Archaeology of Early Northeastern Africa
Studies in African Archaeology 9
Poznań Archaeological Museum 2006

Noriyuki Shirai

Origins and development of bifacial stone tools and their implications for the beginning of animal herding in the Egyptian Western Desert

Introduction

This paper will discuss the correlation between the beginning of animal herding and the appearance of bifacially-retouched formal stone tools in the Egyptian Western Desert in the Early-Middle Holocene on the basis of published information. It has been argued that domesticated sheep/goats had come from the Sinai Peninsula to Sodmein Cave on the Red Sea coast of Egypt across the sea around 5,800 cal. B.C., and then had been diffused immediately from Sodmein Cave to the Western Desert across the Nile Valley (Close 2002b). The arrival of the Levantine domesticates in the Egyptian Western Desert is a consequence of the southward dispersal of sheep/goat herding in the southern Levant which started no later than the PPNC period, but this description of the diffusion process does not explain how and why the Levantine domesticates were adopted in the Egyptian Western Desert when they became available to the inhabitants of Egypt. This question will be answered by asking whether any other unprecedented things were happening in the Western Desert at that time.

It has been observed that a small number of bifacially-retouched projectile points, including tanged and concave-based ones, as well as bifacially-retouched large knives, appeared in such regions as Farafra Oasis, Djara, Dakhleh Oasis, and Nabta Playa just before or almost coincident with the introduction of domesticated sheep/goats into the Western Desert around 5,700 cal. B.C. Therefore, it may be assumed that the development of bifacial stone tools was somehow correlated with the beginning of sheep/goat herding in those regions. The reasons why bifacial stone tools did not appear in the Nile Valley in the Late Pleistocene but developed in the Western Desert in the Early-Middle Holocene may be clues

to understand how and why Levantine domesticates were adopted in the Western Desert at that time.

Origin and development of bifacially-retouched stone tools in the Western Desert

Through the Late Pleistocene and Early Holocene, lithic industries of North Africa have been dominated by the microlithic backed bladelet. According to Close (2002a), backed bladelets appeared suddenly out of nowhere all across North Africa from Morocco to Egypt 21,000-22,000 years ago, and endured for at least ten thousand years. A more curious thing is that although there were some interregional variations, the basic form of backed bladelets had been so standardised across the continent and millennia, irrespective of the availability and variability of raw material and the purposes of use. Therefore, one is tempted to assume some social factors behind this extreme consistency of backed bladelet. Given this historical and geographical context, a question arises as to why the toolmakers in the Egyptian Western Desert in the Early-Middle Holocene gave up their obsession with backed bladelets and started to make a variety of bifacially-retouched tools.

As far as we know, the earliest bifacially-retouched formal projectile points appeared not only in Dakhleh Oasis in the Bashendi A period but also in Djara in the Djara A period after 6,400 cal. B.C. (Gehlen et al. 2002; Kindermann 2003; 2004; McDonald 1991a). The Bashendi A specimens include concave-based, tanged, and leaf-shaped points of various sizes, whereas the Djara specimens do not include large concave-based and tanged ones at all in the earlier period named the Djara A (around 6,400-6,100 cal. B.C.) but large tanged ones appeared in the later period named the Djara B (around 5,800-5,400 cal. B.C.) after a short interval around 6,000-5,900 cal. B.C. Following this Djara sequence, it may be assumed in Dakhleh Oasis as well that all forms of bifacially-retouched projectile points which were roughly included in the Bashendi A period can be subdivided, and that tiny tanged and leaf-shaped ones are dated to the earlier half of the Bashendi A period while large concave-based and tanged ones are dated to the later half of the Bashendi A period. Other bifacially-retouched items like large knives are also notable in Dakhleh Oasis and Djara, and their date seems to be late in this sequence.

Bifacially-retouched formal projectile points flourished after 5,900 cal. B.C. in neighbouring regions such as Abu Gerara, Kharga Oasis and Farafra Oasis (Barich & Lucarini 2002; Caton-Thompson 1952; Hassan et al. 2001; Holmes 1992; Riemer 2003; Smith et al. 2004). Surface surveys at some sites along the margin of the Great Sand Sea, such as Siwa Oasis, Sitra, Lobo and Mudpans, yielded bifacially-retouched, leaf-shaped or tanged projectile points

which could be dated to around this period (Gehlen et al. 2002; Hassan & Gross 1987; Klees 1989; Cziesla 1989).

Further to the east, an investigation at Sodmein Cave in the mountainous terrain of the Red Sea coast yielded a certain number of bifacially-retouched, leaf-shaped projectile points which could be dated to around 5,800 cal. B.C. (Vermeersch et al. 1994; 1996). Further to the south, intensive surveys and excavations in the Nabta-Kiseiba region revealed that the first appearance of bifacially-retouched formal projectile points was in the Middle Ceramic Period (5,900-5,500 cal. B.C.) though they were quite rare, and that the number and variety of bifacially-retouched formal projectile points slightly increased in the subsequent Late Ceramic period (5,400-4,600 cal. B.C.) (Wendorf & Schild 2001; 2004).

It seems that the elaboration of bifacially-retouched tools culminated in the Fayum in northern Egypt around 5,200 cal. B.C. Projectile points, knives, axes and sickle blades were made by bifacial technology. Slightly after that, similar items appeared in neighbouring sites like Merimde Beni Salama in the western Nile Delta and El-Omari near modern Cairo, and this lithic tradition still survived in the Badarian culture of the 5th-4th Millennia cal. B.C. in the Nile Valley of Middle Egypt.

Judging from the evidence available at present, the origins of bifacially-retouched formal tools were somewhere in the middle of the Western Desert between the Great Sand Sea and the Nile Valley around the end of the Early Holocene, and the development and dispersal of bifacially-retouched formal tools continued through the Middle Holocene.

Natural preconditions of the appearance of bifacial stone tools in the Western Desert

The first point to be explained is why such a new set of bifacial stone tools as those observed in the above-mentioned sites had not appeared in the Late Pleistocene but developed in the Early-Middle Holocene. It is assumed that something was different between the Pleistocene and the Holocene, and that the difference gave the possibility for the development of such unprecedented tools.

1) Climate, flora and fauna

The Early Holocene climate of Northeastern Africa is characterised by the advent of generally wetter conditions but with recurrent and abrupt arid intervals after the Terminal Pleistocene aridity (Hassan 1996; 1997; Haynes 2001; Nicoll 2001; 2004). The major determinants of the climatic condition in Northeastern Africa are the Mediterranean polar front which comes from the north and spreads winter rain, and the African monsoonal rain belt which comes from the south and

deposits summer rain. The amount of rainfall has definitely affected the vegetation in Northeastern Africa, and the vegetation in the past as well as at present is a good indicator of the range of the northward-southward shifts of the Mediterranean polar front and African monsoonal rain belt. At present, the southern limit of Mediterranean flora is around the latitude of Cairo, while the northern limit of Sudano-Sahelian steppe shrubs is around the latitude of the Fifth Cataract of the Nile, and the vast area between these two distinct vegetation zones is absolute desert (Nicoll 2004). According to botanical and sedimentological studies, it seems that the Mediterranean polar front has shifted southward to around the latitude of Dakhleh-Kharga Oases, and the African monsoonal rain belt has also shifted northward to around the latitude of Dakhleh-Kharga Oases during the Holocene pluvial maximum dated to around 5,800-5,300 cal. B.C. (Haynes 1987; 2001; Neumann 1989a; 1989b). Recent discoveries of wild sorghum and Mediterranean poppies in Farafra Oasis (Hassan et al. 2001) also suggest the convergence of the African monsoonal rain belt and the Mediterranean polar front around this latitude in that period.

A remarkable change in subsistence in the Early-Middle Holocene Western Desert is the beginning of intensive exploitation of wild grasses including sorghum by hunter-gatherers in such sites as Nabta Playa, Abu Ballas and Farafra Oasis (Barakat 2002; Barakat & Fahmi 1999; Barich & Lucarini 2002; Barich & Hassan 2000; Hassan et al. 2001; Wasylikowa et al. 1993; 1997; 2001; Wasylikowa & Dahlberg 1999). It has been argued that Holocene plants were more productive, nutrient-rich, and cold/drought tolerant than Pleistocene plants due to the improvement of the atmosphere for plant growth, and hence it was almost inevitable for Holocene hunter-gatherers to become increasingly dependent on plant food (Bettinger 2001). Therefore, the beginning of intensive plant exploitation in the Western Desert in the Early Holocene is quite reasonable.

Other remarkable changes are the beginning of cattle herding in such sites as Nabta Playa, Bir Kiseiba and Dakhleh Oasis, and the beginning of sheep/goat herding in such sites as Nabta Playa, Dakhleh Oasis and Farafra Oasis (Barich & Lucarini 2002; Barich & Hassan 2000; McDonald 1998; Wendorf et al. 1984; Wendorf & Schild 1994; 2001). The beginning of animal herding is obviously related to the spread of new vegetation during the Early Holocene, because wild grasses in the Western Desert must not only have attracted wild game animals but also have become good pasture plants for livestock (Wasylikowa et al. 1997; 2001). Therefore, the explanation of the appearance of unprecedented bifacial stone tools in the Western Desert in the Early-Middle Holocene must take account of the spread of new vegetation caused by the Holocene atmosphere and pluvial regime. It may be assumed that the development of bifacial projectile points was triggered by the beginning of the hunting of previously less-encoun-

tered animals which were attracted by the pasture plants, or the beginning of more intensive hunting of familiar animals in the Western Desert.

The extensive Late Palaeolithic fauna from the Kom Ombo Plain in the Nile Valley provides a good sample of the wild animals which have been present in a well-watered environment under cool and dry climatic conditions of the Terminal Pleistocene. Only six ungulate species, including hippopotamus, wild cattle, hartebeest, wild ass, dorcas gazelle, and barbary sheep, occurred in Kom Ombo (Peters 1990). They are definitely the faunal base on which hunters in the Western Desert in the Early-Middle Holocene have depended (Van Neer & Uerpmann 1989).

Major game animals in the Nabta-Kiseiba region in the Early-Middle Holocene had been dorcas gazelle and hare, both of which are desert-adapted and water-independent species, and it seems that the Nabta-Kiseiba region had never become wet enough to attract more water-dependent animals like hartebeest and hippopotamus even in the Early Holocene optimum (Gautier 1984; 2001). Therefore, the former assumption that the beginning of the hunting of previously less-encountered animals triggered the development of bifacial projectile points is apparently not the case in the Nabta-Kiseiba region. An important fact is that the number of gazelle in the archaeological record of the Nabta-Kiseiba region decreased through the Early-Middle Holocene while the number of hare increased. This may possibly imply that bifacial projectile points were inventions to raise the success rate of the hunting of gazelles which were going extinct. In the Nabta-Kiseiba region, it has been reported that the first appearance of bifacially-retouched points was in the Middle Ceramic period (5,800 cal. B.C. onward), and this is almost coincident with the decrease of the number of gazelles. However, it can be said that flake points are not necessarily inferior to bifacially-retouched points in terms of flying distance and killing power, especially if other attributes such as shape and weight are equal. In the Middle and Late Ceramic periods, bifacially-retouched points seem to have been very few, and less-retouched flake points had never been replaced by bifacially-retouched points. Therefore, the appearance of bifacial points in this region cannot be explained in terms of functional superiority but rather in terms of differences in hunting strategy as to whether it is on a stalk basis or an ambush basis, and such differences may have affected the time spent to make and repair points.

In Dakhleh Oasis, there is very scarce evidence for the fauna in the Early Holocene, but ample evidence has shown the presence of the basic ungulate species mentioned above except for barbary sheep, and the presence of the Ethiopian fauna including elephant and giraffe has also been suggested in the Middle Holocene (Churcher 1999). There is some doubt as to whether the remains of the Ethiopian fauna derived from the Middle Palaeolithic context and

were accidentally associated with the Holocene artefacts, because both of them were surface finds (Close 1992: 171). But if the Ethiopian fauna under question was actually associated with the Middle Holocene environment, it was certainly a new addition to the basic fauna in Egypt and hence previously less-encountered. Although it is not certain whether these new large animals became the prey of hunters in Dakhleh Oasis in the Middle Holocene, the number, variety and size of bifacial projectile points became large through the Bashendi A and B periods, and interestingly, it seems that elephant, giraffe and hippopotamus went extinct during the Middle Holocene. It may possibly be assumed that their extinction was caused not only by increasing aridity but also by overhunting, and that large bifacial projectile points which first appeared in the Bashendi A period played a role in the overhunting. Hunting large and tough animals must have required special techniques, and it is reasonable to think that the large concave-based or tanged bifacial projectile points must have been used to tip either hand-held spears or throwing spears, and the spears were delivered to large, slow-moving animals at closer range under greater control and with greater force, than arrows which were tipped by small and light points and shot at relatively small, fast-moving animals from a distance with relatively less accuracy. Indeed, in the Neolithic of the Fayum, two large concave-based spearheads were found embedded in the bones of elephant and hippopotamus respectively (Caton-Thompson & Gardner 1934: 72, 84), and these findings clearly indicate at what kinds of target animals such large concave-based spearheads were shot.

As for possible targets, one question is why there were large concave-based or tanged bifacial projectile points in the sites of Djara, Farafra Oasis, and the Nabta-Kiseiba region, where the existence of large game animals like elephant and hippopotamus has not been reported. Large and heavy concave-based or tanged bifacial projectile points are apparently not suitable for tipping arrows, because arrows tipped by such heavy points would be seriously unbalanced and their flying performance would not be good. Even though such large projectile points did tip hand-held spears or throwing spears, spears are not suitable for hunting fast-moving animals like dorcas gazelles, which were the most common in those sites, but are the most effective against large aggressive animals which are inclined to counterattack rather than flee. Therefore, different explanations about the targets of large bifacial projectile points are necessary. One possible explanation is that those large projectile points were designed to kill humans and not animals. This possibility will be discussed later in relation to social circumstances.

2) Geography

The second point to be explained is why such a new set of bifacial tools had not appeared first in the Nile Valley but developed first in the middle of the

Western Desert. It is assumed that something was different between the Nile Valley and the Western Desert, and that the difference gave the possibility for the development of such unprecedented tools. It is widely recognised that procurement of lithic raw materials is absolutely essential for making stone tools, and the availability and quality of lithic raw materials critically affect and condition the making of stone tools (e.g., Andresky 1994; Bamforth 1986). Therefore, the distribution of sources of lithic raw materials in the Western Desert and the Nile Valley must have offered possibilities and constraints for tool making.

In terms of geography, the main area where bifacially-retouched formal tools developed in the Early-Middle Holocene is a vast rocky plain on the Limestone Plateau which abuts the Nile Valley in the east, between the latitude of Esna in the south and the Fayum in the north. Extensive scarps of the Limestone Plateau are seen in the west, and major oases are located at the foot of the scarps. Wherever bifacially-retouched formal tools appeared in the Early-Middle Holocene, such as Siwa Oasis, Farafra Oasis, Dakhleh Oasis, Kharga Oasis, Djara, Abu Gerara, Sitra and Lobo, it seems that good quality lithic raw materials like flint were abundant locally or available in the vicinity, and there is no evidence for long distance transport of exotic raw materials. It must be noted that the remains of lithic workshops have been reported in some of these sites (Barich 1996; Caton-Thompson 1952; Cziesla 1989; Hassan and Gross 1987; Kindermann 2003; 2004; Klees 1989; Kuper 1996; 2002). They indicate that lithic raw material procurement and subsequent reduction took place locally, and that tools were also made locally.

In contrast, the Nabta-Kiseiba region, which was another major centre of Early-Middle Holocene cultures, is characterised by a flat or undulating desert plain on the Nubian sandstone bedrock with a number of playas, a series of sandstone scarps capped by thin flint layers, named the Kiseiba Scarp, and some sandstone outcrops like the Gebel Nabta, and the vast area next to the Kiseiba Scarp is dominated by the Selima Sand Sheet. It has been revealed that it was not uncommon for the inhabitants of playa sites in the Nabta-Kiseiba region in the Early-Middle Holocene to bring good quality lithic raw materials like flint from remote scarps, even though they exploited locally-available, coarse-grained raw materials like quartzitic sandstone, and there were few bifacially-retouched formal tools (Wendorf & Schild 2001; Wendorf et al. 1984). In the sites of Bir Safsaf, where the ground surface is almost covered by sand and no rock outcrops are readily available, people who used this area seasonally while harvesting wild grasses and herding cattle in the Early-Middle Holocene, had no other choice but to bring all lithic raw materials and tools with them from outside the area, and no elaborate tools developed (Close 1990; 1996).

On the basis of these contrasting geographical and geological conditions between the north and south of the Western Desert, it may be presumed that easy access to the sources of fine-grained flint on and around the Limestone Plateau in the north of the Western Desert could be an advantage for the development of bifacially-retouched formal tools earlier than that in the south, where the sandstone bedrock predominates. Since there are few comparable contemporary archaeological sites in the Nile Valley, it is hard to argue whether accessibility to good quality nodules or cobbles of flint in the Nile Valley affected the development of bifacially-retouched formal tools. In the Nile Valley, flint nodules occur not only on the upland surface but also in consolidated deposits exposed at the rock wall of the valley. In addition, it is also possible to exploit secondary deposits of flint cobbles which were eroded out from the valley wall and transported downslope to the streambed. It seems that this situation was favourable enough for the development of bifacially-retouched formal tools which require fine-grained raw material of a certain size. Therefore, it may be that the lack of such tools in the Nile Valley in the Early-Middle Holocene is simply due to the problem of site preservation (Vermeersch 2002), but other possible reasons will be discussed later.

Interpretations of bifacially-retouched stone tools

Given these natural conditions, the next step is to examine and interpret the appearance and development of bifacial stone tools in the Early-Middle Holocene Western Desert in terms of adaptive strategy and emergent social complexity.

1) Adaptive strategy

Raw material economy is the first concern of the adaptive strategy of hunter-herder-gatherers. According to the idea of economising behaviour (Odell 1996), toolmakers make the most of hard-to-obtain or scarce lithic raw materials, not only by obtaining as many usable flakes as possible from a lithic core, but also by making tools and then using, reshaping, and recycling them repeatedly, in case the raw materials at hand are depleted and access to the sources is unpredictable. Such a series of behaviour can foster the ability to make labour-intensive bifacial tools. An important insight is that bifacial tools are inclined to develop among highly mobile people who forage in the environments where the availability of good lithic raw materials is occasionally limited. In contrast, it has been argued that in the environments where good lithic raw materials are everywhere and readily available, toolmakers are likely to waste the materials and to prefer expedient cores and tools, and thus time-consuming and labour-intensive stone tools do not always develop (Bamforth 1986; Parry & Kelly 1987).

The case of the Nabta-Kiseiba region and Bir Safsaf seems to contradict this idea of economising behaviour. It is thought that Early-Middle Holocene people visited the sites of the Nabta-Kiseiba region and Bir Safsaf after summer rainfall and stayed there for short periods, and hence they were quite nomadic. One study in a playa site in the Nabta-Kiseiba region revealed that more than half of all lithic raw materials used there derived from source areas some 100 km away from the site. The preferred raw material, flint, was brought there in the form of unworked cobble as well as partly decortificated core, but no bifacially-retouched formal tools developed there (Kobusiewicz 1984). Another study in a couple of playa sites in the Nabta-Kiseiba region revealed that people used flint cores in a rather wasteful manner despite a burden of obtaining flint from distant source areas (Close 1999). In Bir Safsaf, people not only carried large flakes as blanks for making partly-retouched tools but also carried cores and struck off a series of flakes when the occasion arose, and they sometimes brought unimaginably heavy unworked blocks of quartzitic sandstone, presumably for future use (Close 1990; 1996). Although they made a certain variety of tools, most tools remained simple, and no bifacially-retouched formal tools developed. These facts seem to suggest that making bifacial tools in advance, and resharpening during use and movement, are not necessarily the only means to economise the use of hard-to-obtain or scarce raw materials, and that toolmakers could find it better to carry lithic cores than to carry completed tools, probably because they adopted a circulating mobility strategy on a seasonal basis and their lithic raw material procurement had been embedded in their routine movement. It may also be concluded that the abundance of good quality lithic raw materials was a necessary but not a sufficient condition for the development of bifacial stone tools in the Western Desert. In addition to toolmakers' consideration on raw material economy, some other socioeconomic circumstances must have required or allowed the development of bifacial stone tools.

Adaptive strategy can also be discussed in terms of the tool curation/expediency dichotomy, or the tool reliability/maintainability dichotomy. Although the concept of curation has been abundantly discussed (e.g., Nelson 1991; Odell 2001) and the economising behaviour mentioned above is also one of curatorial adaptation, most arguments have centred on the difference between curated and expedient lithic technologies depending on the difference in mobility strategies. Foragers who are characterised by a residential mobility strategy are concerned with the risk that tools may break so badly and cannot be used on the next occasion, especially while they are moving in an environment where lithic raw materials are not always readily available, and hence tool maintainability is very important for them. In contrast, collectors who are characterised by a logistical mobility strategy are more concerned with the risk that tools may fail to serve for expected tasks on specific occasions, and hence tool reliability as well

as tool maintainability is critical. Therefore, highly specialised tools can be developed in this context at the expense of maintainability or versatility. Curated tools are made at residential sites in advance of expected tasks at distant sites, transported from site to site, resharpened and used repeatedly, whereas expedient tools are made at task sites at the time of need, used and then discarded upon completion of the task (Bettinger 2001; Binford 1979; 1980; Bleed 1986). Curatorial behaviour implies that toolmakers can afford to spend much time making and resharpening specialised tools for specific tasks, and this behaviour would result in the elaboration of the tools.

In the Western Desert in the Early-Middle Holocene, informal flake tools include sickles, scrapers, perforators, notches and denticulates, which seem to be related to food gathering and craft working tasks, whereas bifacially-retouched formal tools include arrowheads, spearheads and large knives, and they seem to be related to hunting and butchering. This suggests that curation was mainly applied to hunting and butchering tools, and that hunting and butchering were logistically organised. In other words, the development of highly-specialised tools like bifacially-retouched projectile points and knives in basically expediently-made tool assemblages in such sites as Dakhleh Oasis, Farafra Oasis and Djara in the Early-Middle Holocene may indicate the decline of encounter hunting and the emergence of a certain degree of sedentism combined with logistical mobility.

Although the Western Desert became inhabitable in the Early Holocene wet phases, there is no doubt that people had to aggregate around water sources like oases and ephemeral lakes fed by rainfall while adopting a logistical mobility strategy or a circulating mobility strategy on a seasonal basis. Therefore, a degree of sedentism must have been a necessary solution to maintain a close link to water sources and accompanying food resources, and the necessity of sedentism must have been recognised more seriously by the inhabitants of the Western Desert than it had been by those who inhabited the Nile Valley, because the number of water sources was limited in the Western Desert. Even in the Nile Valley, many human bodies which show the evidence of violent death at Late Palaeolithic sites of Wadi Kubbaniya and Gebel Sahaba (Wendorf 1968; Wendorf & Schild 1986) suggest that fierce conflicts between human groups were not uncommon in the Terminal Pleistocene, and it seems likely that such conflicts had been caused by claims for access to essential resources. It may be said that stressful situations and some degree of conflict between different human groups were features of life during the Terminal Pleistocene. Improvement of climate and resultant resource abundance in the Early Holocene may not immediately have led to human population increase, but must have increased its chances. No evidence of violence in the Early-Middle Holocene Western Desert may suggest

the appearance of a new set of social relationships which reduced bloody conflicts.

As more people aggregated around a limited number of water sources perennially or seasonally, the rights to the water sources and accompanying food resources may have become more specific and rigid, and the notion of territoriality may have been generated. In such circumstances, freedom of movement for food quests must have become gradually hampered, even though the rights to visit each other's territory may have been ensured by socioeconomic ties like reciprocity and exogamy. In the case of the Western Desert in the Early-Middle Holocene, recurrent arid intervals could be another cause of stressful situations, and population/resource imbalances must have continually taken place in the short term. It has been argued that in such circumstances much labour may have become increasingly invested to ensure sufficient yield from one's own territory, because it was burdensome to visit and exploit an other's territory. Procuring and storing as many food resources as possible while they were abundantly available would become key subsistence strategies, no matter how time-consuming and labour-intensive the foraging and processing of the food resources were (Bettinger 2001). It has also been argued that such an intensification of food procurement in circumscribed habitats had the potential to lead to the beginning of food production, especially if predictable, relocatable and tameable food resources were available (Rosenberg 1990; 1998).

A tendency toward a certain degree of sedentism has been inferred in Nabta Playa and Dakhleh Oasis as early as the Early Holocene on the basis of lithic assemblages, site distribution and the existence of water wells and storage pits for harvested wild grass seeds (Kobusiewicz 2003; McDonald 1991b; 1998; Wendorf & Schild 1998; 2001; 2002b; 2003). It would be possible that moderately stressful situations over the procurement of water and food took place in these regions, and that digging water wells and storing surplus food were viable solutions to stay in one's own territory as long as possible and to avoid unnecessary conflicts with people inhabiting neighbouring areas. Although both regions seem to have been abandoned around 6,000 cal. B.C. due to a short arid interval, when people returned there to settle down again after 5,900 cal. B.C., they brought domesticated sheep/goats. It may be possible to suggest that domesticated sheep/goats were another solution to augment the amount of available food resources, thereby adjusting population/resource imbalances in circumscribed habitats.

It must be noted that the people in both regions were equipped with bifacial stone tools just before or almost coincident with the adoption of domesticated sheep/goats. A similar phenomenon is observed in Farafra Oasis and Djara as well, though their date seems to be a little later (Barich 1996; Barich & Hassan

2000; Barich et al. 1996; Gehlen et al. 2002; Kindermann 2004). Therefore, the explanation of why bifacial stone tools first appeared and developed in the Western Desert in the Early-Middle Holocene must take into account the possibility of increasing unprecedented social stress, which may have been caused by growing population and emerging rigid territoriality. Considering such possible social circumstances, the presence of unreasonably large bifacial projectile points and the absence of probable target animals in Farafra Oasis, Djara and the Nabta-Kiseiba region may imply that those projectile points were designed to kill enemy humans, as mentioned above. However, since there is no clear evidence for violent death of humans in the Western Desert in the Early-Middle Holocene, it is hard to know whether large projectile points were actually used to attack enemy people. No evidence of violence seems to suggest that people became smart enough to reconcile territorial conflicts in alternative ways.

2) Emergent social complexity

An alternative interpretation about the development of bifacial stone tools in such possible social circumstances is that the bifacial stone tools had some symbolic meanings and some significance for the establishment and maintenance of intra/inter-group relationships. As discussed above, it may be said that both less-retouched informal flake tools and bifacially-retouched formal tools can serve for cutting or thrusting tasks in almost the same manner. The question is why toolmakers took the trouble to make time-consuming bifacial tools even if informal flake tools were able to serve the same purpose. The toolmakers' concern about tool reliability/maintainability must be one reason, but the non-utilitarian function of bifacial stone tools must also be taken into consideration.

It has been argued that even anatomically pre-modern Acheulian hominids made fine symmetrical handaxes in order to attract mates by showing their ability to make high quality tools and proving themselves intelligent and physically healthy, because they were living in large, complex and competitive societies in which sexual selection pressures and inter-male competition for mates were intense (Kohn & Mithen 1999). It has also been argued that anatomically and behaviourally modern humans acquired the ability of making more elaborate bifacial stone tools and possibly giving them symbolic meanings as well as utilitarian functions, as seen in Solutrean bifacial stone projectile points and knives in Upper Palaeolithic Europe. The reason why symbolic meanings were given to bifacial stone tools is because people were living in the severe environment of the Last Glacial Maximum, where personal qualities such as carefulness, perseverance and exactitude displayed in hunting were very much appreciated. As a consequence, a correspondence may have been created between similar skills exercised in hunting and tool making, and the stone tools became not only utilitarian objects but also symbolic items which communicated meaning about

both the nature of the tasks for which they were used and the person who undertook the tasks (Sinclair 1995). The reason why the toolmakers were enthusiastic about acquiring such appreciation is that excellent hunting weapon makers had the right to get a large portion of meat procured by hunting or the right to distribute the meat, as has been demonstrated by ethnological studies (e.g., Wiessner 1983). The food quest can provide hunters or toolmakers with great opportunities to raise their status through procuring and distributing food (Wiessner 1996). In this sense, it is no wonder that bifacial technology was applied to butchering tools like large knives as well in the Solutrean case, because butchering was another important concern of ambitious food providers. Butchering knives are quite visible to many people waiting for the distribution of meat, and hence some symbolic meanings are likely to be given to the knives.

On the other hand, there is another study suggesting that a very small number of bifacially-retouched formal projectile points among basically expedient tool assemblages in a Ceramic Late Stone Age culture in Ghana, may probably have been made by male hunters who had sometimes gone out of their own territory. The hunters encoded some messages regarding their personal and group identity in the uniquely-made projectile points, expecting that people living in neighbouring territories would pick up stray projectile points on the ground by chance and know about the presence of neighbours. In a sense, widely-distributed and visible items like projectile points would have functioned as business cards and occasionally claimed territorial expansion (Casey 1998). Such a case has been known in the ethnology of the Kalahari Bushmen (Wiessner 1983).

It can be said that essential tools for survival are likely to become the media for the representation of personal or group identity. Using Wiessner's terms (1983), assertive style, which carries the message that the maker or owner is different from others, as well as emblemic style, which stresses conscious affiliation to a certain group, can appear in such tools. It should be noted that bifacial technology was initially applied exclusively to hunting and butchering tools in the Egyptian Western Desert in the Early-Middle Holocene. Therefore, I assume that bifacial stone tools in the Western Desert in the Early-Middle Holocene have not merely been utilitarian objects but also symbolic items which represented personal or group identity and delivered social messages to other people in and outside their community. In other words, the appearance and development of elaborate bifacial stone tools in the Egyptian Western Desert in the Early-Middle Holocene may probably be interpreted as a reflection of internally and externally stressful circumstances and resultant competitive aestheticism among toolmakers.

It has also been known in ethnological studies that elaborate projectile points made by renowned toolmakers were often shared or exchanged among

hunters who believed that well-made projectile points would ensure good hunting, and hence the projectile points could move long distances by inter-group exchange (Hitchcock & Bleed 1997). If such an ethnological example is the case in the Egyptian Western Desert in the Early-Middle Holocene, the presence of unreasonably large and elaborate formal stone tools without possible target animals may be explained in terms of symbolic and stylistic behaviours by hunters who wished the success of hunting and satisfied their vanity, rather than bloody conflicts between aggressive men.

Implications of the development of bifacial stone tools for the beginning of animal herding in the Western Desert

While most scholars are coming to agree that a resource-rich environment is an essential condition for the emergence of social complexity and the beginning of food production, there is still controversy over what conditions could drive prehistoric people to intensify food procurement and to compete with each other (Hayden 1995; 2001). In the case of Egypt, it seems plausible that moderately stressful and circumscribed situations under periodically or seasonally resource-rich conditions of the Early-Middle Holocene Western Desert have caused recurrent population/resource imbalances on an unprecedented scale and have driven the inhabitants to enhance food security through storage, sedentism and territoriality. In contrast, the Nile Valley seems to have escaped such stressful and circumscribed situations and failed to encourage the inhabitants to intensify their subsistence, even though a degree of inflow of refugees from the Western Desert may have caused some social tensions and reorganisations of territories.

If bifacial stone tools in the Western Desert in the Early-Middle Holocene were a reflection of emerging socioeconomic competition among individuals, who were enthusiastic about raising their status by procuring and providing food through using elaborate stone tools, then the introduction of domesticated sheep/goats into several regions may also be interpreted to have been motivated by such competition as well as a need for reliable back-up food. The lack of elaborate stone tools in the Nile Valley in the Early-Middle Holocene may also be interpreted as an indication that less stressful situations retarded the adoption of domesticates. Novel food like the meat of domesticates and their dairy products may have enabled ambitious food providers to get ahead of the competition. The reasons why elaboration of bifacial projectile points and knives continued after the period of the initial adoption of domesticates and culminated in the Fayum Neolithic and the Badarian Predynastic culture, may be because hunting was still a prestigious task in most regions regardless of the availability of the domesticates, and because bifacial stone tools did not easily lose their value as the media of social representation or the means of status display.

As has been argued in Near Eastern Neolithic research (e.g., Goring-Morris & Belfer-Cohen 2001), stylistic and symbolic aspects of seemingly utilitarian material culture like lithics should not be ignored for a better understanding of the dynamics of prehistoric societies. Emergent social complexity in the Western Desert in the Early-Middle Holocene has been inferred on the basis of the spread of a limited number of pottery vessels after 9,000 cal. B.C. (Close 1995) or the appearance of monumental stone structures after 5,400 cal. B.C. (Wendorf & Schild 1998; 2001; 2002a; 2004), but the innovation in lithic technology after 6,400 cal. B.C. must be regarded as a symptom of incipient socio-economic complexity which, in some cases, led to the adoption of foreign domesticates in the Western Desert.

References

ANDRESKY, W. 1994. Raw-material availability and the organization of technology, *American Antiquity* 59: 21-34.

BAMFORTH, D.B., 1986. Technological efficiency and tool curation, *American Antiquity* 51: 38-50.

BARAKAT, H.N. 2002. Regional pathways to agriculture in Northeast Africa. In: F.A. HASSAN (ed.), *Droughts, Food and Culture: Ecological change and food security in Africa's later prehistory*: 111-122. New York. Kluwer Academic/Plenum Publishers:

BARAKAT, H.N. and A.G. FAHMY. 1999. Wild grasses as 'Neolithic' Food Resources in the Eastern Sahara: A Review of Evidence from Egypt. In: M. Van der Veen (ed.), *The Exploitation of Plant Resources in Ancient Africa*: 33-46. New York: Kluwer Academic/Plenum Publishers.

BARICH, B.E. 1996. Archaeology of Farafra (Western Desert, Egypt): Settlement patterns and implications for food production in the El Bahr-El Obeiyid Region. In: G. Pwiti and R. Soper (eds), *Aspects of African Archaeology: Papers from the 10th Congress of the Pan African Association for Prehistory and Related Studies*: 401-409. Harare: University of Zimbabwe Publications.

BARICH, B.E., and F.A. HASSAN. 2000. A stratified sequence from Wadi el-Obeiyd, Farafra: new data on subsistence and chronology of the Egyptian Western Desert. In: L. Krzyzaniak, K. Kroeper and M. Kobusiewicz (eds), *Recent Research into the Stone Age of Northeastern Africa*: 11-20. Poznan: Poznan Archaeological Museum.

BARICH, B.E., and G. LUCARINI. 2002. Archaeology of Farafra Oasis (Western Desert, Egypt): A survey of the most recent research, *Archéo-Nil* 12: 101-108.

BARICH, B.E., F.A. HASSAN and A. STOPPIELLO. 1996. Farafra Oasis between the Sahara and the Nile. In: L. Krzyzaniak et al. (eds) 1996: 71-79.

BETTINGER, R.L. 2001. Holocene Hunter-Gatherers. In: G.M. Feinman and T.D. Price (eds), *Archaeology at the Millennium: A Sourcebook*: 137-195. New York. Kluwer Academic/Plenum Publishers.

BINFORD, L.R. 1979. Organization and formation processes: looking at curated technologies, *Journal of Anthropological Research* 35: 255-273.

..... 1980. Willow smoke and dogs' tails: hunter-gatherer settlement systems and archaeological site formation, *American Antiquity* 45: 4-20.

BLEED, P. 1986. The optimal design of hunting weapons: maintainability or reliability, *American Antiquity* 51/4: 737-747.

CASEY, J. 1998. Just a Formality: The Presence of Fancy Projectile Points in a Basic Tool Assemblage. In: S. Kent (ed.), *Gender in African* Prehistory: 83-103. Walnut Creek: AltaMira Press.

CATON-THOMPSON, G. 1952. The *Kharga Oasis in Prehistory*. London: The Ashlone Press.

CATON-THOMPSON, G. and E.W. GARDNER. 1934. *The Desert Fayum*: London. The Royal Anthropological Institute of Great Britain and Ireland.

CHURCHER, C.S. 1999. Holocene Faunas of the Dakhleh Oasis. In: C.S. Churcher and A.J. Mills (eds), *Reports from the Survey of the Dakhleh Oasis, Western Desert of Egypt 1977-1987*: 133-151. Oxford: Oxbow Books.

CLOSE, A.E. 1990. Living on the edge: Neolithic herders in the eastern Sahara, *Antiquity* 64: 79-96.

..... 1992. Holocene Occupation of the Eastern Sahara. In: F. Klees and R. Kuper (eds), *New Light on the Northeast African Past*: 156-183. Köln: Heinrich Barth Institut.

..... 1995. Few and Far Between: Early Ceramics in North Africa. In: W. Barnett and J. Hoopes (eds), *The Emergence of Pottery: Technology and Innovation in Ancient Societies*: 23-37. Washington: Smithsonian Institution Press.

..... 1996. Carry that weight: The use and transportation of stone tools, *Current Anthropology* 37: 545-553.

..... 1999. Distance and decay: an uneasy relationship, *Antiquity* 73: 24-32.

..... 2002a. Backed bladelets are a foreign country. In: R.G. Elston and S.L. Kuhn (eds), *Thinking Small: Global Perspectives on* Microlithization: 31-44. Arlington: American Anthropological Association.

..... 2002b. Sinai, Sahara, Sahel: The introduction of domestic caprines to Africa. In: Jennerstrasse 8 (eds) 2002: 459-469.

CZIESLA, E. 1989. Sitra and related sites at the western border of Egypt. In: L. Krzyzaniak and M. Kobusiewicz (eds), *Late Prehistory of the Nile Basin and the Sahara*: 205-214. Poznan: Poznan Archaeological Museum.

GAUTIER, A. 1984. Archaeozoology of the Bir Kiseiba region, Eastern Sahara. In: F. Wendorf, R. Schild and A.E. Close (eds), 1984. *Cattle-Keepers of the Eastern Sahara: The Neolithic of Bir Kiseiba*: 49-72. Dallas: South Methodist University Press.

..... 2001. The Early to Late Neolithic Archeofaunas from Nabta and Bir Kiseiba. In: F. Wendorf and R. Schild (eds) 2001: 609-635.

GEHLEN, B., K. KINDERMANN, J. LINSTÄDTER and H. RIEMER. 2002. The Holocene Occupation of the Eastern Sahara: Regional Chronologies and Supra-regional

Developments in four Areas of the Absolute Desert. In: Jennerstrasse 8 (eds) 2002: 85-116.

GORING-MORRIS, N. and A. BELFER-COHEN. 2001. The symbolic realms of utilitarian material culture: the role of lithics. In: I. Caneva, C. Lemorini, D. Zampetti and P. Biagi (eds), *Beyond Tools: Redefining the PPN Lithic Assemblages of the Levant*: 257-271. Berlin: ex oriente.

HASSAN, F.A. and G.T. GROSS. 1987. Resources and Subsistence during the Early Holocene at Siwa Oasis, Northern Egypt. In: A.E. Close (ed.), *Prehistory of Arid North Africa: Essays in Honor of Fred Wendorf*: 85-103. Dallas: Southern Methodist University Press.

HASSAN, F.A., B.E. BARICH, M. MAHMOUD and M.A. HAMDEN. 2001. Holocene Playa Deposits of Farafra Oasis, Egypt, and Their Palaeoclimatic and Geoarchaeological Significance, *Geoarchaeology* 16/1: 29-46.

HAYDEN, B. 1995. Pathways to Power: Principles for Creating Socioeconomic Inequalities. In: T.D. Price and G.M. Feinman (eds), *Foundations of Social Inequality*: 15-86. New York: Plenum Press.

..... 2001. Richman, Poorman, Beggarman, Chief: The Dynamics of Social Inequality. In: G.M. Feinman and T.D. Price (eds), *Archaeology at the Millennium: A Sourcebook*: 231-272. New York: Kluwer Academic/Plenum Publishers.

HAYNES, C.V. 1987. Holocene Migration Rates of the Sudano-Sahelian Wetting Front, Arba'in Desert, Eastern Sahara. In: A.E. Close (ed.), *Prehistory of Arid North Africa: Essays in Honor of Fred Wendorf*: 69-84. Dallas: Southern Methodist University Press.

..... 2001. Geochronology and Climate Change of the Pleistocene-Holocene Transition in the Darb el Arba'in Desert, Eastern Sahara, *Geoarchaeology* 16/1: 119-141.

HITCHCOCK, R. and P. BLEED. 1997. Each according to need and fashion: Spear and arrow use among San hunters of the Kalahari. In: H. Knecht (ed.), *Projectile Technology*: 345-368. New York: Plenum Press.

HOLMES, D.L. 1992. Analysis and Comparison of Some Prehistoric Projectile Points from Egypt, *University College London Institute of Archaeology Bulletin* 28. 99-131.

JENNERSTRASSE 8 (eds). 2002. *Tides of the Desert: Contributions to the Archaeology and Environmental History of Africa in Honour of Rudolph Kuper*. Köln: Heinrich Barth Institut.

KINDERMANN, K. 2002. Djara: Prehistoric Links between the Desert and the Nile. In: Z. Hawass (ed.), *Egyptology at the Dawn of the Twenty-First Century: Proceedings of the Eighth International Congress of Egyptologists Cairo 2000*: 272-279. Cairo: American University in Cairo Press:

KINDERMANN, K. 2003. Investigations of the Mid-Holocene settlement of Djara (Abu Muhariq Plateau, Western Desert of Egypt). In: L. Krzyzaniak et al. (eds) 2003: 51-72.

KINDERMANN, K., 2004. Djara: Excavations and surveys of the 1998-2002 seasons, *Archéo-Nil* 14: 31-50.

KLEES, F. 1989. Lobo: a contribution to the prehistory of the eastern Sand Sea and the Egyptian oases. In: L. Krzyzaniak and M. Kobusiewicz (eds), *Late Prehistory of the Nile Basin and the Sahara*: 223-231. Poznan: Poznan Archaeological Museum.

KOBUSIEWICZ, M. 1984. Report on Site E-79-4: The Archaeology of El Ghorab Playa. In: F. Wendorf, R. Schild and A.E. Close (eds), *Cattle-Keepers of the Eastern Sahara: The Neolithic of Bir Kiseiba*: 135-164. Dallas: South Methodist University Press.

..... 2003. Neolithic wells of the Western Desert of Egypt. In: L. Krzyzaniak et al. (eds) 2003: 95-104.

KOHN, M. and S. MITHEN. 1999. Handaxes: products of sexual selection? *Antiquity* 73: 518-526.

KRZYZANIAK, L., K. KROEPER and M. KOBUSIEWICZ (eds). 1996. *Interregional Contacts in the Later Prehistory of Northeastern Africa*, Poznan : Poznan Archaeological Museum.

..... (eds). 2003. *Cultural Markers in the Later Prehistory of Northeastern Africa and Recent Research*. Poznan: Poznan Archaeological Museum.

KUPER, R. 1996. Between the Oases and the Nile – Djara: Rohlfs' Cave in the Western Desert. In: L. Krzyzaniak et al. (eds) 1996: 81-91.

..... 2002. Routes and Roots in Egypt's Western Desert: The Early Holocene Resettlement of the Eastern Sahara. In: R. Friedman (ed.), *Egypt and Nubia: Gifts of the* Desert: 1-12. London: The British Museum Press.

MCDONALD, M.M.A. 1991a. Origins of the Neolithic in the Nile Valley as seen from Dakhleh Oasis in the Egyptian Western Desert, *Sahara* 4: 41-52.

..... 1991b. Technological organization and sedentism in the Epipalaeolithic of Dakhleh Oasis, Egypt, *African Archaeological Review* 9: 81-109.

..... 1996. Relations between Dakhleh Oasis and the Nile Valley in the Mid-Holocene: a discussion. In: L L. Krzyzaniak et al. (eds) 1996: 93-99.

..... 1998. Early African Pastoralism: View from Dakhleh Oasis (South Central Egypt), *Journal of Anthropological Archaeology* 17: 124-142.

NELSON, M. 1991. The Study of Technological Organization, *Archaeological Method and Theory* 3: 57-100.

NEUMANN, K. 1989a. Zur Vegetationsgeschichte der Ostsahara im Holozän: Holzkohlen aus prähistorischen Fundstellen. In: R. Kuper (ed.), *Forschungen zur Umweltgeschichte der Ostsahara*: 13-181. Köln: Heinrich Barth Institut.

..... 1989b. Holocene vegetation of the Eastern Sahara: charcoal from prehistoric sites, *The African Archaeological Review* 7: 97-116.

NICOLL, K. 2001. Radiocarbon Chronologies for Prehistoric Human Occupation and Hydroclimatic Change in Egypt and Northern Sudan, *Geoarchaeology* 16/1: 47-64.

..... 2004. Recent environmental change and prehistoric human activity in Egypt and Northern Sudan, *Quaternary Science Review* 23: 561-580.

ODELL, G.H. 1996. Economizing Behavior and the Concept of Curation. In: G.H. Odell (ed.), *Stone Tools: Theoretical Insights into Human* Prehistory: 51-80. New York: Plenum Press.

..... 2001. Stone Tool Research at the End of the Millennium: Classification, Function, and Behavior, *Journal of Archaeological Research* 9: 45-100.

PARRY, W.J. and R.L. KELLY. 1987. Expedient Core Technology and Sedentism. In: J.K. Johnson and C.A. Morrow (eds), *The Organization of Core Technology*: 285-304. Boulder: Westview Press.

PETERS, J. 1990. Late Palaeolithic Ungulate Fauna and Landscape in the Plain of Kom Ombo, *Sahara* 3: 45-52.

RIEMER, H. 2003. Abu Gerara: Mid-Holocene sites between Djara and Dakhla Oasis (Egypt). In: L. Krzyzaniak et al. (eds) 2003: 73-93.

ROSENBERG, M. 1990. The Mother of Invention: Evolutionary Theory, Territoriality, and the Origins of Agriculture, *American Anthropologist* 92: 399-415.

..... 1998. Cheating at Musical Chairs: Territoriality and Sedentism in an Evolutionary Context, *Current Anthropology* 39: 653-681.

SINCLAIR, A. 1995. The technique as a symbol in Late Glacial Europe, *World Archaeology* 27/1: 50-62.

SMITH, J.R., R. GIEGENGACK, H.P. SCHWARCZ, M.M.A. MCDONALD, M.R. KLEINDIENST, A.L. HAWKINS and C.S. CHURCHER. 2004. A Reconstruction of Quaternary Pluvial Environments and Human Occupations Using Stratigraphy and Geochronology of Fossil-Spring Tufas, Kharga Oasis, Egypt, *Geoarchaeology* 19/5: 407-439.

VAN NEER, W. and H.-P. UERPMANN. 1989. Palaeoecological Significance of the Holocene Faunal Remains of the B.O.S.-Missions. In: R. Kuper (ed.), *Forschungen zur Umweltgeschichte der Ostsahara*: 309-341. Köln: Heinrich Barth Institut.

VERMEERSCH, P.M. 2002. The Egyptian Nile Valley during the Early Holocene. In: Jennerstrasse 8 (eds) 2002: 27-40.

VERMEERSCH, P.M., P. VAN PEER, J. MOEYERSONS and W. VAN NEER. 1994. Sodmein cave site, Red Sea Mountains (Egypt), *Sahara* 6: 31-40.

..... 1996. Neolithic occupation of the Sodmein area, Red Sea Mountains, Egypt. In: G. Pwiti and R. Soper (eds), *Aspects of African Archaeology: Papers from the 10th Congress of the Pan African Association for Prehistory and Related* Studies: 411-419. Harare: University of Zimbabwe Publications.

WASYLIKOWA, K., J. HARLAN, J. EVANS, F. WENDORF, R. SCHILD, A.E. CLOSE, H. KROLIK and R. HOUSLEY. 1993. Examination of botanical remains from early Neolithic houses at Nabta Playa, Western Desert, Egypt, with special reference to sorghum grains. In: T. Shaw, P. Sinclair, B. Andah and A. Okpoko (eds), *The Archaeology of Africa: food, metals and towns*: 154-164. London: Routledge.

WASYLIKOWA, K., J. MITKA, F. WENDORF and R. SCHILD. 1997. Exploitation of wild plants by the early Neolithic hunter-gatherers of the Western Desert, Egypt: Nabta Playa as a case-study, *Antiquity* 71: 932-941.

WASYLIKOWA, K. and J. DAHLBERG. 1999. Sorghum in the Economy of the Early Neolithic Nomadic Tribes at Nabta Playa, Southern Egypt. In: M. Van der Veen (ed.), *The Exploitation of Plant Resources in Ancient Africa*: 11-31. New York: Kluwer Academic/Plenum Publishers.

WASYLIKOWA, K., H.N. BARAKAT, L. BOULOS, A. BUTLER, J.A. DAHLBERG, J. HATHER, J. MITKA. 2001. Site E-75-6: Vegetation and Subsistence of the Early Neolithic at Nabta Playa, Egypt, Reconstructed from Charred Plant Remains. In: F. Wendorf and R. Schild (eds) 2001: 544-591.

WENDORF, F. 1968. *The Prehistory of Nubia*. Dallas: Southern Methodist University Press.

WENDORF, F. and R. SCHILD. 1986. *The Prehistory of Wadi Kubbaniya Volume 1. The Wadi Kubbaniya Skeleton: A Late Paleolithic Burial from Southern Egypt*. Dallas: Southern Methodist University Press.

..... 1994. Are the early Holocene cattle in the eastern Sahara domestic or wild? *Evolutionary Anthropology* 3: 118-128.

..... 1998. Nabta Playa and Its Role in Northeastern African Prehistory, *Journal of Anthropological Archaeology* 17: 97-123.

.....(eds). 2001. *Holocene Settlement of the Egyptian Sahara, volume 1: The Archaeology of Nabta Playa*, Kluwer Academic/Plenum Publishers, New York.

..... 2002a. Implications of Incipient Social Complexity in the Late Neolithic in the Egyptian Sahara. In: R. Friedman (ed.), *Egypt and Nubia: Gifts of the Desert*: 13-20. London: The British Museum Press.

.....2002b. The Role of Storage in the Neolithic of the Egyptian Sahara. In: Jennerstrasse 8 (eds) 2002: 41-49.

.....2003. Food economy and settlement system during the Neolithic in the Egyptian Sahara. In: L. Krzyzaniak et al. (eds) 2003: 145-157.

..... 2004. The Western Desert during the 5th and 4th millennia BC: The Late and Final Neolithic in the Nabta-Kiseiba Area, *Archéo-Nil* 14: 13-30.

WENDORF, F., R. SCHILD and A.E. CLOSE (eds). 1984. *Cattle-Keepers of the Eastern Sahara: The Neolithic of Bir Kiseiba*. Dallas: South Methodist University Press.

WIESSNER, P. 1983. Style and social information in Kalahari San projectile points, *American Antiquity* 48/2: 253-276.

..... 1996. Introduction: Food, Status, Culture, and Nature. In: P. Wiessner and W. Schiefenhövel (eds), *Food and Status Quest: An Interdisciplinary Perspective*: 1-18. Oxford: Berghahn Books.