NEO-LITHICS 2/03

The Newsletter of Southwest Asian Neolithic Research

Contents

Editorial

Neo-Lithics tries to keep its finger on the pulse of Near Eastern Neolithic research developments so that we can be aware of emerging trends that otherwise might appear only years later in peer-reviewed journals. In our research environment, with its wealth of publishing opportunities and self-generating publication constraints, often important and innovative ideas and theses become hidden and mired in many separate, isolated journals without the benefit of a necessary structured and discursive debate. Among other topics, it is quite obvious from personal exchanges and a general tenor in some recent articles that a major dissatisfaction has arisen concerning the need for new supra-regional concepts for the explanation of Near Eastern neolithization that can deal with unexpected new evidence, in particular the Göbekli – North Syrian interaction sphere, the mega-site phenomenon of Jordan, and the colonization of Cyprus.

We see the opportunity for an integrative discussion with good prospects to identify and investigate other widely supported supra-regional concepts before many of the views go astray, and perhaps become lost altogether, over an unfocused and confusing research period. To promote a coordinated effort to bring such supra-regional concepts to the attention of the archaeological community, Mehmet Özdoğan, Klaus Schmidt, Gary Rollefson and H.G.K. Gebel took the initiative for a workshop on *Supra-Regional Concepts in Near Eastern Neolithization*, to be held during the 4th ICAANE, April 1 and 2, 2004. Participants and supporting affiliates are currently preparing the discussions of the gathering (cf. *Supra-Regional Concepts I* in this issue) by their theses and essays, and hopefully the workshop will come up with the first joint insights that time involving archaeozoology and palaeoethnobotany from the beginning.

This spring celebrates also the 5th meeting of the Workshops on PPN Chipped Stone Industries to be held in Fréjus, March 1-5, 2004, following the very fruitful ones held since 1993 in Berlin, Warsaw, Venice, and Niğde. This success, to which the origin of *Neo-Lithics* is linked, is a promising example of the perspectives that lie in integrative research policies.

Hans Georg K. Gebel and Gary O. Rollefson

The 2003 Campaign at Göbekli Tepe (Southeastern Turkey)

Klaus Schmidt
German Archaeological Institute, Berlin <kls@orient.dainst.de>

Fig. 1. Göbekli Tepe, enclosure D from north. (photo: K. Schmidt)

Introduction

As of 2003 nine campaigns of excavations have been undertaken by the Museum of Şanliurfa in cooperation with the German Archaeological Institute at the early Neolithic site of Göbekli Tepe (Fig. 1; for most recent reports see Linsmeier and Schmidt 2003; Schmidt 2002, 2003; Schmidt and Hauptmann 2003). Though only excavated partly, it becomes increasingly obvious that the findings from Göbekli Tepe and the related PPN site in Urfa itself (Bucak and Schmidt 2003; Çelik 2000; Hauptmann 2003) may contribute significantly to our understanding of the transition from a subsistence pattern based exclusively upon hunting and gathering to the appearance of agriculture and animal husbandry in the course of the Early Holocene.

Compared to other PPN sites, Göbekli Tepe is unique in its location on top of a limestone ridge, its architecture and its diverse set of objects of art, ranging from small stone figurines through sculptures and statues of animals to decorated megaliths. The youngest excavated building layer is MPPNB (Layer II, Layer I is the surface layer). The circular or oval enclosures of the so far oldest Layer III are dated to the PPNA/EPPNB. Virgin soil or, more probably, the bedrock of the limestone plateau is not reached inside the mound until now and it seems probable, that there are older layers as Layer III.

Most important are the megalithic pillars of Layer III, often decorated with reliefs. They have been arranged purposefully to delineate round or oval structures. Until 2003, four enclosures with 39 pillars have been discovered *in situ*. In each of these enclosures the ritual space is delineated by up to twelve monolithic pillars, which are interconnected by walls and stone benches. The central part of each enclosure is dominated by two pillars, the so-called twin pillars. As a rule these pillars are larger than the surrounding pillars and of a superior quality, e.g., their surface is extremely well prepared and they are always decorated with figurations.

The pillars itself clearly have an anthropomorphic meaning. The motives of the reliefs illustrate the prominent role animals played in the symbolic world of Early Neolithic human groups inhabiting the region. There are snakes, foxes, wild boars, wild cattle, gazelle and wild ass, and others (Fig. 2-6). The images are large and often in life size. They are generally figured *in toto* in a (semi) naturalistic style. Up to now, decorations in form of

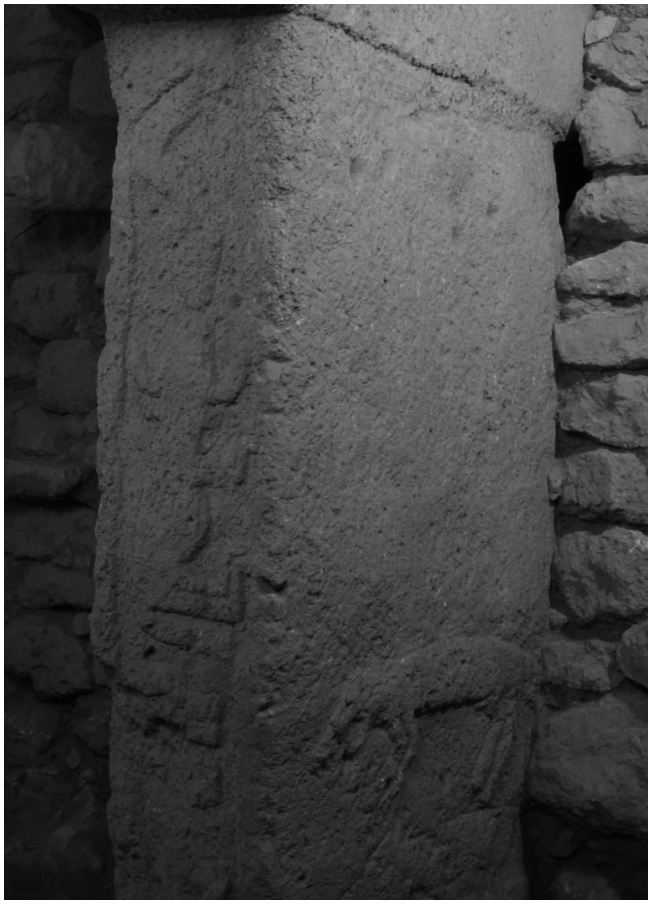


Fig. 2. Enclosure D, pillar 20, reliefs of a snake, wild cattle and foxes. (photo: I. Wagner)

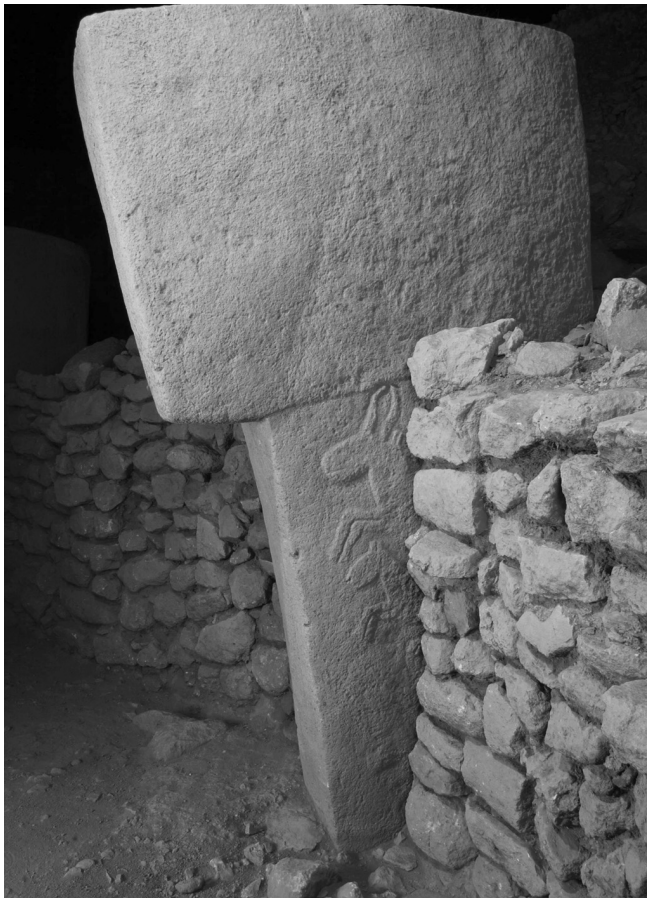


Fig. 3. Enclosure D, Pillar 21, reliefs of a gazelle, a wild ass and an indeterminate animal. (photo: I. Wagner)

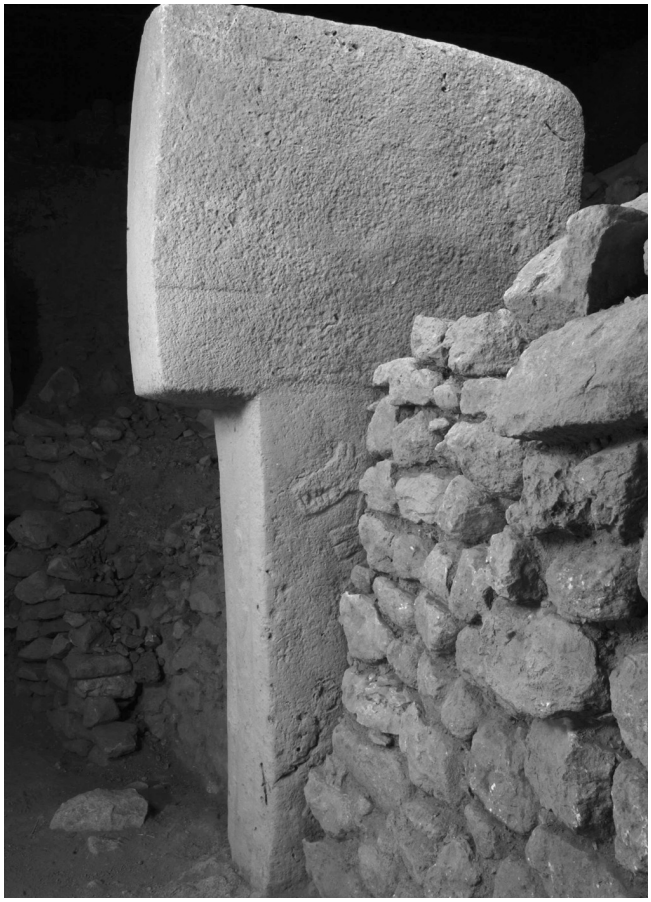


Fig. 4. Enclosure D, Pillar 22, reliefs of a snake and a fox. (photo: I. Wagner)

Masthead

Addresses of Neo-Lithics

Submissions: NEO-LITHICS, Prof. Dr. Gary O. Rollefson, Department of Anthropology, Whitman College, Walla Walla, WA 99362, USA. Email: rollefgo@whitman.edu
NEO-LITHICS, Dr. Hans Georg K. Gebel, Dr. Jürgen Baumgarten, ex oriente e.V., c/o Free University of Berlin, Hüttenweg 7, 14195 Berlin, Germany. Emails: baumgarten@mpib-berlin.mpg.de, hggebel@zedat.fu-berlin.de. Fax 0049 30 98 311 246 or 0049 30 83852106

Orders: ex oriente e.V., c/o Free University of Berlin, Hüttenweg 7, 14195 Berlin, Germany
Email: ex-oriente@gmx.net. Fax 0049 30 98 311 246 or 0049 30 83852106

Deadlines: twice a year: 15th of May and 30th of November

Submission Guidelines
Text formats: in WORD; text, bibliography and caption styles: cf. current issue of *Neo-Lithics*; illustration formats: high resolution eps, jpg, or tif.files – no illustrations embedded in the WORD text –, originals prefered (illustrations are required to the Berlin addresses, as well as hard copies of texts for the final layout); please, keep bibliographic references to the utmost minimum necessary.

Subscription Information
In the upper right part of the address field (envelope) you will find the issue mentioned until which (included) you paid your subscription. If you find an invoice with this issue, a renewal of subscription is necessary for the next three years / 6 issues. If the invoice is not paid after two months it is understood that a prolongation of the subscription is not desired, and no further issues will be sent.

Neo-Lithics is published and distributed by ex oriente, Berlin,Germany

Printing House: Sievert Druck und Service, Bielefeld

Fig. 5. Enclosure D, Pillar 26, reliefs of a wild boar. (photo: I. Wagner)

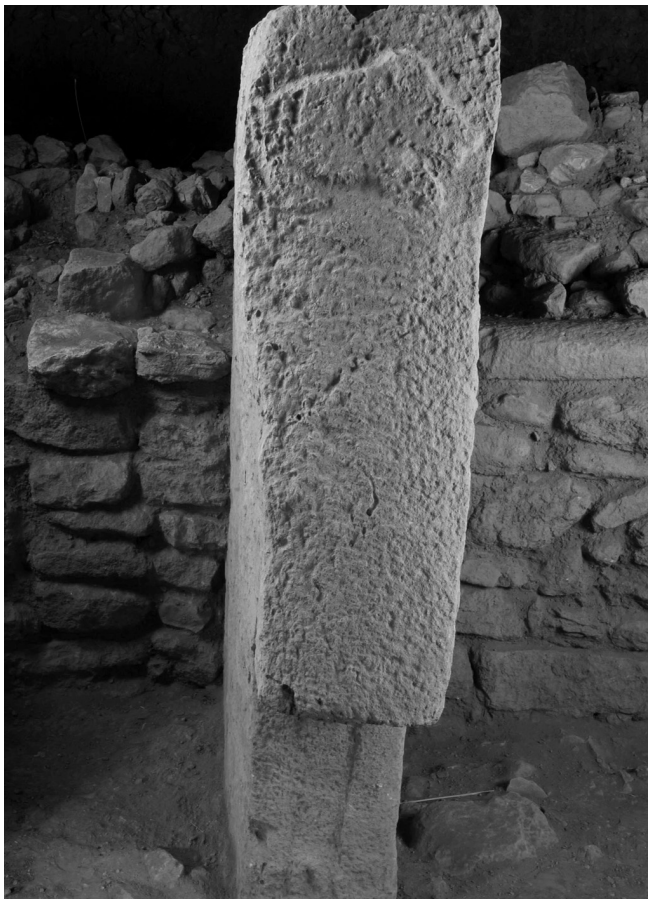


Fig. 6. Enclosure D, Pillar 28, reliefs of wild boars and pictographs at the lower part of the inner face. (photo: I. Wagner)

low-reliefs have been found on 23 pillars, but their number certainly will increase as archaeological work progresses.

Geomagnetic Survey

In 2003 a geomagnetic survey could demonstrate that the prediction based on the archaeological surface investigations at Göbekli Tepe, that round or oval enclosures exist all over the site and are not restricted to a specific part of the mound, was right. More than ten large enclosures could be located in the geomagnetic map (Fig. 7; Giese and Hübner, n.d.), and some more can be expected. As four enclosures are under excavation (Anlage A-D), in total a minimum of 20 enclosures seem to exist inside the mound of Göbekli Tepe. At every enclosure a number of 12 megalithic pillars can be expected. So, in total more than 200 pillars can be calculated.

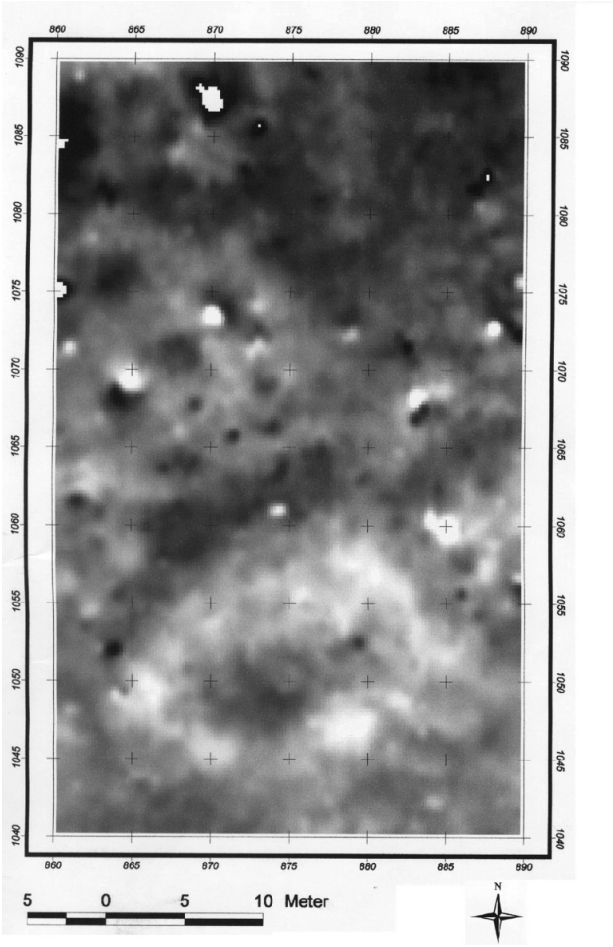


Fig. 7. Göbekli Tepe, northwestern depression, detail of the geomagnetic map of Giese and Hübner (n. d.). The white oval clearly is an enclosure with an inner diameter of about 10 to 15 m. (prospection by S. Giese and C. Hübner)

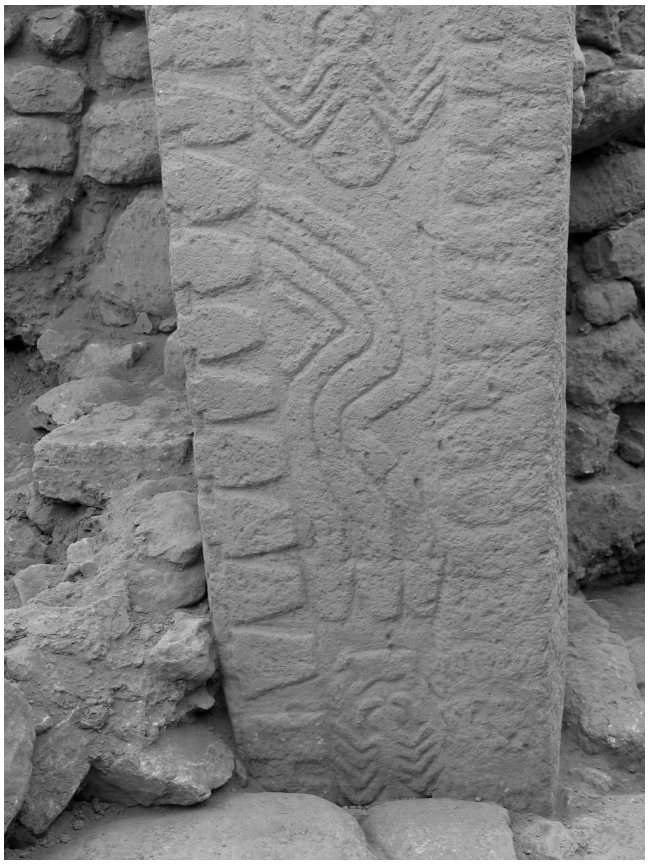
Excavation: Removing the High Baulks

Due to static problems of the 4 to 5 m high profiles in most of the trenches the campaign in 2003 was concentrated on the removal of several baulks. There was only very limited work in the trenches itself. Two more pillars had been found in the baulks, Pillar 38 belonging to the southwestern part of enclosure D and Pillar 39 to the western part of C. Pillar 39 is without decoration until now, but only the T-shaped head is visible. At the right face of Pillar 38, which is excavated in a depth of about 3 m, there are several animals (Fig. 8). Below a fox there is a wild boar, very similar to the boar of Pillar 12. Below the boar a succession of three birds is visible. A duck-like bird is following two long-legged birds with long and pointed peaks, probably cranes or storks. At the inner face of the pillar there is a bucranium, similar to the known bucrania from Pillars 2 and 31. The left face of the pillar is nearly completely covered by the enclosure wall. In the uppermost part of the shaft a head of a long-necked bird is visible.

Pillar 33 was found and excavated in 2002, but the inner face was completely covered by the north baulk of area L9-67. On the eastern face of the pillar's shaft two large birds with long necks and long legs, identified as cranes, were found (Schmidt 2002: Fig. 10). They are placed in front of a series of horizontally ordered wavy lines. Those lines were understood as the depiction of water, of a river or a lake, because rivers and lakes are common habitats for cranes (Schmidt 2003). Above the water and between the cranes several H-shaped pictographs in upright position with two small foxes between can be observed. At the left face of the pillar there was a large fox, nearly in upright position (Fig. 9). Again wavy lines could be observed in front of the animal. It is the first example (of 9 foxes) without the indication of male sex. Removing the baulk covering the inner face, there was a big surprise (Fig. 10). The wavy lines on both faces undoubtedly are not water, but the bodies of snakes, whose heads had been depicted on the inner face of the pillar. Between the snakes there is a vertical sequence of symbols: H-shaped pictographs, groups of 3 or 4 snakes, insects or spiders, and a quadruped, probably a ram (Fig. 11). In the case of the insect or spider, it is difficult to decide if they are two different kinds of animals or if one is depicted with the wrong number of legs. One example has six, the other eight legs, but the general shape of both animals is similar.

Fig. 8. Pillar 38, right face, reliefs of a fox, a wild boar and three birds. (photo: J. Peters)

Fig. 9. Pillar 33, left face, reliefs of a fox and snakes. (photo: I. Wagner)



The reliefs of Pillar 33 especially demonstrate that it seems quite obvious that there was a background different from a simple totemic context. There is a complex system of symbols, which corresponds with iconographical objects from other early Neolithic sites in Upper Mesopotamia. Venomous animals like snakes, spiders, scorpions and centipedes are often included (Schmidt n.d.). Possible interpretations of the signs could be that they transmit an apotropaic message, or that they are a mythic narration. However, in view of our limited knowledge of the role animals and abstract signs played in the symbolic world of the Neolithic, the question how to read the symbols will take much more time to be answered in-depth, if ever.

Further Investigations

Sedimentological analysis was done at one square meter in the east baulk of area L9-68 in a 4m deep column from the topsoil down to the bench of enclosure D, in order to find out the origin of the filling debris. It is not sterile soil; it includes a lot of EPPNB and PPNA artifacts, animal bones and other finds typical of settlement debris, but it is not clear where the enormous amount of debris had been taken from. A minimum of about 300 m^3 (more likely 500 m^3) had been estimated for the filling of one enclosure (Schmidt 2002). The analysis will be completed by work in progress in the sedimentological laboratory at the Institute of Prehistory of the University of Erlangen-Nürnberg.

The analysis of carbonate coatings and fossil soils had been continued by Konstantin Pustovoytov (cf. Pustovoytov 2002, 2003; Pustovoytov and Taubald, in this issue), osteological investigations by Joris Peters (see Von den Driesch and Peters 1999). Preliminary results of the botanical studies by Reinder Neef are included in this issue. An article with the title *Animals in the symbolic world of Pre-Pottery Neolithic Göbekli Tepe* will be published elsewhere (Peters and Schmidt n.d.).

Acknowledgements: I would like to express my appreciation to Eyüp Bucak, director of the Museum of Şanliurfa for his invaluable assistance during the campaign. I would like to express my gratitude to the members of the team and to Ayşe Ersoy, representative of the ministry of culture and tourism. The excavations have been gratefully supported by ArchaeNova e.V. Heidelberg. More detailed reports, especially figures of the reliefs and sculptures, will be published in the first volume of ”Göbekli Tepe”, a serial edited by the German Archaeological Institute.

Fig. 10. Pillar 33, inner face, reliefs of various symbols. The vertical rows of triangles at the left and right lower edge are the heads of the snakes at the right (Schmidt 2002, fig.10) and left face (fig. 10). (photo: I. Wagner)

Fig. 11. Pillar 33, detail of the inner face, reliefs of insects or spiders and other symbols. (photo: J. Peters)

Bibliography

Bucak E. and Schmidt K.
2003 Dünyanin en eski heykeli. *Atlas. Aylik cografya ve keşif dergisi, sayi 127, ekim 2003*: 36-40.

Çelik B.
2000 An Early Neolithic Settlement in the Center of Şanliurfa, Turkey. *Neo-Lithics* 2-3/00: 4-6.

von den Driesch A. and Peters J.
1999 Vorläufiger Bericht über archäozoologische Untersuchungen am Göbekli Tepe und am Gürcütepe bei Urfa, Türkei. *Istanbuler Mitteilungen des Deutschen Archäologischen Instituts* 49: 23-39.

Giese S. and Hübner Ch.
n.d. Geomagnetical work at Göbekli Tepe. In: Deutsches Archäologisches Institut (ed.), *Göbekli Tepe 1* (in prep.).

Hauptmann H.
2003 Eine frühneolithische Kultfigur aus Urfa. In: Özdoğan M., Hauptmann H., and Başgelen N. (eds.), *Köyden Kente. Yakindoğu'da Ilk Yerleşmiler - From Village to Cities. Early Villages in the Near East, Ufuk Esin'e Armağan - Studies Presented to Ufuk Esin* Vol. 2: 623-636.

Linsmeier K.-D. and Schmidt K.
2003 Ein anatolisches Stonehenge? *Spektrum der Wissenschaft, Spezial 2. Moderne Archäologie*: 10-15.

Peters J. and Schmidt K.
n.d. Animals in the Symbolic World of Pre-Pottery Neolithic Göbekli Tepe, Southeast Turkey: A Preliminary Assessment. In: *Jacques Cauvin Memorial Volume* (in press).

Pustovoytov K.
2002 ^{14}C Dating of Pedogenic Carbonate Coatings on Wall Stones at Göbekli Tepe (Southeastern Turkey). *Neo-Lithics* 2/02: 3-4.
2003 Weathering Rinds at Exposed Surfaces of Limestone Rocks at Göbekli Tepe. *Neo-Lithics* 1/03: 24-27.

Schmidt K.
2002 The 2002 Excavations at Göbekli Tepe (Southeastern Turkey): Impressions from an Enigmatic Site. *Neo-Lithics* 2/02: 8-13.
2003 "Kraniche am See". Bilder und Zeichen vom frühneolithischen Göbekli Tepe (Südosttürkei). In: Wilfried Seipel (ed.), *Der Turmbau zu Babel. Ursprung und Vielfalt von Sprache und Schrift. Eine Ausstellung des Kunsthistorischen Museums Wien für die Europäische Kulturhauptstadt Graz 2003*, Band IIIA: 23-29.
n.d. Frühneolithische Zeichen vom Göbekli Tepe, *TÜBA-AR* 7 (in press).

Schmidt K. and Hauptmann H.
2003 Göbekli Tepe et Nevali Çori. *Dossiers d'Archéologie* 28: 60-67.

Field Report

2003 Excavations at Kritou Marottou *Ais Yiorkis*, an Early Neolithic Site in Western Cyprus: Preliminary Report

Alan H. Simmons
University of Nevada, Las Vegas <simmonsa@unlv.edu>

Introduction

During the past decade a reassessment of the early inhabitants of Cyprus has revolutionized our understanding of the Neolithic colonization of the island (cf. Swiny 2001). Conventional wisdom held that the first true colonization of Cyprus did not occur until ca. 7,000 BC, during the Aceramic Neolithic Khirokitia Culture (KC, ca. 7,000-5,000 BC). Recent studies, however, have shown that there was an earlier component to the Neolithic settlement of the island, referred to as the Cypro-PPNB (cf. Peltenburg et al. 2000). Thus far, this is well documented at two sites, Parekklisha *Shillourokambos* (Guilaine and Briois 2001) and Kissonegra *Mylouthkia* (Peltenburg et al. 2000, 2001; 2001). New excavations at the upland site of Kritou Marottou *Ais Yiorkis*, however, indicate that it, too, belongs to the terminal aspect of the Cypro-PPNB, and that it also may represent a transitional site into the KC. This short note is a preliminary summary of the 2003 investigations at *Ais Yiorkis*.

Previous Investigations

Ais Yiorkis, originally thought to date to the KC, is located east of Paphos in the foothills of the Troodos Mountains at an elevation of 460 m. It was first recorded by the systematic Canadian Palaipaphos Survey Project (Rupp 1987; Fox 1987), which also recorded another KC occurrence, Kannaviou *Kochina*. These upland sites were unusual since most known Neolithic settlements are situated near the coast. Based on sur-

face data, the surveyors believed that *Ais Yiorkis* was a temporary camp related to deer and pig exploitation (Fox 1987: 20-22, 26). Thus the site was of particular interest since it appeared to represent a type of locality that was not well represented in the Neolithic record of Cyprus, where most attention has focused on larger coastal villages (cf. Simmons 1991; 1998a).

During two weeks in1997, the University of Nevada at Las Vegas (UNLV) conducted limited test excavations at both *Ais Yiorkis* and *Kochina* (Simmons 1998b; 1998c). The results from *Kochina* were disappointing. The material culture suggested a typical KC occupation, but the site is badly disturbed. Investigations at *Ais Yiorkis*, however, were more rewarding. Although only a very small portion of the site was tested (3 m^2, with depths up to 2.5 m and 175 m^2 of surface collections), a relatively large assemblage was collected. We recovered 2,015 chipped stone artifacts, which confirmed the original impressions of a sophisticated technology. Ground stone implements also were common, as well as a variety of personal artifacts, such as an incised picrolite "thimble" and other picrolite ornaments. A small portion of what appeared to be a wall also was exposed. A substantial faunal assemblage included not only the expected fallow deer and pig, but surprisingly, the presence of a small quantity of *Bos* bones. This was unanticipated since there was no evidence in Cyprus for cattle prior to the Bronze Age (Croft 1991: 63; Knapp et al. 1994: 418). Recent French excavations at Neolithic *Shillourokambos* in south-central Cyprus (Vigne 2001) also have documented cattle, and this species also possibly occurs at Akanthou (Frame 2002; Martin 2000).

Encouraged by the 1997 results, we renewed investigations during the summer of 2002 (Simmons n.d.; Simmons and O'Horo 2003). An additional area of 20 m^2 was excavated. Our goals were to establish if substantial *in situ* deposits and buried architecture, as well as additional cattle remains, were present, and to expand the artifact sample. The results more than met our expectations. Although still under detailed analyses, our data confirm a large faunal assemblage that includes additional *Bos*, abundant chipped stone, including obsidian, and specialized artifacts. Significantly, within the section exposed by a bulldozer cut, part of a large *in-situ* stone structure (Feature 1) (the "wall" partially exposed in 1997) was revealed. This consists of a foundation layer of small boulders topped by numerous large and small cobbles. Accordingly, another season was undertaken in 2003, the preliminary results of which are reported below.

Preliminary Results of 2003 Season

The primary goal of the 2003 was to expose fully and characterize Feature 1. This was successfully completed, adding an additional 24 m^2 of excavation coverage for a total of ca. 47 m^2. Feature 1 is a large (approximately 4 m in diameter) circular structure that is unprecedented in the Cypriot Neolithic. Although its eastern edges have been damaged by erosion, the feature is a well-conceived architectural construction. The undisturbed top is capped with an flat pavement of small, uniform cobbles, and its intact vertical sides, which stand some 0.5 m in height, are faced with similar cobbles.

To the north of the feature is an ashy matrix representing a midden deposit rich in bone and chipped stone. We anticipate that additional *Bos* remains are present, although none of the faunal remains have yet been analyzed. These data sets will contribute to a better understanding of the role of *Ais Yiorkis* in the early settlement of Cyprus.

Over 22,000 chipped stone artifacts (including over 700 additional tools) were recovered, making the total assemblage over 38,000 pieces (Table 1). This is a large number for what have been relatively limited excavations, but nearly 16,000 (41.7%) of these artifacts are represented by debris (or shatter). While these artifacts generally are not usable as tools, the sheer abundance of debris at *Ais Yiorkis* indicates that chipped stone reduction was a major activity at the site. The blade-like technology at the site is clearly seen in the flake to blade ratio of 2.9 : 1; when bladelets are added to the ratio, it is 2.2 : 1. These ratios represent a technological orientation in which blade production was important. This is further supported by the fact that many of the retouched tools were manufactured on blade blanks. Of particular significance was the recovery of an additional 13 obsidian bladelets. This brings the total for the site (from excavation) to 20 pieces. The obsidian is significant because this is a relatively large amount in comparison to most Neolithic sites.

Table 1. Summary of major chipped stone categories from *Ais Yiorkis*, 1997, 2002, and 2003 Seasons.

Category	n	%
Blades	4,102	21.1
Bladelets	1,283	6.6
Flakes	11,921	61.3
CTE	101	0.5
Burin spalls	119	0.6
Cores	279	1.4
Tools	1,652	8.5
Subtotal	19,457	100.0
Microflakes	2,937	(7.7)
Debris/shatter	15,990	(41.7)
Total	38,384	

Although blades clearly were important, it is interesting that the majority (74.2%) of cores are flake types (Table 2). As McCartney (2001: 428) observes, however, blade cores can be reworked into flake cores,

Table 2. Cores from *Ais Yiorkis*, 1997, 2002, and 2003 seasons.

Core Type	n	%
Flake		
Material testing	4	1.4
Akrotiri-type	25	8.9
Single platform	5	1.8
Multidirectional	33	11.8
90 degrees	3	1.1
Globular	42	15.0
Directional	2	0.7
Opposed platform	3	1.1
Discoidal	12	4.3
Sub-discoidal	6	2.1
On flake	8	2.8
Sub-pyramidal	4	1.4
Spheroidal	19	6.8
Core fragment-flake	42	15.0
Subtotal	(208)	(74.2)
Blade		
Single platform	18	6.4
Opposed platform	8	2.8
90 degrees	1	0.4
Sub-naviform	1	0.4
Corefragment-blade	15	5.4
Subtotal	(43)	(15.4)
Bladelet	15	5.4
Core fragment-bladelet	5	1.8
Tabular	1	0.4
Core fragment, indeterminate	8	2.8
Total	280	100.0

Table 3. Chipped stone tool classes from *Ais Yiorkis*, 1997, 2002, and 2003 seasons.

Class	n	%
"Projectile points"	4	0.6
Piercing tools	21	3.0
Scrapers	130	18.5
Burins	58	8.3
Notches	132	18.8
Denticulates	13	1.8
Sickles/glossed pieces	25	3.6
Serrated pieces	11	1.6
Truncations	52	7.4
Tanged pieces	42	6.0
Backed pieces	79	11.2
Microliths	34	4.8
Axes	7	1.0
Bifaces	17	2.4
Unifaces	4	0.6
Crescents	24	3.4
Varia	50	7.1
Subtotal	703	100.1
Retouched blades	513	(31.1)
Retouched flakes	357	(21.6)
Fragments	77	(4.7)
Total	1,650	

blurring the distinction between the two types. Also of interest is the presence of several diminutive "Akrotiri" types initially defined during the Akrotiri Phase (Simmons et al. 1999: 246-247). Naviform or "pseudo-naviform" core types documented at other Cypro-PPNB sites (e.g., McCartney 1999: 2001: 428; Guilaine and Briois 2001: 45-46), however, are absent at *Ais Yiorkis*, with only one "sub-naviform" type being thus far recovered. A partially refittable core also was retrieved, providing further evidence of the *in situ* nature of materials at the site.

A large variety of tool classes are represented at *Ais Yiorkis* (Table 3). Omitting the ubiquitous "retouched blades" and "retouched flakes," the most common classes in the formal tools are several scraper types (18.5%) and notches (18.8%). Of particular interest was the recovery of three more possible "projectiles," bringing the total to four. One of the three "projectiles" is quite crude, roughly similar to the one from the 2002 season. Another one is a medial fragment resembling a typical Byblos point, while a third has an overall Byblos morphology as well, albeit with a minuscule tang. We are somewhat reluctant to call these "projectile points," given their lack of systematic treatment and overall poor morphology. However, there is increasing evidence for points, generally of broadly Byblos forms, in the Cypriot Neolithic (e.g., McCartney and Gratuze 2003: 25-26, 30; Guilaine and Briois 2001: 47), thus the presence of even rudimentary points at *Ais Yiorkis* is potentially significant. Of note as well is the presence of numerous (42) tanged pieces, which may be related to a projectile technology.

Overall, the chipped stone from *Ais Yiorkis* appears to resemble that from the Cypro-PPNB rather than the KC. This must remain a tentative conclusion until more detailed results are published from the small sample of Cypro-PPNB sites and until final detailed analyses of the *Ais Yiorkis* materials are completed.

In addition to the chipped stone, several more ground stone artifacts were recovered, including large platter fragments and numerous handstones (Table 4). Small amounts of charcoal also were preserved. Finally, flotation from the midden deposit yielded several charred seeds. These were examined by Dr. J. Hansen (Boston University), who identified small amounts of either two grained einkorn or emmer wheat as well as other materials.

Table 4. Ground stone artifacts from *Ais Yiorkis*.

Type	n	%
Handstones, complete	7	7.3
Handstones, fragments	37	38.5
Handstone/pestle fragments	3	3.1
Pestle fragments	2	2.1
Ground slab fragments	5	5.2
Bowl/platter fragments	19	19.8
Misc. vessel fragments	6	6.3
Hammerstones	3	3.1
Misc. fragments	14	14.6
Total	96	100.0

We also conducted pollen, starch, and phytolith analyses on ground stone samples. This is particularly significant, since many researchers believe that pollen is frequently poorly preserved in Cyprus. Our results indicate otherwise, and samples from *in situ* contexts were co-dominated by *Poaceae* and *Liguliflorae* pollen, indicating the presence of grasses and weeds, e.g. dandelion (Scott n.d.).

An absolute chronology is essential for proper interpretation of *Ais Yiorkis*. As noted earlier, the site was originally recorded as a KC occupation, and the first three radiocarbon determinations, all on bone (including *Bos*) confirmed this, suggesting an early KC placement. Four additional AMS assays are now available, however, all suggesting a late Cypro-PPNB occupation. These determinations include one *Bos* bone and three botanical samples; given problems with dating bone, the three plant samples should probably be considered the more accurate (Table 5). This placement concurs with the strong technological and typological hints that the chipped stone from *Ais Yiorkis* predates the KC and resembles Cypro-PPNB materials. Accordingly, the radiocarbon chronology presently indicates that *Ais Yiorkis* was occupied during the late Cypro-PPNB and possibility continued into the early KC.

Conclusions

Three test seasons at *Ais Yiorkis* yielded unexpected results, demonstrating that the site is larger and more elaborate than earlier believed. Especially significant has been the recovery of *Bos*. A large and sophisticated chipped stone assemblage, specialized artifacts, and an unusual stone construction complement the economic data. The stone feature is suggestive of a more permanent settlement than previously believed. In addition, radiocarbon determinations support a late Cypro-PPNB chronological placement. Finally, the upland location of *Ais Yiorkis*, where Neolithic sites are virtually unknown, adds a new dimension to the complexity of the early Neolithic in Cyprus.

Acknowledgments. I would like to thank the Department of Antiquities of Cyprus for its assistance throughout all phases of the project. The staff at the Temple of Aphrodite Museum complex was particularly helpful during the investigations. A small but dedicated field crew worked hard in a short time to produce the results reported upon here. Funding for the 1997 testing program came from the B. Johnson Foundation. During the 2002 season, principal funding was from a University of Nevada at Las Vegas' "Planning Initiative Award" grant. The 2003 season was funded by grants from the Institute of Aegean Prehistory and the Brennan Foundation.

Table 5. Radiocarbon determinations from *Ais Yiorkis*.

Laboratory No.	Material	Corrected ^{14}C Age*	Calibrated Date (95% Confidence)
DRI 3441	*Bos* (1 bone)	7,867 ± 106 bp -24.21% per mil	6,468 - 7,007 BC
DRI 3442	*Sus* (2 bones)	7,540 ± 169 bp -28.24% per mil	5,984 - 6,704 BC
DRI 3443	*Dama* (1 bone)	7,658 ± 105 bp -26.49% per mil	6,673 - 6,698 (1%) 6,212 - 6,666 BC (99%)
CAMS 94861	*Bos* (1 bone)	8,290 ± 40 bp -19.36% per mil	7,180 - 7,520 BC
Beta-183649	Charred material	8,480 ± 40 bp -23.0% per mil	7,500 - 7,580 BC
Beta-183650	Charred material	8,600 ± 40 bp -26.8% per mil	7,570 - 7,630 BC
Beta-183651	Charred material	8,580 ± 40 bp -27.1% per mil	7,560 - 7,610 BC

*All determinations are corrected for $\delta^{13/12}$C value; CAMS and Beta are AMS determinations

Bibliography

Croft P.
1991 Man and beast in Chalcolithic Cyprus. *Bulletin of the American Schools of Oriental Research* 282/283: 63-79.

Fox W.
1987 The Neolithic occupation of western Cyprus. In David Rupp (ed.), *Western Cyprus Connections: An Archaeological Symposium:* 19-42. Studies in Mediterranean Archaeology 77. Goteborg, Paul Åströms Förlag.

Frame S.
2002 Island Neolithics: animal exploitation in the Aceramic Neolithic of Cyprus. In W. Waldren and J. Ensenyat (eds.), *World Islands in Prehistory*: 233-238. British Archaeological Reports - International Series 1095. Oxford, B.A.R.

Guilaine J-D and Briois F.
2001 Parekklisha *Shillourokambos*: An early Neolithic site in Cyprus. In S. Swiny (ed.), *The Earliest Prehistory of Cyprus: From Colonization to Exploitation*: 37-53. Boston, American Schools of Oriental Research.

Knapp A., with Held S. and Manning S.
1994 The prehistory of Cyprus: Problems and prospects. *Journal of World Prehistory* 377: 377-453.

Martin L.
2000 Animal bones from Tatlisu-Çiftlikdüzü 1996. In M. Şevketoğlu (ed.), *Archaeological Field Survey of the Neolithic and Chalcolithic Settlement Sites in Kyrenia District, North Cyprus*: 124-127. British Archaeological Reports - International Series 834. Oxford, B.A.R.

McCartney C.
1999 Opposed platform core technology and the Cypriot Aceramic Neolithic. *Neo-Lithics* 1/99: 7-10.
2001 The chipped stone assemblage from *Tenta* (Cyprus), cultural and chronological implications. In I. Caneva, C. Lemorin, D. Zampetti and P. Biagli (eds.), *Beyond Tools - Redefining the PPN Lithic Assemblages of the Levant*: 427-436. Studies in Early Near Eastern Production, Subsistence, and Environment 9: Berlin, ex oriente.

McCartney C. and Gratuze B.
2003 The Chipped Stone. In E. Peltenburg (ed.), *Lemba Archaeological Project, Cyprus III.I. Excavations at Kissonerga-Mylouthkia 1976-1996*: 11-34. Studies in Mediterranean Archaeology 70: 4. Jonsered, Paul Åströms Förlag.

Peltenburg E., Colledge S., Croft P., Jackson A., McCartney C. and Murray M.
2000 Agro-pastoralist colonization of Cyprus in the 10th millennium BP: Initial assessments. *Antiquity* 74: 844-853.
2001 Neolithic dispersals from the Levantine Corridor: A Mediterranean perspective. *Levant* 33: 35-64.

Peltenburg E., Croft P., Jackson A., McCartney C. and Murray M.
2001 Well-established colonists: Mylouthkia 1 and the Cypro-Pre-Pottery Neolithic B. In S. Swiny (ed.), *The Earliest Prehistory of Cyprus: From Colonization to Exploitation*: 61-93. Boston, American Schools of Oriental Research.

Rupp D. (ed.)
1987 *Western Cyprus: Connections - An Archaeological Symposium*. Studies in Mediterranean Archaeology 77. Goteborg, Paul Åströms Förlag.

Scott L.
n.d Pollen and phytolith analysis for Ais Yiorkis, Cyprus. Unpublished Paleo Research Institute Technical Report 03-35. Paleo Research Institute, Golden, Co.

Simmons A.
1991 One flew over the hippos' nest: Extinct Pleistocene fauna, early man, and conservative archaeology in Cyprus. In Geoffrey Clark (ed.), *Perspectives on the Past*: 282-304. Philadelphia, University of Pennsylvania Press.
1998a Exposed fragments, buried hippos: Assessing surface archaeology. In: A. Sullivan (ed.), *Surface Archaeology*: 159-167. Albuquerque, University of New Mexico Press.
1998b Test excavations at two Aceramic Neolithic sites in the uplands of western Cyprus. *Report of the Department of Antiquities, Cyprus*, Nicosia, 1998:1-17.
1998c Of tiny hippos, large cows, and early colonists in Cyprus. *Journal of Mediterranean* Archaeology 11: 232-241.
n.d Preliminary report of the 2002 excavations at Ais Yiorkis, an Aceramic Neolithic site in western Cyprus. Report of the Department of Antiquities, Cyprus, Nicosia (in press).

Simmons A. and O'Horo K.
2003 A preliminary note on the chipped stone assemblage from Kritou Marottou A*is Yiorkis*, an Aceramic Neolithic site in western Cyprus. *Neo-Lithics* 1/03: 21-24.

Simmons A., Neely M., and Reese D.
1999 Additional archaeological investigations on the Akrotiri Peninsula. In: A. Simmons, *Faunal Extinction in an Island Society: Pygmy Hippopotamus Hunters of Cyprus*: 239-258. New York, Kluwer Academic/Plenum Publishers.

Swiny S. (ed.)
2001 *The Earliest Prehistory of Cyprus: From Colonization to Exploitation*. Boston, American Schools of Oriental Research.

Vigne J.-D.
2001 Large mammals of early Aceramic Neolithic Cyprus: Preliminary results from Parekklisha *Shillourokambos*. In: S. Swiny (ed.), *The Earliest Prehistory of Cyprus: From Colonization to Exploitation*: 55-60. Boston, American Schools of Oriental Research.

Overlooking the Steppe-Forest: A Preliminary Report on the Botanical Remains from Early Neolithic Göbekli Tepe (Southeastern Turkey)

Reinder Neef
Deutsches Archäologisches Institut, Zentrale, Berlin <archbotan@dainst.de>

Location and Present Environment

The mound of Göbekli Tepe is located directly northeast of Şanliurfa. It is a complex of small artificial hillocks of red stony earth, located on a high ridge-like limestone plateau (ca. 770m asl) and has an overall diameter of ca. 150 m and a maximum height of 20 m. Since 1995 rescue excavations at the mound have been undertaken by the D.A.I. and the museum in Şanliurfa (see Beile-Bohn et al. 1998; Schmidt 2000; Schmidt 2002a; 2000b). The central location of the site is expressed in the magnificent view to the south over the Harran plain, to the east over one of the main sources of the Balikh River, to the northwest towards the springs at Şanliurfa and the Taurus mountains, and to the northeast to the mountain area of Karaca Dağ, where, according to genetic research on recent einkorn varieties, the strain of wild einkorn closest to the modern cultivated einkorn most likely came from (Heun et al. 1997). It is clear that the setting of the mound is strategic in many respects, including an ecological one, comprising so many various habitats in its immediate vicinity.

Although the average annual rainfall of around 500 mm potentially allows the presence of an arid steppe-forest type, the surroundings of the site are free of trees and higher shrub vegetation except for a few small heavily browsed hawthorn shrubs (*Crataegus* sp.). On top of Göbekli Tepe near three holy tombs stands a lonely mulberry tree (*Morus* sp.). Apart from the mound, most of the limestone rock at the top of the plateau is only covered by a thin layer of soil or even completely bare. It is possible that large parts of the plateau always were barren of soil and therefore of arboreal vegetation. Arguing that massive soil erosion took place after the plateau was denuded of vegetation could only count for the period before or during the use of the monument, according to the many cutting and carving traces in the bare limestone of the plateau (see Beile-Bohn et al. 1998). Furthermore, the slopes of the plateau, which are too steep or too stony for agriculture, are treeless and covered by a grass steppe dominated by wild barley (*Hordeum spontaneum*), wild oats (*Avena* sp.), broom grass (*Bromus* sp.), feather grass (*Stipa* sp.) and goat grass (*Aegilops* sp.). Wild einkorn was not found, although its preferred soils on volcanic rock exist not far from the site. Common dwarf shrubs in this grass steppe are the barely palatable *Astragalus* sp. and *Teucrium polium*. Nevertheless, that sufficient soil cover in the area can support tree growth is demonstrated by the successful forestation with pines, mainly *Pinus brutia*, by the Turkish Forest Department. The lower foothills are mainly occupied by fields with rain-fed agriculture, mainly wheat and barley, together with some small plantations of cultivated pistachio tree and vine. The Harran plain is completely under rain-fed and irrigation agriculture.

Results and Discussion

From the campaigns of 1997 to 2003 soil samples for botanical analysis were taken. The samples were processed by a simple water flotation technique. All the flotation samples as well as the handpicked charcoal samples originated in Layer III dating to the PPNA/EPPNB. Two radiocarbon samples from mixed almond/pistachio charcoal samples from this layer yielded dates of 9559 ± 53 BP (Hd-20036) and 9452 ± 73 BP (Hd-20025) (Kromer and Schmidt 1998). This layer is comprised of the backfill from enclosures (each made up of concentric stone walls) connecting a circle of monolithic T-shaped pillars. The precise dating of the time when this backfill took place is difficult due to the character of the filling material. The soil used is not sterile but instead full of flints and bones, resembling settlement debris (Schmidt 2002a; 2000b). However, so far no settlements contemporary to the monument have been found nearby.

This backfilling means that none of the botanical material retrieved was still *in situ*, but that all the material was redeposited. It explains the scarcity of botanical material and its bad preservation. Redeposition of the fragile carbonized plant remains, in combination with the extremely stony soil, as is the case here, inevitably leads to the loss of most of these remains. This is reflected by the low total of only 164 identifiable pieces of charcoal and 386 remains of mostly fragmented grains and nuts from a total of 1950 liters of floated material (Table 1).

Besides the charcoal from flotation samples, charcoal was collected from the profiles, totaling 144 identifiable pieces. In general the charcoal was very fragmented;

Table 1. Göbekli Tepe, seasons 1997-2003. Total number of carbonized seeds, fruits and other plant remains from the flotation samples from Layer III. (* = estimated number of complete seeds and fruit stones from small fragments).

Species	**Total (n)**	
Graminea (cereal type)	2* (5)	grass family (cereal grain type)
Triticum cf. *boeoticum/urartu*	5*	wild einkorn
Triticum cf. *boeoticum/urartu* (spikelet forks)	11	wild einkorn (spikelet forks)
Triticum cf. *boeoticum/urartu* (glume bases)	4	wild einkorn (glume bases)
Triticum/Secale	1	wild wheat/rye
Hordeum cf. *spontaneum*	16*	wild barley
Lens sp.	½	lentil
Pistacia sp.	17* (124)	pistachio
Prunus sp.	13½* (158)	almond
Aegilops sp.	1	goat-grass
Bellevalia type	1	hyacinth type
Papilionaceae	13½*	pea family
Galium sp.	2	bedstraw
indeterminata	11	indeterminata
Charcoal in gr (n identifications)		
Pistacia cf. *atlantica*	3,14 (104)	pistachio tree
Prunus cf. *amygdalus*	1,90 (59)	almond tree
Quercus type *brantii*	0,02 (1)	deciduous oak species
volume of flotation (litres)	1950	

the identified pieces from the flotation had an average weight of 0.03 gr., and for the handpicked pieces this was 0.06 gr. A total of 7 taxa were identified from the charcoal of all the flotation and handpicked samples; Fig. 1 gives these taxa according to the relative percentage of the total number of positive identifications and weight (gr).

The results of the charcoal analysis show that around 90% of the wood, according to the total number of 308 identifications as well as according to weight, belongs to wild pistachio (*Pistacia* cf. *atlantica*) and wild almond (*Prunus* cf. *amygdalus*). Two other non-hygrophilous taxa were identified: Maloideae (13 identications), which includes wood anatomically indistinguishable between hawthorn (*Crataegus* sp.) and wild pear (*Pyrus* sp.), and a deciduous oak (*Quercus* cf. *brantii*, 3 specimens). These taxa all indicate the presence of a forest-steppe dominated by pistachio-almond stands around Göbekli Tepe in the Early Neolithic.

This forest-steppe is typical of arid areas at the fringe to a steppe with a slightly continental character. It is relatively open, with widely spaced trees. This corroborates with the results from the zoological remains that also indicate relatively open landscapes in the vicinity of the site (Driesch and Peters 1999; Peters et al. 1999). Nowadays, comparable steppe-forest types are destroy-

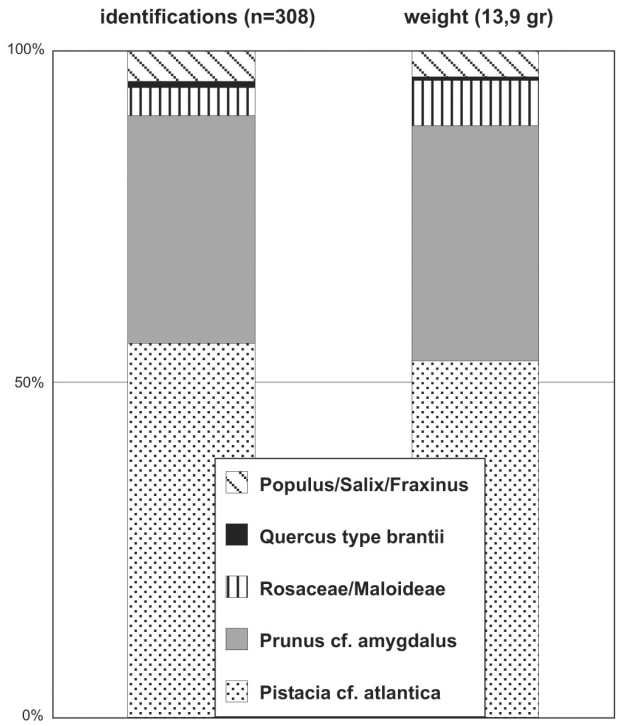


Fig. 1. Relative percentage of the total number of positive identifications and their weights (gr) of the wood taxa from the flotation samples and the handpicked charcoal samples from Göbekli Tepe, Layer III.

ed or are only present in degraded form, because especially in these areas where tree growth is limited by water stress, human interference mostly leads to an irreversible degradation of the vegetation. An impression of this open almond-pistachio steppe-forest, in a strongly degraded form of course, is provided in Fig. 2 from Jebel Abdul Aziz in Syria. The summer aspect shown in the picture reveals that grazing pressure is high because of the nearly absent understorey of shrubs. Characteristic species are wild pistachio *(Pistacia atlantica and P. khinjuk)*, wild almond (*Amygdalus orientalis*) and hawthorn (*Crataegus azarolus*). According to Zohary (1973), Jebel Abdul Aziz was probably deprived of its oaks, because 150 km to the east Jebel Sinjar in Iraq still supports steppe-forests with deciduous oaks (*Quercus brantii*). Remnants of this vegetation occur also, for instance, in the borderland between Turkey and Iraq, the Zagros Mountains in Iran, and in eastern Jordan, all indicating that this steppe-forest type once was widely spread in the Near East.

Fig. 2. Degraded steppe-forest with *Pistacia atlantica* and *Crataegus azarolus* on north-facing slopes of Jebel Abdul Aziz in Syria (summer aspect, 800m asl).

Many Early Neolithic settlements were located in this transitional environment between steppe and forest. The almond-pistachio forest-steppe seems to have been extensive in SE Turkey and even expanding far into NE Syria, according to the charcoal analysis from several Early Neolithic sites in this area (Roitel and Willcox 2000; Willcox 1996).

Denser forest vegetation around Göbekli Tepe would only have been near wells and streams. A total of 14 positive identifications concern taxa from the hygrophilous vegetation near springs, such as ash (*Fraxinus* sp.) and from the riparian forests on the river banks, like poplar (*Populus euphratica*), willow (*Salix* sp.) and also ash.

The presence around Göbekli Tepe of an almond-pistachio steppe-forest and its importance for the people living in this area is also demonstrated by the fruits collected from wild almond and pistachio trees, according to the 282 small fragments of their nuts. These fragments appeared throughout most of the samples.

All other taxa identified from the flotation samples, mainly from the grass and pea families, probably all originated in the grass steppe on slopes with thin soil coverage and between the widely spaced trees of the pistachio-almond steppe-forest. None of the cereal remains showed any sign of domestication; even under these bad preservation conditions a low percentage of their remains was preserved, making the harvest of wild cereals likely at Göbekli Tepe.

The grain fragments of einkorn (*Triticum* cf. *boeoticum/urartu*) were all relatively narrow (1.0-1.6 mm). As far as one can see from this badly preserved material, the disarticulation scar at the spikelet fork is smooth, which is a feature of wild cereals where the rachis of the ripe ear disarticulates below each spikelet at maturity. The fragments of barley grains all seem to belong to wild barley (*Hordeum spontaneum*); the grain fragments are flat (0.7-1.4 mm) with a relative wide furrow. The dimensions of the lentils are well within the range of a wild lentil (diameter 2.1 mm). All other leguminous seeds are of a small type but not further identifiable.

To sum up, so far there is no evidence for domestication in the unfortunately scarce plant material from Göbekli Tepe. This does not exclude the possibility that cultivation of plants had already taken place in the early Neolithic, constituting a so-called pre-domestic agriculture. Indeed, people already capable of erecting such impressive monuments as Göbekli Tepe must have lived in well-organized societies with the potential of experimenting with their natural resources, laying the foundation for the development of farming communities.

Bibliography

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

Driesch A. von den and Peters J.
1999 Vorläufiger Bericht über die archäozoologischen Untersuchungen am Göbekli Tepe und am Gürcütepe bei Urfa, Türkei. *Istanbuler Mitteilungen* 49: 23-39.

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.

Kromer B. and Schmidt K.
1998 Two Radiocarbon dates from Göbekli Tepe, South Eastern Turkey. *Neo-Lithics* 3/98: 8-9.

Peters J., Helmer D., Driesch A. von den and Sana Segui M.
1999 Early animal husbandry in the Northern Levant. *Paléorient* 25/2: 27-47.

Roitel V. and Willcox G.
2000 Analysis of charcoal from Abu Hureyra 1. In: A.M.T. Moore, G.C. Hillman and A.J. Legge (eds.), *Village on the Euphrates: From Foraging to Farming at Abu Hureyra*. Oxford: 544-547.

Schmidt K.
2000 Zuerst kam der Tempel, dann die Stadt. Vorläufiger Bericht zu den Grabungen am Göbekli Tepe und am Gürcütepe 1995-1999. *Istanbuler Mitteilungen* 50: 7-41.
2002a Göbekli Tepe - Southeastern Turkey. The seventh Campaign, 2001. *Neo-Lithics* 1/02: 23-25.
2002b The 2002 Excavations at Göbekli Tepe (Southeastern Turkey) - Impressions from an Enigmatic Site. *Neo-Lithics* 2/02: 8-13.

Willcox G.
1996 Evidence for plant exploitation and vegetation history from three Early Neolithic pre-pottery sites on the Euphrates (Syria). *Vegetation History and Archaeobotany* 5/1-2: 143-152.

Zohary, M.
1973 *Geobotanical Foundations of the Middle East*. Stuttgart, Gustav Fischer Verlag.

Contribution

The Neolithic Figurines from Ulucak Höyük: Reconsideration of the Figurine Issue by Contextual Evidence

Eşref Abay
Ege Üniversity, Izmir <e_abay@yahoo.com, abay@edebiyat.ege.edu.tr>

Introduction

Anthropomorphic figurines, spread across a large area extending from the Near East to Europe in prehistoric periods, are generally interpreted as objects reflecting the images of the god and goddess or as ritual supplicants (Mellaart 1970: 170). These figurines, consisting of mostly female representations, have usually been found in domestic contexts. Therefore, the discussions on figurines are heavily centered on their sexuality and archaeological context. According to the traditional approach, figurines as a part of the prehistoric religious system are involved with the concept of Mother Goddess and fertility cult, and therefore they are considered as an indication of the matriarchal society (Gimbutas 1974; 1989; 1991). Although some scholars accept that figurines may well have been a metaphor for certain aspects of women in relation to social and productive activities, they deny that they are the indicator for the presence of a matriarchal type of society (Meskell 1995: 58). By the same token it has also been suggested that these female figurines may show a considerable role of women in agricultural activities rather than being the representations of the goddess (Chapman 1991: 157). The beliefs involved with concepts of Mother Goddess, gender roles and polarity between nature and culture are criticized by current feminist archaeologists, since they are considered as simple explanations that are used for the legitimization of the claims of the Pseudo-feminists. Current feminists tend to think in a more particularistic way that does not necessarily hold for all contexts. By considering the social and symbolic theories as central, they argue that gender cannot be separated from other aspects of archaeology (Meskell 1995: 58). In this new feminist current, the importance of the context of the figurines and multiplicity of representations are stressed, as Hodder (1990) has suggested.

Female figurine production has been related to domestic concepts and the economic process of domestication by I. Hodder (1990: 45-68). According to him, the house is the place where productive and symbolic activities coincide. In other words, the house is a multi-dimensional structure in which the need for provision and preparation of food, sheltering and protection and space for burials are served. R.G. Lesure has recently explained how meanings and functions of these female figurines can be changed according to the point of view of the researcher. Iconographic, functional, symbolic and social analyses are among these different research tactics (Lesure 2002).

As has been summarized above, there are various explanations for the figurines, and as a matter of fact these interpretations have increasingly varied by the influence of the post-processual movement. One must bear in mind that the insistence on one explanation for all figurines may have potential risk for ignoring other convenient interpretations for them on the one hand, while the general tendency to relate them directly to the sacred world in situations without clear evidence about their function is equally restrictive on the other hand. The Neolithic figurines from Ulucak Höyük have been found in relatively good archaeological contexts. Thus, the aim of this paper is to assess these figurines in the light of the contextual evidence and ultimately to make some contributions about their possible function and meaning.

Site Location and Stratigraphy

Ulucak Höyük is situated about 25 km east of Izmir, near the crossroads of the Ulucak town on the Izmir-Ankara road (Fig. 1). The mound is located in a plain surrounded by mountain ranges from its northern and southern ends. The plain is connected to the Aegean Coast by the Belkahve Pass, and there is also a natural road in the east leading from the plain to the inner parts of western

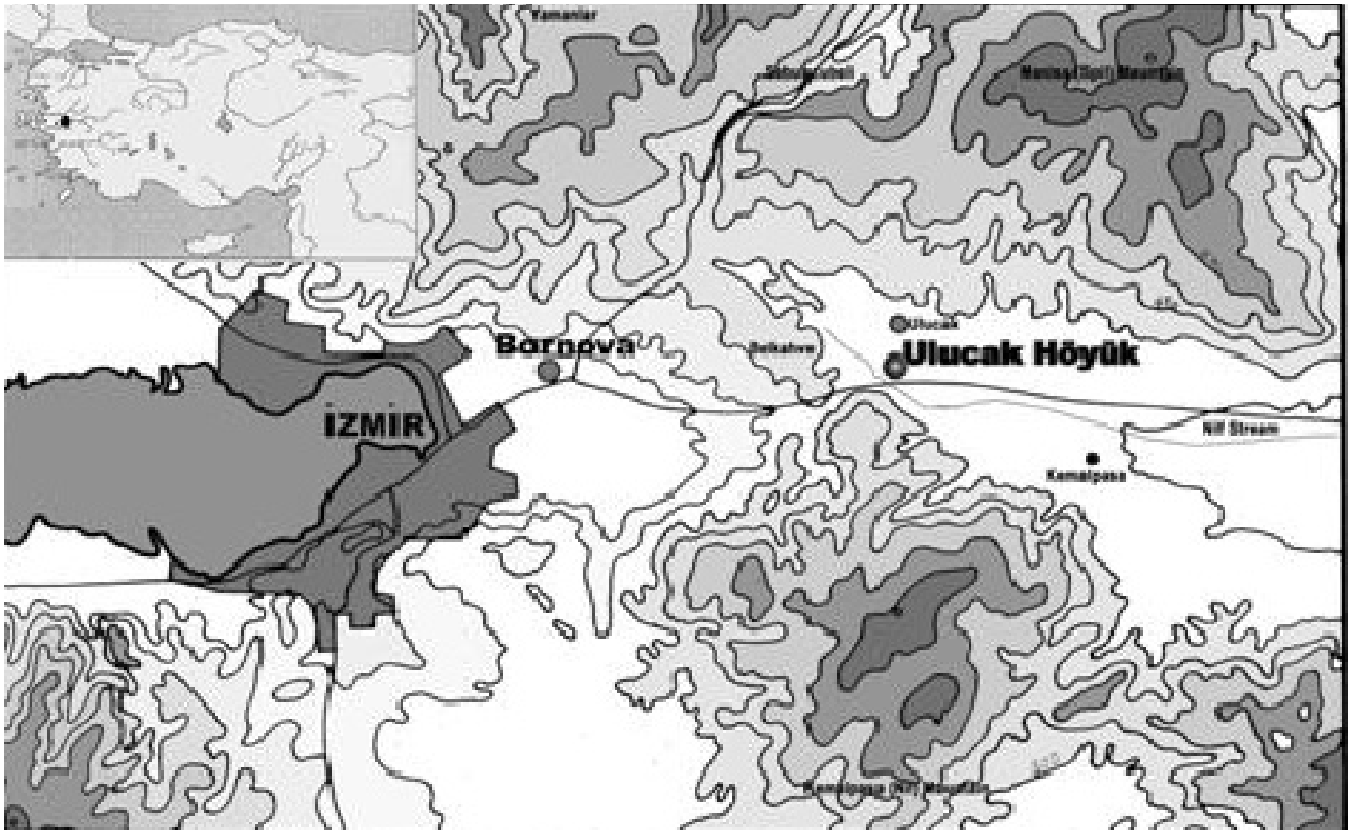


Fig. 1. Location of Ulucak Höyük.

Anatolia. The cone of the mound is ca. 100 m in diameter, although drilling carried out in the slopes of the mound have shown that the occupation area seems to have covered a much wider area, ca. 4.5 hectares. However, these areas had been buried by alluvial accumulation. The small stream of Nif Çayi must have been an important factor in the choice of the area for habitation. In spite of the fact that the mound measures 6 m in height above the present surface of the plain, the results obtained from the core drilling indicate that cultural deposits continue down to at least 9.36 m. The eastern and southern sides of the mound were heavily destroyed both by agriculture and construction activities made by the tobacco factory near the mound (Fig. 2).

Ulucak Höyük has been excavated under the direction of Prof. Dr. Altan Çilingiroğlu since 1995, although the Neolithic occupation at Ulucak Höyük was already reported by various scholars as early as the 1960's (Mellaart 1962; French 1965; 1967; 1969; Meric 1989; 1990). The excavations at Ulucak have focused on two different sectors, namely the mound and the cemetery area located 200 m east of the mound (Fig. 2). However, the cemetery is dated to Early and Middle Bronze Age periods, and no Neolithic burials have been found yet.

As a result of eight seasons of excavations at Ulucak five main architectural levels with numerous sub-phases have been identified. Level I, dating to the Late Roman-Early Byzantine Period, represents the latest stratum at the mound. Level II with three sub-phases is assigned to the Early Bronze Age (EBA). Since this level has been severely damaged, only the stone foundations have been partly preserved. Therefore, the hand-made black and red burnished wares from this level resembling the pottery found at other sites in western Anatolia are the most

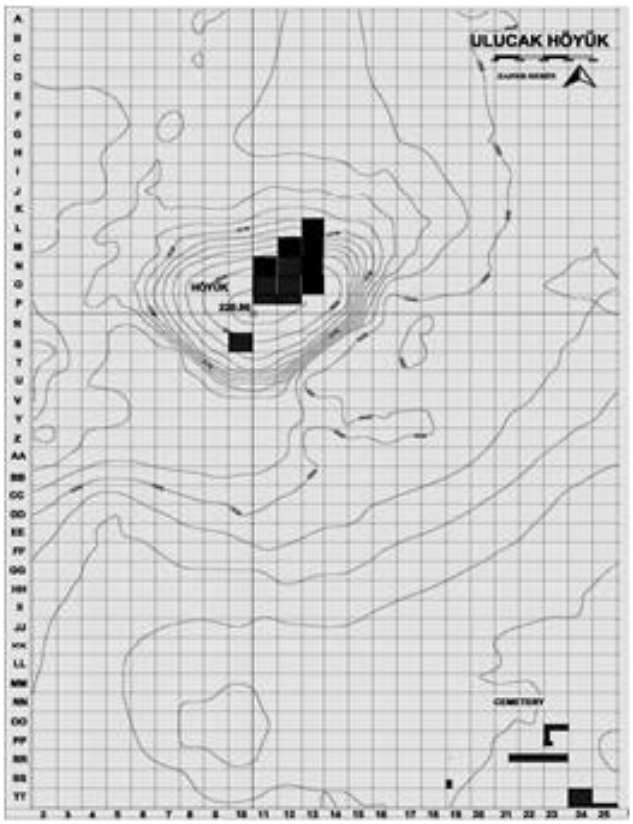


Fig. 2. The topographic plan of Ulucak Höyük.

reliable evidence for dating of this level to EBA II period[1]. Level III, which was heavily disturbed by the following level, has recently been exposed in a very restricted area. However, with the help of the pottery assemblage consisting of mainly hand-made grey and brown large plates, this level can be assigned to the Late Chalcolithic Period (Çilingiroğlu et al. n.d.).

Level IV with eight sub-phases (IV a-h), representing the Late Neolithic Period, is the most substantial and well preserved stratum. The architectural remains of Level IVa could only fragmentarily be traced because of disturbance. Furthermore, our evidence is extremely scarce from the sub-phases between c and h of Level IV since these phases have only been recovered in a small and deep trench (Trench N 11). Therefore, Level IVb, which was exposed in a larger area (ca 600 m^2), characterizes the best understood level at Ulucak. Level IVb was ended by fire, thus the houses of this level provide us rich pottery and artifact assemblages in well preserved contexts. Level IVb is characterized by rectangular mud-brick houses on one-row stone foundations. The houses generally consist of two rooms with forecourts. These courts were enclosed by wattle and daub walls. The houses were built side by side and the walls were usually used in common among adjacent structures. The agglutinative character of the architecture seems to reflect a tightly packed settlement pattern. The hand-made red slipped and burnished wares from Level IVb display close similarities with the pottery from Late Neolithic sites in the lake district and northwestern Anatolia as well[2]. Moreover, we have two radiocarbon dates from Level IVb giving the dates between ca. 5990-5730 cal. BC.

Level V has recently been discovered beneath Level IV in Trenches N11 and L13, and three sub-phases of Level V have been defined. This level differs from Level IV in terms of architecture, pottery and small finds. Houses of Level V were built of wattle and daub. Although studies on pottery and other finds from this level have not yet been completed, it seems that Level V is earlier than Late Neolithic Period. Therefore, future excavations at Ulucak may provide us considerable information about the Neolithization process in western Anatolia.

Archaeological Context of the Figurines

Three anthropomorphic figurines which will be discussed below in detail are all from Level IVb dating to the Late Neolithic Period. Although a number of figurines is also known from Level III, they are badly damaged, and too little is known about their archaeological contexts to make an interpretation about their possible meanings and/or function, in contrast to those from Level IVb.

Figurine A was found in a bowl full of flint flakes and obsidian blades in Building 6 (Fig. 3) belonging to Level IVb (Trench N12). Two walls of Building 6 measuring 7 x 5 m have been excavated. There is a well preserved rectangular oven adjacent to the western wall of the building, and just in front of it were the remains of another, demolished, oven. The bowl with both worked and unworked flint and obsidian tools and the figurine was recovered in front of the ruined oven 20 cm above the floor level. Clay benches lying along the southern wall and western half of the northern wall of the building are at a height of ca. 15 cm above the floor. Grinding stones,

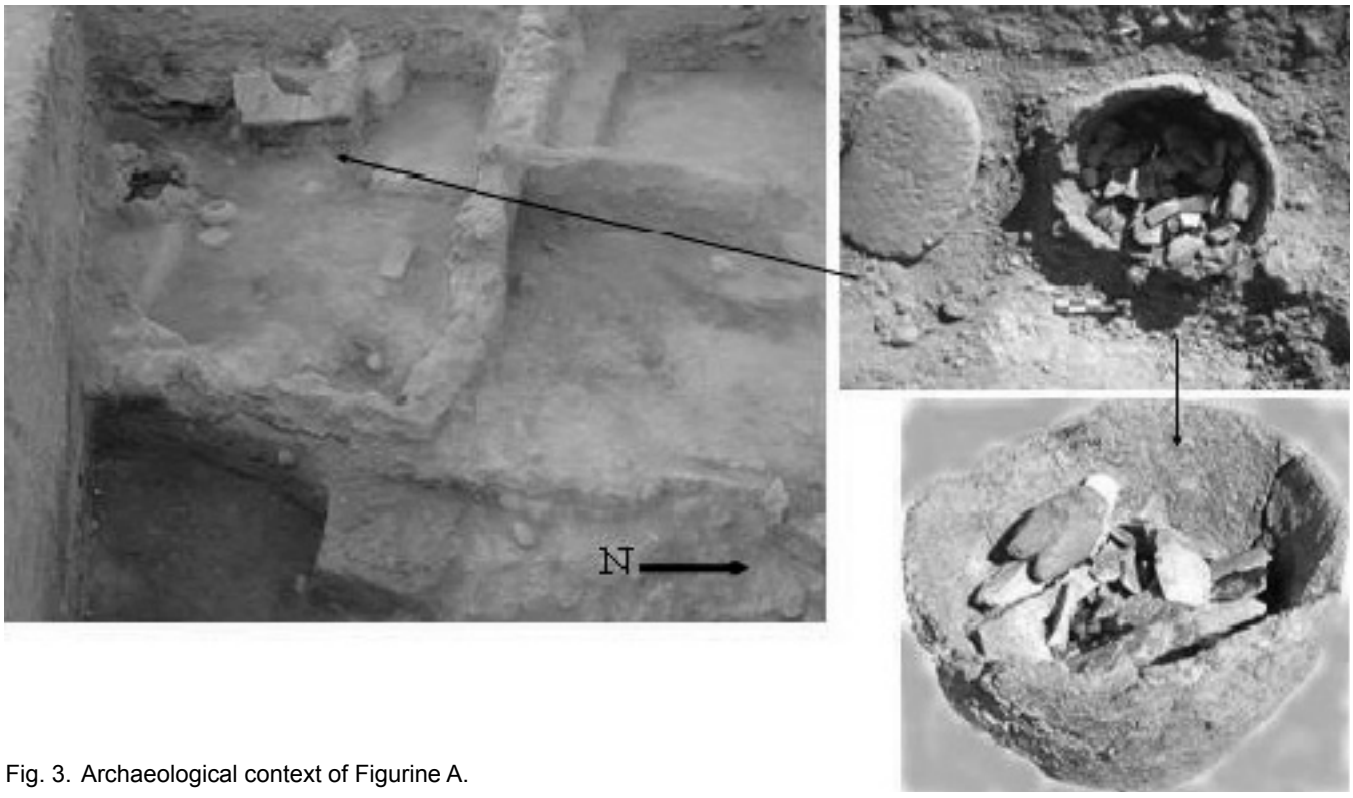


Fig. 3. Archaeological context of Figurine A.

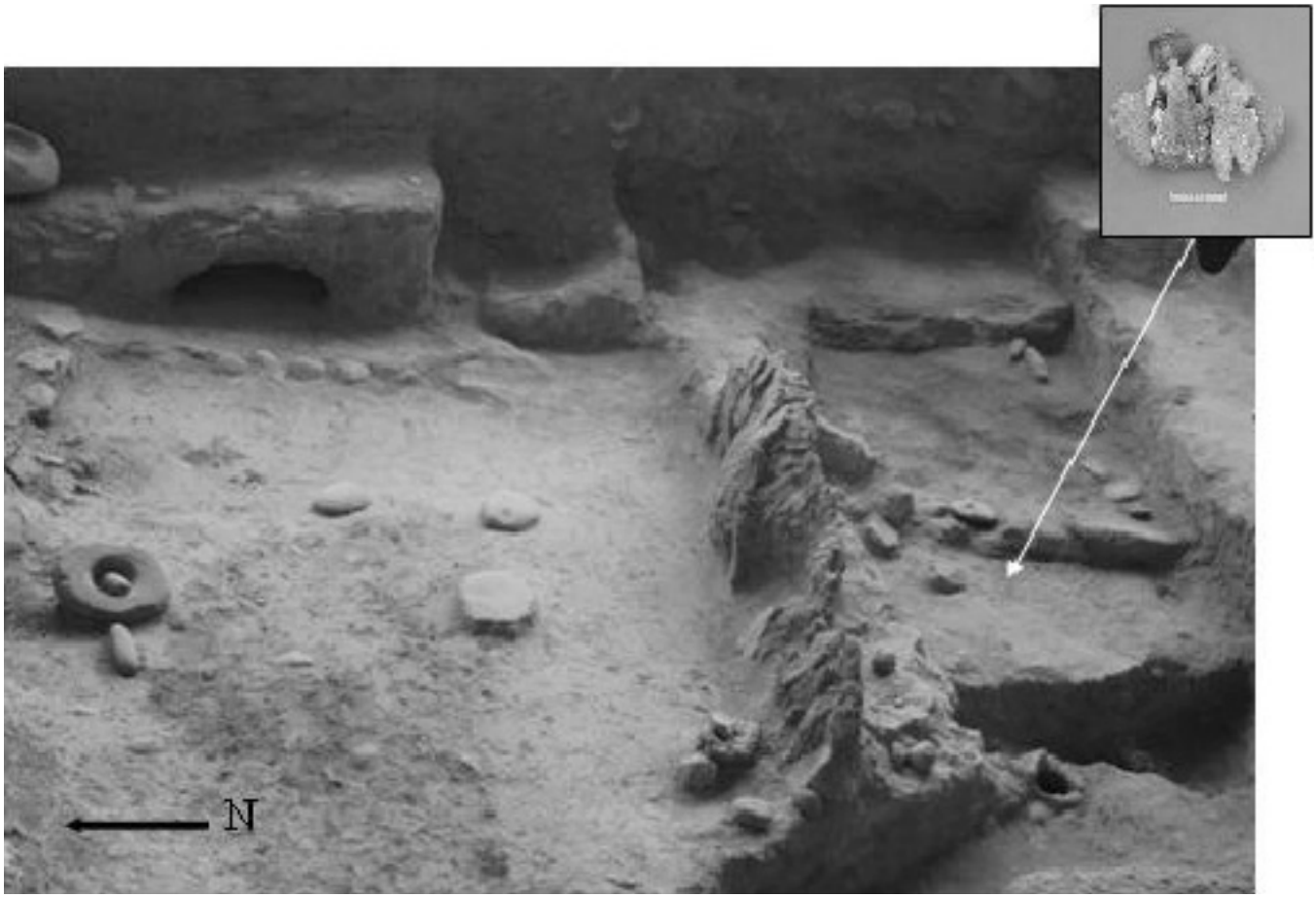


Fig. 4. Archaeological context of Figurines B and C.

chipped stone tools and bone tools, and spindle whorls were found on the clay-plastered floor. Numerous clay lumps and clay slag recovered from the southwestern corner of the building indicate that this area was probably used for pottery making. In general, this structure seems to have been involved with intensive manufacturing activities.

Figurines B and C are female and male, respectively. Both were discovered on the floor of Building 13 (Fig. 4) belonging to Level IVb (Trench N13). A broken bowl and a large quantity of flint flakes on and around of the bowl were found in relation to figurines in question. Thus, it is highly likely that the figurines and flint flakes were originally placed in the bowl as described above (see Fig. 3). Building 13 covering an area of ca. 35 m^2 is a very complex structure. It is rectangular with mud-brick walls ca. 50 cm thick on a one-row stone foundation. It is entered by a door 1.53 m wide in the western wall[3]. This structure was divided into two rooms by a wall extending in an east-west direction that was built using the wattle and daub technique. In the larger room an oven measuring 1.45 x 0.95 m is at the side opposite of the door. Besides pottery, grinding stones, flint perforators and stone axes were also recovered from the larger room. Traces of the red paint on well plastered surfaces have been defined on the southern wall of the smaller room. However, only a very small part of the wall was preserved, and therefore it is impossible to distinguish the designs on it. Several grinding stones were found on the bench lying in the eastern part of the room. Immediately west of the bench is where the two figurines, a bowl, and worked and unworked flint tools were discovered. To sum up, the assemblage from Building 13 as a whole shows that various kinds of daily activities such as food processing and manufacturing of flint tools were carried out here, although the wall paintings may indicate some degree of elaboration of the building.

Description of the Figurines

Figurine A. The upper part of the body and the lower part of the knees are missing from this naked depicted figurine (Fig. 5). Its preserved part is 3.4 cm in height. This figurine can be considered as a female representa-

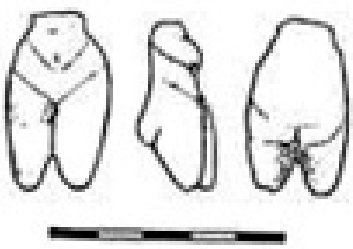


Fig. 5. Several views of Figurine A.

tion because of its big hips and the particular emphasis on the pubic triangle formed by incised lines. The naturalistic style of the representation can be seen in small details such as the dimple of the belly.

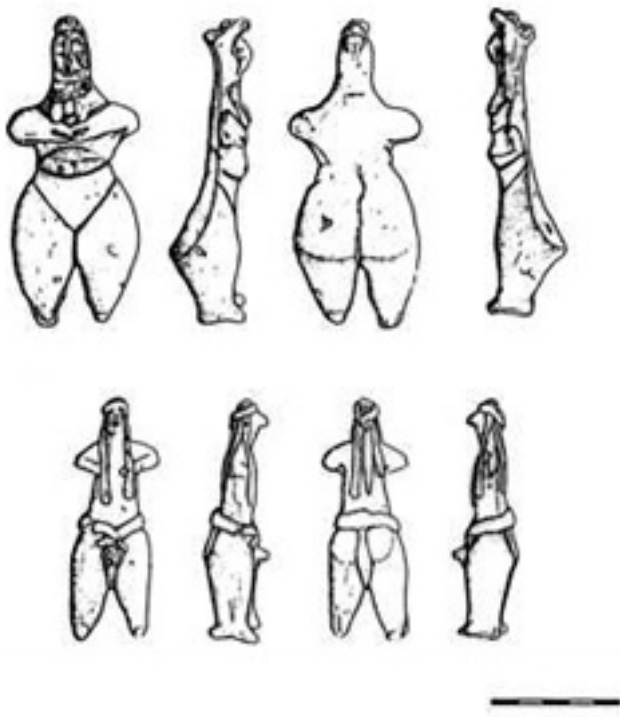


Fig. 6. Several views of Figurines B (above) and C.

Figurine B. This naked figurine depicted in a standing position represents a female as shown by its big hips and breasts (Figs. 6-7). The body details were emphasized by incised lines while her head was plastically made. A portion of her hair was gathered on top of her head and some strands were formed into bangs in the front. The exaggerated long nose and the large mouth give a vivid appearance to the figurine. Her relatively small breasts are placed just below her neck. Her very stylized hands are rested on her chest, below the breasts. Her feet are not clearly depicted as in many other examples from Anatolia.[4]

Figurine C. The clear depiction of its sex organ leaves no doubt that it is a male figurine (Fig. 6-7). Its proportions are more realistic in comparison with the female ones. His hands rest on his chest, just like the hands of the female representation holding her breasts. His hair is depicted as braids hanging down from a diadem-like object on his head. Unlike the female figurines, figurine C is clothed. A loin cloth comprising two parts girds the waist and passes between buttocks and legs forming a codpiece over his genitals. His hips and legs are still broad, although they are not as big as the female ones. It must be emphasized that there is no male figurine of this style from any other Neolithic site in Anatolia.

Fig. 7. Figurines B (left) and C.

Interpretation

The stylistic characteristics of the Late Neolithic figurines from Ulucak are in general similar to those found in contemporary Neolithic sites, particularly Hacilar, in

western Anatolia (Mellaart 1970: Fig. 192, 194, 196, 202, 204). However, they differ from other Anatolian examples by their face and hair depictions as mentioned above. The stylistic features and the close parallels of the Ulucak figurines are beyond the scope of this paper, and these have been discussed elsewhere (Çilingiroğlu et al., n.d.). Here I would rather like to explain the function and/or meaning of the Ulucak figurines by the help of their archaeological context.

It is true that meanings do not imply fixed relations between objects and ideas (Lesure 2002: 588). Therefore, in studies seeking the meaning of the objects, the problem is two-fold. The meaning of the same object may well change from one culture to another, while it is very difficult, if not impossible, to access the thought patterns of an ancient world. If one considers only the object itself, the function of the object may readily omit the social and symbolic meanings of it since the objects themselves cannot fully tell their own stories. However, the best scenario for archaeologists can possibly be determined by carefully looking at the context to which the object belongs.

It seems that during the Neolithic Period in central and western Anatolia, both the religious activities together with daily activities took place in the houses, as the absence of special function buildings has shown. Therefore, at least in terms of space, there seems to be no sharp distinction between the sacred and secular worlds for Neolithic people. In such a world, where the sacred and non-sacred are interwoven, the magical idea probably penetrated into every aspect of life. Accordingly, Neolithic people may also have developed an individual relationship with the sacred just like modern humans who bear amulet-like objects. Here the magical idea does not necessarily imply the sorcery practiced by certain members of the society, such as elders or elites, but rather the ability, power, or will of humans in general to manipulate the ongoing life.

A male figurine found together with a female one in the same context at Ulucak seems to refute the idea that female figurines prove the existence of a matriarchal society. Moreover, in Ulucak all three figurines were recovered in relation to bowls with worked and unworked flint and obsidian tools. Therefore, our examples are related to manufacturing activities in domestic contexts as Hodder has already suggested. It may be proposed that in Ulucak, at least, they may have been used as magical icons that represent the power of the spiritual 'good' protecting both the house and its inhabitants, and assuring the fertility of the productive activities carried out in domestic context as well. They may also have been an inseparable part of the shared meaning, which deeply rooted in culture itself, by whole members of the society.

Notes

1 The ceramic assemblage from Ulucak Level II is similar to those found in Troy Level IIb-d, f-g (Belegen 1963; Podzuweit 1979), Poliochni, Thermi, Kumtepe, Babaköy (Podzuweit 1979) and Aphrodisias (Joukowsky 1986).
2 Among these sites are Hacilar Levels VI-IV (Mellaart 1970), Höyücek, Sanctuaries Phase (Duru 1995: 460-462), Kuruçay Levels 12-11 (Duru 1994), Ilipinar Level VIII (Thissen 2001), and Hoca Çesme Level III (Özdoğan 1999).
3 The larger part of this courtyard is beneath the baulk; therefore, it has not yet been excavated.
4 Hacilar (Mellaart 1970: Figs. 194, 202), Kuruçay Höyük (Duru 1994: Plate 191-6).

Bibliography

Belegen C.
1963 *Troy and the Trojans*. New York, Frederich A. Prager.

Chapman J.
1991 The creation of social arenas n the Neolithic and copper age of SE Europe: the case of Varna. In P. Garwood et al. (eds.), *Sacred and Profane*: 152-171. Oxford, Oxford University Committee for Archaeology Monograph 32.

Çilingiroğlu, A., Z. Derin, E. Abay, H. Sağlamtimur and I. Kayan
n.d. Ulucak Höyük: Excavations Conducted Between 1995-2002. *Ancient Near Eastern Studies Supplement* 15 (in press).

Duru R.
1994 *Kuruçay Höyük I. 1978-1988. Kazilarinin Sonuçlari. Neolitik ve Erken Kalkolitik Çağ Yerleşmeleri* (Results of the Excavations 1978-1988. The Neolithic and Early Chalcolithic Settlements). Ankara, Türk Tarih Kurumu.
1995 Höyücek Kazilari, 1991-1992. *Belleten* 59: 447-490.

French D. H.
1965 Early Pottery Sites from Western Anatolia. *Bulletin of the Institute of Archeology* 5: 15-24.
1967 Prehistoric sites in the Northwest Anatolia I. *Anatolia Studies* 17: 49-96.
1969 Prehistoric Sites in the Northwest Anatolia II. The Balikesir and Akhisar/Manisa Area. *Anatolian Studies* 19: 55 ff.

Gimbutas M.
1974 *Gods and Goddesses of Old Europe*. London: Thames & Hudson.
1989 Women and culture in Goddess-oriented Old Europe. In J. Plaskow & C.P. Christ (eds.), *Weaving the Visions*: 63-71. San Francisco, Harper and Row.
1991 *The Civilization of the Goddess: The World of Old Europe* (J. Marler, ed.). San Francisco, Harper.

Hodder I.R.
1990 *The Domestication of Europe: Structure and Contingency in Neolithic Societies*. Oxford, Basil Blackwell.

Joukowsky M.S.
1986 *Prehistoric Aphrodisias II*. Louvain, Publications d'Histoire de l'Art et d'Archéologie de l'Université Catholique de Louvain-XXXIX.

Lesure R.G.
2002 The Goddess Diffracted: Thinking about the Figurines of Early Villages. *Current Anthropology* 43/4: 587-610.

Mellaart J.
1962 Excavations at Çatal Hüyük 1961. First Preliminary Report. *Anatolian Studies* 12: 41-65.
1970 *Hacilar*. Edinburgh, University of Edinburgh Press.

Meskell L.
1995 Goddesses, Gimbutas and 'New Age' archaeology. *Antiquity* 69/262: 52-62.

Meriç R.
1989: 1987 Izmir-Manisa-Aydin Illeri Yüzey Araştirmasi. *Araştirma Sonuçlari* Toplantisi: 6: 385-392.
1990 1988 Yili Izmir, Manisa Illeri Arkeolojik Yüzey Araştirmasi. *Araştirma Sonuçlari Toplantisi* 7: 361-366.

Özdoğan M.
1999 Northwestern Turkey: Neolithic Cultures in Between the Balkans and Anatolia. In M. Özdoğan and N. Başgelen (eds.), *Neolithic in Turkey, The Cradle of Civilization:* 203-224. Istanbul, Arkeoloji ve Sanat Yayinlari.

Podzuweit C.
1979 *Trojanische Gefäßformen der Frühbronzezeit in Anatolien, der Agais und angrenzenden Gebieten*. Mainz.

Thissen L. C.
2001 The Pottery of Ilipinar, Phase X to VA. In J. Roodenberg and L. C. Thissen (eds.), *The Ilipinar Excavations II*: 3-154. Leiden, Nederlands Instituut voor Het Nabije Oosten.

Contribution

Painting Pots with Bitumen at Late Neolithic Tell Sabi Abyad (Syria)

O.P. Nieuwenhuyse[1], J. Connan[2], A. van As[3], and L.Jacobs[3]

[1] National Museum of Antiquities, Leiden <onieuw@xs4all.nl>
[2] Université Louis Pasteur, Strasbourg <connan.jacques@wanadoo.fr>
[3] Leiden University, a.van.as@arch.leidenuniv.nl <l.f.h.c.jacobs@arch.leidenuniv.nl>

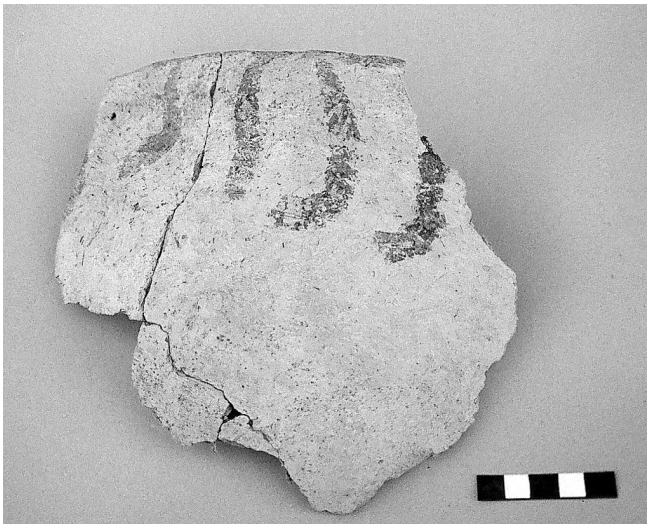
Recent archaeological work has made it abundantly clear that at the close of the seventh millennium cal. BC in northern Syria and northern Iraq, the basis was laid for the proverbial stylistic unity that we, 20th century archaeologists, have termed the Halaf culture. This unity arose during a short-lived 'Transitional' period between the Pre-Halaf and the Early Halaf (Akkermans 1993; Akkermans 1996; Akkermans and Schwartz 2003; Campbell 1992, 1998). At this time local Late Neolithic communities increasingly sought access to "international" networks of exchange and cultural affiliation, as can be seen in the rise of broad archaeological styles such as the Hassuna and the Samarra. The ceramic assemblage changed fundamentally, from one consisting largely of plain, mostly utilitarian wares towards a complex constellation consisting mostly of various abundantly decorated Fine Wares (Cruells 2001; LeMière and Nieuwenhuyse 1996; LeMière and Picon 1999; Nieuwenhuyse et al. 2001, 2002; Van As et al. 1997). What is not always so clear, however, is that alongside the ubiquitous Hassuna, Samarra and Halaf styles, a suite of other contemporaneous decorative styles existed as well. Here we would like to draw attention to a distinct decorative style from Tell Sabi Abyad, a Late Neolithic settlement in the northern Syrian steppes excavated by Peter Akkermans on behalf of the National Museum of Antiquities, Leiden: coarse, plant-tempered vessels decorated with bitumen.

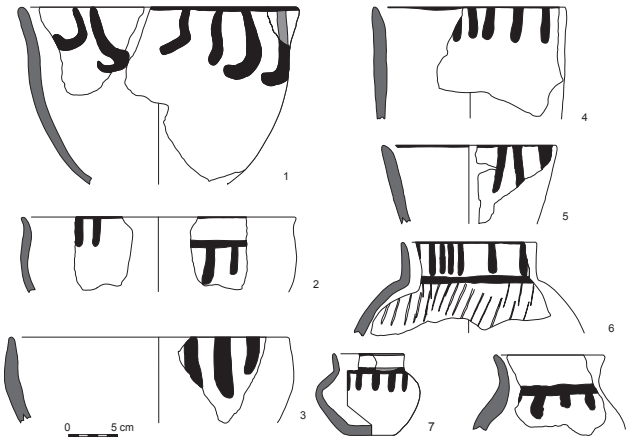
From 1991 onwards, the excavations at Tell Sabi Abyad, situated on the Balikh River in northern Syria, have increasingly exposed an occupation level (level 6) that met its end at around 6,000 cal. BC in a great conflagration (Akkermans et al. n.d.; Verhoeven 1999, 2000; for a popular update in English, see the URL www.sabi-abyad.nl). Excavations in the so-called Burnt Village yielded pottery vessels decorated with a distinctive matte, fugitive black pigment. Marie LeMière doubted that it was ochre (LeMière and Nieuwenhuyse 1996: 156). The organic nature of this pigment has recently been confirmed in the Department of Pottery Technology of Leiden University, when the pigment simply disappeared during refiring at 750o C. In a joint effort of the National Museum of Antiquities, Leiden University and the *Laboratoire de Géochimie Bioorganique* (CNRS, France), the identification of the black pigment as bitumen was confirmed (Connan et al. n.d.). In addition, this study gave interesting data concerning the origin of the bitumen and the exchange networks in which it must have circulated.

Of course, the use of bitumen in the Near East was (and still is) extremely varied. Prehistorically and historically attested uses include hafting composite flint-tools, waterproofing containers and boats, repairing broken pottery and using it as a basis for sculpting (Boëda et al. 1996; Boëda et al. 1998; Connan and Deschesne 1996, 2001; Connan and Nishiaki n.d.; Moorey 1994).

Bitumen-painted vessels are known from later, historical periods (Kelly-Buccelati and Shelby 1977; Sürenhagen 1975). The vessels from Late Neolithic Tell Sabi Abyad, however, represent the *earliest* examples currently known in the Near East of bitumen used as a pigment for pottery decoration. As far as we know at present, the style was short-lived and did not appear again at any other time during the Late Neolithic.

As a decorative style, the pottery is certainly distinctive (cf. Fig. 1a-b). The bitumen-painted vessels are part of the so-called Standard Ware, made of a clay body den-





sely tempered with organic material (LeMière and Nieuwenhuyse 1996). A large variety of decorative styles is included in this group, which differs in decorative technique, design structure and in motif content. In this case the design structures are very simple and they display a very limited repertoire of design motifs. Vertically pending lines or curved 'fish hook'-like designs are the ones most commonly found. The bitumen-painted style includes small and medium-sized jars, large bowls and goblets, vessels suited for the serving of food and drink or for short-term storage. The bituminous decoration was probably applied in the manner observed by Matson during the 1950s in contemporary villages in Diyana, northeastern Iraq (Matson 1983: 623). The modern Diyana potters applied the designs immediately after the vessels came from the oven, scratching them with crayon-shaped lumps of bitumen while the vessel surface was still hot.[1]

So far no bitumen sources are known in the immediate environment of Tell Sabi Abyad. Where could the bitumen have come from? We submitted a small sample of sherds (n = 6) to chemical analyses (for full details, see Connan et al. n.d.). The small size of the sample arises from the unfortunate circumstance that the organic pigment erodes easily, so that very limited amounts of bitumen can be retrieved from the sherds at best. After processing, the highly specific mixture of biochemical 'markers' of the sample material was compared with a large data bank of archaeological and contemporary bitumen sources in the Near East (Connan et al. n.d.). This points to at least two geographically different source areas for the bituminous pigment at Tell Sabi Abyad. A match with oil seeps near the modern town of Zakho in northern Iraq indicates one possible source area. A second group displays affinities with sources located near Kirkuk, also in northern Iraq. The Sabi Abyad bitumen apparently did not originate from the famous sources at Hit (Iraq) (Connan et al. n.d.)[2]. As these sources are about 500 km away from the Balikh basin, our finds throw an interesting light on the exchange networks operating at this time. They also provide further evidence both for the increasingly 'international' character of Late Neolithic societies, and testify to the strong east-west orientation of the cultural affiliations also seen in the Fine Wares. Admittedly, we have little information on Pre-Halaf bitumen exchange to serve as a comparison.

The social context in which this style appeared and existed for a short while is significant. At Sabi Abyad the bitumen-painted Standard Ware is largely restricted to the earliest stages of the Transitional period between the Pre-Halaf and the Early Halaf periods. In levels 7 and 6 it included about 3 % of the Standard Ware pottery, and it disappeared entirely afterwards. This was a time of unrivalled ceramic experimentation and innovation. At Tell Sabi Abyad, alongside the introduction and subsequent rapid rise of Fine Ware pottery made in the Hassuna-Samarra styles, the older ceramic traditions continued to flourish for a short while. At the end of the Transitional period, all of these non-Fine Ware traditions disappeared, and henceforward the ceramic assemblage was composed almost entirely of painted Fine Wares. The introduction of bitumen-painted ceramics and the disappearance of this type of pottery soon after are part of the complex series of transformations that characterize the ceramic assemblage at around 6,000 BC. The strong stylistic contrasts with the new, 'international' Fine Ware styles that arose at this time, and the deliberate application of the bitumen-painted decorative style to

older, 'traditional' pottery exclusively (the plant-tempered Standard Ware) may suggest that the bitumen-painted pottery fulfilled a somewhat different role. Perhaps it was used for a limited set of specialized activities. Alternatively, the bitumen-painters may somehow have 'resisted' the social messages communicated by the new Fine Wares.

Currently, the only Late Neolithic site other than Tell Sabi Abyad where similar bitumen-painted pottery is attested is Tell Dja'de, located on the Syrian Euphrates in the Tishrin Dam area (Faura and Lemière 1999: 289),[3] but it is likely that the geographical distribution was wider than indicated by just these two sites. Until very recently, virtually no Transitional-period sites have been excavated in Syria. Moreover, because the organic pigment degrades quickly by mechanical erosion, the chances of finding it in regional surveys are probably nil. Now that this crucial period is receiving more and more archaeological attention, it may become possible to investigate the regional spread of this style. Is this the expression of merely a highly localized, northern-Syrian regional identity? Or will this style eventually prove to be one of the many far-ranging decorative styles that roamed the Syrian and northern Iraqi steppes just before the onset of the Early Halaf?

Notes

1 Lumps of bitumen have been found in the Late Neolithic occupation levels of Tell Sabi Abyad. These are currently being investigated.

2 Investigations are currently under way to study more closely the ceramic technology of the pottery, as well as to include additional samples of bitumen-painted sherds from Late Neolithic Tell Sabi Abyad.

3 Bitumen samples from Dja'de are currently being investigated. Interestingly, they may resemble the bitumen from Tell Sabi Abyad and other sites in northern Syria. This suggests that the community at Dja'de participated in similar networks of regional exchange as did their neighbours from Tell Sabi Abyad (courtesy of Dr. E. Coqueugniot).

Bibliography

Akkermans P.M.M.G.
1993 *Villages in the Steppe: Later Neolithic Settlement and Subsistence in the Balikh Valley, Northern Syria*. Ann Arbor, International Monographs in Prehistory.

Akkermans P.M.M.G. (ed.)
1996 *Tell Sabi Abyad: The Late Neolithic Settlement. Report on the Excavations of the University of Amsterdam (1988) and the National Museum of Antiquities (1991-1993) in Syria*. Istanbul, Nederlands Historisch Archeologisch Instituut.

Akkermans P.M.M.G., Nieuwenhuyse O.P., Jackson A. and de Cesari C.
n.d. Tell Sabi Abyad: The Late Neolithic architecture 1996 - 1999. *Anatolica*.

Akkermans P.M.M.G. and Schwartz G.
2003 T*he Archaeology of Syria: From Complex Hunter-Gatherers to Early Urban Societies (ca. 16,000-300 BC)*. Cambridge, Cambridge University Press.

van As A., Jacobs L. and Nieuwenhuyse O.P.
1997 The Transitional Fine Ware of Tell Sabi Abyad, Syria: A Pilot Study. *Newsletter Department of Pottery Technology* 14/15: 25-47. Leiden, Leiden University.

Boëda E., Connan J., Dessort D., Muhesen S., Mercier N., Valadas H. and Tisnerat N.
1996 Bitumen as a hafting material on Middle Palaeolithic artefacts. *Nature* 380: 336-338.

Boëda E., Connan J. and Muhesen S.
1998 Bitumen as hafting material on Middle Palaeolithic artifacts from the El Kown Basin, Syria. In T. Akazawa, K. Aoki, and O. Bar-Yosef (eds.), *Neandertals and Modern Humans in Western Asia*: 181-204. New York, Plenum.

Campbell S.
1992 *Culture, Chronology and Change in the Later Neolithic of North Mesopotamia*. Unpublished doctoral thesis. Edinburgh, University of Edinburgh.
1998 Problems of definition: The origins of the Halaf in North Iraq. *Subartu* 4/1: 39-52.

Connan J. and Deschesne O.
1996 *Le bitume à Suse. Collection du Musée du Louvre*. Paris, Réunion des Musées Nationaux and Elf Aquitaine Production.
2001 Matériau artificiel ou roche naturelle? Les surprises du mastic de bitume, *La Recherche* 347: 46-47.

Connan J. and Nishiaki Y.
2003 The bituminous mixtures of Tell Kosak Shamali on the Euphrates (Syria) from the Early Ubaid to the Post Ubaid: Composition of mixtures and origin of bitumen. In Y. Nishiaki and T. Matsutani (eds.), *Tell Kosak Shamali: The Archaeological Investigations on the Euphrates, Syria. Chalcolithic Technology and Subsistence*: Chapter 18. Tokyo, The University Museum.

Connan J., Nieuwenhuyse O.P., van As A. and Jacobs L.
n.d. Bitumen in early ceramic art: bitumen-painted ceramics from Late Neolithic Tell Sabi Abyad (Syria). *Archaeometry* 46.

Cruells, W.
2001 Nuevas aportaciones sobre la cultura Halaf en Siria. *Monografies Eridu* 1.

Faura, J.M. and LeMière, M.
1999 La céramique Néolithique du Haut Euphrate Syrien. In G. del Olmo-Lete and J.L. Fenollos, (eds.), *Archaeology of the Upper Syrian Euphrates: The Tishrin Dam Area*. Barcelona, Editorial AUSA: 281-298.

Kelly-Buccelati, M. and Shelby, W.R.
1977 Terqa Preliminary Report No. 4. *Syro-Mesopotamian Studies* 1/6: 171-234.

LeMière, M. and Nieuwenhuyse, O.P.
1996 The Prehistoric Pottery. In P.M.M.G. Akkermans (ed.), *Tell Sabi Abyad: The Late Neolithic Settlement*: 119-284. Istanbul, Nederlands Historisch Archeologisch Instituut.

LeMière, M. and Picon, M.
1999 Les débuts de la céramique au Proche Orient. *Paléorient* 24/2: 5-26.

Matson, F.R.
1983 The Banahilk potter. In L.S. Braidwood, R.J. Braidwood, B. Howe, C. Reed, and P.J. Watson, (eds.), *Prehistoric Archaeology Along the Zagros Flanks*: 615-628. Chicago, University of Chicago Press.

Moorey P.R.S.
1994 *Ancient Mesopotamian Materials and Industries*. Oxford, Clarendon.

Nieuwenhuyse O.P., Jacobs L., Van As A., Broekmans T. and Adriaens M.A.
2001 Making Samarra Fine Ware. *Paléorient* 27/1: 147-165.

Nieuwenhuyse, O.P., Jacobs, L. and Van As, A.
2002 The ceramics. In A. Suleiman and O.P. Nieuwenhuyse (eds.), *Tell Boueid II: A Late Neolithic Village on the Middle Khabur (Syria)*: 35-124. Subartu XI. Brussels, Brepols.

Sürenhagen D.
1974 Untersuchungen zur Keramikproduktion innerhalb der Spät-Urukzeitlichen Siedlung Habuba Kabira-Süd in Nordsyrien. *Acta Praehistorica et Archaeologica* 5/6: 43 ff.

Verhoeven M.
1999 *An Archaeological Ethnography of a Neolithic Community: Space, Place and Social Relations in the Burnt Village at Tell Sabi Abyad*. Istanbul, Nederlands Historisch-Archeologisch Instituut.
2000 Death, Fire and Abandonment: Ritual Practice at later Neolithic Tell Sabi Abyad, Syria. *Archaeological Dialogues* 7/1: 46-83.

Contribution

Stable Carbon and Oxygen Isotope Composition of Pedogenic Carbonate at Göbekli Tepe (Southeastern Turkey) and Its Potential for Reconstructing Late Quaternary Paleoenvironments in Upper Mesopotamia.

Konstantin Pustovoytov[1] and Heinrich Taubald[2]

[1] University of Hohenheim <pustovoytov@t-online.de>
[2] University of Tübingen <taubald@uni-tuebingen.de>

Introduction

Göbekli Tepe (southeastern Turkey) is a site that may play a key role in understanding the Neolithization processes in Southwest Asia (Schmidt 2001; 2002). At present, little is known about paleoenvironments at the site and/or in its vicinity. Although a significant number of late Quaternary paleoclimatic data for the Eastern Mediterranean has become available since the early 90s (van Zeist and Bottema 1991; Roberts et al. 1993; Rossignol-Strick 1993, 1999; Bottema 1995; Bar-Matthews et al. 1997; Baruch and Goring-Morris 1997; Frumkin et al. 1999; Fontugne et al. 1999; Goodfriend 1999; Reed et al. 1999; Hillman et al. 2001), Göbekli Tepe still remains at least several hundreds of kilometres away from the areas involved into these studies. Of vital importance are therefore investigations of local archives of the landscape history at the site. One such archive is represented by pedogenic (secondary) carbonate laminations that formed at Göbekli Tepe on the pillars and wall stones as a result of pedogenesis (Pustovoytov 2002) and thus can provide an *in situ* record of the landscape history. $\delta^{13}C$ and $\delta^{18}O$ of pedogenic carbonate, with some limitations, can serve as valuable proxies in reconstructing Quaternary environments (Cerling 1984; Cerling et al. 1989; 1993; Amundson et al. 1989; 1996; Quade et al. 1989; Courty et al. 1994a; Pendall et al. 1994; Liu et al. 1996; Wang and Follmer 1998; Wang et al. 1996; 1997; 2000; Connin et al. 1997; Monger et al. 1998; Buck and Monger 1999; Deutz et al. 2001; Srivastava 2001; Budd et al. 2002). Here we report on the stable carbon and oxygen isotope composition of pedogenic carbonate from Göbekli Tepe, its paleoenvironmental interpretation, and significance for Neolithic studies in Upper Mesopotamia.

Materials and Methods

For stable isotope analysis a succession of secondary carbonate lamina on the underside of a PPNA wall stone near the Pillar 8 in enclosure B in area L9-66 (Schmidt 2002) was sampled (Fig. 1). Since the oldest microlayer of this carbonate coating had already been analysed by the radiocarbon method (Pustovoytov 2002), an already available cross section of the coating was used for stable isotope measurements (cf. Pustovoytov 2002 for

Fig. 1. A fragment of the wall near the Pillar 8 (right) in the enclosure B. The arrow indicates the position of the pedogenic carbonate coating sampled for $\delta^{13}C$ and $\delta^{18}O$ measurements. Scale length 1 m.

further details of the preparation procedure). A total of 32 microlayers, each about 0.2-0.25 mm in thickness, was sampled throughout the coating. CO_2 for measurements of stable isotope ratios was obtained through the reaction in 100% H_3PO_4, $\delta^{13}C$ and $\delta^{18}O$ were measured on a Finnigan MAT 252 gas source spectrometer and are reported in per mil with respect to the PDB standard (Craig 1957). Although seven of the samples analysed released quantities of CO_2 too small to be measured, all in all, 25 values both for $\delta^{13}C$ and $\delta^{18}O$ were obtained with several gaps in the sample sequence (Fig. 2).

Results and Discussion

Stratification of the pedogenic carbonate coating by $\delta^{13}C$ and $\delta^{18}O$ values

The $\delta^{13}C$ values vary from -11.03 to -8.92‰ and the $\delta^{18}O$ values from -10.98 to -7.49‰ (Fig. 2). The most general trend throughout the sequence from old to young lamina is a slight increase in both $\delta^{13}C$ and $\delta^{18}O$ values. Closer examination of Fig.1 shows that the whole sequence can be subdivided into four zones. Zone 1 (the nearest to the stone underside and consequently the oldest one) is characterised by carbonate that is relatively enriched in ^{13}C and depleted in ^{18}O and incorporates pronounced peaks of $\delta^{13}C$ (a positive) and $\delta^{18}O$ (a negative). For most of Zone 2 a comparative stability of $\delta^{13}C$ and a slight, constant increase in $\delta^{18}O$ are seen. $\delta^{13}C$ experienced an abrupt increase and reached its highest value at the final stage of this interval. In Zone 3 both the $\delta^{13}C$ and $\delta^{18}O$ values have their maxima. The youngest Zone 4 is distinctive in that $\delta^{13}C$ and $\delta^{18}O$ decrease, with a marked negative excursion of the $\delta^{18}O$ values. At the moment, an absolute chronology of this sequence does not exist. Two radiocarbon dates of the oldest microlamina of carbonate coatings from Göbekli Tepe (Pustovoytov 2002) suggest that the ^{14}C method might be an appropriate tool for absolute age determination of the secondary carbonate laminations at the site. We assume a uniform growth rate of this pedogenic carbonate coating from about 8,000 BC onwards (i.e., the middle

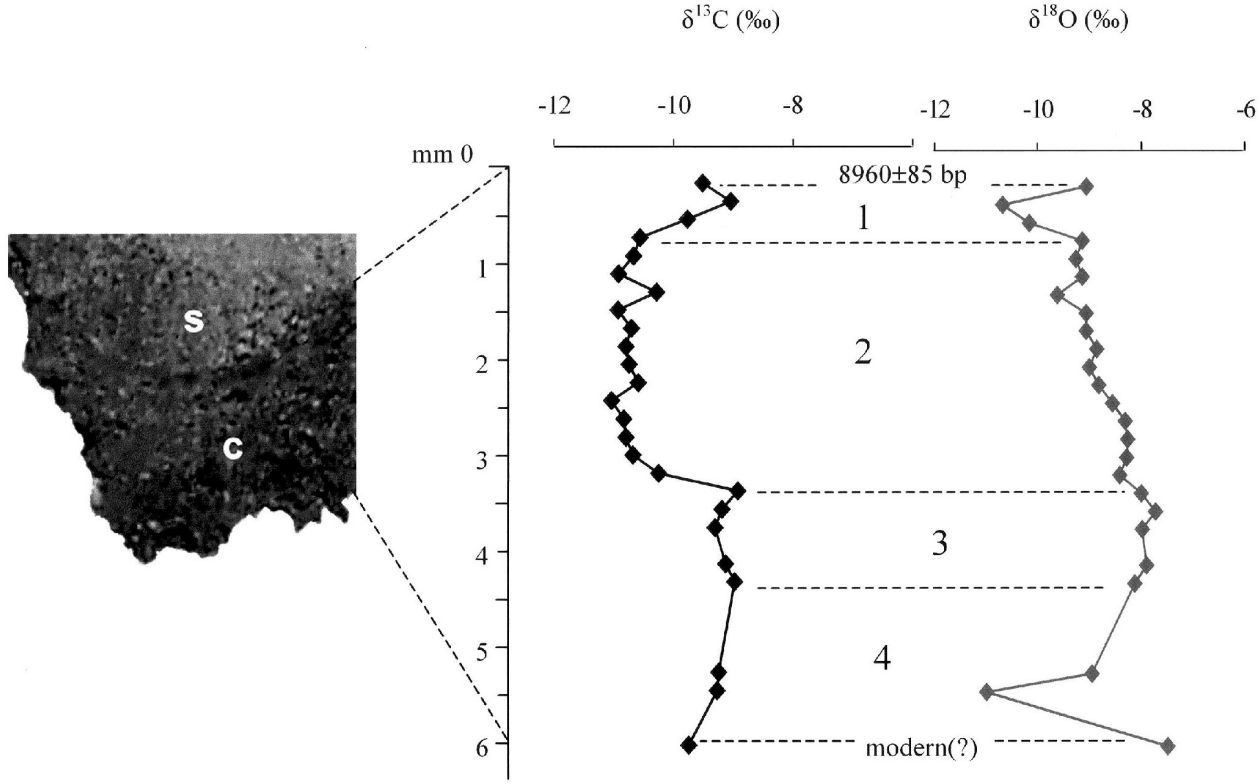


Fig. 2. A cross-section of the pedogenic carbonate coating analysed (left) (c - pedogenic carbonate coating, s - stone) and the associated sequence of $\delta^{13}C$ and $\delta^{18}O$ values of pedogenic carbonate microlamina (right). The measured ^{14}C age of the oldest microlayer (Pustovoytov 2002) is given uncalibrated. The coating strata are numbered 1 to 4.

of the calibrated 2σ-interval of the ^{14}C age of the oldest sampled microlayer of the coating reported (Ua-19562 in Pustovoytov 2002) until further ^{14}C dates are available. It should be stressed that a comprehensive analysis of the $\delta^{13}C$ and $\delta^{18}O$ sequence pedogenic carbonate at Göbekli Tepe is beyond the scope of our report. We focus here on some substantial features of this record which may be relevant to Neolithic research in the region.

$\delta^{13}C$ values

The composition of stable carbon isotopes in pedogenic carbonate is governed by $\delta^{13}C$ of soil CO_2, which is a function of the photosynthetic type of local vegetation, soil respiration rate, the $\delta^{13}C$ value of atmospheric CO_2 and some other factors (Cerling 1984; 1991; Cerling et al. 1989). In a number of paleoenvironmental and pedological studies, $\delta^{13}C$ of pedogenic carbonate has been mostly considered as an indicator of the C3/C4 composition of local vegetation (Quade and Cerling 1995; Quade et al. 1989; 1994; 1995; Cerling et al.1993; Wang and Follmer 1998; Wang and Anderson 1998; Wang et al. 1993; 1996; 1997; 2000; Monger et al. 1998; Buck and Monger 1999; Khatemi and Mermut 1999; Ding and Wang 2000; Leone et al. 2000; Deutz et al. 2001; Srivastava 2001). It also can be used as a record of the CO_2 concentrations in past earth atmospheres if a C4 signal is known or can be ruled out (Cerling 1991; 1992). When studying $\delta^{13}C$ of pedogenic carbonate as a paleoecological record, care should be taken to avoid admixtures of lithogenic carbonate (Amundson et al. 1989; Monger et al. 1998) or diagenetically altered samples (Pendall et al. 1994; Budd et al. 2002).

In the case of Göbekli Tepe, we assume that the shifts in the carbon isotope composition of secondary carbonate on stones were determined essentially by changes in $\delta^{13}C$ of soil-respired CO_2 and soil respiration rates and are not affected by dissolution-reprecipitation. There are three main reasons for this assumption:

1) Two radiocarbon dates (Pustovoytov 2002) suggest that pedogenic carbonate at Göbekli Tepe formed in isotopic equilibrium with soil-respired CO_2 and is free of identifiable admixtures of detrital carbonate (Cerling 1984; 1991; Cerling et al. 1989). The $\delta^{13}C$ values of secondary carbonate and organic matter (see below) support this suggestion. (The difference $\delta^{13}C(CaCO_3)$ - $\delta^{13}C$(humus) is on the order of 15 per mil [Cerling 1984; 1991; Cerling et al. 1989]).
2) It is safe to assume that a number of factors involved in the control of $\delta^{13}C$ of pedogenic carbonate (Cerling 1984; 1991) remained practically unchanged during the whole time of the accumulation of secondary carbonate: soil porosity, depth of pedogenic accumulation below the soil surface and the atmospheric CO_2 concentration (pre-industrial) and its $\delta^{13}C$ (Barnola et al. 1987; Marino et al. 1991).
3) The ^{14}C ages mentioned above also suggest that no ^{14}C contamination took place since the formation of the oldest coating microlayer, but they provide no direct evidence of preservation of younger microlamina. However, submicroscopic (SEM) investigations of the several carbonate coatings from Göbekli Tepe (Pustovoytov, unpubl.) revealed well-shaped microsparitic calcite crystals without any evidence of dissolution-reprecipitation processes (Berrier et al. 1987; Courty et al. 1994).

We propose several ways to explain positive shifts in the ^{13}C sequence from pedogenic carbonate at Göbekli Tepe:

1) *Increase in the proportion of C4 plants*. $\delta^{13}C$ of soil-respired CO_2 reflects the proportions of plants with different photosynthetic pathways (C3, C4 or CAM, the latter being of minor concern in this study) in the local vegetation (Nordt et al. 1996 and references therein). In the present-day world C4-dominated biomes are spread in arid to semiarid and in tropical to subtropical regions (Sage 2001 and references therein). Several factors are known to promote the success of C4 over C3 plants: high light, low atmospheric CO_2, daytime temperatures above 25° to 30°C, drought, salinity and low nitrogen availability (Sage 2001 and references therein). The proportion of C4 plants in Holocene vegetation at Göbekli Tepe was, if at all, presumably very low, as exemplified by two facts. First, C4 vegetation types seem to have been very limited in the eastern Mediterranean within the last 10 ka and can be found today in some desert areas such as that of Levant (Goodfriend 1999 and references therein). Second, stable isotope composition of organic carbon in 11 samples taken at different depth from the soils and fill at Göbekli Tepe (areas L9-56, L9-66, L9-76) revealed typical C3 values from -24 to - 26 per mil (Pustovoytov, unpubl. data). Since $\delta^{13}C$ of soil organic carbon at depth reflects isotopic signals of previous local vegetation types (Goh et al. 1976; Dzurec et al. 1985; Nordt et al. 1994; Desjardins et al. 1994; Boutton 1996; Mora and Pratt 2001), the $\delta^{13}C$ values of organic carbon from the site imply that the proportion of C4 plants at the site could not exceed 15%. However, an admixture of C4 plants, even if minor, might have caused some ^{13}C enrichment of pedogenic carbonate. In this case high temperatures or increased aridity should be taken into consideration as possible reasons for positive carbon isotopic shifts. If no C4 contribution is hypothesised, further following possibilities have to be considered.
2) *Specific photosynthetic responses of C3 vegetation*. An increase in $\delta^{13}C$ values of tissues of C3 plants can be due to environmental conditions such as water stress (Farquhar et al. 1989; Condon et al.

1992; Williams and Ehleringer 1996; Araus et al. 1997; Warren et al. 2001; Ferrio et al. 2003), low temperatures (Körner et al. 1991), and the reduction of canopy effects such as deforestation, for example (Schleser and Jayasekera 1985; Tieszen 1991). Theoretically, all these factors may cause more positive $\delta^{13}C$ values of soil-respired CO_2 and consequently pedogenic carbonate at the site.

3) *Decrease in soil respiration rates*. Lower soil respiration rates result in higher $\delta^{13}C$ values soil CO_2 and pedogenic carbonate (Cerling 1984; 1991). It has been demonstrated (Wang and Hiseh 2002) that: (a) soil respiration rates increase with temperature only when soil moisture is adequate and (b) soil respiration rates are higher at a greater soil moisture, but only until an optimal moisture is reached; further moisture increase reduces respiration of a soil. Taking into account the landscape position of the site, it is unlikely that lower soil respiration rates at Göbekli Tepe were caused by high soil moisture. Relatively high temperatures combined with water stress or low temperatures (with or without water stress) seem to be more reasonable explanations of positive $\delta^{13}C$ shifts of soil carbon CO_2 and pedogenic carbonate.
4) *Decline in plant density*. It is assumed that soil air can be enriched in CO_2 of atmospheric origin and thus increase $\delta^{13}C$ values of pedogenic carbonate if the density of vegetation over a soil is low (Monger et al. 1998 and references therein). It seems to be likely that a less dense vegetative cover could have been a result of desertification, i.e., of more arid climatic conditions.

In the carbon isotope record of pedogenic carbonate from Göbekli Tepe, the $\delta^{13}C$ values of Zone 1 are relatively high when compared to Zone 2. As noted above, the higher $\delta^{13}C$ values in Zone 1 can be explained by one or more of the following: drier climatic conditions, lower temperatures, more open and/or sparser vegetation than during the formation of Zone 2. A suggestion of higher temperatures during the formation of Zone 1 could arise from an assumption of lower soil respiration rates combined with drought or a higher proportion of C4 plants. However, this would be in conflict with the $\delta^{18}O$ evidence, which implies lower temperatures during the accumulation of carbonate of Zone 1 (see below). By contrast, Zone 2 is likely to reflect a long-term amelioration of climatic conditions that apparently covered most of the first half of the Holocene. By about the mid-Holocene this phase was interrupted by a dramatic environmental deterioration (probably by the advent of a more arid climate) as indicated by a distinct positive excursion of the $\delta^{13}C$ values at the late stage of Zone 2. Since then (Zones 3 and 4) $\delta^{13}C$ of pedogenic carbonate shows no principal environmental changes. A slight $\delta^{13}C$ decrease at the recent stage of carbonate accumulation could have been caused, among other reasons, by a decrease in the $\delta^{13}C$ values of atmospheric CO_2 during the industrial era (Friedli et al. 1986).

$\delta^{18}O$ values

$\delta^{18}O$ of pedogenic carbonate is determined primarily by the oxygen isotope composition of local meteoric water and evaporative effects (Cerling 1984; Amundson et al. 1996; Quade et al. 1989; Pendall et al. 1994; Liu et al. 1995). Although this proxy might, on occasion, reflect the influence of different factors such as changes in atmospheric circulation patterns (Amundson et al. 1996), carbonate dissolution-reprecipitation (Cerling 1991; Pendall et al. 1994; Budd et al. 2002) or some specific characteristics of the site (distance from moisture source, precipitation seasonality, elevation, etc.) (Liu et al. 1995; Monger et al. 1998), $\delta^{18}O$ of pedogenic carbonate is mostly assumed to provide a local paleotemperature record (Cerling 1984; Cerling et al. 1989; 1993; Amundson et al.1989; Quade et al. 1989; 1994; Wang et al. 1996; 1997; Connin et al. 1997; Jiamao et al. 1997; Monger et al.1998; Buck and Monger 1999; Leone et al. 2000; Deutz et al. 2001).

The $\delta^{18}O$ values of the secondary carbonate coating at Göbekli Tepe show two distinct negative peaks: in the Early Holocene (Zone 1) and in the Late Holocene (Zone 4), whereas its two pronounced maxima fall into the mid-Holocene (Zone 3) and the recent/sub-recent period (Zone 4). Because the influence of evaporative effects is primarily restricted to surface horizons ($\leq$ 50 cm below the soil surface) of desert soils (Quade et al. 1989; Amundson et al. 1996), their control of $\delta^{18}O$ of pedogenic carbonate is likely to be very limited at the site. Assuming that $\delta^{18}O$ of pedogenic carbonate is determined mostly by $\delta^{18}O$ of local meteoric water, which in turn is temperature-dependent (Siegenthaler and Matter 1983), one can come to recognize cooler climatic conditions at the site in the Early Holocene as compared to the mid-Holocene or today. Based on the model relationships between $\delta^{18}O$ of pedogenic carbonate, $\delta^{18}O$ of precipitation and air temperature (Siegenthaler and Matter 1983; Jiamao et al. 1997; Leone et al. 2000), the early Holocene air temperatures at Göbekli Tepe could have been on the order of 5° lower than the mid-Holocene ones. A progressive increase in $\delta^{18}O$ from Zone 1 to Zone 3 is likely to indicate a continuous rise of temperature during the first half of the Holocene. A marked negative $\delta^{18}O$ excursion in Zone 4 (presumably the Late Holocene) is of great interest as a possible analogue to that of Zone 1 and should be taken into consideration in future research.

Combined carbon and oxygen isotopic record from pedogenic carbonate and its implications for Neolithic research

A combination of the $\delta^{13}C$ and $\delta^{18}O$ records from pedogenic carbonate has some implications for Neolithic research in Upper Mesopotamia. As mentioned above, the relatively high $\delta^{13}C$ values and the relatively low $\delta^{18}O$ ones of Zone 1 suggest comparatively cool and dry climatic conditions which gave way to an amelioration indicated by the isotopic values in Zone 2 (a warmer and more humid climate). It is very likely that the carbonate of Zone 1 formed during a late phase of the Younger Dryas or under a climate that was still strongly influenced by the Younger Dryas, whereas Zone 2 accumulated during the Holocene optimum. Both climatic phases have been evidenced by a variety of paleoclimatic records in the eastern Mediterranean (van Zeist and Bottema 1991; Roberts et al. 1993; Rossignol-Strick 1993; 1999; Bottema 1995; Bar-Matthews et al. 1997; Baruch and Goring-Morris 1997; Frumkin et al. 1999; Fontugne et al. 1999; Goodfriend 1999; Reed et al. 1999; Hillman et al. 2001). The dramatic positive $\delta^{13}C$ shift at about the mid-Holocene corresponding to the $\delta^{18}O$ maximum is attributable to a desiccation of climate and thus marks the end of the climatic optimum. Arid conditions in the eastern Mediterranean in the mid-Holocene have been reported by several authors (Fontugne et al. 1999; Frumkin et al. 1999; Goodfriend 1999).

Although correlation between different paleoclimatic proxies exists, precise patterns of geographical distribution of the Younger Dryas climatic conditions in the eastern Mediterranean are not conclusively established (Bottema 1995). For this reason, of prime importance appears to be the fact that the early laminations of pedogenic carbonate at Göbekli Tepe recorded *in situ* isotopic signals distinctly different (relatively cool and dry environments) from those of most of the first half of the Holocene. Considering that secondary carbonate started to accumulate once the PPNA stone enclosures were covered by fill, it is evident that the builder of the enclosures should have experienced the harsh climatic conditions of the Younger Dryas. The latter are considered as a possible trigger of the earliest plant domestication (Bar-Yosef 1996; Rossignol-Strick 1999; Hillman et al. 2001).

Another interesting feature of the isotope values of the early carbonate microlamina is represented by the pronounced positive $\delta^{13}C$ peak and negative $\delta^{18}O$ peak in Zone 1 and a weaker oscillation at the beginning of Zone 2. They probably reflect a generally unstable climate at the site in the Early Holocene. This climatic instability might have had a significant impact on human activities at Göbekli Tepe during the PPNB, and this may give a clearer insight into the reasons for the site abandonment.

The isotopic evidence from secondary carbonate presented in this report should be supported by further investigations on the stable isotope composition of pedogenic carbonate at Göbekli Tepe and a detailed radiometric chronology of the pedogenic carbonate accumulation on stones.

Acknowledgements: We thank Klaus Schmidt for fruitful discussions and help in the field. This study was supported by the German Research Council (DFG) and by the German Archaeological Institute (DAI).

Bibliography

Amundson R., Chadwick O., Sowers J. and Doner H.
1989 The stable isotope chemistry of pedogenic carbonates at Kyle Canyon, Nevada. *Soil Science Society of America Journal 53. 201-210*.

Amundson R., Chadwick O., Kendall C., Wang Y. and De Niro M.
1996 Isotopic evidence for shifts in atmospheric circulation patterns during the late Quaternary in mid-North America. *Geology* 24. 23-26.

Araus J.L., Febrero A., Buxo R., Rodriguez-Ariza M.O., Molina F., Camalich M.D., Martin D. and Voltas J.
1997 Identification of ancient irrigation practices based on the carbon isotope discrimination of plant seeds: A case study from the south-east Iberian Peninsula. *Journal of Archaeological Science* 24: 729-740.

Bar-Matthews M., Ayalon A. and Kaufman A.
1997 Late Quaternary paleoclimate in the eastern Mediterranean region from stable isotope analysis of speleothems at Sorq Cave, Israel. *Quaternary Research* 47. 155-168.

Bar-Yosef O.
1996 The impact of Late Pleistocene-Early Holocene climatic changes on humans in Southwest Asia. In L.G. Straus, B.V. Eriksen, J.M. Elandson and D.R. Yesner (eds.), *Humans at the End of the Ice Age: The Archaeology of the Pleistocene-Holocene Transition*: 61-78. New York, Plenum Press.

Baruch U.
1994 The Late Quaternary pollen record of the Near East. In O. Bar-Yosef and R.S. Kra (eds.), *Late Quaternary Chronology and Paleoclimates of the Eastern Mediterranean*: 103-119. Tucson Radiocarbon.

Baruch U. and Goring-Morris N.
1997 The arboreal vegetation of the Central Negev Highlands, Israel, at the end of the Pleistocene: Evidence from archaeological wood remains. *Vegetation History and Archaeobotany* 6: 249-259.

Barnola J.M., Raynaud D., Korotkevich Y.S. und Lorius C.
1989 Vostok ice core: a 160.000 year record of atmospheric CO_2. *Nature* 329: 408-414.

Berrier J., Delmas A.B. and Bresson L.M.
1987 Fuctionnement saisonnier et instantane d'un systeme d'alteration calcaire, approche micromorphologique. In N. Fedoroff, L.M. Bresson, and M.-A. Courty (eds.), Soil Micromorphology: 309-314. Proceedings of the VIIth International Working Meeting on *Soil Micromorphology*. Paris, Association Française pour l'Etude du Sol.

Bottema S.
1995 The Younger Dryas in the Eastern Mediterranean. *Quaternary Science Reviews* 14: 883-891.

Boutton T.W.
1996 Stable isotope ratios of soil organic matter and their use as indicators of vegetation and climate change. In: T.W. Boutton and S. Yamasaki (eds.), *Mass Spectrometry of Soils*: 47-82. New York, Marcel Dekker, Inc.

Buck B.J. and Monger H.C.
1999 Stable isotopes and soil-geomorphology as indicators of Holocene climate change, northern Chihuahuan Desert. *Journal of Arid Environments* 43: 357-373.

Budd D.A., Pack S.M. and Fogel M.L.
2002 The destruction of paleoclimatic isotopic signals in Pleistocene carbonate soil nodules of Western Australia. *Palaeogeography, Palaeoclimatology, Palaeoecology* 188: 249-273.

Cerling T.E.
1984 The stable isotopic composition of soil carbonate and ist relationship to climate. *Earth and Planetary Science Letters* 71: 229-240.

Cerling T.E.
1991 Carbon dioxide in the atmosphere: Evidence from Cenozoic and Mesozoic paleosols. *American Journal of Science* 291: 377-400.
1992 Use of carbon isotopes in paleosols as an indicator of the $P(CO_2)$ of the paleoatmosphere. *Global Biogeochemical Cycles* 6/3: 307-314.

Cerling T.E., Quade J., Wang Y. and Bowman J.R.
1989 Carbon isotopes in soils and paleosoils as ecology and paleoecology indicators. *Nature* 341: 138-139.

Cerling T.E., Wang Y. and Quade J.
1993 Expansion of C4 ecosystems as indicator of global ecological change in the Late Miocene. *Nature* 361: 344-345.

Condon A.G., Richards R.A. and Farquhar G.D.
1992 The effect of variation in soil water availability, vapor pressure deficit and nitrogen nutrition on carbon isotope discrimination in wheat. *Australian Journal of Agricultural Research* 43: 935-947.

Connin S., Virginia R. and Chamberlain C.
1997 Isotopic study of environmental change from disseminated carbonate in polygenetic soils. *Soil Science Society of America Journal* 61: 1710-1722.

Courty M-A.
1994 Le cadre paléogéographique des occupations humaines dans le bassin du Haut-Khabur (Syrie du nord-est): Premiers résultats. *Paléorient* 20/1: 21-59.

Courty M.-A., Marlin C., Dever L., Tremblay P. and Vachier P.
1994 The properties, genesis and environmental significance of calcitic pendents from the High Arctic (Spitsbergen). *Geoderma* 61: 71-102.

Craig H.
1957 Isotopic standards for carbon and oxygen and correction factors for mass spectrometric analysis of carbon dioxide. *Geochimica et Comichimica Acta* 12: 133-149.

Desjardins T., Andreux F., Volkoff B. and Cerri C.C.
1994 Organic carbon and ^{13}C contents in soils and soil size-fractons, and their changes due to deforestation and pasture installation in eastern Amazonia. *Geoderma* 61: 103-118.

Deutz P., Montanez I.P., Monger H.C. and Morrison J.
2001 Morphology and isotope heterogeneity of Late Quaternary pedogenic carbonates: implications for paleosol carbonates as paleoenvironmental proxies. *Palaeogeography, Palaeoclimatology, Palaeoecology* 166: 293-317.

Ding Z.L. and Wang S.L.
2000 C3/C4 vegetation evolution over the last 7.0 Myr in the Chinese Loess Plateau: Evidence from pedogenic carbonate $\delta^{13}C$. *Palaeogeography, Palaeoclimatology, Palaeoecology* 160: 291-299.

Dzurec R.S., Boutton T.W., Caldwell M.M. and Smith B.N.
1985 Carbon isotope ratios of soil organic matter and their use in assessing community composition changes in Curlew Valley, Utah. *Oecologia* 66: 17-24.

Farquhar G.D., Ehleringer J.R. and Hubick K.T.
1989 Carbon isotope discrimination and photosynthesis. A*nnual Review of Plant Physiology and Plant Molecular Biology* 40: 503-537.

Ferrio J.P., Florit A., Vega A., Serrano L. and Voltas J.
2003 $\delta^{13}C$ and tree-ring width reflect different drought responses in Quercus ilex and Pinus halepensis. *Oecologia* 442: 512-518.

Fontugne M., Kuzucuoğlu C., Karabiyikoğlu M., Hatté C. and Pastre J.-F.
1999 From Pleniglacial to Holocene: in the Konya Plain, Turkey. *Quaternary Science Reviews* 18: 573-591.

Friedli H., Lötscher H., Oeschger H., Siegenthaler U. and Stauffer B.
1986. Ice core record of the $^{13}C/^{12}C$ ratio of atmospheric CO_2 in the past two centuries. *Nature* 324: 237-238.

Frumkin A., Ford D.C. and Schwarcz H.
1999 Continental oxygen isotopic record of the last 170,000 years in Jerusalem. *Quaternary Research* 51: 317-327.

Goh K.M., Rafter T.A., Stout J.D. and Walker T.W.
1976 The accumulation of soil organic mater and its carbon isotope content in a chronosequence of soils developed on aeolian sand in New Zealand. *J. of Soil Science* 27: 89-100.

Goodfriend G.A.
1999 Terrestrial stable isotope record of Late Quaternary paleoclimates in the eastern Mediterranean region. Quaternary Science Reviews 18: 501-513.

Hillman G., Hedges R., Moore A., Colledge S. and Pettitt P.
2001 New evidence of Late Glacial cereal cultivation at Abu Hureyra on the Euphrates. *The Holocene* 11/4: 383-393.

Jiamao H., Keppens, E., Tungsheng L., Paepe R. and Wenying J.
1997 Stable isotope composition of the carbonate concretions in loess and climate change. *Quaternary International* 37: 37-43.

Khatemi H. and Mermut A.R.
1999 Submicroscopy and stable isotope geochemistry of carbonates and associated palygorkite in Iranian aridisols. *European Journal of Soil Science* 50: 207-216.

Körner C., Farquhar G.D. and Wong S.C.
1991 Carbon isotope discrimination by plants follows latitudinal and altitudinal trends. *Oecologia* 88: 30-40.

Landmann G., Reimer A. and Kempe S.
1996 Climatically induced lake-level changes in Lake Van, Turkey, during the Pleistocene/ Holocene transition. *Global Biogeochemical Cycles* 10: 797- 808.

Leone G., Bonadonna F. and Zanchetta G.
2000 Stable isotope record in mollusca and pedogenic carbonate from Late Pliocene soils of Central Italy. *Palaeogeography, Palaeoclimatology, Palaeoecology* 163: 115-131.

Liu B., Philips F.P. and Campbell A.R.
1996 Stable carbon and oxygen isotopes of pedogenic carbonates, Ajo Mountains, southern Arizona: implications for paleoenvironmental change. *Palaeogeography, Palaeoclimatology, Palaeoecology* 124: 233-246.

Marino B. and McElroy M.
1991 Isotopic composition of atmospheric CO_2 inferred from carbon in C4 plant cellulose. *Nature* 349: 127-130.

Monger H.C., Cole D.R., Gish J.W. and Giordano T.H.
1998 Stable carbon and oxygen isotopes in Quaternary soil carbonates as indicators of ecogeomorphic changes in the northern Chihuahuan Desert, USA. *Geoderma* 82: 137-172.

Mora G. and Pratt L.M.
2001 Isotopic evidence for cooler and dryer conditions in the tropical Andes during the last glacial stage. *Geology* 29: 519-522.

Nordt L., Boutton T., Hallmark C. and Waters M.
1994 Late Quaternary vegetation and climate change in central Texas based on the isotopic composition of organic carbon. *Quaternary Research* 41: 109-120.

Nordt L., Wilding L., Hallmark C. und Jacob J.
1996 Stable carbon isotope composition of pedogenic carbonates and their use in studying pedogenesis. In: T.W. Boutton and S. Yamasaki (eds.), *Mass Spectrometry of Soils*: 133-154. New York, Marcel Dekker, Inc.

Pendall E., Harden J., Trumbore S. and Chadwick O.
1994 Isotopic approach to soil carbonate dynamics and implications for paleoclimatic interpretations. *Quaternary Research* 42: 60-71.

Pustuvoytov, K.
2002 ^{14}C dating of pedogenic carbonate coatings on wall stones at Göbekli Tepe (Southeastern Turkey). *Neo-Lithics* 2/02: 3-4.

Quade J. and Cerling T.E.
1995 Expansion of C4 grasses in the Late Miocene of North Pakistan: evidence from stable isotopes in paleosols. *Palaeogeography, Palaeoclimatology, Palaeoecology* 115: 91-116.

Quade J., Cerling T.E. and Bowman J.R.
1989 Systematic variations of the carbon and oxygen isotopic composition of pedogenic carbonates along elevation transects in the southern Great Basin, United States. *Geological Society of America Bulletin* 101: 464-475.

Quade J., Solounias N. and Cerling T.E.
1994 Stable isotopic evidence from paleosol carbonates and fossil teeth in Greece for forest or woodland over the past 11 Ma. *Palaeogeography, Palaeoclimatology, Palaeoecology* 108: 41-53.

Quade J., Cater J.M.L., Ojha T.P., Adam J. and Harrison T.M.
1995 Late Miocene environmental change in Nepal and the northern Indian subcontinent: stable isotopic evidence from paleosols. *Geological Society of America Bulletin* 107: 1381-1397.

Reed J.M., Roberts N. and Leng M.J.
1999 An evaluation of diatom response to Late Quaternary environmental change in two lakes in the Konya Basin, Turkey, by comparison with stable isotope data. *Quaternary Science Reviews* 18: 631-646.

Roberts N., Black S., Boyer P., Eastwood W.J., Griffiths H.I., Lamb H.F., Leng M.J., Parsih R., Reed J.M., Twigg D. and Yiitbasioğlu H.
1999 Chronology and stratigraphy of Late Quaternary sediments in the Konya Basin, Turkey: results from the KOPAL Project. *Quaternary Science Reviews* 18: 611-630.

Rossignol-Strick M.
1993 Late Quaternary climate in the eastern Mediterranean region. *Paléorient* 19/1: 135-152.

Rossignol-Strick M.
1999 The Holocene climatic optimum and pollen records of sapropel 1 in the eastern Mediterranean, 9000-6000 BP. *Quaternary Science Reviews* 18: 515-530.

Sage R.F.
2001 Environmental and evolutionary preconditions for the origin and diversification of the C4 photosynthetic syndrome. *Plant Biology* 3: 202-213.

Schleser G.H. and Jajasekera R.
1985 $\delta^{13}C$-variations of leaves in forests as an indication of reassimilated CO_2 from the soil. *Oecologia* 65: 536-542.

Schmidt K.
2001 Göbekli Tepe, southeastern Turkey. A preliminary report on the 1995-1999 excavations. *Paléorient* 26/1: 45-54.
2002 The 2002 excavations at Göbekli Tepe (Southeastern Turkey): Impressions from an enigmatic site. *Neo-Lithics* 2/02: 8-13.

Siegenthaler U., and Matter H.A.
1983 Dependence of $\delta^{18}O$ and δD on precipitation on climate. In *Palaeoclimate and Palaeowaters: A Collection of Environmental Isotope Studies*: 37-51. Vienna, IAEA.

Srivastava P.
2001 Paleoclimatic implications of pedogenic carbonates in Holocene soils of the Gangetic Plains, India. *Palaeogeography, Palaeoclimatology, Palaeoecology* 172: 207-222.

Tieszen L.L.
1991 Natural variations in the carbon isotope values of plants: implications for archaeology, ecology and paleoecology. *Journal of Archaeological Science* 18: 227-248.

Van Zeist W. and Bottema S.
1991 *Late Quaternary vegetation of the Near East*. Beihefte

zum Tübinger Atlas des Vorderen Orients. Reihe A (Naturwissenschaften), Nr. 18. Wiesbaden, Dr. Ludwig Reichert Verlag.

Wang D. and Anderson D.W.
1998 Stable carbon isotopes of carbonate pendants from chernozemic soils of Saskatchewan, Canada. *Geoderma* 84: 309-322.

Wang H. and Follmer L.
1998 Proxy of monsoon seasonality in carbon isotopes from paleosols of the southern Chinese Loess Plateau. *Geology* 26: 987-990.

Wang H., Ambrose S.H., Liu C-L.J. and Follmer L.R.
1997 Paleosol stable isotope evidence for early hominid occupation of East Asian temperate environments. *Quaternary Research* 48: 228-238.

Wang H., Follmer L. and Chao-li Liu J.
2000 Isotope evidence of paleo-El Niño-Southern Oscillation cycles in the loess-paleosol record in the central United States. *Geology* 28/9: 771-774.

Wang Y., Cerling T., Quade J., Bowman A., Smith G. and Lindsay E.
1993 Stable isotopes of paleosols and fossil teeth as paleoecology and paleoclimate indicators: An example from the St. David formation, Arizona. *Climate Change in Continental Isotopic Records*. Geophysical Monograph No. 78.

Wang Y. and Hsieh Y.-P.
2002 Uncertainties and novel prospects in the study of the soil carbon dynamics. *Chemosphere* 49: 791-804.

Wang Y., McDonald E., Amundson R., McFadden L. and Chadwick O.
1996 An isotopic study of soils in chronological sequences of alluvial deposits, Providence Mountains, California. *Geological Society of America Bulletin* 108: 379-391.

Warren C.R., McGrath J.F. and Adams M.A.
2001 Water availability and carbon isotope discrimination in conifers. *Oecologia*. 127: 476-486.

Williams D.G. and Ehleringer J.R.
1996 Carbon isotope discrimination in three semi-arid woodland species along a monsoon gradient. *Oecologia*. 106: 455-460.

Yechieli Y., Levi Y., Weber U., Kafri U., Woelfli W. and Bonani G.
1993 Late Quaternary geological history of the Dead Sea area, Israel. *Quaternary Research* 39: 59-67.

Erratum

Contribution Pustovoytov, *Neo-Lithics* 1/03, p. 25, Fig. 3 and p. 26: read correctly ≥ 10000 bp for falsely 10000 bp or = 10000 bp.

Supra-Regional Concepts I

Introductory Remarks

Bo Dahl Hermansen
Carsten Niebuhr Institute, Copenhagen University <bodahl@hum.ku.dk>

The two essays published below form part of the preparations for the workshop *Towards New Frameworks: Supra-Regional Concepts in Near Eastern Neolithization*, to be held at the 4ICAANE in Berlin, April 1 and 2, 2004, organized by H.G.K. Gebel, M. Özdoğan, G.O. Rollefson and K. Schmidt. *Supra-Regional Concepts II* will contain the other theses or essay contributions in preparation for the workshop; they will be circulated prior to the workshop discussions and published in *Neo-Lithics* 1/04. Contributors will be both the workshop discussants as well as colleagues helping the discussion without having the chance to attend the workshop.

The aim of the workshop is to help develop new interpretive frameworks that offer a satisfactory account of the complexity of recent discoveries such as the Göbekli Tepe interaction sphere, the mega-site phenomenon of Jordan and the Euphrates region, as well as the colonization of Cyprus. One concept which has recently been introduced in order to deal with this complexity is "Polycentric Evolution" (Gebel 2002a, 2002b). This concept involves the notion that neolithization encompasses a rich variety of environmentally conditioned, regionally delimited, adaptive strategies that show a general trend over several millennia: i.e., the establishment of food production, supported by new patterns of human territorial behaviour and social complexity. However, the idea of a polycentric evolution also implies that ecological variations and human territoriality would have stimulated a considerable variety in the specific choices of adaptive strategies that would also have included the formulation of ideologies or socially sanctioned interpretations of society and environment. According to this view, such ideologies would have been bound up with a new phenomenon of human ethology, that of "territorial inflexibility". Increasing competition for resources would have led not only to new techno-economic strategies, but also to new forms of aggression and, hence, to a need of conflict management in order to cope with territorial or property claims within, as well as between, regionally defined social groups. This may have contri-

buted to regionalization as well as to the establishment of supra-regional networks of varying sorts. Similar, but not identical, ideas have recently been introduced in American archaeology (Flannery & Marcus 2000, 2003).

The two essays published in the following pages deal with the same range of problems, but with different approaches and emphases. Hence they will be helpful in nuancing our interpretations and in formulating fruitful research agendas. Both are invited papers by major scholars in the discipline, offered in preparation for the workshop. They are published here as a basis for discussion and comments at the workshop and will appear in a finalised form in the proceedings.

Frank Hole's paper points out the need to distinguish between origins and subsequent developments. Hole argues in favour of multiple centers in the process of neolithization, each with its own cultural trajectory. He suggests that the basic issues concerning origins are now generally accepted and that focus should be shifted to the various regional expressions of neolithization. The key question, according to Hole, is "How are we to understand these variable responses to agriculture and the subsequent 'collapses' of some of them?" In consequence of this he outlines ten key factors to consider and then suggests a research agenda for profitable future research.

In his paper, *Trevor Watkins* argues against the 'Levantine primacy' school of thought within which the Levantine corridor is viewed as the cultural core where all critical innovations originated, and from where they were transmitted to other parts of the Near East through various forms of diffusion. Breaking with traditional concepts of culture and diffusion, and inspired by Renfrew's notion of 'peer-polity interaction' within, Watkins proposes that the PPNB expansion may be understood as "the expansion and intensification of a socio-cultural interaction sphere" within which more communities took part as time passed.

References

Flannery K.V. and Marcus J.

2000 Formative Mexican Chiefdoms and the Myth of the "Mother Culture". *Journal of Anthropological Archaeology* 19, 2000:1-37.

2003 The Origin of War: New ^{14}C Dates From Ancient Mexico. *Proceedings of the National Academy of Sciences.* 100/20, 2003:11801-11805.

Gebel H.G.K.

2002a The Neolithic of the Near East: An Essay on a "Polycentric Evolution" and Other Current Problems. In: A. Hausleiter, S. Kerner & B. Müller-Neuhof (eds.), *Material Culture and Mental Spheres: Internatinales Symposium für Hans J. Nissen, Juni 2000*. Alter Orient und Neues Testament 293: 313-324. Münster, Ugarit Verlag.

2002b *Grundzüge sozialen Wandels im Neolithikum der südlichen Levante*. www.freidok.uni-freiburg.de/volltexte/466. Universität Freiburg.

Centers in the Neolithic?

Frank Hole

Yale University <frank.hole@yale.edu, frhole@pantheon.yale.edu>

As the archaeological landscape of Southwest Asia and adjoining regions has filled out in recent years it has become clear that while there may have been a relatively circumscribed region in which the first steps toward domestication were taken, Neolithization as a social/demographic phenomenon was wide-spread and highly varied. It is important, therefore, to clearly separate "origins" from immediately subsequent developments, which are so abundantly represented in the most recent archaeological excavations.

While there is surely more to learn about the timing, locale and extent of origins, the basic issues of timing, general regions involved, and proximate causes are now generally accepted. The more pressing issues now concern the various expressions of Neolithization across the Middle East. The startling discoveries in central and southern Anatolia, from Çatal Höyük to Göbekli, as well as the "mega" sites on the Euphrates and Southern Levant, in comparison with the relatively unimpressive sites in Northern Mesopotamia and Iran, serve to emphasize the distinctly regional nature of the process. Our question is, How are we to understand these variable responses to agriculture and the subsequent "collapses" of some of them?

Factors to Consider

Centrism is basically a geographic concept that becomes clear on an outline map of the Near East when one plots the locations of sites of each temporal period. Even

casual observation reveals clustering or lineation and that vast stretches of landscape have no reported sites. If we superimpose rivers, topography and climate, the clustering begins to make more sense and as we add more layers to our map showing other significant resources, the patterns become quite clear: early agriculturalists favored resource-rich locations. The spatial distribution of these locations, then, leads one inevitably toward "centrism." Beyond this there are a number of other factors to consider. Broadly these break down into empirical data, and causes.

Timing - we must separate *initial* domestications from secondary developments

Climate - how did its changes affect Neolithization?

Resources - what are the scale, quality and distribution of resources?

Antecedents - what effect did preceding cultures have on Neolithization?

Economy - how did the mix of domesticates affect the demographic trajectory?

Level of development - what quantitative and qualitative indices are there?

Spread of influence - did a local innovation spread to other regions?

Tertiary developments - rise and collapse in the Late Neolithic-Early Chalcolithic

Human agency - the role played by individual and local choice

Conflict - resolution of existing problems and anticipation of others

In this short paper there is space only to suggest the relevance of each of these factors.

Timing

It is generally agreed that there was no domestication prior to the terminal stages of the Younger Dryas or a little later. The YD brought severe cold and drought to the region and seriously compromised the ability of hunters and gatherers, including putative agriculturalists to sustain life outside a few favorable "refuge" areas. Both arboreal and economic annual vegetation disappeared from much of the region; consequently until the climatic amelioration following the YD, much of the terrain could not sustain settled life and may have been effectively vacant. The timing of climatic and vegetational regeneration varied by longitude, latitude and elevation. In short, some regions had the potential to get an earlier start than others.

Climate

A second climatic factor is predictability. In effect this controls both the potential for sedentism and population size. In a region with strongly seasonal climate and low total precipitation, interannual variability is a crucial variable so that the first settlements must have taken advantage of the locally best opportunities. The scale of such locales goes a long way toward determining how large, dense and permanent settlements can be and whether they are clustered, as in valleys, or linear, as along rivers.

Resources

We may take inspiration from Jared Diamond's book, *Guns, Germs and Steel*, in which he attempted to answer why there are enormous differences in the level of cultural development around the world. In a nut shell, his answer was that it had a lot to do with geography. That, at least, is a good point of departure for us to use in the present discussion.

The distribution of biological and mineral resources are powerful factors. The presence of economic species in the wild, or environmental conditions that allow them to thrive under domestication, are critical to stability. That such conditions are spatially discrete because of topography and climate, encourages the development of enclosed cultural systems, largely self-sufficient. In the ethnographic world, groups of 400-500 persons are considered to be biologically self-sufficient and a similar constraint may have operated in the past. This has a bearing on how we think of "centers." Countering this natural tendency toward social clustering, is the fact that mineral and other resources may occur outside the territory of any individual cluster. Obsidian, high quality flint, and perhaps mastic had to be imported by most people and this fact encouraged a certain interregionalism and interdependence. Among people who shared a similar material culture over broad areas of the Middle East, such contacts may also have engendered some sharing of ideologies.

Antecedents

Pre-existing occupations must also be factored in. In the event the land was utilized by hunter-gatherers, their rights to the land and its resources, not to mention the ways they scheduled their movements and exploitation of the resources, had a bearing on how they adopted agriculture or how they interacted with agricultural colonists. As in Europe where this has been a issue for a long time, we need to focus attention on the cultural landscape that the first farmers encountered. If the land was "vacant" and freely available, then one would expect farmers to arrive with previous customs and artifacts in tact. In such a case colonization could be rapid, extensive and homogeneous, scale and other conditions permitting.

On the other hand, pre-existing cultures would provide opportunity for various kinds of syncretism, including that of technology and ideologies. Moreover, depending on the density of pre-existing populations and

their propensity to resist Neolithization, colonization and adoption, might be spatially sporadic and delayed.

Economy

Domestication in the Near East developed out of separate plant and animal bases which, when combined, gave rise to the Neolithic Revolution. The relative emphasis on farming and herding relates to local environmental productivity as well as to the density, clustering and permanence of settlements and, consequently, to the degree to which there were "centers" in some regions.

Level of Developments

Size of sites, size of populations, unusual structures, and symbolic representations, among other criteria, can be used as indices of complexity, ideology, etc. Since our understanding of these is based on recovery of non-perishable remains, we are probably missing much of the richness of Neolithic cultures and perhaps giving undue weight to remains that were considered to be mundane by the people of the time.

Spread of Influence

The way to track this is to observe the distribution of different materials and practices. For this to be meaningful, it is essential to secure relative dates so that the direction of spread can be accurately assessed.

Tertiary Developments

Each regional cluster had different trajectories of change with some "collapsing" and others developing greater complexity. Thus, "centers" change with time. Climatic change, degradation of the landscape, hostilities among peoples, changes in technology, innovations in social organization, development of religion, and so on have been invoked for different cases. The same factors outlined above need to be assessed for each case of rise and fall.

Human Agency

One should not discount the role played by individuals, some creative, introspective, mystical, aggressive, successful; others more suited to following than to leading. Elements of style, architecture and ritual, along with mobilization of people and resources for collective gain may have thrived when leaders were strong. Their potential strength was directly related to the productive potential of their locale.

Conflict

Conflict is most likely to arise under two circumstances: intragroup, when population is unusually large; and externally, over inter-group competition for resources. The former might enable enterprising individuals to create an hierarchical organization, whereas the latter might lead to social and physical isolating mechanisms, not to mention "war."

A Research Agenda for Initial Neolitization

Where do these ideas lead us? Is there a research agenda implied? The following are some suggestions for building a structure that will support interpretation.

1. We must focus on problems rather than on sites.
2. We need to generate temporally and spatially precise data on paleoenvironments in order to assess their potential and differences in timing across the Middle East.
3. We need to carry out surveys and excavations to determine the nature of any pre-existing cultural adaptations at the time of agricultural colonization outside of the Southern Levant. This implies a focus on process rather than period.
4. We need to get good data on the size of regional enclaves both through survey for sites, and an assessment of their artifactual diagnostics.
5. We need exemplary studies on the trajectories of development within individual clusters.

Final Remark

One could write a lengthy paper about each of the topics raised here. More importantly, perhaps, we should work toward generating the kinds of data needed to deal with the broader questions of the development of the Neolithic in all its manifestations.

Developing socio-cultural networks

Trevor Watkins
University of Edinburgh <t.watkins@ed.ac.uk>

I believe that we have been overlooking – perhaps because it is of such a large scale – a key cultural and social phenomenon of the early Neolithic period in southwest Asia, that of communities linked in wide-area networks of social and cultural interaction.

There has been some interesting work in recent years on the social organisation of sedentary Neolithic communities. It has been clear that the larger Neolithic settlements must have had some kind of internal structure in order to function coherently. At one level, in the smaller communities, the household may have been the basic unit of social organisation. The larger communities would certainly have needed another layer of structuring between the household and the overall community of several thousand people. However, we should not focus on communities to the exclusion of the relations among communities.

Generations ago, archaeologists sought cultural parallels as a means of relative dating; if two sites in different regions produced near identical cultural assemblages (often reduced to ceramic similarities in later periods, and comparison of lithic assemblages in earlier prehistory), they could be assumed to be broadly contemporary. Gordon Childe's idea of a culture-group was that a polythetic assemblage of cultural traits was shared by a number of communities within a given area and over a given time, and that represents a "people" in the sense that they are defined by the culture that they shared. But some cultural traits were shared and goods were exchanged over very wide areas of southwest Asia, especially in the latter half of the aceramic Neolithic period. The shared cultural traits, however, are not sufficient to indicate a massively widespread culture-group – indeed, it is the reverse, for only a few cultural traits were widely shared.

We should also try to free our minds of an associated model, that of localized innovation and subsequent diffusion. Such a centre-periphery model is the basis of the Levantine primacy school of thought, which sees the Levantine corridor (and in extreme cases, the southern part of the Levantine corridor) as the core zone within which the critical innovations are generated, and the rest of southwest Asia as a secondary zone to which the innovations were transmitted by diffusion of one kind or another. There is a good case to be made against the Levantine primacy model on environmental, archaeological and theoretical grounds, but not space to go into these objections here. In Jacques Cauvin's exciting and innovative mature work, the perspective is that of Levantine primacy, and the underlying cultural models are distinctly Childe-like. His PPNA is a sort of superculture that consists of three regional cultural subgroups, the Mureybetian in the north Levant, the Aswadian in the centre, and the Sultanian in the southern Levant. Cauvin writes of the PPNB culture as expansive, domineering and imperialistic. In some areas, the PPNB culture reached out and swamped indigenous cultural traditions, while population expansion in the core area fuelled demic diffusion in other directions. Much as I admire Cauvin's inspirational thinking in some directions, the cultural models that underpin his synthesis are inadequate. Ofer Bar-Yosef and Anna Belfer-Cohen have attempted to apply the more advanced cultural model of an "interaction sphere" to account for the complexities of the so-called PPNB culture, but in a short essay they did not explore the nature of the construct and its applicability to the full.

The situation reminds one of what Colin Renfrew describes as "peer polity interaction" within an interaction sphere. In his sophisticated analysis of the workings of an interaction sphere, Renfrew was thinking particularly about the circumstances under which emergent states (early state modules) interacted among themselves, moving together towards full-blown state-level organizations, but some of the other contributors to the conference volume that launched the idea sought to apply the principles to situations that were well short of emergent state-level polities. "Polity" does not have to refer to a state-level political entity; any community that takes responsibility for the regulation of its own affairs may be regarded as a polity. Renfrew identifies the nature of the interactivity under three heads: "... the process of transformation is frequently brought about ... as a result of interaction between the peer polities, which we can examine under the headings of: (a) competition (including warfare), and competitive emulation; (b) symbolic entrainment, and the transmission of innovation; and (c) increased flow in the exchange of goods." The competitive emulation in Renfrew's original formulation was usually to be seen in the form of a sharing of symbolism and symbolic elements among the top tier of local hierarchies, enabling them to differentiate themselves within their own communities by reason of their participation in a high-level, cosmopolitan culture-system. This par-

ticular aspect may not apply in our Neolithic world, where there is no evidence of social hierarchies; but there is evidence of competitive emulation in terms of the possession of "cosmopolitan" projectile points, and perhaps some evidence of warfare. If we shed the centre-periphery model of the Levantine primacy school, we can view much of southwest Asia as inhabited by peer polities, in the sense that sedentary communities that effectively operated as self-regulating communities occupied extensive areas of the region.

The timescale in our final Epi-palaeolithic and early Neolithic world is also rather different from that contemplated by Renfrew in relation to the evolution of proto-states. He is thinking in terms of a few centuries, while our emergent socio-cultural interaction networks lasts over several millennia. Perhaps because of our long timescale, I believe that we are able to observe, first, the emergence and, second, the growth of socio-cultural interaction networks. They not only grow in intensity, especially through the aceramic Neolithic period, they also grow in extent. The phenomenal expansion of the so-called PPNB culture, it seems to me, can be better understood as the expansion and intensification of a socio-cultural interaction sphere, with more and more communities "buying into" the networks with the passage of time. Why did communities join such networks of interaction? What were the perceived advantages? The answers may relate to the near universality in our contemporary world of denim jeans, trainers and burger bars, a world in which "brand" and "image" are cultural imperatives.

PhD Dissertation Project: The Use of Experimental Archaeology to Explain and Present Pre-Pottery Neolithic Architecture at Beidha in Southern Jordan

Samantha Dennis
University of Edinburgh <s.j.dennis@sms.ed.ac.uk>

Experimental archaeology, although popular in Europe in the form of open air museums and archaeological parks (for example Butser Ancient Farm and Ljere Forsøgcenter) and occasionally found in the Near East (for example in Cyprus), is as yet unknown in Jordan.

The aim of the experimental research at Beidha is two-fold:

1. to test theories on construction methods and techniques of Middle Pre-Pottery Neolithic B architecture from Beidha, informing the archaeological understanding of settlements, and
2. to provide a visual aid to present the early Neolithic site to visitors

Now in its second year, the experimental research at Beidha has already broadened our understanding of the early Neolithic architecture from the site. The experiments have included the full-scale reconstruction of two circular structures based on evidence from Building 48 and 49, and one 'pier' structure based on the evidence from Building 10 (Fig. 1).

Experiments are being carried out at every stage of the construction process including the acquisition of raw materials, the durability of different mixes of mud plasters and mortars, and roof designs (including one pitched roof and one flat roof). Careful monitoring is taking place of all the structures including interior temperature chan-

Fig. 1. A series of three experimental reconstructions at Beidha, southern Jordan (November 2003).

ges, the effects of changing weather, maintenance needs, and the accumulation of exterior and interior deposits.

The experimental reconstruction of a series of Neolithic structures will help inform the continuing debates concerning structural techniques, size and organisation, function of individual buildings, site location, organisation of interior space, and intersite variability over time. They will further help our understanding of the use of space for storage and domestic activities; population size; and the development of social organisation, providing essential information on the material conditions within which people exacted their social strategies.

If you have any comments or suggestions please contact me at: beidha@cbrl.org.uk.

Website:
www.britac.ac.uk/institutes/cbrl/projects/beidha.html

New Publications & Theses

TAY has published radiocarbon dates of archaeological settlements in Turkey

TAY Project ("The Archaeological Settlements of Turkey") set out ten years ago to compile an inventory of archaeological settlements in Turkey. An important part of this data has now been compiled and is ready for use: The ^{14}C Database of Archaeological Settlements in Turkey.
A loose-leaf binder has been published that contains settlement leaflets with ^{14}C dates from the Paleolithic to the end of the Chalcolithic. This constitutes the first of two phases, and EBA and later settlements will be added to the same volume and published as soon as possible.
The purpose of this undertaking is to compile all previously published ^{14}C dates in order to produce a chronology of Anatolia/Thrace. We believe that this data group, calibrated by TAY Project, will fill an important void in the inventory of Turkey.
To obtain a binder (only in Turkish), please contact:

Ege Yayinlari (Publishing Co.)
Aslanyatagi Sok., Sedef Palas, 35/2
34433 Cihangir Istanbul TURKEY
Tel: +90 212 244 7521-22-23
Fax: +90 212 244 3209
email: pub@tayproject.org

TAY Projesi / TAY Project
Turkiye Arkeolojik Yerleşmeleri
The Archaeological Settlements of Turkey
Kuruçesme Cad. 67/B
34345 Kuruçesme, Istanbul TURKEY
Tel: +90 212 244 7521-22-23 +90 212 263 1758
web: http://tayproject.org
eposta: info@TAYProject.org pub@TAYProject.org

Alizadeh, Abbas
2004 *Excavations at the Prehistoric Mound of Chogha Bonut, Khuzestan, Iran: Seasons 1976/77, 1977/78, and 1996*. Oriental Institute Publications 120. The Oriental Institute, University of Chicago

The book presents the results of three seasons of excavations at Chogha Bonut, Lowland Susiana, in the modern-day province of Khuzestan, south-western Iran. Excavations demonstrate that the initial phases of the colonization of Susiana by early farmers date back to the aceramic phase, ca. 7200 BC.

Akkermans, Peter M. M. G. and Schwartz, Glenn M.
2003 *The Archaeology of Syria: From Complex Hunter-Gatherers to Early Urban Societies (ca.16,000-300 BC)*. Cambridge: Cambridge University Press 2003 (pp. 467)
See: http://titles.cambridge.org/catalogue.asp? ISBN=0521796660

Sayej, Ghattas J.
2003 *The Lithic Industries of Zahrat adh-Drah' 2 and the Pre-Pottery Neolithic Period of the Southern Levant*. Unpublished doctoral thesis, Archaeology Program, School of Historical and European Studies. Victoria, La Trobe University.

Abstract

The aim of this thesis is to clarify the nature of the early Neolithic period in the southern Levant as a key period for the beginning of agrarian societies. This goal is achieved through the analysis of lithics recovered from Zahrat adh-Dhra' 2 (ZAD 2). The importance of ZAD 2 is its short period of occupation, which helps in

clarifying the tool typology and technology of the PPNA period without the problem of admixtures from other periods. According to my analysis, there are no major differences between the Khiamian and Sultanian phases, and thus I argue that there is no need to divide the PPNA into two phases. It is better to divide it into inter- and intra-assemblage variability. By combining the analyses of architecture, groundstone, lithics, and radiocarbon dates, one can infer that ZAD 2 provides decisive evidence for an extension of the PPNA in the southern-central Levant from ca. 9,600 BP to ca. 9,300 BP, and thus a later beginning for the PPNB (around 9,200 BP). In arguing this, sites from the southern Levant are compared to their counterparts in the central and northern Levant, and the role of diffusion or local innovation is presented.
ZAD 2 is located in an arid environment, though the region in antiquity probably featured a more hospitable landscape. None of the plant remains uncovered at ZAD 2 could grow in the vicinity naturally, so pre-domestication cultivation probably happened on site. The lack of projectile points and the existence of sickle blades and groundstone at ZAD 2 indicate extensive food processing activities. A use-wear analysis was conducted on the Hagdud truncation type, which is dominant at ZAD 2. The results indicate that this diminutive tool type could have been used as a micro-scraper.

Bocquentin, F.
2003 *Burial Practices, Biological Factors and Cultural Identities During the Natufian Period: A Bio-Archaeological Perspective*. Doctoral dissertation, Laboratoire d'Anthropologie des Populations Passé. Talence, Université de Bordeaux 1.

Abstract

At the end of the Levantine Epipalaeolithic, during the Natufian period (13,000-9,500 BC, calibrated), some hunter-gatherer populations had adopted a sedentary way of life. With the first permanent settlements, a new organisation of the dwelling area emerged, into which the dead were integrated. In this work, Natufian human remains are thoroughly examined, to improve our knowledge of their biological features and to determine how representative this available sample is, compared to the whole population. Burial practices have been analysed, through unpublished field records and osteological data. The sites of Shukbah, El Wad, Kébara, Erq-el-Ahmar, Nahal-Oren, Rakefet, Hayonim (cave and terrace) and Mallaha, where most Natufian skeletons (N = 358) were found, have been extensively studied. The minimum number of individuals, as well as age at death and determination of sex, are reassessed. Although Natufians shared obvious biological affinities, a joint study of osteometric features, discrete traits, and the frequency of enamel hypoplasia and dental caries in the different groups attests to contrasted living conditions. The comparative study of funerary customs, through the osteo-archeological reinterpretation of each grave, highlights local identities. Nevertheless, in all contexts, the simple or complex treatment given to the corpses was of crucial importance during the funeral. The joint analysis of cultural data and biological factors reveals strong interactions. Burial selection which was carried out according to age, sex or kinship, is part of that evidence. The study of all the factors involved throughout the three thousand years that preceded the Neolithic shows significant changes. It is likely that part of this evolution is connnected with climatic fluctuations and social changes.

KEY-WORDS: Natufian, Near East, Epipalaeolithic, Neolithisation, Bio-archaeology, Funerary practices, Burial selection, Age-at-death, Sex determination, Osteometry, Discrete traits, Occupational indicators, Stress status, Violence, Biocultural interactions.

Calendar

5ème Colloque sur les industries lithiques du Néolithique pré-céramique La diversité des systèmes techniques des communautés du Néolithique pré-céramique : vers la caractérisation des comportements sociaux

Fréjus (France), 1er - 5 mars 2004
Colloque international organisé avec le soutien du Centre National de la Recherche Scientifique et du Ministère des Affaires Etrangères

5th Workshop on PPN chipped stone industries
PPN communities technical system diversity : towards social behaviour
Fréjus (France) March 1st - 5th 2004

International Workshop organized with the support of the National Center for Scientific Research and the French Foreign Office

Programme préliminaire / Preliminary program

29 Février (14:00) - 1er Mars (12:00)
February 29th (2:00 pm) - March 1st (noon)
Accueil des participants - Welcome of the participants

1er mars / March 1st
Typologie formelle, fonction et chronologie du PPNA: vues depuis le Sud-Levant – Formal typology, function and chronology within the PPNA:

Views from the southern Levant

Anne Pirie - Points, perforators and the PPNA: characterising lithic variability at Wadi Faynan and other sites
Sam Smith - Comparing tool morphology, retouch patterns and function between WF16 and Dhra'.
Ghattas Sayej - Lithic variability among the PPNA assemblages of the Dead Sea Basin
Nathan B. Goodale - Lithic technological organization: an analysis of chipped stone spatial patterns from Dhra' and 'Iraq ed-Dubb, Jordan
Dani Nadel & Daniel Kaufman - How different are they? PPNA and Natufian Inter-and Intra- site lithic variability

Expérimentations et interprétations archéologiques - Experiments as a clue to archaeological interpretations

Ran Barkai, Avi Gopher & Jurgen Weiner - Quarrying Flint at Neolithic Ramat Tamar, An Experiment
Juan Antonio Sánchez Priego & Michel Brenet - Approche expérimentale de la fabrication et fonction des herminettes de type Mureybet

2 mars / March 2nd
Du PPNA au PPNB ancien - From PPNA to PPNB

Ian Kuijt & Nathan Goodale - A chip of the old block: PPNA core reduction systems.
Phillip C. Edwards & Ghattas Sayej - EPPNB or not EPPNB? The chronological question for the southern Levant
Frédéric Abbès - Les débitages laminaires de la phase de transition PPNA/PPNB (Jerf el Ahmar, Mureybet, Cheikh Hassan)
Eric Coqueugniot & Makoto Arimura - Industries lithiques PPNB ancien de Dja'de (Syrie)
Makoto Arimura - Lithic industry of the Early PPNB layers at Tell Ain el-Kerkh, northwest Syria.

Système technique et espaces au PPN - PPN technical system and land use

Christina Lemorini & Daniella Zampetti - Early settlements at Çayönü : a perspective on lithics
Juan José Ibáñez, Jesús E. González Urquijo & Amelia Rodríguez - Economic and social changes in the Middle Euphrates during the PPN: a view from lithic tools.
Anna Belfer-Cohen & Nigel Goring-Morris - A New Look at Old Assemblages: A Cautionary Tale

1ère présentation de posters - 1st poster session

O. Marder & H. Khalaily - Hafted tools from recent excavations of PPNB sites from southern Levant
T.T. Rampley - From Blades to Sickles at 'Ain Ghazal, Jordan
Deborah I. Olszewski - Discovering the Unexpected: Neolithic Occupation at Tor at-Tareeq, Wadi al-Hasa, Jordan
M. Hintzman - Questions of Form and Function: battered Stone Spheres from 'Ain Ghazal.

3 mars / March 3rd
Variabilité des assemblages lithiques au PPNB moyen et récent - Late and Middle PPNB lithic variability

Charlott Hoffmann Jensen - New work on the Beidha material: the Early Neolithic phases.
Yosef Garfinkel - The Pre-Pottery Neolithic B Naviform Flint Industry of Yiftahel
Hans Georg Gebel - Technological dualism in Ba'ja and Basta
Philip J. Wilke, Leslie A. Quintero, Gary O. Rollefson & Hans Georg Gebel - The Naviform Core-and-Blade Industry in Orthoquartzite at 'Ain Jammam, Jordan
P. Rassmann - Lithics from the Wadi Qattar, Jordan
Mohammad Najjar - Recent work at the PPNB site of Ghuwayr 1, Jordan.

Dépôts - Caches

Hamoudi Khalaily, Alon De Groot, Zvi Greenhot & Anna Irich - Rose - An Early Pre-Pottery Neolithic Blade Cache from the Site of Motza, West of Jerusalem
Omry Barzilai & Nigel Goring-Morris - PPNB Blade Caches in the Southern Levant
Jacques Pelegrin, Laurence Astruc & P.M.M.G. Akkermans - An obsidian cache at Sabi Abyad II: new data
François Briois - Les "dépôts" de Shillourokambos
Tristan Carter - Burials, blades and blanks: Caches at Çatal Höyük

2ème présentation de posters - 2nd poster session

Jesse Karnes - A MPPBN Blade Cache from 'Ain Ghazal
Angela Davidzon & Nigel Goring-Morris - A Refitted Bipolar Reduction Sequence from Kfar HaHoresh, Israel

* Atelier de discussion autour d'assemblages archéologiques - Work and discussion around archaeological assemblages.

4 mars / March 4th
De la définition des aires culturelles au PPN - Defining PPN Cultural areas

Stefan K. Kozlowski - Big arrowheads industries: borders and territories
Elizabeth Healey - Why is there so much obsidian at Maghzaliah ?
Didier Binder - PPN Pressure Technology: views from Anatolia
Yoshihiro Nishiaki - The PPNB lithic industries of Tell Seker al-Aheimar, northeast Syria, in the regional context
Carol McCartney - Assemblage diversity in the Early/Middle Cypriot Aceramic Neolithic

Echanges et interactions culturelles pendant le PPN en Anatolie - Exchange and Cultural Interactions in Anatolia during the PPN times

Douglas Baird - The implications of Early Holocene microlithic industries in the Konya Plain, Central Anatolia
Nurcan Kayacan - Choice of obsidian and its use at Musular
Osamu Maeda - Change in obsidian use at Akarçay Tepe: a PPN to PN site on the Turkish Euphrates
Anna Spasojevic - 'Flint' in Turkey from 10,000 to 6,000cal BC. Case study Çatalhöyük

* Atelier de discussion autour d'assemblages archéologiques - Work and discussion around archaeological assemblages.

5 mars, matin / March 5th, morning
Conclusions et perspectives - Concluding remarks and proposals