the furnishing of the rooms (stone paved floor and interior walls, well built interconnecting doorway) points to their use as regular domestic rooms. The oblong cavities between double walls in some buildings remain unexplained, but they may have functioned as storage facilities.

Inside three buildings a small stone structure was uncovered to the right of the entrance (Figs. 2 and 5). One seems to be merely a bench or small buttress (building C), whereas the other two clearly were later facilities (A and B). Upright stones and flat stones covered the top of these structures. So far only the smallest one has been excavated, which turned out to be empty. The larger one still awaits excavation and may well turn out to be a storage bin (B).

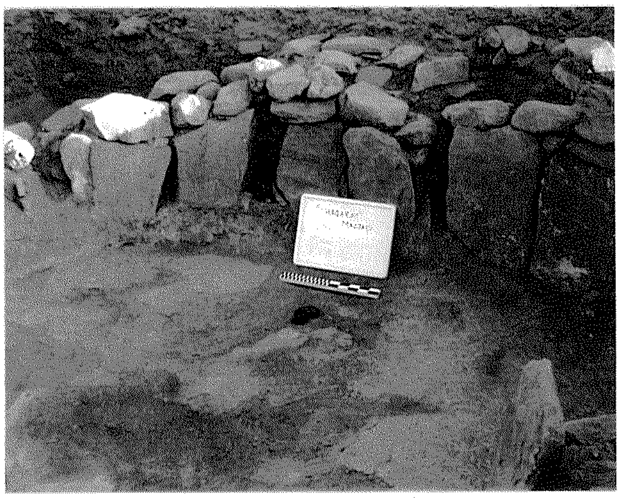

Fig. 3. Postholes and flat, upright stones in building A.

Chipped Stone (CHJ)

The figures shown in Table 1 include all three seasons. There are slight differences in the figures from each season that will hopefully be explained or erased after a more detailed study of the material. As seen from Table 1 the preliminary sorting of the chipped stone material includes more than 50% of the total.

The cores have not been closely examined, therefore the flake-blade core ratio is not known, but bidirectional blade cores mostly of a semi-naviform type are represented. True naviform cores have not yet been identified. The presence of a large number of blades with triangular sections or otherwise thick blades also supports the conclusion that blades do not derive from a true naviform production sequence.

The blade:flake ratio is not yet known for the 1999 material, but the figures for the 2000 and 2001 seasons are, respectively, 1:3.7 in 2000 and 1:2.3 in 2001.

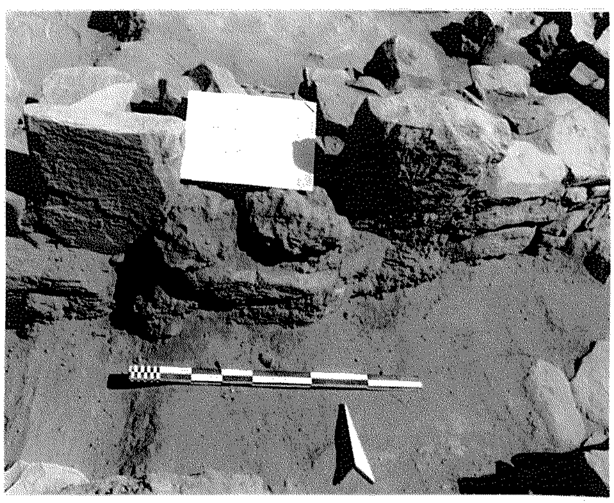

Fig. 4. Two upright stones flanking the entrance to building C.

Although the flakes are far more represented among the debitage than blades, the chipped stone tools show a predominance of blade-related blanks for tools such as arrowheads, knives, borers etc. Arrowheads are the most dominant tool group, accounting for more than 20% of the tools. The arrowheads consist of mostly Jericho or Jericho/Byblos transitional forms. Knives are almost as frequent as the arrowheads, while borers, scrapers, and retouched pieces each comprise between 10 and 15% of the total. Sickle blades are present, but are not very common.

So far no specific working areas have been identified based on the distribution of cores, primary elements and debitage. The different tool types are also evenly distributed across the site except for the borers, where almost 50% of the borers registered in the 2000 season and a large number from the 2001 season derive from courtyard I . In the same loci a large number of finished and unfinished green stone beads were located.

Table 1. Primary production classes in the lithic assemblage from Shaqarat Mazyad.

Primary Production	n	%
Cores	553	2.2
Core trimming elements	1451	5.7
Debitage	21261	83.7
Debris	572	2.3
Tools	1575	6.2
Total analyzed	25412	100.1
(Total)	(41,075)	

Small Finds (CHJ)

Only few core tools of chipped stone have been registered, but quite a few ground stone polished axes and adzes are found at the site. Other finds include beads of stone, bone and shell, bone tools and a few incised objects.

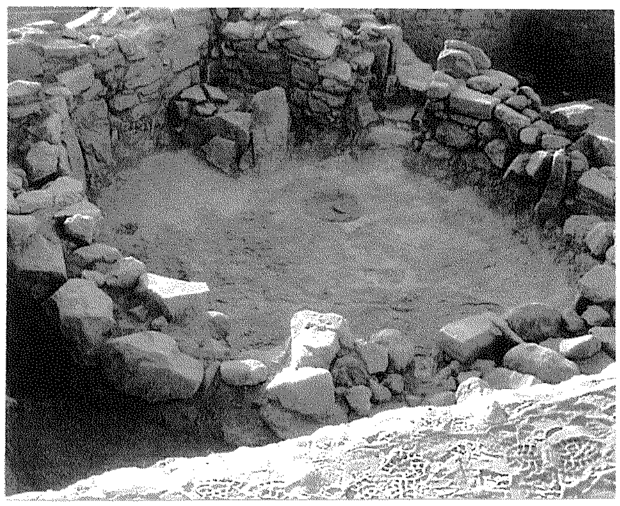

Fig. 5. Building A with hearth and stone construction visible.

Ground Stone Industry (AM)

The ground stone tools are primarily made of locally available stone. They are found both inside the buildings and in the open areas. The three buildings to the north (A, B, and C) all contained similar finds of both grinding stones (1-2), handstones (2-4) and pestles (3-5), suggesting a "household" function. In building D no grinding stones were found. Instead, 9 handstones and 5 pestles were deposited along the wall. Building G as well revealed no grinding stones, but instead a cache of 14 handstones. In addition to the concentration of flint borers and green stone beads mentioned above, the central courtyard I contained 7 grinding stones.

Faunal Remains (PB)

So far only a relatively small part of the faunal material has been analyzed. One thousand fragments have been identified, all originating from square F100. Although this cannot be regarded as a representative selection of the excavated material, it might still be worth mentioning the species identified: *Capra/Ovis* are by far the most dominating group, with a slight tendency for more *Capra*. The group represents more than 50% of the identified bones, and the tendency for smaller and probably domesticated animals with only a small selection of larger and probably wild animals, but the final conclusion will have to await a full measuring and comparison of the fragments. Also present on the site are *Bos*, *Equus*, *Gazella*, *Vulpes* and *Lupus*. Although no human burials have been found among the houses, the identification of two bone fragments suggests that humans were at some stage buried in the vicinity. Finally, three fragments have been identified as bird bones, and although not identified to species yet, two of these bones are from larger predators.

Shells (AI)

Several species of mollusks have been found. The most common are cowries (*Cypraeidae sp.*) and nerites. On all cowries found at the excavation the main part of the body has been removed, thus leaving only the lips.

Among the nerites (*Neritidae sp.*), at least two different species were found, yellow or brown/grey coloured. The latter most probably being the Ox-palate nerite (*Nerita albicilla*). All have been ground down and holed at the apex. An unmodified shell of a *Tridacum maximum* was found on the floor near the southern wall of building D in connection with a concentration of stones. So far all catalogued mollusks can be found in the Red Sea.

Dating and Analytical studies (LRK)

So far only relative dating has been achieved through comparative study of diagnostic elements in the archaeological record. However charcoal has been retrieved and will be sent to a C14 lab. A more precise dating is expected soon. Only a few bits and pieces of plaster have been retrieved so far. They have not yet been analyzed, but we expect them to undergo X-ray diffraction, SEM, and chemical tests in the near future.

Acknowledgements: We are grateful to the Dept. of Antiquities for per-mitting us to excavate the site and for their kind collaboration throughout the first three seasons of campaigning. Especially we wish to thank it's directors, Prof. Dr. Ghazi Bisheh and Prof. Dr. Fawwas al-Khreisheh, as well as the chief inspector of Petra, Suleiman Farajat, and the director of the Museum in Petra, Mohammad Shaubaki. Special thanks are also extended to Dr. Hans Georg K. Gebel for his encouragement and collaboration in setting up the project.

Bibliography

Gebel H.G.

1986 Die Jungsteinzeit im Petra-Gebiet. In: M. Lindner (ed.), *Petra. Neue Ausgrabungen und Entdeckungen*: 273-308. München, Delp Verlag.

1988 Late Epipalaeolithic - Aceramic Neolithic sites in the Petra area. In: A. Garrard and H.G. Gebel (eds.) *The Prehistory of Jordan. The State of Research in 1986*. British Archaeological Reports – International Series 396.1: 67-100.

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Preliminary Report of the Tell Wadi Feinan Neolithic Testing Project

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Introduction

Starting in 1996, a joint University of Nevada, Las Vegas (UNLV) and Department of Antiquities project has been investigating the spectacularly preserved Pre-Pottery Neolithic B (PPNB) village of Ghwair I, in the remote Wadi Feinan system of southern Jordan (Simmons and Najjar 2000). In order to obtain limited comparative data, a brief test excavation was conducted in July 2000 at the nearby Pottery Neolithic settlement of Tel Wadi Feinan, located some 5 km. west of Ghwair I. In particular, we wished to obtain chipped stone and economic information so that we could study the trajectory of change from Pre-Pottery Neolithic through the Pottery Neolithic. This short report summarizes the results of these studies, emphasizing the chipped stone analyses.

Preliminary Results

Tel Wadi Feinan had been previously investigated by Najjar and colleagues (Najjar *et al.* 1990; Najjar 1992), revealing it to be a large Pottery Neolithic village. During the test season reported here, a total of five test pits were excavated, together covering 9 m2. All show the same basic stratigraphic sequence of limited Byzantine materials above sparse Chalcolithic and then more substantial Pottery Neolithic deposits. All were excavated to sterile matrix, which consists of wadi deposits. Stratigraphic integrity was generally lacking; however, the majority of recovered materials are from the Pottery Neolithic occupation of the site. All the cultural deposits occur approximately 1.5 to 2 meters below the present ground surface. This indicates that the Wadi Feinan has been greatly incised since the Pottery Neolithic period, some six thousand years ago, since the current wadi bed is some ten meters below the present ground surface. In fact, active erosion is in the process of destroying the site, and portions of the area previously excavated have collapsed into the wadi. Our test excavations recovered abundant ceramics and chipped stone artifacts, as well as more limited ground stone and paleoeconomic data.

Radiocarbon Dates

Our investigations resulted in four radiocarbon determinations, kindly provided by Dr. E. Banning (University of Toronto). These are presented in Table 1, and are consistent with a Pottery Neolithic occupation.

Table 1. Radiocarbon determinations from Tel Wadi Feinan.

Sample	Uncal BP	Cal BC
TO - 9614	6370 ± 300	5560 - 4955
TO - 9615	6130 ± 89	5210 - 5160 and 5145 - 4935
TO - 9616	6260 ± 90	5315 - 5200 and 5180 - 5135 and 5180 - 5060
TO - 9617	6440 ± 60	5475 - 5355

Ceramics

Numerous ceramics were recovered during the test excavations. Only those from the Neolithic levels are addressed here. Diagnostic forms included a variety of medium jar and bowl forms, as well as several rims for large storage vessels. Rims, handles, and bases are relatively few in comparison to body sherds, implying large vessels.

Technologically, all the pottery was handmade. In many cases mat impressions were found on the underside of the bases. Most bases were heavily abraded, presumably from long use on hard surfaces. The thick walls of the vessels and their even thicker bases (up to 30mm.) were tempered with generally coarse or very coarse rock fragments. The inclusions are primarily igneous or calcareous particles with a fair representation of white or pinkish quartz. Although no carbonized organic tempers were found, the pitted surfaces of many sherds might suggest the loss of organic inclusions during the firing. Fabrics are often gray, suggesting low firing temperatures, and mottled surfaces indicate irregular firing. Surfaces are frequently wet smoothed and decorations are restricted to plastic features. They were applied to the vessel wall, but sometimes raised from it. Finger or bone impressed applied cordons are the dominant decorations.

Paleoeconomy

A total of nine flotation samples give some indication of the paleoeconomic parameters of Tel Wadi Feinan. These materials were analyzed by Ms. Amanda Kennedy, who has prepared a detailed report, summarized here. There were few charred seed and fruit remains in the samples and they were poorly preserved and often fragmentary. Cereal remains including barley and wheat grains, grain fragments and chaff were identified, as were pulses, various fruits including fig and possibly pistachio, as well as identifiable and indeterminate wild/weed seed and chaff remains. Some of the grains were identified as domestic, 6-row hulled barley (*Hordeum cf. vulgare*).

Like the grain remains, there are few pulses in the assemblage making comparisons impossible. It is likely that lentils and peas or vetches are represented. The fruit remains include fig achenes (*Ficus carica*), possible pistachio fragments (*cf. Pistacia* sp.) and nutshell or fruitstone fragments. Of the wild and/or possibly weedy remains in the assemblage, the grass family (*Poaceae*) is represented, as is, possibly, oat or feather grass and nutlets.

Overall, the assemblage resembles that of other Levantine Pottery Neolithic sites. It consists of domestic cereals with a dominance of glume wheat (einkorn and/or emmer) chaff. Grains are far less well represented as are pulses. Fruit remains are similarly few as are the remains of other wild and/or weedy seeds. The variety of genera is limited. The assemblage does show evidence for domestic crops (barley and wheat and possibly pulses) of which some of the wild remains including the grasses and the silicified nutlets may be weeds, although they may equally be wild remains that arrived onto site apart from the crop remains.

In addition to the flotation results, wood charcoal specimens in the flotation samples were examined by P. Austin. While the quantity of charcoal was generally low, the range of taxa represented was broad. Identified plants include *Juniperus* and *Quercus* as possible timber trees, while economically important plants included caper, olive, fig, pistachio, acorn and jujube. The shrub myrtle also was identified. As with the flotation results, the findings from the charcoal analysis are broadly consistent with those from contemporary sites.

In addition to plant remains, animal bones also were recovered. These were analyzed by Ms. Denise Carruthers, who prepared a detailed report. A total of 1309 animal bones were recovered from the site. Of these, 163 bones were identifiable to genus, 1140 bones were identified as either medium or large mammal and 639 bones were classified as unidentifiable fragments. Only three species were identified at the site. *Ovis* sp. dominates the assemblage at 88.5%, followed by *Bos* sp. 9.8% and *Vulpes vulpes 1.6%.*

Miscellaneous Finds

Small finds included a tiny stone bead and an amazonite bead, which was kindly identified in the field by Prof. Andreas Hauptmann. The nearest source of amazonite is the Ras el Naqb region. Other small finds consisted of spindle whorl fragments.

Chipped Stone

A relatively large chipped stone assemblage was recovered (Table 2). While some Chalcolithic materials may be present, the majority of materials appear to be Pottery Neolithic. Lacking clear stratigraphic associations, these materials are considered together here. We do not consider this to be too much of a distorting variable, given that there frequently is a rather indistinct boundary between the Pottery Neolithic and Early Chalcolithic. There is a large size range in both flakes and blades, and in particular, the variation in blades is striking, with many being quite wide, while others are of bladelet proportions. The ratio of blades (including bladelets) to flakes is 1:3.0, although nearly 50% of tools were manufactured on blade blanks (Table 3). Raw material all appears to be locally available.

Table 2. Chipped Stone Artifacts from Tel Wadi Feinan.

Class	n	%	%'
Tools	242	3.4	9.2
Debitage:			
cortical flakes	60	0.9	2.3
secondary flakes	546	7.8	20.6
tertiary flakes	937	13.3	35.4
cortical blades	2	-	0.1
secondary blades	69	1.0	2.6
tertiary blades	384	5.5	14.5
bladelets	63	0.9	2.4
bifacial trimming flakes	1	-	-
core trimming elements	3	-	0.1
core tablets	3	-	0.1
burin spalls	1	-	-
Cores	104	1.5	3.9
Microflakes	231	3.3	8.7
Debris-chunks	952	13.5	-
Debris-chips	3,446	48.9	-
Totals	7,044	100.0	99.9

Table 3. Blank Type Preference for Tools.

Blank Type	n	%
cortical flakes	3	1.2
secondary flakes	38	15.7
tertiary flakes	67	27.7
cortical blades	2	0.8
secondary blades	26	10.7
tertiary blades	73	30.2
bladelets	14	5.8
other	19	7.9
Total	242	100.0

Although this is a restricted sample of only a small portion of the site, some trends are suggested by these data. A large number of cores was recovered. Several types are represented, although the majority are variants of flake cores (Table 4). Despite the high number of blades in the assemblage, less than 5% of the cores are blade types. Several aspects of the assemblage suggest that on-site reduction and possibly final tool manufacture occurred on-site. First, the high percentage of both exhausted cores (nearly 30%) and core fragments (over 20%) suggests on-site reduction. Second, the types of debitage and high amount of waste (debris) materials indicate a similar pattern. Third, the relatively high number of cores as well as an abundance of both cortical and, especially, secondary elements within the debi

Table 4. Core Types.

Type	n	%
flake-material test	4	3.8
flake-single platform	6	5.8
flake-multidirectional	11	10.6
flake-globular	9	8.7
flake-bidirectional	3	2.9
flake-pyramidal	2	1.9
flake-subpyramidal	1	1.0
flake-discoidal	2	1.9
spheroidal	4	3.8
core on flake	5	4.8
exhausted	31	29.8
fragment, flake	21	20.2
blade, single platform	4	3.8
bladelet	1	1.0
Total	104	100.0

tage also support the conclusion of on-site reduction. Finally, the presence of small microflakes suggests local tool manufacture.

In terms of tools, scrapers (n=39,16.1%) and a variety of piercing tools (n=38, 15.7%) predominate (Table 5). Of the scrapers, several types are represented, with side and end scrapers being predominant. One fan scraper was recovered. Piercing tools are equally variable, with nearly half (n=14) being large perforator/awls. The majority of tools (over 36%), however, are simple retouched pieces, including flakes (n=37) and blades (n=51). A wide range of other classes also occur, albeit in small numbers. These include two sickle blades, and, significantly, three projectile points. This is important, since the previous excavations noted the striking absence of projectile points (Najjar 1990:46; Najjar 1992:24). Unfortunately, the points are rather undiagnostic. One is broken and two, both small, are complete. Of these, one is of a nondescript type. The third point is roughly similar to a ha-Parsa point (*cf.* Gopher 1994:43), but also has Byblos characteristics.

Table 5. Tool Class Summary.

Class	n	%
Projectile Points	3	1.2
Piercing Tools	38	15.7
Scrapers	39	16.1
Burins	4	1.7
Notches	18	7.4
Denticulates	6	2.5
Tabular Knives	4	1.7
Glossed Pieces	2	0.8
Truncations	7	2.9
Backed Pieces	12	5.0
Microliths	8	3.3
Retouched Blades	51	21.1
Retouched Flakes	37	15.3
Axes	2	0.8
Biface Preforms	4	1.7
Varia-Battered Pieces	3	1.2
Tool Fragments	4	1.7
Total	242	100.0

The tools are typologically consistent with those from the much larger-scale excavations conducted by Najjar. He reported that scrapers, including two fan scrapers, and borers, respectively, were the two most common tool classes (Najjar 1990:46). Other tool classes included denticulated sickle blades, retouched blades and flakes and more limited numbers of knives and chisels (Najjar 1990:46; 1992:23-24). The variability of tool classes suggests that a wide range of activities occurred at the site, as would be expected at a village site. Ground stone included a variety of querns and handstones, as well as limestone bowl fragments. None of these were complete pieces. Raw material includes red granite, limestone, and basaltic rock.

Summary

In summary, the results from this limited testing project were productive and will provide valuable comparative data. The Wadi Feinan is unique in Jordan in that it contains the remains of all the major Neolithic phases, from Pre-Pottery Neolithic A through Pre-Pottery Neolithic B and Pottery Neolithic. Once analysis from on-going projects in the region is complete, our understanding of the trajectory of early village life in this remote area of Jordan will be greatly enhanced.

Bibliography

Gopher A.
1994 *Arrowheads of the Neolithic Levant.* American Schools of Oriental Research Dissertation Series 10. Winona Lake, Indiana, Eisenbrauns.

Najjar M., Abu Dayya A., Suleiman E., Weisgerber G., and Hauptmann A.
1990 The First Pottery Neolithic Tell in the South of Jordan. *Annual of the Department of Antiquities, Jordan* 34:27-56.

Najjar M.
1992 Tell Wadi Feinan/Wadi Araba: A New Pottery Neolithic Site from Jordan. *The Near East in Antiquity* 3:19-28.

Simmons A. and Najjar M.
2000 Preliminary Report of the 1999-2000 Excavation Season at the Pre-Pottery Neolithic B Settlement of Ghwair I, Southern Jordan. *Neo-Lithics* 1/00:6-8.

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Craft Specialization at al-Basît, Wadi Musa, Southern Jordan

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Introduction

The Late PPNB settlement of Basît was discovered during a survey of Wadi Musa, near Petra, in southern Jordan in 1996 ('Amr *et al.* 1998). A large "megasite" common in Jordan in the latter half of the 8th millennium BP, very little of the c. 8-hectare site remains undisturbed after intensive construction activities. Salvage excavations in 1997 and 1998 (Fino 1997; 1998) and in 1998 and 1999 have shown that at least three stratified major LPPNB architectural phases occur through almost three meters of deposits ('Amr 2001).

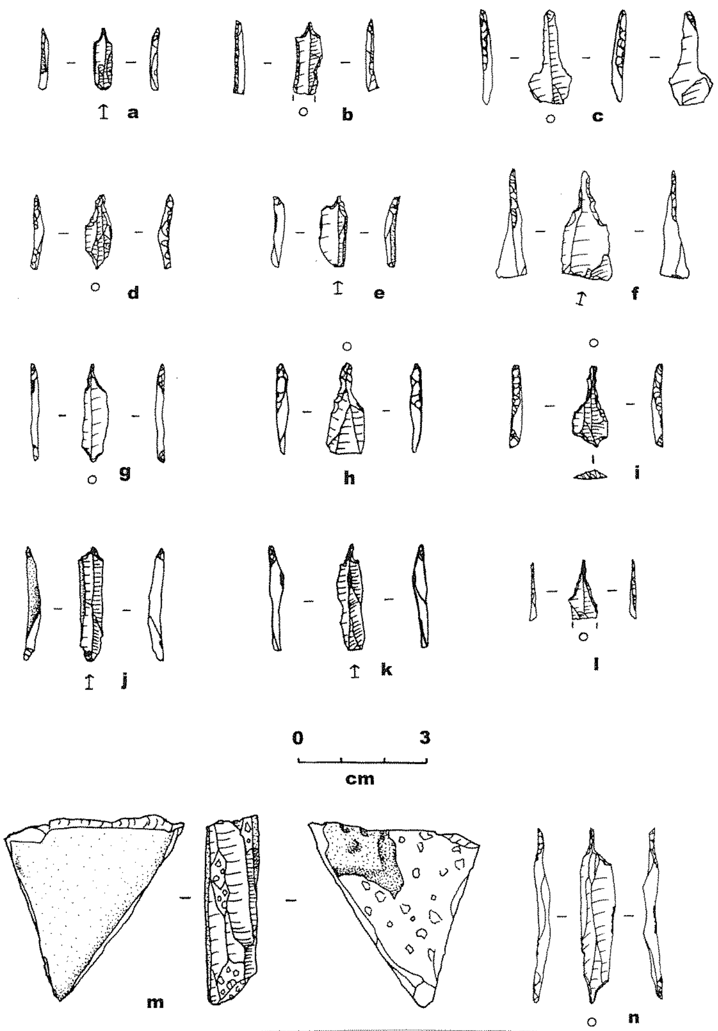

Fig. 1. Selection of drill/borers (a-l, n) and a naviform bladelet core (m) from the al-Basît backdirt. (drawing: S. Dennis).

One of us (GOR) was asked by the Department of Antiquities to examine a collection of artifacts from the survey and salvage excavations. During this study, it was noted that drills seemed to occur in unexpectedly high numbers, although only one bead was present in the sample. Permission was granted to visit what remained of the site in July 2001 to obtain more artifact samples. During this visit, we noticed a pile of backdirt from the excavation of a house foundation. The backdirt, which seemed to be relatively intact (compared to the general surface of the site), was rich in artifacts, especially bladelets that had been retouched to create dills and borers. We sifted through about 0.5 m3 of the backdirt, recovering 913 chipped stone artifacts (including retouch flakes and debris), 13 milling stones and pounders, and several ornaments made of land snails, marine shells (including mother-of-pearl), and a fragment of malachite.

The Chipped Stone Sample

Table 1 provides the breakdown of the debitage classes present in the sifted backdirt from Basît. Of particular note here is the high proportion of bladelets (compare with the average of ca. 2% at 'Ain Ghazal; Rollefson and Kafafi 1996: Table 1), which is usually not seen outside of Epipaleolithic collections. Of the four cores from the sample, two are normal naviform blade cores, although one of the other two cores (a tabular piece only 12 mm thick) was used for a special "naviform bladelet" production (Fig. 1-m). (Another naviform bladelet core of similar thickness was recovered from the surface nearby).

A total of 196 formal tools (i.e., not including irregularly retouched and "utilized" pieces) were present in the sifted sample. Disregarding the small flakes and debris, this total amounts to 21.5% of the chipped stone inventory (Table 1). This tool ratio is much higher than is commonly encountered at LPPNB sites (e.g. Rollefson & Kafafi 1996: Table 1), and this suggests that a special locus was disturbed by the construction equipment at one part of the stratigraphic sequence.

Table 1. Debitage classes from the sifted backdirt sample at Basît. (The table does not include microflakes and debris).

Class	n	%
Ordinary blade	59	6.5
Naviform blade	152	16.7
Indet. blade	43	4.7
Bladelet	275	30.1
Flake	326	35.7
C.T.E.	28	3.1
Burin spall	7	0.8
Core	4	0.4
Indeterminate	19	2.1
(Tool)	(196)	21.5
Total	913	100.1

Tools

The extraordinary focus on bladelet production becomes more understandable when one looks at the tool inventory (Table 2). Despite the relatively broad range of type classes, the most conspicuous tools were of the drill variety, and of these tools, 80% were made on bladelets. (One complete drill was fashioned on a "microflake"12 mm long and 3 mm wide). Some of the drills were produced on bladelets that had cortex on both laterals, indicating that they came from naviform bladelet cores; one of the double-naturally-backed bladelets sporting a drill bit was only 6 mm wide, reflecting the thickness of the tabular piece from which it came.

Table 2. Tool classes in the sifted backdirt sample from Basît.

Class	n	%
Projectile point	5	2.6
Glossed piece	1	0.5
Burin	6	3.1
Truncation	2	1.0
Endscraper	2	1.0
Sidescraper	4	2.0
Notch	2	1.0
Denticulate	1	0.5
Drill/Borer	158	80.6
Knife	11	5.6
Retouched bladelet	1	0.5
Backed bladelet	2	1.0
Other	1	0.5
Subtotal	196	99.9
Retouched flake/blade	(17)	(7.7)
Utilized piece	(5)	(2.3)
Unclassifiable	(2)	(0.9)
Total	220	

The drill/borer tools were sorted according to Mortensen's classification (Mortensen 1971: 26-29), and the results are presented in Table 3. Type "B-6+6" refers to double-ended drills, each end of which would have been classed as a B-6 type. In seven instances, the drill bit was made on the proximal end of the blank, and on four pieces the retouch was located in cortex. In all of the cases, retouch was abrupt, and no tools reflected any bifacial or even alternating retouch. Evidence of rotary motion was clear under a 10x loupe in many cases, and tips often showed twisting damage.

Table 3. Drill/borer types according to Mortensen's classification (1971).

Type	n	%
B-2	1	0.7
B-5	2	1.3
B-6	133	86.9
B-7	9	5.9
B-10	1	0.7
"B-6+6"	7	4.6
Indeterminate	5	(3.2)
Total	158	100.1

Bladelets were the dominant choice as the blanks for drill/borer tools. Although blades accounted for the B-2, B-5, and two of the B-7 specimens, bladelets accounted for the B-10 type, more than half (5) of the B-7 types, 83.5% of the B-6 drill/borers, and all of the B-6+6 pieces. The five "indeterminate" types were represented only by the bits of drills; conceivably, some of these may have been drills fashioned on burin spalls.

Drill/Borer Use

Dimensions for complete tools varied considerably. Lengths of complete tools ranged from 9 (!) to 44 mm, widths from 3 to 14 mm (*cf.* Fig. 1). The smaller pieces would probably have been difficult to manipulate effectively while being held in the fingers, suggesting that many, at least, would have been set in a shaft or haft.

Betts conducted experimental work using burin spalls as drill bits used in bow drills to manufacture beads of soft stone (Finlayson and Betts 1990: 14). Some of the drill/borers in the Basît sample might have been used in this way, but the morphology of many of the tools indicates this would be an unlikely manner of use. Of the blanks, eight showed a pronounced curve to the long axis or a twisted character to the edge profile (e.g., Fig. 1-d, k), properties that would have had deleterious consequences in a bow drill configuration.

Other factors that argue against a bow drill system include the attitude of the bit relative to the axis of the blank as well as the placement of the bit in terms of symmetry relative to the lateral edges of the piece. For 26 of the drill/borers, the bit was fashioned asymmetrically towards one lateral edge (e.g., Fig. 1-n, Fig. 2-d); in five cases, the bit extended at a conspicuous angle to the long axis (Fig. 1-k), and in eight other instances there was a combination of asymmetry and angled bits (Fig. 2-f, g).

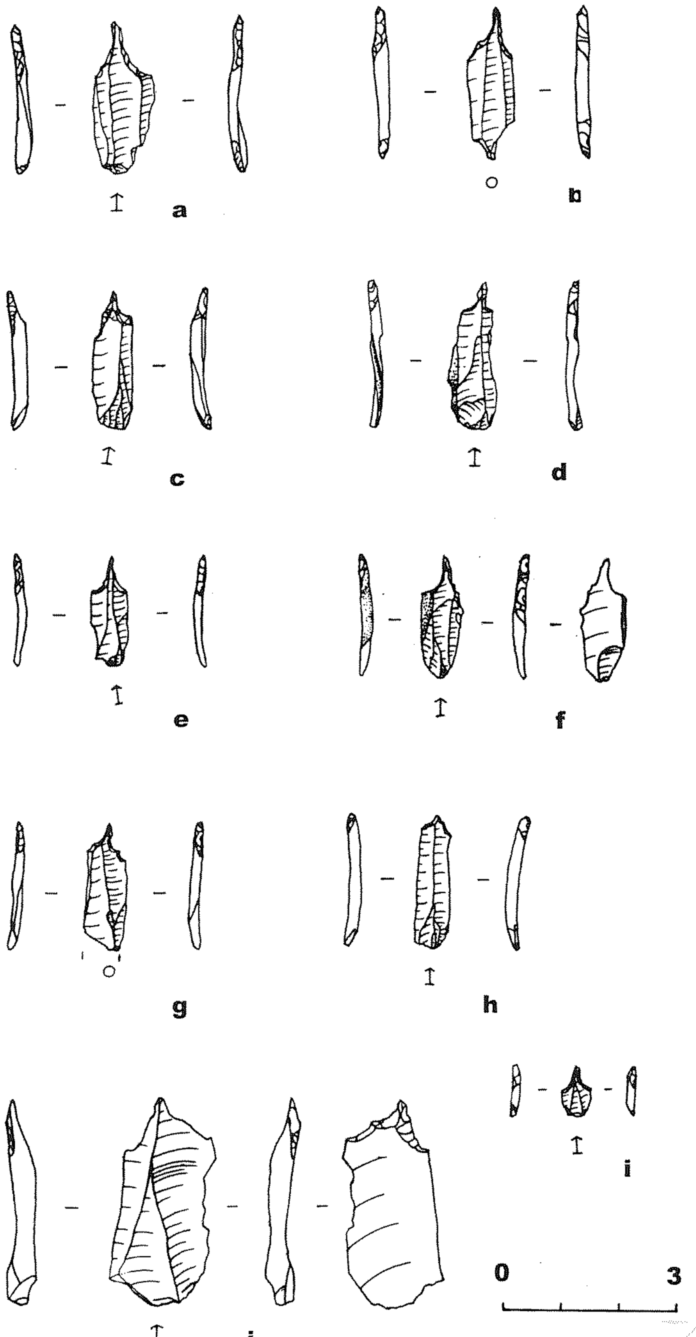

Fig. 2. Selection of drills and borers from the al-Basît backdirt. (drawing: S. Dennis).

Another element that contradicts use in a high-speed drill bow is the delicacy of both the blanks and retouched bit. Concerning the blanks, thickness for 88% of them (n = 136) was 2mm or less; 96% (n = 148) = 3mm. For the measurable bits, 68% (n = 105) measured 1mm or less in width, and 95% (n = 138) = 2mm. (One bit that had broken off the blank measured 13 mm in length but less than 1mm in diameter. Retouching this particular tool must have been a remarkable test of skill, and perhaps the bit broke off during the retouch process).

The daintiness of some of the bits (e.g., Fig. 1-n, Fig. 2-e) and the lack of obvious use (as determinable by examination under a 10x loupe) is suggestive that drill/borers may have been manufactured en masse and held in reserve in case of breakage in whatever task they served. If the blanks were not inserted into a bow drill system but used in some hand-held fashion, it seems unlikely that many of them were used in stone bead production. (This is supported by the presence of a single stone bead from all of the salvage excavations, for example). Shell beads/pendants and bone ornaments are also very rare. It is probable that the large majority of these tools were used on material of medium hardness (shown by rotary wear and twist fractures on some examples) or softer material (where use-wear is less apparent). Tattooing and skin piercing are possible examples for the latter case, although numerous other suggestions are possible.

Concluding Remarks

Accounts of craft specialization during the Neolithic are becoming more numerous (e.g., Gebel and Bienert 1997: 252-257; Quintero and Wilke 1995), and it appears that Basît has provided another example, albeit hazy at the moment (also see Kaliszan *et al.*, this issue). Unfortunately, there is little left of the site to pursue the investigation. More of the disturbed deposits that we sifted in 2001 could be examined in the hopes of finding what the drill/borer artifacts were used for, but the situation is another example of the frustration that faces prehistorians as the demands of an ever-growing population continue to destroy archaeological deposits that have, until now, survived for ten millennia.

Bibliography

'Amr K.

2001 A Note on the Discoveries at al-Baseet During the Implementation of the "Wadi Musa Water Supply and Wastewater Project". In H.-D. Bienert, H.G.K. Gebel and R. Neef (eds.), *Central Settlements in Neolithic Jordan. Proceedings of the Symposium Held in Petra, July, 1997.* SENESPSE 5. Berlin: ex oriente (in press).

'Amr K., al-Momani A., Farajat S. and Falahat H.

1998 Archaeological Survey of the Wadi Musa Water Supply and Wastewater Project Area. *Annual of the Department of Antiquities of Jordan* 42: 503-548.

Finlayson B. and Betts A.

1990 Functional Analysis of Chipped Stone Artefacts from the Late Neolithic Site of –abal Na'ja, Eastern Jordan. *Paléorient* 16/2: 13-20.

Fino N.

1997 Al-Baseet, a New LPPNB Site Found in Wadi Musa, Southern Jordan. *Neo-Lithics* 3/97: 13-14.

1998 Al-Basît Neolithic Site in Southern Jordan. *Annual of the Department of Antiquities of Jordan* 42: 103-111.

Mortensen P.

1971 A Preliminary Study of the Chipped Stone Industry from Beidha. *Acta Archaeologia* 41: 1-54.

Quintero L.A. and Wilke P.J.

1995 Evolution and Economic Significance of Naviform Core-and-Blade Technology in the Southern Levant. *Paléorient* 21/1: 17-33.

Rollefson G. and Kafafi Z.

1996 The 1995 Season at 'Ayn Ghazal: Preliminary Report. *Annual of the Department of Antiquities of Jordan* 40: 11-28.

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Göbekli Tepe - Southeastern Turkey. The Seventh Campaign, 2001

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As of 2001 seven campaigns of excavations have been undertaken at Göbekli Tepe, a mound on top of a high limestone ridge northeast of the town of Şanlıurfa in Upper Mesopotamia, by the Museum of Şanliurfa and the German Archaeological Institute (Beile-Bohn et al. 1998; Hauptmann and Schmidt 2000; Schmidt 1997; 1998; 1999; 2000; 2001). The excavations were located at the south-eastern peak, at the southeastern and the southern slope and at several areas on the limestone plateaus around the mound. Three main layers have been distinguished thus far:

Layer I is post-Neolithic. It represents mainly agricultural activities from the Middle Ages and modern times, which has caused erosion on the top of the mound and high sedimentation on the slopes. In the excavation trenches at the southern slope Layer I reaches a thickness of more than 2m.

Layer II has architectural remains of the EPPNB/MPPNB periods. There are rectangular rooms made of stone walls, all rooms with terrazzo floors and often with some strange installations(e.g., large stone rings or T-shaped pillars) but without fireplaces, ovens, or other usual indications of "domestic life". Such is the case at the so-called "*Löwenpfeilergebäude*" ("Lion Pillar Building", Schmidt 1998, 30 pp. Figs. 8–10). Two of its four free-standing pillars bear reliefs of lions. In spite of its denomination „building" it seems most probable that it is not a complete building but a cell-like structure sunk into the mound. South of the "*Löwenpfeilergebäude*" a quite similar room with a pair of free-standing pillars in the west and a pair of pillars bonded into the eastern wall was found in 2001 (Fig. 1), but all the pillars are without reliefs. Such rooms seem to be miniatures (the average height of the 14 free standing pillars found so far in layer II is only 1,5 m) of the structures exposed in the underlying layer III.

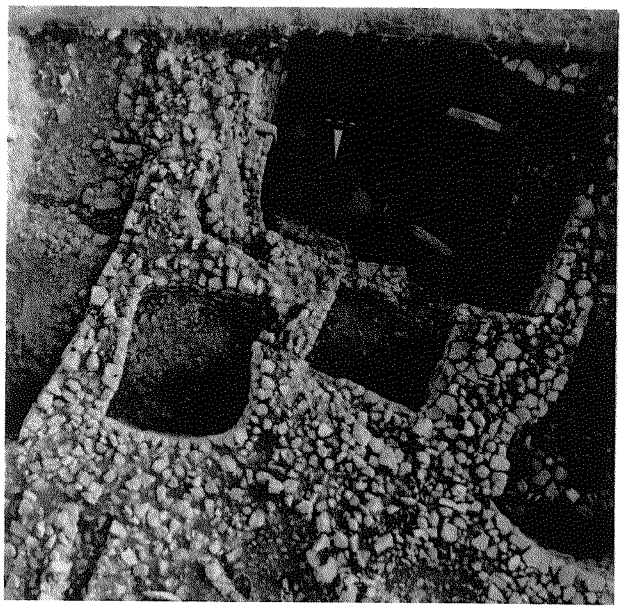

Fig. 1. Göbekli Tepe, area L9-80, vertical view.

Layer III dates to the PPNA/EPPNB, found at the southern slope. The 25 exposed *in situ* monolithic pillars seem to be more than 3 m high (most of them have not been excavated completely so far). Their weight would be about 10 tons. They belong to four round or oval enclosures with a pair of pillars in the centre (enclosures A, B, C and D; see general plan of excavated areas Fig. 2). Several of the pillars are decorated with reliefs, including snakes, foxes, reptiles, bulls, boars, a gazelle and a crane (*cf.* the reliefs of the first through fifth campaigns: Schmidt 1999; 2000; 2001). One of the pillars of enclosure D, which was found and partially excavated in 2001, has a height of 3.5m so far. As it is only partially excavated, a height of 4-5m(!) above floor level might be expected. The pillar is of the Nevalı Çori Type with human arms, but it also has some unexpected additions: a fox and pictograms in relief (Figs. 3 and 4).

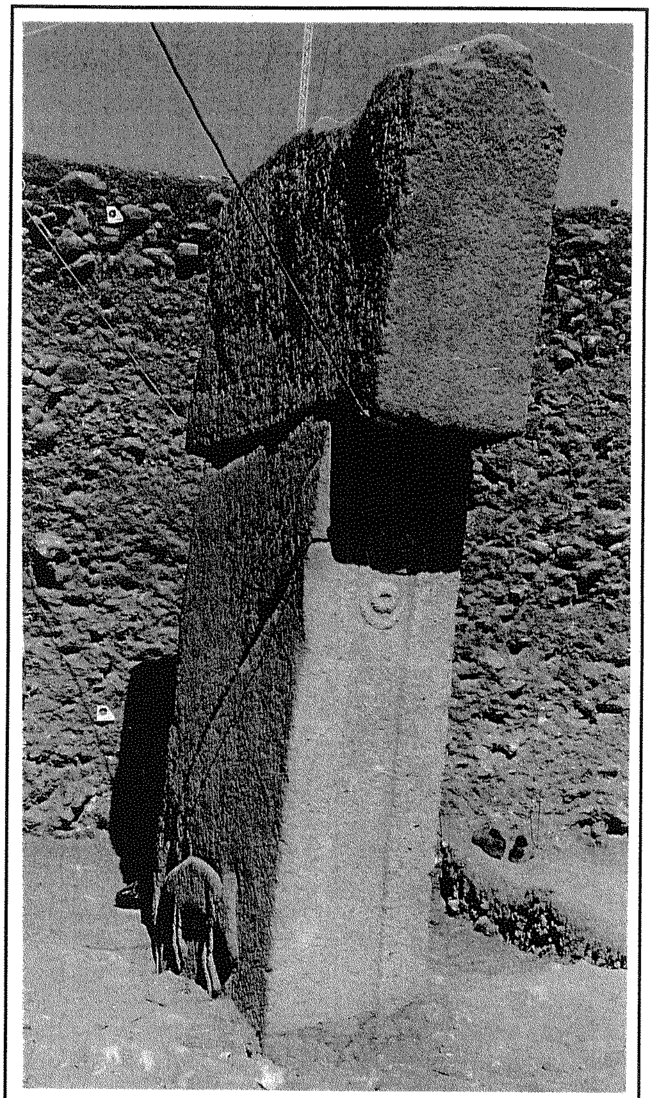

Fig. 3. Göbekli Tepe, area L9-78, monolithic pillar 18, limestone, seen from south.

The lithics of Layer III are based on naviform core technology and tools made from blades. Byblos, Helwan and Nemrik points are common. The analysis of the animal bones revealed a rich fauna of wild species, as wild cattle, wild ass, gazelle and wild pig (von den Driesch and Peters 1999; Peters *et al.* 2000). But no domesticated species have been found. The same is true of the botanical remains from Layer III, studied by R. Neef. There are only wild species such as

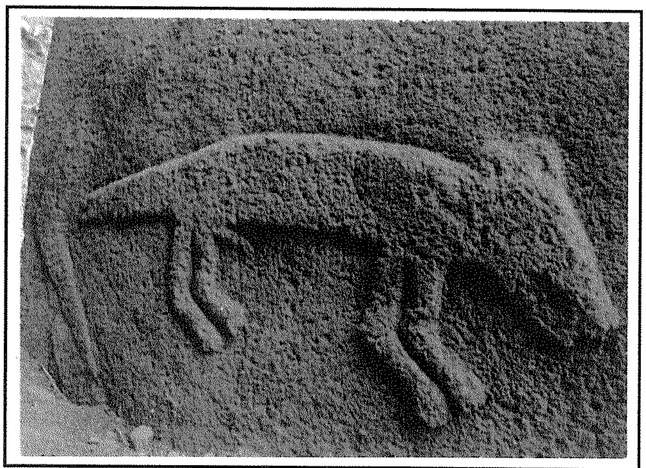

Fig. 4. Göbekli Tepe, pillar 18, western face, detail.

(Fig. 2, see next page)

almond, pistachio, and wild grain. So the construction of the megalithic buildings of Layer III was accomplished not by a village-farming community, but by a hunter-gatherer society. It seems obvious that only organized meetings of several groups of hunter-gatherers from territories around Göbekli Tepe would be able to provide the capabilities for such a purpose, meetings that were rooted in a ritual background. So the hypothesis emerges that these meetings are the starting point of incipient cultivation, as hunter-gatherers living at Göbekli Tepe for an extended time would have caused a serious over-exploitation of the local natural resources. The grassy slopes, reported by Benedict (1980), are still large areas where wild cereals occur. Karaçadağ, a volcanic mountain favored as the homeland of cultivated grains by genetic analysis (Heun *et al.* 1998), can be seen on the horizon looking to the northeast from Göbekli Tepe. Göbekli Tepe quite probably will be a key site in the understanding the process of the development from hunter-gatherers to farmers.

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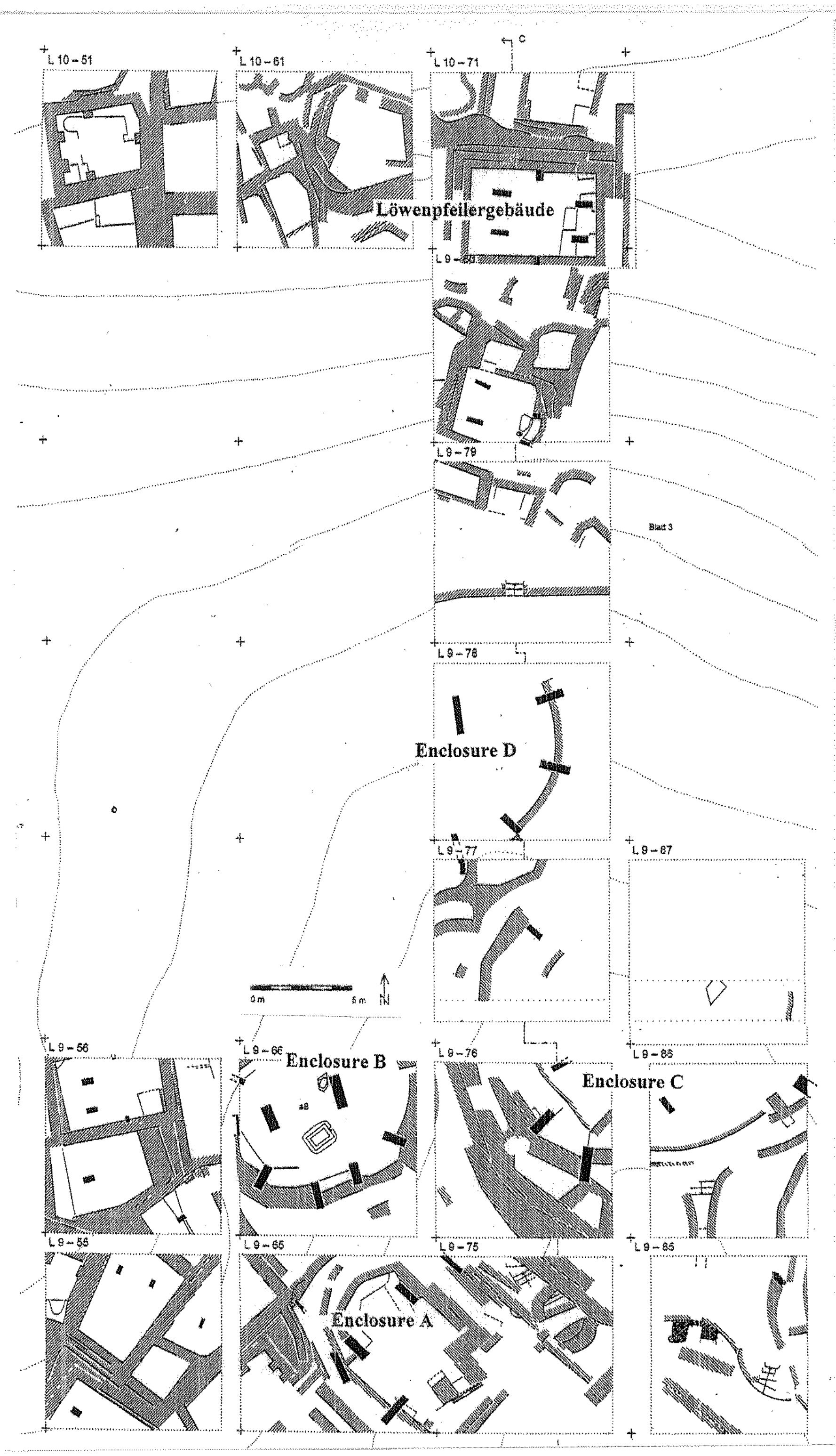

Fig. 2. Göbekli Tepe, general plan of excavations (D.Kurapkat, K.Schott, C. Winterstein).

Selected Bibliography

Beile-Bohn M., Gerber Ch., Morsch M. and Schmidt K.
1998 Neolithische Forschungen in Obermesopotamien. Gürçütepeund Göbekli Tepe. *Istanbuler Mitteilungen* 48: 5–78.

Benedict P.
1980 Survey Work in Southeastern Anatolia. In H. Çambel and R.J.Braidwood (ed.), *The Joint Istanbul - Chicago Universities' Prehistoric Research in Southeastern Anatolia*: 150–191. Istanbul, Edebiyat Fakültesi.

Hauptmann, H. and Schmidt K.
2000 Frühe Tempel – frühe Götter?. In Deutsches Archäologisches Institut (ed.), *Archäologische Entdeckungen. Die Forschungen des Deutschen ArchäologischenInstituts im 20. Jahrhundert*: 258–266. Mainz, Zaberns Bildbände zur Archäologie.

Heun M., Schäfer-Pregl R., Klawan D., Castagna R., Accerbi M., Borghi B., and Salamini F.
1997 Site of Einkorn Wheat Domestication Identified by DNA. *Science* 278: 1312 -1314.

Peters J., Helmer D., von den Driesch A. and SanaSegui M.
2000 Early Animal Husbandry in the Northern Levant. *Paléorient* 25/2: 27–48.

Schmidt K.
1995 Investigations in the Upper Mesopotamian Early Neolithic: Göbekli Tepe and Gürçütepe. *Neo-Lithics* 2/95: 9-10.
1997 „News from the Hilly Flanks". Zum Forschungsstand des obermesopotamischen Frühneolithikums. *Archäologisches Nachrichtenblatt* 2.1: 70–79.
1998 Frühneolithische Tempel. Ein Forschungsbericht zum präkeramischen Neolithikum Obermesopotamiens. *Mitteilungen der Deutschen Orient-Gesellschaft* 130: 17-49.
1999 Frühe Tier- und Menschenbilder vom Göbekli Tepe, Kampagne 1995-1998. *Istanbuler Mitteilungen* 49: 5-21.
2000 "Erst kam der Tempel, dann dieStadt." Bericht zu den Grabungen am Gürçütepe und am Göbekli Tepe 1996–1999. *Istanbuler Mitteilungen* 50: 5- 40.
2001 Göbekli Tepe, Southeastern Turkey. A Preliminary Report on the 1995-1999 Excavations. *Paléorient* 26/1: 45-54.

von den Driesch A. and Peters J.
1999 Vorläufiger Bericht über archäozoologische Untersuchungenam Göbekli Tepe und am Gürçütepe bei Urfa, Türkei. *Istanbuler Mitteilungen* 49: 23–39.

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New Web Sites

http://www.sakura.cc.tsukuba.ac.jp/~elrouj/
http:// www.archaenova.de