POLISH ACADEMY OF SCIENCES
POZNAŃ BRANCH
POZNAŃ ARCHAEOLOGICAL MUSEUM

ORIGIN AND EARLY DEVELOPMENT OF FOOD-PRODUCING CULTURES IN NORTH-EASTERN AFRICA



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Dedicated
to the Memory
of Anthony J. Arkell

POLISH ACADEMY OF SCIENCES
Poznań Branch
POZNAŃ ARCHAEOLOGICAL MUSEUM

ORIGIN AND EARLY DEVELOPMENT OF FOOD-PRODUCING CULTURES IN NORTH-EASTERN AFRICA

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From the Organizers and Editors

The unique role played by northeast Africa in the development of human culture is known to all us. While the importance of the ancient Egyptian and Nubian complex societies in this development seems generally to be well understood, comparatively little was known until recently about the cultural process which led to the formation of these civilizations. It seems that a particular phenommenon could have been associated with the beginnings of this long process: the introduction of the food producing economy. There is no need to explain the importance of this behavioural change in the course of human history, but it may be useful to remember that the developed form of this subsistence economy was the basis for the functioning of the earliest complex societies.

The span of time between the introduction of the production of food and the formation of the first state on the lower Nile (*i.e.* complex society with its written form of communication) comprises, as it now seems, such periods as the Late Palaeolithic, Neolithic and Predynastic. Although these have been studied since the last century, particular intensive and fruitful research took place in the last two decedes. As a result, a completely new picture of the later prehistory on the Nile and in the adjacent parts of Africa has emerged. The prehistorians working in this part of Africa now have reasons to believe that the outcome of this research contributes greatly to the general theory of the development of the later prehistoric societies. The prehistorians, egyptologists and nubiologists feel that it could also help to understand the process of the origin and shaping of the earliest complex societies on the Nile.

Our idea was to undertake an attempt at gathering the scholars of different disciplines studying the later prehistory of the northeast Africa, particularly those investigating the origins of the production of food, to create an opportunity to allow them to present and discuss the results of the latest field works and different studies stemming from these, as well as to organize a place for an exchange of ideas. We also felt that it would be in the interest of this conference to invite prehistorians working on the Neolithic of the Sahara, the Maghreb and East Africa, *i.e.* the regions adjacent to the Nilotic zone, as well as a group of egyptologists and nubiologists who show a clear interest in the studies on the origins of the earliest complex societies on the Nile.

It remains our hope that the papers presented at the symposium, which comprise



Members of the Symposium

these Proceedings, the discussions held and the personal contacts made by its participants will contribute to better understanding and further research of this important period of time in the past of northeast Africa.

The symposium would not have taken place without the encouragement and support which we received from a number of senior scholars in different countries. The late Kazimierz Michałowski, as well as Jan Żak, Fred Wendorf, J. Desmond Clark and Peter L. Shinnie are only a few of them. We also wish to express our gratitude to Professor Fred Wendorf who agreed to hold this symposium under the auspices of his Commission on the Terminology of the Prehistory of the Near East and Africa of the International Union of Prehistoric and Protohistoric Sciences.

The Symposium was also sponsored to a different extent by several institutions in Poland. We wish to express our gratitude to the Archaeological Museum in Poznań, to the Department of Archaeology of Great Poland, Institute of the History of Material Culture – Polish Academy of Sciences in Poznań, to the Department of Archaeology of the Adam Mickiewicz University of Poznań and to the Department of Mediterranean Archaeology of the Polish Academy of Sciences in Warsaw.

We also wish to express our gratitude to two institutions in Federal Republic of Germany, which contributed greatly to the publishing of these Proceedings. We, therefore, thank Herrn Franz Rutzen of the Verlag Philipp von Zabern in Mayence for making a generous gift to the Symposium and sending us excellent printing paper, as well as Professor Dr. Dietrich Wildung, director general of the Staatliche Sammlung Ägyptischer Kunst in Munich for various help extended to the Organizers during the process of editing and printing these Proceedings.

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MODES DE VIE NEOLITHIQUE DANS LE SAHARA ORIENTAL ALGERIEN

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AGRICULTURE, DOMESTICATION AND THE ROCK-ART

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THE KISEIBA PLATEAU: A SYSTEMATIC SURFACE SURVEY IN EGYPT'S WESTERN DESERT

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THE EARLIEST ART IN THE NILE VALLEY

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GREAT PLAINS AND MOUNTAIN AREAS AS HABITATS FOR THE NEOLITHIC MAN IN THE SAHARA

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FAUNAL EVIDENCE FOR EARLY STOCK-KEEPING IN THE CENTRAL RIFT OF KENYA: PRELIMINARY FINDINGS

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PLANTS OF THE NEOLITHIC KADERO (CENTRAL SUDAN): A PALAEOETHNOBOTANICAL STUDY OF THE PLANT IMPRESSIONS ON POTTERY

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THE MAINLINES OF SOCIO-ECONOMIC DEVELOPMENT IN DYNASTIC EGYPT TO THE END OF THE OLD KINGDOM

Other papers accepted for publishing in this volume

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EVIDENCE OF EARLY FOOD PRODUCTION IN NORTHEAST AFRICA: AN ALTERNATIVE MODEL

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ROCK DRAWINGS AT THE MOUTH OF WADI HELLAL, ELKAB (UPPER EGYPT)

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COMMENTS ON THE DEVELOPMENT OF PYROTECHNOLOGY IN EARLY SOCIETIES

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LES GRAVURES RUPESTRES DU GEBEL GORGOD (NUBIE)

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UN MODELE DES DEBUTS DE L'AGRICULTURE AU PROCHE ORIENT

ALESSANDRA NIBBI. 13 Lovelace Road, Oxford. Great Britain.
SOME EARLY DYNASTIC CLUES RELATING TO THE ENVIRONMENT OF ANCIENT EGYPT

EUGEN STROUHAL. Department of Prehistory and Antiquity, Náprstek Museum, Betlémské 1, 110 00 Praha. Czechoslovakia
CRANIOMETRIC ANALYSIS OF THE LATE PALAEOLITHIC POPULATION OF THE WADI HALFA REGION (LOWER NUBIA)

Address to the Participants

Mesdames et Messieurs!

Au nom de la Commission Archéologique de la Section Posnanienne de l'Académie Polonaise des Sciences et comme Membre du Conseil Permanent de l'Union Internationale des Sciences Préhistoriques et Protohistoriques, j'ai l'honneur d'ouvrir les débats du Symposium „Les débuts et le développement initial de la production alimentaire de la population des cultures préhistoriques en Afrique du Nord-Est".

C'est avec la grande joie que je salue le Secrétaire de notre Section, l'academicien Monsieur le Professeur dr. Topolski. Je tiens à saluer aussi avec une grande estime tous les Participants étrangers venus en si grand nombre à notre Symposium, à savoir les archéologues et les préhistoriens: de l'Autriche, de la République Democratique d'Allemagne, de la République Fédérale d'Allemagne, de la Belgique, du Canada, de l'Égypte, de la Grande Bretagne, des Etats-Unis, de la France, de l'Italie, de la Kenia, de la Norvège et du Soudan.

Je souhaite cordialement la bienvenue aux représentants polonais des disciplines scientifiques qui collaborent avec la préhistoire africaine et les archéologues et les préhistoriens polonais de Varsovie, de Cracovie, de Szczecin et de Poznań, qui s'intéressent à la préhistoire de l'Afrique. Je salue tout spécialement et j'adresse les remerciements au Comité de l'Organisation de notre Symposium: c'est-à-dire aux Messieurs doc. dr. Lech Krzyżaniak et doc. dr. Michał Kobusiewicz.

Ce n'est pas par hasard que le Symposium International Africanistique au sujet des problèmes des débuts et du dévelopment initial de la production alimentaire de la population des cultures préhistoriques en Afrique du Nord-Est se tient en Pologne.

Grâce aux possibilités, que nous a créé la République Populaire Polonaise, le groupe des archéologues et des préhistoriens polonais de Varsovie, de Cracovie et de Poznań a entrepris les fouilles méthodiques et les études sur la préhistoire de l'Afrique du Nord-Est. C'est à grâce à leur activité, l'image de l'âge de pierre africain et des autres époques nous est devenu mieux connue.

Je crois que le Symposium, qui commence aujourd'hui ses débats, permetra de confronter les résultats des recherches préhistoriques de tous les centres scientifi-

ques qui contribuent au développement de la préhistoire africaine, qui concourent à la transformation de nombreuses et différentes informations archéologiques en préhistoire de l'Afrique, ou se trouvent les origines de l'Homme. C'est pourquoi la préhistoire de l'Afrique est une science historique par excellence universelle, comme aucune autre.

Etant persuadé que les débats contribueront au progrès scientifiques et à l'approffondissement de la coopèration internationale et approchement personnel des savants — je proclame l'ouverture du Symposium.

Jan Żak
Le Président
Commission Archéologique
Section Posnanienne
L'Académie Polonaise
des Sciences

Preface

The ability to farm, to cultivate plants and to raise domestic animals has been the basis of every civilization known to man. The question of where, when, and how farming began has, therefore, long been a major concern of archaeologists. It is the traditional view that both plants and animals were first domesticated in the Levant in the early Holocene, and that this led rapidly to settled village life, and eventually to more complex societies. This view has been challenged by recent excavations in Northeast Africa which have indicated that the processes of both plant and animal domestication were under way in Africa at least as early as in the Levant, and perhaps earlier. It is also evident that basic changes, not only in the economy but also in social organization, occurred among these early framers and herders in Northeast Africa at a much earlier period than was previously believed.

These new data and the changes they have caused in our perceptions of Northeast African prehistory formed the central theme of a conference held at Dymaczewo (near Poznań, Poland) from September 9 to 13, 1980. The conference was organized by the Archaeological Commission of the Polish Academy of Sciences, Poznań Branch, and was held under the auspices of the Commission on Terminology of the Prehistory of the Near East and North Africa of the International Union of Prehistoric and Protohistoric Sciences.

There were 77 participants from 14 countries at the conference, and they included prehistorians active in northern and eastern Africa as well as egyptologists and nubiologists. It was an unusual opportunity for interaction between those who work in the same areas but have a diversity of intellectual goals and interests.

The idea for the conference originated with Lech Krzyżaniak and Michał Kobusiewicz, who also did a superb job in bringing this diverse group together and in keeping the discussions focused on the central theme. The daily conference program consisted of morning and afternoon sessions, at which formal papers were presented, each being followed by a brief discussion. These formal papers, subsequently revised, are presented in this volume. For more extended discussions the group reconvened each evening after dinner. These evening sessions were free-wheeling, far-reaching, and very animated. After each, the conference would then divide itself into smaller study groups who adjourned to the bar and kept up the good work until far into the night.

The Dymaczewo conference center was an ideal setting for our meetings. It is located on a large state farm several kilometers from the nearest village or other distraction. This quiet and delightfully pastoral locale served to concentrate our thoughts to the task at hand. All of the participants lived, ate and drank at the rest center throughout the conference.

The organization was superb. The enormous logistical problems of assembling, transporting and caring for this large group proceeded without a single difficulty, much to the credit of the organizers of the conference, and the staffs of both the Polish Academy od Sciences, Poznan Branch, and the Dymaczewo Centre. It was a delightful and extremely informative period in the lives of all of us who were privileged to be present.

Fred Wendorf
President
Commission on Terminology of the
Prehistory of the Near East and
North Africa

J. Desmond Clark

The domestication process in Northeast Africa: ecological change and adaptive strategies

Introduction: Palaeoenvironmental considerations

Increasingly, evidence on the extent and chronology of climatic change in northern and eastern Africa during the later Pleistocene and early Holocene makes it possible to understand better the effect such episodes of stress or amelioration may have on the emergence there of pastoral and mixed farming economies some time between eight and six thousand years ago.

The aridity and cooler conditions that characterised the period between c. 20,000 and 12,000 years ago (Rognon, 1976) drastically reduced or entirely precluded human occupation of the desert and can, therefore, be presumed to have been responsible for increasing the populations of the retreat areas north and south of the Sahara and along the Nile. The moister and more favourable conditions that resulted from the northward influence of the tropical monsoon climate during the early Holocene caused the lakes to fill again or levels to rise and put water into the stream systems fed from the high desert massifs. In the Nile the flood level fluctuated with the changes in the climatic regimen in East Africa and on the Ethiopian plateau but was generally high between 10,000 and 5,000 BC with lows between 8,000 and 7,500 BC and again between 5,000 and 4,000 BC .The extended low floods along the Blue Nile between about 9,000 and 6,500 BC presumably reflect drier conditions during that time on the Ethiopian Plateau (Butzer, 1980: 272; Williams and Adamson, 1980: 300 - 301).

The effect of this climatic amelioration on the human and animal populations can be seen in the repopulation of the desert after 10,000 BC (Clark, 1976 [a]; Wendorf and Hassan, 1980). Particularly important was the extensive use made of water resources (where these existed), especially the protein and fat to be obtained from hippopotamus, fish and certain molluscs (Smith, A. B., 1980: 452 - 4; Phillipson, 1977 [a]: 47 - 9). This was possible in particular along the Nile and in the central Sudan, round the Saharan lakes, along the sea coasts and southward in the region

of the East African lakes. Between about 10,000 and 3,000 BC the Sahel and Sudanic vegetation betls may have extended as much as 4° northward of their present limits (Hobler and Hester, 1969; Maley, 1977) thereby making available to the Saharan people the wide range of grasses of these zones, some of which were later domesticated and became important staple crops in West Africa and Ethiopia (Harlan, 1971).

The previous period of lowered temperatures and reduced evaporation during the late Pleistocene had permitted the Mediterranean flora to move south; the recent discoveries at Wadi Kubbaniya indicate that one result of this was that wheat and barley were able to grow 18,000 years ago in Upper Egypt as far south as Aswan and as much as 10° south of where their centre of origin in southwest Asia is considered to have been (Wendorf *et al.*, 1979). Since relict communities of Mediterranean species are still present today in refuge areas in the massifs of the central Sahara, it is not unreasonable to expect that barley, at least, would have survived in favourable localities in the valley of the Nile and so have been available to be brought under cultivation. Early Holocene fossil remains and representations in rock art show that the large game animals of the Ethiopian and Holarctic faunal provinces also spread widely again within the Sahara at this time (Mauny, 1956 [a]; Jaeger, 1975: 404 - 5). The rock art shows not only the importance of hunting for the epi-Palaeolithic immigrants into the desert but also hints at the kind of special relationship that developed between the hunters and the animals they hunted. In particular is this the case with wild cattle which were spread at least as far south as the southern limits of the winter rainfall which, today, are approximately on the latitude of the Tropic (Gautier, 1968: 85 - 9). This special relationship and the fossil remains suggest that the north African wild cattle were ancestral to the first domesticated cattle there, perhaps as early as 6,000 BC. While, therefore, the desert areas were much restricted between 12,000 and 5,000 years ago compared with their extent today and water and grazing were relatively more plentiful, the balance was clearly a delicate one as can be seen by the evidence for remobilization of dunes from Senegal to Chad and the western Sudan between 6,000 and 4,000 and again about 2000 years ago (Talbot, 1980: 41 - 5). Successful exploitation of resources in this relatively fragile environment would have favoured mobility and social groupings of fluctuating size, coalesced or split into smaller units as seasonal availability of resources dictated. This is the pattern favoured by hunter/gatherers in Africa today (*e.g.* Lee, 1976) and by the nomadic pastoral populations of northern Africa (Monod, 1975: 99 - 183) and can provide a model for that of the early post-Pleistocene populations (Clark, 1980: 572).

Climatic and accompanying environmental fluctuations can be seen, therefore, as directly affecting population densities in the Sahara and along the Nile so that a rhythm of movement was initiated out of the desiccated areas in times of drought (as happened from the Sahara into the Sahel and savanna in the 1970s) and back again when water and grazing sources once more became available (Dalby *et al.*, 1977). The stresses on the social and economic behaviour of hunter/gatherers and

pastoralists in the desert during times of drought, as well as those affecting the Nile populations due to the influx into the valley from east and west, clearly necessitated readjustment in life-ways that affected the whole social system. Environmental change was but one, albeit an important one, of a number of interacting factors that affected the way in which early Holocene human populations readjusted. When one or more of these factors – ecological and cultural – underwent change the chain reaction set up affected the whole socio-economic system. The particular patterns that emerged throughout this vast area when equilibrium, if we can call it such, was re-established, were as varied as the circumstances of the ecology and selective preferences of the populations made possible. For prehistorians this variability is manifest in the regional differences seen in the technology and the economic evidence that can be interpreted from the associated food waste and the other land-use behaviour suggested by the demographic patterning. Changing ecology, therefore, is suggested to be by no means the only, though one of the most important influences affecting the development of food production in the predominantly arid regions of northeast Africa. It is considered that we should not look at the different regions with the often locally specialised material aspects of their technologies as isolates. Rather are they part of a general system or complex of behaviour adapted to desert and river that must be treated as an entity since there is an underlying web of traits that determined a more holistic approach transcending the specifics of individual technologies. The behaviour behind the artifacts can be expected to become more understandable against the models available from ethnography when studies of residue patterning on sealed occupation sites and of edgewear leading to identification of the uses of stone and bone tools become the rule and not the exception.

It is the dispersed nature of resources, their seasonal availability and the degree of mobility needed for their exploitation that can be seen to have encouraged and maintained regular contacts between widely separated groups and regions and set up a network of exchange relationships manifest, for example, in the trade in amazonite (Mauny, 1956 [b]). We can look at these desert and waterside cultures at two different levels, therefore – that of the general behavioural level and the overall similarity in life-ways dictated by the desert environment; and the more specific, localised, level that should eventually allow us, through technological studies of style and raw materials, to identify boundaries from the significant characteristics local assemblages have in common and that may, thereby, perhaps have wider ethnic implications.

The northern Sahara: The desert cultures

We are still a long way from being able to do this meaningfully for any one region but, at the more general behavioural level it is possible to see some broad differences between the artifact assemblages that lie north of the Tropic and those below.

Those to the north are characterised mainly by backed bladelets, in particular straight backed forms and geometric microliths not infrequently produced by the micro--burin method. There are sometimes a large number of denticulated forms of scrapers and blades. Pottery is absent or not common at first and the barbed bone points do not occur except on the Nile and in the Fayum. Grinding stones for cereal grasses are sometimes common and sometimes rare.

There was a lag of several thousand years before the earlier Holocene wetter phase began some 6,000 - 7,000 BC and these more humid Holocene climatic episodes were of shorter duration in northern Africa than in the south – about 7,500, 6,000 - 5,000 and 4,500Ø - 1000 BC – and the conditions appear to have been generally drier in the northern Sahara with such lake areas as occurred drying out more quickly (Williams, 1984). Hunting and grain collecting appear to have been the basis of the economy which can perhaps at this time be best interpreted in the light of what is known about the terminal Pleistocene and early Holocene sites (the Esnan, Qarunian, etc.) investigated by Wendorf and his team on the Nile in Upper Egypt and the Fayum (Wendorf and Schild, 1976: 259 - 319); by Hobler and Hester around Dakhla Oasis ("Libyan Culture") (Hobler and Hester, 1969); by Hassan at Siwa Oasis (1978) and by the epi-Palaeolithic (Lubell *et al.*, 1976) and the Neolithic of Capsian Tradition of the Maghreb (Roubet, 1979). Except along the Nile, all of these sites appear to have been camps or settlements of relatively small groups of people. The ethnic affinities of the peoples reflected in the cultural assemblages north of the Tropic are less well known than those further south. However, since fossil remains ascribed by Chamla and others to both Negro and Afro-Mediterranean stock are found in the Sahara in Neolithic and early proto-historic times (Chamla, 1968: 199 - 201) and the remains described as "early Mediterranean" are found associated with Upper Capsian occupation sites in the eastern Maghreb (Camps, 1974: 158 - 62), it may have been people of this stock who repopulated the northern Sahara in the early Holocene.

The central and southern Sahara: Waterside sites and the Khartoum Complex

The central and southern Sahara, on the other hand, during epi-Palaeolithic and Neolithic times appears to have been a zone of overlap between temperate and tropical rains. The high levels and so wetter episodes of Lake Chad date to some 9,000, 7,000 - 6,000, 4,000 and 1,500 to 1000 years BC; the drier times were c. 8,000, 5,500, 2,500 - 2000 years BC and the last 2000 years (Servant and Servant, 1980; Williams, 1984). In general, these events are reflected, though incompletely, in the desert massifs (Hoggar, Tibesti and Air) (Street and Grove, 1976). The cultural manifestation associated with the onset of the Holocene wetter episode after 8,000 BC, the Khartoum Complex, is best known for its waterside adaptation along the Nile and round the Saharan lakes and playas with a related manifestation in the region of the East African lakes. Here specialisation in fishing, hippopotamus hunting and

mollusc collecting reduced the need for mobility and resulted in quite extensive and at least some semi-permanent settlement areas with wattle and daub structures and a material culture that included several varieties of barbed bone points, sometimes net-sinkers, curved backed microliths including a large backed lunate form, and large, wide-mouthed and deep bowls or pots with several decorative motifs notably the well-known "Wavy Line" pottery. The oldest dates for Khartoum Complex sites are between 7,400 and 6,000 BC: *e.g.* on the Nile near Khartoum at Sarurab II – 9,370±110 and 9,330±110 BP (A. R. M. Khabir, personal communication); 9,080 ±70 and 8,640±70 BP from Ti-n-Torha in the Acacus (Barich, 1974: 170), and 8,130 ±100 BP at Nabta Playa in the Western Desert of Egypt (Wendorf *et al.*, 1976: 112) and there can be little doubt that the associated pottery is a regional and independant development, most probably resulting from the need to process large quantities of fish and molluscs (mostly *Pila*). The manner of preparing the fish and recovery of the oil, in large open pots, found among the Bozo on the middle Niger (Ligers, 1966, II: Plate IX) does not appear to differ greatly from the description of the methods of the Ichthiophagi on the Red Sea coast and, apparently, also on the Nile given by Diodorus, Strabo and other classical geographers in the first century BC (Budge, 1928: 63, 67 - 8). The Khartoum Complex people used some eight or more species of fish and in particular large Nile perch are not uncommon. They also made extensive use of wild grasses judging from the amount of grinding equipment at their occupation sites (Arkell, 1949: 16 - 17, 30 - 73). Hunting of medium-to large-sized land mammals also provided an important part of the diet but of special significance, it would seem, was hippopotamus-hunting. The importance of this animal appears to have been underplayed due, no doubt, to the difficulty of estimating numbers of kills when animals are butchered where they were killed, often away from the camp sites. Nonetheless, hippo bones are usually cited as "not uncommon" on Khartoum Complex camp sites (Arkell, 1949: 22) and the amount of meat from one of these animals is equalled only by that from an elephant. The Wayto hippo hunters of Lake Tana and other parts of Ethiopia provide an ethnographic analogue for these waterside sites of the central Sudan, if allowance is made for the greater abundance of fish in the latter region. The Wayto were probably originally Nilotes and much more widely distributed (on the Takazze, for example) than today. They are a despised minority who, until recently, lived by hunting, gathering and fishing. Their way of life in all its aspects was based upon the hippopotamus (Gamst, 1979). The dense populations of hippo on Lake Tana led to relatively large groupings and extended Wayto permanent settlements. An adult hippo weighs between 1524 and 2540 kgs so that a single animal will provide a large amount of meat and, which is particularly important for hunter/gatherers, of fat that would feed a Wayto village of 50 people for a considerable time. A similar, though less well documented, population that concentrated on hippo hunting existed on Lake Abaya in the southern Ethiopian Rift. It is, thus, clear that the Wayto are not a special case so that they may provide a basis for a model against which to compare the way of life of the po-

pulations responsible for the Khartoum Complex along the main river and other waterways of the Nile system.

Where aquatic foods were scarce or absent, a greater emphasis was placed on terrestrial mammal hunting, availability of species and their size being environmentally determined (Barich, 1974: 160).

Although deductions based on technological inferences are not generally reliable, it would, nevertheless, appear that this more southerly region inhabited by the makers of the Khartoum Complex and related cultural entities, allowed greater opportunities for experiment and cultural development even though the northern peoples were in a more favourable position to be affected by cultural influences originating outside the continent. Along the Nile, both in the north and, especially, in the Sudan, the sizes of settlements and the reliance on aquatic foods suggest that populations were able to increase to a density not previously achieved and they may have been able to reduce considerably the amount of seasonal territorial displacement that would otherwise have been necessary and to establish this on more regulated lines (Clark, 1972: 131 - 3).

Skeletal remains with the Khartoum Complex suggest that this and the descendant Complexes that follow may be ethnically related to the ancestors of the Sudanese Negroes (Derry, 1949) as also, perhaps, to the largely vanished Negro populations of the Sahara (Briggs, 1967: 66 - 72).

Earliest evidence of food production

The inhabitants of both the northern and southern Culture Areas had achieved a degree of pre-adaptation that necessitated, at least at first, no very drastic behavioural changes following the acquisition of domestic plants and animals. Equally is it likely that herding and cultivating were not activities that were adopted before it became necessary or expedient to do so. This is well documented by the case of the Sandawe in Tanzania (Newman, 1970) or the San Bushmen in Botswana today (Lee, 1979: 409 - 14) and is determined by the amount of input of labour versus returns in continuing the traditional pattern of behaviour. The effect on foragers of environmental or demographic stress may lead to an intensification of foraging activities with more time and energy put into food procurement and greater distances travelled; or to broadening the economic base by bringing more of the territorial resources into use; or again to making more intensive use of the staples which may be collected in greater abundance for storage so that a reserve is built up. This, in turn, means that the storage areas have to be protected, exchange networks may become more regularised and symbiotic relationships between groups with different behaviour patterns may be established. Also, of course, some groups will choose to maintain virtually unchanged their traditional life style within the symbiotic system.

As yet, the chronology and evidence for domestication in northeast Africa is so incomplete and uncertain that the circumstances and causes leading up to it and

the time when herding and plant cultivation began still have to be convincingly identified; a situation that will only be possible after further systematic excavation and analysis of the settlements and their contents and of intersettlement relations. By 5,000 BC domestic ovicaprids were present in north Africa. At Nabta Playa in the Western Desert, ovicaprids have been identified with the early Neolithic dating to 6,000 BC (Wendorf *et al.*, 1976). It is possible that *Bos* may also be domestic here and claims have been made that the earliest domestic cattle in the Tassili may also be as much as 8,000 years old (Mori, 1965: 240). This rather argues against an earlier stage of small stock herding and a later one when cattle dominated; only further research will resolve this problem. Also to be determined is the extent to which environmental stress was an initiator of economic change. Clearly, no one-to-one relationship should be expected in view of the differences in rainfall regimen and onset of wetter and drier phases in the desert. Also the extent to which influences from southwest Asia may have affected the change to agriculture remains to be determined. Few, surely, believe that this was on the scale once claimed by egyptologists and today the emphasis is on internal, not external, factors that were the catalysts leading to domestication. Were these factors the same in the north as to the south? was there any significant delay in the appearance of domesticates in the south? and, if so, what was the reason for such delay? Did herding of cattle and experimental capturing and taming of other animals first take place in the desert areas or did it start in the Nile valley? Data at present favour the desert but systematic studies of settlements in the valley belonging to the crucial period 8,000 to 5,000 BC mostly still remain to be undertaken. The more abundant food sources, the larger groupings and improved facilities along the river can be expected to have permitted a degree of experimentation in manipulating animals and plants that could, when stress occurred, have resulted in the adoption of herding and/or cultivating as ways of supplementing and improving the diet. On the other hand, it can be argued that the close association of humans and animals in the oases brought about by increasing desiccation, might equally have given rise to herding behaviour. This still remains an open question until more evidence becomes available, though this writer inclines to favour the riverine peoples as having first taken the crucial steps towards food production. These are all questions which require to be answered before the course of domestication in northeast Africa can become clearer. One may suspect that the process began at much the same time and for much the same reasons in both desert and valley.

Studies of the San Bushmen in the Kalahari and of nomadic pastoralists and marginal cultivators in the western Sudan and the Sahel suggest strongly that, in arid or semi-arid environments, agriculture does not always provide the security that is usually assumed to accompany food production (*e.g.* Tubiana and Tubiana, 1977).

On ethnographic and prehistoric evidence a range of adaptations may be expected to have manifested themselves by 5,000 BC in the north and 4,000 - 3,000 BC

in the south. This is beginning to become clearer from the recent work in the central Sudan where, after the Nile began to cut into its bed about 5,000 years ago and to expose large areas of the alluvial plains to settlement, several experimental patterns of exploitation began to emerge in the valley of the Nile (Williams, in press). This is exemplified in the settlements belonging to the Shaheinab Complex between about 3,500 and 2,500 BC during a period of increasing desiccation. Excavations at Esh Shaheinab itself (Arkell, 1953), Kadero (Krzyżaniak, 1978), Zakiab (Haaland, 1978)

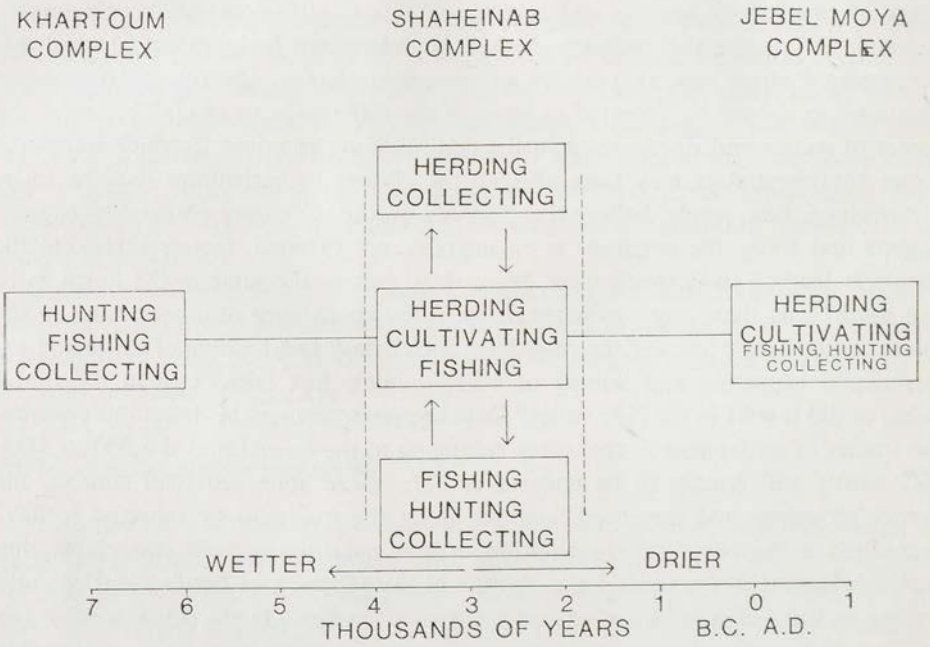

FIG. 1. Model for Holocene economic adjustments in the Central Sudan

and other sites show the economic base to have alternated between hunting, fishing and collecting; hunting, herding, fishing and collecting; herding and collecting; herding, cultivating and fishing and further permutations. These patterns, ethnography suggests, are likely to have been highly flexible; they may have changed seasonally or as a response to short-term environmental or demographic stress. An attempt has been made to show this by the arrows in Figure 1. Also on the Upper Nile, the replacement of old by new kinds of equipment, or ceramic decoration and the continuation of some of these up to and into the beginning of the present era, as seen in the Jebel Moya Complex, exemplifies a technological and ethnic continuity that has its roots far back in the Khartoum Complex (Clark, 1984). A similar situation seems to have existed in the Sahara (if the evidence from Dhar Tichitt is not too far to the west to be meaningful in the northeast) until the populations

were displaced in the first millennium BC by a combination of ecological necessity and militant, metal-using, horse-riding nomads from the north (Munson and Munson, 1969).

An appreciation of the relative importance of herding and cultivating for the populations along the Nile and in the desert is also crucial for understanding the domestication process. So far as the desert is concerned the emphasis can be expected to have been on stock-raising. The acquisition of stock removed, or much reduced, a group's vulnerability to famine; it provided a ready supply of meat on the hoof and milk products enabled less favourable or marginal areas to be brought into permanent use, thereby solving the problem of population increase attendant upon adoption of a food producing economy. At the same time, acquisition of stock, especially cattle, made possible a hierarchical social organization (Murdock, 1959: 33 - 34).

While extensive stands of wild grasses remained available in the desert it is to be expected that these were mostly collected, not cultivated, as is the case today. A likely model also is provided by the historic Hottentots or Khoikhoi who kept cattle and small stock but did not cultivate (Elphick, 1977: 23 - 42). The numerous grinding stones show the importance of grains but not how they were obtained and it is necessary to rely on unequivocal identification of the plant remains themselves to be certain on this crucial issue. Such cultivation as there may have been is hardly likely to have gone beyond the casual kind of planting and reaping that characterises the desert peoples today away from the irrigated oases (Forde, 1934: 396).

In the valley of the Nile itself it might be expected that the greater abundance of edible grasses and other plant foods would have provided even less incentive to cultivate and, even in Meroitic times, classical authors speak of only small barley and millet (presumably *Sorghum bicolor*) gardens and the extensive use of wild plant foods (Jones, 1932, Vol. 8: 143). From Nubia southwards the local grasses such as sorgum, *Pennisetum* and *Brachiaria* presumably replaced wheat and barley because these crops are not well adapted to tropical conditions except under irrigation. But the underlying pressures and stimuli that made the populations there turn to cultivating some of the wild species they had been collecting have not yet been identified. Certainly important factors must have been the need, in times of stress, to maintain population densities at the level which aquatic foods had made possible and to absorb the normal increases which the improved protein diet resulting from herding (meat and milk products) may be expected to have produced. Cultivation and produce exchange may also have enabled a hunting/gathering group successfully to prevent pastoralists from ousting them from their traditional foraging territory. Again, the products of cultivation provide a back-up for pastoralists when sickness or poor rains affect the grazing and reduce the stock yield.

If the domestic status of the plant remains from Kadero is confirmed, then these indigenous grasses first began to be cultivated in the fourth millennium BC. This is quite probable if the domestication process in northeast Africa was in any way

parallel to that in India where herding was being practised between 4,500 and 5,000 BC and rice may have been cultivated about the same time (Jacobson, 1979: 482 - 3). Alternatively, a relatively late date in the first millennium BC would not be unexpected with *Sorghum bicolor* becoming an important source of carbohydrates during Meroitic times and its rapid adoption by surrounding peoples.

The problem remains that, where wild plants and animal species abound as they did in Africa, the incentive for economic change, particularly towards cultivation and the added input of labour this demands, is likely to have been delayed until pressures on the social system and resources forced some groups to turn to cultivation thereby meeting the increased demand for large supplies of grain. Agriculture is not the only way of overcoming scarcity of resources; it did not follow, apparently from the Wadi Kubbaniya experiment, and, with the virtually unlimited wild food--stuffs available in the early Holocene, it would not be cause for surprise if the general move to mixed farming came relatively late in the rich environment of the Nile valley and the tropical parts of the continent.

At one time it seemed that African agriculture, outside the Nile valley, was indeed late in developing but increasingly early dates are now being associated with what have been identified as domesticated plant and animal remains, indicating that the first appearance of these may have been earlier than has previously been thought. If food production is an autochthonous development as a result of pressures and not a ready-made introduction from outside, then the speed and manner of its spread can be expected to have been uneven – coming early in some parts, late in others – depending on geographical, ecological and other factors. The reliability of isochronic maps or diagrams showing this spread, however, will only be apparent after much more well authenticated and dated evidence has been produced.

Ethiopia

Unlike the eastern and western deserts which were linked into a certain unity by the Nile, the Ethiopian high plateau was isolated geographically. On the other hand, the Ethiopian Rift may be regarded as an extension of the arid southwest Sudan and it seems probable that there were contacts between the plains and the plateau which, by reason of its temperate highland ecology, provided the human inhabitants with several different choices when faced with the need to turn from hunter/gathering to food production. Cattle herders are attested in the Rift by 1,500 BC (Clark, 1976 [b]: 77) but they were already in the Lake Turkana basin by 2,500 - - 2,000 BC (Barthelme, 1977 and personal communication) so that the first introduction of stock-raising to Ethiopia cannot have been any later than the middle of the third millennium. The characteristically Ethiopian food plants *teff*, *nuq* and *enset* emphasise the isolation of these high plateau inhabitants from those of the plains to the north, while the longtime use of wheat and barley and of finger millet seemingly show that some contact, perhaps movements from the plains onto the

plateau, took place from time to time, in particular from the north and west. Unfortunately we have no evidence as to when any of these food plants were domesticated except for finger millet though confirmation would be desirable before the 2,000 BC date claimed for these very fresh remains from Axum area can be finally accepted since they are associated with a camel tooth in the exposed terrace outside a shelter close to an Axumite settlement (Phillipson, 1977 [b]).

Wheat and barley with livestock could have been introduced to early Cushitic-speakers on the Ethiopian plateau by Nilotes or pre-Nilotes seeking refuge from one or more of the periods of economic stress accompanying the onset of desiccation in the Sudan between the third and first millennia BC. Alternatively, since it is hard to see why *teff* and *enset* should have been brought under cultivation if wheat and barley were already available, these cereals could be imports with the plough complex by Pre-Axumites from south Arabia in the last half of the first millennium BC (Clark, 1976 [b]: 80 - 82). Negroid peoples who still remain as minorities on the southern parts of the plateau, are most likely to have first brought the *enset* under cultivation and the techniques of the Tschako, for example, may be representative of the ways in which the pseudo-stem of this curious plant – the false banana – was first cultivated and eaten (Straube, 1963: 26 - 32). *Enset* is a staple that supports some of the densest concentrations of rural population in the continent and in prehistoric times can be expected to have favoured relatively dense groupings and larger settlements together with a considerably reduced need for mobility.

There is abundant ethnographic evidence to provide models for the domestication process in Ethiopia but there is almost no archaeological evidence against which to test them and it behoves prehistorians, when political circumstances become more favourable, to put this right. At present it seems that stockraising may have begun in the mid-third millennium but whether the Ethiopian food plants were brought under cultivation at the same time or later remains an open question as does the extent to which events in the Sudan plains to the north and west may have influenced the course of events on the plateau and brought new peoples there. In turn, did plateau peoples move down into the plains and what effect, if any, did this have on the pastoralists of the clay plains and along the Nile? At least one instance when the Axumites sacked Meroe in historic times shows that earlier incursions should not be unexpected.

Some potential behavioural models

This paper has raised more questions than it has answered but no apologies are made for this since we do not have the data needed to provide answers. One approach can be through predictive models using archaeological, ethnographic, linguistic and historical sources that can be tested in the field. Figure 2 presents several star diagrams that attempt to show some of the different kinds of behaviour patterns that might be predicted in different eco-systems before and after the economic changes

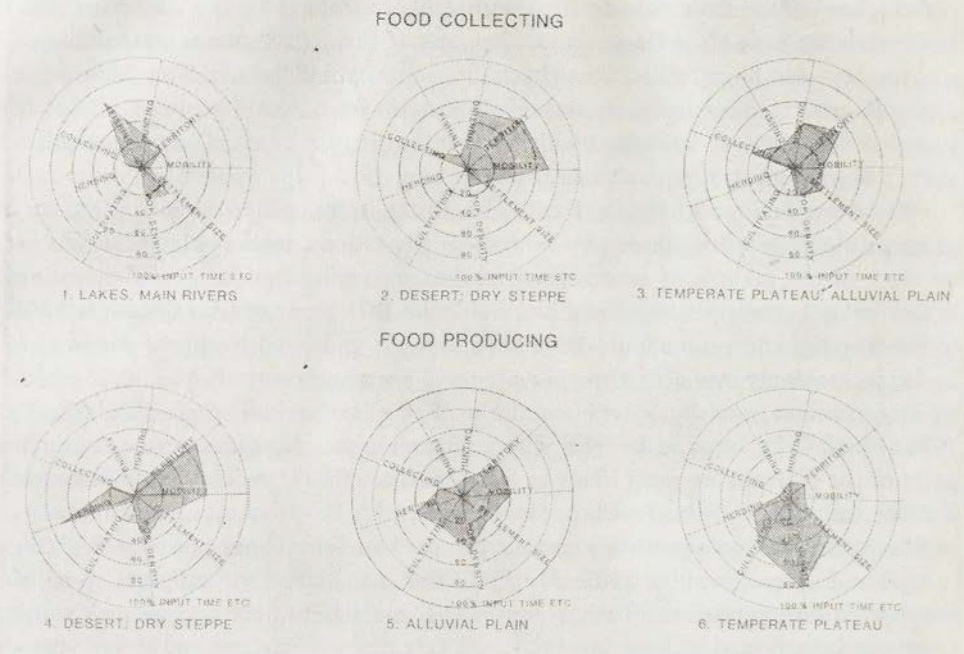

FIG. 2. Land-use model for pre-and post-domestication economies in North-East Africa

brought about by domestication. They are designed to emphasise that it was a broad spectrum of resources that was probably exploited by these prehistoric populations; to show the relative importance of some of the behavioural responses such as changes in population densities, mobility patterns, etc.; and to indicate how the emphasis shifted after food production. The models these diagrams represent are based on estimates of the relative importance of the main food-getting activities – hunting, herding, etc. – of relative settlement and territory size, distances travelled in the yearly cycle, etc. These estimates are obtained from such archaeological data as are available and from ethnographic literature on the peoples of the Sudan, Sahara, Sahel and Ethiopia examined in relation to that for peoples with similar economies in comparable eco-systems obtained from the Ethnographic Atlas (Murdock, 1967).

For the Khartoum Complex and later communities round the lakes and along the Nile the data for Shaheinab, Shabona (Clark, 1973), *etc.*, and the Wayto of Ethiopia and Bozo of the inland Niger delta, suggest much fishing and hunting of hippo and a wider amount of collecting, in particular of water plants of which the Wayto use some eight or nine. Population densities and settlement size would have been relatively large; the necessity for mobility was considerably reduced as also was the size of territories.

For the desert hunter/gatherers, using evidence from the San Bushmen, Hadza (Woodburn, 1968), Nemadi (Gabus, 1952) and other ethnographic peoples and the

very incomplete archaeological data, the emphasis is on hunting and collecting, on increasingly fluid social groupings splitting up and joining for communal hunting during the rains; the emphasis here is on mobility and extended territories.

On the temperate plateau grasslands with forest in Ethiopia and the annual grass and parkland of the central Sudan, scattered, incomplete, ethnographic evidence on the various Fuga, Watta hunting groups of Ethiopia (Shack, 1966: 8 - 12), the Bon, Ribi and Midgan of Somalia (Murdock, 1959: 59 - 63) and the Okiek of Kenya (Blackburn, 1974) suggest that a pattern emphasising hunting and collecting is repeated and territorial range, settlement size and mobility lie between estimates for the waterside sites and those in the desert.

After domestic animals and plants became available some of the waterside as well as other hunting/gathering populations persisted, indeed some still exist, much modified, today by establishing regular exchange relationships with surrounding food producers – fish, meat, hides and honey, for example, being exchanged for grain. This example of symbiotic relationship – Wayto, Okiek, Bozo, Pygmy (Turnbull, 1961), *etc.* – assured their survival. More than one model for desert pastoralists can clearly be constructed but, from a study of the Zaghawa, Tuareg (Nicolaisen, 1963; S. E. Smith, 1980), Fulani (Dupire, 1962), Baggara (Cunnison, 1966), Kibabish (Asad, 1970) and other peoples a pattern emerges emphasising herding, collecting and sporadic cultivation and grain supplies supplemented by barter, a system of seasonal dispersal and coalescing of social units and extensive territory utilization.

In the alluvial plain hunting and collecting may still be practised and, where seasonal inundation occurs, fish may be an important supplementary source of food. Stock-raising becomes all important accompanied by moderate amounts of cultivation done by women and girls. A seasonal pattern of congregating in large villages and dispersal into numerous small cattle camps is hypothesised necessitating regular patterns of land-use based on the data available for the Nuer (Evans-Pritchard, 1940) and other Nilotic peoples as well as patterns described from the Sudan (Tothill, 1948), for the Hausa (M. G. Smith, 1965) and other groups in the eastern Sahel, *etc.*

Lastly, on the temperate plateau, the economic base comes from cultivation and herding (Simoons, 1960). In prehistoric times herding in the northern parts of the plateau must have been as important as cereal cultivation but of lesser importance in the *enset*-growing areas to the south until the intensive system of cultivation by transplanting and manuring was introduced (Shack, 1966). Models for this diagram are suggested by the Cushitic-speaking Agau (Gamst, 1969) in the north, the Nilotic Gummis in the northeast (Simoons, 1960: 52 - 6) and the various, so-called "archaic" tribes – the Baka, Basketto, Dime, *etc.* – of southern Ethiopia (Jensen, 1959: 29 - 85; Haberland, 1959: 189 - 260).

These are, of course, only hypothetical constructs of unknown reliability though it should be possible to test them and so modify or replace them. Their value lies

in the framework they can provide for future research. There is now a need to undertake spatial analysis studies to show patterns of prehistoric land-use, excavation to obtain much more complete plans of settlements, more depth and breadth in analyses of food remains to obtain greater reliability and confidence in the identification of plant and animal domesticates and we need suites of dates rather than having to rely on results from a single sample. All these and more are essential for identifying the economic base and the kind of behaviour on which the social unit was maintained. There is now a need to regard each archaeological site as but a part of a system and to study the ecological data on a regional scale through such techniques as, for instance, site catchment analysis and estimating habitat values.

These are some of the methods and approaches whereby we can expect to arrive at a more complete understanding of the processes that underly the change from hunting and gathering to food production in Africa. This understanding will certainly be neither quick nor easy but, if we set about it in the way that the search for human origins is undertaken – by pooling resources and expertise in the form of interdisciplinary and international research teams with specific problems to solve, crucial localities to investigate in depth, and dynamic models to test – an exciting new break-through in our understanding of how and when domestication in Africa came about is inevitable.

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ACHILLES GAUTIER

Quaternary mammals and archaeozoology of Egypt and the Sudan: a survey

The presently known data on Quaternary mammals and archaeozoological faunal assemblages from Egypt and the Sudan (mainly from the Nile Valley) can be conveniently grouped as follows:

1. Older finds

Quaternary mammals, sometimes associated with traces of human activity, have been recorded in the Nile Valley since the second half of the last century. Thus Falconer (1864; 1865) described a large maxilla of *Hippopotamus amphibius* from alluvia found near the ancient temple of Kalabsha above the First Cataract. An educated guess on the basis of the geology of the area suggests a Late Quaternary age for this find (see section 3 of this review). Another find, not recorded in the valuable bibliography of African fossil mammals published by Hopwood and Hollyfield (1954) but noted by Bate (1951), concerns a fossil buffalo skull found near Khartoum. It was found "half an hour" northeast of that city, apparently in fluviatile deposits and was associated with a large hippopotamus jaw. Vacek (1876) compared it to *Bubalus antiquus* (= *Pelorovis antiquus*, cf. Section 2), but according to Bate (1949 a) it could be conspecific with her *Homoioceras singae*. If this interesting specimen has not been lost, a new study may be rewarding.

An intriguing find was recently "rediscovered" by Midant-Reynes and Braunstein-Silvestre (1977) who drew our attention to the vicinity of Helwan railway station, south of Cairo, where Mook (1880) excavated a Palaeolithic site last century which yielded the remains of hyena (*Crocuta crocuta*), equid (*Equus africanus*, wild ass), hartebeest (*Alcelaphus buselaphus*), an unidentified larger antelope and a camelid somewhat different from the domestic form known in the Old World (Rutimeyer, 1880). The camelid material, possibly conspecific with what this author described as *Camelus thomasi* (Gautier, 1966) should be re-studied, but its whereabouts are not known at this moment.

Fossilized bones collected from the alluvial deposits near Wadi Halfa, in lower Nubia, described by Lydekker (1887) include a large bovid and a small upper molar of an equid. In the discussion following Lydekker's paper, fossil remains of deer and large bovids from the same area are also mentioned. The deer fossils are still regularly cited in literature and have acquired an importance not matched by the direct evidence for the existence of this form. Lydekker compared his equine with *E. sivalensis* and *E. stenonis*. Recently Churcher and Richardson (1978) identified it as *Equus* (*Dolichohippus*) *numidicus*, a primitive zebra existing from the middle Late Pliocene into the Early Pleistocene. However, Sandford and Arkell (1933: 38, footnote) considered this tooth as of Late Palaeolothic chronology and certainly not related to such primitive equids as those cited by Lydekker (*ibid.*). Churcher (*in litt.*) agrees that it is very difficult to evaluate its status [1].

A mixed lot of fossils was collected at Khartoum during the construction of the Blue Nile bridge from 20 to 33 m below the water level. According to Andrews (1912), it contained recent species such as elephant, hippopotamus, giraffe and antelope (? *Tragelaphus*), a siluroid fish as well as an extinct proboscidean, represented by a molar fragment. On the basis of the hypsodonty index and the lamellar frequency as deduced from the figure of the specimen, it may be assigned very tentatively to *Elephas iolensis* Pomel, 1895 (cf. Coppens *et al.*, 1978). This species has also been recorded in the southeastern Sudan at Natodomeri (or Natodameri, cf. Maglio 1973 : 37) in the Kibish Formation, the Late Quaternary fluvio-lacustrine series north of Lake Rudolf. It is associated there with an essentially modern African fauna and has been provisionally dated by U-Th method to about 35,000 B. P. (personal communication by R. Thurber in Coppens *et al.*, *ibid.*). *E. iolensis* is possibly also present in the Nile deposit at Tabo near Kerma, in Central Nubia (Coppens, *in litt.*).

In 1927, a small collection of bones was secured by Arkell during the digging of a well in his garden at Kosti, 180 miles south of Khartoum, on the White Nile. Among these were a carnivore canine and an incomplete lower third molar of a large suid. Hopwood (1929) described it as *Hylochoerus grabhami*, but Arambourg (1941; 1949) changed its name to *Mesochoerus grabhami* and was supported by Leakey (1958: 14, Fig. 6). Recently Cooke and Wilkinson (1978) concluded that the specimen may be described as *Kolpochoerus olduvaiensis*, a chronospecies which could have existed from about 2 to 0.6 million years ago or even 0.35 million years ago (Cooke, *in litt.*). In the opinion of this author this identification should be revised.

From a bore in alluvial deposits at Umm Koweika, west of Kosti, Andrew (1948)

[1] An error has crept into the site list of African fossil equids compiled by Churcher and Richardson (1978 : 388 - 386, Fig. 201); Wadi Halfa (site 93a) does not belong to level 1 *sensu* Joleaud (1933) but to zone 2. To the best of my knowledge there is no second equid find from Wadi Halfa, but such a find is listed as pertaining to zone 2 *sensu* Joleaud. However, this zone refers to finds at Anteapolis near Asiut, in Egypt, described by Parona (1918) (see also section 3 of this review).

records large siluroid fish fragments, fragmentary teeth and reptile and mammal bones, but the age of this material is unknown.

Finally there are the fossil finds from Saggai, about 25 km north of Khartoum. They include molluscs, fish, turtle, crocodile, carnivores, elephant, equid remains, rhinoceros, hippopotamus, a suid, a camelid, giraffe and various bovids as well as a bone harpoon (Cloudsley-Thompson, 1966). They were collected at low water from a small island of gravel-strewn Nile silt and the southern extremity of a large island nearby. Some remains, from the same locality in the Sudan Antiquities Service which I was able to study in April 1981, consist of a rolled fossilized assemblage containing wild mammals as well as probably domestic cattle, perhaps domestic donkey and dromedary. It is certainly derived and of mixed origin, though some remains probably pertain to sites related to Early Khartoum or Esh Shaheinab (cf. excavations at Saggai and Geili by Dr. I. Caneva *et al.*, this volume.). No doubt the fossilisation is due to burial in waterlogged deposits and exemplifies the danger of relying on the degree of fossilisation in predicting age.

2. Abu Hugar and related sites

Rich assemblages from Singa and Abu Hugar, situated 215 and 230 km south of Khartoum respectively, on the Blue Nile, were described by Bate (1951). They were found in deposits now thought to be situated near the basis of the Gezira Clay (upper member of the Gezira Formation, cf. Whiteman, 1971). Abu Hugar yielded the remains of *Hystrix astasobae nov.* sp.; *Equus* sp., rhinoceros (possibly white rhinoceros, *Ceratotherium simum*), *Hippopotamus* cf. *amphibius*, a sivatherine, *Homoiceras singae*, *Oryx* sp., an antelope or caprid (one horncore), *Gazella*, *Crocodylus niloticus* and a freshwater snail. At Singa, the remains of rhinoceros, hippopotamus, a possible hypotragine antelope, an antilope of the size of Grant's gazelle and *Homoioceras singae* were recorded. Singer and Boné (1960) identified the sivatherine from Abu Hugar as *Sivatherium olduvaiense* which, according to Churcher (1978) should be included in *S. maurusium*. According to Churcher and Richardson (1978), the equine of Abu Hugar would be *Equus africanus*, but this identification is based on the geological age of the find (Churcher, *in litt.*). Wells (1963) identified the so-called antelope or caprid as a reduncine (*Cf. Kobus* sp.). Gentry (1978) accepts this identification but points out that *Homoioceras singae*, first described by Bate (1949) is a large form of the African buffalo group (*Syncerus*). The other species included in *Homoioceras* (*H. antiquus* and synonyms, *H. baini*, *H. nilssoni*) represent a different genus now called *Pelorovis*, hence *Pelorovis antiquus* instead of *Bubalus* or *Homoiceras antiquus*. Howell (1978), however, makes a *lapsus calami* and quotes *Pelorovis antiquus* at Singa.

Singa also yielded a fragmentary human skull, originally described by Woodward (1938) as bushmenoid, but Stringer (1979) concludes that its calvarium is pro-

bably derived from a late archaic *Homo sapiens* individual. The Abu Hugar animal remains included a poorly defined assemblage of lithic artefacts which was the object of several debates (cf. Stringer, *ibid.*); its seems to be dated to between 45,000 and 20,000 BP. A radiocarbon date on a crocodile tooth from Abu Hugar assemblage gave an age of ca. 17,300 BP. but the sample is said to be far from adequate (Whitman, 1971: 124).

Simons (1966) described a fossil monkey skull recovered, in 1938, from a clayey deposit in the Gezira Plain near Wad Medani, 1.5 km south of Abu Suheli Gubba. He identified it as *Colobus polykomos abyssinicus*. This form, typical for a canopy forest habitat, occurs today about 450 km to the south of this site. The fossil specimen hence suggests that at least a gallery forest extended as far north as the Wad Medani region during the time of the deposition of the Gezira clays.

3. Late Palaeolithic assemblages (30,000 - 7,000 B. P.)

Faunal remains associated with the Late Palaeolithic artefacts in southern Egypt and the Wadi Halfa area (lower Nubia) have been described by Gaillard (1934; Kom Ombo), Perkins (1965; Wadi Halfa), Robinson (1966; Wadi Halfa), Wendt and Reed (1866; Wadi Halfa), Reed (1969; Kom Ombo), Churcher (1972; 1974; Kom Ombo; see also Churcher and Smith, 1972) and Gautier (1966; 1976 a; Isna, Idfu; 1978; Elkab). Finds from near the ancient temple of Soleb in Nubia, associated with human remains, are probably contemporaneous with artefacts of Late Levalloisian and Upper Palaeolithic tradition and include rhinoceros and giraffe not recorded elsewhere (Coppens, 1971). Near Qau, 50 km south of Asiut in Egypt, bones collected by man in caches during the Pharaonic times were recorded by Sandford (1929; 1934). Most of these derive from the Late Palaeolithic silt outcrops in the area but some more recent specimens (donkey, hippopotamus) are mixed with them. Fossil bones were also reported near Idfu in Upper Egypt, in the Late Palaeolithic silts (Sandford and Arkell, 1931). Some remains from El Hibbah (opposite El Fashin) and Esh Sheikh Timai, near Geziret Shaibah, also belong here (Sandford, 1934).

A critical list of the vertebrates encountered in association with the Late Palaeolithic site includes various fish (mainly *Clarias* sp., cf. Greenwood and Todd, 1978), soft shelled turtle (river turtle, *Trionyx trianguis*), Nile crocodile (*Crocodylus niloticus*), various birds (local species as well as winter visitors, cf. Churcher, 1972; 1974) and a varied group of mammals of which rhinoceros and giraffe from the Wadi Halfa area were already mentioned. Other forms[2] include: wild cat (*Felis libyca*), jackal(s) (*Canis lupaster*; *C. aureus*? *soudanicus* WH; *C. mesomelas*, WH), spotted hyena (*Crocuta crocuta*), striped hyena (*Hyaena hyaena*), bandicoot rat (*Nesokia indica*), porcupine (*Hystrix cristata*), warthog (*Phacochoerus aethiopicus* WH),

[2] Forms recorded in the Wadi Halfa area only, are marked WH.

wild ass (*Equus africanus*), hippopotamus (*Hippopotamus amphibius*), hartebeest (*Alcelaphus buselaphus*), gazelle (*Gazella dorcas* and possibly *G. rufifrons*), barbary sheep (*Ammotragus lervia*), some other antelopes (WH), wild dromedary or camel (*Camelus thomasi*, WH), and *Procavia* (*dassie*, WH). Gaillard (*ibid.*) described *Homoioceras vignardi* as a form related to the North African giant buffalo (*H. antiquus*=*Pelorovis antiquus*), but the reality of this bovid is questionable. At Qau, *Sus* sp. is recorded, but this is probably a recent intrusive element. A new species of crocodile from the same area is also doubtful.

A mysterious collection found in a tomb near Antaeopolis and described by Parona (1918) should also be included here. About two hundred specimens from a collection of several hundred were identified as *Equus*, *Sus*, *Hippopotamus*, *Cervus*, *Camelus*, giraffe (listed as „*Camelopardalis Giraffa*"), ?*Boselaphus* (near to *Boselaphus prebubalis* Pomel, primitive hartebeest, cf. Gentry, 1978: 556), *Bos*, *Felis*, *Struthio cameles* and other birds, *Crocodylus*, *Trionyx*, *Emyda* and siluroids. If traced back, this strange assemblage will probably be reducible to the one predominantly composed of the already cited Late Pleistocene forms. Joleaud (1933) mentions it as his zone 3 of the so-called St. Prestian age. *Cervus* in this assemblage is based on a fourth upper premolar and an incomplete.

This section can be closed by noting that plant domestication was possibly practised by the Late Palaeolithic people at Wadi Kubbaniya (Wendorf *et al.*, 1979; Wendorf and Schild, this volume; Stemler, *ibidem*) as well as a sophisticated resource scheduling (Gautier *et al.*, 1980).

4. Predynastic fauna from the Egyptian Nile Valley and the Fayum (approximately 7,000 - 5,000 B. P.)

Under this heading the faunal assemblages from the period predating the first dynasty are grouped, in which the following cultural complexes are distinguished: Badarian, Amratian (Naqada I), Gerzean (Naqada II) as well as the Merimde Neolithic and the Fayum A Neolithic (cf. Krzyżaniak, 1977). Our knowledge of these assemblages is rather limited because almost no detailed reports have been published on them (as exceptions, cf. Gaillard, 1934, Toukh; Gautier, 1976 b, Fayum A), while the other well-intentioned efforts in this direction are practically useless (cf. Moustafa, 1952; 1953 a and b; 1955). A critical evaluation of most important refererences was made by Reed (1959; 1960) and Angress and Reed (1962). This writer is now studying the Badarian fauna of El Khattara near Naqada (cf. Hassan, this volume) and also investigated some samples excavated at Merimde Beni Salama. This first hand experience and a critical evaluation of the literature indicate that the faunal assemblages of the Predynastic period are dominated by domestic animals including pig, sheep, goat, cattle and dog. Evidence for the domesticated ass is limited (Peet, 1914; Menghin, 1931) but an Early Dynastic burial containing the re-

mains of domestic asses (Petrie, 1914) corroborates the idea that the domestic form of this animal was also present in the Predynastic times. Wild animals from Predynastic sites include birds, fish, crocodile, turtle, hippopotamus, antelope and gazelle. Quantitative analyses of the faunal assemblages found in different settings and periods would be very useful in evaluating ecological and other changes. This will apparently be soon possible as regards the already mentioned El Khattara fauna and that excavated at Hierakonpolis (Hoffman, this volume).

5. Dynastic fauna from Egypt

Studies on the fauna of dynastic Egypt often focused on pictorial representations of animals or their mummified remains (cf. Lortet and Gaillard, 1909), specific domestic breeds (cf. Pia, 1942) and isolated finds (Jackson, 1934; Ducos, 1971 a and b; Boessneck, 1970; 1975; 1977). There has been a lack of detailed analyses of faunal assemblages from dynastic Egypt with only few exceptions (cf. Boesneck, 1976). These would help to reconstruct palaeoecological and palaeoeconomical changes as well as changes in the breeds of domesticates and to establish the dates of introduction of certain animals. The history of the dromedary in Ancient Egypt has recently been reinvestigated by Midant-Reynes and Braunstein-Silvestre (1977). According to them the dromedary became well known in Egypt only from the Ptolemaic period onwards. The introduction of the horse is discussed by Braunstein-Silvestre (this volume).

6. Early Khartoum, Esh Shaheinab and related sites in the Sudan (?8,500 - 5000 B. P.)

The faunal assemblage of the Early Khartoum site on the Blue Nile described by Bate (1949b) includes land and freshwater molluscs, fish (especially *Clarias* sp.), crocodile, python, monitor lizard, soft shelled turtle, land turtle, carnivores, some rodents, hippopotamus, warthog, various antilopes, buffalo, (black?) rhinoceros and elephant. No evidence of domestic animals was found and it is assumed that the inhabitants of the site were hunters, gatherers and fishermen. A preliminary faunal list of Shabona (about 90 km south of Khartoum, west bank), a site excavated by Clark and associates (Clark, 1973) and compared to Early Khartoum also contains wild animals only: elephant, hippo, giraffe, bovids, warthog, mongoose, reptiles (python) and fish as well as numerous remains of an ampullarid (*Pila* sp.), which may have been eaten. The fauna of Saggai (cf. Caneva, this volume) is now under study and appears also to contain no domesticates.

At Esh Shaheinab, however, the faunal assemblage contains wild animals as well as small livestock (Bate, 1953). This livestock is represented by several horncores

of a small goat with straight horns, a caprovid with larger twisted horns, which Bate hesitates to asign to goat, but which is definitely caprine, and of a horncore fragment very probably from a sheep.

The Early Khartoum tradition has recently been dated by finds of barbed bone points in association with radiocarbon datable materials. It apparently developed in the seventh and sixth millenia B. P. (Adamson *et al.*, 1974). Kadero, another Neolithic site dated to approximately 5,300 - 5,100 B. P., yielded a faunal assemblage predominantly composed of domestic animals and some game (Sobociński, 1977). The domestic animals include mainly cattle, small livestock and possibly dog. The wild animals are now being re-studied and include fish, monitor lizard, hare, rodents, squirrel, wild cat, some other carnivores, hippopotamus, warthog, oribi and hartebeest (Gautier, this volume and in preparation; see also Krzyżaniak, this volume). Another Neolithic site at Geili near Esh Shaheinab, but situated on the opposite side of the Nile, yielded only few animal remains and they include freshwater and land molluscs, fish, monitor lizard, crocodile, python, goat and cattle (Caneva, 1976; 1978).

7. Later Neolithic and historic sites in Nubia

Perkins (1965) described a faunal assemblage excavated from the vicinity of Wadi Halfa and pertaining to the A-Group, but according to Nordström (1972) it belongs to the Abkan site ASG-G-25. It contains catfish, Nile perch, ostrich (eggshell), Egyptian goose (*Alopochen aegyptiacus*), hare, gazelle, large bovid and wild ass. Domestic goat seems to be represented by a single distal epiphysis found in the upper layer of the site and may be Terminal Abkan or intrusive. Another Abkan faunal assemblage was described succinctly by Carlson (1966) and includes fish, hare, an equid, gazelle and remains of a large bovid which could have been domestic cattle – at least some of them. Hence our scanty knowledge does not permit an unquestionable affirmation that the Abkans already were practising animal husbandry though it seems that they may have combined gathering and hunting with pastoral activities.

Faunal remains of the subsequent A-Group are also poorly known. Bietak and Engelmayer (1963) recorded cattle, sheep or goat and ostrich eggshell from Sayala, while Nordström (*ibid.*: 129) published a note by Perkins concerning the remains of *Equus* sp., a canid and gazelle from the A-Group site 303. That the A-Group people were already pastoralists is mainly indicated by the fact that the temper of their pottery contained cattle dung and that their rock art shows longhorned cattle. According to Hofmann (1967), the A-Group graves yield remains of gazelle, crocodile, goat, sheep, cattle and dog. The presumably subsequent B-Group graves are said to contain the same domesticates.

Animal remains from several C-Group burial grounds, dated to the period con-

temporary to the First Intermediate Period and the Old Kingdom in Egypt, were recorded by Perkins (1965) in the Wadi Halfa area who identified these as goat, sheep and cattle. The goats have twisted horns, but a few of the smaller female skulls have horncores almost without the twist, thus very much resembling Bate's dwarf goat from Esh Shaheinab (Bate, 1953). The sheep are of the ammon-type ("*Ovis arie platyura-aegiptica*"), the breed that would have replaced the earlier longlegged breed with twisted horns occurring along the Nile, during the 12th dynasty. Cattle skulls from the C-Group cemetaries were described by Hall (1962; cf. also Huard, 1964). Some remains excavated by Bietak (1966) from a C-Group site at Sayala include caprovids, possibly generuk (*Lithocranius walleri*) and cattle.

Faunal remains from Jebel Tomat, a site located about 60 km north of Kosti, and probably related to Jebel Moya, are briefly recorded as small domestic cattle, small livestock and include some remains of various wild species such as gazelle, klipspringer, bush pig, cane rat, mongoose, monitor lizard, several birds etc. Ampullarid shells (*Pila* sp.) are frequent and may have been used as bait for fishing (Clark, 1973). From a test excavation at Jebel Moya itself Clark (*ibid.*) records cattle and goat bones.

Recently the study of faunal material from Kerma (Middle Kerma, 2000 - 1700 B. C.) has begun (Chaix, 1980). Cattle, small livestock, donkey, dog, possibly domestic pig (!), some rodents, hippopotamus, elephant and some reptiles were identified in food refuse. Materials from the eastern necropolis suggest live burial of small livestock and the burial of a small dog. Cattle bucrania deposited near tombs are also mentioned. A detailed study of domestic animals (cattle bucrania; small livestock) buried in graves of the large Kerma necropolis on Sai Island, about 2.5 km north of Kerma, was made by Jourdan (1980).

Other information from the later sites in Nubia can be found in Hofmann (1967) and their contents clearly indicate the urgent need for detailed archaeozoological research in the Sudan. Such research is well exemplified by a recent study on the faunal remains excavated at Old Meroe (Carter and Foley, 1980).

8. Faunal assemblages from the Western Desert

Archaeozoological sites in the Kharga Oasis reported by Caton-Thompson (1952) yielded a fragmentary bovine tooth and a comparable equine molar associated with the Levalloisian spring mounds, while a tooth ascribed to *Hyaena* cf. *striata* and a gazelle mandible were collected in the Neolithic spring mounds. More Neolithic remains from recent excavations are described by this writer (Gautier, 1980) and these include a large bovid, probably a large breed of domestic cattle and a smaller bovid – either a gazelle or domestic caprovid.

Faunal assemblages from Bir Sahara and Bir Terfawi associated with the Middle Palaeolithic artefacts (Mousterian, Aterian) include jackal (*Canis aureus lu-*

paster), fox (*Vulpes rüppelli*), wild ass (*Equus africanus*), white rhinoceros (*Ceratotherium simum*), warthog (*Phacochoerus aethiopicus*), wild camel (*Camelus thomasi*), giant "buffalo" (*Pelorovis antiquus*), (red fronted) gazelle (*Gazella rufifrons*?), a large gazelle (*Gazella dama*?), a large antlope, a medium sized antlope and turtle (Gautier, 1980).

The Terminal Palaeolithic sites in the El Nabta region yielded a much poorer fauna composed of reptiles, birds including ostrich (eggshell fragments), hare (*Lepus capensis*), porcupine (*Hystrix cristata*), (red fronted) gazelle (*Gazella rufifrons*), a larger gazelle (*Gazella dama*) and few remains of a large bovid which is thought to be domestic cattle. These conjectural cattle remains are dated to ca. 8000 B. P. The material collected from the Terminal Palaeolithic sites in the Bir Kiseiba region yielded also ample evidence for gazelle and hare and also some remains ascribable to domestic cattle; here the dates for the domestic cattle may go back to even ca. 9 500 B.P. (site E79/8). The identification of the presumed domestic cattle remains is based on the size and morphology of the material and its ecological context.[3] The low frequency of cattle in this sample could point to the kind of exploitation of this protein source mainly focusing on diary products (and, perhaps, also blood drawing?). If this was so, it seems that other inadequately sampled sites or sites with poor bone preservation may yield no cattle remains and, therefore, no evidence for cattle pastoralism, they may therefore be interpreted erroneously as examples of classical hunter-gatherer subsistence patterns.

Later Neolithic (ca 6 000 B.P.) sites in the area of El Nabta yielded domestic cattle and caprovids. This fauna is also known from contemporaneous sites from Wadi Bakht in the Gilf Kebir (Gautier, 1980).

Preliminary identification of the fauna from the Neolithic site in the Dakhleh Oasis includes elephant (*Loxodonta africana*?), rhinoceros (*Ceratotherium simum*?), a large equid (*Equus* sp., zebra?), hartebeest (*Alcelaphus* cf. *buselaphus*), small gazelle (*Gazella* cf. *dorcas*), large gazelle, wild cattle (*Bos primigenius*), ostrich (*Struthio camelus*) and large avian remains. An assemblage from a site containing mixed Neolithic and Old Kingdom material yielded hartebeest, small gazelle, large gazelle, wild or domestic cattle, ostrich and some large avian remains. Scattered remains from dynastic sites contain domestic cattle, domestic pig, small livestock, ass or horse, gazelle (*Gazella dorcas*) and rodents such as *Gerbillus* sp. (Churcher, 1980).

Our review does not list post-Pharaonic faunal samples because such analyses do not exist, except for a note by Dzierżykray-Rogalski *et al.* (1972) on the bone-working at Kom el Dikka in Classical and Medieval Alexandria. To some researchers such analyses may seem to be uninteresting, but they certainly help to evaluate older finds.

[3] The reasoning is that the identified frequent game animals from these sites indicate poor grazing conditions in this area at the Terminal Palaeolithic and hence larger bovids seem to have been the domesticated animals brought to the area by human groups, and were not a part of the local wild fauna.

9. Comments and conclusion

This review should make clear that the present state of the archaeozoological research in Egypt and the Sudan is rather restricted und uneven, both in its scope and quality. It is difficult, therefore, to draw definite conclusions. However, one can, for example, safely picture the Nile Valley as a stable, conservative environment and the Western Desert as an unstable one, subjected to appreciable climatic and faunal fluctuations. They both harbored an essentially modern fauna (Ethiopian, with some Palearctic elements) during the Later Pleistocene and some presently extinct forms. Along the Nile, the disappearance of this fauna was mainly caused by human activities. In the desert, the climatic change was apparently the main cause for the disappearance of most of the game animals, although I wonder whether prehistoric overgrazing by cattle and, particularly, small livestock may not also have played a role in the process of the desertification. One can also easily imagine that the labile environment of the Western Desert favored the very early development of cattle pastoralism. As the wild cattle is indigenous to North Africa it could have been domesticated independently in this region, but questions related to the how, when and why of this process have not yet been fully answered. Small livestock seem to have been imported from southwest Asia and so was, probably, the domestic pig. From exactly where and by which route the cattle, small livestock and pig came to the Delta, the Nile Valley and the Western Desert is open to further research. One could elaborate on the foregoing, but to avoid idle speculation we need excavations on more sites in Egypt and the Sudan and more research on the faunal assemblages dated to the critical Terminal Palaeolithic and Early Neolithic periods. Only this can provide us with sound evidence and enable us to build new models of the origins and spread of animal domesticates in this part of Africa.

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JOHN A. ALEXANDER

The end of the moving frontier in the Neolithic of North-Eastern Africa

The greatly increased information now available from North-Eastern Africa, much of it summarised in Williams and Faure (1980), suggests that it should be possible to view the relationships of the earliest plant- and animal-husbandmen in a way different from that of the traditional processual studies. The idea of "The Frontier", originally defined by Turner (1893) for North America as "the temporary boundary of an expanding society at the edge of substantially freelands", is valid for a variety of regions through the world (Elkin, 1951; Lingren, 1938; Sharp, 1955) and for widely divergent periods of time (Billington, 1967; Hudson, 1977). The relationship can be further refined by accepting the distinction of a "moving" frontier which exists between husbandmen and hunter-gatherers until the limits of particular complex of plant and/or animal climatic tolerance are reached, and a "static" frontier then develops from the symbiosis within a region between hunter--gatherers and farmers (Alexander, 1977: 25 - 40). The relationship in both situations need to be considered from the farmers' and hunter-gatherers' point of view and the "spectra of reaction" understood. This means that any individual site must then be studied for its place in one or the other spectra. Unless this can be done, any individual site is liable to misinterpretation. Criteria for definitions of this kind already exist in North-East Africa, since recent work by Abbas Mohammed Ali (1978), Hassan (1980), Wendorf and Hassan (1980) and others have shown that hunting and gathering populations were widespread when there plant- or animal--husbandry developed after the 8th millenium B.C. That they were then far more widespread than would be possible today has also been established, and it would seem that the existence of a "Northern Sahel", albeit interrupted by areas of desert, ought to be seriously considered and may have existed as far south as 20° Lat. Areas of pure desert would also have been reduced by a northern extension of the "Southern Sahel" and the greater humidity of the Central Saharan massifs in the period 8000 - 2000 B. C. and the river systems flowing from them.

Some of the hunter-gatherer-fisher communities had already achieved consi-

The moving frontier

Behaviour of: Plant and/or Animal Husbandmen		Behaviour of: Hunter-Gatherer-Fishermen
A. Pioneers using the wilderness (little or no plant husbandry)	← Accepted by H-G's →	Little change but reduction in self-sufficiency
		Archaeologically detectable
B. Pioneers subduing nature (especially plant-husbandmen)	Steadily less acceptable to H-G's	
		Archaeologically detectable
Land acquisition by negotiation or conquest until:	← →	Increasing interference ending in 'static' frontier

The static frontier

1. All currently usable land exploited
2. Geographical boundaries of region reached
3. Limit of (currently domestic) plant and animal tolerances reached

C. Development of 'static' frontier	
1. Restriction of population	1. Annihilation
2. Sociological adaptations.	2. Partial or complete integration with husmendman
3. Utilisation of marginal lands	3. Symbiotic relationships established
4. Utilisation of wild resources, often using indigenous H-G-F techniques	4. Sporadic warfare
5. Migration	5. Retreat into isolation
	All archaeologically detectable

Fig. 1. A general model of a frontier

derable sophistication: the domestication of caprids in the west (Roubet, 1971; Sutton, 1974), and the specialised hunting of bovids and the collection and grinding of wild grasses in the north-east (Clark, 1980) suggest a pre-adaption to husbandry, although of course offering no guarantee of its adoption.

Within this transcontinental web of advanced and varied exploitation, three husbandry complexes can now be seen to have become established by the 4th millennium B.C. One of them, a wheat/barley, caprid/bovid complex is by then installed in the Lower Nile Valley and the Mediterranean littoral, another complex,

millet, caprid/bovid in the Middle Nile Valley and west "Southern Savannah", and the third, bovid/caprid only, in the "eastern south and north Savannah/Sahel". Each of these must be considered in turn.

Wheat/Barley and Caprid/Bovid complex

This is the most easily recognised mixed-farming complex which had been known in Western Asia from the 8th millennium. Its spread across Europe is not in dispute and has been much studied; recently in France this has been done in terms of the frontier theory here being advanced (Alexander, 1978, 45). Of especial interest for North-East Africa was the spread of farming through the northern coastlands and the islands of the Mediterranean Sea.

The spread of farming in Europe may be defined in terms of the Phases A and B of a moving frontier of the kind first recognised in the European occupation of North America (Fig. 1) and proposed for the Middle Nile Valley by Alexander and Abbas Mohammed (1980: 80). Phase A is composed of pioneers with a husbandry complex using the "wilderness" without subduing it, and in Phase B the pioneers subdue it, in the process of so doing they increasingly influence, absorb or destroy existing hunter-gatherer communities. The South Mediterranean littoral might, in a period of greater humidity, be expected to have had a similar history to the north littoral and in broad terms this was so, in the 8-6th millennia B.C. for in both, the Phase A of the frontier seems to include a spread of caprid farming which is found in Greece, southern Italy and southern France in the 7/6th millennium B.C. (Trump, 1980) as well as in Libya and Tunisia (Roubet, 1971; Clark, 1980). An inland spread through the Danube Basin can also be documented in S.E. Europe and something similar might have been expected in N.E. Africa in the Nile Valley. Its absence on present evidence might be accounted for by the Lower Nile Valley and Delta acting as a barrier to Phase A pioneers interested in "wild" pasture and "wild" meat (Fig.2).

From the husbandman's point of view:	From the hunter-gatherer's point of view:
Phase A:	
Acquires: "Wild" pasture	New alternative foods
"Wild" meat and other foods	New technology
Raw materials	New and more prestige goods
Escape routes for groups and individuals	
Phase B:	
Acquires: Cultivatable land	May accept symbiosis
„Controlled" pasture	May accept domestication
„Controlled" water	

Fig. 2. The advantages of the moving frontier

Gallery forest and floodplain vegetation allied, in the Nile Valley at least, with a relatively dense hunter-gatherer-fisher population may well have been so alien as to constitute a formidable obstacle to pioneer movement by land. The spread of Phase A pioneers and new ideas to Libya and beyond may well, therefore, have been by sea only. The finds at Haua Fteah (McBurney, 1967) may well be a pale reflection of this move in the 7th millennium, for Phase B pioneers were already established in Crete by the late 7th millennium. There is no evidence of the presence of Phase B pioneers in the Lower Nile Valley and beyond before the mid-5th millennium, suggesting a slow penetration rate which allowed for much greater local development than in contemporary Europe. The Fayum and Merimde evidence in particular suggests actual immigrations from S.E. Asia and so a recognisable "moving frontier".

The expansion of this farming complex to the limits of its climatic tolerance can be traced southwards through the Nile Valley and westward to the Atlantic. In N.E. Africa the southern limits of its plant tolerances have been recently discussed by Stemler (1980). It has shown that whilst wheat and barley will grow, when irrigated as far south as the 6th cataract (Bertin, 1971), south of 1st cataract is a transitional zone where the tropical millets are more at home. The animal tolerances are greater and no frontier limit exists for them where pasture and water may be found. The development of this Nubian "Frontier" has been discussed at greater length elsewhere (Alexander and Ali Abbas Mohammed, 1980). The spread of plant husbandry westwards from the Lower Nile Valley would have been inhibited by the increasing and well documented dessication of the 3-2nd millennium (Clark, 1980); it would have been restricted to oases and perhaps periodic water courses.

The Phase A zone of a frontier of this kind might be very wide. In Canada in the 17 - 18th centuries it was several 1000 kms wide and may well have been similar in 6th millennium B.C. Europe, so that ideas and objects might travel within hunter-gatherer exchange – or raiding – systems, as they did in pre-European Australia. Another insight might be gained from pre-European South Africa where caprid and then cattle husbandry preceded (in an A Phase) the mixed agriculture linked with the spread of Bantu-speaking peoples (B Phase). Caprid and cattle husbandry also seems to have been accepted by large numbers of Khoisan-speakers.

Caprid/Bovid complex

The second "frontier" area is that of the Central Sahara plains and massifs where, if the C14 dates are accepted cattle husbandry and a new craft of pottery-making were established by the 7th millennium B.C. Whether this was the result of long range stimuli from the Mediterranean littoral or indigenous discovery is not the concern of this paper. It is sufficient here to accept that by the 7th millennium, communities of animal husbandmen existed in the Central Sahara and that two spectra of reaction to the new ideas might to be expected here.

The first spectrum, as must have happened in Western Asia, would have been the whole, partial or non-acceptance of domestication by local groups; evidence of contemporary communities in all these circumstances might be expected. Whilst cyclical movements through pastures may be postulated for many groups (Clark, 1980), wider movement into "empty" lands east, west and south may be suggested (Gulliver, 1975). Here, only the eastward movements may be considered, but a moving frontier of herdsmen utilising open pastures or competing with hunting groups for "wild" meat is likely. Its existence is suggested by the distribution of pottery types found earliest in the Central Sahara and then found (being used by hunter--gatherer-fishers) in the Middle Nile Basin. The Shabona and Early Khartoum communities of the 7-5th millennium B.C. are perhaps best seen as indigenous groups influenced by a movement of this kind. The furthest extention of this frontier to the north-east seems to be in the Western desert in Egypt where cattlebones and Central Saharan type pottery occur in the 7th millennium at Nabta Playa. Nearby, in the Nile Valley, were other cattle-keepers whose stock and ideas were quite different and may well have come from the east. In the north-eastern movement, the importance of the Wadi Howar drainage system may well have been overlooked (Ali Abbas Mohammed, 1978). Even when animal husbandry is well established in a region there may well be niches which can still be occupied by hunter-gatherers, so that a spectrum of sites linked with the static frontier may be found in the Central Sahara and eastern Sahels. These developments may be due to social organisation rather than economic determinism (Bender, 1978: 25).

Millet, Caprid/Bovid complex

The third "frontier" of N.E. Africa was the result of the development of mixed--farming based, on the botanical side, on indigenous tropical millets. There seems no doubt that species of pennisetum were domesticated in the "southern" savannahs and that the region between the Ethiopian highlands and the Jebel Marra shows the earliest evidence of this taking place (Harlan *et al.*, 1976). Stemler (1980) will presumably now modified her late dating for this event in the light of finds from Kadero (Krzyżaniak, 1978) for the domestication of the millets must have happened before or during the 5th millennium B.C. It is not the purpose of this paper to consider how this may have happened, but once mixed farming with caprids and cattle had developed, a new moving frontier may be postulated with a new spectrum of reaction between farmers and existing hunter-gatherers. It would seem that there was a moving frontier westwards, since mixed farming appears only later in the "western" savannahs, and, (of special interest here) northwards. In the Nile Valley between 6th and 1st cataracts, the northern limit of the tolerance of the tropical millets would have been reached, and in much of that zone they would have been preferred as a food crop to wheat and barley. There must, therefore, have developed here that rare and interesting phenomenum, a static frontier between the two agri-

cultural systems with a transition zone in which they mixed. This should be recognisable culturally between 1st and 6th cataracts, where, with developing dessication, there should be an especially complex "spectrum of reaction" between hunter-gatherers, wheat/barley-growing farmers, millet-growing farmers and pastoralists.

Conclusion

By the 4th millennium B.C. it would seem that the three husbandry complexes of North-Eastern Africa had expanded to fill the available space and were all in touch with each other. In the case of the two mixed farming complexes, their boundaries were dictated by the climatic tolerances of their domesticated plants. In each of the three zones, "moving" frontiers at this point gave place to "static" ones in which local relationships with hunter-gatherer-fisher groups became stabilised.

Against this general background, individual sites will have to be studied to see where they belong in either the spectrum of relationships of husbandmen or of hunter-gatherers.

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Abbas S. Mohammed-Ali

Evidence of early food production in Northeast Africa: an alternative model

It has long been established that the end of the Pleistocene coincided, in certain regions, with a marked change in man's economic adaptation and social behaviour. The change in the environment might have had a role in the shift witnessed in these modes of life. It was earlier suggested that food production began as a result of such changes, either at "oases" in dry areas (Childe, 1951), or in "nuclear zones" (Braidwood, 1960), or more widely in regions where there was a "disequilibrium" in man-plant-and-animal relationships (Binford, 1968). All these and other models have been criticized on the grounds that "cultivation" and "domestication" as terms were ill-defined, their concepts were obscure, and the reasons offered for their developments by no means convincing (Higgs and Jarman, 1969). In place of this it was suggested that the whole process was rather to be looked at as a long-term evolutionary process of man-plant-and-animal relationship determined by appropriate economy for the particular environment.

When these models are applied to Northeast Africa, two alternative schools of thought emerge: the first believe that the area received knowledge of plant cultivation and animal husbandry from South-West Asia before they spread to the rest of the continent (*e.g.* Epstein, 1971). The Nile Valley and, occassionally, the Horn and Ethiopia were suggested as possible routes for the diffusion of these ideas. The general acceptance of this thesis was due to:

a) The occurrence in South-West Asia of settlements with evidence of food production predating those from Africa.
b) The oldest domestic plants and animals (wheat, sheep and goats) recovered from Northeast African sites (Fayum, Merimde, Shaheinab... etc) pointed to a South-West Asian origin, since no local wild ancestors of theirs had been identified.
c) Farming in temperate African zones was belived to predate that of tropical Africa.
d) Until recently no settlements with evidence of food production contemporary to, or earlier than, the earliest settlement of the Nile had been discovered in Africa.

The second school supported indigenous African domestication of sub-tropical plants and animals, independent of, and contemporary with, the South-West Asian complex (Vavilov, 1926; Portérés 1951; Harlan *et al.*, 1976). This was also due to a number of factors:

a) There was increasing evidence supported by radiocarbon dates that in Africa there was a stage of intensive plant exploitation (a necessary prerequisite, it was agreed, for food production) as early as, or even earlier than, equivalent intensive exploitation in South-West Asia (Camps-Fabrer, 1965; Wendorf, 1968; Camps, 1974.)
b) Recent botanical work has confirmed that present-day African domesticated tropical cereals (*Sorghum, Pennisetum* etc) were indigenous to Africa, and that their wild forms were unknown to South-West Asia (see Harlan *et al.*, 1976).
c) There was sufficient evidence, supported by radiocarbon dates, that at least two of the so-called "Neolithic" innovations (pottery and ground stone tools) were known in the Sahara prior to their introduction into Northeast Africa (Camps *et al.*, 1968; 1973; Adamson *et al.*, 1974).
d) Wild cattle (*Bos primigenius*) were found widespread in North Africa (Carter and Clark, 1976) and the possibility of a local domestication could not, therefore, be ruled out.

The location of Northeast Africa astride, successively from North to South: the Mediterranean, desert, sahel, savannah, and equatorial zones; and from East to West: the Red Sea Coastlands, the Ethiopian highlands, the Nile Basin, and the Sahara plateaux, together with the evidence it can offer, provides a unique opportunity to contribute towards resolving the differences between the two alternative schools.

Prior to the International Nubian Archaeological Salvage Campaign, the Nile Valley (*i.e.*, Egypt and the Sudan) and the plateaux on either side of it had suffered from an almost complete absence of reliable palaeobotanical and archaeozoological research of any kind and especially from analysis of recovered archaeological materials. In addition, very few attempts had been made to study the floral and faunal distributions of later domesticates along the lines developed in South-West Asia (Harlan *et al.*, 1976; Abbas Mohammed-Ali, 1978; see also Smith, 1976). General problems of ecological adaptations, settlement patterns, etc, had hardly been considered and little was known of the plateaux outside the Nile Valley. It was admitted only recently that any survey of evidence of food production in Africa is "a survey of our ignorance and a reasoned essay in speculation" (Shaw, 1976: 107). The result of recent research has somewhat reduced the areas of ignorance and the questions asked can now be re-stated using, in particular, geochronological, climatological, botanical and zoological evidence to provide a framework for the archaeological one.

Plant cultivation

It has to be stressed that unlike South-West Asia, Northeast Africa can not and should not be treated as a single geographical unit, and the cultivated plants found in it to-day could not have originated in one common area. Plants such as *Sorghum*, *Pennisetum*, *Eragrostis*, *Tef*, *Ensete*, *Ventricosum* etc, although they are all tropical plants, belong by their very nature to more than one habitat and can, therefore, be expected to have been harvested in their wild forms from Ethiopia to the Sahara. For the area under discussion, it can be accepted that at least two major plant complexes existed throughout the Early Holocene, the boundary between them fluctuating but always being within the area. These are a sub-tropical (Mediterranean) complex and a tropical (Sahel-Savannah) complex.

The sub-tropical region

The sub-tropical warm-temperate plant complex has to-day two major domesticates: *Triticum* sp. and *Hordeum* sp. They require either 300 mm of winter rainfall or regular means of irrigation to grow, and cannot to-day be grown successfully south of latitude 25°N except at high elevations. Their wild progenitors are believed to have been common in South-West Asia in post-glacial times, and it was there, during the 10th - 7th millennium B. C. that evidence suggesting their cultivation was found (see Harlan and Zohary, 1966). It was argued that thereafter they spread to other areas, including the Nile Valley, which are considered to have been outside their natural habitat (Zohary, 1969). The wild species of barley which to-day grow on the Mediterranean coast of Africa is believed not to be a progenitor of the domestic barley cultivated in that region (*Ibid*). Yet before this assumption is accepted the recently accumulated evidence from the Egyptian Sahara (Wendorf *et al.*, 1977) should be fully considered. Wild wheat is unknown from Northeast Africa although climatic conditions were not unfavourable to it and in wet phases its southern limits could have shifted with the Mediterranean isohyets as far south as the Tropic of Cancer. Nevertheless the 5th millennium B.C. communities of North and Northeast Africa (McBurney, 1960; 1967; see also Abbas Mohammed-Ali, 1978) show little evidence, as yet, of agriculture in their archaeological record.

Northeast Africa has a wide range of environmental zones and the situation gets rather complicated when we consider the fact that both wheat and barley are cultivated in Egypt while neither of them is a successful crop in the Sudan. In Ethiopia the highlands might allow for their growth, but the lowlands do not. Wheat and barley cultivation, as imported cultigens seem to have developed after 4,500 B.C.; but for climatic reasons they could not spread south of the 20° N parallel.

The kind of evidence which can be considered here is mainly palaeobotanical, consisting of the remains obtained from archaeological contexts; and, more remo-

tely, the cultural evidence traditionally labelled "Neolithic" and dated to the 8th - - 5th millennium B.C., or even earlier. To mention some, the Epi-Palaeolithic communities of the area (13th - 5th millennium B.C.) revealed evidence of numerous grinding stones and microlithic flakes with lustrous edges (Wendorf and Schild, 1975; Caton-Thompson, 1952; Hester and Hobler, 1969) suggesting that intensive collecting and grinding of seeds were amongst the major economic activities of those groups. By the 5th - 4th millennium B.C. the archaeological record shows a well developed adaptation to wheat and barley cultivation (Helback, 1955; Hays, 1976; Lal, 1967; evidence summerized in: Abbas Mohammed-Ali, 1978).

There is, therefore, a strong case for sub-tropical Northeast Africa being within a zone of Post-Pleistocene intensive gathering using specialized equipment. But, similar to other parts of the world (*e.g.*, the American Southwest) it did not develop into full agriculture though it might have pre-adapted those communites for later innovations.

The tropical region

Here we are concerned with two indigenous plant domesticates; *Sorghum* sp. and *Pennisetum* sp. In its wild form, *Sorghum* is indigenous to the Sahel-Sudanic belt, north of latitude 10°N and east of longitude 25°E (Harlan *et al.*, 1976). In this region most of its domestic varieties occur. It is logical to assume (Harlan *et al.*, 1976) that it was first cultivated where "the most massive stands of its wild (forms) occur, north of the equator and on the east side of the continent". It is believed (*Ibid*) that *bicolor* is the most primitive among the many races and sub-races of *Sorghum*, and it could give birth to any one of them. To-day *bicolor* occurs side by side with wild *Sorghum* in Eastern Sudan.

Being a tropical summer crop, *Sorghum* should not be expected to have grown north of the Tropic of Cancer if our palaeoclimatic map is correct. The domestication of the *bicolor* remains, therefore, a Sahel-Sudanic development. The eastern part of the Sahel belt (Lake Chad to the Ethiopian Plateau), was nominated as a possible area for its early domestication (Harlan *et al.*, 1976).

Compared to *Sorghum*, little work has yet been done on early distribution and cultivation of *Pennisetum* (Portérés, 1976; Munson, 1976). In its wild form it exists almost in the whole Sahel-Savannah belt (Purseglove, 1976) and Ethiopia has been suggested as the centre of its domestication (Dogget, 1970). This was supplemented by the possibility of a second centre in the Sudan zone. If these arguments are accepted, then three alternatives need to be tested:

a) Did *Sorghum* and *Pennisetum* cultivation precede wheat and barley cultivation in Northeast Africa?
b) Did it develop as part of the same process?
c) Was it only a later development in which ideas transferred from sub-tropical to tropical milieu?

Both from Sudan and Ethiopia the evidence for early *Sorghum* and/or *Pennisetum* cultivation is too recent to be of use (summarized in: Abbas S. Mohammed-Ali, 1978). From the Nabta Playa, in the Egyptian desert, some botanical remains have been tentatively so identified (Wendorf *et al.*, 1977). There is some isolated evidence, though with earlier dates, for the occurence of *Sorghum* in the Sahara (Camps, 1969; Mond, 1963; see summary in: Abbas S. Mohammed-Ali, 1978). Although there is as yet very little in terms of direct evidence from this tropical zone to rely upon, yet it appears that both *Sorghum* and *Pennisetum* may have been harvested in the 5th millennium B.C. If that was the case, it would be contemporary with the earliest known spread of domesticated wheat and barley strains into Northeast Africa, and it might well represent a separate local acculturation.

Animal Domestication

Unlike cereal cultivation evidence for animal utilization, whether wild or domestic, is more often preserved in archaeological sites, but quite often there is difficulty in distinguishing wild from domestic forms of species. Here we are mainly concerned with species: *Capra*, *Ovis* and *Bos*.

Capra and Ovis

The wild ancestors of *Capra* and *Ovis* are believed to be indigenous to the mountains of South-West Asia. Both species were exploited through the Late Pleistocene and Early Holocene and they were domesticated in this region.

Wild goat and sheep is not known to be indigenous to Northeast Africa, although the presence of the wild "Barbary" sheep (*Ovis ammotragus*) is beyond doubt (Epstein, 1971). When the African evidence for these two species, which does not predate the mid- 5th millennium B.C., is contrasted with that of South-West Asia, it remains beyond doubt that an Asian origin for both is most likely. As there is no evidence as yet to support any importation of these species from the Mediterranean islands to the North African coast or from Arabia to the Horn, it is most likely that similarily to wheat and barley they were brought to Northeast Africa through contacts across Sinai. The only major and extremely important difference was that sheep and goat, unlike wheat and barley, faced no climatic difficulties to prevent their penetration into the continent.

Bos sp.

Compared to the above species, *Bos* sp. has a wider Pleistocene distribution. It was found over the whole of Africa north of the savannah, and it was reported from a number of Upper Pleistocene Northeast African sites (summerized in: Abbas S. Mohammed-Ali, 1978). Despite certain zoological problems concerning the spe-

cies (see Grigson, 1969; Jarman, 1969), it is believed that it was domesticated in Greece and Anatolia by the 7th millennium B. C. but made a rather late appearance in Palestine (Reed, 1969); in Northeast Africa the evidence argues for a 5th - 4th millennium B. C. presence of cattle (see Abbas S. Mohammed-Ali, 1978). This development would suggest certain alternatives:

a) Were the African domestic cattle an introduction from South-West Asia?
b) Were they a result of migration from the Mediterranean islands, or the product of a diffusion from that direction?
c) Was this a product of a diffusion of ideas? and,
d) Were they a local, indigenous development (domestication)?

The evidence from South-West Asia suggests that cattle was not a significant part of the domestic fauna in Palestine before the 4th millennium B.C.; from Egypt we do not seem to have any direct evidence for cattle domestication before the late 5th millennium B.C. The suggestion of cattle migration from Southern Europe and the Mediterranean islands rests on no archaeological evidence and lacks the support of early occurrences of domestic cattle on the North African coast. Culturally, there is very little in common between North Africa and Southern Europe during the Neolithic. As it stands to-day the evidence from the Sahara argues for a local domestication of cattle before the 5th millennium B.C.

Conclusion

Northeast Africa does not seem to have been a cul-de-sac as it was previously thought of. The domesticated species of this region were not necessarily only those of South-West Asian origin. The Neolithic adaptation of those groups can hardly, if at all, be understood without realizing that the area, by its very nature, belongs to at least two geographical units: tropical and subtropical. This factor must have had determined the kind of species involved in the local process of domestication.

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MARGHERITA MUSSI

Un modèle des débuts de l'agriculture au Proche-Orient

Au début du VIII° millénaire avant notre ère[1], si ce n'est plus tôt, on trouve en Palestine, dans un contexte du néolithique précéramique A, le blé amidonnier domestique (*Triticum dicoccum*) à Jericho (Hopf, 1969) et à Wadi Fallah (Noy *et al.*, 1974), et l'orge domestique à Jericho (Hopf, 1969). En dehors de cette région, les témoignages de céréales domestiques semblent actuellement un peu plus récents et remontent au plus tôt à la moitié du VIII° millénaire[2]: c'est le cas d'Ali Kosh (blé amidonnier et engrain, peut-être orge: Hole *et al.*, 1969) et de Cayönü (engrain, puis blé amidonnier: Braidwood *et al.*, 1974). Par contre, si l'on exclut le chien, dont l'importance économique est relative, les plus anciens animaux morphologiquement domestiques ont été retrouvés dans la région nord-occidentale du plateau iranien, et remontent au VIII° millénaire: il s'agit de la chèvre, à Asiab (Bökönyi, 1977) et du mouton à Ali Kosh (Hole *et al.*, 1969). Tant dans le cas des plantes que dans celui des animaux, nous avons à faire avec un nombre limité d'exemplaires, parmi d'autres qui ont encore toutes les caractéristiques de l'espèce sauvage. Toutefois ils témoignent, à eux seuls, d'un contrôle et d'une manipulation de la part de l'homme pendant de très nombreuses générations (Clutton-Brock, 1971; Higgs et Jarman, 1972; Jarman, 1972). Vers 6.500 a.C., dans un cadre de communautés villageoises solidement établies, la domestication est déjà atteinte non seulement par la chèvre et le mouton, mais aussi par le porc et le boeuf: ces animaux domestiques sont présents, à côté d'autres aux caractéristiques encore sauvages, dans tout le Proche-Orient, et en Grèce également (Bökönyi, 1976), alors que les céréales subissent une série de mutations qui les rapprochent de plus en plus des races domestiques modernes (Harlan, 1977).

Les communautés du VII° millénaire au caractère villageois bien défini, à l'éco-

[1] Cette chronologie est basée sur des datations en années-radiocarbone conventionnelles.

[2] A l'exception d'un seul grain d'orge domestique, douteux, à Tell Abu Hureyra, dans le niveau mésolithique (Hillman, 1975).

nomie définitivement engagée sur la voie de la production alimentaire, sont évidemment le résultat d'un très long processus, dont le terme de départ se situe parmi les chasseurs de la fin du Pleistocène. Meillassoux (1976) offre une définition et un modèle théorique, sur le plan socio-économique, des deux termes du problème, et du passage du premier type de société au second. Le premier, celui des agriculteurs, est la communauté domestique, le second, celui des chasseurs-cueilleurs, est la horde.

Selon ce modèle, la horde opère dans une économie de ponction des ressources naturelles, et la terre est l'objet du travail de l'homme, sans qu'elle ne reçoive un investissement préalable en énergie humaine. Le travail a un rendement instantané – pas forcément immédiat – et la productivité du travail est très élevée. La coopération entre les producteurs, quand elle est nécessaire (par ex., lors de chasses au filet) termine au moment-même où cesse l'action, c'est-à-dire lors du partage du produit entre les producteurs: si un producteur quitte l'équipe de travail avant ce terme, il perd la part de travail qu'il a investi, mais il ne brise aucun cycle de production. Le cycle alimentaire, c'est-à-dire le cycle de la reproduction de la force de travail, de l'énergie humaine, est court mais répété presque quotidiennement, car il n'y a pas d'accumulation du produit. Les hordes, cellules de production, sont instables et de composition changeante, et les familles sont précaires: le producteur intéresse en fonction de sa capacité de production présente et non future, et la procréation ne donne pas lieu, dans ces conditions, à un contrôle social étroit: la horde se définit en vertu de l'adhésion. La position sociale de l'individu est fonction de sa participation présente aux activités communes.

Pour la communauté domestique, par contre, la terre est un moyen de travail, et elle est rendue productive par un investissement préalable d'énergie. La productivité du travail est plus basse, par rapport à celle présente dans l'économie de ponction, mais la plus grande productivité des moyens de travail, et la possibilité d'investir un temps de travail plus prolongé dans la production augmentent, en définitive, le volume de celle-ci. Le cycle agricole rend nécessaire une coopération prolongée dans le temps, et le rythme lent de la production, qui se répète cycliquement, augmente la cohésion de la cellule productive. "La communauté domestique est la cellule de base d'un mode de production constitué par un ensemble de ces communautés organisées entre elles pour la production économique et sociale et la reproduction du rapport de production spécifiquement domestique" (Meillassoux, *op. cit.*:58). Les mariages sont strictement réglementés, de même que l'appartenance future des enfants à l'une ou à l'autre communauté: l'appartenance se définit sur la base de la filiation.

Au Proche-Orient, à l'intérieur de l'habitat natural des céréales sauvages, la région pour laquelle nous disposons de la séquence plus complète et détaillée du Paléolithique supérieur final (ou Epipaléolithique) au néolithique acéramique est la Palestine. En acceptant le modèle de Meillassoux, nous voulons voir à quel point de la transition entre la horde et la communauté domestique se situe le Natoufien, qui est chronologiquement – et culturellement – intermédiaire entre les deux,

et quelle est sa position par rapport à la domestication si ce n'est des animaux (il n'y a d'indications dans ce sens que pour le chien), du moins des céréales.

L'utilisation intensive de celles-ci de la part des Natoufiens est prouvée, indirectement, par une série de considérations d'ordre archéologique et écologique (pour une discussion: Mussi, 1976). Elle éxigeait des Natoufiens une technologie assez complexe dans le travail de la pierre (meules, molettes, mortiers, récipients divers, etc.) et de l'os (manches de faucilles), et dans l'aménagement du sol, où étaient parfois creusés des silos. Cette technologie trouvait aussi application dans la confection de pendentifs, figurines, harpons, pointes d'os etc., et l'étendue des capacités techniques des Natoufiens est également prouvée par des parures de coquillages, de petites constructions circulaires, des dallages etc.

Prenons le travail de la pierre: il implique une chaîne d'opérations complexes. En effet, il faut d'abord se procurer la pierre nécessaire (calcaire ou basalte), qui n'est pas présente partout et que l'on va parfois chercher à des dizaines de km. de distance; puis il s'agit de sélectionner un bloc adéquat, éventuellement de le détacher de son contexte géologique, de l'épanneler au moyen d'outils préalablement préparés; la forme définitive est obtenue grâce à une abrasion prolongée, qui requiert l'usage d'un polissoir et, probablement, d'une poudre abrasive composée de minéraux particuliers; enfin, dans certains cas, l'objet est décoré en relief[3].

Le travail de l'os et des coquillages, et la construction, impliquent des opérations tout aussi complexes, prolongées et fatigantes. Au début de ce processus il y a "les choses que la travail ne fait que détacher de leur connexion immédiate avec la terre (...), objets de travail de par la grâce de la nature" (Marx, 1975: 181). Ces objets de travail (os, pierre etc.) passent à travers une première phase de travail, qui les transforme en matière première (dans le sens de Marx: objet de travail déjà passé à travers une phase de travail précédente); celle-ci est à son tout objet d'une nouvelle phase de travail, et ainsi de suite jusqu'à ce que, à la fin, "le travail en se combinant avec son objet, s'est matérialisé et la matière est travaillée. Ce qui était du mouvement chez le travailleur, apparaît maintenant dans le produit comme propriété en repos" (Marx, *op. cit.*: 183). La quantité de travail matérialisée dans les restes archéologiques du Natoufien est infiniment supérieure à celle des époques précédentes: c'est le fruit d'activités répétées d'une façon systématique, et dans chaque cycle intervient l'action d'instruments qui, dans leur majorité, montrent à leur tour les traces d'un travail précédent.

La fabrication de l'outillage nécessaire à l'exploitation des céréales est donc complexe et exige un investissement en travail élevé, mais qui rend au cours des années, car il s'agit souvent d'objets de longue durée: les mortiers en pierre, par exemple, peuvent être perforés à leur base par le long usage – et parfois même réparés – à el

[3] A Mallaha, la précision géométrique de la forme et de la décoration de certaines pièces (Perrot, 1966: fig. 15, 18) prouve une capacité d'abstraction, et une habilité technique, sans termes de comparaison hors du Natoufien pour une période aussi ancienne.

Wad (Garrod et Bate, 1937), Wadi Fallah (Stekelis et Yizraeli, 1963), Hayonim (Bar-Yosef et Goren, 1973). Les difficultés de la fabrication, et la durée de l'utilisation, impliquent une coopération plus étendue, et une plus forte cohésion, à l'intérieur du groupe. Un individu isolé qui l'abandonne renonce à tout le travail investi dans la production d'objets trop lourds pour être transportés, et affronte des difficultés peut-être insurmontables s'il essaie de se reconstruire l'équipement nécessaire à une utilisation individuelle des céréales. Ceci explique probablement pourquoi les petits groupes mobiles du Kébarien et du Kébarien géometrique A, qui ont précédé le Natoufien et qui semblent rentrer pleinement dans la définition de horde, ne se soient appliqués que sporadiquement à la production d'objets durables tels, qu'on les rencontre dans le Natoufien, dont la confection ne présentait pourtant évidemment pas des difficultés majeures sur le plan technologique. On peut en déduire que s'ils ont recueilli et consommé des céréales sauvages, ils ne l'ont fait que sporadiquement.

En définitive, au Natoufien, les moyens de production sont beaucoup plus développés tant en ce qui concerne les moyens de travail (outils, connaissances techniques, organisation du travail), que l'objet du travail (les céréales, beaucoup plus intensément exploitées). Le niveau des forces productives est donc supérieur à celui du Kébarien et du Kébarien géometrique A.

Les céréales sauvages perdent rapidement leur grains, dès maturité et, pour obtenir une bonne récolte, il faut prévoir et suivre attentivement leur mûrissement. Dès lors, la limite imposée à la production sera celle de la quantité de main-d'oeuvre que l'on peut concentrer en un endroit déterminé et à un moment déterminé. Pour garantir une récolte abondante, il faudra: 1. Posséder l'outillage nécessaire; 2. Pouvoir compter sur la présence d'un nombre relativement élevé de personnes; 3. Pousser la récolte au-dela des besoins immediats; 4. Garantir le stockage du surplus, et sa redistribution future, différée dans le temps. Ces deux derniers points seraient inconcevables à l'intérieur de groupes semblables aux hordes actuelles de chasseur-cueilleurs, qui se limitent à une activité "au jour le jour", et à la consommation immédiate des denrées disponibles (Mussi, 1976: 192 - 6). Il faut disposer des moyens, socialement approuvés, de réunir un nombre élevé de personnes pour une tâche prolongée, dans la perspective d'un gain futur — celui d'une longue sécurité et autonomie sur le plan alimentaire — et de les faire patienter jusqu'à la redistribution, différée, des denrées emmagasinées.

Les conflicts qui naissent, inévitablement, à l'intérieur d'un groupe amené à une vie en commun prolongée, ne se résolvent plus, comme dans la horde, par de fréquentes fissions. Un ou plusieurs indivus, grâce à leur prestige personnel, acquis par l'habilité démontrée dans la chasse, la cueillette, ou dans quelque autre activité, seront investis d'une certaine autorité et d'un certain pouvoir, qu'ils utiliseront pour régler les conflicts internes du groupe, mais aussi pour organiser les autres activités communautaires, telles que les grandes cueillettes de céréales et la redistribution, plus tard, des aliments stockés: on ne peut scinder les différents termes du processus.

Avec l'augmentation de l'importance des céréales, et la répétition des cycles de cueillette, préparation, redistribution et, peut-être, parfois, plantation, et avec le passage des années et des générations, cette autorité tendra à se fixer chez les anciens. Meillassoux (*op. cit.*: 70), dans un contexte déjà pleinement agricole, mais qui ne diffère pas, dans la substance, de notre situation de transition, si l'on remplace au cycle des semences le cycle spontané naturel, décrit cette transformation de la façon suivante: "le cycle agricole s'accompagne d'une circulation continuellement renouvelée d'avances et de restitutions du produit entre groupes producteurs des saisons successives: l'ensemble des travailleurs d'une saison avance la substance et les semences à ceux de la saison suivante. Si la plupart des travailleurs demeurent les mêmes d'une saison à l'autre, à mesure que le temps passe, la composition de l'équipe de travail se modifie: les plus vieux disparaissent, tandis que les jeunes prennent leur place. En raison de la transformation progressive de la composition du personnel, elle aboutit, à terme, à un changement de générations. La composition changeante de l'équipe des producteurs se reflète dans la hiérarchie qui prévaut dans les communautés agricoles et qui s'établit entre "ceux qui viennent devant" et "ceux qui viennent après".

Le résultat de l'ensemble de ces changements – que nous décrivons analytiquement mais qui, dans la réalité historique, agissent et réagissent de façon continue l'un avec l'autre est que la famille nucléaire, labile et précaire, de la horde, est remplacée par une famille élargie structurée, qui contrôle la production et la reproduction du groupe. Archéologiquement, ceci est témoigné par l'évolution des fonds de cabanes isolés et de brève durée du Kébarien, et du Kébarien géometrique A, aux *compounds*, de longue durée et habités par une famille élargie, tels qu'ils ont été définis, en premier lieu, par Flannery (1972) et qui apparaissent dès le début du Natoufien. En même temps, nous assistons à un grand développement des rites funéraires: alors que, pendant le Kébarien et le Kébarien géometrique A, la communauté des vivants se séparait des défunts de façon telle que, dans la grande majorité des cas, nous n'avons pas de traces archéologique de ces derniers, il semble que maintenant tous les efforts convergent pour en assurer la présence à l'intérieur de l'habitat – et donc pour mettre en évidence l'importance des ancêtres. Et parmi les centaines de sépultures natoufiennes qui ont été retrouvées, le pourcentage élevé de personnes âgées, et donc moins actives, doit être rapporté, entre autres choses, à la plus grande efficacité de la production alimentaire. En effet, l'analyse par classe d'âge, présentée par Bar-Yosef *et al.* (1971 - 72), de 190 squelettes provenant de différentes localités, démontre que la plus grande partie des adultes mourrait entre 20 et 30 ans: nous pouvons penser que les 20 individus qui ont survécu plus longtemps étaient les "personnes âgées", et elles représentent le 11% du total, donc un pourcentage élevé. Non seulement la communauté s'occupait d'un nombre relativement élevé d'anciens, mais elle leur conférait une grande importance, si l'on considère que les sépultures de type exceptionnel (caisson de pierre de Hayonim, sépulture de Erq el-Ahmar, éventuellement crâne de l'habitation n° 1 de Mallaha)

se réfèrent à des personnes âgées (Bar-Yosef et Goren, 1973; Perrot, 1966; Vallois, 1936). En définitive, au développement des forces productives correspond une transformation de la structure sociale.

La fin du Pleistocène, et les débuts de l'Holocène, semblent caractérisés, au Proche-Orient, par une série d'expériences dans la domestication des animaux (Bökönyi, 1976) et des plantes qui portèrent à la constitution de la base économique des communautés villageoises d'agriculteurs-éleveurs à partir du VII° millénaire. Les différents processus semblent avoir eu lieu de façon autonome, bien qu'il ne soit pas partout possible de les suivre de manière détaillée, par manque de documentation archéologique, mais ils sont probablement comparables entre eux. Ils paraissent caractérisés par une forte croissance des forces productives et par un développement de la structure sociale qui, du moins en Palestine, correspond aux grandes lignes du modèle proposé par Meillassoux (1976). Partout, ils semblent marqués par une augmentation de la quantité de travail investie par l'homme dans les composantes de son habitat. Et selon l'heureuse expression de Marx (1975: 184): "les animaux et les plantes que d'habitude on considère comme des produits naturels sont, dans leurs formes actuelles, les produits non seulement du travail de l'année dernière, mais encore d'une transformation continuée pendant des siècles sous la surveillance et par l'entremise du travail humain".

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WHITNEY DAVIS

The earliest art in the Nile Valley

Rock art in the Sahara west of Egypt and Nubia has frequently been dated by its association with archaeological material, with varying degrees of success (*e.g.*, Sandford, 1933: 220). For much Saharan rock art, these associations are not stratigraphical; implements were found near rock-pictures but not in deposits covering pictures (*e.g.*, Reygasse, 1931; Vaufrey, 1936; 1938; 1939). The reliability of non-stratigraphical association is called into question, for instance, by a number of Lhote's discoveries (1965: 90). It seems best to accept only stratigraphically associated archaeological finds as evidence for dating very early rock art. For areas outside Egypt and Nubia it is possible to make such associations if – and here, of course, we confront the most fundamental problem – suitable sites can be located (see, for some examples, P. E. L. Smith, 1968: 8 - 9, 34 - 35; Mori, 1965: 234; Camps *et al.*, 1968: 28; cf. Leakey, 1936: 138 - 40).

To my knowledge, in Upper Egypt and Nubia only two sites afford possibilities of a stratigraphical association between rock art and archaeological material[1]. Other researchers have found rock-drawing sites with nearby lithic, ceramic, or funerary assemblages. The variety of these discoveries only magnifies problems of interpre-

[1] The work of the Nubian Survey of the Egypt Exploration Society revealed a possible association between A-Group artifacts and the rock-paintings in the shelter at Korosko (Dunbar, 1941: 53). A worn, blackened „boat-shaped" grindstone from the lowermost level (Level C) of the floor of the painted shelter retained „considerable traces of red ochre embedded in it, so that it may well have been used for grinding the paint for the decoration of the shelter" (H. S. Smith, 1962: 89). With the exception of one definitely C-Group sherd, all material from Level C may be definitely assigned to the Nubian A-Group, and a parallel between the grindstone from Korosko and several from the A-Group occupation site at Afyeh has been noted (H. S. Smith, 1962: 59 - 61). However, the survey team did note parallels between the shelter art and representations on C-Group pottery. The paintings from Korosko reproduced by Dunbar (1941: pl. 24, and cf. Zaba, 1967, who questions this copy) are definitely C-Group; only a fraction of the shelter art, then, can be A-Group. The other stratigraphical association will be discussed below.

tation. For instance, at Gebel Furer in the Sudan, Arkell discovered a series of rock--drawings of boats, cattle, and a giraffe, and found close at hand fine potsherds decorated with herring-bone and with incised dots and combing (1950: 32). P. E. L. Smith hopes that Palaeolithic industries found below the cliffs north of Kom Ombo can be associated with the naturalistic drawings of cattle found on the cliffs themselves (1964: 210). The Nubian Survey of the Egypt Exploration Society discovered a rock-drawing of a horned animal beside Grave 3 at Cemetery 244 on the east bank of the Nile near Abu Simbel, dating the plundered tumulus to the era of the Nubian C-Group (H. S. Smith, 1962: 15). The Scandinavian Joint Expedition discovered many Neolithic, A-Group and other sites near rock-drawing sites (Neolithic site 89 near rock-drawing stations 89c - g; 371 near 387a; 424 near 382c; 414 near 378d; 365 near 374a: see Hellström, 1970; Nordström, 1972).

As I have argued in detail elsewhere, because the archaeological record is so limited, a chronology for rock art must be based upon examination of stylistic and other trends within the corpus of rock-pictures (Davis, 1978; 1979). Preliminary examination of these patterns has led to results which are essentially in accord with results obtained by the method of comparing drawings with pottery designs, with art mobilier, and with contemporary technologies (advocated by Červiček, 1978). This latter method will not provide us with much useful information about the earliest rock art in the Nile valley, however, for the simple reason that the earliest rock art happens also to be the earliest art of any kind in this area.

Based upon the magnificent recording by the Scandinavian Joint Expedition and upon my own analysis of this record, I judge two rock-drawing stations, SJE 382c and 382d, to be the oldest to be identified so far in the Nile Valley. These drawings are mainly non-representational and/or geometric designs, consisting, for instance, of concentric circles, dotted circles, parallel lines, interwoven lines, and polymorphic figures. Generally they are found on horizontal rock-surfaces (descriptions in Hellström, 1970: 187 - 91, pls. 108 - 15). I am unable to determine whether Winkler observed a similar phenomenon in the siting of his early drawings, although he does say that the drawings of "hunters" "are as a rule found in sunny places, often on the tops of hills or boulders" (1938: 32). The rock on which these early SJE drawings are found is generally classified as "very smooth", although some smooth surfaces and a single rough surface were noted. Both stations are located on the flat summits of gentle hillocks; the height of both stations, in meters above sea level, is 150 m. It is likely that both stations are of the same age, possibly as early as the eighth millennium B. C. The SJE team noted that the patination of the drawings, complete or *a*-patina, could have formed only through submersion; at one point, then, both stations were under water. Since many incompletely patinated drawings in the vicinity were found at 150 m. and below, the SJE team concluded that the geometric drawings were the most ancient discovered in the area. An available absolute date is Myers' C14 fix of associated material to 7,450 - 7,250 B. C. (for details, see Myers, 1960: 178; Hellström, 1970: I, 29). Non-representational drawings found elsewhere which

closely compare with those from 382c and 382d are probably as old as the drawings from these two stations. (Some unidentified figurations in the *corpus* should be approached cautiously, for it may be that if they could be more clearly made out they would exhibit some representational theme).

Table 1

Chronology of a-patina rock-drawings from the SJE concession

SJE Station	Rock-drawing theme	Station elevation
382c, 382d	geometric	150 (Stage I)
378q	clubs	
152b	e-antelopes	
	h-antelopes (152b40)	150 (Stage II)
154a, 378d	crocodiles	
	human figures	
376c	k-giraffes	
382b	k-, l-, m-antelopes	140 - 50 (Stage III)
390f	oxen	140 - 50
376a		140
151a	h-giraffes	130 - 40 (Stage IV)
206b		

Stage I possesses the oldest known rock-drawings, dating from circa 7,000 B. C. An available C-14 date is 7,450 B. C. (Hellstrom, 1970: I, 29).

Stage II possesses rock-drawings stemming from the transitional phase formed by the introduction of the Neolithic and gradual disappearance of the Palaeolithic traditions (6,000 B. C.?).

Stage III is a sub-prehistoric period possibly not far removed from the Egyptian predynastic. An available C-14 date is 4,650 B. C. (Hellström, 1970: I, 29). In other patinas, boats and other indicators of developed culture appear at this elevation.

Stage IV includes the youngest a-patina rock-drawings, probably dating from periods after the domestication of cattle in Upper Egypt and Nubia (Nubian C-Group?).

Taking the most ancient date of these stations as given, it is possible to construct a relative chronology for all *a*-patina SJE rock-drawings according to methods earlier outlined (Davis, 1978) (Table 1). It will be noted that oxen do not appear until the lower station elevations; an examination of the distribution tables of drawings (Hellström, 1970: I, 31 - 51) shows that for all patinas (*a* through *d*), oxen never appear above the 140 - 50 m. elevation and a significant number appear at 140 m. or below. Crocodiles appear in the relative chronology as characteristic of the 140 - 50 m. elevation, and the distribution tables reveal that for all patinas, slightly more than half of the crocodiles are to be found at this elevation. A substantial number, however, are found at 150 m. or higher, but only in incompletely patinated form. Most human figures are to be found at the 140 - 50 m. elevation or the 140 m. elevation; very infrequently is the elevation any higher, and human figures at a 150 (+) m. elevation are always incompletely patinated. These incompletely patinated figures at the high elevations are probably contemporary with, or younger than, completely patinated figures at the lower levels.

Some at least of these drawings must be attributed to an era preceding the de-

velopment of settled agriculturalist production. Unfortunately, however, it is impossible to tell whether cattle as shown in the rock-drawings are domesticated. The criteria for judging domestication are themselves not at all well-specified: in Egypt, animals buried in archaic burial sites with human remains (Brunton and Caton-Thompson, 1928: 94; Brunton and Morant, 1937: 57) may not have been domesticated (Mustafa, 1953). Collars and head-ornaments depicted on cattle may imply domestication (Huard and Massip, 1964), but with good reason Lhote questions the traditional dating of rock-pictures showing rams bearing discs between the horns to the Egyptian New Kingdom (1964: 196). Collars and other paraphernalia may be signs of "incipient domestication": a special concern for the animals is expressed in decoration with man-made objects (P. E. L. Smith, 1968: 10). Significantly, at riverside rock-drawing sites in the Nile Valley, few if any of the *b*-patina cattle bear ornamentation, and none possesses an udder. This may be contrasted with the desert drawings: in the western desert, for instance, there is a fine panel showing a cow with well-developed udder, patinated completely black (Winkler, 1937: fig. 46). (The contrast may have no significance, for similarity in patination does not imply contemporaneity). Many Nile Valley drawings show men in association with cattle, hunting them (Dunbar, 1941: fig. 27; Winkler, 1938: 20, 24, and pl. 15.1) and "tending" or "herding" them, and Huard has even published a drawing from Myers' survey near Wadi Halfa showing a human figure (?) astride a cow or bull (1968: fig. 3, no. 9). It is, therefore, extremely difficult to judge whether rock-drawings show domesticated cattle; darker-patinated cattle found at relatively high elevations in the SJE concession (140 - 50 m. and above) are possibly undomesticated and would consequently date to some prehistoric era prior to about 4,000 B.C.

The first developed food-producing settlement in the SJE region is that at Khor Bahan, described by Reisner, which has many Upper Egyptian features of the Naqada I and II periods and was evidently contemporary with the late Naqada I or early Naqada II in Egypt (Reisner, 1910: 113 - 40), and possibly with the Abkan culture investigated by the Combined Prehistoric Expedition and the SJE. In other terminology, we are speaking of a period contemporary with the Nagada Ic, IIa - b phases, and Trigger's Bahan phase and Early Nubian Ia subphase (Trigger, 1965: 68 - 72). Despite Nordström's remark that in the late Qadan period and in the beginning of the Early Nubian sequences there is no evidence of pastoralism (1972: I, 7), Trigger's exhaustive survey of the Nubian sequences suggests to him that pastoralism spread through the Sahara beginning in the fifth millennium (1965: 63), and available C14 dates for north African sequences suggest that the source of this pastoralist movement lay in the central/south Sahara (as opposed to the Nile Valley) in about 7,500 B. C., spreading to the northwest Sahara as early as 5,500 B. C. (Derricourt, 1971: 271)[2]. Evidence from Uan Muhuggiag and Adrar Bous indicates

[2] See also Willett, 1971, and compare Clark, 1962: 213 and Clark, 1964: 181. The problems are discussed in Lhote, 1969; 1970; McHugh, 1974a; 1974b.

that a shorthorn *Bos* was actually domesticated there by 5,500 - 4,000 B. C. (Clark, 1971: 53). Nordström's inclination to date cattle pastoralism to as late as the C-Group in the southern portion of lower Nubia, after 3,000 B. C., cannot be ignored (Nordström, 1972: I, 6; cf. Nordström, 1962: 40, 49; Hall, 1962; Nordström 1966; Huard 1964; Myers may have held a similar view: 1960: 176), but the evidence from other areas of the Nile Valley and the Sahara overwhelmingly points to an earlier date for cattle pastoralism and for domestication in northeastern Africa. The earliest drawings of cattle might be associated with this pastoralist movement.

Assuming that from 5,000 - 4,000 B. C. culture tended increasingly toward settlement, rock-drawings depicting horned animals, like antelopes, should probably be dated to an earlier age. Large fauna, like giraffe and elephant, perhaps appeared before the sub-pluvial, ca 6,500 B. C., rendering them easily available for hunting and for representation in that era [3]. Such fauna declined in numbers after 3,600 B. C., but in any case at this later time they probably would no longer have been interesting to man, for attention had shifted to the new settled pastoral/agricultural economy based upon domesticated cattle. Winkler's "early Nile dwellers" (Standarten-Leute), whose work may be dated fairly accurately to the predynastic and early dynastic period (Winkler, 1938: 24, pls. 13.1, 16; 1939: pl. 31.1) did know the elephant (1938: 30, pl. 14.1) and the giraffe (1938: pl. 14.1, 1939: pl. 13.1), but drawings of these large animals are rare among works produced by all but the earliest populations. In other words, it was Winkler's "earliest hunters" (Dirwa-Leute), which he dated before the Egyptian predynastic with a late expression contemporary with the Nagada I (1939: 33), who knew well the elephant (1938: pls. 27.2, 28.1; 1939: pls. 56.1, 57.2) and the giraffe (1938: pls. 38.1, 2, 29.1, 2, 30.1; 1939: pls. 51, 52.1, 53.1, 54. 58.1).

Dating these earliest drawings poses difficulties, but a useful chronological and archaeological control is provided by the work of O. H. Myers. At his site near Abka in the second cataract region of Nubia, Myers had the great good fortune to discover drawings, some of which had evidently fallen from large surfaces still exposed to view, covered by layers of material, and stone tools in definite stratigraphical association with drawings. His work, often neglected, was described in several of his own publications (1948; 1949; 1958; 1960) and his results incorporated in the SJE publication (Hellström, 1970: I, 27 - 28, and see also Hellström, 1966). Among Myers' more important sites, his Site V is equivalent to SJE 152b and Site 2006 of the Combined Prehistoric Expedition, his Site IX is equivalent to SJE 154a, and his Site XXXII is equivalent to SJE 382d. The tools he recovered were analyzed and published by Vaufrey (1958) and Palma di Cesnola (1960). Myers was able to obtain

[3] For the purposes of our inquiry, what is notable about the faunal population of the Late Pleistocene is the lack of giraffe and elephant, two species depicted frequently in Upper Egyptian and Nubian rock art (Churcher, 1972: 127 - 29). As Butzer points out (1975: 148), the absence of these species should be attributed to the ecology of the prevailing „glacial age" climate. A more abundant faunal period can be dated to about 5,000 B. C., the beginning of the so-called Neolithic wet phase, or subpluvial II phase in Butzer's terminology (1957: 27 - 28).

several C14 dates for the various levels at two of his important sites, and published these as follows (listed uncorrected according to modern radiocarbon standards, in Myers, 1960: 176 - 78; Crane and Griffin, 1960: 45 - 46):

1. Site XXXII, lower levels .....7,500±400 B.C. (M-795, shell)
2. Site XXXII, upper levels .....7,225±400 B.C. (M-794, shell)
3. Site IX, level 6 (lowest) .....6,310±400 B.C. (M-804, shell)
4. Site IX, level 5 .....4,010±400 B.C. (M-805, shell)
5. Site IX, level 4 .....2,550±350 B.C. (M-801, charcoal)
6. Site IX, level 4 .....2,520±300 B.C. (M-802, shell)
7. Site IX, level 3 .....1,280±200 B.P. (M-800, charcoal)
8. Site IX, level 3 .....1,300±200 B.P. (M-799, charcoal)
9. Site IX, level 2 .....1,355±200 B.P. (M-798, charcoal)

The last three dates (7, 8, 9) appear as published by the laboratory (Crane and Griffin, 1960); in Myers, they appear only as "about A. D. 675" (1960: 178). Although we could wish for more samples from each level, worries about the dating of shell are put to rest by M-793, shell from the second cataract area, which gave a correct modern result of 0+/−150.

In these levels, various lithic and ceramic artifacts were found, which may be summarized as follows:

1. Site IX, level 7: SJE Ceramic Ware Group K1 (Nordström, 1972: I, 9).
2. Site IX, levels 7, 6, 5: Khartoum Variant lithic and ceramic artifacts (Nordström, 1972: I, 12, 115), apparently with some interspersed Sebilian material (Palma di Cesnola, 1960: 209).
3. Site IX, levels 5, 4: SJE Ceramic Ware Groups M1, M2 (Nordström, 1972, I, 12) and Developed Abkan lithic artifacts (Wendorf, 1968: 625).
4. Site IX, levels 3, 2: "continuation of the microlithic tradition of preceding cultures, though instead of bifacial arrow heads transverse arrow heads are present" (Palma di Cesnola, 1960: 209).

The rock-drawings which Myers discovered covered by the various levels of Sites IX and XXXII, levels dated by radiocarbon analysis, can also be dated fairly precisely by association and are linked with lithic and ceramic cultures of the time, particularly the Abkan culture (Nordström, 1972: I, 12 - 17), and compare the site at Wadi Karagan (Carlson, 1966), dated to 4935±130 BP, and the site at Ambikol East (Nordström, 1972: I, 17), dated to 5330±80 BC. The reader should consult Myers' reports for a full discussion of the excavations. It is to be remembered that SJE 382d (=Myers' Site XXX II) is judged to be perhaps the most ancient station in the SJE sample.

By the stratigraphical associations, various geometric designs discovered at Site IX were dated to no later than 7,000 BC, probably 7,500 - 7,000 BC.[4] Other figu-

[4] Myers, 1960: 177 - 79; 1958: fig. 1, top left, pl. 34.1 = SJE 154a7 = Hellström, 1970: II, pl. 16, bottom.

res – a stylized human figure, four or five hands, a child's figure, a wheel-trap, a club (?), a jellyfish (?), possibly two crocodiles (Nordström, 1970: II, Corpus R13, R14), and a fishtrap (?) (Hellström, 1970: II, Corpus X29) – were dated by Myers to 6000 BC or earlier, and the "pythons" of Site IX, levels 4 and 5, to 5,000 - 4,000 BC.[5] Many geometric designs and a badly-drawn antelope (?), datable to about 7,000 BC, were discovered at Site XXXII.[6] These ancient drawings are all fully patinated (a-patina), and appear on "very smooth" surfaces according to the SJE classifications.

From all of this evidence, it appears that the sites placed earliest by pattern analysis (Davis, 1978) can be dated by archaeological association, and according to the horizons discussed earlier, to between 9,000 and 7,000 B.C. Only a single identifiable representation dates from this extremely ancient period – an antelope from Myers' Site XXXII (1958: pl. 38.1 = SJE 382d3 = Hellström, 1970: II, pl. 110.1) – but even it is very schematic and unclear. Markings at these sites consist mainly of concentric circles and half-circles,[7] (concentric) circles and net-patterns with dots,[8] parallel lines, and curved and meshing lines. Of the more complex designs, which may not be designs at all but surfaces bearing individual unassociated markings, very little can be said.[9] It would be tempting to suppose that the curvilinear forms in these series were incorporated in the developed representational art of the hunters of the Nile Valley. In this art, wavy interwined lines and spirallike designs sometimes appear in isolation.[10] It is most usual, however, for animals to be shown in association with wavy lines or simply curved lines, which sometimes attach to the animals' feet or necks and lead to men standing nearby. At one drawing from Abu Sir, for instance, an animal appears to be trapped in or surrounded by spiral-like wavy lines (Hintze, 1964: fig. 5). Here and elsewhere the lines evidently illustrate a hunting technique or symbolize capture.[11] I doubt that any of these examples represents a serpent, as is sometimes claimed; serpents have another look altogether.[12]

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[5] Myers, 1958: pl. 34.1 = SJE 154a7 = Hellström, 1970: II, pl. 16, middle; Myers, 1960: 177.

[6] Myers, 1960: 176; 1958: pls. 36.2, upper left, 36.3, left = SJE 382d41; Myers, 1958: pl. 37.1, center = SJE 382d32 = Hellström, 1970: II, pl. 112.6.

[7] Myers, 1958: pl. 38.1 = SJE 382d3 = Hellström, 1972: II, pl. 110.1; Myers, 1958: pls. 37.2, bottom left, 39.1, right = SJE 382d21 = Hellström, 1972: II, pl. 112.1; SJE 382d19 = Hellström, 1972: II, pl. 111.2.

[8] SJE 382d4 = Hellström 1972: II, pl. 108.3; SJE 382d1 = Hellström, 1970: II, pl. 109.2, 5; SJE 382d8.

[9] SJE 382d2 = Hellström, 1970: II, pl. 110.2 = Myers, 1958: pl. 38.2; 382d5 = pl. 109.3, 6 = Myers, pl. 39.3; 382d6 = pl. 109.4; 382d18 = pl. 110.5 = Myers, 1958: fig. 3, row 3, no. 1; 382d26 = pl. 113,1 = Myers, 1958: fig. 3, row 1, no. 1, row 2, nos. 1, 2, 4, pls. 37.2, top, 37.3, 39.1, top right.

[10] Winkler, 1939: pls. 59.2, 60.1, 61.1; Almagro Basch and Almagro Gorbea, 1968: figs. 76 - 79.

[11] Winkler, 1938: pl. 29; 1939: pls. 51, 53, 58 - 60, 61.1; Dunbar, 1941: figs. 7, 8.

[12] Admittedly, however, compare SJE 376c5 with Winkler, 1939: pls. 58.1, 59.2, 61.1; for the serpent, see Huard, 1966: 435 - 36, Montet, 1955.

Themes appearing in pattern analysis as slightly later than the very archaic non-representational drawings date to around 6,000 B.C. All of these drawings are also of geometric or polymorphic figurations and line-markings, of antelopes, and of regular forms probably depicting objects associated with hunting, fishing, or trapping. The wheel-trap appears elsewhere in Sudanese Nubia on "very smooth" surfaces and is always fully patinated (Winkler, 1938: 21; Hornell, 1937). In other areas of the Nile Valley, trapped animals sometimes appear; some are found in the western desert of Upper Egypt (see, for example, Winkler, 1938: pl. 19.2) and in the eastern desert (see, for example, Winkler, 1939: pls. 33.1, 38.2), and some of which are rather similar to drawings from lower Nubia (Dunbar, 1941: figs. 23, 164), where the Korosko rock-shelter may preserve a representation of the trap itself (Dunbar, 1941: fig. 166) (at a much later date, it would appear). Such traps are not at all uncommon in other areas of the Sahara (Huard and Leclant, 1973). What is meant by the other forms and lines on Myers' drawings is unclear. One of the forms (Hellström, 1970: II, Corpus X39) is similar to what are just possibly representations of plants, appearing elsewhere in b- and c-patinas (SJE 154a3, 154a34, 154c22); on the other hand, the form may be related to the common concentric circle pattern. The "lattice-shaped" forms find a distant parallel in a "lattice" at 382d18 (Myers, 1958: fig. 3, row 3, no. 1=Hellström, 1970: II, Corpus X79) and a somewhat closer parallel in a c-patina drawing from another site (152b3). What is intended by the lattice is unknown, as is the case for other markings, particularly SJE Corpus X43 and X44, which are completely without parallel. The human figures from Myers' sites which would possibly date to this extremely archaic period should also be mentioned (Hellström, 1970: II, Corpus A13 and A46); one (A13) is very unusual, and has no parallel that I know of in the Upper Egyptian and Nubian material, while the second has some doubtful associations, and is superimposed by a k-technique giraffe. The evidence here is very slight and I hesitate to say that these human figures are as old as the oldest drawings. The chronological position of the crocodiles is likewise difficult to determine. At Myers' sites they are fully patinated, and at another Sudanese Nubian site a similar, but lightly patinated, crocodile is superimposed by an ox (159 a1), but there are two few examples on which to base definitive conclusions.

At Myers' sites, as noted above, the cultures associated with the prehistoric drawings of the earlier phases are the Khartoum Variant and the Abkan. Both of these cultures are known from other sites; the Abkan is possibly the direct "descendant" of the Qadan (Shiner, 1968: 626; Wendorf and Schild, 1975: 161). The dates were obtained by association with the level of material covering the drawings. It must not be assumed that the date of the covering level is the same as the date of the drawing. In fact, the drawing probably had been exposed to view for years before it was covered. The main wall covered with drawings at Site IX, which possesses three bands of coloration, exemplifies this problem. The lowermost band bears the drawings of wheel-traps and the geometric designs. It seems that the Nile rarely

sank below this level, for the water-borne sand apparently scoured away patina as it formed, leaving the band a light grey in color (Myers, 1958: 133). The middle band is dark grey, and presumably was not submerged. There is little sign of sand-scouring; Myers claims that the debris which (later) covered the wall protected this band from the elements and preserved the dark patina (1960: 177). The curving line-markings ("pythons") with dark patina were found on this band, and would therefore have been made some time before the debris was deposited (1958: 132 - 33). The uppermost, light grey band is completely covered with markings and drawings, of all themes and types. Dating these bands assumes that the geometric drawings in the lowermost band date to the period 9,000 - 7,000 B.C. by virtue of the evidence enumerated above. The date of the fill covering the second band is probably 4,000 B.C., but the drawings, showing signs of Nile blackening, must have been made at an earlier time. The uppermost drawings could have been made any time after the river subsided; they must date from 4,000 B.C. to the recent period, primarily of Neolithic and historic date. It can be said with some degree of confidence that many of the drawings not already dated to an earlier phase probably date to the Neolithic wet phase commonly supposed to have been contemporary with one of the main spurts or phases of rock art in the Sahara. [13] Many others are of course C-Group and historical.

The earliest drawings in the Nile Valley, which mostly appear on small smooth surfaces, generally horizontal (although fortunately Myers' surfaces were vertical), are non-representational and therefore few inferences can be made about the culture(s) which produced them. The group of later drawings which precedes the cattle series seems to have been the product of a hunting culture — *e*-technique antelopes, clubs, traps, and such suggestive motifs appear — and they and the preceding geometric group are found, at the second cataract sites, at the relatively high average elevation of 150 m. The drawings showing large fauna, like giraffes, elephants, and k-, l-, and m-technique antelopes, should be dated to the period between the time ecological conditions first became suitable for such creatures and the passing of the hunting way of life. Some few may therefore be as early as 7,000 B.C. These drawings are found at an intermediate elevation, 140 - 50 m., exhibiting a tendency to use large, rough surfaces. The domestication of cattle and transition to settled life provides a date of about 5,000 B.C. for the cattle-drawings and associated motifs found at the relatively low elevations, on large rough surfaces, with light patinas.

It is conceivable that a Late Palaeolithic people was responsible for the earliest series of non-representational drawings and for drawings with hunting associations.

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[13] Petroglyphs in the Nile Valley have often been dated to the moist interval of the sub-pluvial II or to a dry, cool phase contemporary with cultures preceding the sub-pluvial: for example, Monod, 1963: 161. The reader should consult Raikes and Palmieri, 1973 for an account of climatic history which differs in some respects from the one accepted here, based on the work of Butzer, 1957; 1959; Hester and Hobler, 1969: 173 - 75, and Geyh and Jäkel, 1974.

Recent research has dated evolved Sebilian Upper Palaeolithic industries to around 9,000 B.C.[14] The long-lived Late Palaeolithic Qadan industry possesses a late microlithic expression at 4,480±200 B.C.[15], although there is reason to be suspicious of this recent date. Hunters and gatherers were most likely attracted to the Nile Valley in late Upper Palaeolithic times (Huard, 1965; Huard and Allard, 1970), probably following faunal movements; an early Late Palaeolithic date for the Abka area is 14,340±350 B.P. (WSU-290). The fact that they deposited a large number of industrial assemblages, both indigenous and intrusive (P.E.L. Smith, 1967: 150), may be analogous to the presence of indigenous Abkan and intrusive Khartoum Variant in the early levels of Myers' sites. A single area could have been occupied by several groups, and conflict between them was not unknown (Clark, 1971: 50); alternatively, the mixed assemblage at Abka may represent trade between the Abkan and Khartoum Variant groups (Shiner, 1968: 626). However, simply because some non-representational drawings might be as old as 9,000 B.C. does not imply that they are Palaeolithic. Non-ceramic "Neolithic" assemblages have been observed near Wadi Halfa dated to as early as 8,500 B.C., although ceramic Neolithic sequences do not appear for another two thousand years (Marks, 1970; and compare Aumassip, 1972 for northwest Africa). And from certain sites, there is evidence that rock-pictures were made on cliffs submerged in the river waters in the Palaeolithic era (Sandford and Arkell, 1933: 69 - 71).

The significance of the earliest art in the Nile Valley remains a matter for much future research. Since the earliest non-representational designs are limited in number, it seems that specific meanings are intended. There are extremely generalized similarities between non-representational rock-drawings of the earliest phase and very roughly contemporary incised or impressed pottery from Abka (Nordström, 1972: II, pls. 139, 141) and incised ostrich eggshells from Nubia (Carlson, 1966: 61, and cf. Firth, 1915: 60 - 61). These similarities should be explored in greater detail.

The transition to representational art can be observed, as I have noted, in the material surveyed here. Huard and Allard have proposed that Nilotic rock art gives evidence of a stylistic evolution "au schematism vers une seminaturalisme ou une stylisation" (1970: 323). V. Gordon Childe proposed that Egyptian predynastic wall-painting, like the enigmatic painting in Tomb 100 (the Decorated Tomb) at Hierakonpolis, has its origin in predynastic pottery representations, which were in turn descended from early rock art (1934: 83, 105). This is a highly debatable hypo-

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[14] To traditional interpretations of this industry (Vignard, 1923; 1928; with summary in Alimen, 1966: 122 - 26), recent discoveries should be added (Wendorf, 1965: XVII - XVIII, Butzer and Hansen, 1968: 167, Wendorf *et al.*, 1976: 287 - 89, Wendorf and Schild, 1975: 146 - 47).

[15] Butzer and Hansen, 1968: 167; Butzer, 1976: 6 n. 2. For the most recent date, see discussion in Wendorf and Schild, 1975: 146. The Qadan is best known from Wendorf, 1968: 564 - 611, 1050 - 51; see summary by Clark, 1971: 41 - 46. The Qadan culture is equivalent to the Wadi culture of Wheat and Irwin, 1965: 503.

thesis in some respects, but the underlying assumption of continuity in artistic development in the Nile Valley seems completely warranted. At the very least, the pottery art of the Nagada I period frequently thought to inaugurate the artistic tradition of Egypt should not take chronological priority.

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Erika Endesfelder

Social and economic development towards the end of the Predynastic period in Egypt

Presently available information clearly indicates that the emergence of early class-stratified societies was a process with its own marked pecularities in every country and, therefore, did not follow an exact course everywhere, not even within one main region [1]. Thus, definite and striking differences between the course of development in Egypt and in the other countries of the Middle East, and above all in Mesopotamia, are evident. Whereas in Mesopotamia the social and economic differentiation led relatively quickly to the development of independent handicraft, trade, private ownership of land and the emergence of city states, in Egypt such processes took not only a far slower course, but occured in quite a peculiar and characteristic way.

Judging by the available evidence, it does not seem likely that strong city states ever existed in Egypt. But already during the first centuries of the third millennium B.C. a large empire uniting Upper and Lower Egypt had formed under a central authority, whereas independent handicraft and private ownership of land emerged in their first beginnings only during the last centuries of the 2nd millennium B.C., *i.e.* in the final phase of the New Kingdom. Trade had remained in Egypt, over a long period, mainly a local retail trade. Foreign trade had been a state monopoly. Even during the New Kingdom, when for the first time documents speak about merchants, they were not independent dealers who worked on their own account, but dependants of state or temple institutions. Trading in Ancient Egypt was exclusively an exchange of surplus products. Commodity production, *i.e.*, production only for sale, remained largely unknown.

Until recently, the peculiar features in origin and development of the classes and the state in Ancient Egypt seemed sufficiently explained by the need for central

[1] This paper is partly based on a dissertation „Beobachtungen zur Entstehung des altägyptischen Staates", Berlin: Humboldt University 1980 (forthcoming).

administration of irrigation works. Since recent investigations have shown that large-scale irrigation was not in existence in Egypt at the time of state emergence, and the management of irrigation works had not played an important part in the origin of the Ancient Egyptian state (Schenkel, 1978; Endesfelder, 1979), the actual reason for the particularly characteristic formation of that society has become, once again, an open question. It seems likely that instead of irrigation some aspects of the ecological factor played a much more important role in this respect than has hitherto been assumed.

One of these aspects is the fact that in Ancient Egypt already from the time when Neolithic agricultural communities in Upper and Lower Egypt are documented, a relatively high and stable agricultural surplus product could have been produced at a relatively low expense of time, compared with other regions of the world. Since the Middle Pleistocene, when the Nile had found connexion with the water systems of the East African chain of lakes and the Abissinian mountain region, wide areas of the Egyptian Nile Valley were regularily, once a year, irrigated, fertilized and desolated without human interference. During a few weeks immediately after the running-off of the floodwaters, the soil was relatively easy to till. Wooden hoes and, later on, wooden ploughs were entirely sufficient for this tilling, since deep ploughing would have speeded up the undesirable drying out of the soil. The forms of wheat and barley which have been found in the oldest Neolithic cultures of Upper and Lower Egypt required only shallow planting and no additional irrigation. The single, but radical moistening of the soil by the yearly highwater was, as a rule, sufficient for an average crop, provided the tilling was done immediately after floodwater receded from the fields. Moreover, during the predynastic times, and probably still at the beginning of the Old Kingdom, the rains of the Neolithic sub-pluvial could have born a positive influence on the agricultural yields. For the simple subsistence economy of the predynastic communities in Egypt large-scale and labour-intensive irrigations works were, thus, unnecessary, but, according to the local topographic conditions, the existence of smaller channels and barrages constructed by the local communities can be assumed. It is likely that they were primairly for draining-off the floodwaters from the higher fields and not for the influx of water.

While the time of sowing was limited to the few weeks during which the topsoil layers were not yet parched into stony clods, the harvesting period, too, was limited, since the dry and scorching winds could promote the premature fall of the grains, thus causing heavy losses in the agricultural yield.

In all Neolithic agricultural villages of the Egyptian Nile Valley apart from fieldwork the peasents engaged also in cattle-breading. The big wadis and the highland areas, especially the fringes of the desert which were not used for agricultural purposes, offered good pastures the whole year round. This rendered unnecessary the labour-consuming accumulation of a large fodder store. The sometimes expressed view that the early predynastic cultures of Upper Egypt had been, to a greater ex-

tent, communities of nomadic cattle-breeders does not seem to be confirmed, insofar as the combination of agriculture and complicated ceramics, already documented in the sites of Badari and Nagada I, definitely relate to settled communities in which agriculture as well as animal husbandry were evident.

All this indicates that a stable and sufficiently high agricultural surplus product at a relatively low and time limited expenditure of labour could have been reached already by the early predynastic people of the Nile valley. That is one of the peculiarities caused by the ecological factor, which formed the social conditions in Ancient Egypt.

Exploiting these exceptional, in relation to other parts of the world, advantagenous ecological conditions which confined to relatively narrow limits the expenditure or working time necessary for agricultural activities, the members of the predynastic village communities in Egypt had sufficient leisure at their disposal. They made use of it not only by performing the traditional means of acquiring additional provisions like hunting, fishing and collecting food but also by gradually developing specialized crafts like plaiting, weaving, carving, pottery, stoneworking and, particularly in Upper Egypt, metal-working. In this way, within the predynastic village communities, specialists in different handicrafts were able to develope; they were not entirely free from agricultural production but had, nevertheless, ample time to acquire outstanding capabilities and skills.

The social division of labour between peasants and craftsmen, in the course of which there developed a stratum of independent craftsmen who worked with their own materials and on their own account in producing commodities for exchange, thereby stimulating domestic trade and promoting the economic differentiation of the society, had, at least up to the end of the New Kingdom, not been consistent in Egypt. During the dynastic times, there were highly specialized artisans and craftsmen at the royal residences, the various administrative institutions and centres as well as at the temples and even in private households of some high officials who most probably were completely exempted from any agricultural work. But these artisans and craftsmen neither worked on their own account nor with their own raw materials. Their tasks were alloted to them by the institutions to which they belonged and from which they received the main part of their income, even if they sometimes carried out, as a sideline, minor works for private people who paid them. The existence of such a stratum of craftsmen did not, therefore, bear a strong effect on the process of economic differentiation within the Pharaonic society.

A second pecularity of the Egyptian development is manifested by the fact that during the predynastic period agricultural production, hence the possibility of producing agricultural surplusses, does not seem to have been exhausted to the extreme limits. The predynastic cultures were gradually able to extend in the still thinly populated Nile valley towards its southern and northern ends (Kaiser, 1957). Even

far into dynastic times considerable land reserves appear to have existed. The occurence of serious conflicts over arable land during the late predynastic or the early dynastic time seems, therefore, to be most unlikely. This absence of conflicts over arable land among the members of the village communities seems to be at least partly responsible for the non-development of individual private landownership. And when, at the beginning of the Old Kingdom (second to fourth dynasty), the till then existing village communities were forced out of their collective ownership of land, not individual but institutional ownership of land had originated. Within the limits of this institutional ownership of land there had developed, during the dynastic times, a rather complicated system of the ownership relations under the supreme ownership of the Pharaon, which can at best be compared with tenancy or feudality – meaning that the land was given to someone for sometime under certain conditions, such as administration, services, dues, performance of work. However, this system complicated and delayed the emergence of individual and private ownership of land.

At the beginning of dynastic times, the village communities seem to have been largely intact, judging from the preserved materials. This means that the exploitation had not yet fully developed as the determining socio-economic relations within society. Therefore, hard pressure to increase agricultural surplus production did not exist. It seems that only the gradually strengthening central authority, by the middle of the first dynasty, started to make exploitation, through absorbtion of agricultural surplus products, a serious and heavy burden to the village communities. This might also explain the cessation of large and richly equipped private tombs in early dynastic cemeteries in Upper Egypt.

One of the reasons which made the increase of agricultural production a real necessity already at a considerable earlier time is, however, documented by the early predynastic cemeteries in Upper Egypt. Alreday in the Badarian times it was customary to provide the dead with an amount of burial offerings. Especially in Upper Egypt, the expenditure for the equipment of the dead had increased to a striking extent, above all during the Nagada II period. The surplus produce used for this purpose had to be at the actual disposal of the community concerned and it was difficult to receive it back, owing to the peculiarity of its use. Nevertheless, the rather frequent cases of tomb robbery which, according to excavation reports, often took place almost immediately after the burial demonstrate that at least part of these goods were reclaimed by the social groups.

Since the Badari times we can distinguish, according to size and equipment, richer and poorer graves in the Upper Egyptian cemeteries. These differences are undoubtedly indications of the social differentiation within the predynastic communities. The attempts to classify them, as criteria of already existing economic differentiation, seem to be premature as it is still completely unknown who was responsible for the construction and the equipment of the grave: the owner, his family, his friends or the whole community concerned. Only if it could be ascertained that

the owner of the tomb hismelf, out of his personal property covered the expenditure of his burial, and the construction and equipment of the grave, could the tomb be regarded as indication of his economic position. Unfortunately, the available, older publications of predynastic cemeteries are often very cursory as to the distribution of poorer and richer graves within a given cemetery. But in the case of the well-published cemetery of Armant (Mond and Myers, 1937), this distribution can easily be explained by ascribing the groupings to families within the generation, so that the social status of the dead within his family might have been decisive for the size and the amount of equipment of his grave. Later on, during the dynastic times, the position, structure as well as the kind and amount of equipment of a tomb provide reliable indications of the social as well as the economic status of its owner. As a rule, the Pharaohs dedicated a complete tomb only to their close relatives and, in the Old Kingdom, to very high officials. Everybody else was responsible for his own burial for which he was, however, partly entitled to use official property. Occasionally, some of the offerings and even building materials were provided by friends, acquaintences and subordinates. The allocation of special parts of the tomb-equipment by the Pharaoh was regarded as a special favour. However, the construction and equipment of tombs for the Pharaoh's might have been always a task for the whole society, for which the economic resources of the whole country were made available.

The actual reasons why only in Upper Egyptian Neolithic cultures the idea of the need for well-arranged and equipped graves was able to achieve such great importance, and the precise time of the origin of these rites, cannot yet be ascertained. It is, however, very possible that in this respect the environmental factor played a certain role too, since in favourable positions the dead became mumified by natural means – in the warm, dry sand. The accidental find of such mummies and grave furnishings might have led to the assumption that humans required material care to secure their existence after death.

The focal point of social development towards the end of the predynastic times was undoubtably in Upper Egypt. Its cultural unity, which is recognizable since the Nagada I, is not essentially an expression of this early, already existing political unity, but common traditions and ideological views cementing the social groups of this area. There are also indications that towards the end of the predynastic times an authority was in existence by the name of "Horus", who was recognized by the village communities of at least the greater part of Upper Egypt. The development of this authority into the representation of the state, and the formation of a ruling class, were processes of which the final and decisive stage apparently took place in the course of the first three dynasties. The special character of the social structure, which was typical for Ancient Egypt and which came into being during this process, has been influenced by the effects of environmental conditions more strongly then has hitherto been assumed.

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Bruce G. Trigger

The mainlines of socio-economic development in dynastic Egypt to the end of the Old Kingdom

Anthropologists cannot hope to possess the detailed knowledge of the language and culture of ancient Egypt that Egyptologists do. If they are to contribute significantly to the study of that civilization, it must be by employing a wide variety of the Egyptologists' specialized findings to produce a comprehensive and sociologically convincing interpretation of ancient Egyptian society. One test of the validity of such interpretations is that they make sense in the light of comparisons with other civilizations. In making such comparisons, anthropologists do not claim that all early civilizations were alike. The development of a strong and enduring national state at an early phase in Egypt's cultural evolution was not paralleled in many other civilizations. Effective cross-cultural studies must take account of such diversity. This includes understanding how particular ways of doing things in a culture may influence other features of that culture (Trigger, 1979). Only after such variation has been understood, is it possible to define the features that all societies share as a result of belonging to a particular stage of social development or possessing a common mode of production. It is particularly important to examine the history of Egypt prior to the Middle Kingdom from an anthropological perspective because so little contemporary written material, upon which Egyptologists generally rely for their understanding of Egyptian history and culture, has survived from that time. Most of what is known about the Early Dynastic period and the Old Kingdom is inferred from a restricted range of material culture, composed mainly of architectural and artistic items.

As a result of Karl Butzer's (1976) research, the ecological background for the development of Egyptian civilization is more accurately understood. Even in the historic period the overall population density of the Nile Valley was relatively low. In prehistoric times, the extremely rich floral and faunal resources of the region seem to have delayed the acceptance of total reliance upon an agricultural economy (Trigger, 1982). Large irrigation schemes sponsored by the central government do not appear to have been undertaken prior to the Middle Kingdom (Schenkel, 1974). It

was long regarded as enigmatic that the relatively poor section of Upper Egypt stretching south from Abydos should have played such an important role in the creation and maintenance of the Pharaonic state (Wilson, 1955). It now appears that the relatively limited natural resources of that area may have encouraged dependence upon an intensive farming economy at an earlier date than occurred elsewhere in Egypt. The small natural basins found there were also more easily modified to provide the basis for Egyptian hydraulic agriculture than were the larger ones farther north. The high productivity of these basins, when managed on a local or what would later be a provincial (*nome*) level, provided the necessary foundation for the emergence of the craft specialization, social inequality, and small states ruled by petty kings that characterized southern Egypt in the late Gerzean (Naqada II) period.

Patterns of food production do not alone suffice, however, to explain the development of the Pharaonic state. Competition to control long-distance trade has been identified as promoting the development of early states in many parts of the world (Sabloff and Lamberg-Karlovsky, 1975). Much of the material traded was luxury goods that served as status markers for the upper classes. Hence the political significance of such trade, both internationally and internally, often greatly exceeded its economic importance. During the Gerzean period, there is evidence of growing trade between Egypt and southwestern Asia. These contacts brought raw materials such as lapis lazuli, ultimately from Iran, and manufactured goods, such as pottery from Palestine and latterly Mesopotamian cylinder seals, into Egypt. At the end of the Gerzean period, they also brought to Upper Egypt artistic motifs and possibly general knowledge of other useful concepts from the burgeoning centres of civilization in Mesopotamia.

There is no evidence to support the once widely-held conjectures that in predynastic times the Nile Delta was either an uninhabited wasteland (Baumgartel, 1947 : 3) or the locale of a highly developed civilization trading by sea with the littoral of Syria and Palestine (Helck, 1971 : 5). The settlement of Maadi, south of Cairo, although not part of the Gerzean culture, appears to have played an important role in commercial contacts between Upper Egypt and southwestern Asia. It was located along the Nile at the head of the principal overland route that in historic times led to the copper mines of the Sinai Peninsula and on to Palestine.

It is possible that Egypt's most desirable export at this period was gold mined in the Red Sea Hills south of Qena. It is perhaps no accident that Naqada, whose Egyptian name meant literally "the Golden Town", was located opposite Koptos, which was at the mouth of the Wadi Hammamat and controlled access to much gold and other mineral wealth of the Eastern Desert. Other wadis gave access to mines east of Hierakonpolis, Edfu, and Kom Ombo. Managing the procurement of minerals, either by buying them from the native inhabitants of that region or by outfitting and providing military protection for mining expeditions, as was done in

historic times, probably greatly enhanced the power of rulers in the small states that were developing along the Nile in southern Egypt (Trigger, 1982). The desire to eliminate intermediaries and control long distance trade along the Nile river also may have produced the increasing competition and conflict among these rulers that ultimately resulted in the political unification of the Nile Valley north of Aswan. It is not known what part was played by far-sighted political alliances or by naked force in creating a nucleus of political power in southern Egypt that enabled a royal family from the Abydos region to subdue the whole country. The importance of Hierakonpolis and Naqada in later myths and rituals may reflect the major role that these centres played in the origin of the Egyptian state.

Unlike the trading states that developed on the savannas of West Africa during the Christian era, the Egyptian state was well endowed with natural boundaries. Even if, as a result of higher rainfall prior to 2,600 B.C., the distinction between the Nile Valley and the Sahara Desert was less marked then than it has been more recently, the Egyptian state was surrounded on all sides by regions that were poorer and far more thinly populated than it was. It also appears to have been congruent, or nearly so, with a single ethnic group, the speakers of the ancient Egyptian language. Records of wars waged against the Nubians, Libyans, and Asiatics at the beginning of the First Dynasty seem to reflect the efforts of these early kings to reinforce natural and ethnic boundaries by transforming them into political ones (Hoffman, 1979: 248). The Pharaohs clearly sought to curtail and control movement across these frontiers. The state, thus defined, provided a stable setting within which a unique cultural development could take place.

In Mesopotamia, increasing competition among small political units resulted in a high proportion of the population, including most full-time farmers, relocating in large urban centres, each of which became the nucleus of an independent city state. Probably the largest of these states did not have a population exceeding 100,000 while the population of the Egyptian kingdom was about 2 million. There is evidence of the growth of some relatively large towns in southern Egypt, perhaps for defensive reasons, in late Gerzean times. Yet the political unification of Egypt soon eliminated the need for such defence. Later, regional centres served as administrative and religious capitals for their localities, but until the New Kingdom they appear to have had small populations composed mainly of officials, artisans, and priests. The national capital, where the royal court resided, was no doubt the largest and most opulent urban centre, but it too had a relatively small population made up of full-time specialists, most of whom worked directly for the king or his officials. The rest of the population, most of it a peasantry engaged in producing food, had remained in (or in some cases returned to) the peasant villages that were distributed throughout the valley. Unlike most Mesopotamian peasants, who were experiencing urban life at this time, Egyptian ones were able to preserve traditions of rural life that had their beginnings in the early Neolithic period. At the same time, they were less well

placed to benefit from the technological advances occurring in urban settings. In the villages, stone-cutting tools continued to be used into the Middle Kingdom. The small size of urban centres and the strong dichotomy between rural and urban life resemble the Inca civilization of Peru far more closely than they do Early Dynastic Mesopotamia (Morris and Thompson, 1970). A detailed structural comparison of Egyptian and Peruvian civilization might lead to a better understanding of both.

While little is known about the economy of ancient Egyptian peasant villages, we do know that their inhabitants produced, on a part-time basis, a wide variety of handicrafts that were exchanged by barter at local markets (Erman, 1894: 494 - 497). Hence few, if any, goods were required from urban centres and these villages may be regarded as self-sufficient. In this respect, they conform to the village as conceptualized in the Marxist model of Oriental Society (Altorientalische Klassengesellschaft). Yet, the Old Kingdom cemeteries at Naga-ed-Deir demonstrate clearly that the social organization of these villages was not egalitarian (Reisner, 1932). This inequality must have been sanctioned, protected, and reinforced by the power of the state.

One of the most distinctive features of Dynastic Egypt was the durability of its central government. While there is some evidence of a slackening of royal power and perhaps even of internal conflict during the Second Dynasty and to a lesser degree at other times, the unification achieved at the end of the Predynastic period was not totally disrupted until the First Intermediate period, approximately 800 years later. By that time, the concept of a national government was so entrenched in the Egyptian mentality that each of the principal successor states that held sway over part of Egypt was prepared to fight to rule over all of it. Attention must now be paid to the economic and political factors that maintained this unity.

The ancient Egyptians viewed the divine monarchy as the lynchpin of their national unity (Janssen, 1978: 218 - 223). Egypt itself was thought of as the "Two Lands", which the Pharaoh had united and held together. Yet the monarchy, as a focus of loyalty, did not inevitably promote the political stability of Egypt. There was no rule stating which of a king's sons should succeed him, to minimize disputes over succession to royal office. There appear to have been a number of conflicts concerning rights to the throne during the Early Dynastic period and the Old Kingdom, some of which seemingly were invested with ideological overtones. Some kings also violated the monuments of their predecessors.

Royal power was exercised through a hierarchical bureaucratic structure in which all officials were ultimately subject to royal authority. The details of this structure during the Early Dynastic period are by no means clear (Kaplony, 1963) and the effectiveness of the central administration at this time has also been questioned (Mendelssohn, 1974). During the Old Kingdom, the number of officials seems to have increased steadily and the bureaucratic hierarchy was altered and elaborated almost reign by reign (Baer, 1960; Kanawati, 1977). Local Predynastic rulers appear

to have been eliminated, either by being killed or by absorption into the official class or even the royal family. Except for village headmen, during most of the Old Kingdom, officials appear to have been moved from one district to another in the course of their career, with the highest offices, that would have been held later in life, returning them to the royal court (Frankfort, 1956: 99 - 104). Only in the Sixth Dynasty, did prominent officials begin to re-establish significant local roots.

Until the end of the Fourth Dynasty, major officials tended to be close relatives of the king. Hereafter, the administration not only grew more complex but also tended to become increasingly divorced from the family and household of the king and to be discharged by families of powerful officials. One of the duties of the bureaucracy was to collect taxes in kind from the peasantry. These were levied on grain, animals, and handicrafts. Corvee labour was also exacted for state projects. Much of this wealth was used for the support of the state and the upper classes. In return, however, the government maintained internal peace, protected the peasantry against external aggression, and was able to use its extensive storage economy to alleviate crop failures. These were not insignificant benefits for the peasantry. Control over offices and succession to office was a source of power for the king and the central government.

There was a vast increase in craft specialization in Upper Egypt during the Gerzean period. At first, full-time specialists produced goods for a socially undifferentiated local clientele. Later, as social stratification increased, goods began to be produced especially for the upper classes. By late Gerzean times, petty kings appear to have become patrons of certain specialists. Working exclusively for such patrons permitted these specialists to spend large amounts of time and energy to produce goods of extraordinarily high quality. Yet neither literacy nor the historical canons of Egyptian art developed until after the political unification of the country. What may be called the Great Tradition of dynastic Egypt was created by artists, highly-specialized craftsmen, and scholars working under the patronage and control of the king and frequently at the royal court. Under these conditions, knowledge and skills were enabled to reach hitherto unprecedented levels of sophistication and refinement and artists and craftsmen working in different materials were encouraged to develop a unified style that had a remarkable consistency and durability. Because of the wealth and resources at his disposal, the Pharaoh was able to employ such specialists and supply them with materials and labour on a scale that could not be achieved by any of the city states of Mesopotamia, even though in Egypt basic technological innovations, as evidenced by bronze-working and wheeled vehicles, tended to lag behind Mesopotamia (Trigger, 1968: 53 - 54). The Egyptian kings had at their disposal furniture, clothing, jewellery, and building skills such as no one else in Egypt possessed. These were used to provide status symbols for the king and his family and to reward officials and retainers for their faithful service. The upper classes sought these goods, both for their intrinsic value and as a sign of royal favour.

Hence the monopoly that the king possessed over the highest quality goods and artistic skills was an important source of power for him.

This power was reinforced by a monopolistic control of foreign trade. While the peasantry made do with local materials, the jewellery, furniture, and funerary equipment of the upper classes required imported raw materials, such as ivory and ebony from the Sudan, lapis lazuli and cedar wood from southwestern Asia, and incense from Somalia. These were paid for by the export of agricultural products, cloth, and other manufactured goods. In addition, the crown sponsored many expeditions to procure gold and rare stones from the Eastern Desert and turquoise and copper ore from the Sinai Peninsula. By controlling the procurement of exotic goods, the king further enhanced his control over the production of luxury goods. The abandonment and apparent destruction of Maadi at the beginning of the Early Dynastic period may symbolize the assertion of a royal monopoly over a formerly free trade (Hoffman, 1979: 213 - 214). The absence of an alternative procurement system for exotic raw material was no doubt an important stimulus for the struggle to restore a centralized administration during the First Intermediate period.

From early Predynastic times, there was a marked emphasis on funerary cults in Upper Egypt. These activities absorbed increasing amounts of wealth for tomb construction and grave offerings, but they also stimulated craft production and the procurement of raw materials. In the Gerzean period, there is evidence of pronounced social stratification in the form and contents of graves (Fattovich, 1976). This continued to be elaborated into the Fourth Dynasty. The earliest, so-called "royal" graves occur at Hierakonpolis, Naqada, and Abydos in the late Gerzean period (Kemp, 1973). In the Early Dynastic period, there appears to have been a hierarchy of upper class tombs, but there is not sufficient difference in size, quality of grave goods, or presence or absence of accompanying "retainers" graves to permit archaeologists to distinguish the tombs of kings unambiguously from those of the most important nobles. If Barry Kemp (1966) is correct, however, the tombs of monarchs were kept separate at that time even from those of other members of the royal family and were provided with imposing "funerary palaces". Beginning in the Third Dynasty, there was a vast increase in the wealth expended on royal funerary complexes, which were now built largely of stone rather than mud-brick. This culminated in the great pyramid complexes of the Fourth Dynasty. This elaboration seems to reflect the increasing emphasis being placed on the funerary cult of dead god-kings as essential for national prosperity. Temples erected in provincial centres served, among other things, as an indication of royal concern for that region and its patron deities. Yet, temples dedicated to the most important deities appear to have been quite humble constructions prior to the Fifth Dynasty and even those erected after that time were small by comparison with ones built in the New Kingdom and still later periods. Judging by the monuments, the funerary cult of deceased monarchs was the most important Old Kingdom religious practice. While a careful com-

parative study should be made of factors influencing the wealth invested in constructing royal funerary monuments, as opposed to other types of religious architecture in the early civilizations, it is clear that Old Kingdom Egypt represents an extreme case. It is rivalled, however, by the royal funerary temples of the Khymer, who also believed that their rulers posthumously became, or merged with, major deities (Sedov, 1978). The elaborate burials of the upper classes, on which their good fortune after death was believed to depend, required goods from abroad, including cedar wood for coffins, that only the king could procure (Goedicke, 1967). Even if most tombs were built at their owners' expense, only royal craftsmen could provide the highest quality of ornamentation. Hence religious beliefs reinforced and helped to add a significant supernatural dimension to the economic and political subordination of the upper classes to the monarch.

While it is difficult, given the limitations of available evidence, to reconstruct the nature of ancient Egyptian society at different periods of its history, especially the early ones, it is even more difficult to account for the changes that took place. Traditional explanations, popularized by James H. Breasted, interpret royal power as increasing into the Fourth Dynasty and then declining in favour of the growing political and economic activity first of major religious cults and next of a rising provincial nobility. Naguib Kanawati (1977) has argued, however, on the basis of a comparative study of tomb sizes in the Old Kingdom, that there is no evidence (in the form of more wealth in the provinces) of gradual decentralization during the Fifth and Sixth Dynasties. He argues that as more officials, largely resulting from family expansion, were incorporated into the official hierarchy during the Old Kingdom, the resources that were available to each official declined. By the reign of Unis, lower class officials were no longer able to afford tombs and by the reign of Pepi I the middle rank was similarly incapacitated. By undermining the reward system, the expansion of the privileged classes also undermined the stability of the state. It is alternatively possible that there was a slow but continuous expansion and elaboration of the Egyptian economy and society during the Early Dynastic period and the Old Kingdom. Until the end of the Fourth Dynasty, the growing prosperity of Egypt may have placed more wealth and talent at the disposal of the king and increased the power and effectiveness of the central government. Eventually, however, some decentralization became necessary to cope with growing complexity at a regional as well as a national level (Rathje, 1975). If that is so, increasingly effective administration at the provincial level, even when involving the development of hereditary succession to office, does not inevitably imply the weakening of the central government. It would have produced, however, alternative administrations that could exert strong centrifugal pressure if the central government weakened and became less vigilant. Far more knowledge of the economic and social structure as well as the ecology of ancient Egypt will be needed before we can really begin to explain the dynamics of social change during the Early Dynastic period and the Old Kingdom.

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The mainlines of socio-economic development in the Sudan in Post-Neolithic times

It is a matter of some difficulty to understand and evaluate the social and economic development of the ancient Sudan in Post-"Neolithic" times. The difficulty arises from lack of written documents for much of the period involved, that is from 3,000 B.C. to the end of an organised Kushite state. Not only is a time span of over 3,000 years likely to give rise to considerable variations of the social and economic aspects of life, but there are also varying ecological conditions from the narrow desert surrounding riverain strip of much of Upper Nubia, to the wide grasslands of the central Sudan.

Lack of written documents, which aid so much in discerning the nature of ancient Egyptian life, means that hypotheses and deductions must be almost entirely based on the still rather scanty archaeological material. Even when written documents occur, from the time of the Egyptian occupation of the north, they are not very helpful, being concerned more with royal and divine activities than with providing information comparable to that available in Egyptian tomb scenes. As a result largely irrelevant material in Egyptian and untranslatable documents in Meroitic are all that are available.

Another problem in attempting to present a coherent story of society and its economic activities in the ancient Sudan is the considerable disparity between what is known of development in the stretch along the river downstream of the Fourth Cataract and what is known further upstream. For the downstream part it is possible, from archaeological evidence, to see a developmental sequence, upstream there is apparently either a dearth of material from the end of "Neolithic" times until the foundation of the city of Meroe, in about the eigth century B.C., or the basic culture of the first agriculturalists as known from Shaheinab, Kadero, Zakiab, Geili, and Shabona and other sites recently investigated continued for over 2,000 years with little, or no, change. This long gap has been a cause of surprise to archaeologists working in the area, and though work at Kadada has gone some way to close the gap there still remains an archaeological problem which can, on present evidence,

best be solved by suggesting that the second alternative given above is the most likely. This implies that after the important development that the Neolithic sites demonstrate there was little change – a basically agricultural and perhaps trans-humant society growing sorghum and raising cattle and living in small villages with a technology dependent on stone tools, and making much pottery, occupied the area until, probably under outside stimulus, the originally copper, and later iron, using society responsible for the development of Meroitic culture developed and rapidly spread along the river and into the Butana. Because of this any discussion of Post--Neolithic socio-economic developments must be confined to the northern part of the country until the beginning of Meroitic civilization when a broader treatment can be used. Even for this limited area the information on which such a discussion can be based causes difficulty and in many cases only the most tentative views can be expressed.

The first archaeologically observable entity of any significance to be known from Post-Neolithic times in the Sudan is that commonly called the C-Group, the earlier metal using, though probably not metal working, A-Group, only being found in Lower Nubia – so we may conveniently start at about 2,300 B.C. (the time of the Egyptian Sixth Dynasty). Little can be said about society or food production at this time though archaeological material is plentiful enough. There is evidence from cemeteries to suggest an increase in population, and dwellings appear to have been tents of skin in earliest C-Group times, developing a few hundred years later into circular huts with walls at least partly built of stone.

The economy must be presumed to have largely consisted of self sufficient village units, but the presence of a considerable number of Egyptian objects implies that something was being rendered in return. It has been suggested that the Egyptians were recruiting mercenary troops in the area and that Egyptian goods represent payments made to such soldiers. It is certain from the records left by such Egyptian noblemen as Harkhuf and others based in Aswan, that the Egyptians were much concerned with trade to the south for the purpose of acquiring luxury goods. The materials which the Egyptians record as having been brought back by their trading expeditions to Nubia – incense, ivory, ebony, leopard skins etc. are not those likely to have been available locally in Nubia, and it seems more probable that they came from further south and that Nubian chiefs of whom that of Yam in the region of Kerma, perhaps Kerma itself, seems to have been a leading one, owed their importance to their ability to regulate the external trade.

Egyptian texts imply that Yam at least was organised as a small state, though we are unable to say more than that chiefs existed – the nature of their power and how it was exercised eludes us. The cemeteries do not demonstrate great differences in size or tomb contents and this suggests a society without marked class differentiation. Relations with Egypt, with occasional exceptions seem to have been good, and the Egyptian caravans bringing manufactured goods and sometimes food stuffs and

taking out the luxury goods from the south came and went regularly with little interference, and at times were escorted by local troops.

By the Egyptian Middle Kingdom some changes can be seen of which the most obvious is the group of forts built through the Second Cataract from Semna northwards showing that the Egyptians were becoming concerned at the growing power of the natives of the region, perhaps of the state of Yam, which may be the same as that now for the first time called Kush, but also perhaps implying that the Egyptians felt the need to exercise greater control over the flow of trade goods.

An increase in C-Group population can be seen at this time from the evidence of a considerable increase in the number of sites, an improvement in housing styles, and a decrease in the number of Egyptian objects found in tombs. The reason for this decrease is not entirely clear, perhaps there was less contact with Egyptians now largely confined within their forts, or a reduction in mercenary recruitment amongst the natives. It certainly implies an increase in agricultural production and the traditional view of the C-Group has always seen them as a cattle people. Nubia today, and presumably then, is not ideal country for keeping cattle and Trigger (1976 : 52), amongst others, has suggested that cattle were kept as prized prestige objects but not in large numbers. In the few cases where animal bones found in excavations have been studied, sheep bones are seen to predominate. The main crops, though there is little direct evidence, would have been wheat and barley, examples of both of which have been found in A-Group contexts, and it is probable that dates formed an important part of the diet.

The site of Kerma and its large constructions which may well have been the centre of the state of Kush has been something of mystery for a long time. Recent work there (Bonnet, 1978, 1980) supplementing the classic examination by Reisner (1923) has emphasised its importance, and shows that a large town existed indicating a much more developed urban society than has usually been associated with the Sudan at this date and shows a very different society from that usually associated with the more or less contemporary C-Group. The large number of Egyptian objects at Kerma suggests a high level of wealth. Some organised administration is implied by the recently found fortifications of the town as well as by the need to control a large labour force to build the brick "deffufas".

The very large burials, such as the famous K III with its several hundred bodies, imply a powerful centralised monarchy and probably a massive use of slaves. Trigger (1976 : 94) and Adams (1975) have suggested that the evidence of the tombs shows considerable differences in wealth but no evidence for sharp class distinctions. I am not sure that to distinguish differences of wealth but not of class is valid, and it is certainly not easy to say on the basis of burial customs alone that the poorer graves represent people tied by kinship with the richer ones. The evidence on which this argument is based is primarily that there is no demarcation of richer and poorer areas in the cemeteries but that tombs of all sizes seem to be distributed at random.

At present it seems safer to suggest some considerable gap between the kings buried under large mounds with their sacrificed retainers and those buried in much simpler fashion.

The basis for the wealth of Kerma was almost certainly, as for the earlier Yam, largely due to trade with the south. Of southern materials only ivory was found in quantity, but it can be supposed that most of the luxury goods from the south were traded to Egypt as had been done in earlier times. Although control over trade may have been responsible for the wealth and power of the kings the main subsistence must have been from local agricultural production and Kerma is well placed for crop growing in an area of considerable fertility – the main crops can only be guessed at in the absence of direct evidence, but it can be assumed that wheat and sorghum were grown, as well perhaps as barley. A search for such crops needs to be made so that a better idea of agriculture at this important stage of Sudanese history, when perhaps the beginnings of the later Kingdom of Kush were laid, can be obtained. That grain was stored is shown by the finding of an Egyptian type granary associated with a C-Group settlement near to Debeira (Save-Söderbergh, 1963: 58), though this does not prove that similar construction were in use at Kerma.

What subsequently happened to Kerma is not clear, though Hintze (1964) suggests that it was attacked and burned by Tuthmosis I. Certainly the Egyptian occupation of Nubia in New Kingdom times must have caused considerable changes in both social and economic conditions. A number of Nubian chiefs who adopted an Egyptian way of life and used Egyptian burial customs are known. There is little to tell us of the common people and it has been suggested (Trigger, 1976: 130) that the pattern of land holding and of agricultural production, whatever it may have been in earlier times, now approximated to the Egyptian model, with Egyptians and Egyptianised Nubians owning land which was worked by native serfs. The tomb painting of Djehutyhotep from Debeira certainly suggests, if it is not just an automatic copy of Egyptian ideas, that the "prince" controlled land and workers. The social position of the workers is not known, but it has been suggested (Trigger, 1976: 130) that the two shades of skin colour represented amongst the workers may indicate two groups – Nubians and people from further south who were slaves.

During this period there is no doubt that the Egyptians, in addition to exercising political control and establishing towns and temples also controlled the economy, not only the primary agricultural production but also the flow of the luxury goods that had been sought by Egypt from earliest times – the flow of such goods to Egypt seems to have markedly increased and there was also a large development of gold production. The days of powerful independent rulers who could control Egyptian access to these goods, and profit from such control, were over and it is possible that the Egyptians, now ruling as far upstream as the Fourth Cataract, were directly in touch with the source of supply. Evidence of increased population in Lower Nubia in early New Kingdom times suggests that Egyptian control, if not responsible for it, at least coincided with an increase of wealth – but in the Sudan there is scarcely

yet enough information to decide whether the same held good nor to have a very clear picture of the society of the time and the transition to the considerable drop in population by the end of the New Kingdom is not as clear as it is in Lower Nubia.

The beginning of the Napatan epoch of the Kushite or Meroitic state, obscure as the reasons for it are, marks a sharp change in social relations. However the state may have been organised it was now an indigenous one for the first time since Kerma many centuries earlier. Social organisation is difficult to discern and the economic one almost invisible – political arrangements are less obscure, and the role of kings and priests can be partly understood. It seems that kings, subject perhaps to some control by the priesthood, were supreme, and we can assume a hierarchy of officials, perhaps similar to the Egyptian one.

With the change of emphasis caused by the increasing importance of Meroe, certainly by 300 B.C., when the first burials of rulers occur there, and perhaps somewhat earlier, some changes can be seen. There are still many obscurities in defining the nature of Meroitic society, but recent research has added something. We see a society with several social classes. At the top was the king – for early Napatan times something is known of the succession pattern with brother succeeding brother, but we do not know whether this system persisted through Meroitic times. The role of women is obscure though we have examples of women rulers. Below the king were certainly local rulers, administrators and priests, and many grave stones, particularly in Lower Nubia, give names and titles. This implies that such officials were to be found throughout the Meroitic state.

The town of Meroe provides some details suggesting differentiation in terms of wealth, and perhaps social class. The clearly defined and separated area, known conventionally and conveniently, as the "Royal City" may well have been such, since it contains large buildings, some of them of stone, as well as such luxury constructions as a Bath House and the area with special stone seats close by. Other parts of the town show different aspects of social and economic life. The main temple area is in one place, though there are temples elsewhere, industry, both iron working and pot making has its own areas, and the main domestic occupation section shows houses of varying size and standard of construction in different parts of the town, implying areas of different economic wealth.

Meroe was certainly a centre of early semi-industrial production, and it is reasonable to suppose that these products, of which we know for certain of iron and pottery, and rather less certainly of copper and stone quarrying, were for more than just local consumption. A scatter of luxury goods from the Mediterranean in the royal tombs, and rather fewer in the town site, show that there was contact with Egypt and perhaps the Classical world, but we cannot say for certain how these objects were paid for. We have no direct evidence that the luxury items sought by Pharaonic Egyptians were still being obtained from the Sudan but it seems highly likely. Ivory, which was much prized in Rome, would have been an important item, and one elephant tusk found at Meroe may have been part of a consignment meant

for further north. Although some items of the ancient Egyptian list may have come from further south, the emphasis on the elephant at Mussawarat al Sufra strongly implies that elephants were living in the Butana at the time.

Whatever the production of manufactured goods from Meroe may have been, the town like the rest of the country must have largely depended on local agriculture for its subsistence. In Nubia agriculture presumably continued in much the same way as in earlier times except that the introduction of the ox driven water wheel, the *sagia*, in the first centuries B.C., made it possible to irrigate greater areas, and therefore to increase production and make possible the larger population that archaeology shows.

Further south a climate with annual rain made for a different system and it is noticeable that at Meroe town the small knobs from the bottoms of *sagia* pots, that are so common at Nubian sites of the period, are completely missing. This indicates that the *sagia* was not in use and that crops were not grown in the *sagia* watered plots that is the normal method down river. Some crops could be, as they are today, grown on the *seluka* land along the river which would be covered by the annual Nile flood, but to provide sufficient food for the large town of Meroe that would not suffice, and from the evidence of modern usage it can be assumed that the considerable crop growing potential of the wadis was used. After the floods caused by the summer rains these wadis today are used for growing large amounts of sorghum and if they were so used in Meroitic times there would have been plenty of grain for the town and possibly a surplus for export to other areas.

We now have good evidence that sorghum was grown and was the main crop, as it is today. Large samples have been found at Meroe, some was found at Mussawarat al Sufra (Hintze, 1971), the well known scene on the rock at Jebel Qeili shows a god with several heads of sorghum in his hand, and some was found at Jebel Tomat (Clark and Stemler, 1975). It has also been found at Qasr Ibrim (Plumley, 1970: 15, Pl. XXIII, 1, 2; Mills, 1982: 86) which suggests that it was grown along the Nile throughout most of the Meroitic kingdom. There is no such direct evidence for other crops, but it seems likely that the main pre-Columbian crops of the area today, *bamia* (*Hibiscus esculentus*), *mulukhiya* (*Corcorus olitorius*), various beans particularly *ful masri* (*Vicia faba*) and certainly *Pennisetum typhoideum* would have been grown. *Pennisetum* has also been found at Qasr Ibrim (Mills, 1982: 86).

Another important element in the Meroitic economy was cattle, and to a lesser extent sheep; pigs, whose remains are common in medieval sites, are not found in Meroitic times. Cattle, apparently *Bos taurus*, are depicted in a number of scenes in tomb chapel reliefs, and study of animal bones from domestic refuse at Meroe shows that cattle bones predominate (Carter and Foley, 1980), indicating that beef composed a large part of the diet and that there must have been considerable herds in the neighbourhood. The Butana, especially if, as seems possible, the rainfall was somewhat greater than it is now, would have provided adequate grazing and I suggest that ancient reservoirs, some certainly of Meroitic times, that are scattered

across the land between the rivers Atbara and Nile were to serve the purpose of watering the cattle.

If this interpretation of Meroitic subsistence is right it assumes a considerable importance for the hinterland as being the area where the main food production, both animal and cereal, was carried out. What we are ignorant of are the people who did the work of planting and reaping the crops and herding the cattle. We know very little of occupation sites away from the river, although a considerable amount about temples. A number of interesting questions remain to be answered concerning the nature of the Meroitic economy and the social system behind it – who were the agriculturalists and where did they live? How were cattle owned, and how was grain distributed? Although much still remains unexplained, a great deal more can be said of economy and society in Meroitic times than for any previous ones. It can be seen that it was a complex society with a considerable range of activities and one that is, as a result of the wave of research now in progress, being better and better understood.

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Fred Wendorf and Romuald Schild

Some implications of Late Palaeolithic cereal exploitation at Wadi Kubbaniya (Upper Egypt)

The recent discovery of several grains of barley in a Late Palaeolithic site, dating between 17,000 and 18,000 B.P.,[1] at Wadi Kubbaniya near Aswan, Egypt, is perhaps known to all of you (Wendorf, *et al.*, 1979) (Fig. 1). As you will hear later in this symposium, a grain and inflorescence fragment of einkorn wheat have also been identified from this site. These discoveries have challenged some of our previous assumptions about when intensive utilization of cereals began, where the first steps toward food production occurred, and the social and economic consequences of this development. It is understandable, therefore, that these discoveries are disturbing to many of us, long accustomed to the belief that food production was a post-Pleistocene phenomenon which began in the Near East and spread from there to Africa and Europe. It is fair to say that a healthy degree of skepticism greated the initial announcement of the Kubbaniya discoveries. It was felt that there must be some mistake: the grains must have been accidentally intruded into the site, or else the site must not be dated correctly, or the grains have been incorrectly identified.

The discovery, however, should come as no surprise to those who are familiar with recent work on the prehistory of the Nile Valley in Egypt and northern Sudan. In the mid-1960s several sites in this general area were reported to contain numerous grinding stones, and one of these sites yielded pollen from a large, unidentified cereal-type grass and wheat rust spores. The same site also produced several lithic pieces with lustrous edges, presumably from use as sickles. The sites with grinding stones occurred as far south as the Second Cataract, and northward to Kom Ombo. Several radiocarbon dates placed these sites with grinding stones between 14,500 and 13,000 B.P. (Butzer and Hansen, 1968; Wendorf, 1968).

Farther north, near Isna, Egypt, other sites with grinding stones and lustrous edged pieces (sickles) were found and dated between 12,600 and 12,000 B.P. (Wen-

[1] It is obvious that these dates need to be confirmed by individual dating of the original cereal grains.

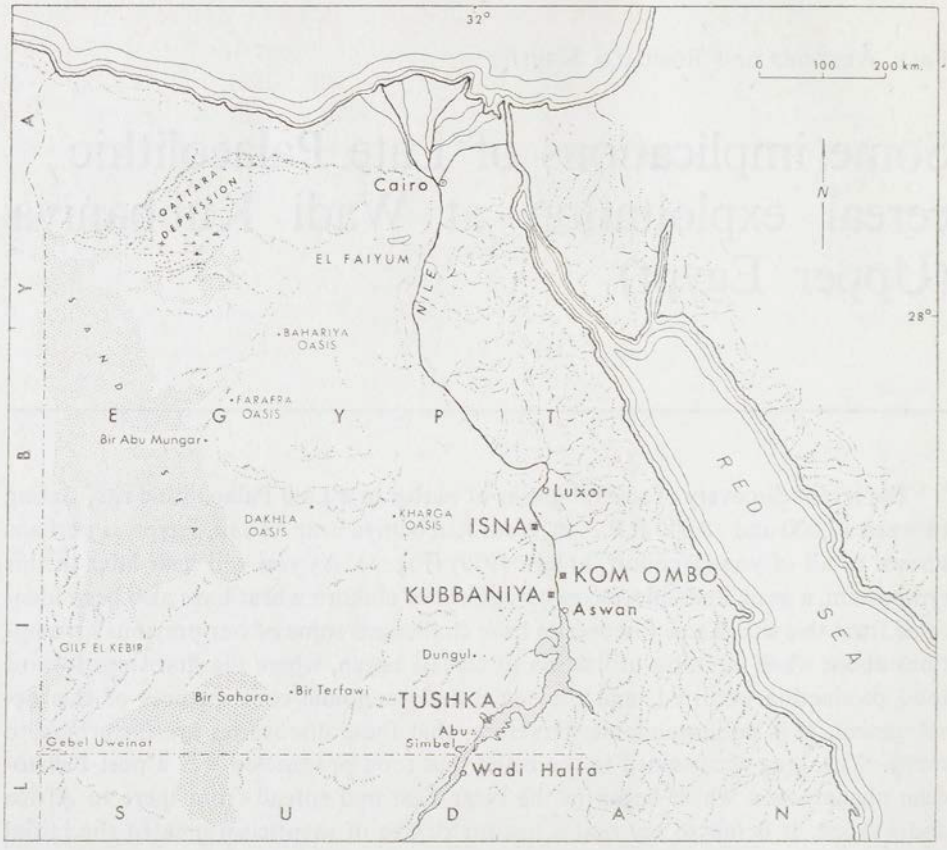

FIG. 1. Map of Egypt showing location of Kubbaniya and other localities discussed in text

dorf and Schild, 1976: 69 - 75). A nearby fossil pond yielded grains of a cereal--type pollen, indentified as barley. The cereal-type pollen occurred sporadically throughout the pollen profile, and suddenly became numerous (10 - 15% of the total pollen) near the top of the sequence, roughly contemporary with the Late Palaeolithic occupation.

These discoveries had shown that ground grain was intensively used in the Nile Valley in southern Egypt, and that there were reasonable grounds to believe that these utilized grains included barley, and perhaps other Mediterranean cereals. The recent finds at Kubbaniya, therefore, should be seen as entirely consistent with previous data from the Nile Valley. The new finds merely extend our knowledge of the grain-using complex backwards in time some 3,000 to 3,500 years, and provide specific information on the identities of the grains utilized. Instead of being surprising, the Kubbaniya finds should be seen as entirely expected.

The question of wheather the cereals recovered were somehow accidentally

intruded into the sediments at Kubbaniya can best be discussed by considering first, the geomorphic setting in which the sites occur; second, the stratigraphy of the site; and third, the nature of the remains.

Around 20,000 years ago the desert adjacent to Wadi Kubbaniya was hyper-arid, deflation scoured the landscape, and the Nile was confined to a narrow channel. Shortly thereafter, before 18,000 years ago, the river began to aggrade, and during periods of high water the floodplain extended up the dry wadi bed a distance of more than 3 km. as a large embayment. The bed of the floodplain was about 95 m. above sea level. Vegetation, sustained by these floodwaters, grew along the edge of the floodplain, and began to trap some of the sand which was moving into the wadi, driven down the scarp along the sides of the wadi by strong northerly winds. Thus began a complex process of simultaneous dune and silt accumulation which continued until, finally, the dune completely blocked the mouth of the wadi and a pond formed by seepage behind the dune. The maximum height of the dune barrier is not known, but the highest trace of the seepage pond is 17 m. (112 m. above sea level) above the lowest sand/silt sediments, and the dune barrier presumably stood somewhat higher (Fig. 2).

Almost immediately after the sand/silt accumulation began, the dunes adjacent to the wadi were occupied by Late Palaeolithic groups, no doubt drawn there by the opportunity to take the fish which had been carried into the dunes by the flood and then trapped in the swales and low areas as the flood receded. These first Late Palaeolithic occupants at Wadi Kubbaniya also brought with them a fully developed grain-using technology, including numerous crude but adequate milling stones and handstones, but no sickles, so far as is presently known. Except for the grinding stones, the lithic assemblages are entirely consistent with other Late Palaeolithic complexes in the Nile Valley of comparable age.

Most of these dune sites have evidence of multiple occupations, often separated by thin lenses of aeolean sand. In addition to the lithics, the dune sites yielded numerous faunal remains, mostly fish, but also wild cattle, hartebeest, gazelle, hippo, and numerous bones of ducks and geese, of species which today are winter visitors to Egypt. These avian remains suggest that the dune sites were occupied during the winter months. If the Nile flood occurred then as today, in late August and September, the sites also must have been occupied during the early fall as well, when fishing would have been the most productive.

Besides the dune settlements, there is evidence that the same Late Palaeolithic people were using the adjacent floodplain. These floodplain sites differ from those in the dunes in several important features. First of all, there are no traces of grinding stones; secondly, they yielded few remains of fish; thirdly, there were no winter birds; and fourthly, gazelle were more important than hartebeest in the faunal remains. These sites are seen as dry season camps, and during this period it seems that processing of cereals was not an important economic activity.

As the accumulation of the sand and silt continued in the wadi, these earlier

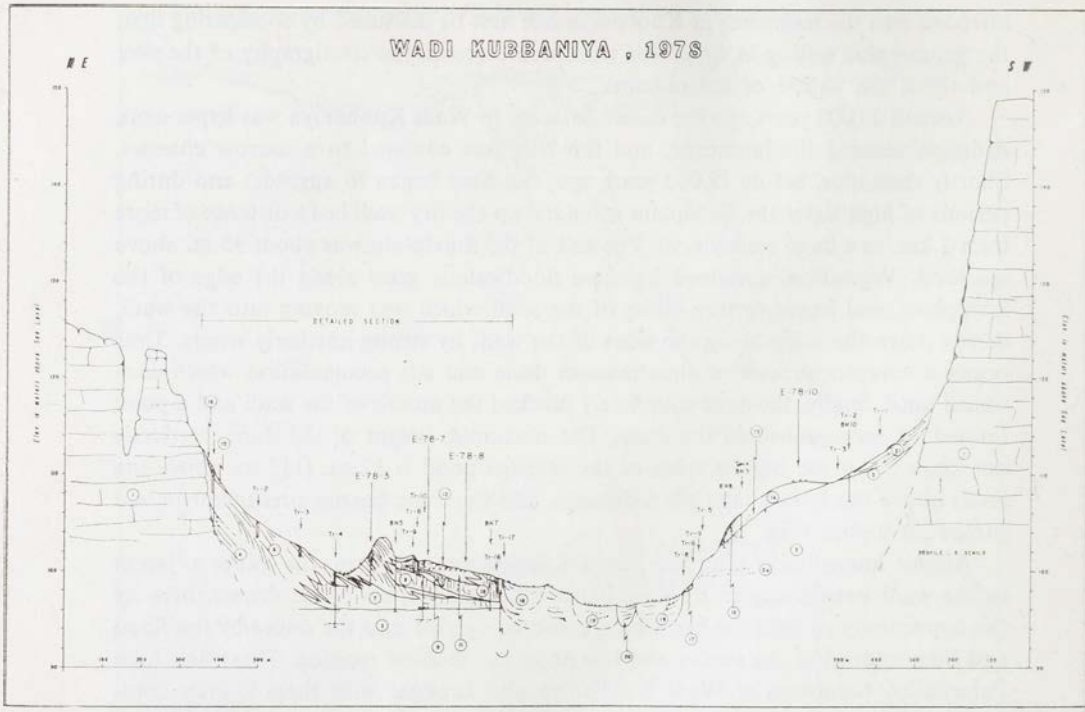

FIG. 2. Transect across Wadi Kubbaniya

1: Nubian sandstone; *2* and *3*: Cemented wadi sand and gravels; *4*: Sandy slope wash; *5*: "Old" slope wash, contains pebbles unit 2; *6*: Dune, very deflated, shows foreset beds and slopes interfingering with silt, and lenses of cultural materials; *7* and *8*: Silt and sandy silt; *9*: Coarse aeolean sand; *10*: Lower vertisol clay; *11*: Cemented silty sand with dense cultural material *12*: Upper vertisol clay; *13*: Casts of plant roots; *14*: Remnant of dune formed in later phase of dune accumulation; *15*: Diatomaceous pond silt with snail breccia; *16*: Brown silt; 17 - 20: Wadi sands and gravels; *21*: Loose slope wash

Late Palaeolithic occupations (both the dune and floodplain sites yielded several radiocarbon dates between 18,240 and 16,960 years ago) were buried beneath 10 to 15 m. of accumulated sand and silt. The dune barrier, with its enclosed archaeological remains, stood as a huge block, over 2 km. thick at its base and 20 m. or more high, extending across the entire wadi, blocking the mouth. Around 12,000 years ago large lake formed behind the barrier, fed by seepage from the higher Nile floods. There is no evidence of wadi discharge into the lake, indicating that local rains were extremely rare. Final Palaeolithic groups occasionally camped around the ponds.

Shortly after 12,000 years ago the level of the Nile fell to an elevation below the modern floodplain, but the huge sand/silt barrier at the mouth of Wadi Kubbaniya probably continued to block the wadi until the Early Holocene, when the adjacent desert began to receive rainfall and the runoff down Wadi Kubbaniya cut through the barrier, leaving remnants on both sides of the wadi. Modern de-

flation continues to erode the sand and silt remnants, and has exposed parts of the earlier Late Palaeolithic settlements near their base. The lenses of silt and sand, and enclosed occupation horizons, are clearly preserved at the sites, until recently protected by the thick overburden of the dune barrier (Fig. 3).

These lenses of silt, sand, and occupation horizons are still evident at Site E-78-4, which yielded the carbonized remains of barley and einkorn wheat. On Fig. 4 may be seen a map of the site showing the distribution of artifacts and the two areas worked. One of the studied areas was only surface collected, but at the second area,

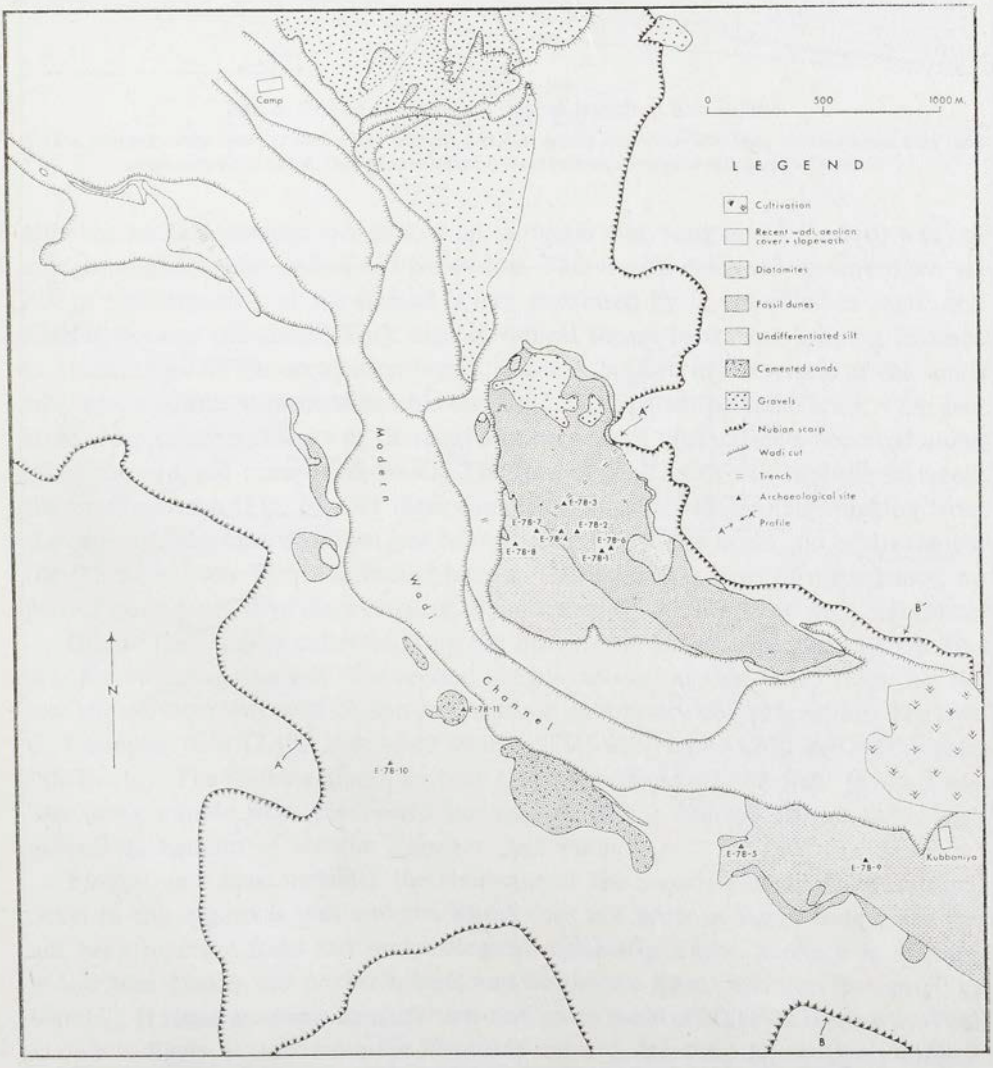

FIG. 3. Map of Wadi Kubbaniya showing location of the sites investigated and the extent of the major geologic units. The Nile river is off the right edge of the map

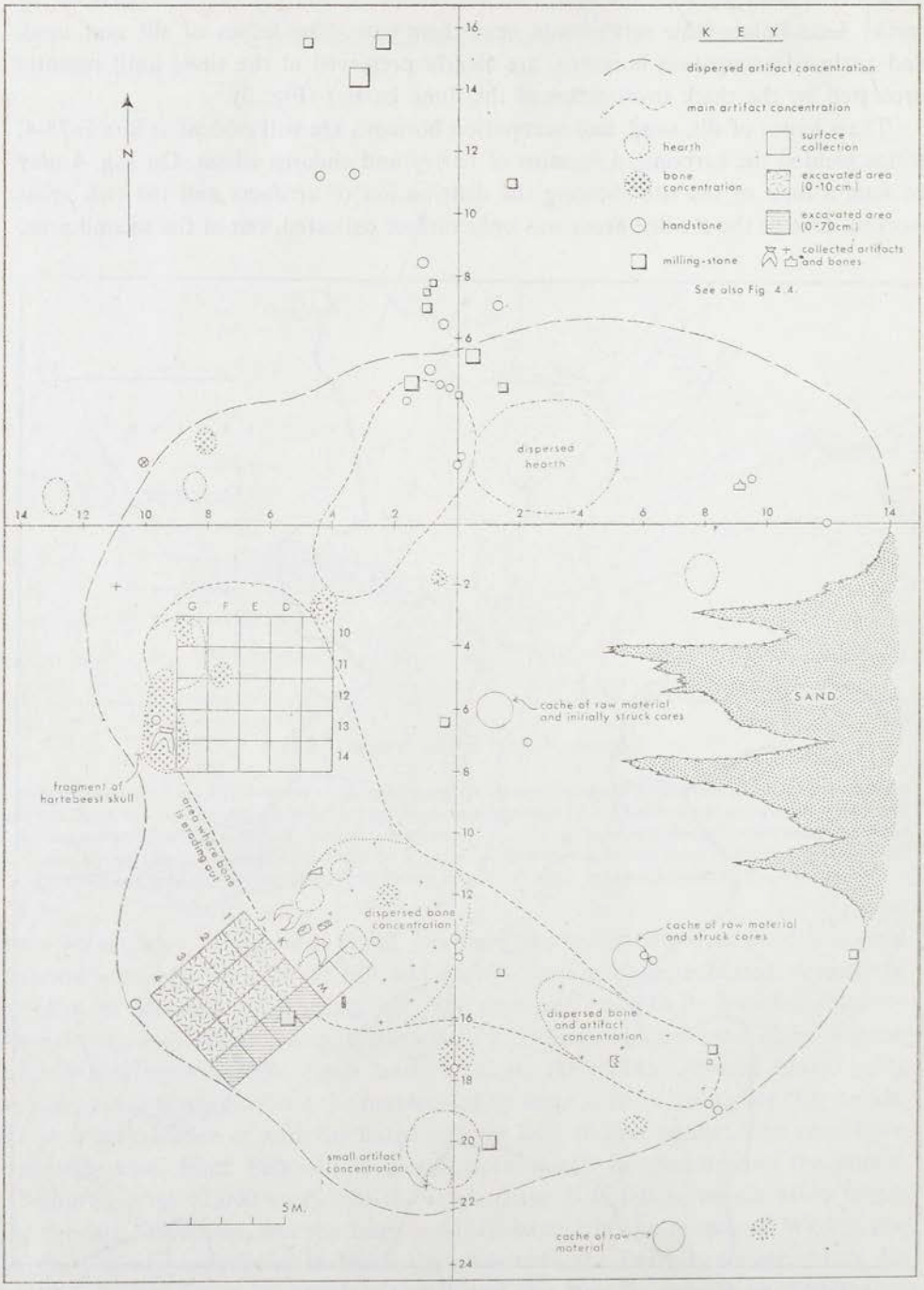

FIG. 4. Map of Site E-78-4 showing areas collected and tested

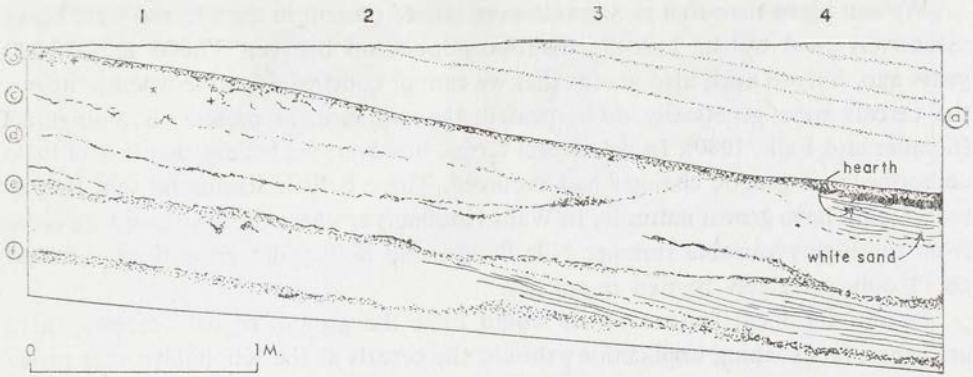

FIG. 5. Profile of southeast face of trench at Site E-78-4

a: Thin, brownish-white lenses of sand mixed with silt, archaeologically sterile; *b* and *e*: Main cultural lenses, hard sand mixed with silt; *c* and *d*: Thin cultural lenses; *f*: Hard yellow-brown sand with flecks of charcoal

after the surface material was picked up, a trench 4 m. long and 1 m. deep was cut at right angles to the line of sedimentation. This trench disclosed an unbroken series of thin organic and silt stained layers, separated by layers of clean sand, and dipping toward the south. They display typical topset to foreset bedding features of a dune. One of the occupation layers, near the bottom of the trench at the south end, was a hearth with considerable charcoal. Nearby, at the same level, were two large, deep mortars. Flecks of charcoal and occasional artifacts also occurred along all of the exposed occupation lenses. The face of the trench was carefully cleaned, the profile drawn (Fig. 5), and three samples were removed by hand picking from the exposed face. One was from just below the surface at the north end of the trench; the other two were from the buried hearth. There were no signs of disturbance, no pits or rodent activity; the overlying sediments and bedding lines were unbroken.

One of the samples collected from the buried hearth area was given to Dr. Hadidi for botanical analysis. The second sample, as well as that taken from just below the surface, was sent to the radiocarbon laboratory for processing. The two C14 samples date 17,100 B.P. $\pm$540 years (SMU-623) and 17,670 B.P. $\pm$250 years (SMU-616). The humate fraction from the latter dated 17,380 B.P. $\pm$340 years. The other sample from the buried hearth yielded the charred barley and wheat, as well as remains of *Acacia*, *Tamarix*, and palm.

Finally, one must consider the character of the cereals recovered. Most significant in this regard is that einkorn wheat does not grow in Egypt today, and has not been reported from any archaeological context in Egypt. Einkorn is at home in southern Turkey and northern Iran, and northward from there into Europe (Figs. 6 and 7). It requires cooler temperatures and more moisture than does emmer wheat, known in Egypt at least from the Neolithic onward. It would be extremely difficult to account for the presence of the einkorn at Wadi Kubbaniya by deriving it from a later settlement.

We can agree then that the cereals were indeed present in the site and were being intensively used by the Late Palaeolithic population between 17,000 and 18,000 years ago, but we must also accept that we cannot conclusively state whether or not the cereals were genetically domesticated; the evidence, at present, is ambiguous (Stemler and Falk, 1980). In behavioral terms, however, we believe that it is of little consequence if genetic changes had occurred. There is little likelihood that the cereals would have grown naturally in Wadi Kubbaniya, where the only moisture came from the highly variable summer Nile floods, and if they did grow there it would be in only extremely limited quantities.

Besides the local factors which would limit the growth of wild cereals, there are other, far-reaching implications should the cereals at the Kubbaniya sites prove to be wild. If wild wheat and barley were growing along the Nile in southernmost Egypt 18,000 years ago, they were sustained by the moisture from the Nile floods. Local rainfall was insignificant; it was certainly no more than today, and probably less. If the cereals present at Kubbaniya were indeed wild, then they must have been present along the entire Nile, northward to the Mediterranean, and more signficantly, there is no reason why they should not have been present as far south as Ethiopia. There is no evident barrier which would confine wild cereals sustained by Nile floods to southern Egypt. In fact, between the Mediterranean and the Ethiopian highlands, southern Egypt is the least favorable region for the growth of cereals. This hypothetical distribution of cereals in the Late Pleistocene is markedly different from most currently accepted reconstructions of cereal distributions for that period. Before we reject it, however, perhaps we should recall the earlier suggestion by Vavilov (1926) that Ethiopia was the locale where wheat and barley were first domesticated.

Thus we see that the Kubbaniya cereals pose enormous problems, whether wild or domestic. In some respects, the complications are less severe if they are domestic, but this requires that the process of planting, harvesting, and storage (at least of seed stock) began earlier than we previously believed.

Regardless of the eventual resolution of this question, we are left with the conclusion that the first known Late Palaeolithic occupants in this portion of the Nile Valley already possessed, when first seen, an economy which placed considerable emphasis on cereals as an integral portion of their diet. We do not know if these first Late Palaeolithic cereal users were recent migrants into the Kubbaniya area, or developed locally. There is no archaeological record anywhere in Egypt or northern Sudan which can be placed in the interval from the latest Middle Palaeolithic, dated at more than 35,000 years ago, and the Kubbaniya sites.

It is interesting to note, however, that the Kubbaniya lithic complex has few resemblances to any of the known industries in the Levant, but there are close parallels with the Ibero-Maurusian of Cyrenaica and the Maghreb, where the earliest occurrences are comparable in age with the Kubbaniya finds. A generally North African origin for these complexes would seem to be indicated.

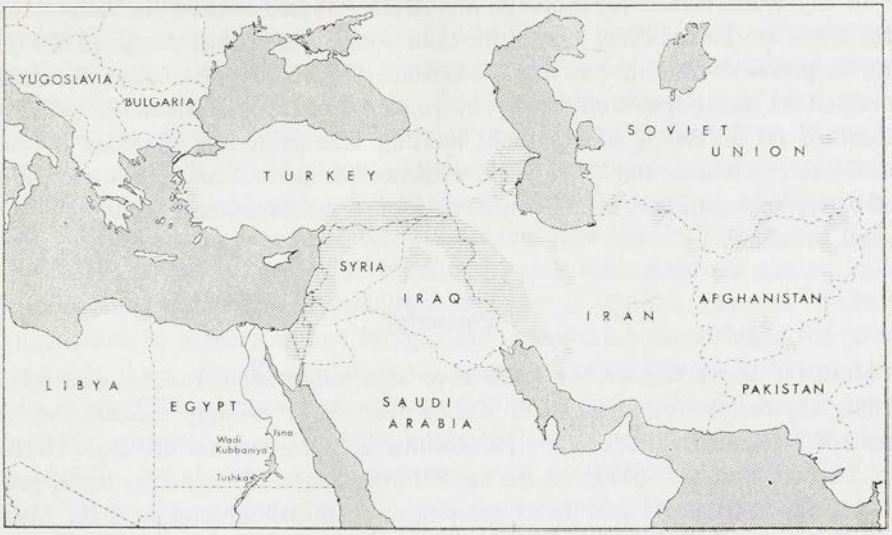

FIG. 6. Map showing known modern distribution of wild barley (after Harlan and Zohary, 1966 Fig. 1)

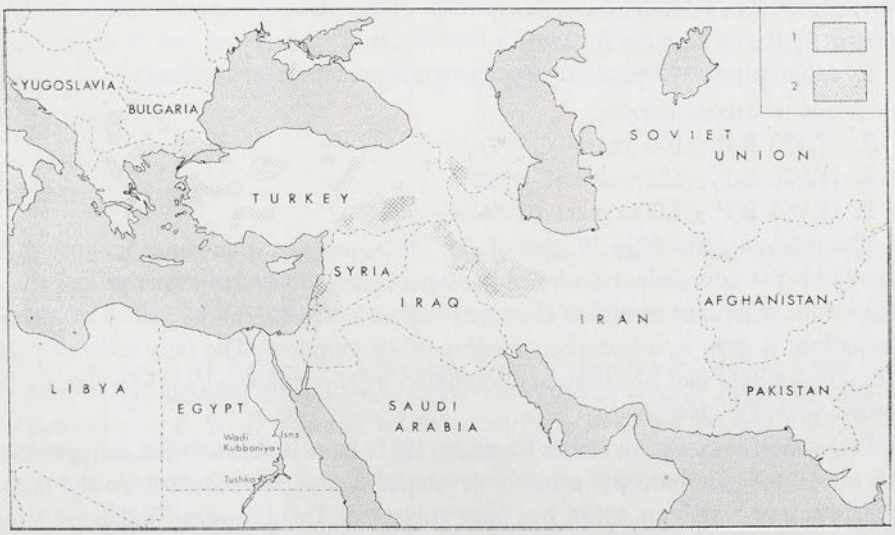

FIG. 7. Map showing known modern distribution of wild emmer wheat and wild einkorn wheat. Note the more northerly distribution of einkorn wheat (after Harlan and Zohary, 1966, Figs. 3 and 4)

1: Einkorn wheat *2*: Emmer wheat

In any event, cereals remained an important resource in the Nile Valley throughout the Late Palaeolithic. For more than 6,000 years (until about 12,000 years ago, the period of the large and numerous Isnan sites) there is no evidence for changes in settlement size, population density, or social organization. Instead the settlements continued to be small, conventional hunting and gathering remained the basic subsistence activities, and there is no evidence for permanent habitations. Wheat and barley appear to have been no more than other resources used as part of a broad-based economy.

Postscript

Since the above was written there have been important new developments concerning the cereals found at Wadi Kubbaniya, which strongly indicate that they were not associated with the Late Palaeolithic occupations, but are more recent in age. This conclusion is based on the age-determinations of the actual cereal grains, using the recently developed linear accelerator radiocarbon counter at the University of Arizona in Tucson.

Four of the grains found in 1978, and two others found in 1981 were dated, together with three pieces of wood charcoal. The cereals dated as follows:

1. 820 B.P. $\pm$ 500 years (C-299)
2. 1,090 B.P. $\pm$ 500 years (C-298)
3. 2.4 $\pm$ 0.05 $\times$ modern (C-448A)
4. 2,670 B.P. $\pm$ 220 years (C-447)
5. 1.3 $\pm$ 0.05 $\times$ modern (C-449)
6. 4,850 B.P. $\pm$ 150 years (C-450A)

The wood charcoal dated:

7. 17,450 B.P. $\pm$ 100 years (C-297)
8. 18,020 B.P. $\pm$ 525 years (C-450B)
9. 19,060 B.P. $\pm$ 1,000 years (C-446A)

The post-modern dates of two of the seeds and the wide range in ages of the others indicate contamination by radioactive carbon-14 tracers. Analysis of the residue of the glue used to mount the seeds indicates that this is the source of the contamination: it gave a radiocarbon reading of 40 $\times$ modern. The only specimen from Site E-78-4 which had not been contaminated by the glue was No. 6, which had remained with Dr. Hadidi in Cairo.

Two other barley seeds, both found in 1981, have been analyzed using electron spin resonance spectroscopy, a newly developed technique to determine the highest temperature to which an object has been subjected. These analyses indicated a temperature of only some 150°C for the Kubbaniya specimens, which is too low to cause the charring required if the seeds were to survive through millennia of seasonal flooding. The fact that they had not been charred suggested that these two barley seeds were not truly associated with the Late Palaeolithic site where we found them.

When these results became available we returned to Wadi Kubbaniya in January--March 1983 to make a special effort to find additional cereals. Extensive areas were opened, large quantities of charcoal were recovered, and numerous charred remains of edible plants were found. All of the identified edible plants are of local species, still growing in the area today and collected or cultivated by Egyptians. There were no more cereals. It is also of interest that none of the recovered edible plant remains can be readily processed with grinding stones. Thus the function of the scores of heavily utilized grinding stones in the Kubbanyian sites remains unknown.

Nevertheless, we can no longer support the view that cereal-use was an important component of the Late Palaeolithic economy of Wadi Kubbaniya. While the contamination by modern carbon isotopes has complicated the dating of the cereals, the date on the minimally contaminated specimen, the indicated low temperature results of the ESR spectroscopy, and our failure to find additional cereals even in painstaking excavations of the same levels lead us to reject our previous conclusion that the cereals were truly associated with the settlements where they were found. Instead the economy seems to have been one of gathering, fishing and hunting.

This experience has provided us with a vivid illustration of the difficulties inherent in determining associations in archaeological sites, particularly where small, fragile specimens are concerned. It is also an excellent example of the continuing contributions of the physical and chemical sciences to archaeology. Archaeologists in the past have had to rely entirely on visual observations during excavation to establish associations. This left many obvious opportunities for error and, even worse, it could not be verified by repetition. Physical chemists have now provided us with tools whereby observed associations can be confirmed or disproved.

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Ann Stemler and Richard H. Falk

Evidence of grains from the site of Wadi Kubbaniya (Upper Egypt)

A recent study of botanical materials from the site of Wadi Kubbaniya (Stemler and Falk, 1980) illustrates that scanning electron microscopy can be used to obtain more information from palaeoethnobotanical specimens than is possible with light microscopy. However, even with the application of advanced techniques of study of individual specimens, the conclusions that may be drawn are still limited if the sample size is limited. This is because biological populations are highly varied. Hence, very small numbers of archaeological samples do not allow the investigator to describe with certainly the nature of an entire ancient population. Conclusions are especially hard to draw when we are seeking to determine the status of populations that may have been undergoing change as a result of human intervention. Human selection increases the range of variation in populations.

In the case of the botanical remains from Wadi Kubbaniya, the small sample size is probably the result of the fact that the excavators had no expectations of finding plant remains in cultural layers 17,000 years old and so were not systematically searching for them. The plant materials from the site were part of a composite charcoal sample collected by Kim Banks from the side walls of the trench in site 4 just before the trenches were filled with sand at the end of the season's work. The charcoal samples were examined at Cairo university by Dr. Nabil El Hadidi who discovered four grains and one inflorescence fragment. The results of Hadidi's study are the basis for most of the botanical discussion in the report of the site published in *Science* (Wendorf *et al.*, 1979) and are included in an appendix to the site report (Close, 1980).

Hadidi's conclusion was that the barley from the site was domesticated. The basis for the conclusion was the size of some of the specimens which was within the size range of domesticated barley. (Scanning electron micrographs of the barley grains are shown in Figure 1). Unfortunately grain size is not a conclusive indicator of domestication. Many domesticated varieties of barley have larger grains than wild barley, but this is not always the case. There is a race of wild barley, for example,

that presently grows in southwestern Syria, northwestern Jordan, and northern Israel that is characterized by extremely large grain along with robustness in all other features as well (Harlan and Zohary, 1966). This race of wild barley has grains larger than some varieties of domesticated barley. As you can see from figure one, the barley grains from Wadi Kubbaniya are well within the range of variation of wild barley as well as domesticated.

In order to explore the possibility of getting more information from the Wadi Kubbaniya specimens, an additional study was made at the University of California, Davis, using scanning electron microscopy (Stemler and Falk, 1980). The objective of the second study was to more closely examine the single inflorescence fragment in the sample to see if it bore the characteristics of a wild or domesticated cereal. The reason for this approach is that undoubtedly the most clear-cut morphological indicator that a cereal has been fully domesticated is that it has lost its natural ability to disperse its grain (Fig. 2). All wild plants form an abscission or dividing zone between the parent plant and the fruit that facilitates the release of seeds. Progeny are thus free to be carried by wind, water, gravity, or animals, to places far from the parent plant, where they can germinate free of competition from the parent plant and their siblings. Indeed the success of diverse genera of plants can be largely attri-

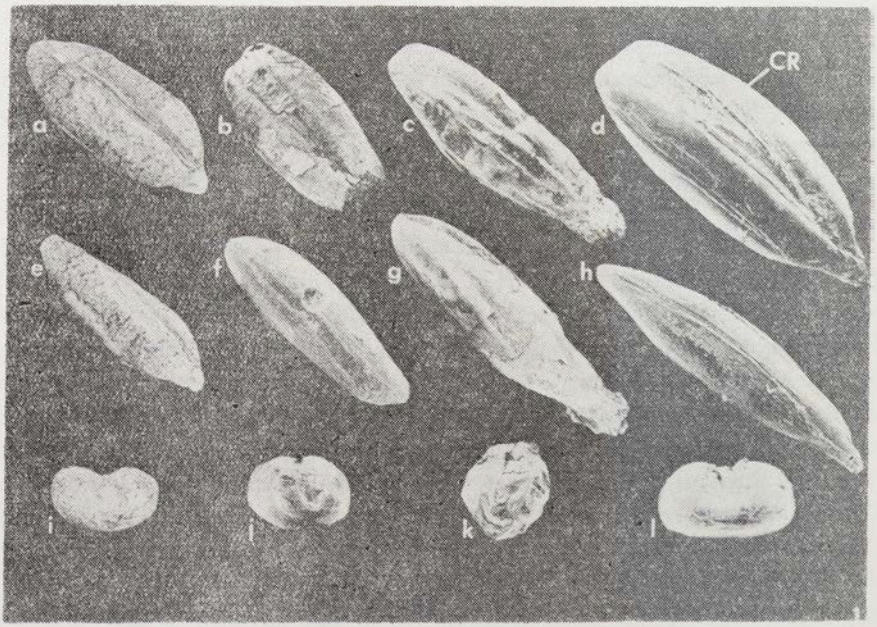

FIG. 1. Archaeological grains from Wadi Kubbaniya (*a-c*, *e-g*, *i-k*). Approx. 3.6 mm long, 1.9 mm wide, and 1.0 mm thick. Views of a charred grain of modern barley, *Hordeum spontaneum* (*d*, *h*, *l*)

a - d: The ventral aspect of the grains. Note the broad, shallow crease (CR), characteristic of barley; *e - h*: The dorsoventral aspect of the grains; *i - l*: Views looking down at the tip of the grain are useful for an appreciation of the relatively great breadth compared to the thickness of the grain of barley

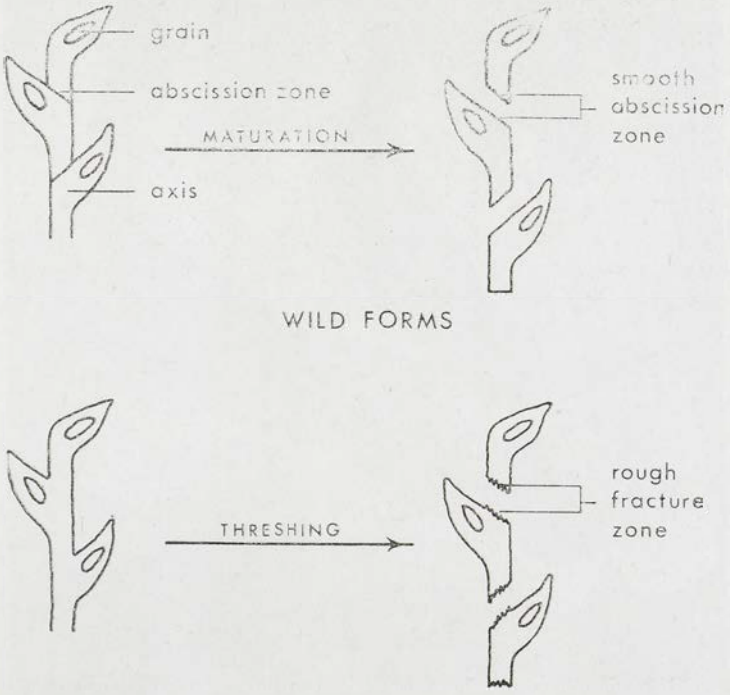

FIG. 2. A comparison of the general appearance of the inflorescence and inflorescence fragments of wild and domesticated members of the tribe *Hordeae*, to which wheat and barley belong. In wild members of this tribe of grasses, the central axis, or rachis, of the inflorescence breaks apart as a result of the formation of abscission zones. A rachis that fragments in this manner may also be referred to as brittle or shattering. Fragments of a wild type inflorescence can be recognized by the smooth regions, or scars, where one unit of the inflorescence was joined to the neighboring unit, or node. In domesticated members of this tribe, the formation of abscission zones is inhibited. Shattering does not occur, so threshing is required to release and process the grain. Fragments of a domesticated member of this tribe can be recognized by the comparatively rough fracture zones where the fragment was mechanically broken from its neighboring nodes. Domesticated inflorescences are referred to variously as non-shattering, non-brittle, or tough

buted to elaborate adaptations for dispersal of progeny that all must begin with the release of the fruit.

In fully domesticated cereals, as a result of human selection, the ability to release seeds has been lost. Domesticates have been selected for altered forms of the genes involved in the formation of abscission zones, so the separation of grains from the plant does not take place until the inflorescence is mechanically broken by some sort of threshing process. The inability of domesticated cereals to release their progeny makes them fully dependent on man for their propagation. For man this characteristic makes each head of grain a conveniently harvestable package of food. Domesticated cereals can be harvested long after maturity without fear that grain will

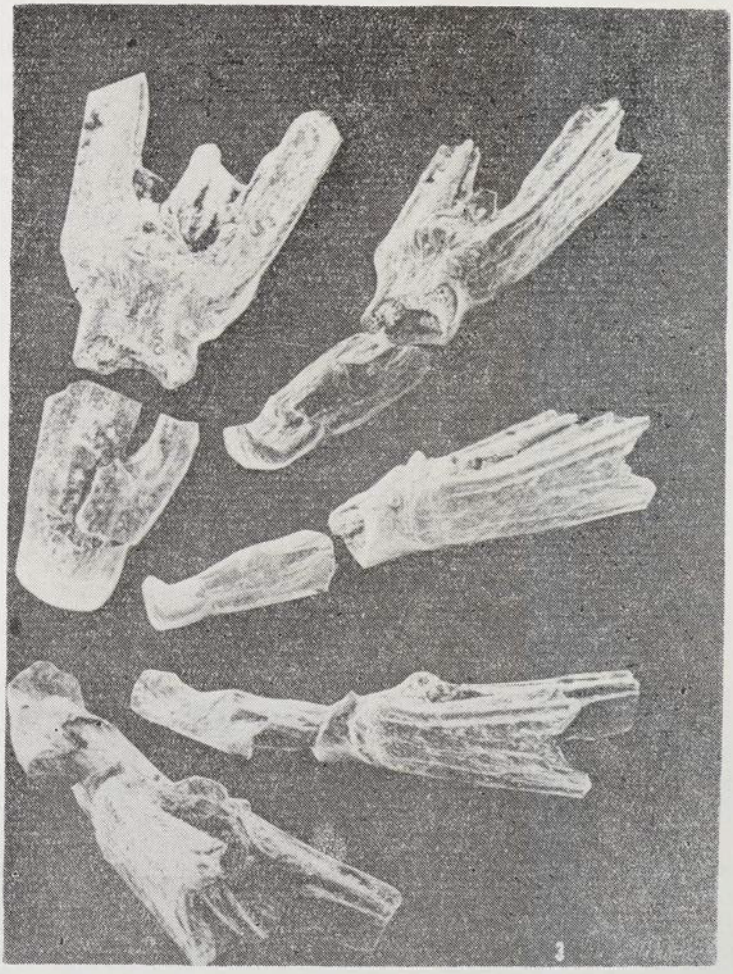

FIG. 3. Five views of the wheat inflorescence fragment from Wadi Kubbaniya. The paired ascending portions are the glumes that enclosed the grains. The descending portion is the rachis, which formed part of the central axis of the inflorescence. This fragment is a single node of an inflorescence. The break in the rachis allows us to see the excellent preservation of cell structure. The fragment is 5.2 mm long, 3.9 mm wide, and 1.5 mm thick

be lost. This is a great advantage to the cultivator because in this way the grain can be allowed to stand in the field until it is sufficiently dry at harvest to be stored without serious damage by fungi.

If we define a fully domesticated cereal as one that has been modified by human selection so that it has lost its natural ability to disperse its grain, then we must investigate the grain-bearing portion of the plant, the inflorescence, in order to deter-

mine whether a cereal found in an archaeological deposit is wild or domesticated. Fragments of the inflorescence of a wild cereal will have smooth scars where abscission zones were formed to facilitate seed dispersal. Fragments of a domesticated cereal will have rough fracture zones where the inflorescence broke as a result of threshing (see Fig. 2).

With all this in mind the single inflorescence fragment from Wadi Kubbaniya was studied with the scanning electron microscope. Photographs revealed the absence of a smooth abscission zone suggesting that the fragment might have come from a domesticated plant (Fig. 3). Unfortunately one more factor became apparent that prevented us from considering the evidence as conclusive. When we compared the Wadi Kubbaniya inflorescence fragment with extant cereals, we found the following:

1. The fragment appears most similar to wild diploid wheat (rather than barley as was suggested by the first study of the material – Fig. 4).

2. In wild wheats harvested before the grain is fully mature, the abscission zones are not fully developed, so an immature inflorescence breaks with rough fracture zones similar in appearance to those of domesticated wheats (Fig. 5).

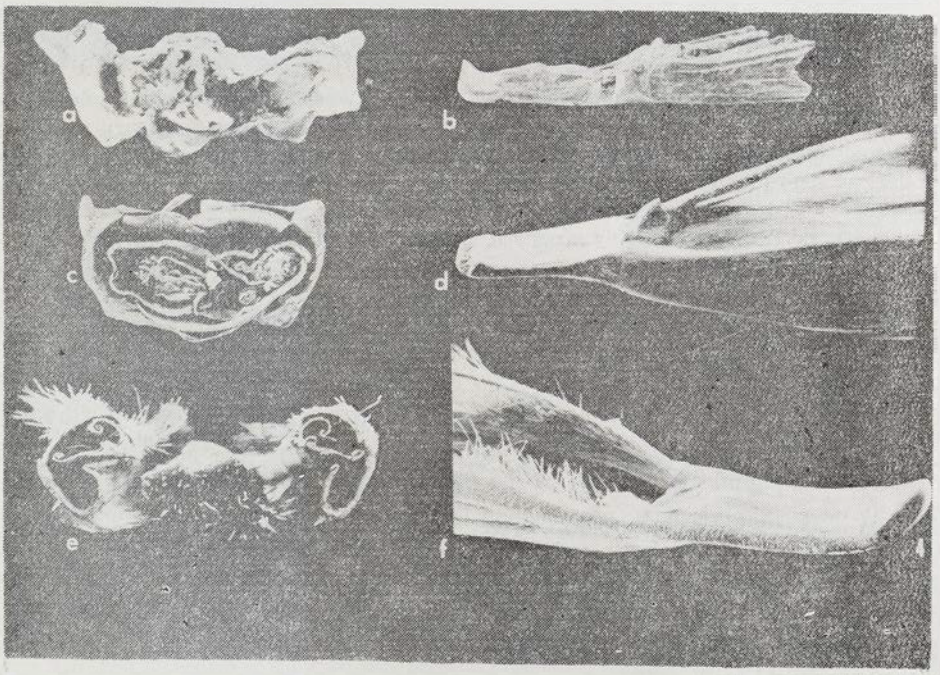

FIG. 4. A comparison of the Wadi Kubbaniya inflorescence fragment (*a* and *b*) with modern wild diploid wheat (*c* and *d*) and modern wild barley (*e* and *f*)

a, *c* and *e* are views of sections through the glumes of wheat and the lemmas and paleas of barley showing the parts of the plant that enclose the grains; *b*, *d*, and *f* are views of one node of an inflorescence. The longest dimensions of the portions of the plants shown are as follows: $a = 3.9$ mm, $b = 5.2$ mm, $c = 3.2$ mm, $d = 6.5$ mm, $e = 3.8$ mm, and $f = 8.4$ mm

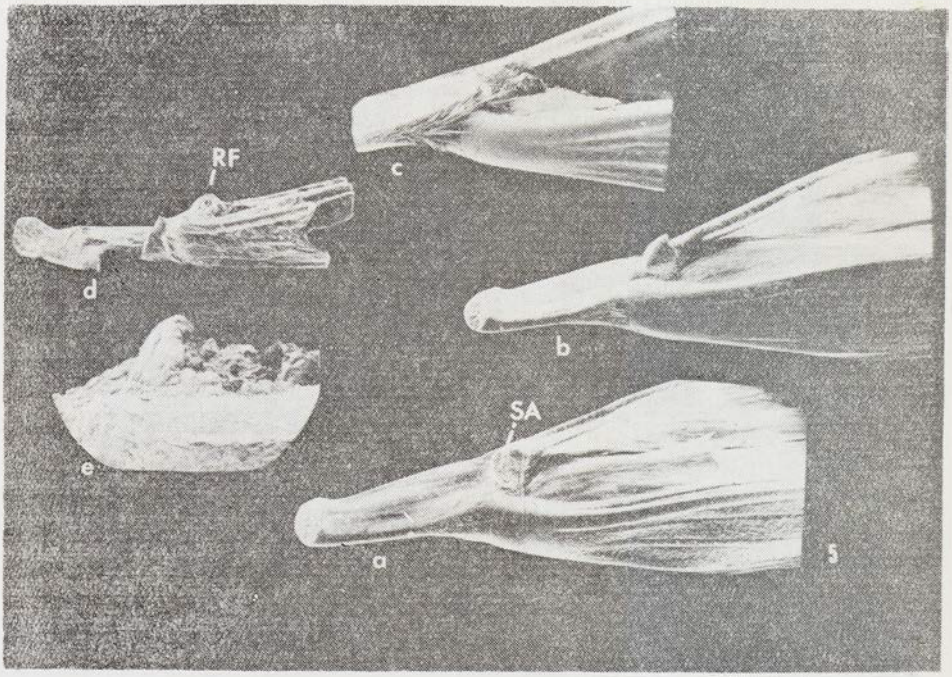

FIG. 5. A comparison of the inflorescence fragment from Wadi Kubbaniya with a wild diploid wheat and domesticated diploid wheat. Wild diploid wheat harvested when the grain is mature (*a*) has a smooth abscission zone (*SA*) where the next portion of the inflorescence used to be attached. In the immature wild diploid wheat (*b*), in the domesticated wheat (*c*), and in the archaeological wheat (*d* and *e*), we see a rough fracture zone (*RF*) where the next node of the inflorescence was attached. View *e* is a highly magnified view of the rough fracture zone in view *d*

Since we do not know whether the inflorescence fragment from Wadi Kubbaniya was part of a plant that was immature or fully mature, we cannot state with confidence whether it was part of population of domesticated plants or wild plants. If the inhabitants of the site were harvesting plants growing wild or were sowing and harvesting seed of wild grains (thus cultivating undomesticated grains), we would expect that a significant portion of the harvest would consist of immature heads. This is because wild plant populations have individual plants reaching maturity throughout the growing season, in contrast to fully domesticated populations in which selection has favored maturity of most individuals at the same time. What is needed in the case of wheat to demonstrate that a population was domesticated, is a significant number of inflorescence sections, or nodes, joined together or with rough fracture zones, with some spikelets containing grain to indicate maturity. It was hoped that more evidence of ancient cereals could be found when the Combined Expedition returned to Wadi Kubbaniya in the spring of 1980.

During the return visit to the site, part of the original team, including Kazimierz Szczepanek and Hanna Więckowska but not including Kim Banks, with the additional help of Dr. Maria Hopf of the Römisch-Germanischen Zentralmuseum in Mainz and Ann Stemler searched charcoal deposits of site 4 where the charcoal samples had been collected. Unfortunately in the few days available on the site, no more plant specimens were found. Since the sample in which the grains were found was a composite we do not know exactly where in the depositional layers of site 4 the plant material occurred. Thus we may not have searched the exact portion of the site where the grains were deposited. However, the absence of grains in the layers we did search suggests that cereals were not the major source of food for the inhabitants of the site. This conclusion is consistent with the evidence of very primitive grindstones and very small mortars which, if used to process cereals, would have allowed processing of only small quantities of grain at any one time.

Finding wheat on the site, whether it was morphologically wild or domesticated is in itself intriguing because at the present wild wheats are found in areas far to the north, in the foothills of the mountains of southwest Asia (Harlan and Zohary, 1966). Palaeoclimatic evidence suggests that the climate at Wadi Kubbaniya during the time of occupation was cold and hyperarid (Wendorf *et al.*, 1979) but it is questionable that wheat might have occurred as part of the natural flora.

More botanical material must be found on the site and studied if we are ever to know whether the inhabitants of Wadi Kubbaniya were gathering or cultivating populations of morphologically wild cereals or whether they were growing truly domesticated cereals. The evidence as it now stands does suggest that the interaction between human populations and wheat and barley that resulted in domesticated cereals may have begun much earlier than was previously thought and that the people involved in the domestication process may have occupied a larger or perhaps a different area than was previously thought (Ucko and Dimbleby, 1969).

On a less theoretical level, a lesson to be learned from the Wadi Kubbaniya experience and other sites (Hansen and Renfrew, 1978; Noy *et al.*, 1973) is that one should always be alert to the possibility of finding plant remains at even the oldest sites. Students from palaeothnobotanical laboratories should be involved in excavations to search systematically for plant remains and to follow the study through to publication of detailed photographs and detailed analyses of the botanical material found.

Let me close with a plea for understanding by archaeologists of the limited conclusions that can be drawn from small palaeoethnobotanical samples. When archaeologists ask their cooperating botanists whether tiny, charred, broken, and distorted bits of botanical material represent wild or domesticated cereals, they should not be too disappointed if they do not receive a simple, definitive, one-word answer and perhaps should be skeptical if they do! We must not be led to wide ranging and possibly erroneous conclusions based on dangerously fragmentary evidence.

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Note

Two series of studies have been performed on the cereal grains from the site of Wadi Kubbaniya since this manuscript was completed. The first series done by electron spin resonance spectroscopy indicated that the maximal temperature to which the grains had been subiected before burial was only 150°C. Tbis temperature would bave been too low to have brought about the charring that would have been required to preserve the grains from decomposition through millennia of seasonal flooding. The second series of studies involved direct C–14 dating of the cereals by the tandem accelerator mass spectrometer at the University of Arizona at Tucson. These studies indicate that the cereals themselves are much younger that the charcoal and other artifacts from the site.

Pierre M. Vermeersch

Subsistence activities on the Late Palaeolithic sites of Elkab (Upper Egypt)

Elkab, an old dynastic site, is situated on the east bank of the Nile, 120 km to the north of Aswan. The dynastic site with its huge ramparts fills the whole alluvial plain from the Nile to the lower desert. Inside the rampart walls several small concentrations of Final Palaeolithic artifacts were excavated in 1968 - 1975 (Vermeersch, 1978).

The problem of the subsistence activities at these Palaeolithic sites, with a series of 14-C dates clustering around 8,000 B. P., can be approached on the basis of different elements.

The eight concentrations, which are located within a sequence of wadi and Nile deposits, are all of small size; the largest, E-1-upper layer, is not larger than 5 m in diameter. This suggests very small human groups.

The study of the geomorphological situation of these sites concludes that the location of the sites is correlated with a dying Nile branch in a wadi mouth area. The modern alluvial plain on the east bank of the Nile is already very narrow. Previously it was even narrower as the sites are located very near the eastward border of the Elkab lithozone. Therefore, the alluvial plain in the direct surroundings give very few opportunities for subsistence activities oriented toward food production. As the climate was certainly wetter than it is today, as is indicated by a gentle wadi activity, the possibility of exploitation of the lower desert can be questioned. If we accept the possibilities of food production farther west in the Sahara (Kuper, 1978), we must also accept the possibility for at least seasonal agriculture in the Elkabian lower desert. In that case, agriculture should have been practised during late winter and spring. However, the sedimentology and the analysis of the fauna suggest that the occupation of the Elkab sites took place in the late summer and the autumn. Considering that even the most rudimentary form of irrigation can be excluded for this period, it seems that agriculture could not have been practised by the Elkabian groups.

Moreover, analysis of the faunal remains (Gautier in Vermeersch, 1978) gave

the following frequencies: aurochs – 38%, dorcas gazelle – 25%, a small bovid, may be barbary sheep – 13%, tortoise – 12%, hippo – 9%, hartebeest – 1% and jakal – 1%. Fish remains all belong to genera which occur in the present-day Nile. There is no indication of food producing activity as all of the species are correlated with hunting activities. The flint industry of the Elkabian sites has a microlithic character. Implements associated with agriculture, *e.g.*, sickle blades, are absent. However, the function of the tool kit remains unclear not only in the case of the Elkabian but also for most of the North African microlithic industries. An approach to the function of the tools by microwear analysis as introduced by L. Keeley (1979) was unsuccesful, probably because of the special properties of the Egyptian Eocene flint (Gijsels, 1980). So, at this moment the analysis of the tool kit of the Elkabian gives no evidence at all with regard to food-producing activities.

Several types of grinding stones are present. The first type is made on fine grained (100 - 200 μm) laminated sand stone slabs, shaped by a bifacial retouch. These grinding stones are always rather small and thin (6 to 9 mm) plates. Their surface is flat and shows intense abrasion with pecking either anterior or posterior to the abrasion. On some of the grinding stones very vague shallow parallel rills are visible. A second and larger (10 × 8 cm) type is made of medium grained sandstone. The grinding surface is nearly flat and stained with red pigment. Abrasion is not very intense but the outer perimeter of the grinding surface shows a pecked surface. The last type is made of a coarse grained (up to 3 mm) arkose. Excavations provided only fragments but it seems that this type of grinding stone was larger (25 × 15 cm). Both grinding surfaces are flat to concave. One of them is intensely abraded and pecked. The other surface is poorly defined. Both surfaces are stained with red pigment. The staining with red pigment which could be observed on the larger grinding stones, suggests the use of grinders for red pigment. The use of the first small type of grinding stones remains unclear. However, as they are small and thin they could hardly have been used as milling stones for cereals. So the presence of different types of grinding stones can not be interpreted as an indication that grain was ground on the Elkabian sites.

In conclusion, I do not see any indication of subsistence activity on the Elkabian sites, related either to collecting wild cereals or to incipient agriculture or herding. The Elkabian human groups had a purely Palaeolithic type of subsistence at the time when other prehistoric groups in north-east Africa and the Levant had already achieved some degree of food production.

Now one faces the question whether or not the Elkabian can be traced in other parts of north-east Africa. F. Wendorf and F. A. Hassan (1980) have stressed that the Terminal Palaeolithic assemblages of the Libyan desert in Egypt are distinctly different from the Nilotic assemblages of the same period. However, in my opinion, the Elkabian industry shows greater ressemblance to some industries of the Western Desert than with other contemporaneous industries in the Nile Valley itself. A study

of the material of DIW 51 [1], type locality for the Shamarkian, convinced me that, because of striking differences in technology and typology, the Elkabian does not fit in the Shamarkian.

If one looks for an industry similar to that of the Elkabian sites, the Saharan site E-72-5 in the Dyke area (Schild and Wendorf, 1977) can be considered. It displays the following characteristics. There are numerous single platform blade cores (Fig. 1: *1 - 2*); microlithic elements are dominated by elongated triangles with short, often concave sides, and a number of pieces have their retouched sides right or semi-right angled (Fig. 1: *6 - 12*). Backed bladelets include straight backed bladelets, sometimes with a slightly concave back (Fig. 1: *3 - 5*), and shouldered backed bladelets (Fig. 1: *14 - 15*). The shouldered pieces are the most common. Notched and denticulated pieces (Fig. 1: *18 - 21*) are very common. Endscrapers and burins are rare. All these characteristic elements can be found in the Elkabian industry. Indeed, in Elkab 80% of the cores are single platform cores for blades and bladelets (Fig. 2: *1 - 2*). The backed bladelets are mostly of the straight backed type (Fig. 2: *3 - 5*). Those with slightly concave back occur, e.g., in E2-inf. Shouldered bladelets (Fig. 2: *11 - 16*) are a very distinctive element in the Elkabian tool kit, especially in E2-inf. where they account for 15%. The group of notched and denticulated blades (Fig. 2: *23 - 27*) represents up to 20% in E2-inf. As in E-72-5 the notches are generally retouched, shallow to deep, usually wide, but occasionally narrow. Right or semi-right angled triangles (Fig. 2: *6 - 10, 17 - 19*) are present at E3. Microburins, well represented at E-72-5, are even more numerous at the Elkabian sites (Fig. 2: *21 - 22, 29*).

It seems, therefore, that there are clear technological and typological connections between Elkab in the Nile Valley and E-72-5 in the Dyke area. This connection seems to pass over the Eocene region half-way between E-72-5 and the Nile Valley as is indicated by a triangle collected on E-72-5 made of Eocene chert, the so-called Egyptian flint. Similar assemblages to that of E-72-5 were disclosed at E-76-6, Kharga oasis and at E-77-6, El Beid, 20 km north of Nabta (Wendorf and Hassan, 1980). This indicates that Elkabian-like industries can be found over a large area in the western desert from the Kharga oasis to the Sudanese border.

J. D. Clark (1976) has pointed out that the Epipalaeolithic technology with Ounan points became generally, but sparsely, diffused within the desert as far east as the Nile. Indeed, Ounan points were traced not only in Kharga but also in the Nabta playa sites. Two sites at Elkab (Fig. 2:*28 - 30*) yielded a few Ounan points.

Ostrich eggshell beads are present in the Western Desert but also along the Nile Valley, in Elkab and in the Shamarkian sites (Wendorf, 1968).

It is not clear if the small fragment of v-incised ceramic that was found at E2-inf.

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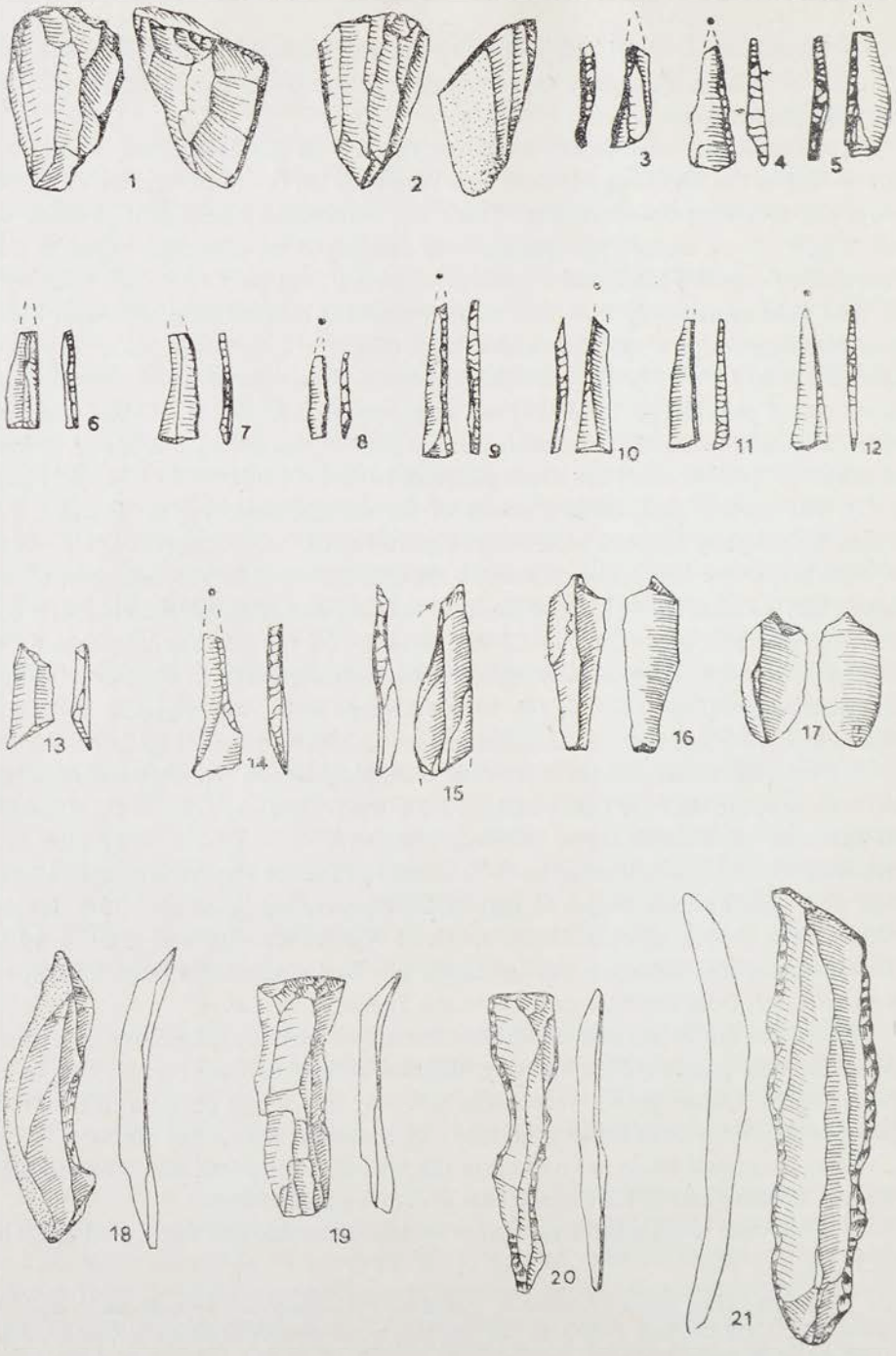
[1] I would like to thank Professor R. Schild for the opportunity he gave me to study the material of DIW 51 and E-72-5 at the Institute of the History of Material Culture, Polish Academy of Sciences, Warsaw.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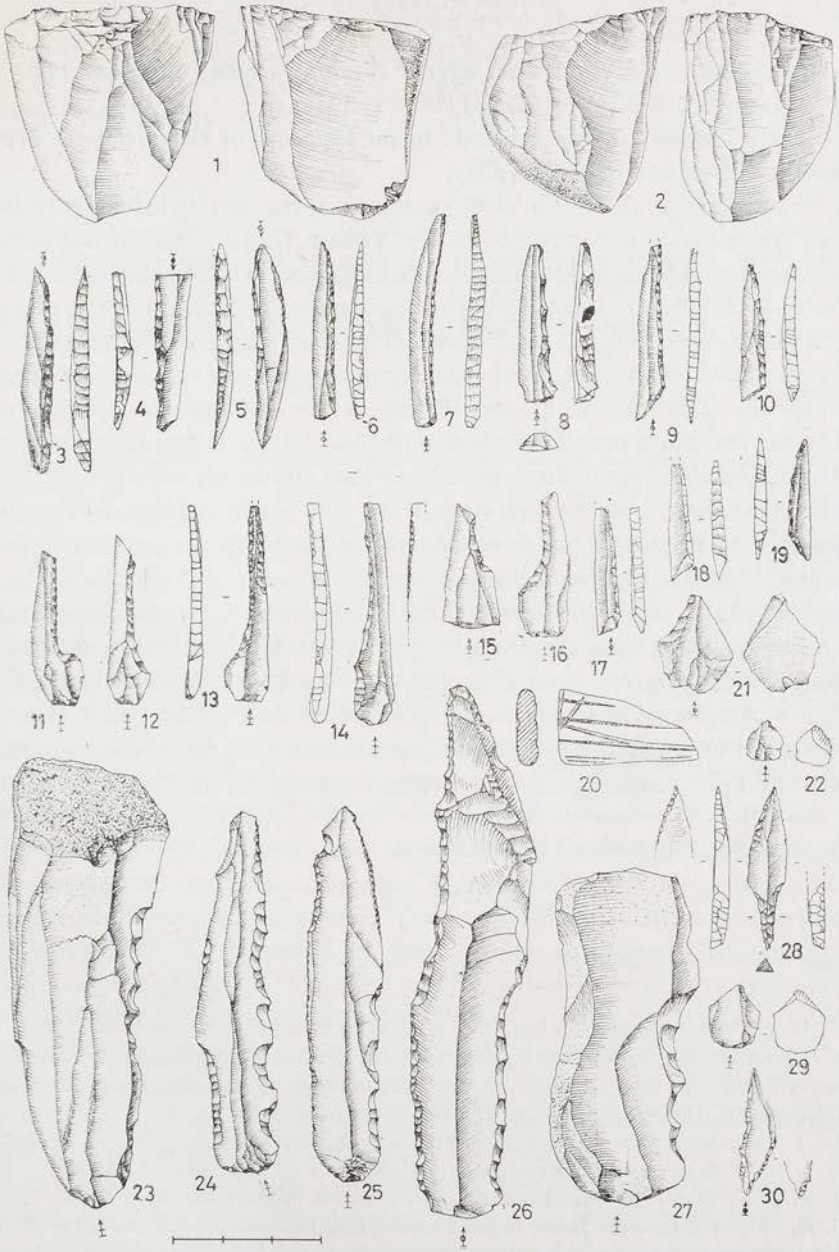

FIG. 2. Elkab

1 - 2: Cores; *3 - 5*: Backed bladelets; *6 - 10, 17 - 19*: Triangles; *11 - 16*: Shouldered bladelets; *20*: Ceramic; *21 - 22, 29*: Microburins; *23 - 27*: Denticulated blades; *28, 30*: Ounan points
1 - 5, 30: Elkab 1 — inf.; *17 - 18*: Elkab 2 — middle; *5, 9 - 16, 20 - 29*: Elkab 2 — inf.; *6 - 7*: Elkab 3; *8, 19*: Elkab 4

Fig. 1. Dyke, site E-72-5 (after R. Shild and F. Wendorf, 1977)

1 - 2: Cores; *3 - 5*: Backed bladelets; *6 - 12*: Triangles; *13*: Trapeze; *14 - 15*: Shouldered bladelets; *16 - 17*: Microburins; *18 - 21*: Notched and denticulated blades

could be an influence of the Saharan ceramic tradition already present at Ti-n-Torha in Libya at 8,640±70 B. P. (R 1035a) (Barich, 1978).

All these elements point very clearly to the existence of close relations between the Western Desert and the Nile Valley.

F. Wendorf and F. A. Hassan (1980) pointed out that during the Early Holocene relatively moist conditions prevailed in the Western Desert. Rainfall was sufficient to sustain ephemeral lakes and ponds in numerous places such as Nabta, El Kortein, El Beid and Gilf Kebir. If, at least for the Egyptian Sahara, one can reasonably think of winter rains, it would mean that at this period of the year the playa's could be very attractive for hunters. In summer, however, one can suppose that these regions were less hospitable to hunters. Perhaps some of them moved to the north or the south, but others certainly moved to the Nile Valley. It is probably not fortuitous that the Elkabian occupations are late summer and autumn settlements. During that season the water from the high stage of the Nile begins to recede leaving numerous pounds, and the Nile Valley seems to have then been very attractive for the Terminal Palaeolithic hunters of the Western Desert.

The subsistence of the Elkabian should be viewed as a nomadic-hunter subsistence with east-west routes of winter hunting in the Western Desert and summer hunting and fishing in the Nile Valley. The working hypothesis of D. Lubell (1976) explaining the cultural pattern of the Late Palaeolithic in the Nile Valley as a seasonal adjustment by single cultural groups is probably correct but should, at least for the Terminal Palaeolithic, take into account a seasonal adjustment not only in the Valley itself but also in the semi-desertic regions of the Egyptian Sahara and, perhaps, even in the yet poorly known Eastern Desert.

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Douglas R. Connor

The Kiseiba Plateau: a systematic surface survey in Egypt's Western Desert

A systematic surface survey of Neolithic sites on the Kiseiba Plateau of Egypt's Western Desert was conducted in 1980 by members of the Combined Prehistoric Expedition (Southern Methodist University, USA and Institute for the History of Material Culture, Poland). The survey mapped and recorded more than five hundred archaeological features (hearths, lithic scatters, faunal remains) in two transects totaling 5.0 km^2 in area. Controlled sampling of lithic remains suggests that most of the sites recorded are Late or Advanced Neolithic in age (c. 6,000 - 5,000 B. P.). Isolated finds suggest the area was also used, albeit infrequently, by Middle Neolithic groups (c. 7,500 - 6,000 B. P.).

Bir Kiseiba, one of a series of small oases in the southern portion of the Egyptian Sahara, lies approximately 200 km. west of Abu Simbel and 350 km. south of Kharga Oasis (Fig. 1). Physiographically, the Kiseiba region divides itself naturally into two parts (Issawi, 1971). To the south and east it forms an internally drained basin of c. 1,900 km^2, called the Nakhlai-Sheb pediplain, which during the Holocene wet phase contained numerous and extensive playa lakes. To the north and west, it consists of a featureless plateau of more than 1,100 km^2 standing 60 - 90 m above the pediplain. The plateau surface is heavily deflated and broken only by low sand ridges covered with lag gravels. Further north, the plateau descends gradually toward the area of Bir Mur, the northernmost playa in the region.

Prior research in the region had established the existence of numerous sites in the pediplain which spanned the entire Neolithic era (c. 9,500 - 5,000 B. P., cf. Wendorf and Schild, 1980). Preliminary reconnaissance of the plateau during 1979 demonstrated the presence of numerous surface features of unknown date or cultural affinity (though the absence of modern debris and the extreme aridity of the historic environment precluded association with historic populations). The first objective of the survey, then, was to establish the relationship of sites on the plateau to those in the pediplain basin. To this end, we needed to establish the distribution of sites

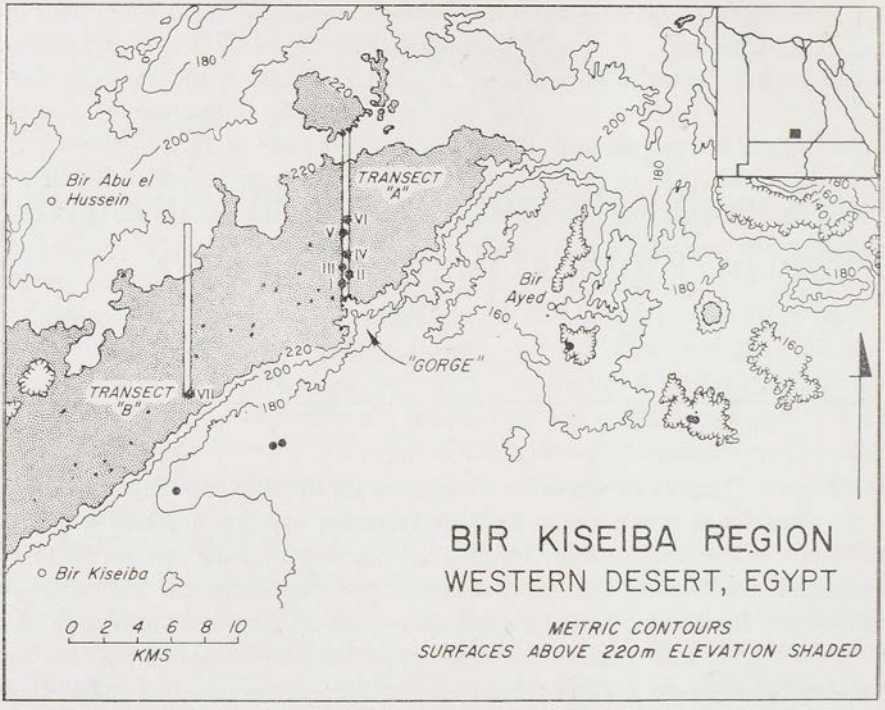

FIG. 1. Bir Kiseiba Region

on the plateau, their chronology, the typological and technological structure of their assemblages and, insofar as possible, their economic bases.

Data were collected in two transects, 10 km. in length and 250 m. wide, running north-south from the southern edge of the plateau (Cf. Fig. 1) [1]. All surface features within the transects were mapped and recorded. The transect locations were chosen to test a hypothesis concerning access to the plateau from the pediplain. If a single population had used both areas, we assumed that over a long period of time, a larger number of encampments would be found near places where the scarp slope of the plateau could be easily surmounted. If the plateau had ever been used for pasturage, this hypothesis would be reinforced by the need to find easy access for livestock. The contour lines in the area map show the location of a "gorge" in the scarp slope. The gradient of ascent here is significantly less than elsewhere along the escarpment. Transect "A" was located at the head of this gorge, near the scarp edge. Approximately ten kilometres west of this point (and near the scarp edge) a series of hearths and lithic scatters had been sampled in 1979 and were known to contain both datable

[1] Ten kilometers was chosen as a suitable length since further than ten km. to the north, the surface falls in elevation and has been severely dissected by erosion.

charcoal and stone tools. Transect "B" was laid out so that these features would be included. The scarp at this point is quite steep and diffcult to scale. If ease of access to the plateau was not a significant determinant of Neolithic camp location (as, for example, if the plateau population was different from that of the pediplain and had made no use of the basin), we assumed that the density and distribution of sites in both transects should be nearly identical.

The work of recording, description and sampling was carried out by two teams of three archaeologists, a mapping crew of three, plus six to eight experienced Egyptian workmen who searched the hearts to recover charcoal, for radiocarbon dating, as well as organic remains. Since some surface configurations of hearths and lithic cover 250,000 m^2 while others are 50 m^2 or less, the term "site" was not used in the descriptions. While the smaller configurations are probably "sites" insofar as they represent single episode camps, the larger are almost surely multicomponent aggregations from which deflation has obliterated the sedimentary context. The descriptive term "occurrence" was applied to groups of features located close to each other (whether in isolation or within a larger aggregation) – in practice, this meant within a circle of 20 - 30 m. diameter, since this was the practical limit for sketch mapping by tape and compass. In most cases, each "occurrence" in the survey area consisted of one to five features, whether hearths, lithic scatters, pottery, ostrich eggshell or bone fragments. For each occurrence field description included a sketch map (as noted above), number, diameter and height of hearths (as an index of deflation), size of lithic (or other) scatters, approximate proportion of various raw materials, number and approximate size of cores, number and class of tools, presence of organic remains (and suitability for collection). At selected occurrences, lithic samples were collected for analysis. Since the number of tools per scatter was usually small (30 or less), sampling was aimed first at providing a technological sample (debitáge) of at least 200 pieces; tools were included when present.

After completing the description, the survey team left a steel pin with a numbered tag at the origin point for the sketch map. A plane table map at 1 : 2,000 recorded the exact location of each pin. This procedure provided the most accurate and efficient use of mapping and survey personnel. Survey on the plateau was completed in a total of eleven days.

Analysis of the survey results is still in progress, yet some conclusions have already emerged. First, the density of sites differs between the two transects. Transect A, near the gorge, produced a total of 403 archeological features; Transect B, to the west, a total of 119. Second, despite density differences, the distribution of features was remarkably similar. Figure 2 shows the number of features recorded in each kilometer of the two transects. Note that in both cases, the majority of features occurred near the southern edge of the plateau. Deflation is severe on the plateau and it is unlikely that superficial masking of features to the north could account for this difference. Moreover, the condition and scattering of surface features does not differ from south to north.

With occasional exceptions, features tend to occur in aggregates of 20 to 100 hearths. These aggregates distinguish themselves by location, and have been termed "Localities". Figure 1 shows the distribution of these localities within the transects, designated by Roman numerals. A dropoff in the number of features and localities as one moves north or west from the gorge was observed not only within the transects,

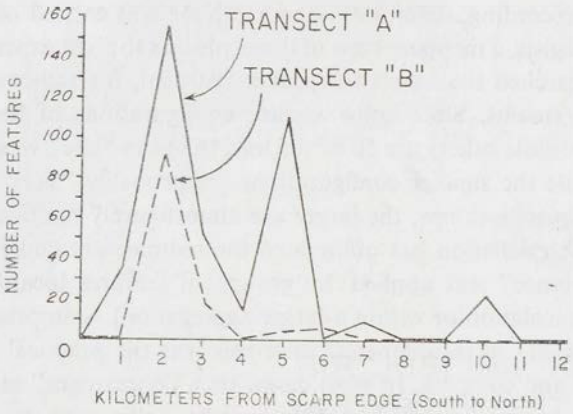

FIG. 2. Bir Kiseiba. Number of features recorded in Transect A and B

but also in a series of east-west sweeps by vehicle, connecting the transects. During the sweeps, localities were recorded on a topographic map (by odometer reading) and were sketch mapped to record approximate size and number of features. Two sweeps to the east of Transect A suggest a similar dropoff in size and number of features in this direction as well.

While the notion of differential access could account for the radial decrease in density as one moves away from the gorge, the higher density near the scarp edge is not as easily explained. Stratigraphic trenches, dug within the transects, showed slightly higher accumulation of silts nearer the scarp. While there is no bedding or induration of silts to indicate episodes of running or standing water, infiltration or sheetwash may have settled in topographic lows near the southern edge of the plateau, supporting heavier vegetation and perhaps a longer growing season than elsewhere on the plateau.

Technological studies of the lithic are not yet complete, but preliminary studies of the tools, grouped by class and locality, showed highest proportions of notches and denticulates, followed by retouched pieces; present but in lower frequencies were perforators (on flakes, shouldered, not backed) and endscrapers. Other classes of tools were only sporadically represented. Loglinear chisquare tests of counts for he classes named, by locality, showed no significant differences for localities I - IV. Differences for localities I - VI were significant at a rejection level of 0.05, but not att 0.01. Differences were significant at a level less than 0.005 when locality VII was

added to the test. Differences appear to be due in large measure to the proportion of notches and denticulates observed (very high in locality VII). There is, it appears, some tendency for localities near each other to resemble each other typologically. Whether this similarity is due to function or some other variable may be resolved by forthcoming technological studies.

Raw material analysis suggests nearly exclusive use of locally available chert nodules. Indeed, several flaking stations were recorded in which partially reduced nodules were surrounded by flakes – all apparently undisturbed since the flaking episode. Occasional flaking scatters consist of high quality flint available only from the Eocene plateau 30 km or more to the northeast. Two such scatters have been reconstructed. The reassembled nodules show flake decortification followed by production of blade blanks with a single platform, change orientation technology. As blade blanks are characteristic of the local Middle Neolithic but are rare in later phases, these cores may pertain to Middle Neolithic presence on the plateau. Reconstruction of several of the local chert cores is now under way and suggests a technology of unpatterned flake reduction.

Ceramics are rare and mostly undecorated. The few decorated examles appear to be of Late or Advanced type (Banks, 1980).

Faunal remains are few but include some identifiable classes now under study. Surface scatters of ostrich eggshell fragments are common while shells of the land snail *Zootecus insularis* occur in more than half of the hearths examined. The shells of another bird were found in two locations, but may not pertain to the Neolithic habitation of the plateau. Bone remains include birds, large and small mammals. On analogy with sites in the basin, these are likely to include *Gazella* sp. (cf. *dorcas*) and *Bos* sp. (cf. *taurus*) (Gautier, 1980).

While some ash or charcoal was found in perhaps 4% of the hearths examined, charcoal suitable for dating was found in only about 1% of the total. Two charcoal samples are now being processed by the SMU radiocarbon laboratory along with two further samples of ostrich eggshell.

The broad affinities of the plateau campsites seem to lie with the late end of the regional Neolithic spectrum. A cluster analysis comparing major tool classes in the plateau assemblages with those of 27 other Neolithic assemblages ranging from 9,500 to 5,000 B. P. placed them, without exception, among assemblages of Late or Advanced date. If the radiocarbon dates confirm the suggestions of the pottery and lithic typology, settlement on the Kiseiba Plateau must be explained in relation to a Late Neolithic pastoral economy based on cattle and caprovids, with domesticated wheat and barley cultivated in and around the playa basins (Wendorf and Schild, 1980). Since the Late-Advanced Neolithic is a phenomenon of the later half of an extended moist interval (c. 7,500 - 5,000 B. P.), the development of playa basins and their surrounding floral communities must have reached its maximum during this period. Pediplain sites of the period are larger than their predecessors and probably represent increased population as well as reoccupation of the localities.

The appearance of settlements on the plateau may betoken pressure on the resources of the pediplain, forcing seasonal use of marginal pasturage on the plateau (which must have provided the best of its Holocene resources during this period). Other possible explanations, such as a shift to more widely circulating settlement during the Late Neolithic, or the arrival of new populations seem less likely, but must be tested in light of further faunal, technological and radiocarbon evidence[2].

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[2] Drs. F. Wendorf and R. Schild provided the structure and opportunities which made the survey possible. I am additionally grateful for the contributions by Drs. M. Kobusiewicz, H. Więckowska and K. Szczepanek, and to that of my colleagues, K. Banks, A. Radwan and P. Volkman, to the last of whom goes an added measure of gratitude.

K. Morgan Banks

Early ceramic-bearing occupations in the Egyptian Western Desert

Recent investigations by the Combined Prehistoric Expedition have provided new information on the appearance and spread of ceramic-bearing occupations in the Egyptian Western Desert during the Holocene Wet Phase (Wendorf and Schild, 1980). Excavations at Nabta Playa, Bir Kiseiba and Wadi Bahkt have shown that there were at least three different ceramic traditions present between about 10,000 B. P. and 5,000 B. P. One of the traditions encompassed three temporal units. The same stratigraphic and cultural sequences were identified at both Nabta Playa and Bir Kiseiba while the Wadi Bahkt material represents a distinct cultural unit and one that apparently had little or no interaction with the other areas.

The ceramic collections are small; the largest collection from a single site only includes 239 sherds. Sherds are generally small and many are weathered. Rimsherds account for less than 10% of the collections while decorated sherds only account for about 50%. However, several sites lacked decorated sherds altogether. No whole or reconstructable vessels were recovered. These factors complicated attempts at determining vessel size and shape and the identification of motifs as well as spatial and temporal comparisons.

1. Nabta Playa and Bir Kiseiba

Nabta Playa is a large, internally draining basin about 120 km. west of Abu Simbel. Although one large playa dominated the area, the smaller adjacent basins also contain playa sediments. These playas were the focal points for human occupation. Bir Kiseiba is a modern well another 100 km. further west of Nabta Playa. The *bir* is at the foot of Kiseiba Scarp, the dominant physiographic feature in this part of Egypt. During the Holocene Wet Phase the Kiseiba area was characterized by a number of small playas and marshy areas both above and below the scarp. These areas were also focal points for human settlements. A total of 9 sites have

been excavated at Nabta Playa and 13 at Bir Kiseiba. Of these, 15 contained ceramics.

The Holocene Wet Phase in both areas consisted of at least 3 successive intervals of playa expansion – Playa I, II and III – that were separated by periods of recession (Wendorf and Schild, 1980). Each period of buildup was associated with a distinct cultural unit: Playa I with a Terminal Palaeolithic occupation, Playa II with the Early Neolithic and Playa III with the Middle and Late Neolithic (Wendorf and Schild, 1980).

1.1. Terminal Palaeolithic

The Terminal Palaeolithic occupation has been dated between 9,700 and 8,300 B. P. Sites are generally small and apparently represent short-term occupations. The subsistence mode involved gathering and gazelle and rabbit hunting. Cattle bones were also found at 5 sites and, based on morphological and ecological arguments, appear to have been domesticated (Gautier, 1980).

The tool kits were predominantely microlithic and usually dominated by backed elements, notches and denticulates. Geometrics were often present, occasionally dominated the assemblages. The microburin technique was also often present. Based on variations in the frequencies of these different elements, three taxanomic units that have temporal significance have been identified (Wendorf and Schild, 1980).

Terminal Palaeolithic occupations were first identified during the excavations at Nabta Playa. None of the sites contained ceramics. However, pottery was recovered from two Terminal Palaeolithic occupations during subsequent investigations at Bir Kiseiba.

Two rimsherds from the same vessel were recovered from the Lower Occupation Horizon at E-79-4 (Kobusiewicz, this volume), a Terminal Palaeolithic occupation dated to 8,250 B. P. $\pm$140 (SMU 750). The sherds are reddish colored, unburnished and sand tempered and with a diameter of approximately 30 cm. The outer edges have short, vertical incisions extending down from the rimtop. This motif is almost identical to a rim motif found in both the Early and Middle Neolithic, especially the latter.

Four sherds from the same vessel were found at E-79 - 8. They came from a buried occupation lens, next to a hearth that has been radiocarbon dated to 9,440 B. P. $\pm$230 years (SMU 758).

Site E-79-8 is one of the oldest sites dating to the Holocene so far reported in the Western Desert and has yielded the largest *in situ* collection of Terminal Palaeolithic material. In addition, cattle bones were identified among the faunal remains which indicates that this ceramic-bearing population already possessed domesticated animals or were familiar with animals that eventually would become domesticated.

The E-79-8 ceramic collection consisted of 3 body sherds and one rimsherd

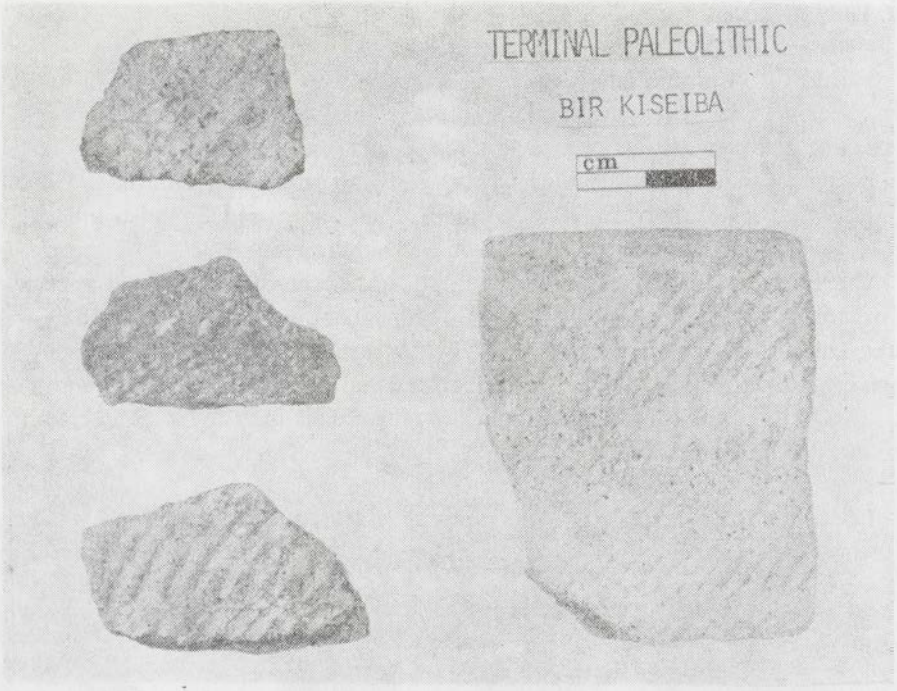

FIG. 1. Bir Kiseiba. Terminal Palaeolithic ceramics from site E-79-8

(Fig. 1). All are reddish-brown to grayish-brown in color, unburnished, sand-tempered and constructed by coiling. The rimsherd had a diameter of about 45 cm.; sherd thickness ranged from 7 to 10 mm.

The exterior surfaces were decorated with bands of upwardcurving, dashed lines that probably were executed by impressing a thin, serrated edge of a shell or curved spatula. The bands encircle the vessel, parallel to the rim, and are about 1 cm. wide. Each band is distinct from the next. Although impressed designs are the hallmark of Holocene ceramic occupations in the southern Western Desert, this particular motif if unique as it is not repeated in any of the subsequent collections nor has it been reported from elsewhere in the Sahara.

The E-79-4 and E-79-8 occupations are separated by a thousand year hiatus that was filled by apparently aceramic Terminal Palaeolithic populations. However, the lack of ceramics in these occupations may be more apparent than real. Holocene settlement patterns, whether involving hunters and gatherers or nomadic pastoralists, appear to have involved a fair degree of mobility (Clark, 1980; Smith, 1980; Wendorf and Schild, 1980). It is possible that these mobile groups treated ceramics differently than more sedentary, agricultural-based groups. Ceramic collections from Saharan sites tend to be smaller than collections from later, more sedentary agricultural-based villages along the Nile.

1.2. Early Neolithic

The Early Neolithic has been identified at 7 sites: 1 at Nabta Playa and 6 at Bir Kiseiba. These occupations all date to around 8,100 - 8,000 B.P. which suggests that this occupation was apparently short-lived.

Economic pursuits consisted of hunting and gathering along with the use of cattle (Gautier, 1980; Wendorf and Schild, 1980). Macrofloral remains also indicate the presence of domesticated barley at E-75-6 (Hadidi, 1980).

The Early Neolithic occupation is important because it marks the appearance of organized "villages" that consisted of alignments of walk-in wells and house structures, each of which was accompanied by at least one storage pit. Two such sites have been identified: E-75-6 at Nabta Playa (Wendorf and Schild, 1980) and E-79-4 at Bir Kiseiba (Kobusiewicz, this volume). These sites indicate some degree of sedentism but the presence of smaller reoccupation sites, such as E-79-5 at Bir Kiseiba, attests that this sedentism was not permanent.

The tool kits are dominated by perforators, burins and retouched pieces. Backed

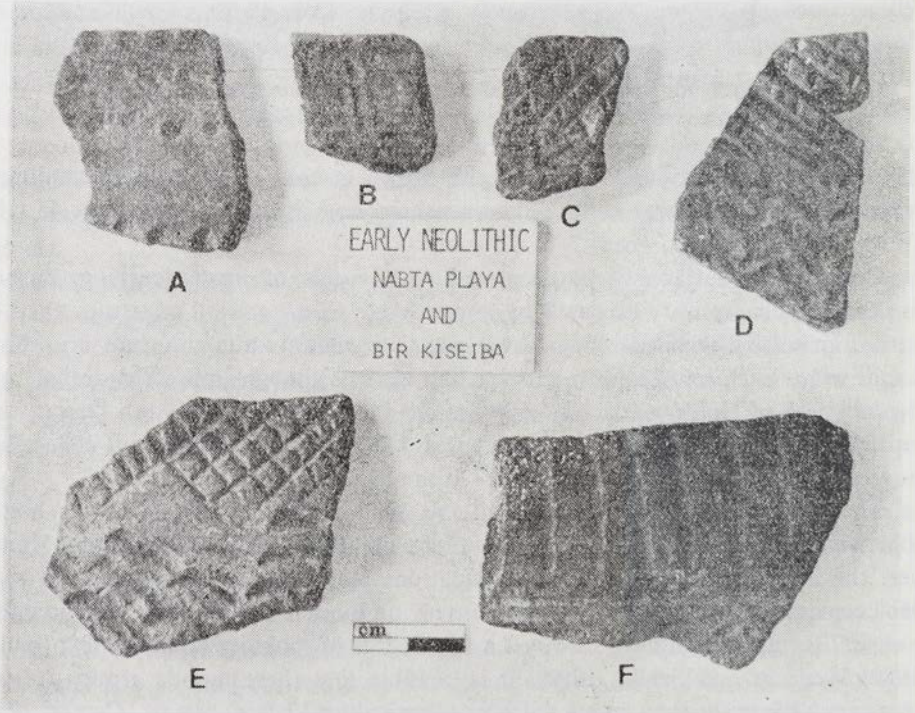

FIG. 2. Bir Kiseiba and Nabta Playa. Early Neolithic rimsherds. Note composite decorations on C–E. Rims B and C are outward flaring

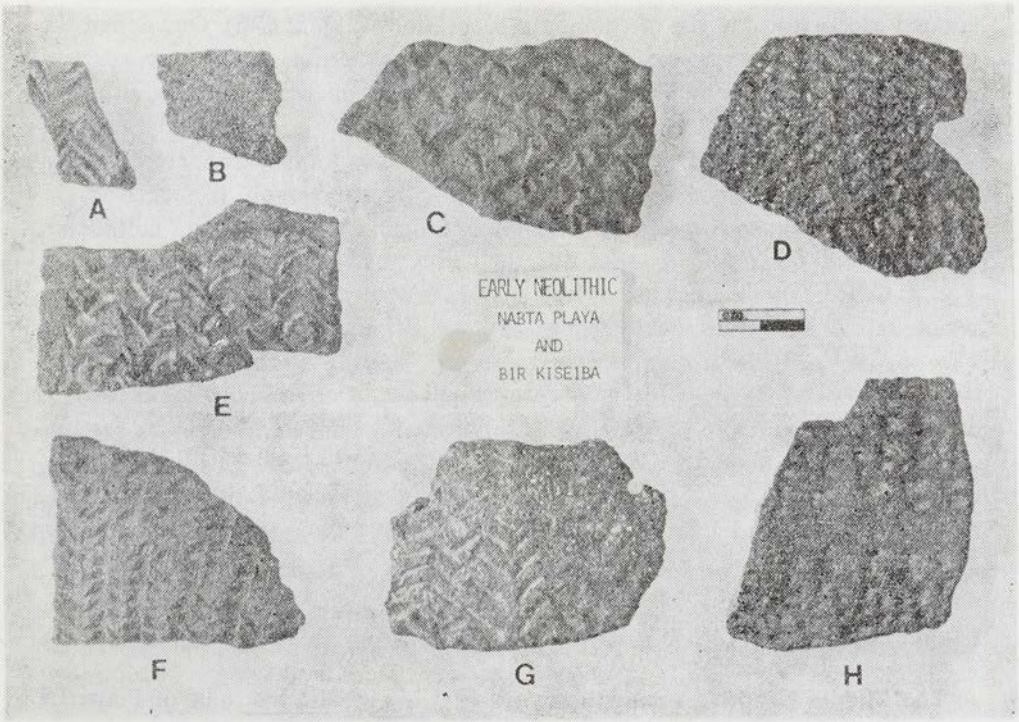

FIG. 3. Bir Kiseiba and Nabta Playa. Early Neolithic body sherds. Fingernail impression: sherds C, E, F, G. Rocker stamped: sherd H

elements, notches, denticulates and, occasionally, geometrics are also present. End-scrapers and microburins are occasionally present.

The size of the ceramic collections varied between sites. They are comparatively rare at the "village" sites; seven sherds were recovered from E-75-5 and five from E-79-4. On the other hand, 35 sherds were recovered from the small reoccupation site of E-79-5.

All sherds are unburnished, sand-tempered and constructed by coiling. The pottery was well-fired and colors range from dark grayish-brown to dark yellowish-brown to reddish-brown. Vessel and rim diameters are consistent with one another and range from 28 to 38 cm. Sherd thickness varies from 4 to 16 mm. Except in two instances, rims are indistinct from the vessel body. The exceptions consist of outflaring lips (Fig. 2: B-C). Rims, *sensu stricto*, generally are decorated with short vertical incisions along the outer edge (Fig. 2: A), a pattern reminiscent of the Terminal Palaeolithic sherd.

All decorations were well-executed and quite distinct (Fig. 2 and 3). Two identifying characteristics of Early Neolithic ceramics are the low frequency of unde-

corated sherds and the use of composite decorations (Fig. 2: C-F). One design was used on the upper portion of the vessel, just below the rim, while a second motif was used on the vessel body. The small number of undecorated sherds suggests that the entire vessel was decorated in most instances.

Four decorative techniques were employed: fingernail impression, comb impression, incision, and punctation, the first being the most common. In several instances a motif combined two different techniques (Fig. 3: F). Nine different motifs were identified but the most common was the "Fingernail Impression" (Fig. 2; B-C, Fig. 3: C, E-F). A fingernail or curved spatula is deeply impressed at a slight angle which raises a ridge around the impression and brings the background forward. This process was repeated across the vessel face, creating a series of broken undulating lines or dashes (this is different from the classic "Dotted Wavy-line" as defined by Arkell: cf. Fig. 2: G). In a variant of this motif, the fingernail or spatula is subsequently dragged down the vessel face between the impressions. This further accentuates the ridges and gives the motif a 3-dimensional appearance (this is the "Ripple motif" as described by Banks (1980; cf. Fig. 3: F).

1.3. Middle Neolithic

The Middle Neolithic occupation is associated with the first half of Playa III and has been dated between 7,800 and 6,600 B. P. This was probably the most populous period during the Holocene Wet Phase as Middle Neolithic sites are scattered throughout the southern Western Desert and two of the largest and densest sites recorded so far, E-75-8 at Nabta Playa and E-79-2 at Bir Kiseiba, are acsribed to this period. However, the majority of sites, such as E-77-5 near Nabta Playa, appear to represent short-term reoccupations and no evidence of organized villages comparable to those of the Early Neolithic has yet been found.

Hunting and gathering continued as part of the subsistence mode but domesticates were becoming increasingly important (Gautier, 1980). Along with cattle, sheep/goat were recorded at one of the largest sites. Macrofloral remains included domesticated wheat and barley as well as date palm (Hadidi, 1980).

The tool kit was dominated by retouched pieces, notches, denticulates and scaled pieces. Truncations and perforators were present along with several varieties of unifacial and bifacial projectile points. Burins, endscrapers and geometrics were also present in varying frequencies.

The ceramics were still unburnished, sand-tempered and constructed by coiling. However, there were several differences with the Early Neolithic. The ceramics are not well-fired and the sherds are more friable. Composite decorations are absent, undecorated sherds are more frequent and there is greater emphasis on rim decorations (Fig. 4). Vessels are larger, up to 60 cm, and the larger vessels often have

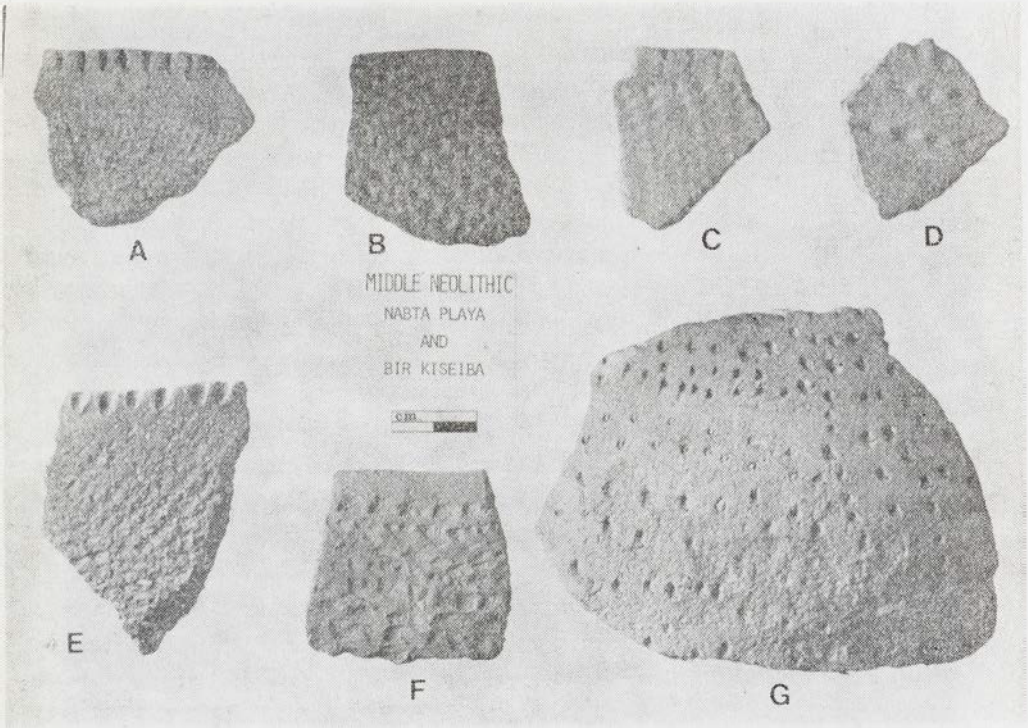

FIG. 4. Bir Kiseiba and Nabta Playa. Middle Neolithic rimsherds. Sherds A, C, D, E are incised along outer edge. Sherd G is incised across rim top. Sherds B and F have undecorated rims. Sherds A-C and E-F have Woven Mat body decorations

lugs on the base for added stability. Further, sherds are thicker and vary from 4 to 9 mm. and may be up to 18 mm. thick at the base.

Colors vary from reds to yellowish-reds to reddish-grays to browns. Rims are undifferentiated from the body but are often decorated with punctations across the top (Fig. 4: G) or vertical incisions along the outer edge (Fig. 4: A, C-E).

Decorative techniques used on the vessel body included impression, incision, punctation and, occasionally, rocker or roulette stamping (Fig. 4 and 5). Implements included shell edges, cord-wrapped roulettes, square-toothed combs and pointed wands; there was only a minimal use of fingernail impressions. Ten different motifs have been identified, including several that are reminiscent of the "Dotted Wavy-line" and the "Wavy-line" (Fig. 5: D, G). There was little repetition of the Early Neolithic motifs and by far the most common motif was the "Woven Mat" (Banks, 1980; Fig. 4: A-C, D-E and 5: A, E). This is a monotonous, comb-impressed motif that was most often executed with a square-toothed comb. In most instances the elements are sharp and distinct but occasionally the tool was slightly dragged

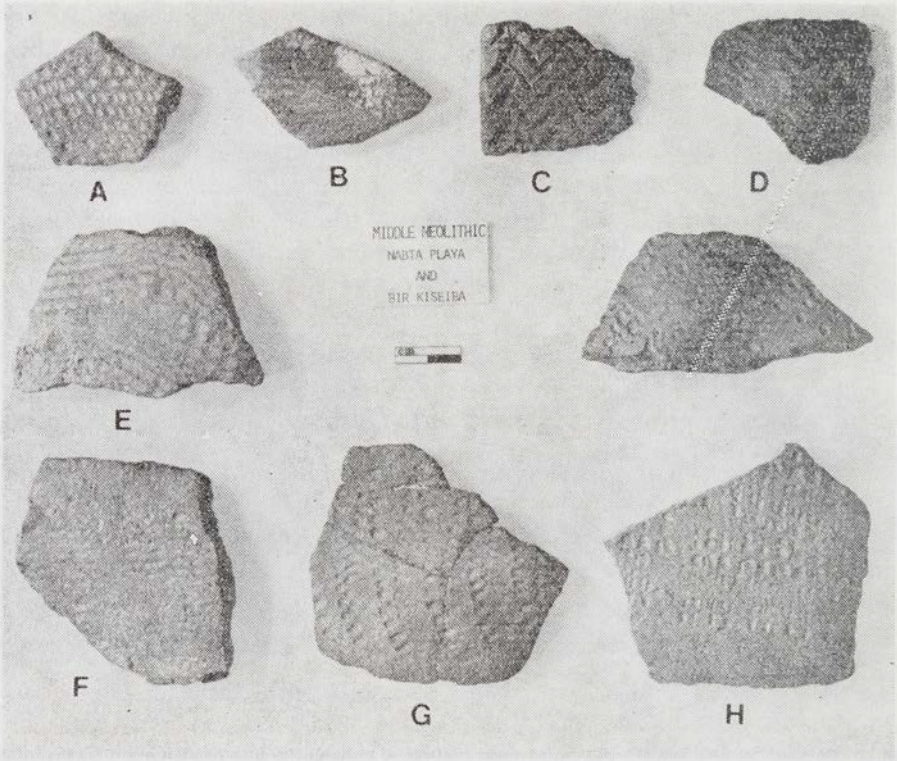

Fig. 5. Bir Kiseiba and Nabta Playa. Middle Neolithic body sherds. Sherds A and E have Woven Mat motif. Sherds G and H are rocker stamped. Sherds D and E have variants of Dotted Wavy Line

which blurred the design. On some vessels the exterior surfaces were systematically covered by the motif while on others the motif was more randomly applied with one series of impressions at an angle to the next (Banks, 1980; Fig. 5: E).

1.4. Late Neolithic

The Late Neolithic was the last extensive period of occupation in the southern Western Desert and is associated with the latter half of Playa III. It is only known from 3 sites: the upper horizon at E-75-8 at Nabta Playa, the surface material from E-79-4 (Kobusiewicz, this volume) and another as yet unexplored site above Bir Kiseiba. The occupation at E-75-8 has been dated from about 6,500 to after 6,300 B.P. The Late Neolithic represents a much less intensive occupation than the preceeding periods and probably reflects the increasing dessication that was setting in.

Gazelle and rabbit were still exploited but now the majority of faunal remains

consisted of cattle and sheep/goat. In addition a number of rootlets from plants usually found in cultivated fields were recovered from E-75-8 (Hadidi, 1980).

The tool kit is reminiscent of the Middle Neolithic as retouched pieces, denticulates and notches are the most common tool type and geometrics and backed elements are fairly rare. The assemblage is completed by bifacial arrowheads, sidescrapers, flaked and/or ground and polished celts and the occasional transverse arrowhead. Side-blow flakes are also present (Wendorf and Schild, 1980).

The ceramics are different from the preceeding material as the design techniques and motifs are no longer present. Vessels are still sand-tempered and coil-made but they are now often finished by paddle-and-anvil. Burnishing and smudging also appear for the first time and colors now range from black to brown to buff and red.

The only identified decorative technique was incisions of parallel, straight lines that apparently encircled the vessel (Fig. 6). Most burnished sherds lacked these incisions. Diameters varied from 40 to 46 cm. and thicknesses ranged from 5 to 8 mm. Some rims had two parallel rows of punctations along the outer edge or shallow incised lines that cut across the rim top.

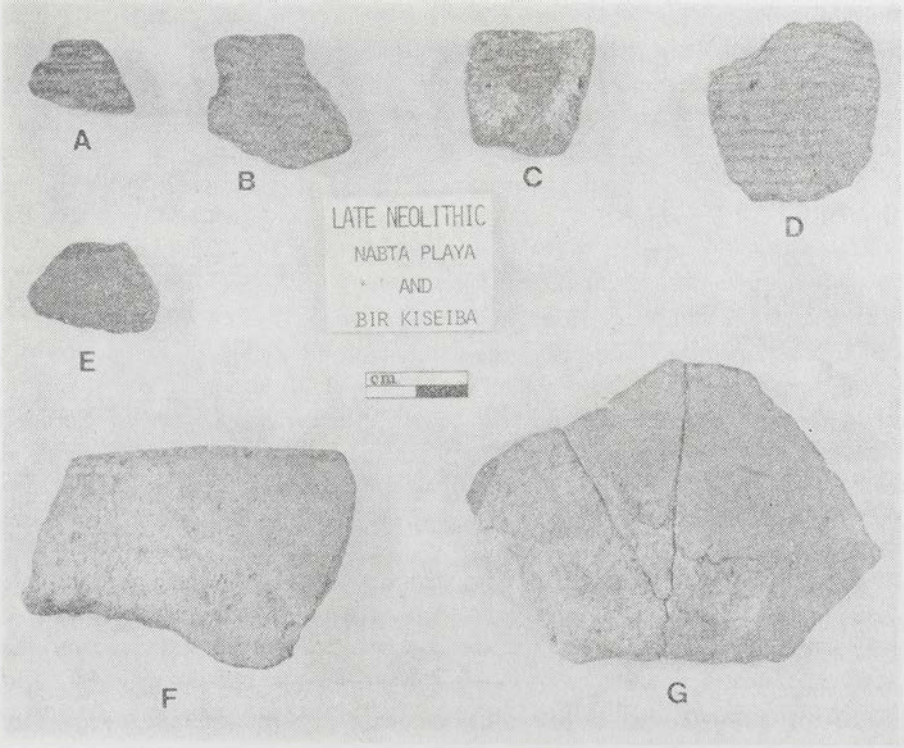

FIG. 6. Bir Kiseiba and Nabta Playa. Late Neolithic sherds. Sherds A-D are incised. Sherd E is burnished. Sherds F-G are undecorated

2. Wadi Bahkt

The Wadi Bahkt collection is the only other ceramic tradition identified so far in southern Egypt that dates to the Holocene Wet Phase. Sites in the Gilf Kebir were first described by Myers (Bagnold *et al.*, 1939) and subsequently studied by McHugh (1975). In 1976 the Combined Prehistoric Expedition visited the area during which a new ceramic collection was made and ostrich eggshell was obtained which later yielded a date of 6,930 B.P. ±180 (SMU 273) (Wendorf and Schild, 1980). Other ceramic-bearing sediments in Wadi Wasa, also in the Gilf, have been dated between 8,695 and 8,460 B.P. (Pachur and Braun, 1980).

Short-term reoccupation sites were situated around a pond that had formed behind a dune that blocked the wadi (Wendorf and Schild, 1980). Cattle and sheep/goat were identified among the faunal remains (Gautier, 1980) and grinding implements attest to the use of plant food.

The tool kit collected by the Combined Prehistoric Expedition was dominated by denticulates, especially denticulated blades. Endscrapers, retouched pieces and sidescrapers were also present while geometrics, backed elements, bifacial pieces

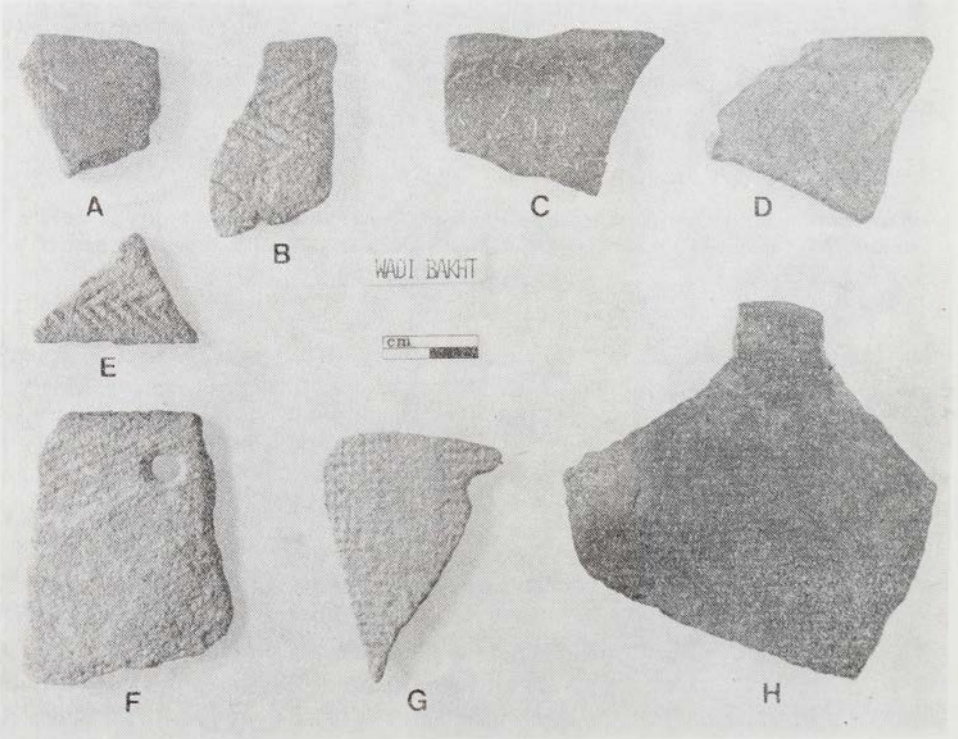

FIG. 7. Wadi Bahkt. Sherds B-D are rimsherds. Note plant impressions on sherd C. Sherds B, D and E have Dotted Chevron motif. Sherd H is smudged and burnished

and polished celts were absent. McHugh (1975), however, reported that the collection of Myers contained some geometrics and backed elements.

The ceramics do not resemble those from Nabta Playa and Bir Kiseiba (Banks, 1980). Vessels were constructed by molding and were well-fired in either oxidizing or reducing atmospheres. Vessel necks were occasionally constructed with outward flaring rims which were generally undecorated (Fig. 7). Rim diameters varied from 15 to 25 cm. and vessel diameters from 24 to 41 cm. Sherd thicknesses ranged from 4 to 6 mm. although basal sherds were occasionally up to 11 mm. thick.

Most sherds were sand-tempered but some also had organic matter present. Sherds with organic temper has plant impression on their surfaces (Fig. 7: C). Colors ranged from reddish-yellow to reddish-brown to brown.

Impression or impression/incision with finely pointed wands or fine toothed combs were the only decorative techniques employed. However, about 50% of the sherds were simply burnished or smudged and burnished. These sherds represent the earliest recorded occurence of smudging and burnishing in the Western Desert, at least 500 years earlier than the Late Neolithic.

Three different motifs were identified (Banks, 1980), the most distinctive being the "Dotted Chevron". This motif consisted of single bands of horizontal chevrons that encircled the upper portion of the vessel just below the rim (Fig. 7, b, d-e). Each chevron is composed of a series of dashed that were impressed with a fine-edged comb, possibly a serrated shell edge.

A second motif was reminiscent of the Middle Neolithic "Woven Mat" (Fig. 7: G). However, this motif was executed by dragging the comb in one direction and then 90° in the other direction. This served to obliterate the design.

3. Comparisons and Contrasts

These five units – the Terminal Palaeolithic, the Early, Middle and Late Neolithic of Bir Kiseiba and Nabta Playa and the Neolithic of Wadi Bahkt-all represent separate temporal, and in the case of Wadi Bahkt, spatial units. However, the Terminal Palaeolithic, and Early and Middle Neolithic can be viewed as being within the same tradition as the ceramics are all unburnished, sand-tempered and decorated with impressions, incisions or punctations. The tools employed were either combs, fingernails, spatulas, wands or cord-wrapped roulettes. Rims were often decorated with either punctations or incisions and vessels were constructed by coiling. Although the collections differed in specifics – such as the particular designs employed – these general traits are reminiscent of the Khartoum Horizon Style (Hays, 1971). As Hays pointed out, the "Woven Mat" motif, so diagnostic of the Middle Neolithic, is one of the most prevalent motifs found among Khartoum-related sites throughout the south-central Sahara and in the Sudan. Assuming that the ceramics from these three units are within the Khartoum Horizon Style, two observations can be made. The first is that within the Khartoum Horizon Style there appears

to have been some temporal changes within this region. These changes are not only apparent in the ceramics but also in the lithics. The second is that the radiocarbon dates further underscores Hays' postulate that this horizon style had a Saharan origin (Hays, 1971). The Nabta Playa and Bir Kiseiba collections represent one of the few instances in which a number of sites within a restricted area have been investigated. Whereas much of our previous knowledge have come from the excavations of individual sites such as Amekni or Meniet, the investigations in the Western Desert have focused on examining a number of sites that date to the Holocene Wet Phase.

The Late Neolithic and Wadi Bahkt collections represent departures from the other collections; neither appears to have encompassed the time span nor the geographical extent of the other material. Part of the problem is that these occupations are known from a very limited number of sites. However, the Late Neolithic does appear to represent somewhat of a departure from the earlier material. The ceramics are characterized by the appearance of new traits such as smudging and burnishing, new methods of construction, and a de-emphasizing of impressed or incised designs. These ceramics appear to share a lot of traits with the Abkan and Khartoum Variant traditions along the Nile (Banks, 1980; Nordström, pers. comm.). If such is the case, then the associated radiocarbon dates and the similarities in the lithics with the preceeding Middle Neolithic suggests a Saharan origin for the Nilotic traditions.

The Wadi Bahkt material appears to represent a totally isolated tradition. No other collections so far reported are similar; the most closely related material is possibly from several sites in southern Libya briefly reported by Vita-Finzi and Kennedy (1965). More research is needed to determine the relationship of this material to the Khartoum-related material so prevalent elsewhere in the southern Sahara.

A comparison of the Nabta Playa and Bir Kiseiba sequences with those from elsewhere in the Sahara reveals two interesting differences. The first is that ceramics were already a part of the earliest Holocene occupants in the Western Desert whereas the earliest occupants elsewhere appear to have been aceramic (Smith, 1980; Clark, 1980). The second is that domesticated animals, or potentially domesticated animals, were present throughout the Nabta Playa and Bir Kiseiba sequence. In the central and southern Sahara domesticated animals appear fairly late in the sequence (Smith, 1890; Clark, 1980). If these observations are confirmed by future research, they will have implications for the origins and spread of both ceramics and domesticates in the southern Sahara.

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ANGELA E. CLOSE

Early Holocene raw material economies in the Western Desert of Egypt

This paper deals with the use and treatment of lithic raw material in 22 assemblages, from 16 sites in the Western Desert of Egypt. Geographically, the sites fall into two major areas: six in the region of Gebel Nabta, some 100 km. west of Abu

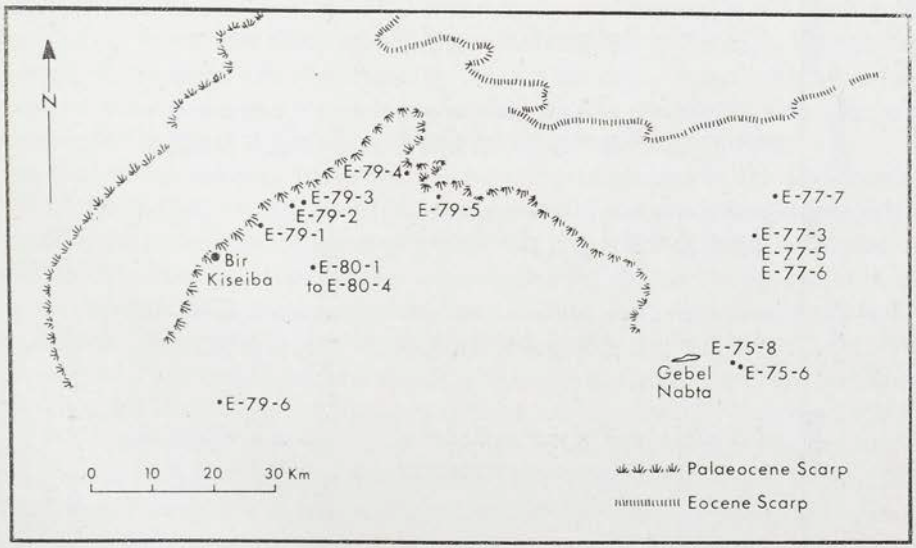

FIG. 1. Location of sites discussed and of Eocene and Palaeocene scarps

Simbel (Wendorf and Schild, 1980), and ten in the region of Bir Kiseiba, about 180 km. west-north-west of Abu Simbel (Fig. 1).

In the Nabta area, the Terminal Palaeolithic sites of E-77-3 and E-77-7 have radiocarbon dates of 8,840 B.P. ±90 (SMU 416) and 8,960 B.P. ±110 (SMU 440), respectively. The Early Neolithic of E-75-6 has 12 radiocarbon dates, ranging from

Table 1

Percentage frequencies of raw meterials in Early Holocene assemblages in the Western Desert

	Period	Chert	Flint	Quartz	Sandstone	Petrified Wood	Granite	Basalt	Chalcedony	Jasper	Agate	Sample Size
Kiseiba Sites												
E-79-1, Surface	T.P.	53.7	21.1	5.3	2.5	17.1	0	0	0	0.4	0	2110
E-79-1, Excavated	T.P.	73.5	12.4	1.4	1.3	11.1	0	0	0	0.3	0	1200
E-79-3	T.P.	33.3	5.0	3.3	0.3	57.2	+	0	0.3	0.6	0	2361
E-79-4, Lower	T.P.	4.6	76.9	2.3	2.0	14.3	0	0	0	0	0	2437
E-80-4	T.P.	55.3	1.5	2.6	7.2	24.8	0	0	8.6	0	0	6949
E-79-4, Upper	E.N.	7.8	70.3	9.2	1.0	11.6	0	0	0	0	+	2890
E-79-5	E.N.	10.5	36.6	46.7	1.1	4.5	0.4	0	+	0.1	+	5466
E-80-1, Area A	E.N.	35.8	11.2	3.0	21.9	25.7	0	0	0	2.6	0	3320
E-80-1, Area C	E.N.	29.1	28.0	27.2	2.7	12.9	0.1	0	0	0	0	5974
E-80-2	E.N.	60.7	24.6	0	4.4	10.3	0	0	0	0	0	252
E-80-3	E.N.	64.7	9.5	3.6	3.0	16.7	0	0	0	2.5	0	3350
E-79-2	M.N.	45.9	8.6	26.1	1.6	17.1	+	0.2	0.4	0.1	+	27846
E-79-6, Surface	M.N.	28.6	3.5	38.4	21.6	6.1	0.7	0	0.1	0.9	0	6871
E-79-6, 0-20 cm.	M.N.	43.5	2.7	32.7	16.9	3.7	0.4	0	0	0.1	0	4489
E-79-6, Below 20 cm.	M.N.	55.6	2.6	21.5	15.8	4.5	0.2	0	0	0	0	1323
Nabta Sites		(Chert & Flint)										
E-77-3	T.P.	94.8		1.3	0.5	1.7	0.1	0.5	0.2	0.8	0.1	3977
E-77-6	T.P.	83.5		10.0	0.5	4.4	0.4	0	0.7	0.3	0.2	5236
E-77-7	T.P.	69.5		7.6	2.7	19.8	0.3	0	0	0	0.1	1733
E-75-6	E.N.	45.8		43.0	1.5	7.4	1.9	0	0.3	0.1	0.1	3208
E-75-8	M.N.	61.5		24.5	3.0	0.7	3.2	+	1.0	6.0	0.1	9459
E-77-5	M.N.	31.7		53.7	1.8	2.7	4.8	0	4.2	0.9	0.2	3898
E-75-8	L.N.	55.3		33.9	4.8	0.7	0.9	0.3	1.3	2.4	0.4	2261

Legend: T.P.: Terminal Palaeolithic
E.N.: Early Neolithic
M.N.: Middle Neolithic
L.N.: Late Neolithic
\+ : present but less than 0.1%

7,680 B.P. ±70 (SMU 191) to 8,130 B.P. ±60 (SMU 255). There is one date for the Middle Neolithic site of E-77-5 (7,530 B.P. ±100; SMU 462), and 13 dates for the same period at E-75-8, ranging from 6,240 B.P. ±70 (SMU 361) to 7,120 B.P. ±150 (SMU 242). The Late Neolithic at E-75-8 has a single date of 5,810 B.P. ±80 (SMU 473) (Close, 1980; Haas and Haynes, 1980). Near Bir Kiseiba, radiocarbon dates for the Terminal Palaeolithic are 8,250 B.P. ±70 (SMU 739) at E-79-1, 7,950 B.P. ±130 (SMU 744) at E-79-3, and 8,250 B.P. ±140 and 8,190 B.P. ±120 (both are SMU 750) at E-79-4. The Early Neolithic is dated to 7,890 B.P. ±90 (SMU 756) in the Upper Cultural Layer at E-79-4, and 8,070 B.P. ±190 (SMU 761) at E-79-5. The Middle Neolithic has dates of 8,130 B.P. ±110 (SMU 760) and 7,610 B.P. ±70 (SMU 764) at E-79-2, and 7,170 B.P. ±80 (SMU 749) at E-79-6 (below 20 cm.).

The assemblages have classified into four been groups: Terminal Palaeolithic (eight), Early Neolithic (seven), Middle Neolithic (six) and Late Neolithic (one) (Table 1). It was originally believed that this classification had some "cultural" significance, particularly in the distinction between the Terminal Palaeolithic, thought to represent essentially hunting-and-gathering groups, and the Neolithic, associated with pottery and domesticated plants and animals. It now appears, however, that the so-called "Terminal Palaeolithic" sites may also contain pottery and probably domestic cattle, so that the implications of a radical change in economy between the Terminal Palaeolithic and the Neolithic are misleading. Nevertheless, the four categories still retain some chronological meaning and they will be used here as a convenient short–hand to indicate the relative ages of the assemblages.

A total of ten different types of stone has been recognised in the assemblages, of which chert, flint, quartz, sandstone and petrified wood are the most important. Overall, chert is the most common raw material. It is a fine-grained, homogeneous rock, which usually flakes well, and it occurs along the Palaeocene scarp and in the rare desert wadis. Flint is generally less common than chert, but is a higher quality raw material and seems to have been a preferred one. It is found along the Eocene scarp. Quartz and sandstone are usually poor raw materials, particularly quartz; petrified wood may be of very high quality but many sources of it have been subject to thermal shattering. Chert, quartz, sandstone and petrified wood were quite readily accessible in both the Nabta and Kiseiba areas; the nearest source of Eocene flint however, was some 60 - 70 km. north of Gebel Nabta and well over 100 km. northeast of Kiseiba.

Of the minor raw materials, granite and basalt are found in occasional outcrops and are difficult to work. Chalcedony occurs as nodules on the "chalcedony playas" (Haynes, 1980) and may be a high quality raw material if the nodules are of sufficient size and not to have been weathered throughout. Jasper and agate both flake well but were little used. Jasper was available from local basement outcrops and agate may have been brought from the Nile Valley.

Given the differences in flaking-properties between the various raw materials, it is hardly surprising that they were treated differently within assemblages. Chert

is the most common raw material and, overall in the Kiseiba area, it is divided between the three major artefact classes as follows: 93.1% debitage; 5.5% cores; 1.4% tools. Taking chert as a standard with which other raw materials can be compared, we find that sandstone, jasper, chalcedony, granite and basalt produced relatively fewer cores and tools than chert; these are generally not high quality raw materials. Petrified wood was used to manufacture approximately the same relative frequencies of cores and tools as was chert; this is a good quality raw material when not thermally fractured and such pieces could, presumably, be recognised and discarded "in the field". Quartz yielded fewer tools than chert, which accords with its poor flaking-properties, but more cores. The latter phenomenon is assumed to result from the initial small size of the quartz pebbles, from which fewer useful flakes could be struck before exhaustion. Eocene flint, on the other hand, produced a relatively much higher frequency of tools than did chert, and fewer cores. Of the major raw materials, flint was the most difficult to obtain, but the cores do not seem to have been more fully exploited than were those of other raw materials; they are not, for example, noticeably smaller. The lower frequency of flint cores may, therefore, reflect the practice of curation – that flint was so highly valued that groups would take the cores with them when they moved. Flint was the finest of the available raw materials and was, therefore, much preferred for the manufacture of retouched tools (The frequencies of agate are so low that comparisons would be meaningless).

There are some exceptions to these general rules, but they concern only specific artefact-types in one or two assemblages. Thus, quartz was used for an unusually high frequency of the retouched tools at E-79-2, but this assemblage included many scaled pieces, which tend to be made on quartz. Similarly, sandstone tools are quite frequent in the assemblages from E-75-6 and E-75-8, but almost all of these are scrapers made on large sandstone flakes. On the whole, the differential treatment of the various raw materials within assemblages, which has been outlined above, is applicable to all of the sites under discussion.

Above this sub-stratum of similarity, there are, however, differences between sites in different areas and between assemblages of different periods. The percentage frequencies of the raw materials in each assemblage are given in Table 1. Unfortunately, chert and flint were not distinguished during the analyses of the Nabta material and only combined figures are available for the two. However, since the chert--flint group at Nabta includes significantly more tools and fewer cores than does the chert-flint group at Kiseiba, it seems likely that flint was used relatively more frequently in the Nabta sites than it was in the Kiseiba sites. The Kiseiba and Nabta assemblages differ most clearly in two of the minor raw materials, agate and granite, both of which are more common at Nabta. The consistent presence of agate may reflect the smaller distance from Nabta to the Nile Valley than from Kiseiba; the occasional presence of *Unio* shells in the desert sites shows there was some contact with the Valley. The higher frequency of granite is surely because of the large granite outcrop a few kilometres north of Gebel Nabta. Quartz crystals also could be ob-

tained from this outcrop, and quartz is more common in the Nabta sites. Of the other major raw materials, chert and flint are more frequent in the Nabta area and, as noted above, it is believed that flint, specifically, was used more frequently than at Kiseiba; this would accord with the greater distance from Kiseiba to the Eocene scarp. In contrast, petrified wood is of much greater importance in the Kiseiba area than in Nabta, possibly because flint was more difficult to obtain.

Variations in raw material frequencies between assemblages of different periods are a little less obvious from Table 1, but, in fact, are quite marked and concern principally the major raw material types. The greatest contrast is between the Terminal Palaeolithic and the Middle Neolithic assemblages – essentially, the beginning and the end of the sequence, there being only one Late Neolithic assemblage. The Terminal Palaeolithic groups made significantly more use of chert and flint (72.3%) and of petrified wood (17.5%) than did the Middle Neolithic groups (50.6% and 10.4%, respectively). Sandstone was rather less common (2.7% in the Terminal Palaeolithic and 6.0% in the Middle Neolithic) and quartz was much less common in the Terminal Palaeolithic (4.4%, as opposed to 29.8% in the Middle Neolithic). Other raw materials account, in total, for a little over 3% in each group and show only minor variations: chalcedony is rather more frequent in the Terminal Palaeolithic (probably only because of its high frequency at E-80-4) and granite and, to a lesser extent, jasper are slightly more common in the Middle Neolithic. The assemblages called Early Neolithic are a more heterogeneous group, but, as a whole, they fall quite firmly between the Terminal Palaeolithic and the Middle Neolithic, with 57.1% chert and flint, 12.4% petrified wood, 4.6% sandstone and 24.7% quartz.

Discriminant analyses were carried out on these data in an attempt to derive functions which could classify assemblages into periods, on the basis of their raw material frequencies. The attempt was only partially successful. The derived functions were able to classify the Terminal Palaeolithic and Middle Neolithic groups correctly and consistently, but not the Early Neolithic. In fact, using the major raw materials only, three of the seven Early Neolithic assemblages would be classified as Terminal Palaeolithic and two as Middle Neolithic. Additionally, in two-dimensional space the centroids of the three groups fall almost into a straight line. This, when considered together with the percentage frequencies given above, suggests that the Early Neolithic may be regarded as transitional between the Terminal Palaeolithic and the Middle Neolithic, or, to put it another, and probably better, way, that the Terminal Palaeolithic, Early Neolithic and Middle Neolithic are parts of a diachronic continuum, and that there are no real breaks between these three so-called "stages". This would accord with the underlying continuity, discussed above, in the patterns of exploitation of individual raw materials, and with evidence, from other sources, of correspondences in broader economic traits, such as the presence of domestic animals throughout the sequence and the extensive use of ground plant-foods, as witnessed by the numerous grinding-stones in all sites

and the recovery of domestic cereals from some of the Neolithic sites (Wendorf and Schild, 1980).

It remains to consider the lithic raw material economy within the overall economy of these Western Desert occupations, and how either might shed light upon the other. It is believed that the initial occupation was by groups of rather mobile cattle-herders and that their subsistence-strategies may not have been too different from those of modern cattle-herders in the Sahelian belt. Faunal studies indicate that, while cattle were present, wild rabbits and gazelle were the major sources of meat. Wild plantfoods were used extensively and, at least from the Early Neolithic onwards, barley was cultivated. Emmer wheat and sheep or goat appear in the Middle Neolithic. The (wild) fauna and flora indicate that the environment was not lush — indeed, that it was not really suitable for cattle — and it is therefore likely that the cattle had to be herded over rather long distances in order to find sufficient grazing. Sites of the initial period of occupation are small; large, organised settlements appear in the Early Neolithic and continue to be used, in conjunction with small sites, throughout the sequence.

It seems that the major factor in the selection of raw materials was opportunism. The occupants of a site tended to make use of the closest sources of suitable raw materials, hence the overall differences between the Nabta and Kiseiba areas and the differences between sites within each area. The high frequency of petrified wood at E-79-3, for example, presumably indicates the existence of a good and very close source of this raw material. It is also worthy of note that, in the large, stratified sites, the several assemblages from each site tend to be more like each other than they are like assemblages from other sites. This suggests not only a predominant use of local sources of raw materials, but also occupation of the sites by groups who already knew the local sources; that is, re-occupation by the "same" group. This, in turn, implies an established pattern of exploitative strategies with return visits to one locality, possibly on a seasonal or annual basis. This would be expected if the rains were predominantly seasonal in nature, and therefore predictable.

As well as opportunism, however, there was also a strong appreciation of, and preference for, good quality raw materials, particularly in the Terminal Palaeolithic and Early Neolithic. This is especially seen in the use of two raw materials, agate and Eocene flint. Agate is very rare and probably came from the Nile Valley. Traces of the Western Desert groups have not been found in the Valley, and it seems likely that the agate was obtained by trade. Flint, also, might have been got by trade, but the volume of it used suggests otherwise. After the rains, the plateau above the Eocene scarp would have been covered by grassland, with water being trapped in the numerous small basins. It seems improbable that the cattle would not have been taken up there to graze, in season, and flint could have been collected at the same time. The Eocene plateau remains an archaeological *terra incognita* but the hypothesis seems reasonable, particularly since many small and short-lived encampments of this general period are known from above the Palaeocene scarp near Ki-

seiba. As the plateau dried, the cattle would be brought back to the much larger basins below the scarp, and the flint was brought with them and treated as a prized raw material. Here, the assemblages from E-79-4 must be mentioned as being anomalous. Although the site is so far from the Eocene scarp, over 70% of all artefacts were made on flint, even during the Early Neolithic when the site appears to have been a large and well organised settlement of some permanence. The reason for this very high frequency is not known. The site may have been some kind of trading centre, but there is no sign of the goods for which the flint was traded. Alternatively, it may simply have been the first major stop after the return from the scarp, when the herders were still carrying a full complement of flint. In any case, it would seem to suggest that there was heavy and possibly quite rapid contact between E-79-4 and the Eocene scarp area.

This is essentially the pattern throughout the Terminal Palaeolithic and Early Neolithic, but it seems to have changed a little during the Middle Neolithic. There is no change in the settlement pattern, as we know it, but emmer wheat and sheep or goat were introduced into the economy at about this time. The changes in raw material usage are, perhaps, best shown in the Middle Neolithic sequence from E-79-6, where flint is always rare, chert decreases markedly through time and sandstone and quartz become much more common. This is accompanied at all sites by a change in typology, from the well made, specialised and essentially "Palaeolithic" tools of the Terminal Palaeolithic and the Early Neolithic, to a more generalised and, on the whole, less well made tool-kit, composed principally of notches, denticulates and retouched pieces. These two, the changes in raw material and in typology, correlate very closely but the relationship between them need not have been one of cause--and-effect. I would suggest that they are both symptoms of a general loss of interest in stone-working.

The reduction in the use of flint, which is known for the Kiseiba area and may also have occurred at Nabta, might indicate that the Eocene scarp was less accessible in the Middle Neolithic. Perhaps the greater emphasis upon food-production led to an increased territorial sense, so that it was more difficult to herd animals over long distances, or perhaps there was greater sedentism. In either case, it would be more difficult to obtain flint. On the other hand, the fine-grained Palaeocene chert was readily available from the Kiseiba scarp, but even this nearby source was much less heavily exploited during the Middle Neolithic. In this light, it seems possible that the Eocene plateau may have continued to be used for grazing as before, but that there simply was no longer so much interest in bringing back large quantities of fine flint.

Why this decline and loss of interest in stone working occurred is a mystery, but it has been observed in other Neolithic contexts. It does not seem to be associated with the onset of food-production *per se*, but it may be that it occurs at the stage when food-production finally becomes the most important part of the subsistence--strategy; when the "hunter" becomes a "peasant". It is interesting, in view of the

recent finds from Wadi Kubbaniya (Wendorf *et al.*, 1980), that even in the harsh Western Desert, where "environmental stress" might be expected to have been rather significant, some form of food-production was known and practised for several millennia before this change took place.

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MICHAŁ KOBUSIEWICZ

The multicultural Early Holocene site E-79-4 at El Ghorab Playa, Western Desert of Egypt

This work presents the latest results of studies of one of the key sites of the Early Holocene prehistory of the Western Desert. These studies are not yet completed; detailed publication will follow.

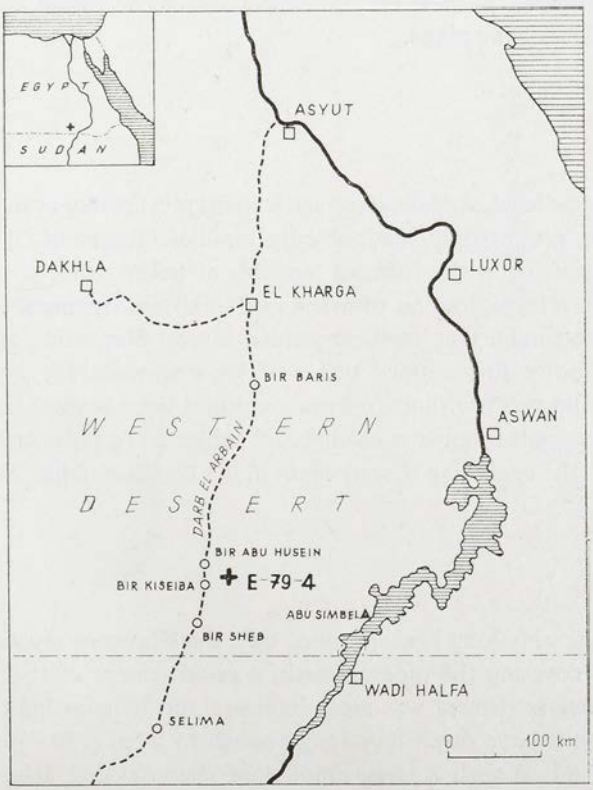

FIG. 1. Location of site El Ghorab E-79-4

Site E-79-4 was unearthed in 1979, in the course of a longterm investigation programme of the Combined Prehistoric Expedition, which aimed at a closer knowledge of the prehistory of the Western Desert. Exploration of the site lasted, seasonally, through 1979 and 1980, and was carried out by excavations. To explain the geomorphological situation a series of stratigraphic diggings and drillings were carried out. The contents of the cultural layer were sifted and partially studied by the flotation method.

Site E-79-4 is situated in the southern part of the Western Desert of Egypt, 80 km north of the Sudanese frontier, about 160 km west of Abu Simbel, and about 25 km east of the route Darb El Arbain, between two wells: Bir Abu Husein and Bir Kiseiba (Fig. 1). On the southern shores of extinct shallow lake, which the discoverers called Playa El Ghorab, abundant traces of settlement were found. In the Early Holocene, rainfall waters, from the nearest vicinity and from the plateau situated about 1 km northwards, accumulated there, forming the El Ghorab reservoir. The supply of water was sufficient to keep the shallow reservoir, about 2 km in diameter, constanty full. The sequence of repeatedly appearing settlement layers, unearthed on the site, prove that this reservoir has always been an attractive site for human settlements. At present, at least five successive settlement period have been confirmed on the borders of the playa.

Level I

This is the oldest level. A short-lived settlement, presumably occupied by one or a few small human groups only, undoubtedly families. Traces of their dwelling are the remains of hearths, in the form of lenticles of baked sand, with an admixture of silt mixed with a large amount of ashes and small coal remnants. Two such fire-hearths have been found. One of them yielded several flint relics, among them one micro-burin and some fine-chipped bones of big mammals. However, the sejourn of the human group was too short to form a cultural layer beyond the lenticle of the hearth itself. The small fragments of charcoal subjected to radiocarbon analysis indicate the date of the beginning of settlement in the El Ghorab playa to ca. 8600 B.P.

Level II

After a considerably long break, proved by a thick layer of archaeologically barren yellow sand covering the oldest hearth, a re-settlement of the playa's borders followed. This time settlement was more intensive and long-lasting (Fig. 2). Several human groups must have dwelt here long enough to form a 20 - 30 cm thick layer containing sand mixed with a large amount of charcoal and ashes. This cultural layer, called "the Lower Cultural Layer", is situated in the eastern part of the site

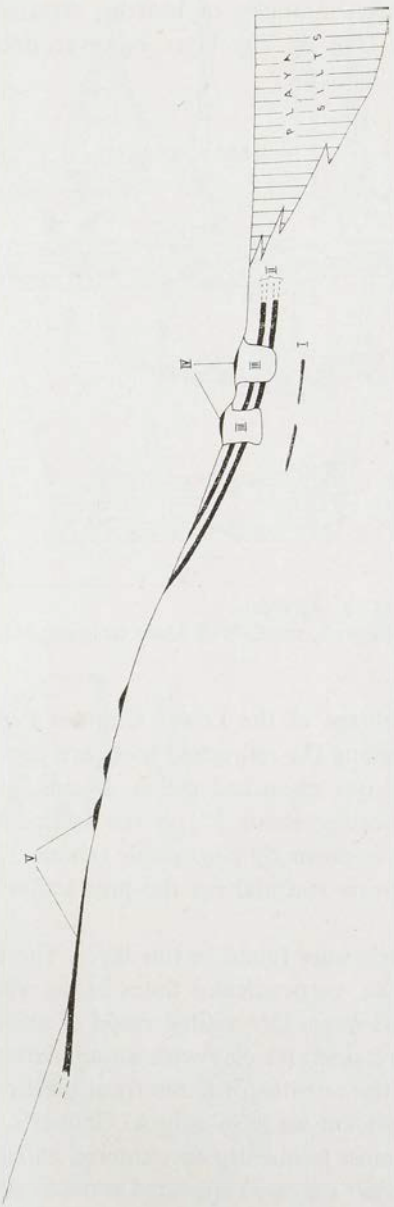

FIG. 2. El Ghorab, site E-79-4. Generalized sketch of the stratigraphy

and contains numerous flint relics, some fine-chipped and also bigger fragments of bones, as well as ceramics. In the second level, settlement took place repeatedly, as is proved by the redbaked lenticles of hearths, stratigraphically differentiated inside the layer described (Fig. 3). This layer, however, does not continue, and appears in the form of large lenticles.

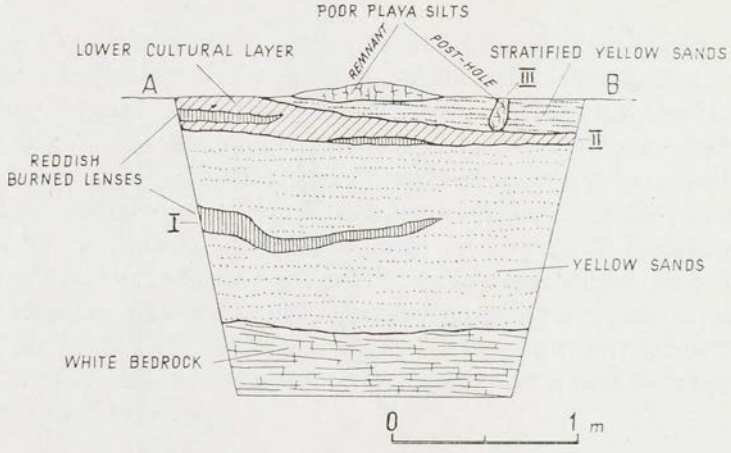

FIG. 3. El Ghorab, site E-79-4. Main stratigraphic profile

In the rich flint assemblage of the Lower Cultural Layer blade technology is insignificant. Dominant among the retouched tools are backed bladelets of various types, triangles and numerous retouched pieces. Burins, perforators, notches and denticulates are sparse, forming about 5% of the assemblage. The application of the micro-burin technique is distinctly perceptible (about 5% among the retouched tools) (Fig. 4). The basic raw material for the production of stone tools was the Egyptian flint.

Two fragments of vessels were found in this layer. The outer edge of one fragment is decorated with wide, perpendicular flutes below which runs a band of horizontal lines and points. It was a thin-walled vessel of about 23 cm in diameter at the rim, made of medium-baked, fat clay with an admixture of sand (Fig. 5).

A detailed analysis of the remains of fauna from the Lower Cultural Layer has not yet been finished. At present we have only A. Gautier's initial notations for the site. These show that the most frequently encountered animal is the Dorcas gazelle (*Gazella* sp.). The hare (*Lepus capensis*) appeared sporadically and there were small amounts of remains of big rodents like porcupine (*Hystrix*), and also ground squirrel, wild cat and few birds. Radiocarbon analysis dated this layer to about 8300 B.P.

Chronologically closest to the Lower Cultural Layer is the so-called "Cultural Layer West". It also shows intensive settlement in the western part of the site. This

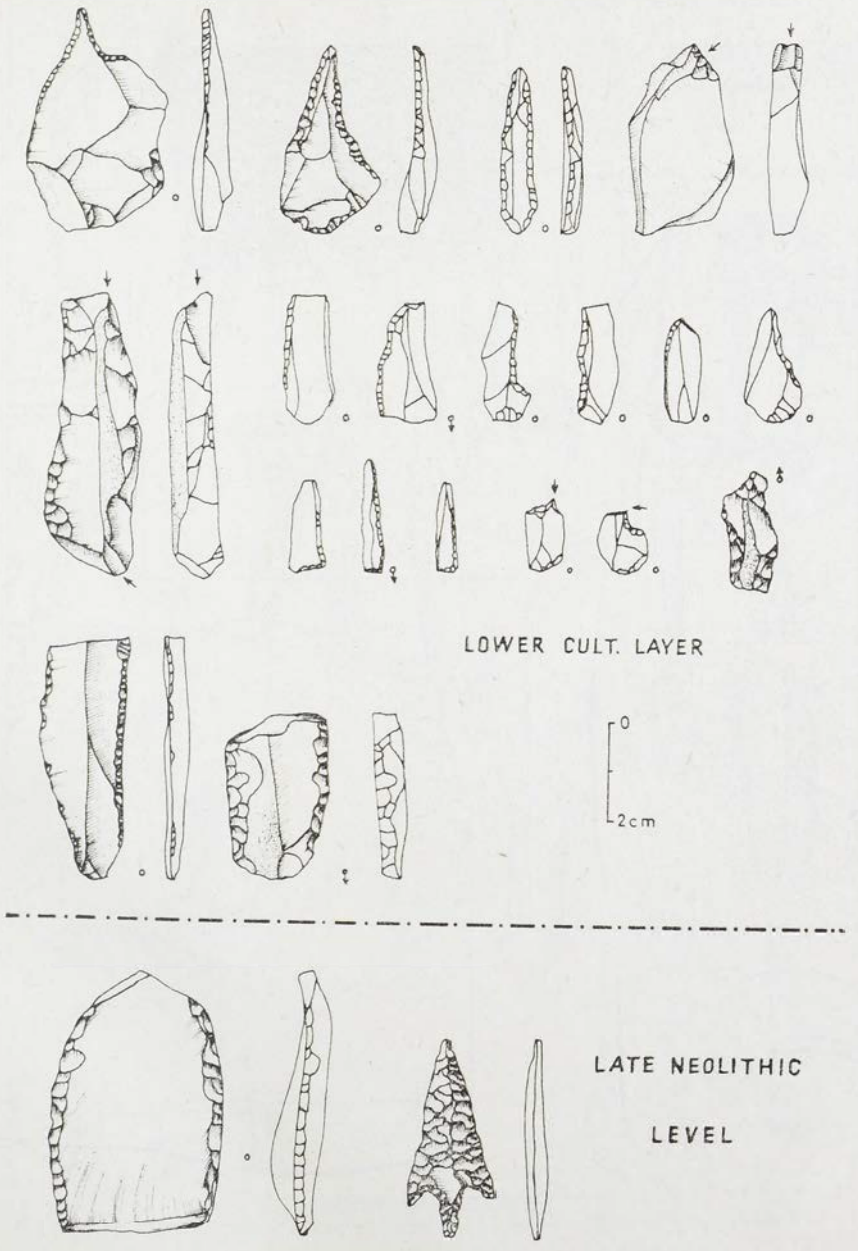

FIG. 4. El Ghorab, site E-79-4. Retouched tools from Lower Cultural Layer and from Late Neolithic settlement

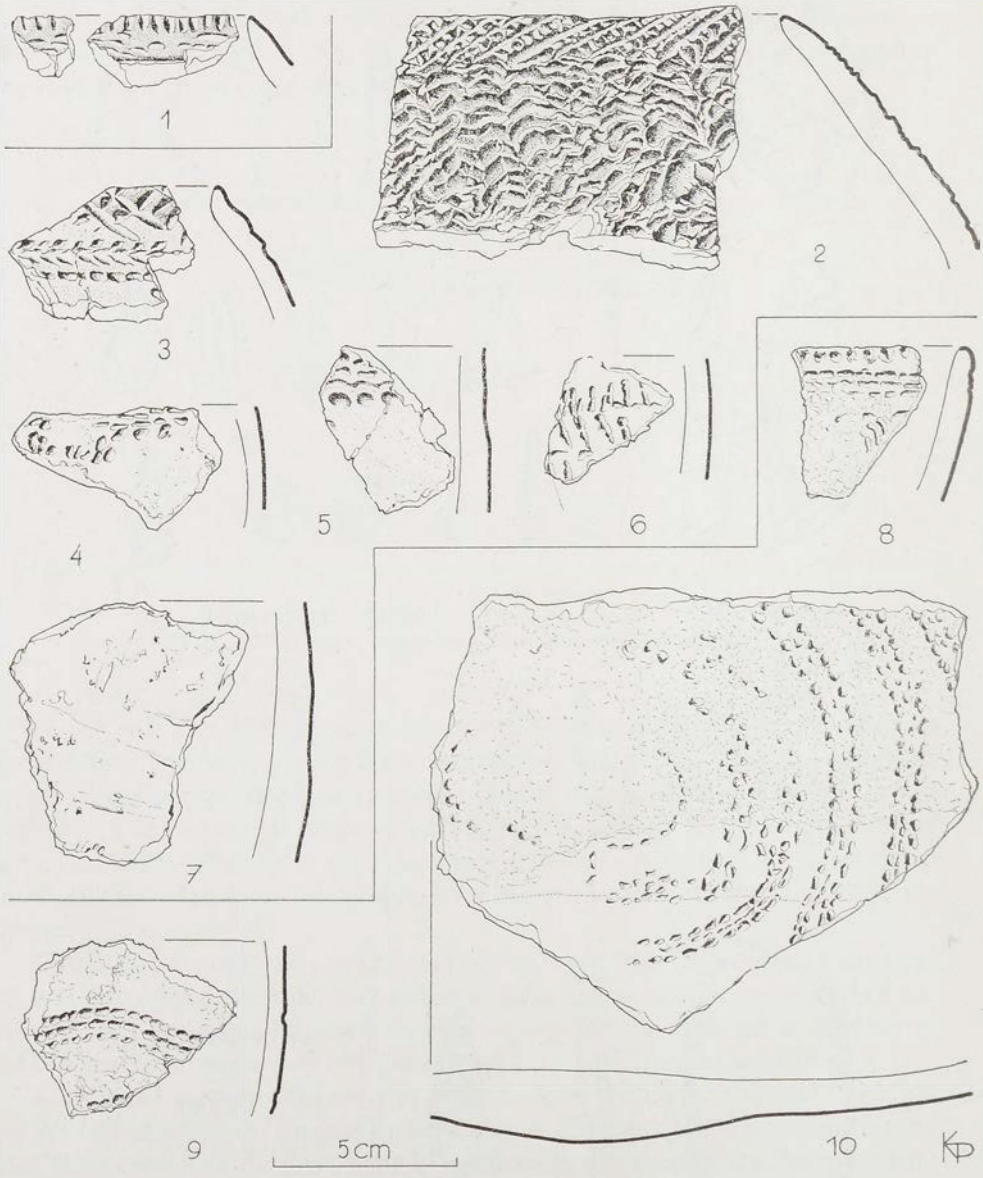

FIG. 5. El Ghorab, site E-79-4;

1: Sherd from Lower Cultural Layer; *2 - 7*: Sherds from Upper Cultural Layer, *8 - 10:* Sherds from the Late Neolithic settlement

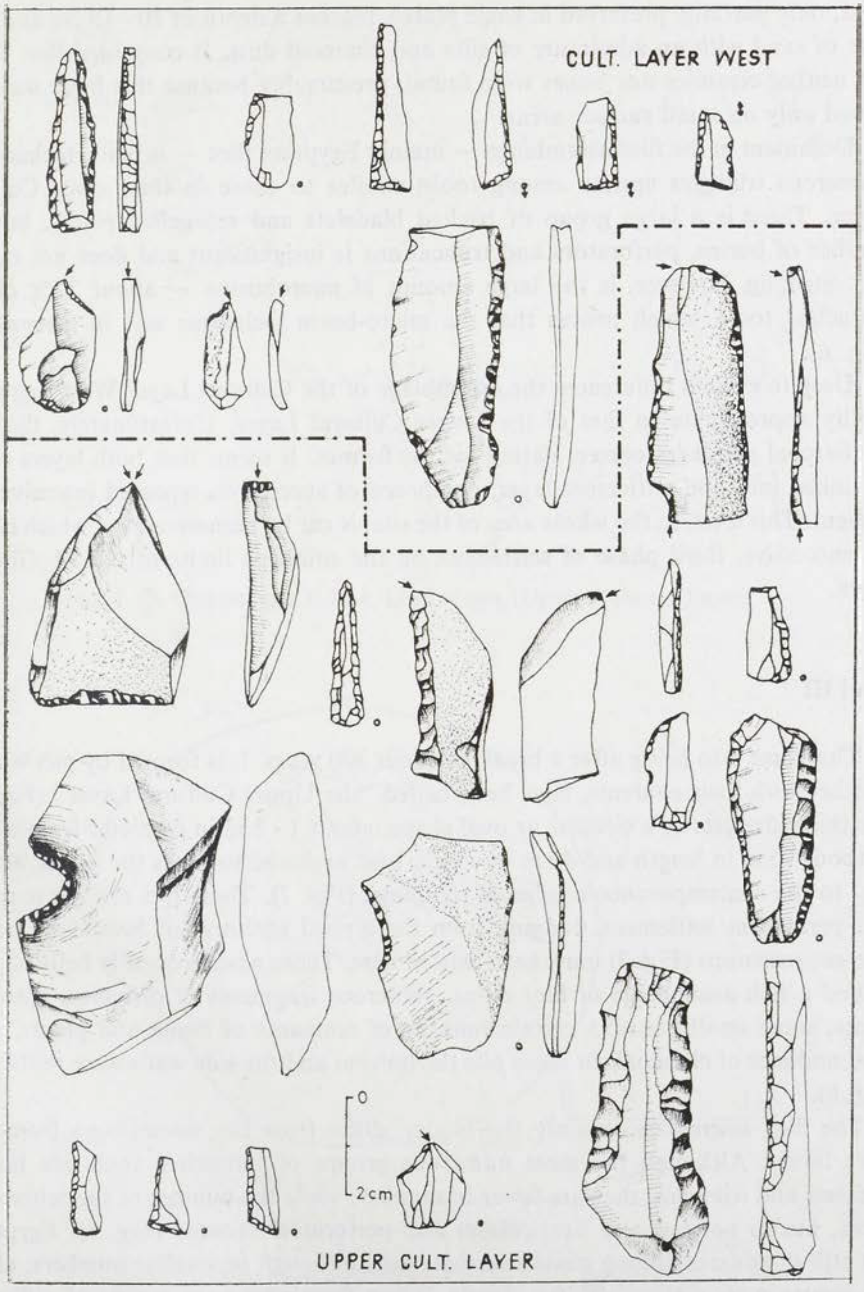

FIG. 6. El Ghorab, site E-79-4. Retouched tools from Cultural Layer West and Upper Cultural Layer

layer, only partially preserved in some places, reaches a depth of 10 - 15 cm and consists of sand with an admixture of silts and charcoal dust. It contained flint relics, but neither ceramics nor bones were found; presumably because this layer was preserved only on small surface areas.

Dominant in the flint assemblage – mainly Egyptian flint – is blade technology. Numerous triangles appear among tools, similar to those in the Lower Cultural Layer. There is a large group of backed bladelets and retouched pieces, but the number of burins, perforators and truncations is insignificant and does not exceed 4%. Striking, however, is the large amount of microburins – about 37% of the retouched tools, which proves that the micro-burin technique was in general use (Fig. 6).

Despite evident differences the assemblage of the Cultural Layer West is typologically approximate to that of the Lower Cultural Layer. Unfortunately, the lack of charcoal precludes correct dating for the former. It seems that both layers could be linked into one settlement layer, composed of successive, repeated intensive settlement. This level, in the whole area of the site, is cut by numerous pits, which define the successive, third phase of settlement on the southern limits of the El Ghorab playa.

Level III

This came into being after a break of about 300 years. It is formed by pits which, together with their contents, have been called "the Upper Cultural Layer" (Fig. 2). The thirty-five pits of a circular or oval shape, about 1 - 3 m in diameter form a line of about 70 m in length and 40 m in width, bent archwise towards the south, according to the contemporaneous edge of the playa (Fig. 7). These pits are the remains of a permanent settlement. Judging from the typical hollows left behind by poles, pole-constructions (Fig. 3) must have existed here. These pits, frequently bell-shaped, yielded a rich assemblage of flint relics, numerous fragments of ceramics, grinding stones, some small bones, a certain number of remnants of fauna and plants, and an abundance of charcoal. In some pits the bottom and the side walls were redbaked (Fig. 8).

The flint assemblage, mainly the blades, differ from the assemblages from the older layers. Although the most numerous groups of retouched tools are baked bladelets and triangles, they are fewer in number, while the number of the retouched pieces, burins notches and denticulates and perforators mounts (Fig. 6). Egyptian flint still dominates among stone raw materials, although in smaller numbers; chert and quartz play a more significant role. Apart from numerous stones of different sizes the pits contained also a number of spherical grinders or their fragments, made of sandstone, and some fragments of vessels (Fig. 5: *2 - 7*).

A detailed analysis of some sherds, made by K. M. Banks, has permitted partial

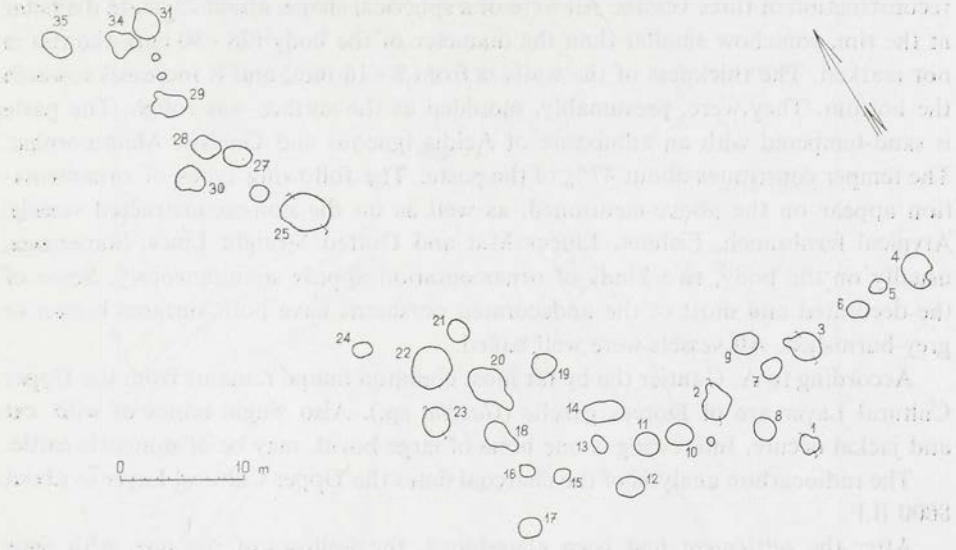

FIG. 7. El Ghorab, site E-79-4. Line of pits (Upper Cultural Layer)

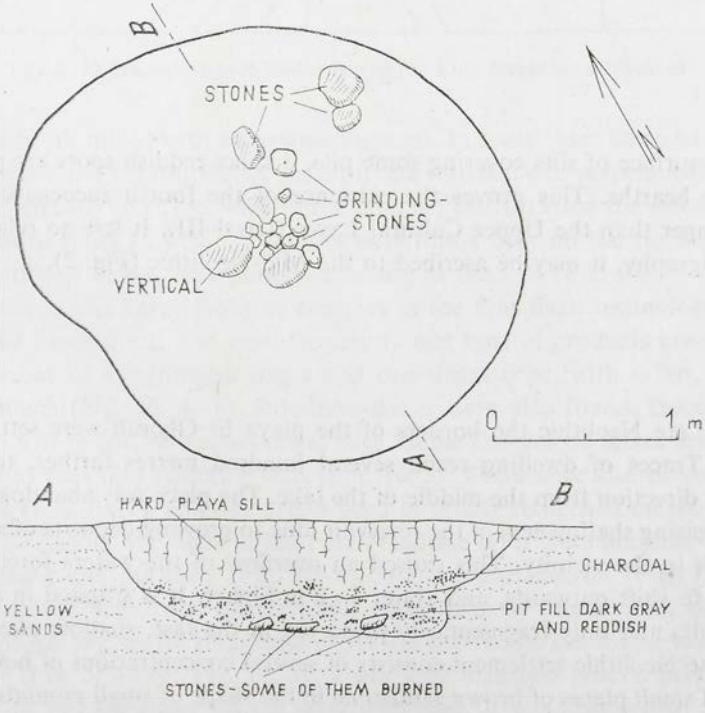

FIG. 8. El Ghorab, site E-79-4. Pit No. 25

reconstruction of three vessels. All were of a spherical shape, about 25 cm in diameter at the rim, somehow smaller than the diameter of the body (28 - 30 cm), the rim is not marked. The thickness of the walls is from 8 - 16 mm, and it increases towards the bottom. They were, presumably, moulded as the surface was rough. The paste is sand-tempered with an admixture of Acidis Igneous and Gneissic Metamorphic. The temper constitutes about 47% of the paste. The following types of ornamentation appear on the above-mentioned, as well as on the non-reconstructed vessels: Atypical fernbranch, Fishnet, Linear Mat and Dotted Straight Lines. Sometimes, usually on the body, two kinds of ornamentation appear simultaneously. Some of the decorated and most of the undecorated potsherds have both surfaces brown or grey-burnished. All vessels were well baked.

According to A. Gautier the by far most common faunal remains from the Upper Cultural Layer are of Dorcas gazelle (*Gazella* sp.). Also single bones of wild cat and jackal occure. Interesting is one bone of large bovid, may be of domestic cattle.

The radiocarbon analysis of the charcoal dates the Upper Cultural Layer to about 8000 B.P.

After the settlement had been abandoned, the hollows of the pits, with their cultural contents, were flooded by silts, due to the aggradation of the lake in a humid period. When the waters receded the hard silt contents fixed the shape and closed the pits.

Level IV

On the surface of silts covering some pits, distinct reddish spots are perceptible; these were hearths. This proves the existence of the fourth successive settlement layer, younger than the Upper Cultural Layer (Level III). It left no relics. Judging from stratigraphy, it may be ascribed to the Mid-Neolithic (Fig. 2).

Level V

In the Late Neolithic the borders of the playa El Ghorab were settled for the last time. Traces of dwelling reach several hundred metres farther, towards the south-west direction from the middle of the lake. The place was abandoned because of the increasing shallowness of the reservoir, due to growing deposits of silt brought by rainfalls in the vicinity. This caused an overflow of the waters forcing the last settlement to shift outwards, and about 1 - 2 m higher. It is situated in and on the youngest silts and only fragmentarily preserved in the last, shallow playa (Fig. 2).

The Late Neolithic settlement consists of several concentrations of hearths which are built of small plates of brown sandstone in the shape of small mounds composed of charred stones, reaching 50 cm in height and 1 - 3 m in diameter, and placed in a

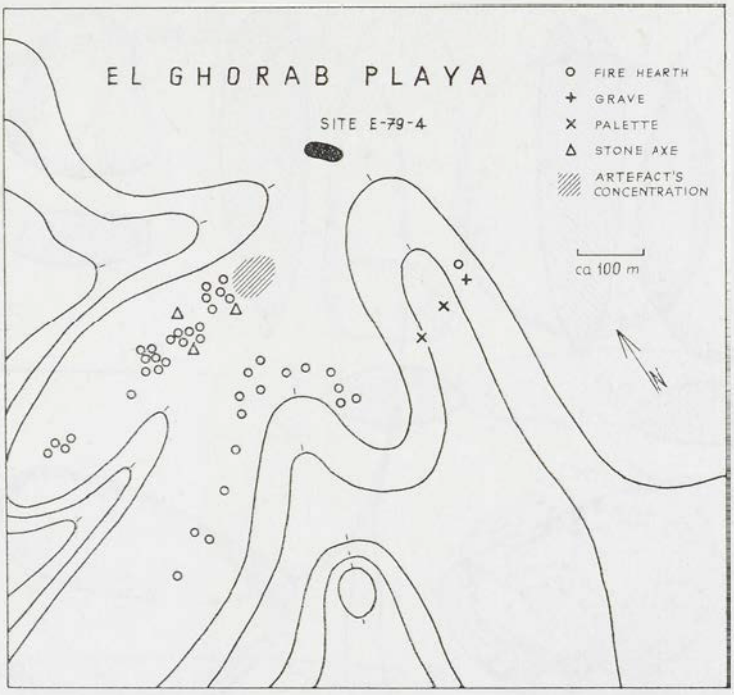

FIG. 9. El Ghorab, site E-79-4. Map of the Late Neolithic settlement

layer of sandy silt mixed with ashes and charcoal. In some cases there was a distinct stone setting around the hearths, in the form of a wall made of perpendicularly placed stones, semi-circular in shape, which protected the hearths from the northern winds. Flint and stone relics as well as ceramics were found only on the surface. Only the burial, mentioned below, was preserved *in situ* in the silts (Fig. 9).

Dominant in the Late Neolithic complex is the flint flake technology, the only raw material being chert. The most frequently met type of products are short, wide flakes with one or two longish edges and one distal edge, with a flat, sometimes bifacial retouch (Fig. 10: *4 - 6*). Side-blow-flakes were also found, frequently large in size, also with a flat, retouched distal edge. Some fan-shaped flakes are retouched in such a way that they resemble celts (Fig. 10: *5*). There were also massively retouched blades (Fig. 10: *7*), and one arrow-head bifacially retouched on the whole surface (Fig. 4). Among the finds in the Late Neolithic layer were hoe-shaped hatchets made of basalt and porphiry (Fig. 10: *1 - 3*) and stone palettes (Fig. 11: *1*). Near the hearths there were lower (*matate*) and upper (*manos*) querns made of sandstone (Fig. 11: *2*). Among sparse fragments of vessels were some decorated with a Dotted Wavy Line (Fig. 5: *8 - 10*; Fig. 11: *3*). There were also two broken ostrich eggs. A child's burial was unearthed in the layer described. It was deep-seated in the silts, in a crouched position, the head turned westwards, the face southwards, hands

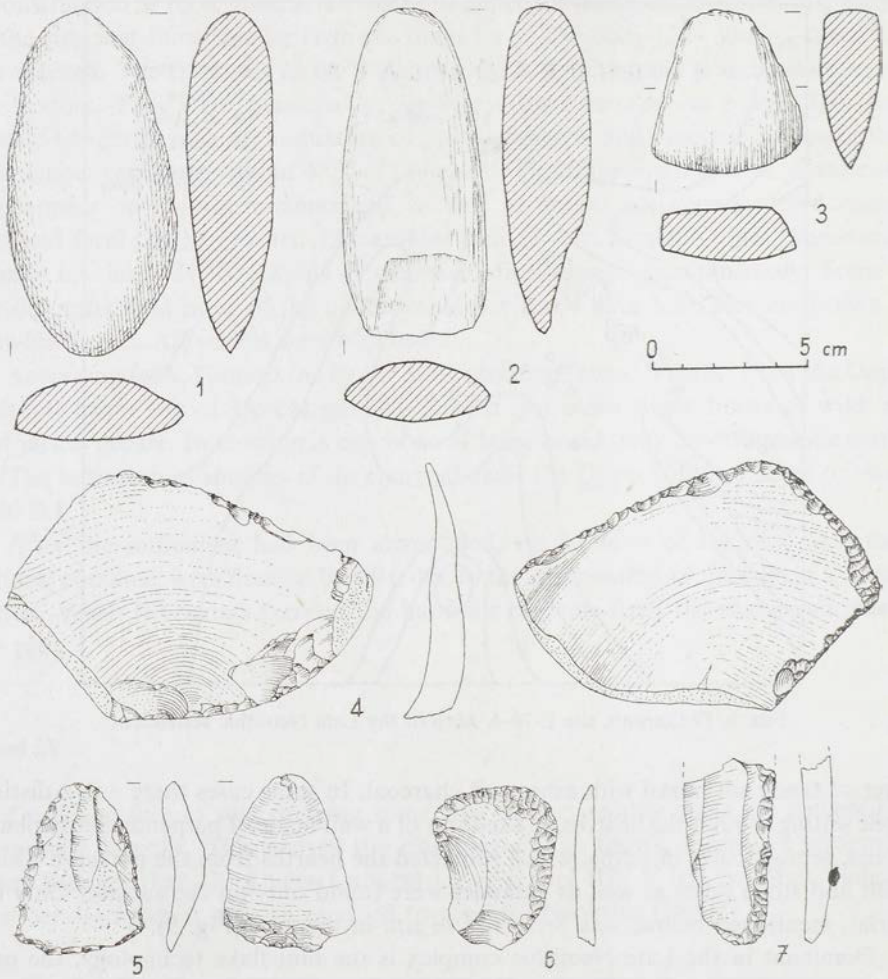

FIG. 10. El Ghorab, site E-79-4. Artifacts from the Late Neolithic settlement
1 - 3: Stone axes; *4 - 7*: Retouched tools

placed under the head (Fig. 12). The skeleton was badly preserved, hindering measurements. On the basis of the preserved teeth the child was – according to M. Henneberg – 4 - 5 years old. The degree of abrasion of the milk-teeth is 1 - 2 and is only insignificantly stronger than in living contemporary children. This would be proof of a diet of soft food, uncontaminated by sand.

The samples of charcoal collected from the hearths delivered the date of about 6300 B. P.

This was the last stage of settlement in the site under discussion. The encroaching desert hindered further human existence in this part of Sahara.

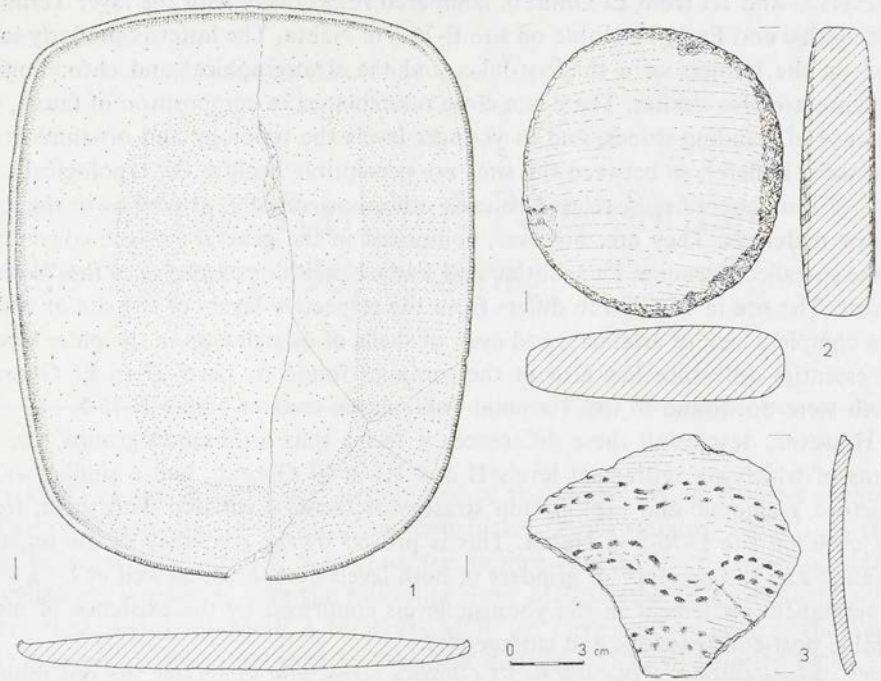

FIG. 11. El Ghorab, site E-79-4. Artifacts from the Late Neolithic settlement
1: Stone palette; *2*: Grinding stone; *3*: Sherd with Dotted-Wavy-Line design

The above characterized five settlement levels constitute one of the most comprehensive chronological sequences known from Early Holocene sites of the Western Desert.

Site E-79-4 from Playa El Ghorab shows numerous common features with site E-75-6 from Nabta Playa, situated about 50 km eastwards. This applies mainly

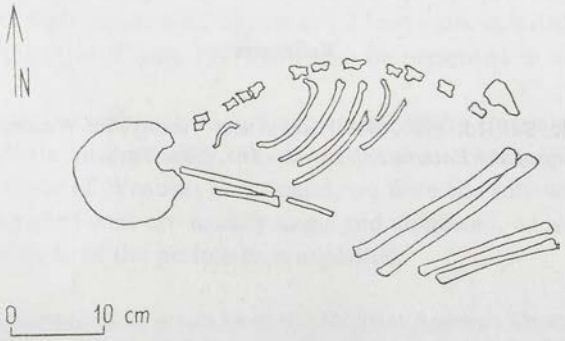

FIG. 12. El Ghorab, site E-79-4. Skeleton of a child

to levels II and III from El Ghorab, compared respectively with the layer Terminal Palaeolithic and Early Neolithic on site E-75-6 in Nabta. The latter is similarly localized on the borders of a shallow lake, and the stratigraphical and chronological sequence are also similar. There is a close resemblance in composition of fauna, the presence of grinding-stones, and in younger levels the typology and ornamentation of vessels. Differences between the sites are perceptible both in the typological contents of flint assemblages, related to each other horizontally, as well as in the kind of raw materials. They are, however, comprised in the general stylistic convention of the so-called Terminal Palaeolithic and Early Neolithic complexes of the Western Desert. The site in El Ghorab differs from the respective layers of the site in Nabta by a complete lack of artefacts, and even of shells of ostrich eggs in the older layers. An essential difference lies also in the ceramics found in Level II in El Ghorab, which were not found in the Terminal Palaeolithic level in Nabta E-76-5.

However, despite all these differences it seems that the human groups, the remains of which are settlement levels II and III in El Ghorab, had a similar social structure, economic and exploitation strategy as those, compared with them, from the levels on site E-76-5 in Nabta. This is proved by the similarity of the remains of fauna and the presence of grinders in both levels compared, as well as by a kind of permanent settlement in the younger levels confirmed by the existence of more durable post-constructions and storage pits.

The examination of the site in El Ghorab essentially facilitates the possibilities of interpretation of the discoveries in Nabta. It permits the conclusion that at the turn of the 7-th and 6-th millennia B.C., essential changes took place in the structure of – at least – several human groups living in the areas of what is the Western Desert today. These changes consisted in the formation of more durable, multi-family settlements. In various places of the area the use of ceramics was widely diffused, although this had been known here before. Analyses of the archaeozoological and archaeobotanical materials will reveal whether, and to what degree, these changes resulted from economic transformations.

References

Wendorf, F. and R. Schild. 1980. Gebel Nabta and Vicinity. In: Wendorf, F. and R. Schild (eds.). *Prehistory of the Eastern Sahara:* 81 - 165. New York.

MARGHERITA MUSSI,
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More on the Terminal Palaeolithic of the Fayum Depression

In 1966 - 68 the Institute of Palethnology of the University of Rome surveyed the Fayum Depression north-east of modern Birket Qarun (Puglisi, 1967)[1]. As far as the Terminal Palaeolithic is concerned, ten surface concentrations were localized and collected. We report here the following sites: MB2Sa (the "Two Sisters" site: Caneva *et al.*, 1978), S4, MOE 2, MOE 2b, MOE 2c. They are located near the Terminal Palaeolithic sites published by Wendorf and Schild (1976) (Fig. 1; Table 1).

We examined the stone tools following the typology proposed by Tixier (1963, 1974). Some new subdivisions were needed to account for peculiarities of the material. However, in order to make a cumulative graph and comparisons with other published sites, our categories were reduced to those of Tixier, but not without difficulty. For example, those composite tools not expressly given in Tixier's list had to be refiled, according to the directions of this author (1963 : 92) and, therefore, disappeared from our graph. A detailed classification was made of the numerous retouched pieces, which will be published later. As for the *débitage*, we made a careful classification on an extensive sample: blades, bladelets and flakes were classified according to the presence/absence, quantity and localization of cortex; cores according to platform position and to exploitation size, degree, *etc.* These more detailed results, which include studies on the style (Close, 1977) will also be presented in an extensive report.

Our collections, while on the whole similar to those of the Qarunian, are different in a number of stylistic and, possibly, functional characteristics (Fig. 2). Comparing our sites with those of Wendorf and Schild, we note the following:

1. Cores: striking platforms are usually single and unfaceted, as in the Qarunian. No more than two-thirds of the perimeter is exploited.

[1] The project was supported by grants from the National Research Council and from the Italian Ministry of Foreign Affairs. In this paper, the tool typology is by Margherita Mussi, except for backed tools, studied by Isabella Caneva. Comparisons by Annalisa Zarattini.

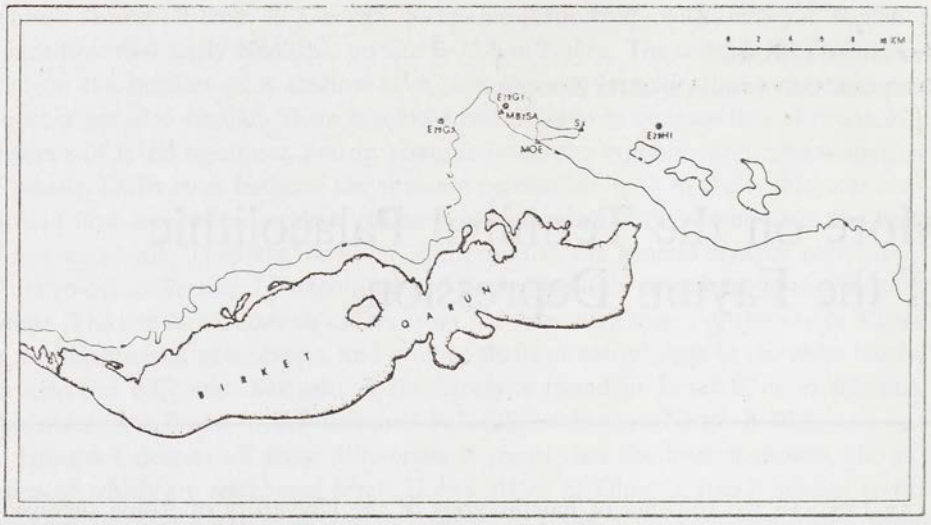

FIG. 1. Fayum Depression. Location of Terminal Palaeolithic sites

2. End-scrapers: their percentage is higher (5 - 10%) and their typology is more diversified: *e.g.*, No 4 (on a core) includes different types. In type No. 10, on a large backed blade, the endscraper, whether simple or double, is generally poorly made and possibly should be considered rather a truncation.

3. Perforators: again, their percentage is much higher (7 - 18%). They are exclusively of the simple type, which includes borers, groovers and core tools.

4. Burins: as in the Qarunian they are rare or completely lacking; moreover, they are not very typical.

5. Backed blades: they are rare but always present.

6. Composite tools: as in the Qarunian, they are lacking, at least if we follow only Tixier's definitions.

Table 1

Fayum Depression. Elevation of Terminal Palaeolithic sites (E29G1, E29H1, E29G3 after Wendorf and Schild, 1976)

Sinking Premoeris Lake:			
Site E29G1, Area 1 and B	elevation	17 - 15 m.	6,150 B.C.
Site E29H1, Area A and B	elevation	15 m.	6,120 B.C.
Site E29G3, Area A	elevation	12 m.	5,550 B.C.
Site MB2SA	elevation	12 m.	
Site MOE 2			
Site MOE 2b	elevation	−2 m.	
Site MOE 2c			
Rising Protomoeris Lake:			
Site E29H1, Area C	elevation	17 m.	c. 5,200 B.C.
Site E29G1, Area E	elevation	19 m.	5,190 B.C.
Site S4	elevation	c. 22 m.	c. 4,900 B.C.?

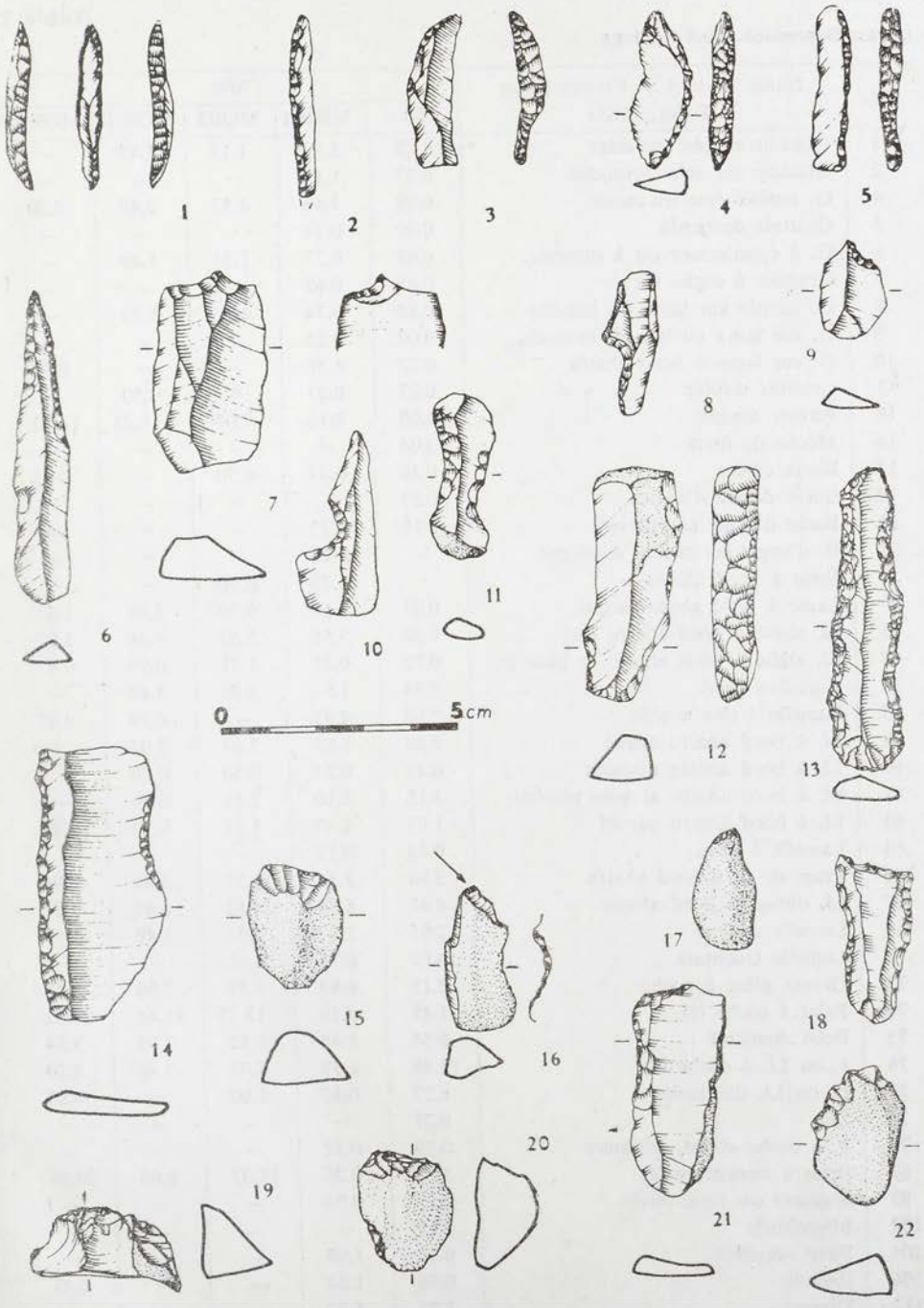

FIG. 2. Fayum Depression. Tools from site S4

Table 2

Fayum Depression. Tool typology

Nr.	Name of tool in French (after Tixier, 1963)	Site				
		S4	MB2Sa	MOE2	MOE 2b	MOE 2c
1	Grattoir simple sur éclat	1.25	2.59	1.15	1.49	–
2	Grattoir sur éclat retouché	0.27	1.11	–	–	–
4	G. nucleiforme ou rabot	0.98	3.46	4.52	2.49	4.20
5	Grattoir denticulé	0.09	0.74	–	–	–
6	G. à épaulement ou à museau	0.68	0.25	1.51	1.49	–
7	Grattoir à coche (s)	0.45	0.62	–	–	–
8	G. simple sur lame ou lamelle	0.80	0.74	0.50	1.49	–
9	G. sur lame ou lamelle retouch.	0.09	0.25	–	–	–
10	G. sur lame à bord abattu	0.27	1.36	–	–	0.93
11	Grattoir double	0.27	0.37	–	0.50	–
12	Perçoir simple	6.00	8.16	7.03	18.41	14.02
16	Mèche de foret	3.04	–	–	–	–
17	Burin dièdre	0.36	0.37	0.50	–	0.93
18	Burin dièdre d'angle	0.27	–	–	–	–
19	Burin d'angle sur cassure	0.18	0.25	–	–	1.40
21	B. d'angle sur tronc. rectiligne	–	0.25	–	–	–
34	Éclat à bord abattu	–	1.73	0.50	–	–
37	Lame à bord abattu arqué	0.09	3.58	0.50	2.98	1.87
45	Ll. aigüe à bord abattu rect.	6.62	5.56	5.53	4.48	3.27
47	Ll. aigüe à bord abattu et base tr.	0.72	0.37	1.51	0.99	0.47
53	Aiguillon droit	3.58	1.85	3.01	3.48	–
55	Lamelle à tête arquée	2.00	4.45	–	0.99	0.47
56	Ll. à bord abattu arqué	8.68	8.65	3.01	3.97	–
60	Ll. à bord abattu gibbeux	0.45	0.25	0.50	0.50	–
61	Ll. à bord abattu et base rétrécie	3.13	2.10	2.51	0.50	–
63	Ll. à bord abattu partiel	1.07	2.47	1.51	0.50	1.87
64	Lamelle à cran	0.63	0.12	–	–	–
66	Frag. de ll. à bord abattu	3.94	3.34	13.57	5.47	7.94
67	Ll. obtuse à bord abattu	4.47	6.80	4.52	8.46	3.27
68	Lamelle scalène	2.95	2.97	2.01	1.49	1.40
70	Lamelle Ouchtata	10.09	0.74	2.01	–	–
73	Grosse pièce à coche	2.15	6.92	6.53	7.96	8.41
74	Eclat à coche (s)	1.88	8.16	13.57	11.44	14.02
75	Eclat denticulé	0.54	1.48	3.52	2.49	9.34
76	L. ou Ll. à coche (s)	14.86	1.73	4.02	7.46	4.20
77	L. ou Ll. denticulée	6.27	0.37	1.00	–	0.93
78	Scie	0.27	–	–	–	–
79	P. à coche et ret. continue	0.89	0.12	–	–	–
80	Pièce à troncature (s)	5.55	10.26	15.07	8.95	20.56
82	Segment ou demi-cercle	0.27	0.86	–	–	–
102	Microburin	2.15	–	–	–	–
104	Pièce esquillée	0.18	1.98	–	–	–
106	Racloir	0.36	1.24	–	–	0.47
112	Divers	1.25	1.36	–	–	–

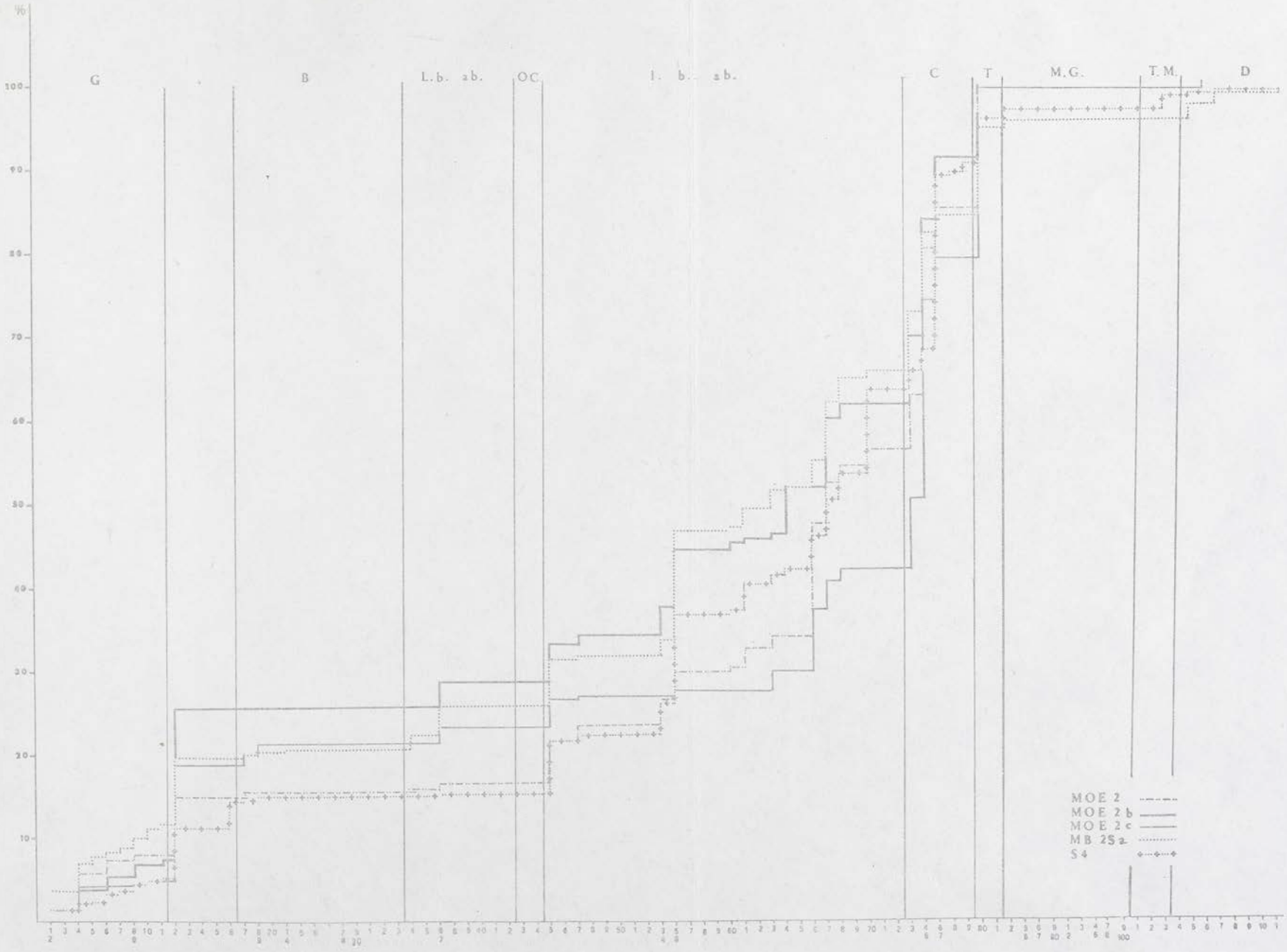

FIG. 3. Fayum Depression. Cumulative frequency curve.

Table 3

Fayum Depression. Main typological indices (percentage)

Name of tool in French	Site				
	S4	MB2Sa	MOE 2b	MOE 2	MOE 2c
Grattoirs	5.2	12.0	7.5	8.2	5.7
Troncatures	5.6	10.7	8.9	15.4	20.5
Denticulés	27.3	19.7	29.8	29.2	36.3
Burins	0.8	0.9	–	0.5	2.3
Bords abattus	49.4	47.1	33.8	37.4	20.0
Perçoirs	9.2	8.6	18.4	7.2	13.9
Microburins	2.2	–	–	–	–
Géometriques	0.3	0.9	–	–	–
Total number	1.117	809	201	199	214

7. Backed bladelets: the tool kit is dominated by them (18 - 48%) but in the Qarunian they are more frequent. Types No. 45 (pointed straight backed bladelets) and 55 (bladelets with curved backed end) as well as No. 56 (curved backed bladelets) predominate, as in the Qarunian. However in our collections there are many pointed straight backed bladelets with truncated base (No. 47) which in the Qarunian are poorly represented.

8. Notches and denticulates: they account for a much higher percentage of the tool kit (20 - 36%) and it would be useful to keep these two groups of tools separate on the graph. At S4 either deep or marginal notches occur, often on blades, as well as fine strangulated or denticulated blades. At MB2Sa denticulates and notches are always on flakes or cores, except for one piece.

9. Truncations: they occur much more frequently in our collections (7 - 20%). Many of them are on flakes or blades retaining cortex.

10. Geometrics: they are only a few, as in the Qarunian. The microburin technique is unknown, except at S4, where it could be accidental resulting from the fracture of deep notches on blades.

The different techniques used for the collection of the material (surface collection vs. excavation) do not seem to have had a relevant effect, since microliths have similar values. The possibility of mixtures with artifacts from subsequent periods cannot be rejected, but one of us (A.Z.) studied the Neolithic collections of Fayum without discovering any resemblance. The graphic trend is very similar in all five cases (Fig. 3 - 4) and makes any substantial mixing unlikely.

Between our backed bladelets and the Qarunian ones, stylistic differences exist. These and the different elevation of the sites may point to different chronological positions. The greater number in our collections of end-scrapers, perforators, notches and denticulates and lower percentage of backed bladelets, as well as the considerable presence of retouched pieces (at MB2Sa – more than 700) suggest a different range of activities (Table 2 - 3).

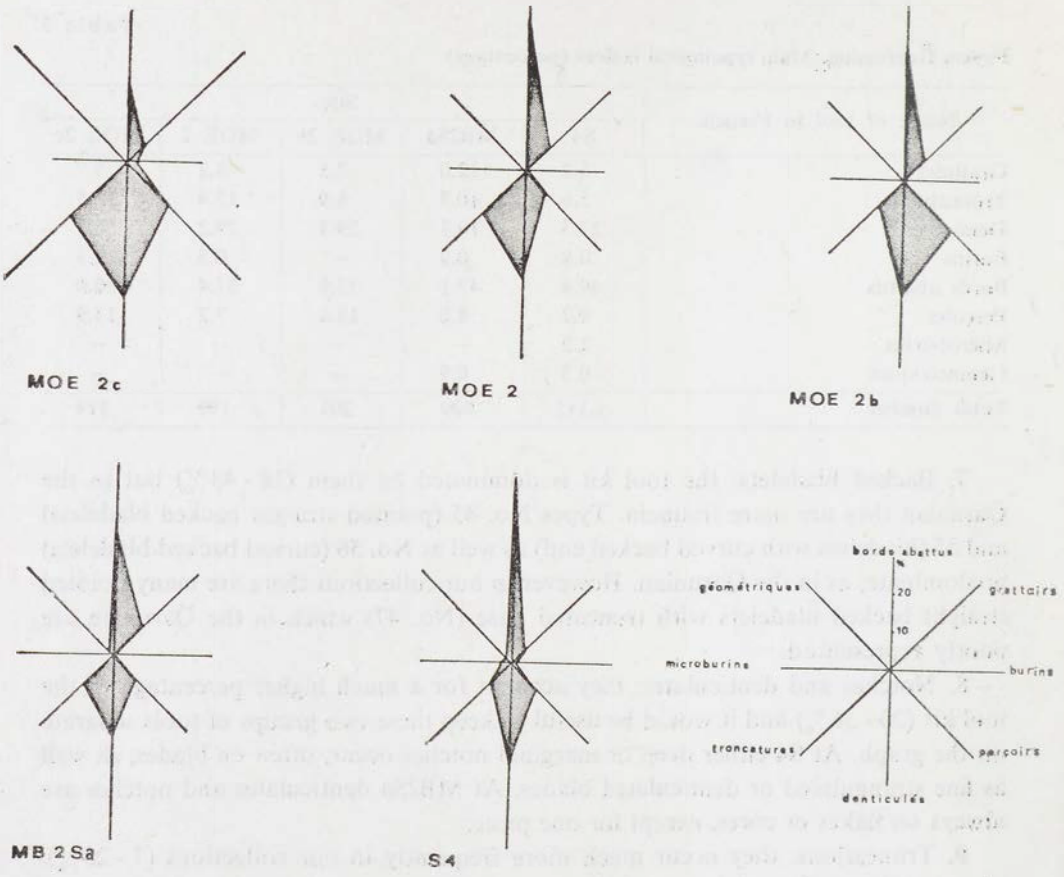

FIG. 4. Fayum Depression. Diagrams of main typological indices

The Terminal Palaeolithic of the Nile Valley does not seem to be as homogeneous as Wendorf and Schild suggest (1970; 1976). From a technological point of view there are some affinities between Elkab (Vermeersch, 1978) and the Qarunian sites (E29H1A, E29H1C: Wendorf and Schild, 1976): for example, bladelets were obtained essentially from cores with unfaceted striking platforms. However, from a typological point of view the Qarunian is characterized by backed bladelets which are very rare at Elkab. Moreover, the microburin technique which is highly noticeable at Elkab, is lacking in Qarunian sites.

Although the relations between the Arkinian and the Shamarkian, and between the Elkabian and the Qarunian are still poorly understood, there are certainly connections between the industries of the Nile Valley and the Western Desert (Nabta Playa and Siwa Oasis: Hassan, 1980) as well as those of the Sahara. For instance, similarities exist between Elkab and site E-72-5 in the Western Desert (Hassan, 1980). While there appear to have been no direct contacts between the Nile Valley

and the Western Desert industries on the one hand, and Iberomaurusian and Capsian on the other hand, they all are part of the same technocomplex. Local characteristics, differences and similarities can be explained not only by differences in chronology but also by various ecological adaptations and economic exploitation patterns with changing emphasis on hunting, fishing or collecting.

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ROBERT J. WENKE

Early agriculture in the Southern Fayum Depression: some test survey results and research implications

My objectives in this paper are to discuss a research project I have just begun in the southern Fayum Depression (Fig. 1) and to relate this project to recent research on agricultural origins elsewhere in northeastern Africa [1]. Because we have made only 6 one-day trips to the Southern Fayum, mainly to formulate research plans for more extended fieldwork next year, my emphasis here will have to be more on our research plans than on our results. Yet I think even our brief test surveys yielded information of general interest concerning early agriculture in this region.

These surveys consisted of walking and driving in the area between the Hawara Channel and the extreme western edge of the Fayum lake, from the edge of current cultivation south to the area of the Wadi Rayan (Fig. 1). My interest in this area results from the fact that, despite the northern Fayum's well-known importance in early agriculture and domestication (Caton-Thompson and Gardner, 1934; Wendorf and Schild, 1976), almost no attention has been given to the southern half of the Depression. Caton-Thompson and Gardner made a one day trip by automobile around the western edge of the lake and to the Wadi Rayan (1934: Plate CIX), and there have been excavations at several large sites in the south Fayum (Medinet Maadi, Bresciani, 1967; 1976; Qasr Qarun, Schwartz, 1969) and visits to larger known sites (Arnold, 1966), but no systematic surveys have been undertaken to locate Predynastic and Neolithic sites in these areas.

Indeed, despite the heavy concentrations of early agricultural sites on the northern lake shore, there are no reports, except of two small sites discovered by Caton-Thompson and Gardner (1934: Plate CIX) on the southwest shore, of substantial early occupation of what was the southern shore of the early Holocene Fayum lake.

Thus in our test surveys we wanted to determine if early sites were sufficiently

[1] I wish to thank Nadia Ashur of the Egyptian Antiquities Service for assistance in these test surveys. Co-principal investigator for the Fayum project is Mary Ellen Lane, of the Sorbonne.

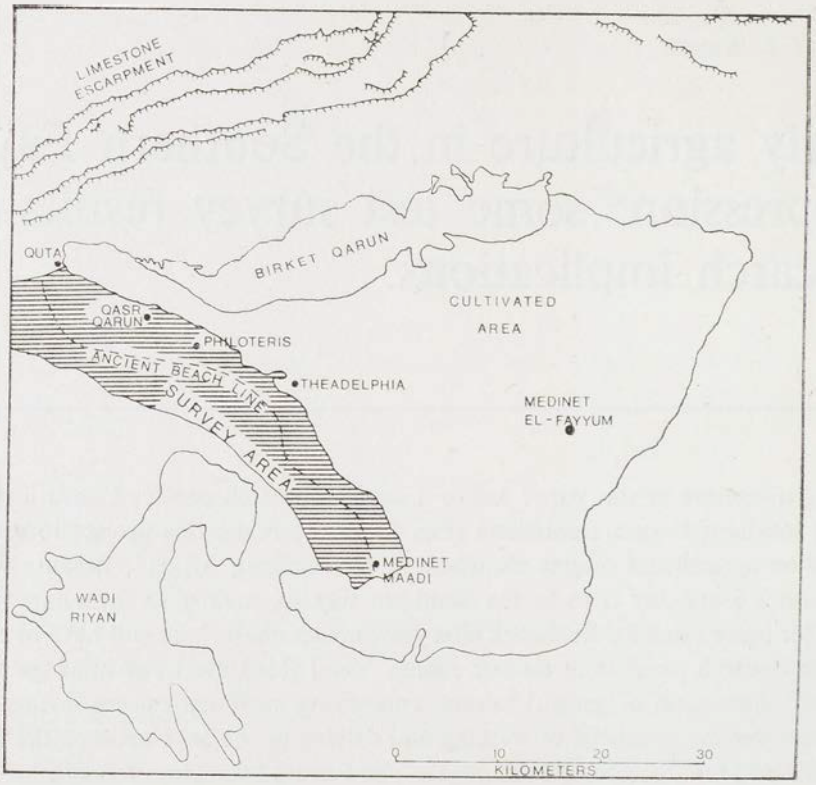

FIG. 1. Map of the Fayum Depression showing the limits of the area under survey

numerous in this area to warrant intensive surveys, and also whether Neolithic and Predynastic sites in this area – if they existed – possessed characteristics that would make their excavation a useful extension of what we know about early Fayum agriculture from excavations on the Fayum's northern shore.

More specifically, we were looking for sites that would allow us to determine if it is true, as Michael Hoffman recently suggested, that when "more prehistoric settlements in the Fayum have been excavated with ... care, and when today's sophisticated analytical techniques are applied to problems like the nature of the transition from food gathering to food producing – from Fayum B to Fayum A – we will have answered one of the most important questions in Egyptian prehistory. For now it seems clear that the Fayum ... could possibly hold the key to the nature of this transition" (1979: 190).

Another specific point of interest was whether or not the Fayum Depression and adjacent areas possess archaeological remains of any relevance to the reported (*e.g.* Wendorf *et al.*, 1979) Pleistocene "protoagricultural" economies that may have developed at Wadi Kubbaniya, Kom Ombo, and elsewhere in Upper Egypt.

The results of our test surveys – and let me once again emphasize the extremely limited duration of this work – are sufficiently positive that we have asked for a research concession for this area and are currently making plans for a field season of 3 months in summer, 1981.

Concerning the density of sites along the Pleistocene surfaces and early Holocene shore lines in the southern Depression, we did indeed find many unreported sites, but most are of Ptolemaic age and are between the currently cultivated areas and the Moeris shore line (Fig. 1). We found no earlier sites in this zone, nor did we expect any, as this area was under water until about 285 B.C. In our planned surveys we shall collect artifact samples from these sites and make preliminary maps of some of them, as they are currently being destroyed by the expansion of agriculture into the desert.

Concerning the presence of Neolithic and Predynastic settlements, we walked long segments of the three ancient shore lines and found many isolated stone tools and occasional sherds that are probably of these early periods, but in our opinion, many of the Predynastic and Neolithic occupations here are buried under sediments of the great floods of the Old Kingdom period, as they are on the northern lake shore (Wendorf and Schild, 1976), or under the several large Ptolemaic settlements and cemeteries in this area. It is interesting to note in this context that the one Predynastic settlement Caton-Thompson and Gardner found on the southern lake shore (1934: Plate CIX; Map 1) was discovered only because a few artifacts had eroded from the huge gravel banks marking these ancient shore lines. To reach this site they had to remove these lake sediments, and we hope to do similar trenching during the 1981 season.

The most positive aspect of our test surveys, and the focus of our research plans, is a site we have labelled FS ("Fayum Survey") 1. This large and apparently unrecorded Neolithic site is located on the southwestern side of the main gravel banks marking the Moeris shore line (Fig. 1), and is in the vicinity of what Caton-Thompson and Gardner called Neolithic "Site J" (1934: Plate CIX). But it is clearly a different site. They reported eroding limestone buttes and a complete absence of pottery at Site J, whereas FS 1 is not near such buttes and has abundant pottery. FS 1 covers at least two square kilometers, extending about one kilometer southwest from the ancient shore lines. Artifact density is highly variable, the densest areas containing on the surface scores of lithics, sherds, animal bones, and other debris, the lighter areas containing only one or two flints. Deflation in one area has disclosed what appear to be about 30 "hut floors", 1.5×1.5 m ovoid-shaped concentrations of pebbles surrounded by dense concentrations of lithics sherds, bones, and other cultural debris. The pottery closely resembles the plain redwares of the Fayum A complex.

Comparisons of surface artifacts at FS 1 with Caton-Thompson and Gardner's illustrations suggest that the two square kilometers of FS 1 contain scores of both Fayum A and Fayum B occupations. The microlithic aceramic deposits characteristic of Fayum B seem to be concentrated close to the ancient beach lines on the

eastern edge of the site, but they may be interspersed throughout the many Fayum A occupations and buried beneath these later deposits. There was no way to determine the depth of deposits at FS 1, but the black lake sediments under the sand on which the artifacts are scattered and the disconformities of the site's surface suggest there may be relatively deep deposits.

There have been numerous excavations of Fayum Neolithic sites, but in our estimation there are several reasons why FS 1 is an exceptionally significant site and offers an excellent opportunity to study the transition from food-gathering to food--producing in this part of Egypt. It is much larger than other reported sites of this age in the Fayum, and it apparently includes considerable intact and accessible architecture. Hassan has noted that for most early Egyptian agricultural sites "there is very little and sometimes no information whatever on the internal variability in the density and composition of artifacts. In many cases, also, basic information on the area or shape of the site and the average artifact density is lacking. The location of sites with respect to geomorphic features... is rarely noted. The case for the Predynastic of Egypt is worse..." (1980: 447).

FS 1 offers an opportunity to gather exactly these kinds of data. Also, the evidence suggests that the appearance of sedentary communities based on agricultural economies in the Nile Valley and the Fayum was the result mainly of the introduction of domesticated animal and plant species from areas in the Libyan desert and southwest Asia (Butzer, 1976: 11). Yet we know very little about how this introduction took place and how much indigenous domestication occurred (Clark, 1971). It is still possible that we shall find that the "mysterious gap" of 1,500 years between the Fayum B and Fayum A cultures involved considerable indigenous domestication and development of agricultural strategies. It is possible, for example, that the Fayum's transition to agriculture resembled agricultural origins in Mesoamerica and Peru, where it has been suggested (Flannery, 1973; Flannery and Coe, 1968; Wenke, 1980: 320 - 322) maize, beans, and other plants were domesticated by hunters and collectors in highland areas but were first brought into agricultural economies in coastal areas where large sedentary communities had existed for many millennia by exploiting the rich littoral areas. Such coastal communities may thus have been "preadapted" to the agricultural way of life.

FS 1 also may be relevant to the problem of the chronological sequence in which domestication, agriculture, and sedentary communities appeared in northeastern Africa. This sequence has been shown to be quite variable in other early agricultural centers (reviewed in Flannery, 1973), and this variation seems to reflect much about the causal factors involved in different sequences in which these phenomena appeared. Wendorf and his associates have suggested, for example, that grain "was used in the Nile Valley for more than 6,000 years... without any evidence for changes in settlement size, population density, or social organization" (1979: 1347) and that there might even have been "deliberate planting" of barley without any evidence of permanent habitations" (*ibid*).

We hope to address the question of the association of sedentary communities and agriculture/domestication by a systematic program of intensive surface collection and excavation of FS 1. We particularly hope to determine if sedentary communities, at least as inferred from architecture and seasonally specific plant and animal remains, existed at FS 1 before the introduction of domestic cattle, sheep, goats, wheat, and barley.

Another aspect of our investigations of these kinds of questions will be surveys to determine the presence or absence of Pleistocene sites like those of the supposedly protoagricultural communities of Upper Egypt. Our evidence concerning the earliest stages of agriculture is meagre for most areas of the world, especially Egypt, but if it is true that there was intensive grain use and even cultivation in Upper Egypt for many thousands of years in the Pleistocene without consequent radical cultural changes and the development of agriculture, this would seem to be a great contrast to the developmental pattern in Mexico, southwest Asia, and elsewhere. Hassan (1980: 446 - 447) suggests that plant domestication and agriculture may not have arisen directly out of these Pleistocene protoagricultural economies because of climatic changes and catastrophic Nile floods in the late Pleistocene, but even so, the 6,000 years of grain use to which Wendorf and his associates refer is much longer than the span between the beginnings of intensive grain use in the Fertile Crescent and the appearance there of agricultural villages. Why did Egypt apparently differ in this regard?

Suggestions include the effects of seasonal flooding in preventing dense occupations of the flood plains for parts of the year, so that groups had to break up into small subsistence units (Hassan, 1980: 438) and the "resistance" to the adoption of agriculture provided by the rich resources of the Nile Valley (Butzer, 1976: 11; Hassan, 1980: 446 - 447).

But much more research is needed to test these ideas, and we hope that the Fayum can provide critical information on these issues. We have made some test surveys of Pleistocene surfaces in the southern Fayum in an effort to locate Pleistocene sites of an age comparable to the possible agricultural sites in Upper Egypt, and we found isolated scatters of tools similar to those from Wadi Kubbaniya. But these lithic styles may persist very late into the Pleistocene in the Fayum (Wendorf and Schild, 1976), and only much more intensive surveying and test trenching will reveal whether or not there were intensive grain-using societies in the Fayum as early as 12,000 to 18,000 years ago. Wendorf and his associates point out that relatively cool evening temperatures, water availability, and sandy – not clayey – soils are primary limiting variables in the distribution of wild barley, and the wadis and sandy Pleistocene surfaces of the southern Fayum Depression would seem to offer environments at least as favorable as those of Upper Egypt for the growth of wild and domestic cereals. If systematic surveys and excavations do not reveal Pleistocene grain-collecting cultural remains, we must ask why this is so. There would seem to be no obvious answer.

If the archaeological remains of Pleistocene grain-collecting societies are found in the southern Fayum Depression, we have the problem of explaining why these communities also failed – assuming they did – to develop into sedentary agricultural communities. The floods mentioned as a limiting factor in the Nile Valley may not have been nearly as serious a threat in the Fayum, especially in the southern areas, where the beach areas would have had a very gentle slope. Of course, there is the consideration that it took thousands of years to adapt wild wheat and barley, which are native to cool, upland environments, to the hot lowlands of southwest Asia, and from there, possibly to the Nile Valley. But we might also ask why, if wild barley existed in Egypt in the late Pleistocene, it was not quickly adapted to Nile environments.

These and many other questions about early Egyptian agriculture will require extended testing with archaeological data, and we hope that our research in the Fayum will be especially productive in this regard.

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Maria Casini

Neolithic and Predynastic in the Fayum

In 1966 - 1968 Professor Salvatore M. Puglisi, director of the Institute of Palaethnology, University of Rome, carried out a survey in the Fayum Depression. The surveyed area is located to the north-east of the present-day lake, the Birket Qarun, and was previously studied by Caton-Thompson and Gardner (1934). In the course of their field-work the remains of what was thought to be a chain of Neolithic villages situated along the ancient shores of the lake were found: subsequently, several Neolithic and Predynastic implements in some mixed concentrations near Qasr el Sagha, on the north-western shore of the Birket Qarun lake were discovered. This locality yielded also the Early Dynastic (Protodynastic) sites. Caton-Thompson recorded several of these concentrations and, on the basis of their vertical and horizontal stratigraphy, constructed a picture of the cultural sequence in this area.

The geomorphology of the Depression had also been studied by Sandford and Arkell (1929) and Butzer and Hansen (1968). All these studies turned out to be indispensable for the altimetrical and topographical localisation of the sites in the north-eastern part of the Depression alternated by large, flat plains. In summary, in the course of earlier field-work, a large amount of archaeological material was collected from surface concentrations in several areas. As regards its typology, the material could be classified to Lower and Middle Palaeolithic, Epipalaeolithic, Neolithic A, Early Dynastic and Old Kingdom times.

During the Italian survey in 1966 - 1968, the Fayum A, Predynastic and Early Dynastic surface materials were collected in several localities. Some of these were small, other seem to have been large. The occupation debris of these sites was composed of animal bones, lithic artifacts and pottery sherds (Fig. 1) which were found lying scattered on the sandy surface of the sites. These sites seem to have formed a series of villages, "ateliers" and camping places situated along the shoreline of the present-day lake.

The sites which are the subject of this paper are situated on the northern edge of the Fayum Depression and on the northeastern side of the shores of the present-day

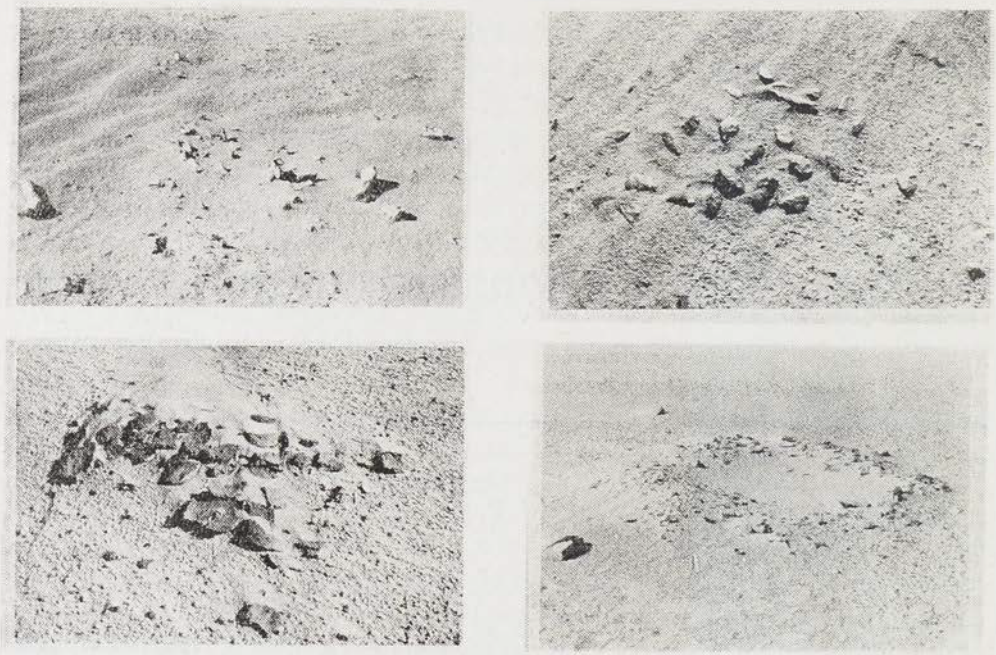

FIG. 1. Concentrations of surface materials

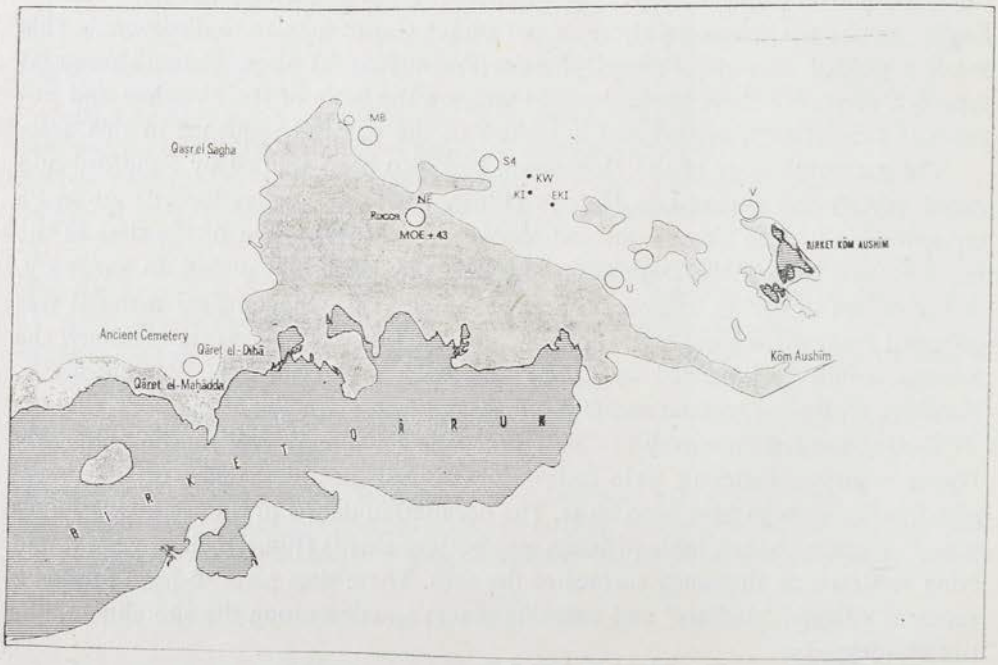

FIG. 2. Map of the sites located in the northern part of the Fayum Depression and in the north--eastern section of the shore-line of the present-day lake

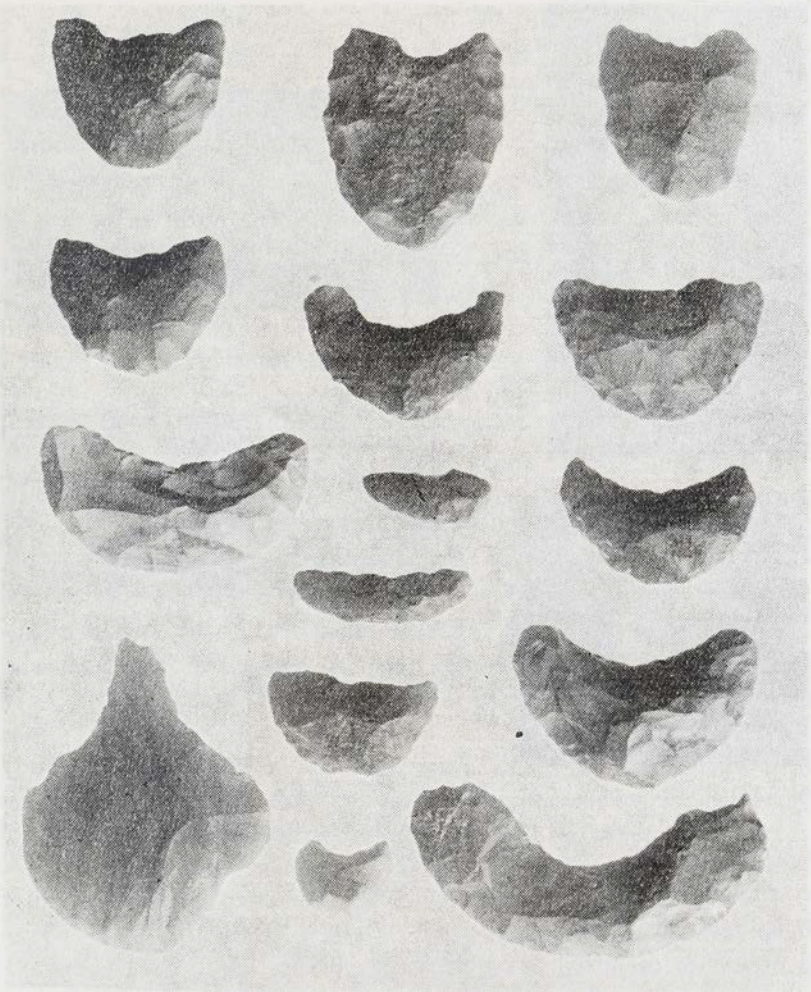

FIG. 3. Drills of Early Dynastic age found near Qasr es-Sagha

lake. They are numbered by the following abbreviations: K-I, EK-I, EEK-I, SS-4 and SES-4 (Fig. 2). Near Qasr el Sagha several drills of Early Dynastic chronology have also been found (Fig. 3).

The Neolithic A sites yielded such typical implements as arrow-heads with concave base and sickle blades. The Predynastic sites yielded saws, bifacial knives and fish-tailed points worked all-over with the shallow retouche commonly known as ripple-flaking, typical technique and implement of the Naqada period (Fig. 4).

As all archaeological materials found in the course of the Italian field-work were surface collected, we do not have evidence on vertical stratigraphy of the respective sites. It seems, therefore, that only a comparison of their contents with the

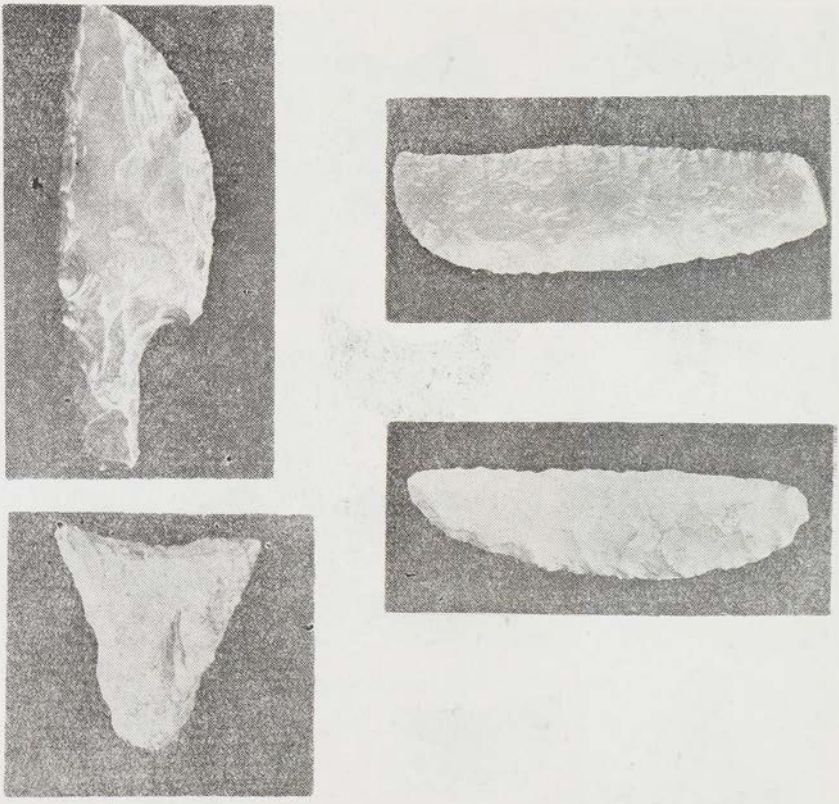

FIG. 4. Bifacial flint implements, typical for the Naqada times. Surface finds from the northern edge of Birket Qârun

artifacts from the Egyptian Nile Valley could shed light on their chronology and cultural context.

The occurence of mixed assemblages of objects belonging to different facies within the same eroded sites in the Fayum may be explained as a result of an overlapping of original stratigraphy and the subsequent action of the wind which blew off the sand interposed between the different layers.

The studies on the archaeological assemblages found in the course of the Italian survey indicate the presence of a substrate of hunters-fishers-gatherers which preceeded the groups of farmers in the Fayum. This, and the changing environmental conditions, which certainly affected the development of the Fayum human groups, lead to the following conclusion: the Fayum A culture can no longer be considered the result of the immigration of alien peoples (Arkell and Ucko, 1965) but as an effect of a process of local evolution and gradual cultural specialization in the course of which the indigenious food-gathering social groups were adapting to the new environmental conditions (Puglisi, 1967).

It is worth adding that several Neolithic A sites are situated about 60 m above the sea-level in the Depression, *i.e.* near the Neolithic shore-line. These sites seem to be the remains of villages whose economy must have depended heavily on water abundancy, necessary for agriculture. This situation can also be found in subsequent cultural development in the Fayum.

The presently known Fayum evidence seems to indicate a need for the use of a more general terminology than the traditional one referring to only aspects of the cultural development (Petrie, 1939; Massoulard, 1949; Baumgartel, 1955). It seems that some ideas in this respect come from various cultural features evident in the examined assemblages.

The mixed plant cultivation-pastoralism and the hunting-fishing-collecting economy is well reflected in the stone tool kit of the Fayum A sites; this and other traits show the characteristics of a typical Neolithic society. The idea, put forward recently by Wenke (1980), seems worth quoting here: "in the Fayum region in the mid-fifth millenium B.P. peoples were living along the lake shores, subsisting primarily on fishing-hunting and gathering, but also growing grains, which they stored in silos. They also made artifacts from flint, bone and pottery. At the same time settlers in the Delta had essentially the same subsistence basis and technological skills, but were culturally distinct. In Upper Egypt the people of Naqada culture made some advances in stoneworking and other arts and crafts, but the economic and subsistence base probably remained much the same with hunting, gathering and pastoralism".

It seems that in the light of the development of the ecological conditions in the Fayum area, we can regard the local agricultural culture contemporary to the Predynastic (Naqada I - II) period in the Egyptian Nile Valley as the stage of the development of the Fayum Neolithic society and, therefore, a later phase of the Fayum Neolithic culture.

Butzer (1976) thinks that the bifacial knives and concave-based arrowheads of the Fayum A linked to Merimde are macrolithic and quite distinct from all microlithic traditions in the Nile Valley, both on technological and typological grounds. Butzer upholds an interusive origin of the Neolithic and Predynastic, involving migration rather than trait diffusion or local innovation; he believes that the new groups involved were North African, coming from the oases of the northern Libyan Desert or further west in the Sahara or along the Mediterranean littoral. As the Fayum A economy included strong hunting, fishing and gathering components, Butzer thinks that this points to a subsistence pattern already preadapted ecologically to riverine, lacustrine or spring oases, much like the previous Nile Valley culture had been.

An analytical study of all the materials coming from the Fayum area will certainly suggest a complete reconstruction of the agricultural societies of the Fayum depression from Epipalaeolithic to Early Dynastic times and its evolution.

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ANTHONY J. MILLS

Research in the Dakhleh Oasis

The Dakhleh Oasis Project, which is jointly sponsored by the Royal Ontario Museum and the Society for the Study of Egyptian Antiquities and largely funded by a grant from the Social Sciences and Humanities Research Council of Canada, has now completed two seasons of field work.[1] The project is designed to come to a detailed understanding of the cultural and environmental history of the Dakhleh Oasis since the beginning of the Neolithic. Initially, we are surveying the floor of the oasis, recording cultural and environmental information on the surface. Following this survey, we will excavate various locales in order to shed light on the many specific problems which are being generated.

The Dakhleh Oasis is located in the Egyptian Sahara, centered on 25°48'N and 29°05'E. The oasis is overlooked by a 400 metre high south-facing limestone escarpment. The floor of the oasis is a flat clay plain, originally lacustrine, which dips slightly northward and lies between 100 m and 135 m above sea level. The oasis is sausage-shaped, about 80 km in length and up to 25 km wide. The local population, estimated to be about 35,000, lives in some 17 settlements scattered over the area. The town of Mut, which is the capital of the region, is the largest, with a population of about 10,000. The local economy is based entirely on agriculture, the major income crop being dates, which is exported to the Nile Valley. Various cereals, including rice, wheat and sorghum are produced for local consumption, as are a few vegetables. Fruit crops of importance, besides the dates, include apricots, oranges, olives and grapes. The climate of the oasis is, of course, hyperarid and relatively hot, maximum temperatures ranging between 21.5°C in winter and 39°C in summer. Through most of the year, the prevailing wind is from the north. The vital water

[1] Preliminary reports of these field seasons are published in *Journal of the Society for the Study of Egyptian Antiquities* IX. 4 (August, 1979) and X. 4 (August, 1980). Various contributing members of the expedition include C. S. Churcher, palaeontologist; W. K. Hodges, geomorphologist; C. A. Hope, ceramicist; M. M. A. McDonald, prehistorian; A. J. Mills, director; and J. C. Ritchie, palaeobotanist.

of the oasis is borne by several aquifers at various depths and it is under sufficient pressure to bring it to the surface without the aid of pumps, even from 500 - 600 m. Basin irrigation systems, similar to those of the Nile Valley, are universally employed, although currently there are attempts to introduce overhead sprinkler systems. The soil is naturally subjected to prolonged periods of fallow because the streets of moving barchan dunes from time to time force the farmers to move from one area to another. There is no naturally occuring surface water at the present, despite the fact that there is a superbundance of water being tapped – the excess is dissipated by evaporation.

Animal husbandry in Dakhleh is on a small scale. Each household has a small flock of sheep and goats and a small flock of mixed fowls – chickens, ducks, geese and turkeys, sometimes pigeons. A cow or two completes the complement. Larger flocks of sheep and goats, as well as small herds of camels, are maintained by Beduin-related nomadic "Arabs" who have settled in the oasis. Dairy, meat and egg production is all on a very limited scale and it is not always possible to find these provisions locally for the expedition because there is no excess.

Currently, approximately 1/5 of the land of the oasis is devoted to agriculture. Although not all the area has arable soil cover, there is still considerable unused land for various reasons. It is this potential which is prompting the development of the "New Valley" agricultural scheme to help feed Egypt's expanding population.

Interest in the beginnings of food production is high, but unfortunately, the evidence we have gathered to date about the Neolithic inhabitants of the Dakhleh Oasis yields only a little information. We have recorded some thirteen individual sites, two of which have provided enough evidence on which we can begin to reconstruct a landscape. Preliminary field identifications of teeth and bones of elephant, aurochs, hartebeeste, two species of gazelle, an equid, ostrich and another bird, were made from remains which appear to be in a butchering context within a Neolithic habitation area at two separate sites. The implications of this faunal complex are that the oasis area more closely resembled present East African savannah zones, with grass cover and a thin forest of shrubs and small trees to accomodate both the grazing and browsing animals. There must also have been some permanent standing surface water, presumably as marshes or ponds and, probably, some seasonal rainfall. One or two Neolithic sites are situated beside playas, a circumstance which reinforces this latter aspect of the landscape. Although the faunal analysis is a preliminary one and the sample is surely incomplete – there are no predators or rodents, for example – it is perhaps significant that no domesticates are identified until possibly Old Kingdom levels. This does not correlate with the domesticated cattle and caprovins found by Wendorf at Nabta Playa and dated to the Terminal Palaeolithic and early Neolithic phases (Wendorf *et al.*, 1977).

One of the problems we encounter in dealing with the Neolithic sites in western Dakhleh is their greatly deflated condition. Despite rich remains of the lithic and

ceramic industries and the faunal complex mentioned above, none of the sites so far examined displays any depth of occupation debris. This, of course, means that unless fossilized and originally well below the ground surface, we are unlikely to encounter floral remains. Certain fossilized root and stem remains have been noted at one Neolithic site, but cannot be definitely associated with the cultural remains at this stage. Pollens have been found preserved in certain sediments and will eventually provide us with some floral information. Indirect evidence for the use of cereals is found in a number of small grindstones, which occur on several sites for Neolithic onwards. These are, however, not plentiful and are nowhere near the size of those, for example, from Wadi Kubbaniya (Wendorf *et al.*, 1979).

Evidence, in the form of material remains, has now been recovered which attests to habitation in Dakhleh by ancient Egyptians from the Archaic Period until just before Dynasty XVIII, *i.e.*, between c. 3,000 and 1,600 B.C. Most parts of this period are represented by small groups of finds and burials. There is, however, one time when the Egyptians are very strongly represented. That is during the latter part of Dynasty VI and into the Frst Intermediate Period. At this time there were major and monumental sites at Ain Aseel and Kila ed-Debba in the Balat area[2], where a large town mound and inscriptional evidence indicate some important activity at a great remove from the usual Egyptian world. In western Dakhleh, there are twelve recorded inhabited locations from this period, the area of some of them as great as 80 hectares. Many of them bear traces of some kind of industrial activity, as yet unidentified, and some have the remains of mud brick architecture. None is very well preserved. The significance of this is that, while a single isolated community might be provisioned from a distance, such a population as that represented in this context would have had to have been locally supplied, either producing its own food or purchasing it from a local agricultural population. This in turn means that a landscape somewhat different from that of the Neolithic would have occurred. The Egyptians had had a sedentary agricultural basis for much too long a period for them to have adopted hunting and gathering subsistence techniques in the oasis. On the contrary, they would have adapted the new area to their accustomed farming patterns. With the end of the pluvial activity of the period preceding the third millennium, there must have been changes in the faunal and floral aspects of the oasis. Probably many of the grasslands and the shallow surface water areas dried up, or were reduced in extent or frequency. With a decreased browsing or grazing pressure created by the disappearance of the megafauna, the increased land available for cultivation and animal husbandry, and the farming techniques already well developed in the Nile Valley, the Egyptians would have had little difficulty in developing agriculture in the oasis. Unfortunately, no evidence speci-

[2] Originally published by Fakhry (1972). The sites are now being excavated by the Institut Français d'Archéologie Orientale and reported in *Bulletin de l'Institut Français d'Archéologie Orientale* 77 (1977) and 78 (1978) by J. Vercoutter and others.

fically supporting this has yet been recovered, nor has evidence, apart from the fact that some Neolithic sites have ceramics on them, been recovered to shed light on the probable Neolithic adaptations to the changing environment.

Another group of evidence comes from the Nile Valley itself. This is the literary and pictorial references to the oasis and its products. Already in the First Intermediate Period, when the land of Egypt had fallen on difficult times, trade in fowls and the agricultural products of the oases continued (Gardiner, 1909). Later references attest to prized commodities such as figs, grapes, and especially wine coming from the oasis (Ebbel, 1937; Breasted, 1906; Gardiner, 1947; Sethe, 1920). Painted and relief scenes in tombs as those of Rekhmire (Davies, 1944) and Puyemre (Davies, 1922) depict oasis trade or tribute items, including wine, fruit, fancy baskets and woven sandals – all agriculturally derived products. What we cannot be absolutely certain of is the precise nature of the Egyptians' participation in all this. So far, no Middle Kingdom remains have been recovered, but there is sufficient Second Intermediate Period material to attest to the Egyptians' presence, although not to give us any real idea of population size or activity. After Dynasty XV there is no archaeological evidence for any Egyptian occupation in the oasis apart from two stelae of post-New Kingdom date which are supposed to have been found at Mut at the end of the last century. One of them (Gardiner, 1933), dating to Dynasty XXII, attests to agriculture and administrative officials and concerns disputes over wells and water rights. The other (Janssen, 1968), from Dynasty XXV, tells us that the region was still occupied, but that it was probably under the control of a "Libyan" tribe. As yet, we are unable to judge whether the oasis and the Nile Valley were trading partners, whether the former was subjugated to the latter, or whether there were many Egyptians living there as in late Old Kingdom times. It may be that what population was in the oasis after the Old Kingdom was gradually forced by changing conditions into the centre of the oasis – an area as yet not investigated.

Whatever activities were conducted during the first millennium B.C. in central and eastern Dakhieh, there is no doubt about the rapid population expansion of western Dakhleh in the first century A.D. Well over half of all the 130 sites are massive, others consist of a single small building. There is a great range of types of sites as well as temples, towns, farmsteads, cemeteries, industrial areas and irrigation systems. In addition, many of them are in a state of excellent preservation. To judge from the number and size of sites and from the general spread or distribution of Roman potsherds over western Dakhleh, land use and perhaps also the population was greater than at any other time, including the present.

There can be little doubt that there was a real agricultural development scheme in Dakhleh in the first century A.D. During this period a community was established there with all the earmarks of such planning. There is a stone temple, rather cheaply and badly built, at Deir el-Haggar[3], which is dedicated to the worship of Theban

[3] The most complete recording of this temple is in Winlock, 1936.

deities in a local guise, and which is inscribed with the names of various first century emperors, including Titus, Nero and Vespasian. Attached to this cult centre is a small complex of buildings. Nearby are several isolated "farmsteads", which are two-roomed brick buildings, each with a large pigeon loft.

There are a couple of dozen of these within a radius of four kilometres of the temple, all bearing that sameness which is the stamp of governmental building projects. The pigeon lofts were probably intended to fulfill the protein needs of the immigrant farmers until their land was properly developed – a breeding pair of pigeons will produce two birds for the pot per month. Also in the Deir el-Haggar vicinity are several large aqueducts which brought water from springs a kilometre or more away to the south. While the dating of these aqueducts is conjectural, it is difficult to associate them with any sites other than the Deir el-Haggar ones. Similarly, undated remnants of field systems can be seen in the vicinity. An interesting coincidence is the occurrance of an agricultural disaster of the mid-first century in the Fayum and the potential source of migrant farm labour that this would be.

Although many of the western sites were apparently only occupied for a relatively short period, the Roman settlement stabilized and continued to thrive in Dakhleh. Major towns, such as Amheida and Smint el-Gharab, grew up and evidence shows them to have been occupied for a considerable span of time. A most interesting tomb scene of the early third century at Muzzawaka depicts some chief products of the oasis. Identifiable in the picture are dates, olives, sorghum, grapes and pigeons. We have also tentatively identified seeds or other gross plant remains of millet, rice, apricot, peach and fig from Roman archaeological contexts. Bones of domesticated cattle, ass, pig, chicken and sheep-goat have also come from test excavations or from *in situ* provenances. That much of this was destined for the Nile Valley and even further afield can be ascertained from continuing references to the produce of the oasis, particularly the wine.

An historical indication of the greater water resources of the Dakhleh than the Kharga Oasis can be seen in the Roman period. Kharga was as much the subject of development as was Dakhleh in the first century. However, it seems that the underground water of Kharga was overtapped and soon began to run dry and many of the wells there were quickly abandoned[4], while the Dakhleh occupation continued for three or four centuries.

Evidence now suggests that the aeolian sand which is the bane of the modern Dakhleh farmer was one of the major contributiong factors to the sharp population decline at the end of the Roman period. The evidence for the decrease is, simply, that while 70 Roman sites have been recorded, only 17 Coptic period sites are known from the same area. The spread of surface artefacts suggests that areas now heavily sanded, once had exposed soil. Another indication that the sand activity is only recent is the absence of fossil or mineralized dunes in areas where Roman mud brick

[4] V. Haynes, personal communication, 1978.

has become strongly mineralized. Undoubtedly, social and political conditions in the Nile Valley have often had a strong effect on life in the oasis, but when the Islamic conversion of Egypt occurred, there was no influx of Copts to Dakhleh similar to that which occurred in Lower Nubia, an equally inhospitable area. It is also quite probable that the clay soil of Dakhleh became impoverished after a few centuries of intensive Roman farming and was unable to provide more than subsistence living for the vastly reduced and declining population.

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Thomas R. Hays

Predynastic development in Upper Egypt

1. Introduction

It has long been recognized that Egyptian civilization developed from the preceding Predynastic cultures of Egypt. The Predynastic period refers to "Neolithic" occupations along the Nile River prior to the political unification of Egypt around 3,100 B.C. The best known Predynastic sequence has been recorded in Upper Egypt. Previous work conducted several decades ago suggested an evolutionary sequence based on ceramic decoration and form (Petrie, 1917; Brunton and Caton-Thompson, 1928). The earliest of the Predynastic cultures was called "Badarian", followed by the "Amratian" and "Gerzean."

The origin of the Badarian is not known, but influence from the Near East has been suspected (Frankfort, 1951; Kantor, 1965). Brunton and Caton-Thompson (1928) suggested that the Predynastic Egyptians were not indigenous, but possibly arrivals from the area of the Red Sea. The idea of an intrusion of people into the Nile Valley has been repeated by more recent workers. Non-ceramic sites in Egypt dated prior to the Predynastic show little relationship with the later ceramic sites (Wendorf *et al.*, 1970; Vermeersch, 1970).

That these "Neolithic" groups came from outside the Nile Valley is generally accepted, but their origin has been placed in the east (Kantor, 1965), west (Hassan *et al.*, 1980), and south. Baumgartel (1965) and Arkell and Ucko (1965) postulated that the origins may be found in Sudan.

In order to assess these hypotheses, it will be necessary to establish ceramic characteristics and chronological parameters for the ceramic industries of Upper Egypt both along the Nile and in the Western Desert, as well as for the cultural development in Northern Sudan (Fig 1). Recent field work in each of these areas relate to this problem.

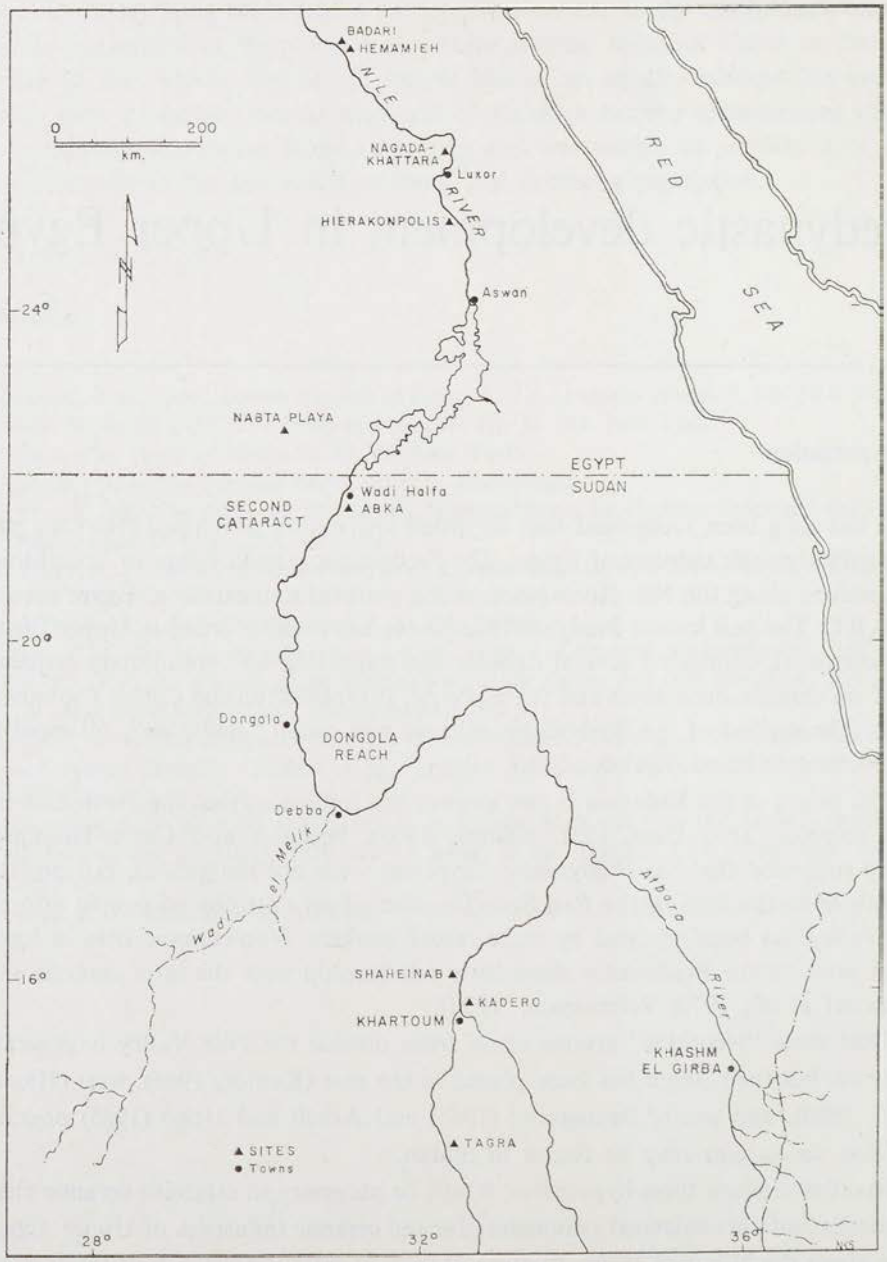

FIG. 1. Map of the Central Nile

2. Cultural sequences

2.1. Nile Valley

The previously accepted chronology for Upper Egypt along the Nile indicated a change from preceramic occupations to the Predynastic period beginning about 5,600 years ago. This estimate was based on radiocarbon dates provided by Libby (1955):

"Culture"	Sample	14C Age (B.P.)
Gerzean	C-813	4,720 ± 310
Gerzean	C-812	5,020 ± 290
Amratian	C-814	5,577 ± 300
Amratian	C-811	5,619 ± 280
Amratian	C-810	5,744 ± 300

The solid carbon method was used to date museum samples from Predynastic graves. Comparison of solid carbon dates with more modern techniques of radiocarbon dating reveal the earlier dates are about ten percent too old (Hassan, Hays and Shepard, n.d.).

Recently, thermoluminescence dates were published for the Predynastic period (Caton-Thompson and Whittle, 1975):

"Culture"	Sample	TL Date (B.C.)
Gerzean ("D" ware sherd)	OX TL 131 b18	3,775 ± 300
Amratian (polished red sherd)	OX TL 131 b9	4,330 ± 355
Amratian ("rippled" sherd)	OX TL 131 b19	4,360 ± 355
Badarian ("rippled" sherd)	OX TL 131 b10	4,450 ± 365
Badarian (polished red sherd)	OX TL 131 B12	4,510 ± 475

The dates were on pottery samples from the Ashmolean Museum which contained some of the original soil matrix. The dates could be misleading, however, due to an error in estimating the environmental dose rate (Caton-Thompson and Whittle, 1975). Even though the dates are in good stratigraphic agreement, they are considerably older than expected from radiocarbon determinations.

More recently, new radiocarbon dates have been obtained from a series of Predynastic sites near El Khattara in Upper Egypt. Based on the pottery, the sites must be considered as Badarian (Hays, 1976). Other dates result from work at Hierakonpolis (Table 1).

Table 1

Radiocarbon dates from Predynastic sites in El Khattara and Hierakonpolis

Culture	Site	Sample	14C Age (B.P.)
Gerzean	South Town	W-4350	4,680±60
	South Town	W-4349	4,730±70
Amratian	Hierakonpolis (Loc. 14)	WSU-1730	4,250±130
	Hierakonpolis (Loc. 14)	WSU-1729	4,830±120
Badarian	Hamamiya	GrN-223	5,110±160
	Hamamiya	WSU-1728	5,290±130
	Hierakonpolis (Loc. 11)	UW-104	4,720±94
	Hierakonpolis (Loc. 11)	UW-105	4,717±94
	Khattara (KH 1)	SMU-351	4,930+70
	Khattara (KH 1)	SMU-360	5,030±100
	Khattara (KH 1)	WSU-2256	5,270±100
	Khattara (KH 3A)	TX-2340	4,970±70
	Khattara (KH 3A)	SMU-353	4,780±70
	Khattara (KH 3B)	SMU-493	5,214±54
	Khattara (KH 3B)	WSU-2255	4,960±100
	Khattara (KH 6A)	SMU-303	5,005±69
	Khattara (KH 6A)	SMU-355	4,810±80

In addition, two thermoluminescence dates are available from the El Khattara sites (J. Huxtable, personal communication). These dates are in general agreement with the calibrated radiocarbon dates from the same sites (Hays and Hassan, 1976):

Culture	Site	Sample	TL Date (B.C.)
Badarian	KH 1	OX206 a2	3,800±400
Badarian	KH 3	OX206 b4	3,350±550

As a result of this recent work, it has been suggested that a reappraisal of the evolutionary sequence of Predynastic development is required (Hays, 1978). It must be concluded that the Badarian and Amratian are contemporary followed by the Gerzean.

2.2. Western Desert

During the past few years several areas of the Western Desert of Egypt have been examined under the direction of Fred Wendorf.

Of particular interest is the area near Nabta Playa located about 100 km west of Abu Simbel (Fig. 1). Several sites around these ancient lakes have provided an extraordinary picture of cultural development. Beginning as early as 8,200 B.P., there is evidence of settled ceramic-using occupation which possibly also had do-

mesticated plants and animals (Wendorf and Schild, 1980). The following sequence has emerged for the Western Desert:

Culture	Date (B.P.)	Climate
Late Neolithic	6,300 - 5,800	Pluvial 3
Middle Neolithic	7,700 - 6,300	Pluvial 3
	7,900 - 7,700	Arid Phase
Early Neolithic	8,200 - 7,900	Pluvial 2
	8,500 - 8,200	Arid Phase
Terminal Palaeolithic	9,000 - 8,500	Pluvial 1

The Early Neolithic contains a few sherds comparable in decorative motif to some atypical sherds from Early Khartoum. The lithic assemblage shows marked continuities with the earlier local Terminal Palaeolithic, but no relationship to the Khartoum Mesolithic in the Nile Valley (Wendorf and Schild, 1980).

With the onset of the major pluvial period at 7,700 B.P., the playa was occupied by peoples of the Middle Neolithic, making mat-impressed pottery comparable to the dotted-wavy line pottery of the Late Khartoum Mesolithic. In addition, these people already had domestic cattle, as well as sheep and goat.

By 6,300 B.P. the Late Neolithic sites at Nabta Playa contain ceramics unrelated to the Khartoum Horizon Style, but comparable to that described for the Abkan (Ware Group M, Nordström, 1972) on the Nile near the Second Cataract. Domestic cattle continue to be found, as well as some domestic sheep and goat (Wendorf and Schild, 1980).

2.3. Sudan

In Nubia, there is thought to be a generic link between the generally aceramic Qadan and the ceramic Abkan (Shiner, 1968). On two of the Final Qadan sites there were a small number of potsherds which display affinities with the Khartoum Variant or Abkan pottery. Following the Qadan are several Ceramic Age industries: the Khartoum Variant, the Abkan, and the A-Group (Table 2).

The term Khartoum Variant implies a relationship with the Khartoum Mesolithic described by Arkell (1949). The lithic industry was sufficiently unlike the Qadan and Abkan that it seemed to be the result of a new group (Shiner, 1968). On the other hand the lithic industry of the Khartoum Variant also is significantly different from that of assemblages of the Khartoum Horizon Style further to the south (Hays, 1974).

Whereas the Khartoum Variant appears to be intrusive, the Abkan is believed to be an outgrowth of the aceramic Qadan and also, to phase into the Early A-Group of Nubia (Nordström, 1972). The Abkan pottery, as classified by Nordström, is

Table 2

Radiocarbon dates from late prehistoric sites in northern Nubia

Culture	Site	Lab	14C Age (B.P.)
Terminal A-Group	SJE-340	U-2425	4,270 ± 70
	SJE-340	U-2426	4,440 ± 90
	Afia	TF-47	4,380 ± 115
Classic A-Group	SJE-277	U-819	4,630 ± 120
Terminal Abkan	11-I-16	GXO-423	4,935 ± 130
	AS16-S-10	U-2490	5,330 ± 80
Developed Abkan	AS16-S-10	U-820	5,730 ± 160
	IX : 5	M-803	5,960 ± 400
Early Abkan	CPE-605	WSU-190	6,430 ± 200
Khartoum Variant	DIW-5	TX-1155	6,540 ± 110

composed of a wide variety of surface treatment. Unburnished, plain pottery is very common. Another predominant ware is thin, burnished, and decorated with rocker stamp designs. "Rippled" surface and "black-mouthed" wares are diagnostic of the Terminal Abkan pottery. The latter are the forerunners of the "rippled wares" characteristic of the Nubian A-Group (Nordström, 1972).

3. Summary

In view of the recent suggestions that the Egyptian Predynastic was influenced by settlers from the deserts, it is necessary to evaluate such possibilities. It has been suggested that the Terminal Palaeolithic groups in the Western Desert may have come from the Nile Valley of Upper Egypt or Nubia (Wendorf and Schild, 1980). There are close similarities in typology and in general tool structure with the Nile Valley sites, but subsequent desert sites show marked differences from the slightly later sites on the Nile.

The Early Neolithic sites in the Egyptian desert are dated ca. 8,200 B.P. and are related to the previous Terminal Palaeolithic. A contemporary Egyptian Nilotic site would be El Kab. Ceramics and domesticates are present at the desert sites, but not at the Nile sites which emphasized fishing and hunting.

On the other hand, recent dates at Early Khartoum sites in the Central Sudan also indicate an early beginning for ceramic technology. The site of Sorourab II near Khartoum yielded two charcoal dates of 6,550 B.P. (Abbas M. Ali, personal communication). The site of Shabona on the White Nile produced a shell date of 7,000 B. P. (Clark, personal communication). During this period, Khartoum Mesolithic related sites also are found in the northern Sudan.

The Sudan occupations are contemporaneous with the Late Khartoum related "Middle Neolithic" at Nabta Playa in the Western Desert of Egypt. These desert

sites, however, contain evidence of settlements of herders and farmers. The "Late Neolithic" at Nabta has ceramics which are similar to the "Abkan" of the Nubian region of the Nile.

It is significant that there are no settlements in Upper Egypt during this time period. The earliest ceramic-bearing sites in Upper Egypt are the Predynastic Badarian recently radiocarbon dated to 5,200 - 4,800 B.P. (Hays, 1978).

Ca 5,800 B.P. drying conditions forced abandonment of the desert. If these people moved to the Nile Valley, it must have been to the Second Cataract region of Northern Sudan. There we have evidence of similar groups (Abkan) which were indigenous to the area.

4. Conclusion

Almost a decade ago, it was suggested that ceramic technology spread from the Sahara into the Nile Valley (Khartoum Horizon Style) where it mixed with Near Eastern ceramic ideas (Gerzean) moving southward up the Nile (Hays, 1971). Ce-

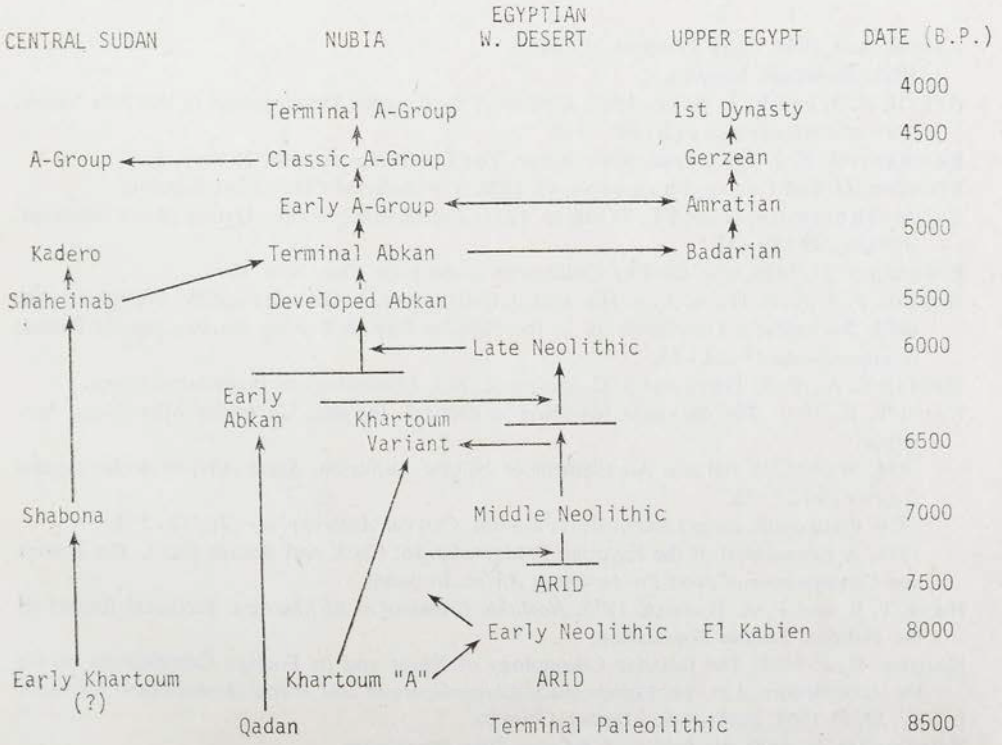

FIG. 2. The development of the ceramic traditions on the Central Nile

ramics along the Nile in the Sudan show a change through time from rather thick, comb impressed, unburnished pottery (Khartoum Mesolithic) through a thin, burnished, impressed ware (Shaheinab Neolithic) to a thin, burnished "ripple ware" with black tops (Terminal Abkan). The latter pottery is similar to the "rippling" characteristic of the Predynastic Badarian in Upper Egypt, as well as the Nubian "Classic A-Group". The possibility exists, then, that the ceramic tradition suddenly occuring along the Nile in Upper Egypt ca. 5,000 years ago (Badarian) resulted from a northward diffusion from Sudan.

If the occurrence of the different ceramic styles in northeast Africa is plotted through time, the following picture emerges (Fig. 2). The Early Abkan developed from the indigenous aceramic Qadan, but received its ceramic traits from the Shaheinab Neolithic of Central Sudan. The Terminal Abkan evolved into the A-Group in Nubia, and the Badarian/Amratian in Upper Egypt. Subsequently, these Predynastic Egyptian groups were succeeded by the intrusive Gerzean from the north.

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Fekri A. Hassan

Toward a model of agricultural developments in Predynastic Egypt

This paper presents a working model of agricultural developments in Predydynastic Egypt. It is based mostly on the preliminary results of the excavations undertaken by Washington State University (F.A. Hassan, P. I.) in the Nagada--Khattara area in 1978 under grants from the National Science Foundation and the Smithsonian Institution, Foreign Currency Program. The excavations are a continuation of the work begun by T.R. Hays in the area in 1975.

As a result of the initial investigations by T. R. Hays (1976) numerous Predynastic sites were discovered in the area stretching from Danfiq to Ballas. These sites, consisting mostly of the remains of Predynastic settlements, were either ignored or overlooked by Petrie (1896). In 1978 an intensive systematic survey of the region in 40-200 meter grid units and a program of excavation were initiated by F. A. Hassan.

Radiocarbon dates on some of these sites indicate that the settlements span about 700 years from 5,270 to 4,400 uncalibrated radiocarbon years before present. The Delta and Fayum settlements predate the Predynastic sites of Upper Egypt by about one millennium (the earliest dates are 6,130±110 B.P. at Merimde [Olsson, 1959] and 5,860±115 B.P. at the Fayum [Wendorf and Schild, 1976]).

Our investigations indicate that the inhabitants of the Nagada region raised sheep/goats, cattle, and pigs, and that they cultivated emmer wheat and barley. The faunal remains indicate that there is a definite and dramatic change in the ratio of sheep/goats to cattle from the lower levels to the younger levels. The ratio drops from about 5 : 1 in the oldest levels at site KH3B to 1.05 : 1 at South Town. It is noteworthy that the ratio of sheep/goat to cattle in the upper levels is similar to that at Qena today, which is 1.2 : 1 (Dinasouri, 1957) compared with 4 : 1 in the desert provinces. Data from Pharaonic Egypt, and I am indebted to Professor Klaus Baer (*In Litt.* 10 Jan. 1980) for information on that issue, are scant and dubious, but they are in the range of 1.01 to 3.5 : 1. It is also interesting to note here that the ratio is 3.6 : 1 on Narmer's mace head and 5.3 : 1 in petroglyphs from Wadi Hammamat (Hassan, personal observations).

This temporal variation suggests that the early inhabitants of the Nagada region were most probably involved in a pattern of subsistence emphasizing utilization of desert resources since goat and sheep are better adapted to the desert than either cattle or pigs.

Evidence from the work of Professor Wendorf in the southern part of the Western Desert (Wendorf *et al.*, 1976) and the work conducted by F. A. Hassan at Siwa and Baharia oases (Hassan, 1978, 1980 a) document a phase of moist conditions from 9,500 to 6,700 B.P. (Wendorf and Hassan, 1980). This period was associated with human occupation of almost all Egyptian oases by Terminal Palaeolithic hunters and gatherers, and in the South by herders of cattle and sheep/goats and cultivators. Two varieties of barley, one of them domestic were also identified in a Neolithic context at Nabta playa in the south of the Western Desert dating to an average of 7,944±140 B.P. (Wendorf *et al.*, 1976).

The moist phase was followed by a period of severe aridity which has most likely led to the gradual depopulation of the desert and an infiltration of the Nile Valley by individuals and families in a manner not unlike the modern dispersal of the Sahel peoples following the recent droughts in the area. Similar aridification seems to have affected the Sinai and the Negev, and a similar movement of population toward the Nile is plausible. This was no mass invasion, but a gradual infiltration by drifters and refugees over a span of about 500 years or more. These groups intermingled easily with the local inhabitants of the Nile Valley who were at the time hunters, gatherers, and fishers (Hassan, 1980b) with a flexible social organization and presumably exogamous marriage pattern, as among most hunter-gatherers. Agriculture therefore did not displace the pre-existing subsistence patterns but supplemented it. The change in subsistence was almost imperceptible peaceful, and gradual. This model explains why agriculture appeared in Egypt when it did, and how it was introduced without assuming any deliberate choice on the part of the Nilotic inhabitants. The people of the Nile must have been aware of the agricultural practices in the desert areas and in the Near East, and probably occasionally utilized wild grain and may have in fact tended some plots of barley at the edge of the floodplain perhaps as early as 18,000 years ago (Wendorf *et al.*, 1979). The Nilotic people were engaged in a profitable and predictable subsistence pattern oriented toward hunting cattle, hartebeest, capturing hippos, catching Nile fish, and gathering Nilotic plants. The sufficiency of the Nile habitat as argued by J. Desmond Clark (1971), and the stability of the Nilotic resources compared to those of the Near Eastern mestastable rain-governed resources was probably not conducive to an autonomous change toward cultivation as a means of securing additional food or a further stabilization of the economic base.

Once the new elements of subsistence and other cultural traits were incorporated in the Nilotic cultures they diffused along the Nile. There are indications that one of the directions of the spread of agriculture was from the Delta southward. The Khartoum Neolithic seem to have been either indigenous or derived from adjacent sources of the

Sahelian belt. The Shamarkian Neolithic seems also to have been affiliated with the Neolithic of the region of Nabta Playa.

The results of botanical investigations indicate that barley was the most dominant cultigen with a frequency twice that of wheat. This is in marked contrast with the present dominance of wheat over barley. In 1950 - 1954, the acreage under barley was 7.2% of the combined acreage for wheat and barley (Mabro, 1974: 50). This compares with 30.9% in 1899 - 1900 (Selim, 1940: 16). In 1875, barley amounted to 31.8% of the combined produce of wheat and barley (McCoan, 1882). Data on earlier periods has not been collected yet, but barley was still the most common cultivated plant at the time of the Napoleonic invasion of Egypt. The minimal emphasis on barley today reflects thus a progressive replacement of barley with wheat, most probably in association with the advances in perennial irrigation (beginning in 1825/34) and other water controls. Under conditions of natural irrigation the predominance of barley is understandable given the greater resistance of barley to drought and salinity. It is interesting to note that the only other quantitative estimate of cereals from the Fayum Neolithic (Caton-Thompson and Gardner, 1934) closely matches that from Nagada. Barley at the Fayum represents 72.3% compared with 70.7% at Nagada.

Our work on Predynastic agriculture, as I have mentioned earlier, represents a basis for higher level interpretations of the causes for the emergence of political hierarchy and centralization that culminated ultimately into the emergence of the Egyptian State. Once agriculture became the dominant mode of subsistence with an attendant reduction of spatial mobility, and enlargement of group size, and a simplification of the ecological network by focusing on a few resources the economic system became vulnerable to periodic fluctuations in agricultural yield. Given the unpredictability of Nile floods and the fact that about one of every five floods is a "bad flood", emergence of intraregional and interregional networks of food exchange fostered the emergence of a managerial elite, formal social organization, and military force. The emergence of regional political units with distinct group ethnicity paved the way toward the enlargement of the political framework to include other units through alliances and conquests to ensure the regular flow of resources. It must be also noted that once a differentiated elite emerged with greater access to wealth and power it began to guard its own interests and aggrandize its own gains. The expansion of trade in non-food goods was thus attendant upon the rise of an elite and status differentiation.

The emergence of the religious component in Predynastic cultures may be also viewed as an expression of the psychological and metaphysical response to the greater anxiety assciated with the unpredictabilities of the incipient agricultural system.

In summary, the emergence of agriculture in Predynastic Egypt was a result of demographic fusion between the inhabitants of the Nile Valley and refugees from the desert regions adjacent to the Nile Valley from ca. 7,000 to 6,000 B.P. and the

subsequent diffusion of agricultural practices along the Nile. The subsequent evolution of Predynastic culture was essentially an expression of a trend toward greater integration of the resources of food producers within and among Nilotic communities in order to stabilize the economic base and secure it against adverse fluctuations of Nile floods and other agricultural failures [1].

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[1] Research by F. A. Hassan was supported by grants from the National Science Foundation and the Foreign Currency Program of the Smithsonian Institution. The 1978 field season was directed by Dr. James Gallagher (University of Wisconsin, La Crosse). The plant remains were examined by Wilma Wetterstrom (Massachusetts Institute of Technology). The faunal remains were analyzed by A. Gautier (Rijksuniversiteit, Ghent). T. R. Hays (North Texas State University, Denton) investigated the lithic artifacts with assistance from M. Duymunck. Afifa A. Hassan secured a number of radiocarbon dates and helped with the geochemical investigations. I am thankful to all who participated in the field operations and laboratory analyses and to the officers of the Egyptian Department of Antiquity for their continued support.

STAN HENDRICKX

The Late Predynastic cemetery at Elkab (Upper Egypt)

During the 1968 campaign of the Belgian Archaeological Mission at Elkab (Upper Egypt), Professor P. M. Vermeersch, while excavating his recently published Epipalaeolithic Elkabian, found a number of intrusive late predynastic tombs (Vermeersch, 1978). The excavation of this cemetery was finished by the Belgian Mission during the 1977 - 80 seasons.

The site is situated within the great enclosure wall of the dynastic Elkab, in the area F85--G00/G50-75 (Depuydt and Vermeersch, 1972). In total, the cemetery yielded some 100 tombs, out of which only 25 were undisturbed. Originally the cemetery must have been larger, since Quibell too excavated a number of late predynastic tombs within the enclosure wall of Elkab in 1897 (Quibell, 1898). The exact location of these tombs was not given by him but it is highly possible that they were located in the immediate neighbourhood of our excavation [1].

Typologically, the cemetery can be placed within Petrie's S. D. 65 - 81, or Kaiser's Stufe III A1-B (Petrie, 1920; Kaiser, 1957). However, since the Petrie system is highly doubtfull nowadays, without trying to attack the original value of the S. D. (the Kaiser system is also largely based on it), we can not consider this as definitive results.

1. General description of the cemetery

The tombs have the normal predynastic orientation, SE – NW, parallel to the direction of the Nile at Elkab. The skeletons always lie on the left side, in a contracted position, facing the west, arms bent in front of the chest, but the degree of contraction is slightly different.

[1] There is a fragmentary list of 19 tombs with their grave contents in his publication which seem to belong to the same group of tombs as those considered here. Quibell also mentions a number of plundered early predynastic tombs, „well outside the town, on the west side of the railway..." (Quibell, 1898).

As regards the tomb construction, a division into two kinds of tombs can clearly be made (cf. also Krzyżaniak, 1977: 156). The first and the most numerous group, 21 out of 25 undisturbed tombs, and nearly all the disturbed ones, are simple pits, without any further indication of construction. The second group consists of tombs where the construction is reinforced by means of large, unworked, sandstone slabs.

The distribution of the grave goods within the first group of tombs has the general outline, well known in Upper Egyptian predynastic burial areas. The large storage jars stand around the feet, whereas the smaller jars and bowls are situated before the chest and around the head. The most precious grave goods such as slate palettes, stone vessels and spoons are generally placed between the face and the hands.

In the small second group, the tombs are all different from one another. They seem to have only one common trait: the grave goods and the deceased are as much as possible separated from one another. Following is a short description of the most interesting tombs of this group:

Tomb 50

This tomb was partly disturbed but the construction was clearly evident. A slope led to the burial chamber proper. This burial chamber was a niche dug out from the slope and separated from it by a sandstone slab. The grave goods were situated at the end of the slope, towards the sandstone slab and had been partially disturbed, but the burial chamber had not been touched and there were no grave gifts at all near the skeleton.

Tomb 65

Here the skeleton was laying in a grave pit and the grave goods were placed separately in a niche on the southern side of the tomb. One side of the grave pit was lined with a sandstone slab and another slab covered the niche with grave goods. Once more, no objects were situated around the skeleton.

Tomb 76

This tomb was clearly the richest one found at Elkab. The grave pit of 2.5×1.2 m was entirely covered by four sandstone slabs. The objects were so numerous that there was no separation between them and the body. The skeleton was even lying on the grave goods. There were 50 pottery vessels of different types, 8 stone vessels and 2 slate palettes. A spoon, a small vessel and four hairpins, all of bone and a necklace of beads of different hard stones were also found here.

All these tombs belong to relatively old male adults, except the richest one of all, tomb 76, which belongs to a rather young male adult. Following the traditional vessel typology of Petrie these tombs are the youngest in the Elkab cemetery and can be dated to S. D. 78 - 81. So, we can well see at this cemetery the link between the predynastic pit burials and the Old Kingdom burials with a separated shaft.

Remarkable at Elkab are the several multiple burials. In general, this custom assumed to have disappeared towards the end of predynastic times. At Elkab, however, there were at least 10 multiple burials. Since the deceased were buried at the same time, family burials are highly unlikely. Despite the study of the human remains from these tombs their interpretation is inexplicable (Van Rossum, 1980). This is because the soil in the tombs contains a great amount of salt which disintegrated the skeletons thus making the determination of their age and sex almost impossible. We can only say that there are no tombs of children under 3 years of age at Elkab and that this fact is compatible with the general conclusions reached by Masali and Chiarelli (1972).

2. Grave goods

The contents of the graves consisted mostly of pottery although a number of stone vessels, palettes, pearls etc. were also found. The pottery is a particularly interesting feature since research on predynastic times has mostly been based on its typology (Petrie, 1921; Kaiser, 1957). Although the form of these ceramics is well known, no appriopriate research has been made on their material and manufacturing. The attempt made at Armant (Mond and Myers, 1937) remained unfollowed. In this paper, a descriptive system and a typological list following the criteria used by Nordström (1973) will be used. This means that an attempt has also to be undertaken to distinguish the differences in raws and pottery technology.

In traditional terms, the most frequent pottery types at Elkab belong to Petrie's Late series. Very common are the large storage jars of L 36 (hard pink ware, limestone tempered) and L 31 families (coarse brown ware, straw tempered). Nearly every tomb contained one or more pieces of these families. The so-called Wavy Handle pottery is also frequently represented. In the Elkab serie we find types ranging from Petrie's W 46 to 80; nearly all of them are made of hard pink ware, often with a white wash. In addition, there is an important series of different bowl types (both in hard pink and coarse brown ware) and other small vessels. There is only a small quantity of decorated pottery but none has figural decoration. Here the most frequent type is W 62, with a line pattern imitating basketwork. A great number of these vessels were fairly or completely worn-out when buried.

The pottery vessels at Elkab did not contain foodstuffs or any other materials with the exception of two small bowls in tomb 76 which contained raw copper. All the other vessels were filled with different kinds of earth. In an attempt to understand the original function of the different pottery types, these contents are under study. But it already seems evident that they do not parallel with the grave filling. A possible explanation was made by Scharff on his exvacations at Abusir el Meleq (Scharff, 1926: 14), when he presumed that a kind of "Ersatz"-filling was buried in the vessels instead of real foodstuffs.

Nearly every tomb contains a palette, sometimes even two. They are of different material, quality and measures. The simplest forms are just unworked pieces of quartz. The worked ones are all made of "slate" (in fact, greywacke). Simple rectangular and oval shapes are the most common palette types. A fish-shaped and two double--bird-head palettes are rare forms. On some of these palettes traces of the original pigment were still present and two of them, examined by C. Traunecker (of Centre Franco – Egyptien des Temples de Karnak, Laboratoire de Technologie), appeared to be malachite. In tomb 56, an unfinished palette of greywacke was found together with a quartz hammerstone unquestionably used for shaping. This palette is nearly triangular and it could very well be an unfinished double-bird-head form; only the first phase has been here finished, the shaping was made from the exterior towards the interior, somewhat in the way a Palaeolithic handaxe is shaped; afterwards the sides were reworked. The final shaping and polishing never took place.

The presence of stone vessels was limited to the richest tombs, where there are always more than one of these items. The most popular raw material is alabaster (calcite), but limestone was also frequently used. The type differentiation is rather extensive; there are large, flattened, unrestricted bowls, smaller restricted bowls, small vessels and two stone imitations of cylindrical Wavy Handle types. All these stone vessels were imported to Elkab since neither alabaster nor good limestone can be found in the area.

Bone (not yet determinated) was used for the fabrication of bracelets, hairpins, spoons and, in one case, a small vessel. The presence of worked bone was in most cases correlated with the presence of stone vessels. On the partially disturbed body of a child in tomb 46, 19 small bracelets were grouped on the lower arms. A small bone vessel decorated with a cross line pattern on the body was found in the important tomb 76. A rather large collection of beads of different types and materials was also found. Most common were small, flat limestone beads but larger cylinders and other forms in different kinds of stone were also frequently present. Several kinds of shell (not yet determinated) were also used for this purpose. No flint implements have been found in these tombs.

It seems that the social differentiation of this population is illustrated by the difference in number and luxury of the goods occuring in graves. The presence of rich tombs mostly belonging to old male adults (in one case also to a younger man), fits well into the picture of the class stratified society in its definitive stage of formation as proposed by Krzyżaniak (1977).

3. Conclusions

According to the traditional typological systems, the Elkab cemetery can be placed between S. D. 65 and 81, or Stufe III A1 - B. A C14 date (Lv-1035), made on a char coal sample found in a vessel from the undisturbed tomb 67, gave an (uncorrected)

date of 4,490±60 B. P. Another date (Lv-1050 D), 3,910±210 B. P. on charcoal, was obtained for tomb 46. Further dates are being processed.

The time during which the cemetery of Elkab was used is not therefore easy to establish since the only dating possibilities we have is Petrie's S. D. system. According to Kantor (1965), the sequences of the final predynastic periods are much more restricted in time than those in the initial and middle phase of this period. Due to the fact that Petrie's system is based on only a limited number of tombs found in a much larger graveyard at Naqada and the absence of absolute datings, the value of time that has to be given to every sequence remains disputable.

A serious obstacle for estimating the importance of the Elkab settlement is the fact that the information about the exact number of inhumations is lacking. The cemetery is severely damaged and the results of the Quibell excavations are almost entirely unknown.

It is difficult to say that the area of Elkab was only inhabitated in the late predynastic times although, until now, no undisturbed tombs of earlier periods seem to have survived. However, sherds of older pottery (Black Topped, Red Polished) and even some rippled Badarian sherds have been found scattered over the surface within the circular wall of dynastic Elkab – an area completely destroyed by sebakh diggers – and also outside the wall, near the NE corner (Vermeersch, 1978: 144). So, it seems that Elkab may have been inhabited through the whole of the predynastic period. No trace of the settlement related to the cemetery, however, has been found though it is possible that it is situated below the alluvial plain (Butzer, 1959: 49).

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DIRK HUYGE

Rock drawings at the mouth of Wadi Hellal, Elkab (Upper Egypt)

During the 1979 - 80 campaign of the Belgian Archaeological Mission at Elkab (Upper Egypt) we had the opportunity to make a small-scale survey of rock drawings in the mouth of Wadi Hellal. This wadi, cut deeply through Cretaceous Nubian sandstone, opens into the Nile Valley forming a vast hemicycle. Its lower course exhibits numerous affluents, creating recesses and isolating sandstone buttes. Although rock drawings have been known from this area for a long time, only a few have been discussed in detail (Porter and Moss, 1937: 190). Moreover, the several hundreds of textual graffiti, recovered and copied by Janssen and Mekhitarian (1951), still await final publication.

Amongst the sites listed during our survey several attract attention for the antiquity of their drawings. Unlike fully Dynastic engravings and texts most of these drawings face the east and may be found alongside the north-western part of the wadi. All the decorated surfaces are fairly easily attainable and situated only a few meters above the present level.

Lacking appropriate material aids and due to shortage of time, it was impossible to obtain a complete and satisfactory account of the graffiti. Nevertheless, some preliminary suggestions may be put forward as regards their chronology and association with the habitational history of the Elkab area.

Nonrepresentational geometric designs, according to Davis (1977; 1978) the earliest known rock art achievements in Upper Egypt and Nubia seem to be wanting. Moreover, no decisive arguments can be put forward as to the attribution of drawings to the local Epipalaeolithic Elkabian, 14C-dated about 8,000 B.P. (Vermeersch, 1978). Faunal remains from Elkabian sites indicate preferential hunting of dorcas gazelle and aurochs, the latter and hippopotamus accounting for more than 90% of the meat supply. With the possible exception of dorcas gazelle, which occurs however in uncontestable Predynastic/Early Dynastic context, this game is not depicted amongst our series.

The portrayal of large mammals, such as elephant and giraffe, should not ne-

cessarily be thought to predate Predynastic times. These animals, in fact, fit well into Predynastic (especially, though not exclusively, Amratian) iconography. On the basis of style, technique, patination and, in one instance, superimposition they may be marked out from the great mass of Gerzean/Early Dynastic graffiti depicting boats and associated scenery. For the present, we would thus feel inclined to attribute elephant, giraffe and associated drawings (Fig. 1) to a Badarian or Amratian age. Human presence in the area at that time is attested by stray finds of red polished and black topped ware as well as rippled pottery within and near the great enclosure wall of Elkab (Vermeersch, 1978: 144).

Untill now, no direct archaeological evidence of Early Gerzean occupation has been recovered. Some rock drawings, however, bear so close a ressemblance to Early Gerzean figurative art, that not much doubt could be expressed as to their cultural affiliation. Amongst these, representations of sickle-boats with rounded stem and

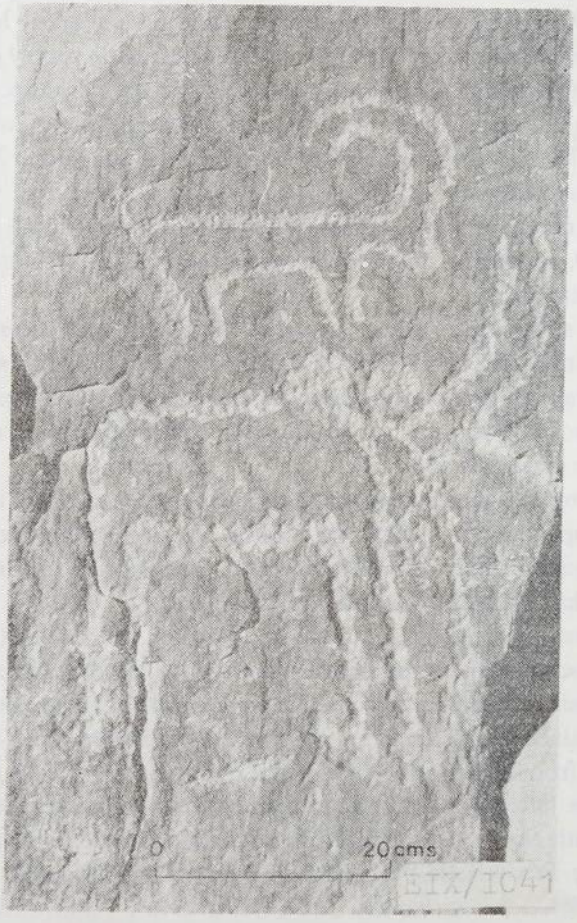

FIG. 1. Elephant and ibex (Badarian or Amratian?)

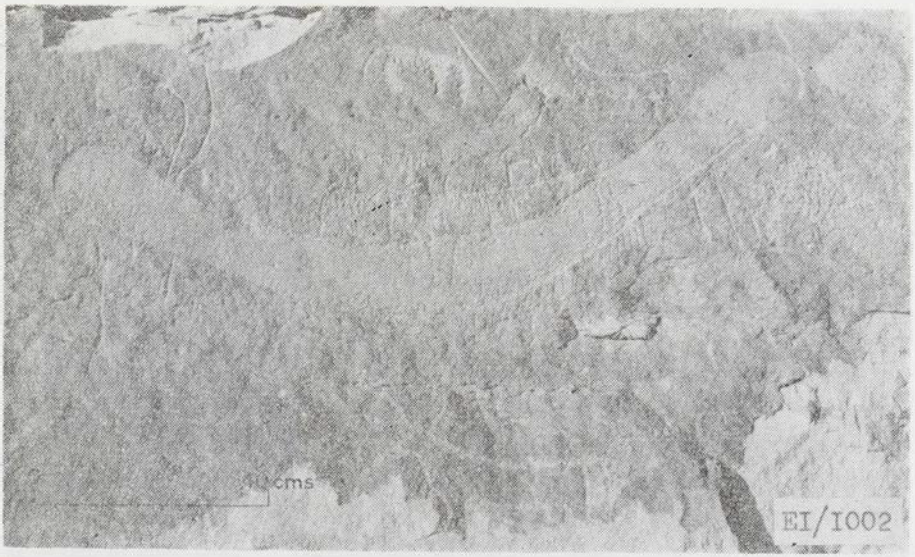

FIG. 2. Sickle-boat (Early Gerzean)

stern (Fig. 2) and human figures with upraised arms may be closely paralleled with painted ware motifs.

The numerous boat-drawings recorded display a great variety of styles and techniques. In addition, numerous transitional types between sickle-boats and square--boats may be noted. According to Engelmayer (1965: 71), these hybrid forms may well account for the methodical translation of indigenous papyrus boats (or their wooden replicas) into wooden square-shaped vessels in the Late Gerzean period. The plausibility of this theory, anticipated by Scharff (1942), may well be supported by the obvious late date of square-boats and their derivations in the Elkab area (Fig. 3). The associated scenery includes wild fauna, amongst which ibex, ass and gazelle predominate, as well as human representations. The latter are quite rare and appear most often in hunting scenes. In all likelihood the dog was used for hunting, thus presenting the only decisive evidence for animal domestication. Depictions of oxen (indifferently cows or bulls) do not show clear indications of domestication and on the basis of patination and superimposition can mostly be assigned to full Dynastic times. Thus, the assumed importance of animal husbandry in Late Predynastic/Early Dynastic society is not at all reflected in contemporary rock art.

The numerous Late Gerzean/Early Dynastic rock drawings accord well with the known archaeological record at Elkab. A recently excavated Late Predynastic cemetery (Hendrickx, this volume), sustaining the burial-needs of probably a relatively large community, may indeed account for an important demographic growth in the area. As all the evidence points to an archaeological continuum from Predynastic to Dynastic times in this area, it i s not clear to what extent the rock drawings

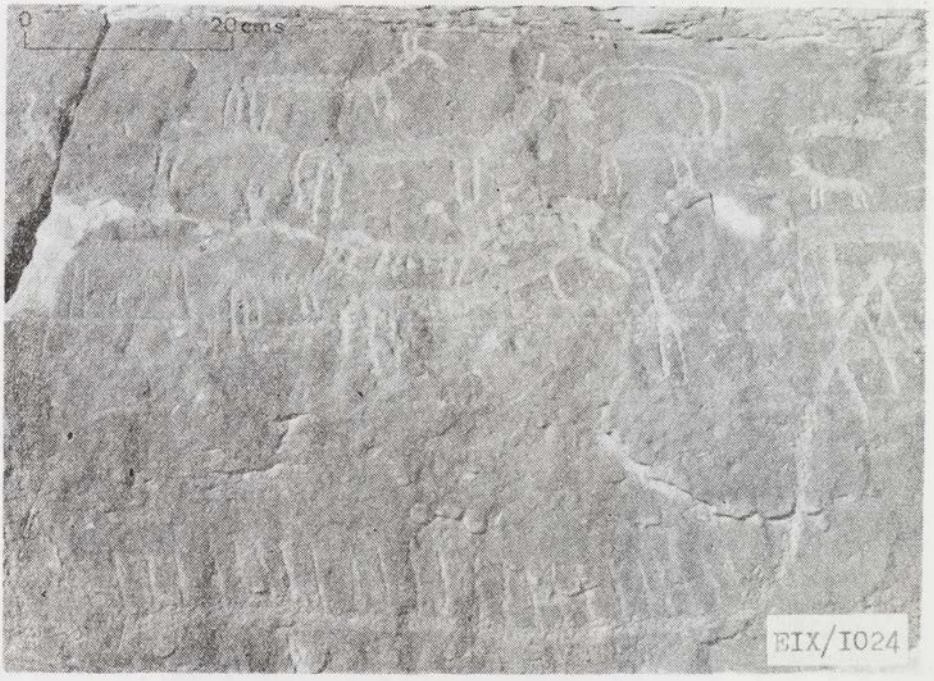

FIG. 3. Square-boat derivation and associated drawings (Late Gerzean/Early Dynastic)

fall into the historic period. On the basis of patination and superimposition it seems, however, that their greater part substantially predates local Old Kingdom textual graffiti belonging essentially to the 6th Dynasty (reigns of Teti and Pepi).

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MICHAEL A. HOFFMAN

Predynastic cultural ecology and patterns of settlement in Upper Egypt as viewed from Hierakonpolis

1. Introduction

Laying approximately 650 km. south of Cairo and 113 km. north of Aswan on the western bank of the Nile, the site of Hierakonpolis [1] has played a critical role in the emergence of the Egyptian state around 3,100 B.C. Known to the ancient Egyptians as Nekhen and sacred to the hawk-headed god Horus of Nekhen, Hierakonpolis boasts a wealth of archaeological remains dating from Acheulean through Ptolemaic times. Perhaps the site is best known for its Archaic and Old Kingdom town and the huge Predynastic settlements and cemeteries which stretch for approximately 2.5 km. along the low desert on the edge of the modern cultivation and extend 3.5 km. into the Western Desert along an ancient drainage course known to archaeologists as the Great or Fort Wadi and, to local inhabitants, as the Wadi Abu Suffian. As one of the few spots in the world where we can identify the rise of an autochthonous national state — the first in recorded history — Hierakonpolis is of inestimable importance to those interested in the origins of complex social, economic and political systems that were the direct ancestors of modern states.

Archaeological research at Hierakonpolis began in the late 19th century and has continued, sporadically, throughout the 20th. The present research originated in the late 1960's under Walter Fairservis and was resumed in 1978, after an interruption of eight years. An interim monograph *The Predynastic of Hierakonpolis* was published in 1982 by The Alden Press, Oxford, England summarizing the 1978, 1979 and 1980 seasons.

This paper presents in condensed form our preliminary conclusions on three interrelated aspects of the Predynastic cultural ecology of Hierakonpolis: settlement

[1] The archaeological work conducted at Hierakonpolis was made possible by a grant from the Smithsonian Foreign Currency Program administered by the American Research Center in Egypt and supplemented by a grant from the Virginia Museum of Fine Arts.

patterns, environment and economy. Each aspect is considered as an "issue". It is hoped that further discussion of such issues will shed more light on the general processes of state development in the Nile Valley during the fourth millennium B.C.

2. Settlement pattern issues

There are four aspects of settlement patterns that are directly relevant to the reconstruction of a Predynastic settlement system: (1) regional variation, (2) inter-site variation, (3) intra-site variation and (4) the architectural competence. These are cross-cut by a fifth concern – chronology. At present, it can only be noted that an extensive suite of radiocarbon dates has placed our material between about 3,800 and 3,100 B.C. (MASCA corrected radiocarbon years).

Without doubt Hierakonpolis was a major population center during Naqada I (Amratian), Naqada II (Gerzean) and Naqada III (Protodynastic) times. While no systematic surveys have been conducted beyond the central core of our concession, visits to neighboring desert fringe areas by staff members and reports by local informants and the earlier work by W. Kaiser and K. Butzer suggest a lack of significant Predynastic settlement. Although this situation must be confirmed by future ground and aerial survey, for now we may treat the area in and around the Great Wadi (including the Dynastic town of Nekhen) as a major focus of settlement. To what degree the floodplain outside the walled confines of Nekhen and its two mound-like outliers might have been populated in Predynastic times remains unknown. Inspection of a drainage ditch and plowed fields between the present desert edge and the site of Nekhen and deep soundings within the later site have revealed Pre- and Protodynastic pottery, structures and graves. Thus, in the absence of a systematic sub-surface testing of the local floodplain, any conclusions we draw about regional settlement patterns are biased in favor of the desert.

Despite these limitations, we may describe with some accuracy the nature and extent of Predynastic settlement in the desert. From the beginning it must be recognized that the Predynastic settlement pattern in the Hierakonpolis is unique in that it is both perpendicular and parallel to the Nile. This pattern contrasts with that traditionally reported for Predynastic settlements and emphasizes the importance of the Great Wadi as a focus for settlement. Contrasting to the sand and silt-choaked wadis immediately to the North and South, the Great Wadi possessed sufficient gradient and protection from drifting sands to enable it to collect and efficiently discharge the minimal rainwater runoff of the light rains that fell at Hierakonpolis during at least the first half of the fourth millennium B. C. For this reason, we believe that the Hierakonpolis region offered a very special attraction to potential Predynastic settlers. By concentrating the economic advantages of a number of ecological niches within a small area near to the Nile, Hierakonpolis offered an opportu-

nity for people to complement the floodplain based and river-oriented economy with adjacent desert pasturages and provided clay, fuel and ideal locations to support a major ceramic industry.

Viewed broadly, the Predynastic desert settlement pattern at Hierakonpolis presents the aspect of large, "core" sites surrounded by "outliers" of varying size and function. Interestingly enough, this pattern anticipates that for the Archaic and Old Kingdom town of Nekhen, with its two outliers. If the settlement pattern with its hierarchy of sites distributed over the landscape displays the structural aspect of human occupation, then the various, inter-related functions of those sites reveal the organizational fabric of Predynastic society and economy. For instance, it is now possible to identify seasonal, transhumant, industrial, residential and perhaps even military and administrative aspects of Predynastic settlement organization – not to mention mortuary and ceremonial-religious systems.

Viewed through time, the following conclusions can be drawn about desert Predynastic occupation: (1) The greatest extent of occupation was reached in Naqada I times (ca. 3,800 - 3,500 B.C.) and covered an area of about 304,878 m^2. (2) The greatest amount of site diversity also occurred in Naqada I times. (3) Definite Naqada II (as opposed to transitional Naqada I - II) occupation covered about 36,432 m^2. (4) Naqada III occupation extended over only about 2,994 m^2. These figures do not include the recently measured areas north of the Khasekhemui Fort but do give an accurate picture of the general trend toward the abandonment of the desert and the movement of the population center closer to the later site of Nekhen on the alluvium.

In Naqada I times there were two exceptionally large settlement centres (Fig. 1). The largest, traditionally known as the "Predynastic Town Site" embraces about 201,984 m^2 (not including outliers) and lies along and probably extends partly under the present borders of cultivation. The second major center, generally known as Locality 11, covers about 68,432 m^2 and lies at the mouth of the Great Wadi where it debouches from the sandstone hills onto the flat, Late Pleistocene silts of the low desert about 2 km. from the edge of cultivation. Both large centers are internally diversified and surrounded by smaller outliers. Excavations suggest that the "Town" site was more intensively occupied while Locality 11 acted as a secondary dispersal center for food procurement tasks (especially herding and dry farming) and pottery production (especially of red wares along the north bank of the nearby Great Wadi). A third function of Locality 11 involved servicing nearby cemeteries.

To understand the smaller outliers of the Locality 11 complex, we should visualize the flat, alluvial terraces of the low desert covered with clumps of tamarisk and acacia trees (especially the banks of the Great Wadi) and supporting seasonal plant communities sufficient to feed village herds, supply fuel for cooking and pot firing and attract occasional desert game. Nineteen different genera of plants have been identified from the Locality 11 excavations as well as a wealth of animal bone. The later suggest important differences between the two major centers in both the

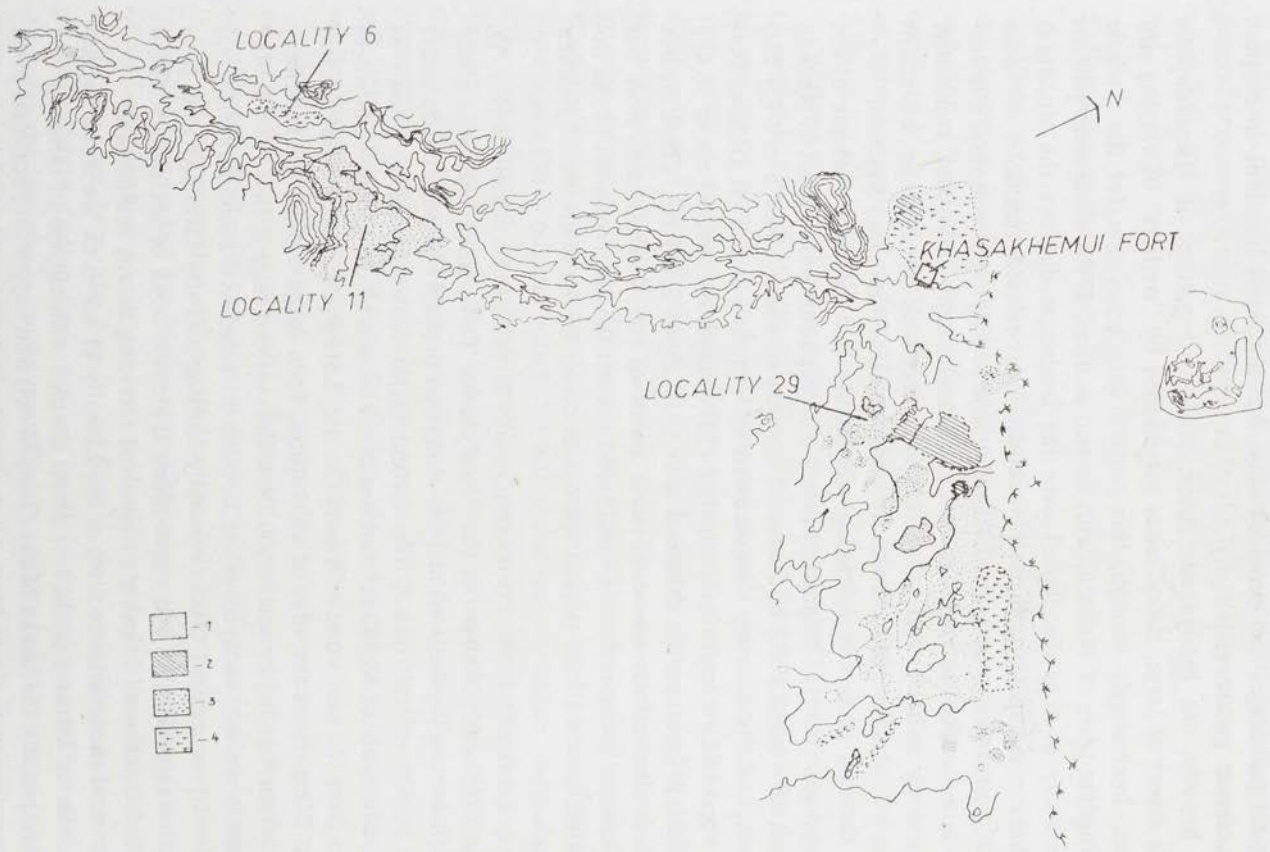

FIG. 1. Hierakonpolis. Map of Predynastic settlements and cemeteries

1: Early Predynastic settlements (ca. 3,800 - 3,500 BC); *2*: Late Predynastic settlements (ca. 3,500 - 3,200 BC); *3*: Proto-dynastic settlements (ca. 3,200 - 3,100 BC); *4*: Cemeteries

composition and age profiles of domestic animals in Naqada I times. Locality 3, the farthest site from the borders of cultivation (3.5 km.) was an outlier of Locality 11 located at a fork in the Great Wadi. Its distinctive plan of circular huts arranged in a circle recalls transhumant cattle camps among contemporary Nilotic herding peoples. Locality 5 in a small feeder wadi was probably an individual homestead while Locality 60, a trash mound on the low desert NE of Locality 11, probably belonged to a small group of dwellings and was in an ideal location to exploit the open seasonal pasturages of that zone.

Both the size and number of outliers associated with the "Town" center were greater than those associated with Locality 11. Evidence for specialized industrial production is not limited to kilns as at Locality 11. In addition to a number of huge pottery kilns used to manufacture the straw tempered utilitarian and industrial wares of the day, stone vase and bead manufacturing areas have been identified. More will be said of the role of trade and presence of exotic raw materials when discussing economic issues. The abundant evidence for the subsistence economy unearthed in our excavations and identified by our archeo-botanist, Prof. Nabil El Hadidi, and archeo-zoologist, Prof. John McArdle, will be considered at that time as well.

By Naqada II times (ca. 3,500 - 3,200 B.C.) all desert settlement was restricted to a strip about 300 m. wide parallel to the edge of modern cultivation. Naqada II occupation covers an area of about 36,432 m^2 and (to date) consists of three principal sites. In at least one of those sites, there is clear evidence that the population was moving closer to the river from their previous Naqada I homes. There is thus clear evidence for continuity of population between Naqada I and II times – a fact that should lay to rest forever the old concept of Gerzean invaders. The settlement shift is mirrored in the relocation of cemeteries closer to the edge of modern cultivation.

The apparent concentration of Naqada II population near the edge of cultivation and in particular around Locality 34b (an impressive "stone mound") might be due to a number of factors acting either singly or (most probably) in combination. These include: (1) degradation of the fragile desert ecosystem by the use of trees and shrubs for fuel in the numerous pottery kilns and overgrazing by sheep and goats; (2) climatic deterioration involving the decline or final disappearance of the light seasonal rains of the Naqada I period: (3) military factors requiring more defensible population aggregates; (4) increasing emphasis on alluvium-based subsistance and manufacturing; (5) increasing emphasis on river transport, involving both trading and raiding and (6) the development of a ceremonial center – probably at the adjacent site of Nekhen – which served as a focal point for regional worship and social, political and ideological integration.

The population shift toward the alluvium continued in Naqada III times (ca. 3,200 - 3,100 B.C.). A total of three sites covering only 2,994 m^3 represent the de-

sert portion of the Naqada III settlement system. One exception to this are two apparent guard stations along The Great Wadi near the Locality 6 elite cemetery. Otherwise, the desert settlement pattern consists of a residential stone mound (Locality 25c (1) – a smaller and better-preserved version of Locality 34 b – and an adjacent, large rectangular structure (Locality 25 c (2) – probably an elite administrative building. A small earlier site (Locality 25) was used as a trash dump.

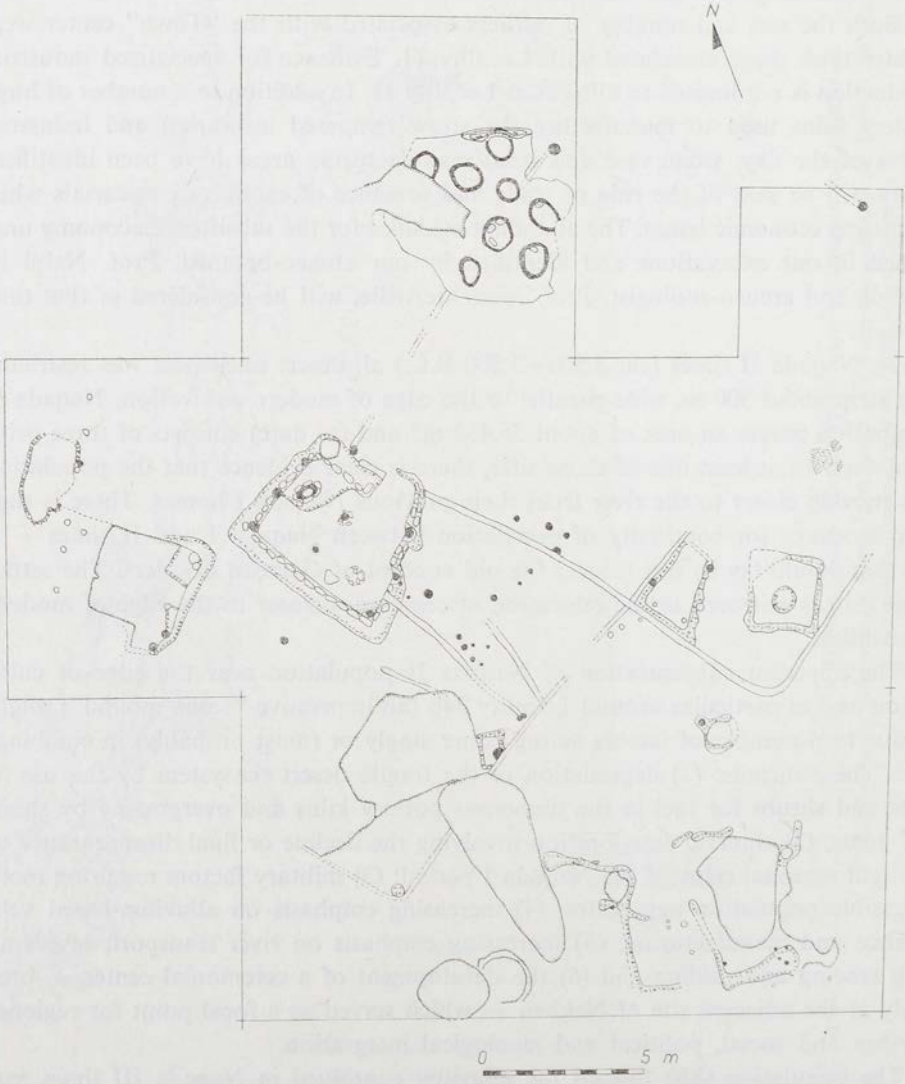

FIG. 2. Hierakonpolis, Locality 29. Plan of Amratian settlement

It is clear from our 1969 investigations at Nekhen that most of the population was now resident there during Naqada III times.

Finally, brief mention must be made of the knowledge gained of internal site variation and architectural units. At Locality 29, the most extensively tested site, 600 m^2 have been cleared and two principal occupation phases – both Naqada I – revealed (Fig. 2). The earliest phase (I) features an "open" or "barnyard" pattern with a rectangular, semi-subterranean house (4.0 × 4.50 m.) and associated outbuildings enclosed within a *zeriba* type fence. Appended to this complex was a pottery kiln, the fire from which ultimately caused the destruction of the rectangular dwelling. A number of other features and structures have been mapped and all the ceramics (over 357,000 sherds), part of the lithics (about 6,000 pieces), the botanical remains and faunal assemblage analysed.

Excavations at the Naqada I site of Locality 11 revealed portions of apparently circular post dwellings of substantial size and separate trash disposal and industrial (pottery kiln) zones. It has been shown that function – as much if not more than time – accounts for major differences within sites, including both artifactual and organic remains.

Although houses have been identified and mapped at ten sites, two Naqada I sites – Localities 3 and 49a – provide interesting complements to the data gathered from Localities 29 and 11. As mentioned earlier, Locality 3 consists of a circle of approximately 12 small, circular dwellings. These resemble the "hut circles" reported by Caton-Thompson from Hemamieh, at least on the surface. The average house size was 5.51 m^2 – a figure far below the average for rectangular structures.

Locality 49a consists of a grid-like arrangement of cobblesize rocks. As long ago as 1969 we noted the probability that such concentrations represented the deflated foundations of rectangular, agglutinated houses of mudbrick. To date we have mapped two rectangular dwellings and associated compounds, situated next to one another. Field observations and statistical calculations suggest a settlement of 10 or 11 houses packed tightly together. The house plans resemble those of Dynastic Egyptian peasant dwellings and the famous Predynastic house model from El Amrah.

A final type of structure, represented by previously-mentioned "stone mounds", has been identified at Naqada II Locality 34b and Naqada III Locality 25c (1). In both sites, cobble-size rocks were used as building foundations. Although the mud mortar has long since disappeared, distinct rooms are often detectable. At Locality 34b large buildings were terraced against a low hill surrounding an open courtyard, creating the impression of a fortified compound. Although the walls were lower and structures less impressive, the Locality 25c (1) complex was also built on a low rise. Its many rooms give it the appearance of a maze, while a large rectangular structure nearby [Locality 25c (2)] may have been a palace or administrative building.

3. Environmental issues

Four environmental issues will be considered: (1) the question of regional boundaries, (2) the role of the Great Wadi, (3) climatic change and (4) the problem of "cultural biomass".

The regional boundaries of the socio-political unit of Hierakonpolis have yet to be defined archaeologically. We suspect they will correspond to natural geographic boundaries and correlate roughly with the borders of the Hierakonpolite nome in Old Kingdom times. More extensive regional surveys are being undertaken to solve this problem.

It seems apparent that the area around the Great Wadi was a major population center at least from Predynastic times. The unique effectiveness of this drainage and catchment system has already been mentioned. Protected from the accumulation of wind blown sand and having a comparatively steep gradient, the Great Wadi was able to concentrate and transport surface runoff to create a well-watered pocket of high biomass in the desert borderlands – a pocket that ultimately attracted Predynastic settlers. The presence of desert clays and rocky prominences exposed to the prevailing northerly winds also rendered it attractive to Predynastic potters intent on the production of fancy, mortuary wares.

The Naqada I settlement pattern can only be explained by increased rainfall producing additional runoff in the Great Wadi. Although the actual amount of rainfall may have been quite small, the fact that it occurred at all was enough to trigger responsive xerophytic plant communities and produce desert pasturages and, probably, permit the cultivation of a crop of barley. The 19 genera of plants found at Locality 11, including weeds, argue against the deliberate importation of the floral materials by man (also, the barley is unprocessed) and force us to admit the likelihood that increased rainfall permitted the extension of the floodplain flora onto the low desert – a phenomenon we were able to observe ourselves in 1980 after the two downpours of late 1979. It is possible that these rains were a terminal phase of the "Neolithic Subpluvial" and that their cessation forced the effective abandonment of the far desert after 3,500 B.C. It is also possible that this process was the result of environmental degradation caused by the pottery industry and overgrazing by village flocks and herds.

Finally, it is necessary to consider the effects of the cultural filter through which organic archaeological remains pass. It has been our aim to reconstruct what we call the "palaeo-cultural biomass" at desert sites where our 1969 testing revealed nearly perfect organic preservation. As already mentioned, we have found significant differences between controlled floral samples from different functional zones of the same site. This should caution against the facile reconstruction of palaeo-environments so characteristic of recent archaeological and palaeoclimatic research. Nevertheless, given proper preservation conditions and intelligent sampling procedures, we may be able to reconstruct the Predynastic biomass of the low desert.

This might be accomplished by noting the relative volumes and frequencies of plant and animal remains in functionally distinct zones of the same component, contrasting this information with dietary data provided by coprolite analysis and then comparing all data to contemporary plant density and consumption patterns after serendipitous rainfalls such as occurred in 1979.

4. Economic issues

We define economy as the means by which people manipulate their environmental and cultural resources according to a mixture of socially-derived rules, norms and alternatives and individually-manipulated opportunities and possibilities. We will discuss three economic issues: (1) subsistence, (2) artifact production and (3) exchange.

Subsistence deals directly with food hunted, caught, collected, produced, processed and consumed. The archaeological evidence includes: wheat, barley, sycamore figs, cattle, sheep, goats, pigs, gazelle, hippo and fish. Wild plants and animals (with the exception of fish) played negligable roles in Predynastic diet although several wild and domesticated plants and animals not used as food played significant economic roles as artifacts (*e.g.*, flax for linen, grasses for mats and baskets, wood for beds, leather for rope and clothing) and means of transport (*e.g.*, donkeys).

The fact that plant and animal remains vary in distribution both within and between sites complements the artifactual evidence and suggests a complex division of labor organized around alternate strategies of food extraction, production and processing.

A complex division of labor surrounding artifact (craft) production is most apparent in pottery manufacture which attained truely staggering proportions during Naqada I times, being closely linked to environmental degradation, the mortuary and exchange system and the rise of elites. Other crafts included the production of stone vases, stone and shell ornaments, and maceheads; the weaving of baskets, mats and rope from local reeds and grasses; the manufacture of fancy chipped stone knives, "lanceheads" and animal effigies; the weaving of linen from flax and the carpenter's trade, which turned out well-fitted beds and boats which plyed the Nile. Almost certainly, well-developed metallurgy and vase and mural painting should be added to this list by Naqada II times.

Exchange systems operated on at least three levels: (1) regional, (2) inter-regional and (3) international. In addition to the physical objects exchanged, we are interested in the social, economic, political and symbolic consequences of this activity. Ultimately, we want to identify the networks through which goods moved, the pattern of distribution of these goods with Predynastic communities, the volume of exchange and the ultimate effect of unequal or assymetrical exchange on the grow-

ing division of labor, increasing military competition and the emergence of elites.

On the regional level, we have already noted differences in subsistence strategies between contemporary sites in the Hierakonpolis area and identified "industrial" and craft production *loci*. Such functional specialization pre-supposes local networks of exchange and re-distribution and probably markets. For the pottery industry, for example, there were doubtless economic arrangements for obtaining fuel, for manufacturing and transporting the finished products and, ultimately, for distributing these to customers for use in either utilitarian or mortuary contexts.

On an inter-regional level, Hierakonpolis was clearly a pottery production center. It is hoped that our quantification of almost 400,000 sherds and the micro-stylistic analyses currently in process as well as radio-chemical tests will identify scientifically the extent to which Hierakonpolis pottery was distributed throughout the Nile Valley. Other probable exports were groundstone vases and bowls, maceheads and stone beads. To date, we have identified unfinished porphyry maceheads at surface localities and clusters of stone vases and ornamental raw materials within several sites. These data are supported by earlier observations by Butzer (in the "Predynastic Town") and by Quibell and Green (within Nekhen) as well as our 1969 excavations at Nekhen. Other, more perishable, materials found in cemeteries (mats, rope, baskets, leather goods, linen and "mummia" resin) may also have been exports. Although much fancy, painted Naqada II pottery is generally regarded as an import, we wish to reserve judgement on this matter pending scientific tests. One clear import, however, was Aswan granite. This material was employed for milling stones in Predynastic times and was even found in unmodified boulder form in the fill of a large Naqada III stone-cut tomb (the earliest structure of its kind). The import of such material foreshadows the wholesale use and exchange of Aswan granite in Dynastic times for monumental sculpture and architecture.

Finally, we consider the international implications of Predynastic exchange systems. Most spectacular in this regard is a small lapis lazuli figurine found at Nekhen by Quibell and Green and Garstang. The material is probably derived from Afghanistan, although the sculptor was probably Egyptian. The date is probably Naqada III (Protodynastic). Throughout Egypt in Naqada III timea (ca. 3,200 - - 3,100 B.C.), there is also evidence for imported "Syro-Palestinian" or "Levantine" pottery and such ware has been noted recently by Williams at the Nubian site of Qustul, about 350 air km. south of Hierakonpolis. In Egyptian archaeology there has been a longstanding and somewhat counter-productive argument over the "origins" of many "foreign influences" in Naqada II and III times, including architectural styles and artistic motiffs closely linked with the emergent kingship. I suggest that it would be most productive to abandon our search for a mythical "center of civilizational influences" in the same way that we have abandoned (hopefully) our search for a conquering "Dynastic Race." Instead, we must broaden our scope, bot h temporally and geographically, and inquire into the relationship between the

rise of elites and the growth of international exchange during the fourth millennium B.C. in a vast area extending from Greece in the West to the Indus Valley in the East. Such inquiries, I believe, will bring us back, ultimately, to the regional and functional contexts which led to the development of complex societies and force us to appreciate the diverse social, economic, political, environmental, ideological and even idiosyncratic processes responsible for cultural changes [2].

[2] Due to insufficient space and the primary nature of these data, footnotes and citations have been omitted. The general reader may consult the author's *Egypt Before the Pharaohs*, Knopf 1979, or *The Predynastic of Hierakonpolis*, Alden Press, 1982 for a general bibliography and discussion of the archaeological history of Hierakonpolis.

Bolesław Ginter and Janusz K. Kozłowski

The Tarifian and the origin of the Naqadian

The state of research on the origins of the Neolithic cultural units from the Nile Valley in Upper and Middle Egypt is entirely unsatisfactory. There are two reasons for this: our generally poor knowledge of the Early Holocene cultures (aggravated by the considerable hiatus between them and the Neolithic), and the similar paucity of our knowledge about the Neolithic cultural units themselves.

Particularly striking in the region concerned is the wide gap – both cultural and chronological – dividing the latest Epipalaeolithic cultural unit – Elkabien, dated to the turn of the 7th millennium B.C. (C14) and based on a pre-ceramic, microlithic, geometric blade industry (Vermeersch, 1970; 1978), from the earliest ceramic units including the Badarian whose dates do not exceed the 5th millenium B.C. (C14).

Our knowledge of the Badarian and the subsequent cultural units of Naqada I and II is equally deficient. While it is true that the stratigraphic sequence of the site at Badari (Hemamieh) indicates the basic features of the cultural evolution, nevertheless the definition of the various cultural units is based not on the stratigraphy of settlement assemblages, but on highly selective materials from the cemeteries classified according to the principle of sequence dating. Radiocarbon dating of the units distinguished in this way, *e.g.*, Naqada I and II, does not confirm that they form a sequence, thus pointing to the need to verify both the diagnostic elements for the individual units and their chronological position (Cf. Kaiser, 1956). This will be possible only when we have at our disposal clearly stratified settlement material. Unfortunately, the stratigraphic sequence of the site at Badari (Hemamieh) – despite the many interesting suggestions arising from the account published by Brunton and Caton-Thompson (1928) – does not enable us to reconstruct in full the assemblages occurring in the different levels. The other settlement sites in the area (these total to about 40 in the regions of Badari/Qau, Matmar and Mostagedda) also deny us the possibility of fully exploiting the stratigraphic observations, mainly because they have been excavated by means of random exploration levels, without sufficient attention to the cultural-stratigraphic and lithologic units. The same applies to the

site, with the relatively best documentation, at Armant (Mond and Myers, 1937).

In view of the above situation it is worth drawing attention to the importance of the stratigraphic observations made at the site of El Tarif (despite the comparatively small area of the undisturbed Predynastic strata, preserved only fragmentary between the two 4th Dynasty mastabas). The site, located at the point where the low desert meets the cultivation area, was investigated by Arnold (1974) and subsequently by the authors of this paper (Ginter *et al.*, 1979).

The site rests on the gravel deposits of the recent pediment deposits composed of material originating from the destruction of the Theban limestones and Esna slate which surround the low desert zone. As can be seen from the profiles situated directly at the foot of the Theban Gebel, in the area of Qurna village the deposits are later than the silts of the Sahaba-Darau aggradation. On the surface of the gravels, part of which forms a kind of calcareous breccia, Late Palaeolithic artefacts occurr containing backed elements (arched backed blades) alongside the Levallois elements. The gravels themselves, on the other hand, contained, in secondary position, both Upper and Middle Palaeolithic artefacts. The surface of this sediment is intersected by some older rain channels. On the basal gravels there rests a loamy sediment containing fine gravel. The composition of the loamy fraction does not include quartz or feldspars, and its mineral composition suggests that it is of eolian origin. The thickness of this layer fluctuates between 2-20 cm. and it yielded some heavily eolized artefacts connected with the new cultural unit defined as the Tarifian.

Above this layer we also found loamy sediments, but without archaeological material. Preserved only in parts, the sediments include in their composition: products of the laterite weathering of the rocky substratum and, above all, clay minerals from the illite group and the ferrous oxides: hematite and getite. This bears witness to the transport of material belonging to the destroyed red soils on the slopes of the Gebel.

On this series lies the black anthropogenic level consisting, to a considerable degree, of ash and charcoal as well as clay minerals and carbonates. It was this sediment which yielded the settlement levels associated with the Naqadian which subsequently were intersected by a younger generation of rain channels. Part of the Tarifian finds from the loamy sediment form fairly restricted concentrations of artefacts of the "kshemenitsa" type, one of which was associated with a hearth approximately 0.5 m in diameter. The rest of the finds were loose and did not form any distinct planigraphic structures.

The flint inventory of the Tarifian yielded by the excavations of Arnold as well as our own totals approximately 5,400 artefacts (Fig. 1-3). These include 110 cores and 561 retouched tools (not including unidentified fragments). Flakes are more numerous than blades which account for less than 10% of all products. Similarily, among the tools flake forms are more common than those made from blades. Over 80% of the total were made from the local grey Theban flint. Imported raw materials are negligible. Our attention is drawn to the lack of care taken, or even the arbi-

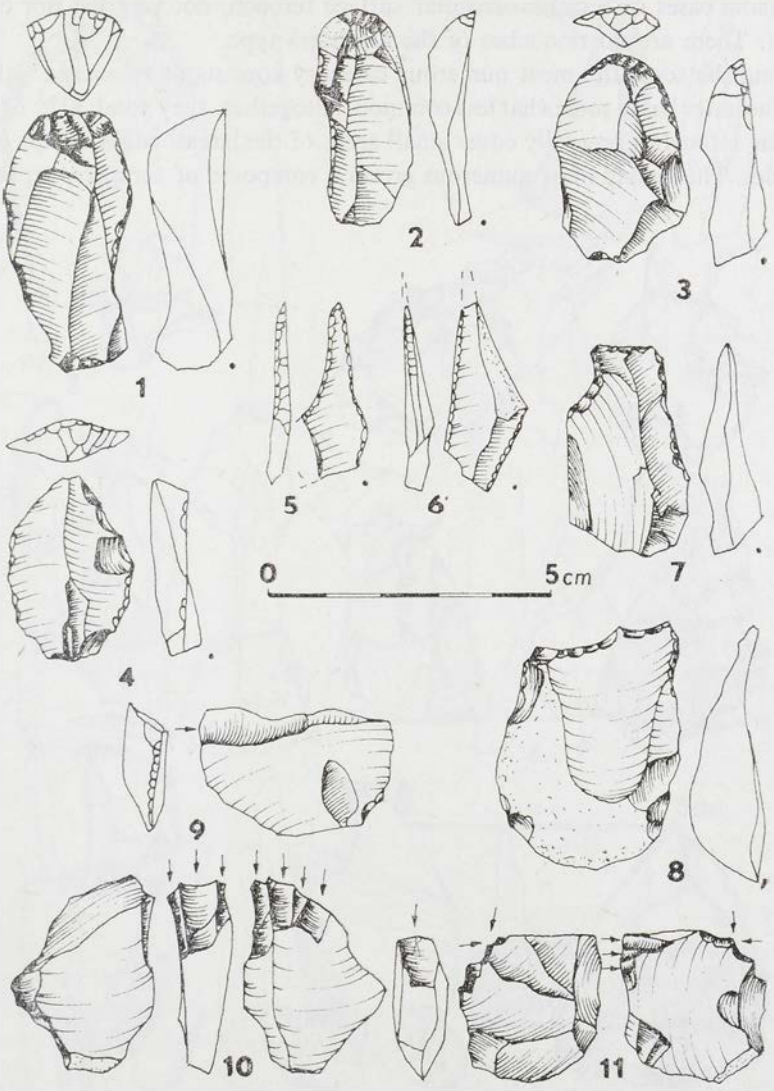

FIG. 1. El-Tarif, layer 2. Tarifian implements
1 - 4: End-scrapers; *5 - 8*: Perforators; *9 - 11*: Burins

trariness, which characterizes the initial preparation of the cores. Apart from a small number of blade specimens these are often completely devoid of preparation. The frequently random choice of blanks for producing the tools is also a characteristic feature. Traces of Levallois technique as well as microlithic bladelet technique are completely absent. In forming the tools, the predominant type of retouch used was marginal, semi-steep and steep; flat retouches are more rarely encountered and there

are sporadic cases of a rather irregular surface retouch, not very flat nor carefully executed. There are no retouches of the Ouchtata type.

Among the tools the most numerous category consists of retouched flakes and blades, the latter being somewhat less common. Altogether, they total 30% of all the tools. The retouches generally cover small areas of the lateral edges or tips of flakes and blades. The second most numerous group is composed of scrapers, representing

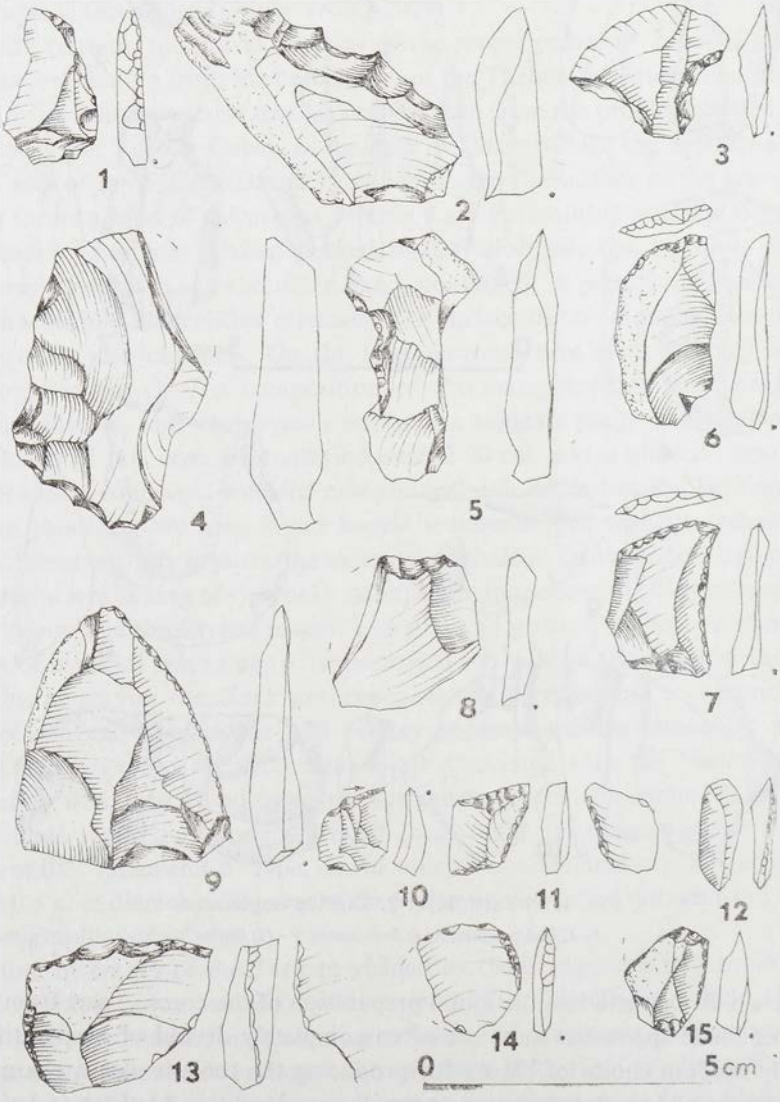

FIG. 2. El-Tarif, layer 2. Tarifian implements

1: Backed piece; *2*: Denticulated implement; *3 - 5*: Notched pieces; *6 - 8*: Retouched truncations; *9, 13 - 15*: Retouched flakes; *10, 11*: Microliths; *12*: Microburin

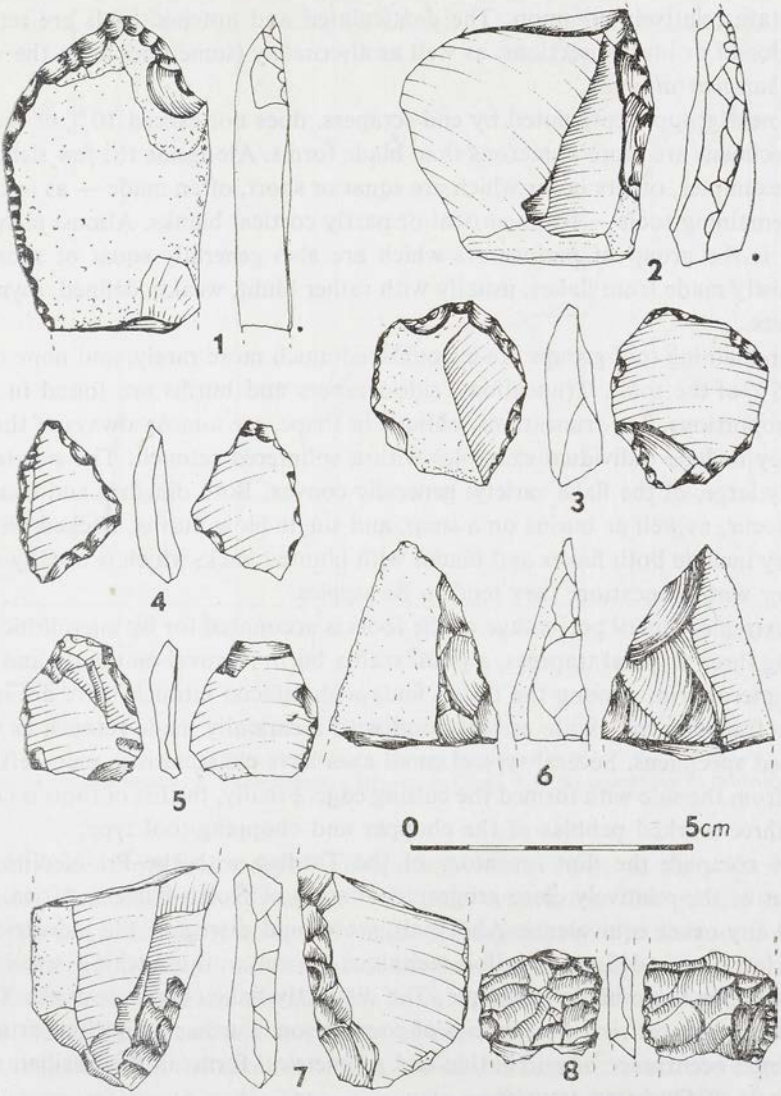

FIG. 3. El-Tarif, layer 2. Tarifian implements
1 - 2: Side-scrapers; *3 - 5*: Irregular scrapers; *6 - 8*: Bifacial tools

approximately 20% of the tools. Irregular, steep and semi-steep retouches on the dorsal and inverse sections generally cover considerable parts of their edges. Together with the retouched flakes, they are a particularly characteristic feature of the Tarifian tool kit.

A much smaller group is that containing notched and denticulated pieces, usually made from relatively large and robust flakes. Among the notched pieces Clactonian

notches are relatively common. The denticulated and notched tools are retouched on the dorsal or inverse sections, as well as alternately (sometimes after the fashion of *bec burinant alterne*).

The next group, represented by end-scrapers, does not exceed 10% of the tools; flake specimens are more numerous than blade forms. Alongside the few slender and regular examples, others occur which are squat or short, often made – as in the case of the remaining tools – from cortical or partly cortical blanks. Almost identical in number is the group of perforators which are also generally squat or short; they were mostly made from flakes, usually with rather blunt, weakly defined, asymmetrical points.

The remaining tool groups are encountered much more rarely, and none of these exceed 5% of the total. Truncations, side-scrapers and burins are found in almost equal proportions. The truncations, oblique in shape, are almost always of the blade type; they include individual examples with a splintered retouch. The side-scrapers are fairly large, of the flake variety, generally convex. Both dihedral and truncation burins occur, as well as burins on a snap, and single blow burins. Backed pieces are rare; they include both flakes and blades with blunted back, which is usually slightly arched or with truncation; they tend to be atypical.

An extremely small percentage of the tools is accounted for by microlithic forms, including three atypical trapezes, a point with a burin removal on the tip and a *Krukowski* microburin. Among the dozen finds with bifacial retouch there are axe-like forms, a fragment of a knife or leaf point with a carefully made retouch as well as unfinished specimens. Several typical small axes have characteristic scars left by removals from the side with formed the cutting edge. Finally, the list of tools is completed by three worked pebbles of the chopper and chopping-tool type.

If we compare the flint inventory of the Tarifian with the Pre-Neolithic flint industries of the relatively close geographical areas of North-Eastern Africa, we do not find any exact equivalents. Above all, we should disregard the industries with more or less clearly defined Levallois technique, as well as those with a strong component of microlithic blade technique. The distinctly flake character of the Tarifian also substantially restricts possibilities of comparison. Further limitations arise from the minimal occurrence of microlithic and geometrical forms in the Tarifian as well as the lack of Ouchtata retouch.

However, despite the differences, a comparison of the frequency and structure of the major tool classes may indicate a certain similarity between our inventory and the industries which constitute the complex called the Shamarkian, particularly its final ceramic phase known as the Post-Shamarkian. Analysis of the Tarifian tool kit suggests that it represents development of certain tendencies which become visible if we compare the Post-Shamarkian with the earlier chronological stages of this whole complex; namely a trend towards a decrease in the frequency of geometrical microliths and an increase in the incidence of flake technique for producing tools.

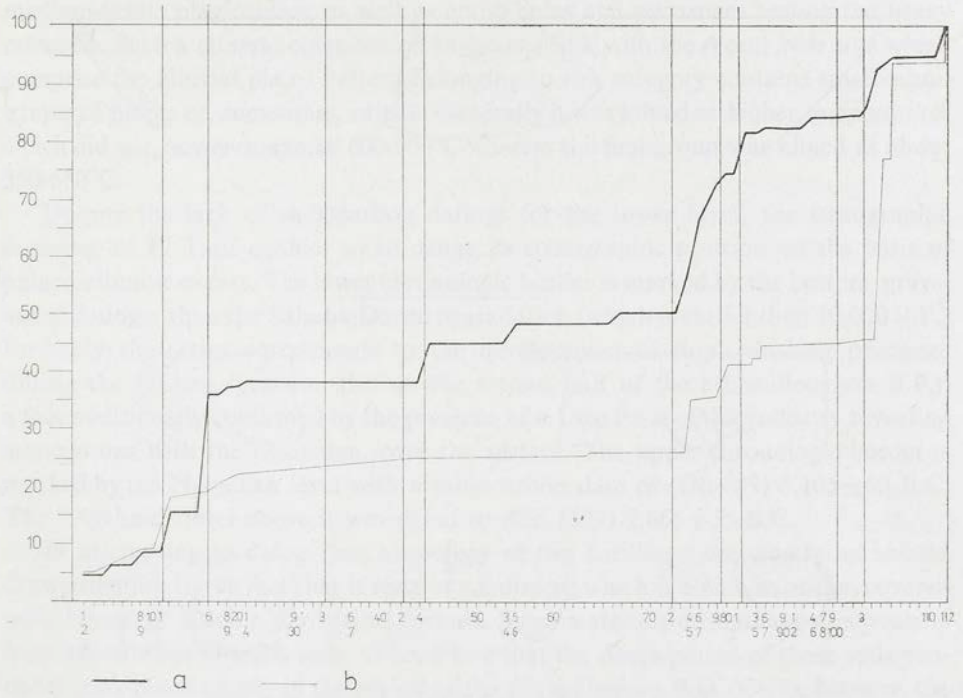

FIG. 4. Cumulative diagram

a: Dibeira West 50; *b*: Tarifian (excavation 1978)
According to typological list by J. Tixier; additional types cf. B. Ginter, J. K. Kozłowski and B. Drobniewicz, 1979

The occurrence in our inventory of bifacial implements may, on the other hand, be the consequence of its already more "Neolithic" character. The possibility should also not be excluded that some technological divergences may arise from the markedly different character and dimensions of the raw material employed. A comparison with the Post-Shamarkian assemblages from Dibeira West 4 and especially with DIW 51 reveals a rather similar pattern of cumulative curves on the graph, which perhaps suggests that the taxonomic position of the Tarifian is not too distant from the latter assemblage (Fig. 4). Thus, it is quite possible that the Tarifian represents the northern, late ceramic variant of the Shamarkian.

The pottery occuring in the Tarifian assemblage (Fig. 5) is not numerous and is preserved only in small fragments, which renders reconstruction of its forms extremely difficult. The following forms of vessels were encountered: a hemispherical bowl, a spherical vessel with a thick collar, a vessel with a spherical belly and cylindrical neck, a conical bowl, a large vessel with straight walls and, finally, a fragment of a flat plate. Apart from one fragment with an oblique printed pattern the ceramic finds bear no decoration.

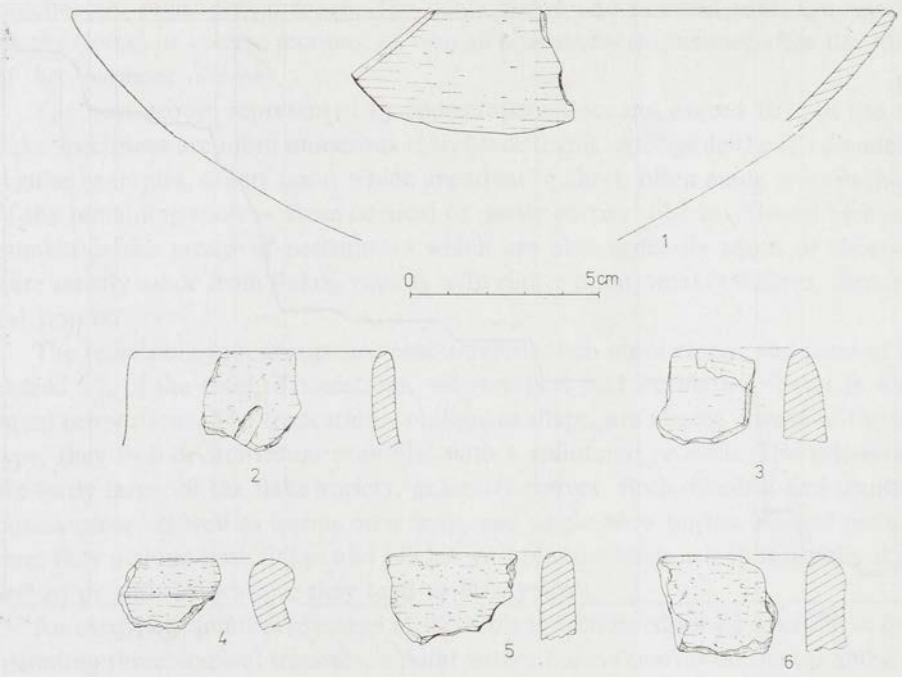

FIG. 5. El-Tarif, layer 2. Pottery from Tarifian layer

The macroscopic features of the ceramic mass allow us to distinguish the following type:

1. potsherds of medium thickness, straw, fibre and mineral (sand) tempered (56%),
2. fragments of thin-walled ceramics with a smooth surface, sand tempered (10%),
3. fragments of thin-walled, fibre tempered,
4. potsherds with walls of medium thickness, straw tempered with mineral (crushed stones) admixtures.

It thus follows that most of the ceramics correspond to the so-called chaff ware.

The petrographic – mineralogical and technological – examination of the pottery from Tarif allows us to distinguish two technological types: ceramics with a random texture, undoubtedly struck by hand, and ceramics with a parallel texture, probably formed on a moving base. The first type may, perhaps, be made of material from the Late Pleistocene silts of the Nile, *e.g.*, of the Sahaba-Darau formation. This is suggested by the presence, in the mineral composition, of elements originating from the weathering of granites and syenites, such as potash feldspars or, among the heavy minerals, zircon and rutile. The pottery of this group is tempered with quartz, organic admixtures and fragments of clay rocks.

The second group, consisting of ceramics with parallel texture, was made from material originating from basalts and diabases; this is indicated by the presence of

medium-acidic plagioclases, as well as amphiboles and pyroxenes among the heavy minerals. Such a mineral composition suggests a link with the recent Nile silts which comprise the alluvial plain. Pottery belonging to this category contains small admixtures of plants or, sometimes, calcite. Generally it was kilned at higher temperatures which did not, however, exceed 600-900°C whereas the first group was kilned at about 350-650°C.

Despite the lack of radiocarbon datings for the lower layer, the stratigraphic sequence of El Tarif enables us to define its stratigraphic position on the basis of palaeo-climatic events. The lower chronologic border is marked by the bottom gravel series younger than the Sahaba-Darau aggradation (which is earlier than 10,000 B.P.) Probably the series corresponds to the development of slope washing processes during the Dishna recession (before the second half of the 8th millennium B.P.). a fact additionally confirmed by the presence of a Late Palaeolithic industry revealing associations with the Qadanian, over the surface. The upper chronologic border is marked by the Naqadian level with a radiocarbon date of (Gd-689) 3,105±60 B.C. The "Archaic" level above it was dated to (Gd-1127) 2,665±55 B.C.

In attempting to define the chronology of the Tarifian more closely we should draw attention to the fact that it rests in a sediment which is eolian in origin, covered with layers of similar derivation formed from materials containing components from the erosion of fossil soils. Considering that the development of these soils probably took place mainly in the period of the 6th millenium B.C. (C-14), between the El Kab/Dibeira 51 micro-aggradation of 6,040-5,750 B.C. (Wendorf and Schild, 1976 : 310) and the micro-aggradation corresponding to the deposits in Cattfish Cave of 5,110 B.C., we should conclude that the series of sediments under discusion was formed in the following dry period when the processes of eolian erosion (for example, of the earlier soils on the slopes of the Gebel) were at their peak, namely in the first half of the 5th millennium B.C. (C-14). This would be the period corresponding to the above-mentioned micro-aggradation known from the Nubian Cattfish Cave and to the lake Protomoeris in the Fayum depression. If we take into account the occurrence of archaeological relics in the bottom part of the series – *i.e.*, in the part which was formed at the very beginning of the dry period – then it would seem likely that the age of the Tarifian coincides with the very beginning of the 5th millennium B.C. (C-14).

A comparison between the chronologies of the Tarifian and Naqadian is possible not only in the case of the sequence discussed here. The stratigraphy of the cultural development at Badari (Hemamieh) would seem to reflect a similar sequence, except that it is richer in developmental levels. The lower part of the Badari sequence, beneath the breccia, consists of sediments of the limestone debris type. These yielded flint products, mainly flake tools including a large number of scrapers and high end-scrapers as well as numerous denticulated and notched tools. Such artefacts correspond, in a general sense, to the Tarifian assemblage and are quite different from these appearing in the later layers. The oldest pottery from the levels in question was dated

by TL to 5,580±420 (for the level 6.5 feet below the breccia) and 5,495±405B. C. (for 1.33 feet below the breccia) (Whittle, 1975 : 119). These dates ought to correspond to the radiocarbon dates from the first half of the 5th millennium B.C., after taking calibration into account. At the same time, the debris series at the site must also have come into being in relatively dry conditions (Butzer, 1958 : 90). At El-Tarif we do not find any equivalent of the Badari breccia (where the pottery in this layer has a TL date of 4,690±350), but the TL dates for the Naqadian ceramics from El-Tarif (4,340 and 3,810) agree with the dates from Badari from the level at 5.5-5.0 feet, in the layer of slope deposits (4,330 and 4,450) and at 2.5 feet, in the anthropogenic layer (dated to 3,775±330). In this last case the pottery has been defined as already Naqadian (Gerzean). The increase in the humidity of the climate – evidence of which may be found in the second generation of rain channels at El-Tarif – has also equivalents at other Predynastic sites, *e.g.* in Armant where evidence of increased wadi activity is apparent and is connected with the increase in humidity towards the end of the Naqada period; this has already been suggested by Butzer (1958). Our own observations made in the Fayum depression, concerning the increased supply of water to the Neolithic lake in the middle of the 4th millennium B.C. (C-14) indicate that the growth of humidity began somewhat earlier than the radiocarbon date of 3,105±60 from El-Tarif (Ginter *et al.*, 1980).

In trying to trace the relationship between the flint inventory of the Tarifian and the flint industries of the Predynastic cultures we should bear in mind the difficulties arising from the hitherto unsatisfactory state of research as well as from the lack of typical settlement assemblages. The stratigraphic sequence of the sites belonging to both Badari and Naqada culture reveal a clearly defined differentiation of the inventories throughout the various levels; however, the way in which these were distinguished in the field and, in particular, the system of their publication leave much to be desired. This is clearly visible in relation to the basic multilayer sites, such as Badari (Hemamieh), Mostagedda or Armant. Therefore, any methodical attempt at comparing the flint materials of the Tarifian with the Naqadian inventory resting in the upper layer at the site of El-Tarif would seem to be more than justified.

The structure of the tool kit as well as the techniques used for obtaining blanks and the frequency of the basic raw materials reveal numerous, quite distinct differences between these two series of finds. In the Naqadian inventory – despite the continued predominance of grey Theban flint – imported materials are considerably more numerous, particularly the so-called "black" flint, much of which was probably brought here in the form of ready-made blades and, perhaps, even tools. In the Naqadian levels at El-Tarif we observe a marked growth in the proportion of blade technique, evident both in the greater frequency of blades themselves (twice as high – *I. lam. ess.* 24) and of blade cores, as well as in the considerably higher number of blade tools.

Other fundamental distinctions can be discerned in the structure of the tools. The proportions of side-scrapers and scrapers, as well as of retouched flakes and

notched-denticulated tools are now the reverse. The Naqadian assemblage contains considerably more burins. The most fundamental differences concern the proportion of backed pieces, relatively numerous in the younger inventory where they are represented by several dozen rectangular sickle inserts made from regular, high-quality blades. The bifacially retouched tools also show certain basic differences, despite their similar frequency in both cases in relation to the total amount of retouched tools. Whereas in the Tarifian mainly axes and axe-like tools occur, in the case of the Naqadian it is sickles and fragments thereof which prevail, formed by a highly developed, regular, flat retouch covering the whole side, known only from a single Tarifian fragment. The divergences among the backed pieces and bifacial tools, both in form and technology, were undoubtedly connected with their function as sickle implements in Naqada culture. Thus, in comparing the two inventories we may exclude the hypothesis which argues that they are genetically linked.

On the other hand, certain elements encountered in the Tarifian may also be found in the assemblages of Badari culture. However, this concerns exclusively the lower levels in the stratigraphic sequences of these sites as, for example, the layers between 6.5 to 5.0 feet below the breccia at Badari. In fact, at present the question of isolating and classifying the flint industries of Badari culture still raises so many doubts that any attempts at comparing them with other units cannot be properly justified.

The pottery from the Naqadian levels at El-Tarif consists of 4 basic groups:
1. fibre tempered, so-called chaff ware (over 87%),
2. so-called red polished (10%),
3. so-called black topped (under 2%),
4. so-called "Perlen und Schuppendekor" (under 1%).

The groups differ among themselves technologically and also from the mineralogic-petrographical point of view. Although the Naqadian pottery contains examples with both random and parallel texture, neither of these groups entirely correspond to the finds from the Tarifian level. Additional significant differences occur in the mineral composition; only in the case of the ceramics of the "chaff ware" type we presume that it was made – like the technologically more advanced examples of the Tarifian pottery – from the recent sediments of the alluvial plain of the Nile. Even the comparatively primitive fibre and grain tempered ceramics with so-called "Perlen- und Schuppendekor" from the Naqadian level differ in their paste from the Tarifian pottery, including those finds of the latter which also have plant admixtures. We are concentrating here only on a comparison of the technology and paste since the poor state of preservation of the Tarifian sherds do not allow us to form conclusions as to the original shape of the vessel forms.

As already mentioned, the Tarifian level at El-Tarif represents a settlement structure similar to the Palaeolithic camps. We arrived at this conclusion partly in view of the lack of any distinct traces confirming the existence here of an economy based on agriculture or animal breeding; there are also almost no signs of polishing

Table 1

The cultural development in Upper Egygt and Lower Nubia in the Terminal Palaeolithic-Neolithic/Predynastic times

Climatic sequence		Nubia	Upper Egypt		El - Tarif
Nile	Fayum				
	Dynastic Lake				
	Recession				Archaic /Layer 7/ C14- 2665±55
			Naqada II 3070±90		Naqadian /Layer 5/
Dibeira-West Sub-aggradation	Neolithic Lake	3460±150	Naqada I 3627±300		C14- 3105±60
		Post-Shamarkian 3650±20	3669±280		TL - 3810 and 4340
		3830±150	3794±300		
Recession	Recession			3775±330 /2.5 feet/	
				4330 } 5.5-5.0 feet	
				4450 }	
Cattfish Cave Sub-aggradation	Proto-Moeris	Cattfish Cave /5110±120/		4690±450 /breccia/	„Tarifian" /Layer 2/
Recession	Recession	Shamarkian /5750±120/		5495±405 /1.33 below/	
			/5980±160/	5580±420 /6.5 feet below brecccia/	
El-Kab Aggradation	Pre-Moeris		El Kabian /6400±160/		
Recession	Recession				
Arkin Aggradation	Palaeo-Moeris	Arkinian /7410±160/			

Badari /Hammamieh/ sequence TL - Dates

on the stone artefacts. By contrast, the Naqadian levels yielded traces of stone structures, probably dwellings, which as yet have no analogies in the Nile Valley (Ginter *et al.*, 1979). Moreover, numerous macro-remains of plants were found, grain imprints are visible on some potsherds and, finally, the animal bones – *e.g. Capridae* – unearthed. Specialized sickle implements are extremely common. All this points to a highly developed agricultural and cattle-raising economy of the type encountered widely in the Middle East.

The observations made so far lead to the following conclusions:

1. The Tarifian is the ceramic stage of the local Late Palaeolithic dated from the beginning of the 5th millennium B.P. (C-14) in whose flint inventory certain Neolithic features – particularly in the form of bifacial tools (axe-like and, perhaps, leaf-point) – are already visible.
2. The flint inventory of the Tarifian reveals, however, a lack of fundamental links with the later industries of the Predynastic cultures, particularly of the Naqadian.
3. The same applies to the pottery which does not possess any direct technological links with Naqadian ceramics. The basic sources of their raw materials were also probably quite different. It should, however, be stressed that the Tarifian also yielded a more developed group of ceramics, formed on a moving base. Thus the Tarifian pottery must have its sources in other, older traditions but the scarcity of materials makes it impossible to identify them.
4. Whereas the Tarifian corresponds economically to the hunter-gatherer stage of the Late Palaeolithic, the younger layers at our site represent a typical Neolithic food-producing economy, probably adopted from the Middle East. This direction of cultural affinity, already suggested by Thomas (1967), is also indicated by the flint inventory from the Naqadian levels at El-Tarif where elements (*e.g.* sickle inserts) derived from the Early Neolithic of the Middle East occur.

All these observations show that the societies of the Late Palaeolithic were evolving in the Nile Valley over a long period: if we also include their ceramic phase, this development would last at least through the 5th millennium B.C. (Table 1) Their technological traditions in both flint production and ceramics did not, however, play significant role in forming the culture of the Neolithic peoples in Upper Egypt from the 4th millennium B.C. onwards.

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Béatrix Midant-Reynes

La taille des couteaux de silex du type Gebel-el-Arak et la dénomination du silex en égyptien

Ce bref exposé, qui nous méne à la fin de la période prédynastique, se propose d'attirer l'attention, tant des préhistoriens que des égyptologues, sur le phénomène du silex en Égypte. S'il est inutile de souligner l'importance de ce matériau pour l'outillage préhistorique, en revanche, le rôle qu'il a joué dans la mentalité des anciens Égyptiens comme la pierre de prédilection des Dieux dans leur lutte contre les démons de l'au-delà, ce rôle était pratiquement inconnu. Or, cette signification rituelle de la pierre-silex apparaît sous deux formes, l'une matérielle, l'autre linguistique: – c'est le soin sans égal qui a présidé à la confection des couteaux du type Gebel el-Arak (ainsi nommés par référence à l'exemplaire du Museée du Louvre et mieux connus dans la terminologie anglosaxonne sous le nom de "ripple-flake technique") – et la résurgence, tout au long de l'histoire de l'Égypte, dans les textes à caractère rituel, du mot qui désigne le silex, pierre utilisée pour frapper et tuer les ennemis du monde inférieur.

Ces couteaux constituent l'un des sommets de la taille du silex. Une vingtaine seulement fut trouvée dans des contextes datables, toujours funéraires, étroitement localiseé à la phase finale de la période gerzéenne. Les méthodes et techniques qui ont conduit à l'élaboration de ces piéces ont été mal étudiées, toute l'attention des chercheurs s'étant portée sur les manches sculptés. Une analyse a pu être effectuée, en collaboration aves le Professeur J. Tixier, de 6 couteaux du Musée du Louvre, qui nous a permis de retrouver, dans leur chronologie, les différents gestes techniques qui ont mené a leur confection.

Les couteaux du type Gebel el-Arak sont des objets plats de 200 à 300 mm de longueur sur 45 à 65 mm de largeur et 7 à 10 mm d'épaisseur (Fig. 1 : 1). Une face est taillée, l'autre polie. Lorsqu'on oriente la pièce en regard de la face taillée, la partie arrondie (emmanchée) vers le bas, on observe le bord droit, trés légerement concave et le gauche, coupant, offrant une lente convexité dans sa partie inférieure et moyenne, puis s'arquant brusquement pour rejoindre le bord droit. Sur tous les exemplaires étudiés, la partie emmanchée se distingue clairement par l'absence de

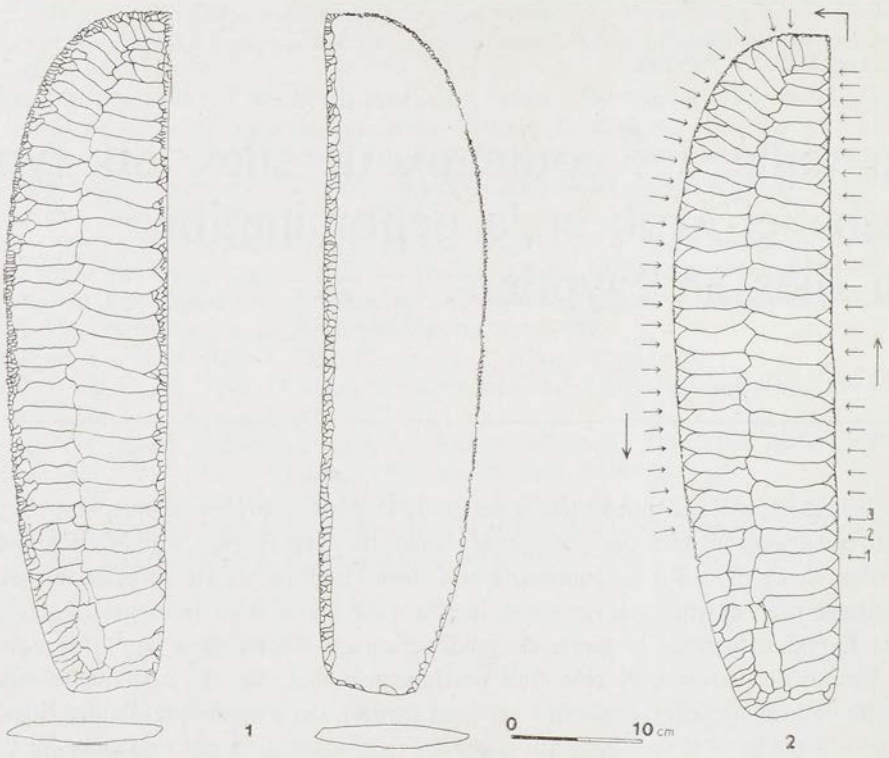

FIG. 1. *1*. Couteau du type Gebel el-Arak; *2*: Sens des enlèvements

soin apporté à la taille, l'arrêt de la denticulation du bord gauche et, parfois, la présence d'une petite entaille pratiquée dans l'un et l'autre bords, marquant le niveau supérieur du manche.

A partir du moment où le tailleur a choisi sa matiére première (toujours d'excellente qualité et vraisemblablement dans un silex tabulaire) jusqu'aux denticulations finales du bord gauche, nous avons pu distinguer, globalement, 4 étapes dans son travail:

1. La pièce est ébauchée dans ses formes et son volume presque définitifs, à l'aide de percuteurs durs et tendres.
2. Les deux faces sont polies et la forme définitive est donnée en même temps que les bords sont préparés par de fines retouches régulières pour les enlèvements définitifs.
3. Cette préparation est nécessaire si l'on veut obtenir les longs enlèvements en S qui ont donné son nom à la technique "ripple-flake". On les obtient chacun par une pression en partant du bord droit, près du manche, et en faisant le tour de la pièce dans le sens inverse des aiguilles d'une montre (Fig. 1 : *2*). Les points de

rencontre de ces enlèvements de droite et de gauche dessinent une ligne médiane, plus ou moins droite selon l'habilité du tailleur. Chaque enlèvement est soigneusement préparé et pensé. Cette opération s'effectue au moyen d'outils, probablement à pointe de cuivre, tandis que la pièce est vraisemblablement fixée dans un „étau".

Sur quelques-unes de nos lames, des traces du pré-polissage subsistent encore. L'autre face reste polie.

Il faut insister sur la régularité de ces longues retouches en *S*. quantifiables au mm près, tant pour les espacements que pour les longueurs. Nous n'avons constaté, d'un exemplaire à l'autre, que de très faibles variations.

4. Le dernier travail consiste, par de petites pressions, à régulariser les nervures du bord droit et à effectuer la minuscule denticulation du bord gauche. C'est cette denticulation qui assure à la pièce son efficacité.

La durée totale du travail peut être estimée à 10 heures dont 5 heures de polissage! C'est donc un travail long et pénible que l'artiste gerzéen s'est imposé pour le seul plaisir esthétique. Car les retouches en *S* ne sont pas fonctionnelles, elles ne servent que la beauté de la pièce.

Tout ceci est d'une extrême logique. Si l'on veut obtenir le „ripple-flake", il est nécessaire de disposer d'une surface plane, très régulièrement et très légèrement bombée, sans aucune aspérité, pour assurer le „glissement" de l'enlèvement sous l'impulsion donnée par la pression. Seul le polissage permet d'obtenir une telle surface. Ce qui laisse méditer sur la forte motivation esthétique du tailleur gerzéen et sur sa maîtrise exceptionnelle de la taille du silex. Cette maîtrise est le fruit d'une longue pratique. Sur les lances fourchues (fishtails) en particulier, on rencontre ces enlèvements par pression qui préfigurent la remarquable technique du „ripple-flake". Une étude technologique systématique du matériel lithique de la Préhistoire de l'Égypte permettrait de retrouver les différents maillons de cette chaîne qui a conduit au coutaeu du type Gebel el-Arak.

Une sorte de „dégénérescence" se produit ensuite dans le soin apporté à la taille des objets de silex. Si leur utilisation demeure jusqu'aux temps ptolémaiques, leur confection est plus grossière (souvent par simple percussion), plus rapide, plus utilitaire. Cependant, la connotation religieuse que nous avons pu déceler dans le perfection des couteaux étudiés plus haut se retrouve et persiste comme le prouve l'existence d'un mot  *ds*[1] (Midant-Reynes, 1981), qui signifie „silex" et qui, dès les Textes des Pyramides, désigne de „couteau" utilisé par la Roi et les Dieux pour abattre les démons de l'au-delà. On le retrouve dans les textes rituels, régulièrement, jus-

[1] Nous ne nous livrerons pas ici à un long développement linguistique qui déborderait largement le cadre de ce Symposium, mais nous bornerons à exposer les conclusions d'une recherche dont la publication est prévue pour les mois à venir.

qu'à l'époque ptolémaique. Les dictionnaires traduisent „couteau de silex", mais une étude attentive des attestations de ce mot montre qu'il s'agit d'abord de la pierre, pierre dont on fit, entre autres choses, ce que nous nommons „un couteau".

Ainsi, durant plus de deux millénaires, le Roi ou le Dieu frappe l'ennemi d'un „silex", ajoutant à l'efficacité de l'objet tranchant, le caractère magique de la pierre à feu.

Le mot garde donc, au cours de la longue histoire de l'Egypte, soit environ de 2,500 jusqu'au premier siècle avant notre ère, une valeur rituelle propre qui plonge ses racines dans cette protohistoire qui vit, à la fois fois, l'élaboration des étonnants couteaux et la naissance de ce trésor de mots que l'on découvrira, près d'un millénaire plus tard, organisés en un système parfaitement constitué dans les Textes des Pyramides.

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Dietrich Wildung

Terminal prehistory of the Nile Delta: theses

So far, in presenting the general outline of Egyptian prehistory, the Nile Delta – the whole area north of Cairo – has played an insignificant part, because except for the Neolithic site of Merimde Beni Salama, no representative archaeological sites in this region were known and no systematic field research on the prehistory of the Delta was carried out.

Actually, the research of Werner Kaiser has shown as early as the fifties that a prehistoric settlement of the Delta should be taken into account; and the considerations on the history of religion carried out by Kurt Sethe already at the beginning of our century succeeded to disclose that the great religious centres of the Delta in historical times, Buto and Sais, should have gained their overregional significance already in the prehistoric period.

Archaeological research on the terminal prehistory of the Delta began with chance finds which appeared around 1950 in the art trade and found their way partly to the Egyptian museums (Cairo, Ismailia), and partly to the foreign collections (Metropolitan Museum of Art in New York, Staatliche Sammlung Ägyptischer Kunst in Munich). On the East Delta sites of Beni Amr, east of Zagazig and Tell Aga (Kufur Nigm/Khudiriya), north of Abu Kebir, known from objects in the art market, the Egyptian Antiquities Organization undertook test excavations in 1961/62 and in 1978. Their results remain unpublished but they prove, at any rate, that the presence of significant prehistoric find complexes in the eastern Delta can be taken into consideration.

The third area of provenence of prehistoric finds in the Eastern Delta known from the art market was located by a mission of Staatliche Sammlung Ägyptischer Kunst in Munich in 1966. North of the modern village of Minshat Abu Omar, ca 30 km NE of the modern town Faqus and 15 km SE of the famous archaeological site Tanis (San el-Hagar), the Tell es-Sabaa Banat conceals a cemetery which was used between Nagada II and the First Dynasty, ca 3,300 - 2,900 B.C. and then, after a total lack of finds of ca 3,000 years, again in the Roman Period.



FIG. 1. Minshat Abu Omar. Late Predynastic grave No. 322 containing rich furnishing

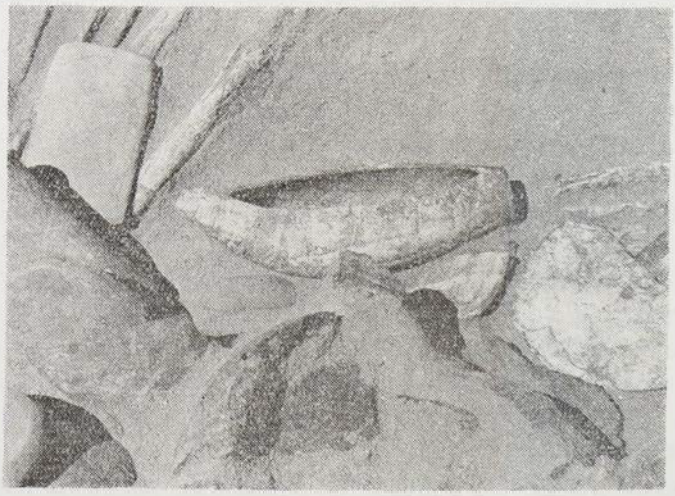

FIG. 2. Minshat Abu Omar. Model of a papyrus boat made of calcite found in grave No. 322

During systematic excavations since 1978 which should continue until *ca* 1985, 205 prehistoric and protodynastic graves have been discovered. They are simple pit graves in the homogenous sand of the mound, which rises to 3 metres over the level of the surrounding fields. No overground structures are preserved. Skeletons lay in a contracted position, with head oriented to the north or north-east, mainly on the right side, facing westwards, and less frequently on the left side, facing eastwards (Fig. 1).

Grave goods include pottery, stone vessels and models (Fig. 2), copper tools, adorments and palettes, rarely flint tools (Fig. 3). Pottery with the exception of B-vessels (Black Topped) and C-vessels (White Cross-Lined), consists of all types of the predynastic vessels with a predominance of R (Rough Faced) and P (Polished). Particularly remarkable are the D-vessels (Decorated) with representations of ships

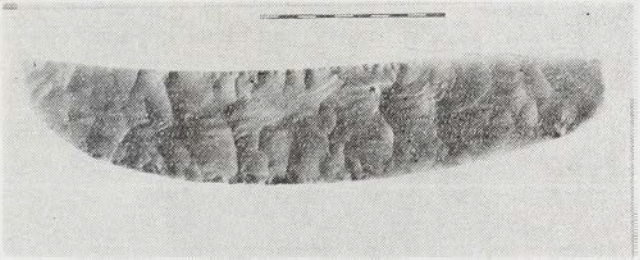

FIG. 3. Minshat Abu Omar. Bifacially worked flint knife from grave No. 761 (scale in cms)

(Fig. 4) and spiral motives (Fig. 5) as well as P-vessels with engraved names of kings, which can be interpreted as Horus Scorpion (or Aha) and Horus Narmer (?). Both kinds of pottery span the extreme points of time: D-vessels – Nagada IIa/b and P-vessels – „0" Dynasty, an uninterrupted sequence of pottery, which proves the continuous use of the cemetery during the Nagada II, Nagada III, "0" Dynasty periods until the First Dynasty. Continuous use of the cemetery – and uninterrupted occupation of the settlement belonging to it – is particularly indicated by the pottery of the W-type (Wavy Handled), which ranges from the earliest Nagada II-type – bulged, with deeply set and broadly protruding wavy handles through the slightly bulged conical forms – to the cylindrical vessels with cord ornament, so that it reaches a direct adjacency with the early historic pottery.

A set of stone vessels proves the validity of this picture of the continuous use of the settlement and the cemetery. From simple forms of beakers to thin-walled cylinders, the most important forms of the hard-stone and calcite vessels known from other sites are present.

Close analogies in pottery and stone vessels from Minshat Abu Omar with the materials of the Middle and Upper Egyptian sites leave no doubt that Tell es-Sabaa Banat was occupied by a purely Egyptian population. On the other hand, one group of pottery finds proves contacts with Palestine. The earliest vessels with wavy handles from Minshat Abu Omar have a sharp edge – a feature characteristic for the Early Bronze Age I in Palestine, in contrast to the thickened edges of the Egyptian W-vessels. The raw material of the vessels formally assigned to Palestine differs clearly by its sandy structure and its orange-red colour from the clay of the Egyptian vessels which are made of marl clay or of Nile mud.

The total number of the prehistoric and early historic graves from Minshat Abu Omar can be structured chronologically. One early group from Nagada II includes shallow grave pits with few goods (R and W, plus D), situated in the southern part of the cemetery. The middle group, in the central part of the Tell, consists of graves of ca 1 m deep, with Nagada III-pottery and copper objects; the number of grave goods rises distinctly, and the density of the use of cemetery is smaller. The later group was first distinguished at the current stage of excavations. It lies deep in the severely damaged northern part of the Tell and includes graves of the protodynastic

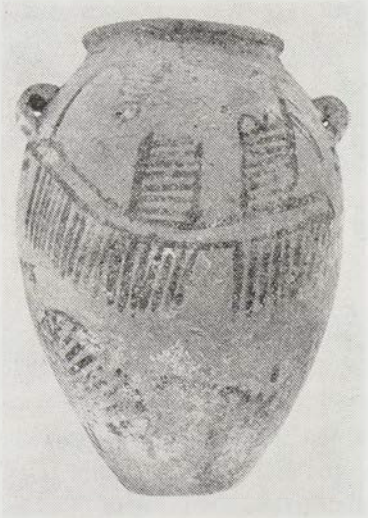

FIG. 4. Minshat Abu Omar. Painted pottery vessel from grave No. 757



FIG. 5. Minshat Abu Omar. Painted pottery vessel from grave No. 750

period with exceptionally fine stone vessels and with types of pottery which on other sites are dated back to the Third Dynasty. On the southern edge of this latest cemetery, in the transitory zone to the middle group, vessels with kings' names have been found.

A preliminary evaluation of the excavation results leads to the following conclusions:

1. Tell es-Sabaa Banat was occupied about 3,300 B.C. by an Egyptian population living there until ca 2,900 B.C.
2. There is no indication of military conflicts in this region. The area lays culturally within the limits of the Egyptian territory.
3. The geographic position on the eastern bank of the former Pelusian arm of the Nile, directly south of its outlet into the Mensaleh Lake, made Tell es-Sabaa Banat a landing point for ships arriving from Palestine and a port of departure for the Egyptian missions to Palestine and the Middle East.
4. The prehistoric settlement on the Tell es-Sabaa Banat functioned as a reloading port between Egypt and Palestine.

For Egyptian prehistory this means that there was never a real "unification" in the sense of the final subjugation of the Delta and its neighbouring areas under the dominance of the king of Upper Egypt – as it is represented, for example, on the Narmer Palette. We should be much more prepared to accept the idea of a continuous cultural evolution of Egypt, which included the Delta as early as 3,300 B.C.

The rise of the Egyptian state occurred at least from Nagada III as a broad-range evolution in the whole area of the later Kingdom and it seems to have been carried out harmoniously, without any major conflicts.

The representations of the "victory" of the Upper Egyptian king over his "enemies", for example on the Narmer Palette, are the heraldic fixation of the situation reached in ca 3,100 B.C., not a historical report of an authentic conquest of foreign "enemies" or internal "rebels".

The alleged "cultural explosion" of Egypt in ca 3,100 B.C. with the foundation of the state, "discovery" of writing, and canonization of arts did not take place. In Egypt, too, the "higher culture" developed in a long, organic process of evolution, which already in Nagada II and Nagada III covered the whole of Egypt, including the Nile Delta, and found its end several generations before the fictitious unification of the Kingdom. What is for us historically legible, are the very latest phases of a long-term, natural growth.

Further information can be expected not only from the next seasons of excavations on the Tell es-Sabaa Banat, but also from the adjacently planned research of settlements at Tell Samara and Tell Aga (Kufur Nigm/Khudiryia), which, during the survey carried out in 1981/1982 yielded large quantities of flint tools and settlement pottery. Particularly Kufur Nigm/Khudiriya (nowadays called Tell Aga), of an area of 400 × 400 metres, and ca. 3 metres of undisturbed stratigraphy of Nagada II until the end of the Old Kingdom, promises good results.

Florence Braunstein-Silvestre

Quand le cheval arrive-t-il en Egypte?

Si les documents servant de support à l'hypothèse de l'arrivée du cheval avant et pendant la XVIII-éme dynastie ne manquent pas, en revanche, aucun d'entre-eux ne s'accorde pour nous donner la même réponse [1]. De ces documents nous n'avons retenu que ceux qui appartenaient au domaine de la paléontologie, pour deux raisons: la première est que se sont eux qui nous ont opposé le plus de difficultés, car ils répondaient à la double exigence de la stratigraphie et de l'identification. La seconde est que l'un d'entre-eux, en suggérant l'arrivée du cheval dès les temps les plus anciens (doc. n°I,) nous obligeait à reposer en termes généraux la domestication du cheval au Proche Orient.

Il est un peu currieux de penser que le cheval ne sera introduit en Egypte — que deux mille ans après les débuts de sa domestication [2]. Entre cette période et celle où il gagne la vallée du Nil, nous savons fort peu de chose sur son histoire; les témoignages ostéologiques sont rares avant le milieu du deuxiéme millénaire:

1. Une métacarpe retrouvé à Arad en Israël dans une couche du Bronze ancien (Davies, 1976: 153 - 164).
2. Plusieurs squelettes de chevaux mis au jour à Korucetepe en Turquie et datés de 1,800 B.C. et 1,600 B.C. (Boessneck et von den Driesch, 1974: 109 - 112).

Mais ces lacunes seront peut être comblées par de nouvelles fouilles. Les témoignages archéologiques ne nous apprennent pas grand chose non plus. Les représentations d'équidés sur des plaquettes gravées [3], sur des mosaïques [4], avaient été tenues pour les premières figurations de chevaux domestiques (Bökönyi, 1966: 35 - 38). L'interprétation dans un texte sumérien de la III-ème dynastie d'Ur du mot (Falken-

[1] Ce travail a fait partie d'un sujet de thèse dans le cadre de École Pratique des Hautes Études VIe section.

[2] Ses dèbuts commencent vers 3,500 B. C. à Dereioka en Ukraïne.

[3] Notamment celle de Suse ou se profilent de façon très schématique des têtes d'équidés avec un semblant de crinière.

[4] Celle du roi d'Ur.

stein, 1952: 64; Liebermann 1968: 53) *Anse Kurra* comme le premier terme désignant le cheval domestique avait servi à alimenter cette supposition. En fait, l'attribution de ce terme qui signifie "l'âne qui vient des montagnes" et par extension „l'âne qui vient des pays étrangers" n'est pas évidente. Il n'est pas d'ailleurs prouvé qu il se réfère à l'âne lui-même. Si l'on en croit donc les renseignements fournis, soit par la paléontologie, soit par l'archéologie, le cheval ne supplantera les hémiones et les chevaux sauvages qu'au milieu du deuxiéme millénaire. Cela coïncide en Egypte à peu près au moment où vont apparaitre ses premières représentations [5] et le terme qui le désigne [6]. Les deux appartiennent à l'époque de Thoutmosis I. Mais les documents qui nous concernent pencheraient en faveur de l'introduction du cheval avant cette période.

1. Les ossements de Kom-Ombo

Plusieurs publications suggérent l'hypothèse d'un cheval en Egypte pendant les périodes de la fin du Paléolithique, début du Néolithique [7]. Elles se réfèraient à plusieurs notes concernant l'analyse du material osseux (Gaillard, 1934: 16; Vignard, 1955: 699) du gisement de Kom-Ombo où l'on y mentionne la présence de chevaux (*E. caballus*) et d'ânes (*E. asinus*). Si les fouilles faites dans le Sud de l'Egypte attestent bien l'existence d'un âne (*E. asinus africanus*) (Gautier, 1968: 96) chassé à la fin du Pleistocène, et au début de l'Holocène, en revanche, elles se taisent sur celle du cheval. Churcher (1972: 48 - 51) ré-étudia le matérial osseux de ce site et note que celui-ci ne provient que d'une collection de surface. Cela expliquerait pourquoi on a retrouvé étroitement mélés les ossements d'ânes et la dent du cheval. L'abscence de stratigraphie est un argument pour rejetter définitivement ce premier document.

2. Le cheval de Buhen

Avec le squelette de cheval retrouvé sous un mur du Moyen Empire de la forteresse de Buhen (Emery, 1960: 8; 1965), la datation et l'identification semblaient assurées. Mais tous les problèmes n'ont pas été soulevés. Tout d'abord, ils concernent la forteresse elle-même: construite sous les rois de la XII-ème dynastie elle, fut détruite à la fin du Moyen Empire. Mais un détail important reste négligé. On arrête souvent son histoire à cette période alors qu au Nouvel Empire on l'a reconstruite et l'on en remanie les parties les plus anciennes. Le mur a pu s'écrouler à cette période.

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[5] Scarabèe où l'on voit Thoutmosis I sur son char attelé atteindre d'une fléche un ennemi qui tombe à la reverse.

[6] Le mot *SSMT*: Donner (1955).

[7] Elles fondent leur argumentation souvent sur la prèsence de chevaux dans les gisements prèhistoriques d'Europe.

En somme, nous avons comme datation que celle où le mur s'est écroulé et non celle où le cheval fut tué. Néanmoins, nous avons une datation absolute: celle des cendres qui se trouvaient sur le cheval (3,630 B.P.) (Emery, 1960 : 7). Mais là encore nous n'avons pas véritablement progréssé. Le cheval pourrait être effectivement de la même époque sinon plus ancien; à condition que ces cendres n'aient pas été utilisées postérieurement pour recouvrir le squelette. Malheureusement, nous n'avons aucune publication de ce dépot de 1.15 m et les seuls renseignements concernant cette stratigraphie viennent d'être énoncés.

La question aurait pu être définitivement réglée, si l'on avait pu dater le cheval lui-même. Or, cela s'est avéré impossible par manque de collagène dans les os. Un autre élément rend encore plus suspect son attribution au Moyen Empire: Clutton-Brock (1974) a relevé un détail, en ré-etudiant le squelette du cheval, qui non seulement confirme bien sa domestication, mais aussi en précise l'utilisation. La seconde prémolaire montre une usure faite par un mors. Cette partie du harnachement n'est pas attestée en Egypte avant la XVIII-ème dynastie. Voilà donc un argument sérieux pour rattacher une fois de plus le cheval de Buhen au Nouvel Empire plutôt qu'aux époques précédentes.

En résumé nous rejoignons le rang des sceptiques (von Beckerath, 1964 : 117), non pas qu'il soit improbable que le cheval apparaisse pendant le Moyen Empire, mais parce que ce second document offre toutes les chances d'appartenir au Nouvel Empire.

3. Les dents de Tell ed-Daba

Les fouilles faites dans le delta, à Tell ed-Daba, par Bietak (1968 : 79) ont révéle un grand nombre de sépultures d'équidés. Il s'agit dans tous les cas de sépultures d'ânes. La seule attestation de chevaux est représentée par la découverte de deux dents (Boessneck, 1976 : 42) trouvées chacune dans un niveau Hyksos. C'est le premier indice sérieux que nous avons pour l'instant et qui témoignerait, non seulement de la présence de chevaux domestiqués pendant la période Hyksos, mais surtout dans un site Hyksos. L'hypothèse classique veut que ce soient les Hyksos qui aient été les détenteurs, puis les promoteurs du cheval et du char en Egypte. Or, jusqu'à présent l'archéologie n'a pas permis de vérifier cette hypothèse car ni chars, ni chevaux[8] n'ont été retrouvés sur un site Hyksos. Quant aux Hyksos, les auteurs ne s'accordent pas toujours lorsqu'il faut les rattacher à une ethnie précise[9]. Pour l'instant, nous préférons attendre le résultat de nouvelles fouilles qui viendront confirmer ou rejetter cette hypothèse, avant de conclure sur le seul témoignage de deux dents.

[8] Les chevaux de Gaza sont postérieurs à la période Hyksos.

[9] Des Indo-Européens: pour Meyer (1928), Hrozny (1929). Des Hurrites: Speiser (1933), Engber (1929); Save-Söderberg (1951) refutte l'hypothèse hurrite.

4. Conclusion

Les trois documents paléontologiques étudiés plai daient en faveur de l'existence d'un cheval domestiqué depuis la fin du Paléolithique jusqu' à celle de la seconde Période Intermédiaire. Avant de les rediscuter, nous avons remonté jusqu'aux sources les plus lointaines de sa domestication et pointé sur la carte géographique de Proche Orient ses plus anciennes attestations. Le cheval ne semble pas y jouer un grand rôle avant le second millénaire. Aussi ne sera-t-il pas introduit en Egypte à la fin du Paléolithique (Doc. 1), ni pendant le Moyen Empire (Doc. 2), ni pendant la période Hyksos (Doc. 3). Pour conclure en répondant à la question posée au début de ce travail, "quand le cheval avrive-t-il en Egypte", nous pouvons dire qu'il n'existe pas pour l'instant de preuves formelles de son apparition avant le règne de Thoutmosis I.

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Prentiss S. de Jesus

Comments on the development of pyrotechnology in early societies

The beginnings of fire-making are understandably obscure. It is not an aspect of early prehistory that has received abundant attention, though a recent book by Catherine Perlès (1977) does pull together the existing references and offers a cogent outline to the use of fire in the Palaeolithic. As the use of fire – pyrotechnology – is one of the underlying determinants of the formation of Neolithic society, it is essential that we understand the transformations it underwent since its use in early cultures.

Lower and Middle Palaeolithic

It is generally accepted by most scholars that since the Mindel glaciation in Europe early man was able to make fire.[1] Not only did he make it, but he made use of hearths to render it more efficient. By the Riss glaciation numerous examples of hearths existed in France,[2] which show such refinements as paved bottoms and draught channels (Bordes, 1972 : 60-62). Fire had by then become mastered by many early groups, and at least for Europe, the existence of hearths at campsites was on its way to becoming the rule, rather than the exception. In the contexts of the Lower and Middle Pleistocene, Northeast Africa has not yet yielded any traces – direct or indirect – of hearths or fire, but this could be due to archeaological chance.

[1] Hearths have been recorded at the following sites: 1. La Grotte d'Escale (Bouches du Rhône) France, excavated by de Lumley in 1960 and dated to Mindel I; 2. Vertesszölös, Hungary, dated to Mindel I but more recent than the above; 3. Fossilized dune near Nice where hearth stones were recovered and dated to Mindel III; 4. Torralba, Spain, dated to Final Mindel; 5. At Locus 13 Choukoutien, China, and dated to Final Mindel. The above are according to Perlès, 1977 : 14 - 17.

[2] For example at: 1. Observatoire (Monaco); 2. Peche de l'Asé II (Dordogne); 3. Cagney-la--Garenne (Somme); 4. La Grotte de Rigabe (Bouches du Rhône); 5. Orgnac 4 (Ardèche); 6. Cotte-Sainte Brelade, level H (Jersey). The above are according to Perlès, 1977 : 20 - 21.

Discovery and use of fire

How could fire-making have originated? Early man had no doubt seen natural fires brought about by the eruption of volcanoes or fires caused by lightening. He may also have seen fires as a result of spontaneous combustion of peat, gas or bituminous substances. But all these natural sources, if indeed they were used, could not have been very regular. Moreover, we must take into account the low population density, which reduced the chances of man being at places where natural fires broke out.

For most archaeologists there is a link between fire and chipped stone. It is more or less accepted that a spark produced by striking flint against flint was one of the first fire-making methods. Hence, once a chipped flint industry had become established, fire-making was a possibility. It may have been realized soon afterwards that using flint against a ferruginous stone, such as pyrite, a hotter spark could be obtained, thus constituting a superior fire-making method. On the other hand, it has been established that one cannot produce a spark by striking quartz (Perlès, 1977 : 33). A Middle Palaeolithic piece of carbonized wood has given evidence of having been rotated, thereby suggesting that it was used as a turning stick to produce fire by friction (*Ibid*: 36). Other methods – also using wood – have been suggested, but right now they are only speculative.

The technique of fire-making requires the use of proper combustible material. In most cases, easy-burning materials have been identified, such as dried shrubs, driftwood, roots and bark. In some rare cases bone was also used (*Ibid*: 42). There are instances where hard woods were preferred, even though easy-burning soft woods were available. This suggests that a certain selectivity was practised by some fire-using groups, and their preference for hard woods may be related to the type of fire they required.[3]

What were the uses of fire prior to the Upper Palaeolithic? We do not know for certain all of the applications, but using indirect evidence, we can suppose a few. The preparation of food comes quickly to mind. Food, generally speaking, is easier to eat and digest when cooked, and some food, namely cereals and certain roots, can be eaten only when cooked. Moreover, by cooking food one spends less time eating, particularly meat, thereby affording more time for other activities.

Heating must have been a common use of fire, and there is no reason to doubt that this was one of its first applications. Heating a cave permitted man to modify his immediate environment and struggle successfully against the cold. Although not proven, one may wish to see a relationship between the colonization of Europe and the use of fire (Perlès, 1977 : 58).

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[3] In this paragraph, the use of these materials applies to all of the Palaeolithic, the Upper Palaeolithic included. No comprehensive, chronological treatment is yet available on combustibles.

Fire was also used for light. Lamps date only from the Upper Palaeolithic, but simple campfires could have been used for lighting from the Lower Palaeolithic onwards when the first hearths are known. Light offered the possibility of increasing daily activites, if not to say productivity. The greatest benefit of this may have been a hastening of artifact development.

Fires were used in craftmaking in the Lower Palaeolithic. As early as *Sinantropus*, fire was being used to burn off projecting bulges on antlers, and bones were severed by burning and cutting. Reindeer antlers were heated and straightened in the Upper Palaeolithic, but there is reason to believe that this technique was also applied to wooden sticks in earlier periods. In the Riss-Würm interglacial stone points were heated for easier flaking (Perlès, 1977 : 112-115). The technique required that the flint be burried in hot sand for 24-72 hours, the limit being established according to the type of flint. The heat (above 200°C) caused dehydration of the stone, and it then became possible to pressure flake objects into shapes that would have been impossible with untreated flint (Bordes, 1967 : 45). This is a technique which is complex in the sense that the flint must be maintained at a constant temperature during the heating period. Apart from cooking, this is the first evidence that we have (prior to the Middle Palaeolithic) of temperature control over a particular length of time.

Fire-making did not replace another task, and someone had to tend to it. There was more involved than just igniting a fire. Fuel had to be collected and the fire had to be maintained. These jobs fell to certain members of a group, perhaps to children who otherwise would have remained unoccupied. So, while fire-making became an additional burden, it probably did not provoke any profound changes in social structure.

It is only with the advent of the Late Acheulean phase in the Upper Pleistocene that our attention can be directed to Africa. One of the first African examples of the use of fire comes from Kalambo Falls in Zambia and dates to ca. 60,300 B.P./61,700 B.P. Fragments of charred wood were uncovered which had friction grooves in them. These artifacts were interpreted as fire-making utensils. In addition, fire was employed to shape and harden wooden digging sticks and other implements, and at least one hearth was identified (Coles and Higgs, 1975 : 107).

Fires have been mentioned in the context of the Cave of the Hearths at Makapansgat, South Africa (Clark, 1959 : 105, 129; Perlès, 1977 : 21). There, hearths with as much as 4 feet of ash were observed in relation to Final Acheulean handaxes and cleavers.

Taken as a whole, the Lower and Middle Palaeolithic cultures of Europe, Africa and Asia established a wide variety of pyrotechniques, albeit dispersed. Nevertheless, they constituted a valuable legacy for the following period, the Upper Palaeolithic, and the arrival of modern man. It is odd that in the Upper Palaeolithic *Homo sapiens* did not innovate as much in this domain as his intellectually inferior predecessors.

Upper Palaeolithic

At the Upper Paleolithic site at Ballana (Site No. 8950 between localities B and C) hearthstones and fire-cracked stones were found dated between 16,000-14,500 B.C. (Wendorf, 1968, II : 859). In the same area, at Locality C, charcoal and more hearthstones were observed and dated to 12,550 B.C. (*Ibid*: 861). In the area south of Halfa (Site No. 443) hearth and earth ovens were located (*Ibid*, I : 399). Fire-cracked stones and burned clay lumps were also found in this context (*Ibid*: 433-434). Charcoal from earth ovens was dated to 14,500 B.C. Lithic tools were found in these fire-using contexts. Even a few burnt cores turned up, suggesting that the preheating of flint before flaking (and even stone splitting by fire) may have been practiced there.

Lamps and torches make their appearance in the Upper Palaeolithic at numerous sites in Europe (Perlès, 1977 : 62-69), which points to increased activity in the caves. No doubt portable light was directly responsible for cave art so characteristic of this period (Laming, 1959 : 98-103). In this respect Africa, again, seems to have lagged.

To sum up the Palaeolithic as a whole, we can say that the use of fire was wide-spread. It had afforded a longer work day, and it became a means of artifact manufacture. It allowed groups of early man to survive in cold climate, and it affected their diets through cooking. The side effects of fire could even have been more profound. As a point of reunion the hearth or campfire could have favored the elaboration of a structured language and thereby facilitated the exchange of ideas, the development of oral traditions and the use of fire as ritual. It has been suggested that fire is the second greatest technical achievement after chipped stone, and it constitutes an absolute criterion for the difference between early man and the animal world.

The Neolithic

It is in the Neolithic that great strides were made; the most significant are considered to be the development of pottery and metallurgy. With this period another set of inquiries comes to the fore, and we must now observe the relationships between the different applications of pyrotechnology. For reasons of brevity and to comply with the geographic limits of this symposium we will limit out discussion to the Nile Valley as a principal contributor to pyrotechnology. This does not mean that we should discount influences from other people outside this area, for technological changes surely took place, but the Nile Valley cultures provide us with a wide spectrum of technologies that is useful as a basis for further inquiry.

The Fayum A unit – the oldest Neolithic culture known in Egypt – is thought to have had its origins in the Delta, or at least in the North of Egypt (Hoffman, 1979 : 189-190). This view is consistent with the North-South orientation of Egypt

in later predynastic times, but as Hoffman (*Ibid*) has suggested, we cannot isolate the possibility of a multiferous origin. The mixed economy of the Neolithic people (hunting, fishing, stock raising and agriculture) and the fact that they carried on long distance trade may be indications of this.

The pottery from this period is generally poor in quality and was fired most likely in open hearths. Kilns would come much later. No analyses have been done on firing temperature or clay composition, but it is not difficult to imagine that pottery was not the most important craft of the Fayumis, and it was produced as simply as possible. Vessels for holding liquids are the predominant form, just what one would expect in a warm climate. Though rudimentary, the pottery of Fayum A may not necessarily have been the oldest in Egypt as it could have been the result of an earlier pottery-making tradition.

The passage from a non-ceramic society to a ceramic society is definitely an important one, but we may not wish to see it as dynamic as some authors would have it. There is no reason to relegate the development of pottery-making to Neolithic cultures *a priori*. The special conditions for the availability of pottery clays in Egypt may have been exploited by Late Palaeolithic cultures. A pre-Neolithic ceramic could have been one of the threads which linked Upper Palaeolithic to Neolithic *per se*. There could have been a slow, but deliberate, development of pottery-making along the banks of the Nile by nomadic groups who utilized the clayey silts to fashion crude pots and bake them in campfires. Utlimately, this pottery became one of the elements of a hybrid Neolithic society. While this is speculative, the present archaeological record can tolerate it. Moreover, it would seem odd that after 50,000 years since the first use of hearths in Africa ancient man had not observed the virtues of baked clay for vessels.

The flint napping remains found in the contexts of hearths at Fayum A may suggest that pre-heating of flint was a common practice and another legacy inherited from the Palaeolithic. Unfortunately, dehydration studies have not been carried out on the lithic assemblage, which might have clarified this point.

The site of Merimde offers the improvement of harder-fired pottery. This suggests that the Merimdens used pottery kilns, as opposed to simple hearths, to reach a higher temperature[4]. They were more attentive to the decoration of pottery, and it would stand to reason that a hotter firing temperature would be developed in consequence, even though the fabric did not surpass that of Fayum A. Hearths for parching grain were found at the site, but, on the archeaological record, this is not a new application of fire. There is now recent evidence for the parching of grain at the Upper Palaeolithic site of Wadi Kubbaniya (Wendorf and Schild, 1981).

The Badarian sequence offers an innovation in pottery-making: the use of reduction for a black-topped effect. The explanation of this technique has not been totally agreed upon by scientists (see Lucas, 1962 : 372-376 : 377-381; cf. Eisa *et al*, 1973;

[4] It must be recalled that no kilns have been found dated prior to the Old Kingdom.

Reisner, 1966), but it is nevertheless clear that the Badarians were toying around with reducing fires. They had grasped the notion that a different type of fire would produce a different color on pottery. This is important in the sense that they may have understood the difference between reducing and oxidizing kilns.

With the Badarians we normally associate the introduction of a rudimentary metallurgy. The Badarians were probably using native copper, as there was sufficient supply to meet the small demand. The smelting of copper ore would come in a later phase. Few though they are, the copper artifacts from El Badari attest to the understanding of the annealing process, that is, softening of copper by heating after it has become hard by hammering. This would be an important technique later, particularly when chisels and axes were manufactured. But now the Badarians were interested only in making copper beads, stripes, tubes and pins.

There is no evidence for melting at this time, which means that the size of the metal artifact was governed by the size of the piece of native copper found. Copper melts at 1,083°C, and an ordinary campfire cannot reach this temperature. However, the Badarians were apparently able to reach a temperature well above this, as seen in their manufacture of glazed beads (infra). Why they did not melt copper bits together in order to produce larger artifacts may be explained by their conservative attitude towards new materials an attitude which seems to be inherent thorughout the history of ancient Egypt (Harris, 1971: 83-91).

The use of copper did not significantly improve the quality of Neolithic life, even though metal has certain advantages over other materials. Traditional materials such as bone and flint were sufficiently abundant to compensate for their lack of durability. The fact that the first copper artifacts were decorative items is a clear indication that Neolithic man had found no practical applications for metal. Again, the innate conservatism of the Egyptian Neolithic had undoubtedly a dampening effect on the adoption of new ways.

Glazed steatite is likewise found in Badarian contexts and provides us with another example of pyrotechnology in the Neolithic. Steatite is a soft form of massive talc. It can be easily carved with a knife, but when it is heated in a hot fire, it dehydrates and becomes hard. Its early use was as a base for Badarian (and later) glazes. Glazes are crystalline in Badarian times but vitreous in the Predynastic period. Beck (1934: 75) identified the crystals in the Badarian examples as mullite, which indicates that the beads were baked at around 1,300°C, the temperature at which mullite crystals form. Chemically speaking the glazes are either a sodium-calcium silicate or a potassium calcium silicate, but Beck was not sure how the mullite crystals formed. The surface of the glazed Badarian beads are hard enough, like the core, to scratch glass, but what is odd, the later Predynastic glazes are generally softer. Even though Predynastic glazes were formed at a higher temperature, from the point of view of hardness they are inferior to the Badarian examples. Nevertheless, this new application of heat to form glaze may have given Neolithic man the notion that hard or earthy materials could be melted. Although the Badarian glazes did not

melt at any stage of their formation, it was clear to the glaze-maker that a fusion had taken place. This realization may have eventually urged him to attempt fusing other hard substances such as native copper, but this would not happen until the succeeding phase of cultural development, *i.e.* in the Amratian period.

Copper was not employed for more than simple trinkets in the Amratian period, and there is no evidence for the use of copper tools, apart from some non-descript borers. Hence, from the point of view of metalwork, the Amratian is a continuation of the Badarian. There is something new, however, in the realm of precious metal. At El Mahasna were found gold and silver beads. This is the earliest occurrence of gold and silver, and while gold can be thought as having come from the Eastern Desert and being native in origin, the presence of silver poses some problems.

Silver can occur native, but it is rare[5]. Silver metal had already occurred by Amratian times in Anatolia[6], but we know very little about silver-working this early. Could it be that cupellation of silver had already been developed in Anatolia by the Late Chalcolithic (ca. 4,800 B.C.)? Or was silver somehow a by-product of some other pyrotechnique such as copper smelting? Whatever the case, the Amratian bead was no doubt a traded item from abroad. As it was probably melted at some point in its manufacture, we can say that the silver metalworker – Egyptian or foreign – had realized a temperature of 1,000°C, the melting point of silver metal. If the gold bead had also been melted we can say that the goldworker – probably Egyptian – had realized a temperature of 1,060°C, the melting temperature of gold and, incidentally, the maximum temperature possible in a campfire without draught air. Hence, somewhere in the ancient world metalworkers had learned to fuse metal.

By the Amratian period metalworkers had become a standard element in the make-up of Neolithic societies, and not a specialized and separate group. At El Badari were found amorphic copper fragments[7] and while only tentative, these bits have been interpreted as the remains of copper working at the settlement itself.

In the Gerzean period the intensification of metal production called into use the various techniques known in the previous periods, such as melting, annealing and hardening by cold hammering. In addition, the Gerzeans – or their contemporaries somewhere in Egypt – appear to have innovated considerably by introducing copper smelting and casting into moduls. An impressive adze from Matmar (Brunton, 1948: 21, 23) is the largest cast artifact to occur this early[8]. Its analysis reveals not only that it was smelted but that it is characteristically high in nickel content. At one time it was believed that high nickel in copper was indicative of foreign copper, but now

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[5] Ransom-Williams (1924 : 28) suggests that all early Egyptian silver is native.

[6] In Late Chalcolithic contexts at Beycesultan XXXIV (de Jesus, 1980 : 76).

[7] At Spur 3 in Area 3000 and in Area 3200 (Brunton and Caton-Thompson, 1928 : 45, 46, pls. XVIII (4) (5)). Also in Area 3200 a copper pin was found.

[8] A similar axe, but smaller, was found at Maadi of approximately the same date, M. Amer, Bull. Fac. Arts Cairo Vol. II, Pt. p. 177. It is illustrated in Excavations of the University of Cairo at Maadi 1930 - 1935 (in Arabic) fig. 16a.

we cannot isolate the possibility of its having come from the copper deposit at Abu Swayel in the Eastern Desert where nickel is a prominent constituent in the ore-body[9].

Increased production of copper means that more individuals were involved, thereby increasing the chance for innovation and diversification. The range of metalwork in the Gerzean period increased, for it now included tools and weapons such as harpoons, fish hooks, axes, gouges, adzes and knives. It is not unlikely that small copper vessels were also produced during this period. The quantity of copper suggests that smelting had become a regular part of the metalworker's activities, for native copper would not exist in these amounts.

It has been reported that the hard-fired pottery from this period was baked at ca. 1,200°C (Krzyżaniak, 1977: 165), and this would seem consistent with the high temperatures used in the production of copper metal. Copper ore smelts at about 800°C under ideal conditions, but ancient smelters probably operated at temperatures well above 1,000°C (de Jesus 1980: 34). We can conclude from this that high-temperature kilns for smelting and melting were becoming commonplace.

The abundance of silver artifacts found in Gerzean contexts[10] attests to foreign trade but it is conceivable that the items themselves were manufactured on Egyptian soil. The sudden appearance of silver in substantial quantity suggests that production was being carried out on a regular basis somewhere in the Neolithic world. While Anatolia seems to be the most obvious source of silver, as in the Badarian period, one cannot eliminate Western Saudi Arabia as a potential candidate, as argentiferous galena deposits are known there (Roberts *et al.*, 1977).

Wood was used as fuel in the Neolithic just as it was in the Palaeolithic. In the Fayum at Kom W, it was discovered that wood was used as cooking fuel which points to a certain abundance of this material (Caton-Thompson and Gardner 1934, I: 25; II: pl. XIII [81), probably tamarisk. Dung fuel was used in the Badarian period; remains of dung storage were discovered at Hemamieh (Brunton and Caton-Thompson, 1928: 73, 83, 95, 106). Lucas (1962: 456) points out that charcoal was known n Badarian times, but one may wish to suspect that it had been used as early as the Pialaeolithic with the advent of hearths.

Conclusion

From its humble beginnings in the Lower Palaeolithic to the Neolithic pyrotechnology followed primarily a single course. There were, to be sure, offshoot uses such as lighting and heating, but the most consequential applications were directed to-

[9] A report of this deposit and its possible role in antiquity is in preparation.

[10] Some of these are the followings: 1. A silver dagger from Hamra Dom (Quibell, 1905, pl. 58 (14514). 2. A silver knife from Hamra Dom (*Ibid*: pl. 58 (14515). 3. Silver and gold foil from Hamra Dom (*Ibid*: no. 14516). 4. A silver adze from Ballas (Petrie and Quibell, 1895: pl. LXV (6)). 5. A silver figurine from Naqada (*Ibid*: pl. LX (14). 6. A silver dagger from El Amra (Baumgartel, 1960: pl. II(1).

wards the transformation of materials by an efficient use of fire. A rough chronological list of these applications would look something like the following:

Lower-Middle-Upper Palaeolithic	Maximum operative temperature
1. heating	1060°C
2. cooking	200 - 600°C
3. light	1060°C
4. heating flint, cracking stone	200°C
5. heat-hardening of wooden points	600°C
6. grain parching	600°C
Fayum A	
7. pottery kilns	1060°C
Badarian	
8. reducing fires	1060°C
9. annealing of native copper	1060°C
10. glazed steatite	1300°C
Amratian	
11. silver melting	1000°C
12. gold melting	1060°C
Gerzean	
13. hard-fired pottery	1200°C
14. melting of copper	1083°C
15. copper smelting and reducing kilns	1100 - 1300°C

While the temperature of a campfire does not appear significantly less than that of a pottery kiln, the control of the fires is vastly different. Hence, it is in the control and manipulation of fire where the story of early pyrotechnology is told.

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ALESSANDRA NIBBI

Some Early Dynastic clues relating to the environment of Ancient Egypt

Our effort to understand the culture of ancient Egypt, both prehistoric and historic, must include a study of the vegetation in all its phases (Nibbi, 1976; 1981 a and b).

The tree is usually represented in the ancient Egyptian reliefs and paintings as though it had an almost magical quality. Gods are often shown within its foliage. It has generally been assumed that this is because of the rarity of trees in a predominantly desert environment. But scientific evidence in recent years is suggesting that trees in the natural environment were a much more frequent sight in ancient Egypt than they are today.

The areas remaining fertile in Egypt today are shown in red on a land satellite map of Egypt prepared by Dr. Abdel Hady of the OSU-Remote Sensing Centre, Academy of Scientific Research and Technology, Cairo (Abdel-Hady, 1974). This map also carries some interesting marks, which could represent an ancient Nile valley running north-westwards, from the general area of Sohag and Assiut, through a depression between the oases of Qattara and Siwa and into the Mediterranean Sea. We cannot yet be sure what these marks represent, but we cannot exclude the possibility that it was an old bed of the Nile.

In another of his studies, carried out jointly with others, Dr. Abdel Hady tells us that the desert is encroaching upon Egypt from the west, thus moving eastwards (Abdel Hady, 1976). It is only in recent years that we have begun to look carefully at the ancient environment of these regions, in order to try to understand it. The work of scientists during the last twenty years shows that the whole of north Africa and the southern countries of the Near East were very thickly forested in the not so distant past and that much of this forest was denuded mainly during this last century. We are all familiar with the writings of early travellers in these regions from the fifteenth century A.D. onwards, among the latest of whom, Richard Pococke and H. B. Tristram describe this vegetation in some detail (Pococke, 1743-45; Tristram, 1876). But the best description of this situation that I have been able to find is by a present-day botanist, G. E. Wickens of the Herbarium, Royal Botanic Gardens,

Kew who said (Wickens, 1975): "There is ample evidence from the literature to show that the vegetation of the Sudan, in common with many other African countries, has greatly deteriorated since the beginning of this century. There is similar evidence of a decrease in both numbers and areas of distribution of many African ungulates (Sidney, 1965) and other mammals. Consequently the present-day conditions of flora and fauna will give a false impression of the natural environment in relation to the climate, which until recently has remained relatively static..." "The recent drastic reduction in the density of the mammals can be attributed to a number of factors. The rapid increase in the human population has resulted in increased pressure upon the natural resources. More land is being required for cultivation and grazing, resulting in a rapid deterioration of the vegetation due to cultivation malpractices, overgrazing, burning etc. (Wickens, 1968). The increase in the use of motor transport has led to the opening up of remote areas, which, with the improvement in firearms, has increased the chances of both hunter and poacher. More and more, animals are being slaughtered for "sport", food or to protect cultivation and stock. The mammal populations have had to change because their habitats have been destroyed, their migration routes interfered with, their numbers reduced..." Wickens goes on to tell us that in prehistoric times, the impact of man upon the environment would have been insignificant, partly because man was then a relatively inefficient hunter and partly because he was not present in sufficient density in that environment.

Among the trees which we see represented on the scenes from ancient Egypt, we recognize the sycomore fig and the acacia, which Karl Butzer found to be present in the Nile valley in approximately twenty varieties (Butzer, 1959). These are plants which thrive in warm and fairly dry conditions. But we see many other kinds of trees which we cannot properly recognize, because of the schematic way in which they are presented artistically. In thinking about these problems, it is important for us always to remember that forests do not disappear quickly if left to nature. When we see a group of trees in a natural evironment, which in Egypt today will occur in a desert or semi-desert area, these trees will certainly be survivals of a former forest rather than a new burst of growth.

The Algerian botanist P. Quézel studied some pollen and wood remains from the last wet period in the Sahara and he found that a Mediterranean vegetation flourished there as far south as Hoggar and Tibesti (Quézel, 1963). He found that around 10,000 B.C., oak and cedar forests are present in these regions. Some remains of this Mediterranean type of vegetation continue to exist even today, in favoured pockets of these highlands, but only in a small and stunted form. Quézel's study consisted of twenty-six boreholes taken within a confined area. Above the layers revealing oak and cedar, Quézel found an even richer vegetation including deciduous oak, *Pistacia lentiscus*, maple, tree heather, ash, walnut, lime and alder.

It seems that the maximum and optimum period for this vegetation corresponded

to the expansion of the flint industries throughout the Sahara. Quézel found the continuation of this Mediterranean vegetation after the appearance of the Neolithic culture, but with the addition of Aleppo pine, juniper, *Duprez cypress*, the southern alder (micocoulier) and the *Laperrine olive*. This shows that drier conditions had begun and that the savanna vegetation would follow in due course as the drying out process continued. Quézel concluded that in the last four thousand years, that is, since approximately 2,000 B.C., the Mediterranean vegetation in the region of the Sahara which he studied had moved northwards by fifteen hundred kilometres. Wickens (1975) noted a similar phenomenon for the Sudan. We are taking of a movement of the vegetation over thousands of years. Wickens discusses the work of Quézel in detail and points also to some problems in his important study of the flora of Jebel Marra (Wickens, 1977 a).

Two geographers, F. Alayne Street and A. T. Grove, found support for these from a study of lake-levels in Africa (Alayne Street and Grove, 1976). These were based on the fluctuations during the Late Quaternary period. Their technique relied exclusively on radiocarbon-dated chronologies from which they constructed a series of maps representing lake-level patterns during each millennium since 21,000 years B. P. They found the lake-level record to be more complex after 8,000 B.P. Their conclusion was that since 3,000 B.P., desert conditions have once more descended on the central Sahara, causing many East African lakes to become dry or saline. It is interesting to note that these scientists found minor moister fluctuations during the past two millennia and even in the present century. In terms of vegetation the results of the work of these scientists indicates that after 10,000 years B.P., there was a general restoration of forest across Central Africa. They tell us that a lowland forest species advanced 300-400 kilometres north of their present limits in the Sudan and they noted the formation of lagoonal clays and swampsoils from 12,000 to 4,000 B.P., which must have been of great agricultural and economic significance.

The Eastern Delta of Egypt has yielded a number of pollens of the Mediterranean vegetation which have been studied by scientists, but as yet only on a limited scale. Some years ago, Martine Rossignol analysed some marine sediments on the coast of Israel and found in them deposits of Nile mud which had been left by the currents moving northwards, which is their normal pattern (Rossignol, 1960). This mud contained pollens of many kinds, including Aleppo pine. She was able to compare these results favourably with actual samples from the Nile Delta, namely from the Berenbal region south of Rosetta and she tabulated her results in that study. Further work on core samples from this same area in the Delta was done by Professor Shukri Saad from the University of Alexandria (Saad and Sami, 1967). In his published results there is pine pollen, as well as its related vegetation. This scientist has taken samples from other areas in the Egyptian Delta and all seven sites have produced pine pollens as well as pollens of its related family of plants. We look forward to the further publication of these important results.

Although we are as yet unable to date these levels from the Egyptian Delta, we now have some pollen and vegetation studies from Israel and the Negev, which should help us to co-ordinate the various levels. Although we have as yet no published pollen results for the Sinai, these results from Israel seem to point to the fact that there may well have been some correlation right across north Africa at least during the Early Neolithic period. Aharon Horowitz found the Upper Palaeolithic spectrum of the Central Negev to reflect a cool Mediterranean climate while the vegetation of the following period which he calls the late Upper Palaeolithic reflects an increase in the vegetation and arboreal pollen which continued to increase into the Pre-Pottery Neolithic period (Horowitz, 1971; 1974; 1976).

In a recent study, Menashe Har-El emphasized that oak and pine forest is well attested in southern Palestine from biblical times until the First World War, when the remains of that forest was cut down by the Turks who were building a railway (Har-El, 1977). Evidence for this forest has been brought forward by a number of scholars, among them M. B. Rowton, in his study of ancient topographical names which reflect the presence of trees (Rowton, 1967).

So far, then, we have referred to the present-day remains of two ancient forests: in the Sahara and in southern Palestine, both of which are relevant to the Egyptian situation. There is another one adjacent to Egypt whch we must mention here as well. It is the juniper forest of the northern Sinai. Stands of juniper have been seen today in the area between the Suez Canal and Wadi El Arish in places called Gebel Hallal and Gebel Maghara (which has nothing to do with the ancient mining place further south bearing the same name). A study of the prehistoric period in these regions by James Phillips of the Department of Anthropology, University of Illinois and Ofar Bar-Yosef of the Institute of Archaeology, Jerusalem, found large amounts of coals from *Juniperus*, proving that it was burnt for firewood and must therefore have been abundant at that time (Phillips and Bar-Yosef, 1974).

We thus have the ancient remains of tree forests, attested by several scientists, in close proximity to Egypt.

We are not so fortunate in our information from Egypt itself. The root systems of trees and pieces of wood are often found in excavations, yet few excavators treat these as serious finds. It is good to hear that Professor Elmar Edel is having a large number of his woods from Qubbet El Hawa analysed, with results which will be certainly very exciting. We must be grateful to Madame Desroches Noblecourt who has had all the wooden objects in the Louvre analysed, even if some of the results are thought to be tentative and not final. Not all the museums, even the large and important ones, are equipped for such work and it is not easy to get it going. However, what we require most of all is a belief in its importance on the part of the keepers of the collections. Such a belief would soon be followed by the will to get such a project going. Until this is done, we shall go on arguing about what we think the ancient Egyptians meant by the terms they used.

The importance of having a precise knowledge of the woods which were used by the ancient Egyptians must be:
a) that far less cedar was used by the ancient Egyptians than is at present believed,
b) much of the wood called cedar may in fact be juniper because they look the same to the naked eve,
c) as Victor Loret (1916) rightly argued, the most prized wood in ancient Egypt was shown as pale gold, with no grain markings, consistent with a variety of pine (Nibbi, 1981 a and b). It could be found growing much closer to Egypt than we have so far believed possible. Thus the recent work of scientists shows that the ancient Egyptians did not need to go to the Lebanon for this wood. It is, in any case, an absurdity to define cedar as being of the Lebanon when we have the remains of a cedar and oak forest in the highlands of the Sahara.

As far back as 1970, Jean Lauffray with great perspicacity rightly questioned our assumptions about the sources of the woods used by the ancient Egyptians. He was discussing the timbers in the Taharqa shrine and the massive trunks which the large columns had demanded. Lauffray challenged the average dimensions quoted by G. Post in his *Flora of Syria* and quoted the evidence of P. Mouterde, who attested that the variety of *Juniperus* called *Excelsa Bieberstein*, rendered in Arabic *lisab*, can attain the height of thirty metres, as high as any cedar, whereas the variety called *J. drupacea*, rendered in Arabic *difran*, now on its way to extinction, can reach a height of over twenty metres. Only the cypress could reach a height of forty metres (and not a maximum of 25 metres, as Post stated), and this seems to be the tree most likely to have been employed in the building of the Taharqa shrine. There is, however, no evidence that it was to be found in the Lebanon. Lauffray tells us that Lucas quotes Beekman as saying that it could be found there, but there seems to be no basis for this. Moreover, Lauffray emphasizes that, in addition to the question as to whether such trees could actually be found in the Lebanon, we have the added problem of the political situation in the time of Taharqa, which would have made imports from these regions difficult. Thus Lauffray rightly posed the problems inherent in our assumptions concerning the importation of wood from the Lebanon into Egypt, at any time in history, in effect.

There is the added problem of the physical importation of logs from such a distance. The Sargonid reliefs from Khorsabad (Pritchard, 1954) show us logs being transported by boat, with four usually lashed overhead and three being hauled in the water behind the boat. The Egyptian story of Wenamun confirms that seven logs are full load for any boat transporting timber (lines 2, 35 - 40), so we must suppose that we are speaking of a system very similar to that shown on the Khorsabad reliefs. Such boats as these carrying a heavy load and subject to the constantly changing strain of the logs in the water could not be controlled in the sea. They would be at the complete mercy of the waves, particularly in the rough waters along that coast. We must therefore abandon any idea that large and heavy timbers could ever have been imported

into Egypt in this way. The impossibility of transporting long whole logs from the Lebanon into Egypt, either by sea or by land, which is extremely mountainous, must make us reconsider fundamentally the sources of timber for ancient Egypt. I have already pointed out (Nibbi, 1981 a) that the assumption that cedar was imported from the Lebanon by Egypt depends on the wrong intepretation of the word *ᶜš* as cedar, which Egyptologists today agree to be wrong.

Lastly, we must draw attention to the presence of antlered deer among the animals portrayed by the ancient Egyptian artists of the pharaonic period and later (Nibbi, 1980). Thirty-three antlered deer have been counted, the number of representations dwindling from the time of the Old Kingdom to the Coptic and Byzantine period. This signifies beyond doubt the survival of forest environment, at least in isolated stands, along the Nile valley during this time.

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EUGEN STROUHAL

Craniometric analysis of the Late Palaeolithic population of the Wadi Halfa region (Lower Nubia)

The Late Palaeolithic skeletal series found at Site 117 at Gebel Sahaba, 3 km north of Wadi Halfa, and at Site 8905 at Tushka, 77 km north of Wadi Halfa, as well as another series from Site 6 B 36 found opposite Wadi Halfa, on the left bank of the Nile, have been analysed as separate groups (Anderson 1968; Greene and Armelagos, 1972). The first two series were excavated by the expedition of the Colorado University at Boulder, the third by the expedition of the Southern Methodist University in Dallas, Texas. The small number of individuals in each series excluded the use of statistical tests in the analysis made by Anderson (1968) and made it also impossible to prove the significance of several differences in the tests performed by Greene and Armelagos (1972).

These series are not only geographically in proximity, but also belong to the same cultural (industrial) complex called Qadan by Wendorf (1968), or the Wadi Complex by Wheat and Irwin (1965). Chronologically, they belong to the same Late Palaeolithic horizon, dated 12,000 - 10,000 B.C. or slightly later.

By comparing mean values of different measurements of these series Anderson (1968) concluded their proximity, which was later on confirmed by Green and Armelagos (1972) in statistical tests dealing with metric, non-metric and dental traits. Even the behavioural pattern of the population, as reflected in their pathological findings, showed close resemblances.

During my study of these materials at the Universities of Boulder and Dallas [1] in 1973 I reached the conclusion that the series can be pooled together in a larger series representing the Late Palaeolithic population of the Wadi Halfa region of Nubia. To the three pooled series mentioned I added another skull [2] from tomb 45 at

[1] This study was supported by Grant No. 2623 of the Wenner-Gren Foundation for Anthropological Research Inc., New York, NY, and by a grant of the Hrdlička Foundation, Smithsonian Institution, Washington, D. C.

[2] Its publication will apear soon in the journal "Anthropologie" (Brno).

Site 117, and donated by the Southern Methodist University Expedition to the National Museum in Helsinki, Finland [3]. The whole pooled series consists thus of 59 adults: 26 males and 33 females.

In the previous analyses Anderson (1968) and Greene and Armelagos (1972) showed that the Wadi Halfa material resembles the Upper Palaeolithic Cromagnon type, especially that of the Northwest African variety (most closely the Afalou-Bou-Rhummel series). At the same time, a possible relation to some Central African material (Ishango) was also discussed by Greene and Armelagos (1972). The question of whether the Late Palaeolithic Wadi Halfa material was genetically linked with the Predynastic Egyptian material was, however, not solved. The same applies to the problem of the place occupied by the Wadi Halfa series in the Late Palaeolithic material in relation to the origin of recent human races.

Taking all this into account I compared the pooled Wadi Halfa series with the Predynastic Egyptian series from Naga-ed-Der (Upper Egypt), dated to 4th millennium B. C., which I studied in the Lowie Museum of Anthropology, University of California, Berkeley [4] (36 individuals). To elucidate the relation of the Wadi Halfa series to the European Upper Palaeolithic material I used the data of Billy (1972) on 33 Aurignacian and Perigordian as well as 25 Magdalenian individuals. For the evaluation of the complex of features pointing to Negroid affinities I used, as a model, a series of West African Ashantee Negro skulls ($n=32$), which I studied in the American Museum of Natural History in New York [5]. This was necessary because of the lack of ancient Negro skulls.

For this paper I analysed, in both sexes, 71 craniometric features, viz. 23 on the neurocranium, 16 in the facial skeleton according to Martin's (1928) technique, 6 features of the vertical and 7 features of the horizontal profilation of the face, measured, mostly, according to the technique of Woo and Morant (1934), 7 specific measurements of the maxilla and zygomatic bones and 12 features of the mandible and teeth. Besides the usual gross or complex measurements some very detailed morphological features could thus be evaluated. The same measurements were determined in the comparative series with the exception of those two by Billy (1972) where only 11 measurements were available for comparison. The significance of differences found was tested by the F- and t-tests.

In all measurements of the neurocranium but one [6], the Wadi Halfa series showed higher values than both the Predynastic Egyptians and the West African Negroes, most of the differences being significant ($p=0.05$) or even highly significant ($p=0.01$). In the neurocranic measurements (except one [7]), the Wadi Halfa series resembled more the younger (Magdalenian) Upper Palaeolithic European series.

[3] I would like to thank the Director of this institution for the facilities he granted me.

[4] I would like to thank the Director of this institution for the facilities he granted me.

[5] I would like to thank the Director of this institution for the facilities he granted me.

[6] The porion-bregma height.

[7] Very broad minimum breadth of the forehead.

In all classical measurements of the facial skeleton but one [8], the Wadi Halfa series showed higher values than both the Predynastic Egyptians and the West African Negroes. In features discriminating Europoids and Negroids (measurements of the piriform aperture, the facial length, both maxillary diameters), the Wadi Halfa skulls are closer to the West African Negroes than to the Predynastic Egyptians. The Wadi Halfa series showed also bigger dimensions than both the Upper Palaeolithic European series with the significant exception of the nasal height which was lower in the Wadi Halfa series.

In the measurements of facial profilation the Wadi Halfa series was found to be much closer to the West African Negroes than to the Predynastic Egyptians. In both the Wadi Halfa and the West African Negro series we find a well developed total and alveolar prognathism, a smaller prominence of the nasal bridge, a flattened nasal bone, a less prominent subspinal region and more prominent zygomatic bones.

In the mandibular and teeth measurements the Wadi Halfa series showed preponderance of size and robustness over the Predynastic Egyptians and the West African Negroes.

In a paper prepared for the journal "Anthropologie" (Brno, Czechoslovakia) I shall publish all the metric data supplemented by the indices and the non-metric features.

It may be concluded that there is no morphological relation in any of the studied measurements between the Wadi Halfa and the Egyptian Predynastic series. If the Predynastic Egyptians were the result of microevolution of the Wadi Halfa people as was presumed (Anderson, 1968), at least some similarities would be expected.

In the make-up of the Wadi Halfa people, features of massive robustness and great size, correlated with the heavy masticatory function and common with most of the Upper Palaeolithic series, clearly predominate. Heavy, long and basally large skulls with very large faces and low orbits are characteristic for younger Upper Palaeolithic hunters and food collectors, not yet affected by gracilisation produced by the change in food habits and nutrition connected with the beginning of agriculture.

In features discriminating the White and Black races of recent *Homo sapiens*, the Wadi Halfa series has been found nearer to the African (Black) side. Whether this finding should be explained in terms of relationship to the area of formation of the Black race or by convergent adaptive development under similar climatic pressure or even as the result of hybridisation cannot, however, be established on the available evidence.

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[8] Lower orbital height.

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Jean Leclant

Les gravures rupestres du Gebel Gorgod (Nubie)

La mission Michela S. Giorgini a travaillé à partir de 1962 dans le Gebel Gorgod, vaste ensemble de collines dominant le ouadi du même nom, sur la rive Ouest du Nil, à proximité de la bourgade actuelle de Delgo, au Nord immédiat de la IIIe Cataracte. Depuis Décembre 1977, la mission française installée désormais à Sedeinga a repris les investigations dans le Gebel Gorgod. La station principale (station A) se trouve dans le vaste cirque du gebel lui-même. Sur de grandes dalles plates sont gravées une profusion d'animaux de la grande faune paléo-africaine (girafes et autruches en particulier), ainsi que des représentations de bovidés et de capridés (dont certains portent des attributs culturels tels que des boules pendant à leurs queues); plusieurs scénes de chasse avec des chiens sont très animées. Il y a également quelques barques et des „pieds".

Au cours de toutes récentes recherches, auxquelles a été associée Mme Léone Allard-Huard, une station B a été repérée à 4 km en amont de A; on y remarque de nombreuses figurations pastorales, d'autres relatives à la faune sauvage, des scènes de chasse, ainsi que des gravures plus récentes de bateaux et de cavaliers. A proximité du village même de Gorgod, une piste est jalonnée de nombreuses gravures rupestres (station C); il s'agit d'un lieu de passage plutôt que d'un habitat, car on n'y trouve guère de cuvettes à moudre les grains qui abondent dans les sites précédents.

Si le Gebel Gorgod présente des éléments de la grande faune paléoafricaine et des traits culturels du niveau des Chasseurs, il se situe cependant dans l'ensemble au niveau bovidien.

Isabella Caneva and Annalisa Zarattini

Saggai: a settlement of hunter-fishers north of Khartoum

The Italian Mission for Prehistoric Research in Egypt and the Sudan [1] started working on the Nile in 1966, with surveys in the Fayum depression. Since 1970 the research has been extended to the Sudan, where surveys and excavations on the East bank of the Nile, between Khartoum and the Sixth Cataract [2] were carried on by Prof. S. M. Puglisi.

During the last two seasons field activities have been concentrated in the Saggai area, 40 km north of Khartoum, not far from the river. Among the sites located, one revealed the presence of an extensive settlement, related to the Early Khartoum "Mesolithic" culture (Arkell, 1949).

Hunting and fishing appeared to have been the main subsistence activity, as indicated by the association of bones of wild mammals, fishes and reptiles with specialized bone and lithic weapons. However, the presence of pottery vessels and grinding equipment indicates low mobility and developped techniques of food manipulation: we are dealing here with a "settlement" with a successful, non-agricultural economic system.

The site-mound is large, covering a surface of 200 × 160 m. During the first season (Caneva and Zarattini, 1979) two soundings were made (Fig. 1), reaching virgin soil at a depth of 1.60 m. The levels were extraordinarily rich in findings and appeared to be undisturbed by graves. In the second season (Caneva and Zarattini, 1980) the general interpretation of the site was confirmed but new elements appeared, referable to a later horizon: a very deep grave with goods including ostrich egg-shell beads of Meroitic type and red burnished pottery.

A preliminary study of the faunal remains associated with the Early Khartoum

[1] Supported by grants from the University of Rome, the National Research Council, the Italian Ministry of Foreign Affairs.

[2] Excavations are licensed by the Sudan Antiquities Service, which we would like to thank for its kind cooperation and help during our field work.

assemblage (A. Gautier, pers. comm.) revealed the presence of aquatic molluscs (mainly *Pila ovata*), landsnails, fish (mainly catfish), some reptiles, a few birds, and a varied assemblage of mammals, including rodents, carnivores, warthog, hippopotamus, elephant, gazelle and other bovids. A second assemblage collected from pit-like structures consists mainly of disarticulated dromedary bones as well as some bones of other domesticates and gazelle.

Archaeological materials, probably related to the younger assemblage, were few and not very diagnostic: pottery fragments, black or red-slipped and well burnished, belonging to hemispherical bowls, sometimes with simple bands of impressed decoration.

Findings of the older deposit concern lithic industry, pottery, bone artifacts and ground stone tools typical for an Early Khartoum assemblage. Lithic implements consist almost exclusively of quartz microlithic crescents and chopping tools or hammerstones (Fig. 2). Bone implements include combs for pottery decoration, grooved bones and some barbed points with barbs on one side only (Fig. 2). Vessel shapes can not be reconstructed but the sherds suggest that globular forms were predominant. Their surface is unburnished and decorated by comb impressions (Fig. 3). Pounding and grinding tools were found to be numerous: pestles, upper and lower grinding stones, stone rings (Fig. 4).



FIG. 1. Saggai. General view of the sounding

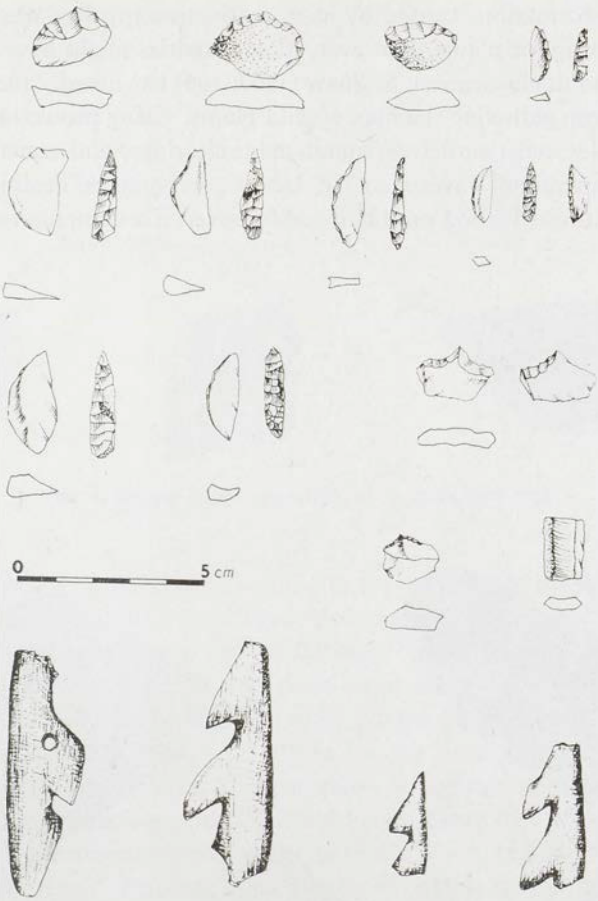

FIG. 2. Saggai. Lithic and bone implements

The emphasis put on grinding equipment suggests a kind of settled way of life and a focus on the processing of vegetable food. In the absence of more specialized tools the presence of pottery and grinding stones is only indirect evidence of grain using and, possibly, root and vegetable cooking; we know, however, that these re-resources may constitute 60% to 80% of the diet of the present day hunters (Woodburn, 1968).

The list of African cultigens is very extensive (Cf. Harlan *et al.*, 1978). As Harlan (1978: 13) has written, "African agriculture is based on a mosaic of crops; traditions and techniques do not reveal a "center", a nuclear area or a single point of origin". It is, therefore, necessary to look for pre-adaptive factors in every area for local domestication processes. It is possible, in the long run, to have an increment in production by protecting and caring for plant life: while domestication is an end-product

of genetic transformations caused by man, cultivation involves merely activities relative to the caring for plants. However, these activities might have had remarkable effects leading to domestication: as Shaw (1977: 106) has noted, "the borderlines are very hazy between gathering the nuts of wild plants, giving protection to a wild tree, allowing trees to seed themselves in man-made clearings, and actual planting" but, through the intentional investment of labour, we may be dealing with the first, significant step towards food production. Moreover, if a community becomes accus-



FIG. 3. Saggai. Vessel sherds decorated by comb impressions

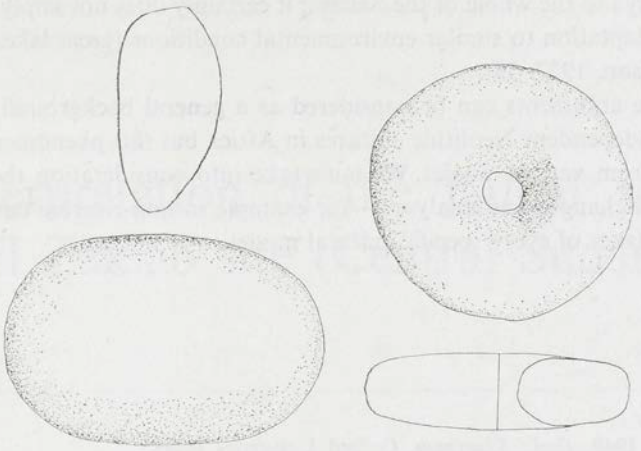

FIG. 4. Saggai. Upper grinding stone and stone ring

tomed to a sedentary way of life, this would be an incentive to make grasses and tubers grow near the camp site, even without their domestication (see "house gardens" of Indian communities) (Harris, 1973a; Lathrap, 1973). In any case, the areas of domestication of certain indigenous African crops seem to be corrrelated with the distribution of the stone-tool-using fishermen groups (Shaw, 1977: 111).

We have in fact archaeological evidence for the development, in "mesolithic" contexts, of a type of permanent settlement based on the exploitation of the environment by non food-producing groups. It would seem likely that causes for sedentarization resulted from changes of climate – not strictly in terms of environmental determinism, but in terms of pressure not directly avoidable within the bounds of the dialectic relations between natural and cultural elements (i.e., territorial limits, population size, potential of natural resources, food production, quantity of work, technological level, social relations, etc.). These elements are normally kept in balance through various measures of control and compensation.

Towards 9,000 B. C. the increasing temperature caused greater evaporation and, therefore, greater precipitation, certainly producing a rapid growth of vegetation (Rognon and Williams, 1977). Concomitant changes of both quantity and type of fauna can have produced a general imbalance provoking different reactions in different groups. Restrictions on hunting then could have favoured the widening of the spectrum of required resources, resulting in changes in technology (including manipulation and storing), and causing a lesser mobility and, therefore, bringing about the sedentarization (Harris, 1973: 19).

The archaeological evidence testifies to the presence of microlithic technology in similar cultural contexts. Evidence for this as well as for the presence of combed and impressed pottery and bone points can be found from the upper Nile and the Rift

Valley in Kenya to the whole of the Sahara; it certainly does not imply migrations of people but adaptation to similar environmental conditions (great lakes of the Holocene) (Phillipson, 1977: 55).

The above arguments can be considered as a general background for the development of independent Neolithic cultures in Africa but this phenomenon should be approached from various angles. We must take into consideration the local causes for functional changes and analyse – for example in non-riverine environments – the characteristics of every specific cultural model.

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A. Tigani El Mahi

An interpretation of the faunal remains from El Zakiab site (Central Sudan)

This paper is an attempt to correlate some evidence which indicates the seasonal status of El Zakiab site and to investigate the suitability of the settlement during the rainy seasons. I will concentrate on osteological evidence, abiotic evidence, and some observations based on the excavated material, with reference to ethnographical information.

The El Zakiab site lies 18 km. north of Khartoum, on the eastern bank of the Nile, at a distance of 3 km. from the stream of the river. The material from the site consists of typical Shaheinab pottery, lithic tools, fish-hooks, bone harpoons, and artifacts used for personal decoration. The osteological remains of the terrestrial fauna are those of domestic cattle, small livestock, and various wild animals. The aquatic fauna is represented by the remains of *Lates niloticus*, *Tilapia* sp., *Clarias* sp., *Heteratis* sp., *Protopterus* sp., and *Crocodilus niloticus*. The site is radiocarbon dated to 5660±80 B. P. (MASCA calibrated to 4525±65 B. C.) and 5350±90 B. P. (MASCA calibrated to 4225±155 B. C.).

The study of the remains of the lungfish *Protopterus* sp., its behaviour in absence of water, and its general ecological requirements offered some indications of the status of the site and its surroundings with reference to the seasons, the river's behaviour, and human behaviour.

The lungfish remains represented 72% of the aquatic faunal remains from the site. The measurements of the material indicated that the smallest specimens belonged to species of 170 mm. in total length. On the other hand, the lungfish is known for its habit of aestivation in sleeping nests in the absence of water. At many localities in Africa, the lungfish is caught (especially in dry seasons) by digging up the sleeping nests. This explains the high occurrence of the fish – 72%. Thus, it is possible to conclude that the fishing activity at El Zakiab took place in the dry season.

On the basis of the results of study of soil samples from the site, which indicates that the samples were homogeneous to riverain sand, the river behaviour can be re-

constructed. It is evident that it flooded the area leaving pools and marshes after the inundation which eventually evaporated, forcing the fish to aestivate.

The material recovered from the site contains remains of fish species whose habitat are oxygenated and deoxygenated waters, as well as fishing-hooks and bone harpoons. I found that the two categories of fishes and fishing equipment are quite sufficient to be considered as representative of diverse types of hydrological conditions in terms of water depth, especially in absence of clear evidence of boats. Again, this reflects the river behaviour which produced marshes and pools after resession in the dry season. Thus, El Zakiab site offered the human group in question and its livestock a very promising locality in the dry season.

On the basis of this conclusion, let us have a closer look at the following features of El Zakiab site. The absence of human burials on the site can be explained by its seasonal status, for the range of social and ritual activities is expected to be more limited in dry season camps than in base camps. The relatively small size of this site in comparison with other Neolithic sites in the area indicate the possibility that El Zakiab site was not an "independent" site. Another feature from the area is the distributional pattern of sites in relation to the present bank of the Nile. This distributional pattern reflects the limits of the river in the wet seasons, since we believe that the location of sites served a well-known function to the inhabitants of these sites.

By examining the suitability of El Zakiab site under such environmental conditions, the following can be concluded. The location of the site during a rainy season and a flooding river exposed the livestock to the danger of predators, such as crocodiles. Yet not only predators cause danger to man and his livestock but, more important, any settlement under such conditions would be unfavourable for the health of the livestock during the wet seasons. Hence, from an ecological point of view, El Zakiab site could not have been inhabitated during the wet seasons.

In conclusion, we find that the osteological remains of the lungfish, the observations on the excavated archaeological material, and the nature of the site itself indicate that El Zakiab was a dry-period seasonal site[1].

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[1] An ela borate discussion of these data will be published in the *Norwegian Archaeological Review* (1981). The author of this paper is most grateful to the NORAD for supporting his study.

Lech Krzyżaniak

The Neolithic habitation at Kadero (Central Sudan)

The Neolithic site at Kadero is located on a low, eroded mound of sand of about 4 hectares in surface area which rises to ca. 1.8 metre above the expansive and flat bottom of the Valley of the main Nile. Both the mound and the surrounding plain seem to be characteristic features of the Gezira Formation which occupies the area to the south of the confluences of the White and Blue Niles (Butzer and Hansen, 1968). The Kadero site is situated 18 km to the north of this confluence and 6.5 km to the east of the channel of the main Nile.

Eight seasons of excavations at Kadero, carried out until 1980, resulted in the testing of 1,744 square metres of the site [1]. As a result, the settlement deposits and burial grounds of the Central Sudanese Neolithic tradition were found and partly investigated. The investigation pursued on their contents yielded a considerable amount of information on the character and organization of cultural life on this site.

In the course of excavations of several pits and trenches, two settlement deposits were found on the mound and their limits were roughly assessed, partly also by surface examination. The deposits are located on the opposite edges of the mound: southern and northern, and are interpreted as the remains of dwelling places. No settlement deposit was found on the flat, central part of the mound (Fig. 1). The sample of the remains of food and artefacts excavated from the southern deposit is, so far, the basic source of information on the subsistence economy (Krzyżaniak, 1978), lithic industry (Nowakowski, this volume) and pottery (Chłodnicki, this volume) of the Kadero social group. Three radiocarbon measurements for this deposit, all made on freshwater shells which, undoubtedly, were brought to the site by its inhabitants,

[1] Basic reports on the first eight seasons at Kadero have been published by L. Krzyżaniak: Kadero (first season, 1972), *Etudes et travaux*, Vol. 8 (1974) : 361 - 366; Kadero (second-third season, 1973 - 1973/74), *EeT*, Vol. 9 (1976) : 283 - 287; Kadero (fourth-sixth season, 1975 - - 1976), *EeT*, Vol. 11 (1979) : 246 - 252; Kadero (seventh season, 1978), *EeT*, Vol. 14 in press.

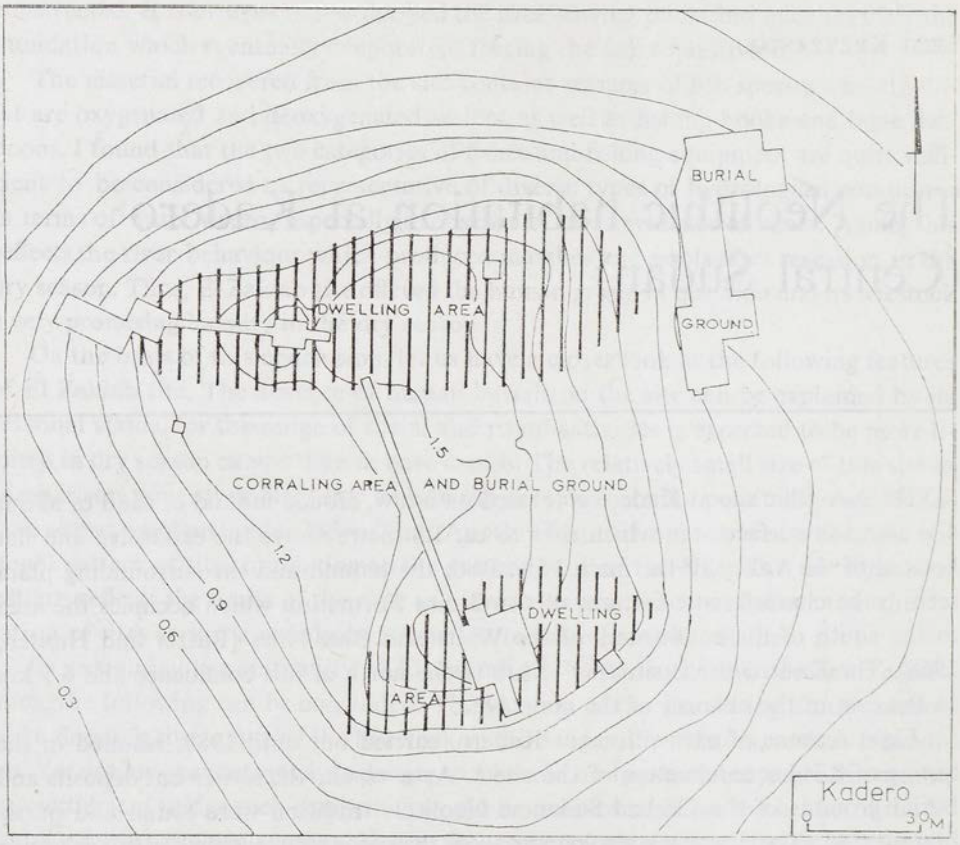

FIG. 1. Kadero. Pits and trenches excavated during the first 8 seasons and a hypothetic interpretation of the Neolithic site (settlement deposits are vertically hatchured)

gave dates ranging from ca. 5030 to 5280 B. P.[2] and, after calibration, date the southern part of the Kadero settlement to the end of the 5th millennium B. C.

The larger pit excavated in the southern settlement deposit yielded direct faunal evidence which points to the more advanced food producing economy practised by the Kaderans as compared to that known from Esh Shaheinab, the type-site of the Central Sudanese Neolithic tradition (Arkell, 1953). As is reported by the archaeozoologist (Gautier, this volume), the most frequent remains from this deposit are by far those of domestic animals: the most numerous are clearly the skeletal remains of cattle, whereas much less frequent are the remains of sheep and goat; some remains

[2] The following ^{14}C dates are available so far for the southern settlement deposit at Kadero:
(T-2188) 5,260±90 B.P.
(T-2189) 5,030±70 B.P.
(SMU-482) 5,280±90 B.P.

of dog are probably also present. It seems that similar evidence derives from the small pit excavated in the northern settlement deposit in 1980 (Gautier, personal communication). The large sample yielded by the southern deposit, consisting of tens of thousand of pieces of skeletal remains, suggests the consumption by the inhabitants of this settlement of meat of the domestic cattle on a considerable scale. There is, so far, no evidence on the consumption of milk and its processed products at Kadero.

The impressions of grains of different plants found on the potsherds excavated from the southern and northern settlement deposits seem to shed some light on the kind of vegetable food which might have been eaten by the Neolithic Kaderans. Contrary to the earlier reports about the presence of two tropical, cultivated cereals (sorghum and finger millet) in this evidence (Klichowska 1978; this volume), most recent investigation reports only wild cereals (including sorghum), grasses and tree fruits at Kadero (A. Stemler, personal communication). The intensive and permanent crushing of grains at Kadero is clearly documented by tens of thousands of fragments of worn-out grindstones found in both settlement deposits (Fig. 2) and this seems to indicate a regular consumption of processed grains on a considerable scale.

The faunal and botanical evidence point, therefore, to the subsistence economy at Kadero composed of animal husbandry, mainly of cattle, and an intensive collecting of grains of wild tropical cereals, other grasses and tree fruits. Among the apparently still flourishing food-gathering activities, the collecting of snails *Pila* and freshwater molusces whose shells were found in the deposits (Gautier, this volume) should also be mentioned. Similarily to collecting, hunting was also practised, although on a small scale, and seems to have concentrated on smaller forms of antelopes, gazelles and carnivores. Only several fish-bones were found at Kadero so far and this suggests that fishing was of marginal importance at this settlement (Cf. Gautier, this volume).

The evidence obtained so far from the northern settlement deposit seems to confirm the data yielded by its southern counterpart. This deposit is, however, not yet dated by the radiocarbon measurement[3] but its contents are clearly of the Central Sudanese Neolithic tradition. Its pottery, the lithic and bone artifacts, are simlar to the material excavated from the southern part of this settlement and it would not be surprising to learn as a result of the isotopic dating that it is contemporary to the southern deposit. It is worth adding that its western end contained an exceptionally heavy concentration of grindstones and only very small amounts of potsherds and animal remains as compared to the quantities of these remains recorded in the southern deposit. "Normal" amounts of these artefacts seem, however, to have come from the smaller pit excavated in the centre of the northern deposit last season (cf. Fig. 1). This may point to the existence of areas of special activities within the Kadero settlement.

[3] The following radiocarbon measurements were obtained in 1982 for the northern settlement deposit at Kadero:
(KN-2821) 5,500±70 B.P., (KN-2822) 5,610±55 B.P. and (KN-2823) 5,380±65 B.P.

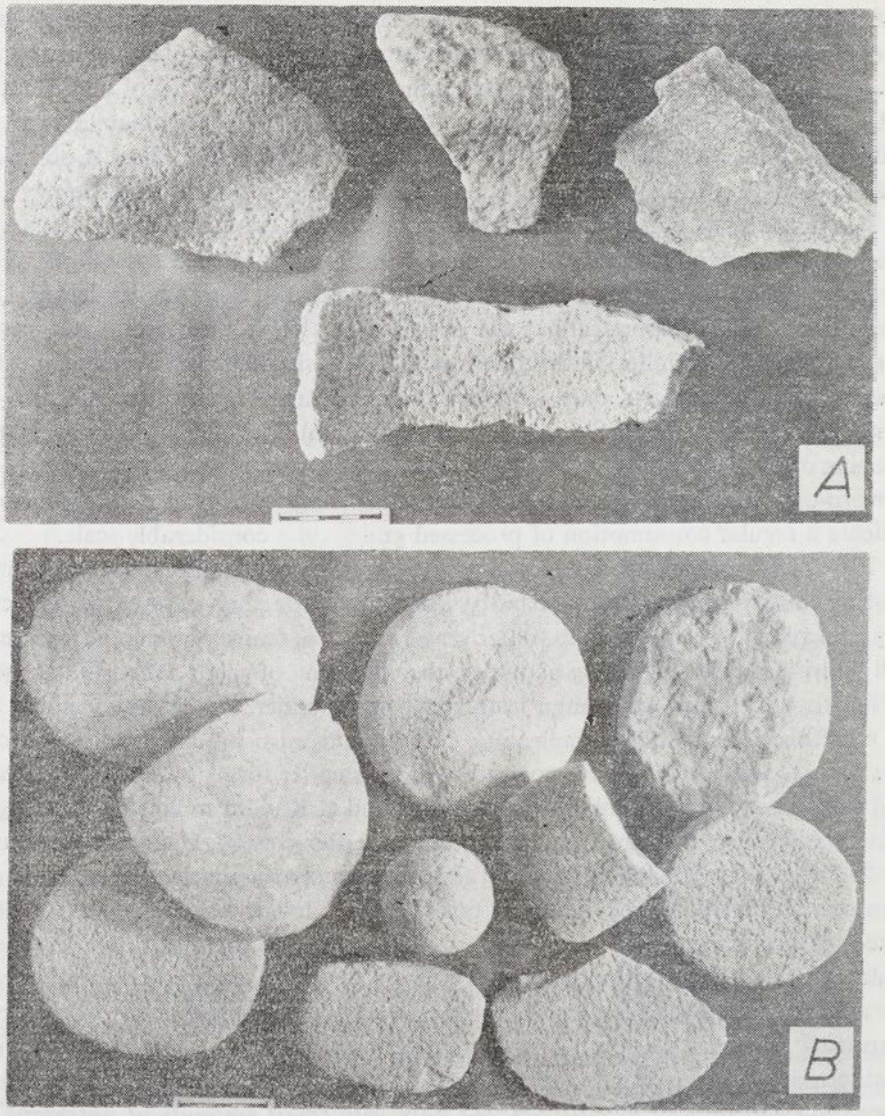

FIG. 2. Kadero. Lower (*A*) and upper (*B*) grindstones found in the settlement (scale in centimetres)

It seems that the original level of both parts of the Kadero settlement deposits was elevated somewhat higher than their present surface. This is suggested by the evidence coming from the burial grounds at Kadero and other sites in the area where the Neolithic skeletons lay exposed on the surface; this indicates considerable erosion in the Central Sudan which has taken place since the Neolithic times (cf. Arkell, 1953: 1). As a result, mounds like Kadero may have been eroded to the depth

of, perhaps, as much as 1 metre or more below the original Neolithic surface, which account for the exposition of these burials.

No settlement deposit was found in the central part of the Kadero mound. It seems, however, that this particular part of the site may have played an important role in the economic and social life of the local Neolithic group.

The faunal evidence obtained at Kadero (*e.g.*, shells of semiaquatic molluscs) (cf. Gautier, this volume), seems to confirm the hypothesis formulated earlier by Arkell (1953: 8) that the level of the Nile waters was about 5 m higher in the Neolithic period that in most recent times. Consequently, as can be computed on the basis of his data and the contour map of this area,[4] the expansive plain which surrounds the Kadero and other mounds on the bottom of the Valley was flooded by the Nile waters in the wet season. It seems that the average depth of this inundation around the Kadero mound may have been of only several tens of centimetres (Krzyżaniak, 1978: 161). The inundation of the expansive pastures, which undoubtedly existed on the bottom of the Valley at this time, had certainly forced the Neolithic herdsmen to evacuate their animals onto higher land; the mounds of the Kadero type seem to have been, therefore, a convenient locality for such a retreat. It was already hypothesized by this author (1978: 172) that the central part of the Kadero mound, where no remains of dwelling activities have been found so far, could have been organized by this Neolithic social group to corral its herds in a somewhat similar way to the present pastoralists living on the Upper White Nile who build kraals for this purpose (Evans-Pritchard, 1940: 16-112).

The excavations of the Kadero mound also yield evidence which shows that it was a location not only of economic activities of the local Neolithic group, but that it was also the place where this population performed its important social activities. This is indicated by the discovery of 39 inhumations of the Neolithic chronology found so far on the mound. Judging by the results of the testing carried out until today, the inhumations occur in two localities: in clusters of graves found on the north-eastern slope of the mound and in the central part of the mound, outside the limits of the settlement deposits. In both these localities, adult individuals and infants of both sexes were buried (Promińska, this volume). In general, human bodies were inhumed in similar, contracted positions (Dzierżykray-Rogalski, this volume).

Two clusters of graves were found on the north-eastern slope of the mound (cf. Fig. 1). They contained 9 and 5 individual inhumations, respectively. The larger cluster was composed of the remains of adults of both sexes and infants, and the smaller one contained the remains of adult males and infants. The furnishing of these graves was exceptionally rich by Kadero standard. In the larger cluster, the top position in this respect was occupied by Grave No. 3 of a male 45 years old, where the discoidal mace-head, 3 high quality pottery vessels (washed with red ochre) and

[4] Cf. the Khartoum North and Wadi Seidna sheets of the Sudan 1 : 25,000 maps, prepared and printed by the Sudan Survey Department, Khartoum, in 1970.

an impressive necklace of carnelian beads and pendants were found. Most of these graves in both these clusters contained similar high quality pottery vessels, Red Sea shells used as beads, necklaces of carnelian beads and nose- and lip-studs of zeolite.

In contrast to these graves, poor or no furnishing was found with the inhumation excavated in the central part of the mound. As many as 11 such graves were found in the trench unearthed across the central part of the mound (cf. Fig. 1), 5 inhumations were found accidentally in its vicinity and 6 graves were found on the outskirts of the northern settlement deposit. If these two major groupings of inhumations on the Kadero mound are confirmed by future excavations, and if we try to explain their cooccurence in a way common to prehistoric archaeology, then they would appear to represent inhumations of individuals of different social status. This may lead to the conclusion that the elite of the Kadero social group were buried in separate ground, while the rest of the members of this social group were buried near their dwellings and all over the large, hypothetic corralling area.

The complexity of the cultural evidence obtained in the course of the testing carried out so far at Kadero seems to be of a unique magnitude in Central Sudan. Present evidence encourages us to go on with this project and excavate a much larger part of this site, far beyond the present limits of exploration. In this way it is hoped to obtain not only qualitative but also quantitative data for this site, *e.g.* the amount of animal remains and potsherds left on the site, the number of lithic implements and graves, and spatial distribution of these finds on the mound. It seems that on the basis of such evidence, and parallel to the much needed, intensive field research in the surrounding area, a more comprehensive picture of the cultural life of the early food-producing social groups in the Central Sudan could emerge.

One of the aims of future research in the Central Sudan might be the testing of the hypothesis, in part already presented by the present writer (1978: 171), and based on presently available evidence, which implies a diversified picture of adaptation strategies prevailing in the Central Sudan at the advent of the production of food. The hypothesis suggests the following trends in the development of these strategies which have resulted from the exploitation of different ecological niches in this area:

1. Riverbank Adaptation: subsistence based on fishing, collecting and hunting, supplemented by small-scale animal husbandry (possibly only of the ovicaprids). Type-site: Esh Shaheinab,
2. Valley Plain Adaptation: subsistence based on large-scale animal husbandry (mainly cattle) of pastoral character combined with the intensive, and perhaps already with elements of specialisation, collecting of seeds of wild tropical cereals, other grasses, tree fruits, molluscs, and some hunting. Type-site: Kadero,
3. Wadi Adaptation: subsistence based probably on pastoralism, hunting and collecting. (There is, however, very little evidence so far for this kind of adaptation in Central Sudan developing outside the Nile Valley). Type-site: Sheq ed Dud?

This hypothesis, of working character, rather differs from the more traditional explanation which seem to have suggested a linear mode of economic development

in Central Sudan at this time, and rather simultaneous changes in the adaptation strategy in all ecological niches.

It may be also interesting to point out that in the several millennia later Meroitic times, some parallels to pluralistic trend in the adaptation strategy in the Central Sudan could have been found. It is pointed out that different economic and cultural activities may have been pursued at that time in such niches as the Nile Valley, on the plain comprising the sandstone plateau dissected by numerous valleys and in the sandstone plateau cut by large wadis (Ali, 1972).

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ACHILLES GAUTIER

The fauna of the Neolithic site of Kadero (Central Sudan)

The extensive faunal collection excavated at Kadero in the Central Sudan adds substantially to our knowledge of the fauna associated with prehistoric man in the Sudan, which until now was rather limited (A. Gautier, this volume). Kadero site (6 km E of the Nile, 18 km N of Khartoum), situated on mound (erosional remnant?) in an ancient alluvial plain, has yielded evidence for two settlement areas and two contemporaneous burial grounds. One of the settlement areas has been dated to ca. 5,030-5,280 B.P. and the cultural contents of the various excavated *loci* of the site fit well in the so-called Central Sudanese Neolithic. More on the site can be found in the paper by the excavator (L. Krzyżaniak, this volume).

A preliminary report on most of the fauna of the first four excavation seasons (1972-1975) was published by Sobociński (1977). Since then new material has been collected and a revision of part of the report on the domesticated animals as well as the detailed study of the various wild animals is now being made by the present author. In the following, preliminary results based on the material studied by Sobociński and the samples collected during the 4th, 6th and 7th field seasons, are listed. Quantities (number of fragments) are indicated by R (rare = less than 30 fragments), F (frequent = more than 100) etc.; estimates or exact members are sometimes added between brackets. Most of the fish remains were identified by G. Howes (British Museum, Natural History):

Marine shells:	*Engina mendicaria* (beads, burial)	R
	Cypraea sp. (bead; intrusive?)	R(1)
Landsnails:	*Zootecus insularis* (intrusive)	R
	Limicolaria cailliaudi (food?)	FFF
Freshwater gastropods:	*Cleopatra bulimoides* (intrusive)	R(4)
	ampullarids (mainly *Pila ovata*; food?)	FFF
Freshwater bivalves:	*Aspatharia rubens*	F
	Corbicula consobrina (intrusive)	R(2)
	Etheria elliptica	F

Domesticates:	dog? (*Canis lupus* f. familiaris)	R
	cattle (*Bos primigenius* f. taurus)	FFF(1000)
	sheep (*Ovis ammon* f. aries) / goat (*Capra aegagrus* f. hircus)	FF(300)
Wild vertebrates:	Nile perch (*Lates niloticus*)	R
	lung fish (*Protopterus aethiopicus*)	R
	catfish (Clariidae)	R
	monitor lizard (*Varanus niloticus*)	R
	birds (small species)	R(14)
	hare (*Lepus capensis*)	R(6)
	porcupine (*Hystrix* sp.)	R(3)
	squirrel (*Euxerus erythropus*)	R(1)
	other rodents (*Tatera* sp.; *Jaculus* sp. intrusive)	R
	wild cat (*Felis libyca*)	R
	serval (*Felis serval*)	R
	honey badger (*Mellivora capensis*)	R
	warthog (*Phacochoerus aethiopicus*)	R(4)
	hippopotamus (*Hippopotamus amphibius*)	R(8)
	bovids (buffalo, *Syncerus caffer*, and 4 other, smaller species)	F(±150)

The marine shells were brought from the Red Sea and point to connections with that region. Ampullarids and the landsnail *Limicolaria cailliaudi* form the bulk of the molluscan assemblage and are generally accepted to represent food refuse; this, probably, also applies to *Aspatharia rubens* and the Nile oyster (*Etheria elliptica*).

Livestock makes up at least 80% of the mammalian assemblage with cattle 3 to 4 times more frequent than smaller livestock, among which sheep predominate (2 : 1). The status of the canid remains is not well established, but the size of the specimens and the presence of presumed carnivore coprolites suggests the presence of dog rather than that of jackal. The claim that domestic cat may be present at the site (Sobociński, 1977: 59) should be withdrawn, as the material on which it is based can be assigned more reasonably to wild cat. A comparison of some of the measurements on cattle given by Sobociński (*ibid.*) with those for the cattle from the Celtic oppidum at Manching (Bavaria) (Boessneck *et al.*, 1971) suggests that the cattle of Kadero was rather large, standing between approximately 110 and 130 cm at the withers. The goats and sheep do not appear to be exceptionally small or large, but the data are limited.

The wild fauna contains animals that were collected or hunted for various reasons (food, skin, quills, protection of livestock, etc.) and some penecontemporaneous or later intrusives. Among these animals no wild equid (possibly wild donkey, *Equus africanus*) occurs as was previously stated (Sobociński, *ibid.*: 3,7); the identification was based on a rather poorly preserved second phalanx, which can be ascribed to hippopotamus.

As a whole the fauna is suggestive of a pastoralist economy (cattle and small livestock) supplemented by shell collecting, fishing and hunting in open savanna

country with marshy areas (ampullarids, lungfish) and denser vegetation along the river (marsh mongoose?). To this spectrum of animal resources the exploitation of various domestic plants (sorghum, millets) should be added at Kadero (cf. Klichowska, this volume).

A detailed study of the remains described here as well as that of the most recently excavated material from the northern midden at Kadero, containing evidence for some other wild animals than the ones listed above but basically comparable in quantitative composition, is under preparation. It is hoped that it will provide a more detailed picture of how the Kadero people exploited their animal environment. Comparison with other sites in the same time range and general area (for example, El Zakiab, cf. A. Tigani el Mahi, this volume) may clarify the function of the Kadero site, but it appears already now that it probably was a permanently occupied settlement.

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MELANIA KLICHOWSKA

Plants of the Neolithic Kadero (Central Sudan): a palaeoethnobotanical study of the plant impressions on pottery

In the course of the first six seasons of excavations on the Neolithic settlement at Kadero, in the central Sudan, dated to ca 5030-5280 B.P., a sample of about one metric ton of potsherds was obtained. It came from two pits located in the southern (S) and northern (N) settlement deposits on the site (cf. Krzyżaniak, 1978). The excavator selected more than 300 pieces of potsherds from this large sample and gave them to me to study the impressions visible on their surfaces. I was able to find the impressions of plants on 141 potsherds (=47 per cent of the sample).

In total, I found 171 impressions of plants on these potsherds: 153 of these were found on 126 potsherds excavated from the southern and 18 impressions were found on 15 potsherds excavated from the northern settlement deposit. It should be, however, remembered that the pit established in the southern part of the site yielded a large majority of all potteries found at Kadero.

All the identified impressions belong to the grasses (*Gramineae*) and the domesticated forms are clearly predominant among them. The most frequent impressions are those of the domesticated tropical cereals: sorghum and millet.

The plants identified for the Neolithic Kadero are classified into 3 groups:

A. Sorghums

B. Cereal grasses known as millets (*Panicum*) *sensu lato*,

C. Unidentified grasses (*Gramineae* indet.), probably growing wild.

This classification has been introduced as a result of the present situation in the systematics and nomenclature of African cereals characteristic by the use of a number of synonims. Of considerable help in this respect is the work of W. Nowiński (1970).

The list of the identified plants from the Neolithic Kadero consist of 10 "taxa".

A. Sorghums
1. *Sorghum vulgare* (=*S. bicolor*),
2. *Sorghum* sp.,
3. *Andropogon halapensis* (=*Sorghum halapense*),
4. *Andropogon* sp.

B. Millets
1. *Eleusine* cf. *coracana* (=*Cynosurus coracanus*),
2. *Eragrostis abyssinica* (=*Poa abyssinica*),
3. *Digitaria* sp.,
4. *Panicum* sp.,
5. *Setaria* sp.

C. Unidentified grasses (*Gramineae* indet.)

From the botanical evidence from the particular parts of the settlement at Kadero, the following results were obtained:

Southern settlement deposit

A total of 153 impressions was found on 126 potsherds yielded by the excavations in this part of the Neolithic settlement (Table 1). The most numerous impressions were made by the grains of the finger millet (*Eleusine coracana*) (41.17 per cent) while sorghums were in the second place in this respect (29.10 per cent). Among the

Table 1

Southern settlement deposit

Group	No.	Taxon	Number of impressions		Per cent	
A	1	*Sorghum vulgare* (=*S. bicolor*)	31	45	20.26	29.10
	2	*Sorghum* sp.	9		5.88	
	3	*Andropogon halapensis*	4		2.31	
	4	*Andropogon* sp.	1		0.65	
B	5	*Eleusine coracana*	63	100	41.17	65.32
	6	*Setaria* sp.	17		11.11	
	7	*Setaria* sp.?	6		3.92	
	8	*Panicum* sp.	5		3.26	
	9	*Panicum* vel *Setaria* sp.?	5		3.26	
	10	*Eragrostis abyssinica*	2		1.30	
	11	*Digitaria* sp.	1		0.65	
	12	*Setaria* vel *Panicum* sp.	1		0.65	
C	13	*Gramineae* indet.	8		5.22	
		Total	153		99.64	

sorghums, the most numerous impressions were those of the *Sorghum vulgare* (20.26 per cent of all impressions from this part of the settlement). As regards other taxons, the relatively high frequency of the impressions of *Setaria* sp. (11.11 per cent) should be noted in this sample. The frequency of the taxons identified for the southern settlement deposit is presented in the following list:

1. *Sorghum vulgare* (=*S. bicolor*). 31 impressions, including 30 impressions of unglumed grains and 1 or 2 impressions of glumes.
2. *Sorghum* sp. (but not *S. vulgare*). 9 impressions of the unglumed grains. These include 7 impressions of grains, 1 impression of a spikelet and 1 impression of a grain of somewhat different shape.
3. *Andropogon halapensis* (Sorghum). 4 impressions of unglumed grains. It is possible that one of them belong to *Sorghum* sp.
4. *Andropogon* sp. (Sorghum?). 1 impression of grain.
5. *Eleusine coracana* (Finger millet). 63 impressions of the grains, mostly unglumed, including 21 badly preserved negatives.
6. *Digitaria* sp. 1 impression of a grain.
7. *Eragrostis abyssinica*? (teff?). 2 impressions of the unglumed grains, badly preserved.
8. *Panicum* sp. (Millet). 5 impression of grains.
9. *Panicum* sp.? or *Setaria* sp.? 5 impressions of grains.
10. *Setaria* sp. 17 impressions of grains
11. *Setaria* sp.? (bristle-grass?). 6 impressions of grains.
12. *Setaria* sp. vel *Panicum* sp.? (bristle-grass or millet?). 1 impression of a grain.
13. *Gramineae* indet. (unidentified grasses). 8 impressions, including 5 of grains, 2 of glumes and 1 of a part of a blade.

In the sample of potsherds from this part of the settlement a number of less clearly impressed and unidentified negatives of plants were noted as well as traces of charred plants (charred blades?). In lumps of compact soil, pugging (?) or treshing floor (?) concretions were also noted on more than 50 pieces of these materials; these were found as numerous apertures which probably are the remains of the desintegrated tubes of rootlets of plants.

Northern settlement deposit

A total of 18 impressions of plants was found on 15 potsherds excavated from this part of the Neolithic settlement (Table 2). The most frequent turned out to be the impressions of domestic *Sorghum vulgare* which are represented by 38.88 per cent of all negatives. The frequency of the botanical taxa identified for the northern settlement deposit is shown by the following list:

1. *Sorghum vulgare* (=*S. bicolor*). 7 impressions of the unglumed grains.
2. *Sorghum* sp. vel *Andropogon* sp. (Sorghum). 4 impressions of glumes.

Table 2

Northern settlement deposit

Group	No.	Taxon	Number of impressions	Per cent
A	1	*Sorghum vulgare* (=*S. bicolor*)	7	38.88
	2	*Sorghum* vel *Andropogon* sp.	4	22.22
B	3	*Panicum* sp.	2	11.11
	4	*Eleusine coracana*?	2	11.11
	5	*Eleusine* sp.?	3	16.66
		Total	18	99.98

3. *Panicum* sp. (Millet). 2 impressions of grains.
4. *Eleusine coracana*? (Finger millet?). 2 impressions of grains.
5. Unidentified impressions, perhaps of *Eleusine* sp. 3 impressions of grains.

The frequency of the impressions and taxa from both settlement deposits at Kadero are shown in breakdowns on enclosed Tables 1 and 2, while Table 3 contains the breakdown showing the total of botanical evidence obtained for the Neolithic settlement at Kadero. Table 4 shows the size of the grains of cereals from the southern settlement deposit and Table 5 presents a comparison of size of the presently culti-

Table 3

Impressions of plants from the Neolithic settlement at Kadero

	Taxon	S		N		Total	
		Number	Per cent	Number	Per cent	Number	Per cent
A	*Sorghum vulgare* (=*S. bicolor*)	31	20.3	7	38.9	38	22.2
	Sorghum sp.	9	5.9	–	–	9	5.3
	Andropogon halapensis	4	2.3	–	–	4	2.3
	Andropogon sp.	1	0.6	–	–	1	0.6
	Sorghum vel *Andropogon*	–	–	4	22.2	4	2.3
B	*Eleusine coracana*	63	41.2	–	–	63	36.8
	Eleusine coracana?	–	–	2	11.1	2	1.2
	Eleusine sp.?	–	–	3	16.7	3	1.7
	Setaria sp.	17	11.1	–	–	17	9.9
	Setaria sp.?	6	3.9	–	–	6	3.5
	Panicum sp.	5	3.3	2	11.1	7	4.0
	Panicam vel *Setaria* sp.	5	3.3	–	–	5	2.9
	Eragrostis abyssinica	2	1.3	–	–	2	1.2
	Digitaria sp.	1	0.6	–	–	1	0.6
	Setaria vel *Panicum* sp.	1	0.6	–	–	1	0.6
C	*Gramineae* indet.	8	5.2	–	–	8	4.7
	Total	153	99.6	18	100.0	171	97.8

Table 4

The measurements of the impressions of grains from the southern (S) settlement deposit

No.	Taxon		Length in mm	Breadth in mm
1	*Sorghum vulgare* (=*S. bicolor*) (15 impressions)			
		average	3.27	3.58
		minimum	2.7	2.8
		maximum	4.0	4.1
2	*Sorghum* cf. *vulgare*			
	(11 impressions)	average	3.69	3.41
		minimum	2.9	2.7
		maximum	4.3	4.3
3	*Sorghum* sp.			
	(8 impressions)	average	3.71	2.32
		minimum	2.7	1.7
		maximum	4.6	2.7
4	*Eleusine coracana*			
	(20 impressions)	average	2.14	2.0
		minimum	1.8	1.6
		maximum	2.5	2.6

Table 5

The measurements of the grains of Sorghum

1. The measurements of the grains of the presently cultivated *Sorghum vulgare* in the area of Khartoum (on the basis of measurements of 50 unglumed grains)

	length in mm	breadth in mm	thickness in mm
average	3.90	3.93	2.53
minimum	3.7	3.7	2.2
maximum	4.2	4.1	3.0

2. The measurements of the charred grains of *Sorghum bicolor* (L.), race *bicolor* from the excavations at Jebel el Tomat on the lower White Nile, dated to 245 ± 60 A.D. (after J.D. Clark and A. Stemler, 1975)

   length: 3.0 – 3.4 mm
   breadth: 2.3 – 2.9 mm

vated *Sorghum vulgare* in the environs of Khartoum (delivered by Dr. Ikhlas Abd el Bari from the Department of Botany, University of Khartoum) and the charred grains of *Sorghum bicolor* (L.) from the recent excavations at Jebel el Tomat on the lower White Nile dated to ca. 245 A. D. as they were published by J. D. Clark and A. Stemler (1975).

Summary

The identification of the plant impressions found on the potsherds from the Neolithic settlement at Kadero is a contribution to the growing research on the ecology and economy developing in present day Central Sudan in the later prehistory. It looks to the present writer as the social group of Kadero was engaged in the cultivation of 2 taxa of tropical cereals: sorghum (*Sorghum vulgare* = *S. bicolor*) and millet (*Eleusine coracana*); the impressions of these cereals constitute a large majority of all negatives of plants found in this sample of potsherds. The domestic status of these cereals is indicated by the size of their grains, similar to the presently cultivated forms.

It should be added that large quantities of grindstones are reported by the excavator of Kadero (Krzyżaniak, *op. cit.*) and it looks, therefore, as if the cultivated grains were extensively processed for foods in this settlement. It seems also that the supposed wild grasses which, perhaps, may be associated with some impressions, *e.g. Setaria* sp., may have been collected by the Neolithic Kaderans, or perhaps some species may have been both cultivated and/or collected in wild form (*Panicum, Digitaria*). In most cases it was, however, very difficult to identify more precisely the impressions of *Panicum, Digitaria* and *Setaria* because of the unclear shape and/or excessive depth of the negatives of their grains preserved in the ceramic paste.

This paper is the final version of the preliminary studies pursued on the Kadero botanical evidence which were published earlier by this author as a communique (Klichowska, 1978).

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ELŻBIETA PROMIŃSKA

The demography of the populations from Kadero (Central Sudan)

In the course of excavations carried out at Kadero in 1972-1980, Neolithic (ca 5,100-5,300 B.P.) and Late Meroitic (ca 200-400 A.D.) burial grounds were found. The Neolithic burials were found in two localities on the mound at Kadero (Krzyżaniak, this volume) whereas the Late Meroitic cemetery was located in a separate part of the site (Krzyżaniak, 1979). All skeletons found in these inhumations were considerably decomposed due to the erosion which had previously taken place on the mound (most of the skeletons were found just under the surface), and also due to the fact that the soil of the site contain a heavy content of calcium carbonate which is known to cause disintegration of human bones.

The skeletal remains from all burial grounds were examined by T. Dzierżykray-Rogalski and this author, mostly during excavation. The poor state of preservation of these remains, however, made impeded anthropological observation and measurements. Nevertheless, it was possible to determine to a varying degree the sex and age of 52 individuals from these cemeteries: 25 males, 12 females and 15 children. This is illustrated by the Table 1.

Altogether, 54 graves have been discovered at Kadero so far, but graves Nos. 52-54, excavated during the last season in the Neolithic burial ground have not yet been examined by physical anthropologists who were absent at the terminal stage of the campaign. Of the 51 graves we investigated, 36 are of the Neolithic chronology, 14 – Late Meroitic and 1 – Post-Meroitic. In total, in the 36 Neolithic graves 37 individuals were interred: 18 males, 8 females and 11 children. In the 14 Late Meroitic burials 14 individuals were interred: 6 males, 4 females and 4 children.

The number of males buried in both cemeteries thus considerably exceeds that of females. In the Neolithic population the sex distribution of adults is 69.2% of males to 30.8% of females. In the Late Meroitic group this proportion is 60.0% of males to 40.0% of females.

The higher frequency of males than females is not unusual in anthropological material known from northern Nubia. Vagn Nielsen (1970) found a majority of males

Table 1

Sex and age at death of the individuals buried at Kadero

Grave No.	Chronology: N – Neolithic LM – Late Meroitic PM – Post-Meroitic	Sex	Age at death in years
1	N	(child)	–
2	N	female	50
3	N	male	45
4	N	(child)	4 - 6
5	N	female	25 - 30
6	N	(child)	13 - 15?
7	N	(child)	7 - 8
8	N	male	50 - 60
9	N	male	30 - 40
10	N	female?	35 - 45
11	N	(child)	6 - 10
12	N	male	50 - 55
13	N	male	35 - 40
14	N	male	50 - 55
15	N	male	55 - 60
16	N	(child)	2 - 3
17	N	female	19 - 23?
18	N	(child)	0.5
19	LM	(child)	4
20	LM	female	28 - 30
21	LM	male	35 - 40?
22	LM	female	18 - 20?
23	LM	female	30?
24	LM	(child)	15 - 16?
25	LM	male?	25 - 30
26	LM	(child)	4 - 5
27	LM	male	30 - 35
28	LM	male	25 - 28?
29	LM	(child)	3 - 4
30	LM	male	35
31	N	female	30?
32	LM	male?	17 - 18
33	N	(child)	–
34	N	(child)	3 - 5?
35	N	male	35 - 45?
36	N	male	35 - 45?
37	N	female	adult
38	N	male	30 - 35?
39	LM	female	25 - 28?
40	N	male	35 - 40
41	N	male	30
42	N	male	30 - 55?
43	PM	male	25 - 28

cont. Table 1

44	N	male	45 - 50
45	N	male?	30 - 35
46	N	ind. I: female?	25?
		ind. II: (child)	5 - 6?
47	N	(child)	1 - 2?
48	N	male	35 - 40?
49	N	male	50 - 55
50	N	female	40
51	N	male	40?

in most groups of skeletal material: 56.2% in the C-Group, 60.8% in the Pharaonic group and 54.7% in the X-Group. However, in the Meroitic group from that area there is a small excess of females amounting to 5.6%. According to Nielsen the excess of males in above mentioned groups was partly caused by the bad state of preservation of the more fragile bones of females. Strouhal and Jungwirth (1971) found in the Late Roman cemeteries at Sayala a clear predominance of males, *e.g.* in the burial ground A – 61.9%, CI – 55.7%, CII – 56.0% and CIII – 63.1% of males. A similar situation was described in the series from the Egyptian fort at Mirgissa dated to the Middle Kingdom and Second Intermediary Period where 60.6% of the skeletons were identified as males (Billy, 1976). In the Meroitic cemetery at Aksha 53% of the identified skeletons were male (Chamla, 1967). On the other hand, there are also cemeteries in Nubia with an even proportion of males and females, *e.g.* in the X-Group burial ground at Wadi Quitna (Strouhal, 1971) and in the A-Group site studied by Vagn Nielsen (*op. cit.*). According to Strouhal (1977) some cemeteries in Nubia were reserved for adults only, either for both sexes (in even proportion) or mostly for men (warriors?), whereas other cemeteries are said to be used predominantly for women and children.

At Kadero, the predominance of males may have been the result of the bad state of preservation of bones of females but, particularly in the case of the Neolithic population, this phenomenon may be the result of burial customs and taboos of this social group; *e.g.* one can suppose that women who died at parturition were buried together with the infant in a separate burial ground.

The frequency of child remains in the Neolithic Kadero group is 29.7% and in the Late Meroitic one – 28.6%. In the material from the Scandinavian Joint Expedition excavations in northern Nubia, the frequency of child and juvenile remains varies between 14.3% in the Pharaonic graves and 35.1% in the series of Christian date (Vagn Nielsen, *op. cit.*). At Wadi Qitna (Strouhal, 1977) the frequency of child burials up to 14 years old was 32.9%. As regards the strikingly high infant mortality in the Neolithic and Meroitic populations in the Sudan, we must admit that the bones of children, certainly much more perishable that these of adults are not truely represented in our sample and, hence, we do not have clear evidence of this high rate of

mortality in these populations. It is also possible that a large number of dead children were not inhumed in adult cemeteries but elsewhere. This supposition seems to be confirmed by Strouhal's studies of the large burial complex in Sayala where, in some cemeteries, there was a very limited number of skeletons of children (CI – 6.2%, CII – 3.6%, CIII – 6.0%) but in cemetery N a surprisingly high number – 62.5% of all burials – were those of children (Strouhal, 1977). On the other hand, Polish excavations at Faras disclosed large pots containing the bones of newborns buried under the floor of the local church. The same phenomenon was noted in Balat, in the Dakhleh Oasis in Pharaonic burials (T. Dzierżykray-Rogalski, personal communication). It can not be excluded that the newborns were buried in a separate place in earlier periods, too. If this was so, the small frequency of the remains of children in the Kadero material may have been due to their total dissintegration and/or the custom of interring their remains in a separate place.

Arithmetic mean of the age at death of the Neolithic adults at Kadero is 42.6 years (SD = 8.47) for males and 33.4 years (SD = 10.27) for females. In the Late Meroitic population the mean age at death for males is 29.4 years (SD = 7.21) and for females 26.1 years (SD = 4.97). The mean age at death is, therefore, much lower for both sexes in the Late Meroitic population than in the local Neolithic group. The age at death of the Late Meroitic individuals from Kadero is rather low but we have to remember that the sample of our material is too small to draw any definite conclusion in this respect.

The age at death in the Neolithic population of Kadero is relatively high, higher than for instance that observed for Neolithic Europe. For example, at Kadero 27.8% of all male and 12.5% of female burials are over 50 years of age. In Neolithic Poland, only 2.2% of the population lived more than 50 years (Dzierżykray-Rogalski, 1957). In the A-Group population studied by Vagn Nielsen (*op. cit.*) there were only 3.1% of males and 9.7% of females over 50 years old. The age at death in the Kadero Neolithic population is also higher than that observed in a much later period in northern Nubia. For instance, in the complex CI in Sayala studied by Strouhal and Jungwirth (1971) the mean age at death was 36.3 years for males and 31 years for females.

The presently excavated graves at Kadero undoubtedly are only a part of the Neolithic burial grounds on this site and, consequently, our present sample is incomplete, representing only a part of the buried population. It is, therefore, hoped that the excavations at Kadero will be continued and more skeletal material will be examined by physical anthropologists. Nevertheless, already at this stage of the research, it seems that the general conditions of life of this Neolithic population were relatively good, much better than in subsequent periods in Nubia. In contrast, the burials from the Late Meroitic times seem to be the remains of the population who experienced worse living conditions than the local Neolithic group.

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TADEUSZ DZIERŻYKRAY-ROGALSKI

Remarks on the position of human remains in the Neolithic graves at Kadero (Central Sudan)

The position of a corpse in a grave is the subject of interest for both archaeologists and physical anthropologists. There is no need to cite here the extensive and growing bibliography on this subject. Scholars seem to be particularly interested not only in the position of the human body in its grave pit but in the whole of the burial rite practised by "primitive" societies. Research on these phenomena is inevitably bound with religious beliefs.

It seems to the writer that the position of the corpse in the grave was connected with the corresponding beliefs about life after death which were shared by a given social group. The contracted position of the dead human body is a characteristic trait common to burial practices in many prehistoric societies. This position was also called "embryonal", which, according to some authors, suggested the belief in the close association between the phenomena of death and birth.

It seems that the Neolithic inhumations discovered at Kadero, 18 km to the north of Khartoum, provide an opportunity for further studies on the practice of laying the human corpse in a tightly contracted position into the grave pit. The Kadero burial ground is typical of the Central Sudanese Neolithic tradition and is dated to ca 5,300-5,100 B.P. The interred individuals belong to the local social group practicing pastoralism and some forms of food gathering (Krzyżaniak, 1978). In total, some 36 Neolithic graves containing the remains of 37 individuls have been found so far at this site (Dzierżykray-Rogalski, 1977; Promińska, this volume).

In spite of the generally poor state of preservation of the Kadero skeletel remains, due to their erosion, it was possible to note that in these Neolithic burials the corpses were laid on their sides (usually on the right side) in the grave pit, in most cases in an extremely contracted position. Their arms were bent at the elbow and placed on the chest so that the hands were very close to the face. The knees were drawn up in the front of the bend head (Fig. 1). From observations of these skeletons *in situ* the authors concluded that the tightly contracted position of the corpses could not have been obtained without previous preparation. Probably, immediately after death the

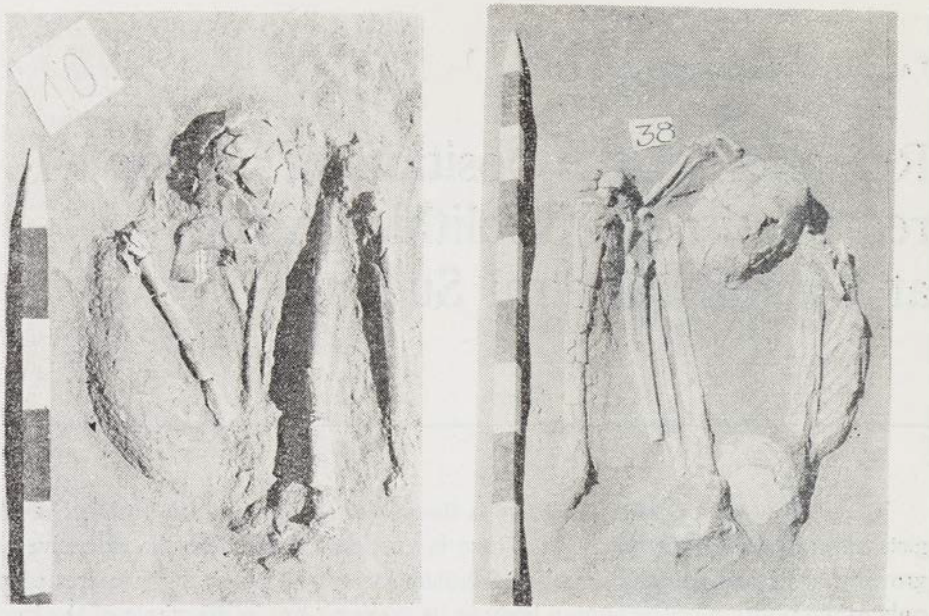

FIG. 1. Kadero. Neolithic graves Nos. 10 and 38

body was contracted and bound with a cord of twisted vegetable fibers and only then laid into the grave pit. The custom of burying human corpses in a tightly fitting container, such as a bag or basket, is also known to exist in some prehistoric cultures. In the opinion of the writer the custom of binding corpses may have been practised in the Kadero Neolithic inhumations.

Graves containing human remains resting in a contracted position were also found in other prehistoric cemeteries in Central Sudan, *e.g.* from such sites as Khartoum of the Early Khartoum (pre-Kadero) tradition (Arkell, 1949), and Omdurman and Esh Shaheinab of the Central Sudanese Neolithic (post-Kadero) tradition (Arkell, 1949; 1953).

It is interesting to note that till today no attention was drawn to the anatomical impossibility of achieving the degree of contraction, found in corpses at Kadero and other sites, without immediate post-mortem binding of the body.

Is such a tightly contracted position of the body in the grave pit the result of corresponding beliefs about the form of human life after death? The answer seems to be in the affirmative. One can assume that the intention of the people, burying the deceased member of their social group, was to immobilize the dead person in the grave pit. This may have been prompted by the belief that the dead could rise from the grave and harm the living.

In support of this assumption are the burial customs known from the Neolithic burial grounds in Poland (Stok, Las Stocki) where there are graves with heavy stones

laid upon the body presumably to immobilize the dead (Dzierżykray-Rogalski, 1958; 1961). Putting stones into the mouth of the dead was also practised there.

This attempted explanation seems, however, to be inconsistent with the practise of furnishing the Neolithic burials at Kadero with grave goods, such as fine pottery vessels, stone mace-heads, tools and chipped stone implements which were in use by this social group. These objects may have been deposited in the grave to serve the dead in his further existence. But, perhaps, this practise was, also, intended to keep the dead away from the living members of a given social group?

Any attempt at explanation the contracted position of a human corpse in the grave pit should take into account not only the observations made by archaeologist and physical anthropologist in the field, but also the point of view of scholars working in such disciplines as theory of religion, cultural anthropology and ethnography. The ultimate aim will be an attempt to reconstruct the complex and poorly known sphere of religious beliefs of this Neolithic society and its burial customs.

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MAREK CHŁODNICKI

Pottery from the Neolithic settlement at Kadero (Central Sudan)

The pottery from the Neolithic site at Kadero was described for the first time by Chittick (1955). He ascertained, on the basis of a surface collection from the settlement, its remarkable similarity to the ceramics originating from the Esh Shaheinab settlement. A much larger amount of the potteries have been obtained at Kadero in the course of systematic excavations carried out by Krzyżaniak (1975; 1976; 1979) since 1972. About 800 kg of ceramics, consisting of almost 170,000 potsherds, were yielded by a pit of 336 sq. m. excavated in the southern part of the settlement; a smaller pit of 16 sq.m. excavated in the northern deposit yielded about 80 kg (about 20,000 potsherds). This sample was the basis of this preliminary study on the Kadero Neolithic pottery (Table 1).

Petrographical analysis show that the Kadero ceramics were made of a Nile silt and contain a significant proportion of fine-to-medium textured sand particles. Grains of sand of the size range above 0.5 mm are rare. The results of the analysis also permits inclusion of almost all this material to Group IIc, within the classification proposed by Hays and Hassan (1974); the predominant inclusion in this pottery is quartz, but feldspar is also common. Many of these potsherds also contain red grains of ferruginuous rock. The colour of fracture is mostly black, grey or dark brown. Surface colour is mostly brown (87% of the uncoated pottery), sometimes black or grey.

Particles of organic matter are very rare. There are only a few sherds with carbonized particles, or voids in the fracture and vessel surfaces, which may originate from a vegetable material, possibly dung. These potsherds are black or dark grey in colour, and are softer than pottery containing mineral temper.

Pots with red-coated surfaces are very common at Kadero. Red ochre wash was applied to one-fourth of the whole sample of potsherds, mostly on both sides of the vessel wall, and seldom on the outside only, with brown or blackened insides of the

pots. This coating is more common to ceramics originating from the upper stratum (0 - 20 cm) of the Kadero settlement.

The surfaces of the pots are usually burnished and only seldom combed. Sherds with an unburnished, coarse surface are very rare at Kadero. They seem to be more common in the lower stratum (20 - 50 cm) of the settlement. The upper stratum contains rare sherds with well polished or scraped surfaces.

Vessel forms at Kadero are, in general, simple (Fig. 1), and consist of deep bowls or pots with restricted orifice, and with hemispheric or ovoid shape. Shallow or small pots are rare. Cups with flat base and ladle-pots occur only sporadically.

Table 1

The Kadero Neolithic pottery

In the southern part of the settlement 11,557 rim sherds have been examined, and in the northern one – 1,355 rim sherds

Ware and patterns	% in the part of the settlement	
	southern	northern
I. Impressed ware		
1. Dotted wavy-line	>0.0	–
2. Burnished dotted wavy-line	>0.0	–
3. Two lines of triangles and multiple lines of dots between them	11.6	9.0
4. Single line of triangles and several lines of dots	6.1	8.4
5. Multiple lines of closely spaced dots	18.0	19.7
6. Two lines of triangles with line of dots between them	3.7	6.3
7. Two lines of triangles or vees	2.5	2.1
8. Close zigzag of dotted lines	10.5	12.2
9. Zigzag of dotted lines	2.5	2.4
10. Zigzag of continuous lines	2.3	1.4
11. Paralell lines of impressed dots	5.1	3.8
12. Semicircular panels of dotted lines	1.3	0.8
II. Incised ware		
1. Incised horizontal lines	8.4	11.1
2. Groups of incised paralell lines	0.2	0.1
3. Semicircular panels of incised lines	8.1	5.6
III. Plain ware		
1. Brown burnished	7.2	5.9
2. Black burnished	1.4	0.3
3. Brown coarse	0.7	0.6
4. Brown scraped	0.1	0.1
5. Brown combed	1.7	1.7
6. Red coated (on both sides of vessel wall)	3.5	5.4
7. Red coated (outside only)	1.7	1.0
8. Red coated outside only, blackened inside	1.2	0.4
IV. Black-top Red ware		
1. Black bands below the rim top	0.5	0.4
2. Row of black triangles below the rim top	1.4	0.7
V. Impressions of a single stamp	0.1	>0.0
VI. Other atypical wares	0.4	0.6
Total	100.0	100.0

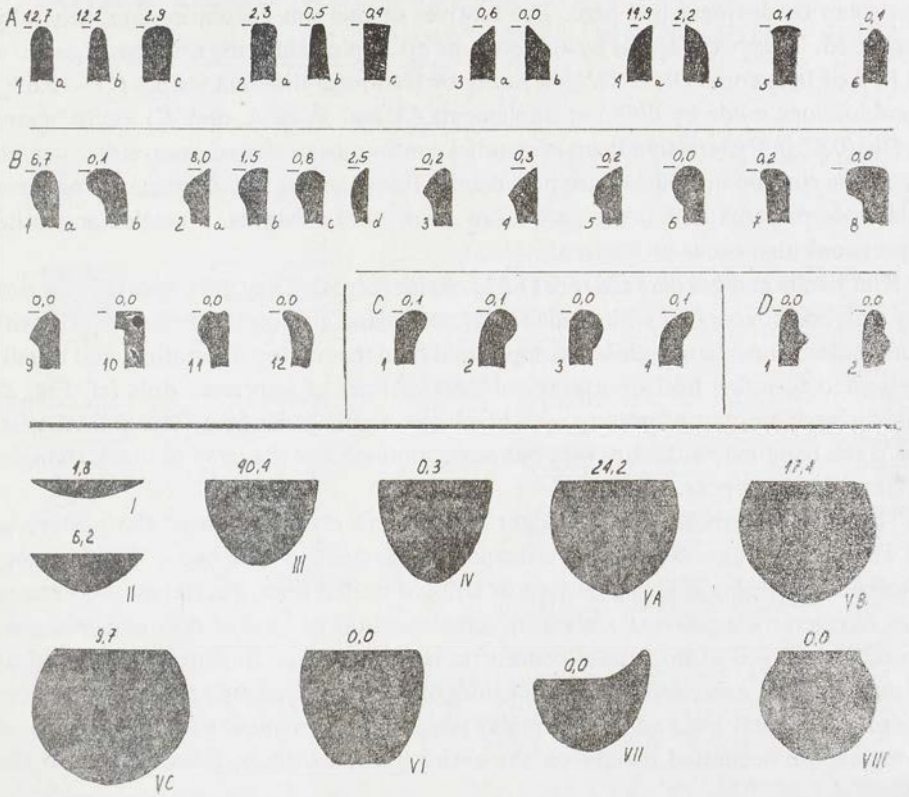

FIG. 1. Kadero. Principal rim and vessel shapes of the Neolithic pottery. The frequency of occur-rence in percentage is given on the top of a given trait

Bases are mostly rounded; only a few flat bases have been found. The rim shapes are generally simple, too (cf. Fig. 1). Nearly 80% of rims are a direct continuation of the vessel walls (A) and usually have rounded rim tops. Modeled reverted rims (B) are also common and are associated mainly with restricted vessels. Modeled, everted rims (C) are rare and have been found only in the upper stratum of the settlement. There are also two pieces of rims with modeled or stricken borders below the rim top (D).

Pots with rim diameters of about 18 cm dominate among the unrestricted vessels, whereas the most common diameter of restricted vessels is of 25 cm. The largest pots have a rim diameter of more than 45 cm. Wall thickness ranges from 3 to 13 mm, but most walls are 5 to 6 mm thick.

A very characteristic trait of the Kadero pottery, as well as the pottery of the Central Sudanese Neolithic in general, is its decoration. About 80% of all potsherds found at Kadero are decorated. About 25% of the rims have decoration executed on the rim top. This decoration shows a high degree of differentiation and about 80 va-

riants can be distinguished here. The motives of this rim decoration are, generally, impressed. They were made by the edge of an implement with a sharp edge (A – 64.1%) or by a comb (B – 27.7%), rarely by stamps of different shapes (C – 7.6%). Combinations made by different implements (A and B, or A and C) occur sporadically (0.6%). Patterns made up of parallel continuous or dotted lines, either straight across the rim top or oblique, are particularly frequent (Fig. 2). Zigzag, herring-bone, criss-cross patterns and combinations of oval dots, crescents, triangles and other impressions also occur at Kadero.

Rim bands and borders are rare (7.3% of rim sherds). They are typical for the pottery with body decorated with semicircular panels and also occur among the pots with plain bodies. These bands are less complicated than the rim top decoration, and usually are limited to a few horizontal, incised lines or lines of impressed dots (cf. Fig. 2). A fairly large amount of pottery with black top occurs at Kadero. This trait consists of a black band below the rim top, but most common are the rows of black triangles on the red coated pots.

The most important trait for identification and classification of the pottery of the Central Sudanese Neolithic are the pattern elements on the body. Rocker stamp impressions, forming a zigzag pattern or straight dotted lines, are the most common. Most characteristic patterns are various combinations of lines of dots and triangles, generally arranged in horizontal concentric bands (cf. Fig. 2). Zigzags of dotted or continuous lines, and bands of multiple lines of closely spaced dots, are also common. Incised, horizontal lines and semicircular panels occur frequently, too. The body of the vessels are decorated mostly on the entire outside surface, from the rim to the base.

The types of the pottery decoration known from Esh Shaheinab (see Arkell, 1953: 68 - 77, Pls. 29 - 37) have also been found, in similar proportion, at Kadero. The Shaheinab pottery is also similar in the technology to that of Kadero and contain the same, limited number of vessel forms. However, only few sherds with wavy-line or dotted wavy-line patterns, which are more frequent at Esh Shaheinab, have been found at Kadero. On the other hand, at Kadero, a larger amount of pottery with alternately hatched and plain chevrons pattern, hatched bands with close spaced comb impressions have been found. The Kadero pottery contains more types of the decoration which was defined by Arkell as atypical at Esh Shaheinab; these kinds of decoration are different from what is understood as the Khartoum Neolithic style. These ornaments are, however, similar to those excavated from the Omdurman Bridge site (Arkell, 1949: 99 - 106, Pls. 94 - 100), at Esh Shaheinab where the burials of protodynastic date have been found (Arkell, 1953: 82 - 89, Pls. 40 - 43) and also from El Kadada (Geus and Reinolds, 1979: 30 - 81). Also the pottery with finger-nail impressions and other patterns made with a single stamp occur at Kadero.

FIG. 2. Kadero. The pottery decoration

PATTERN ELEMENTS ON THE BODY

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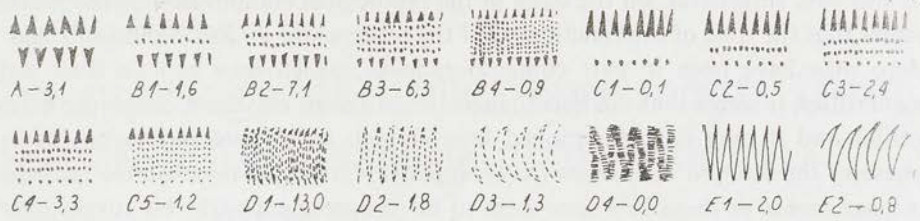



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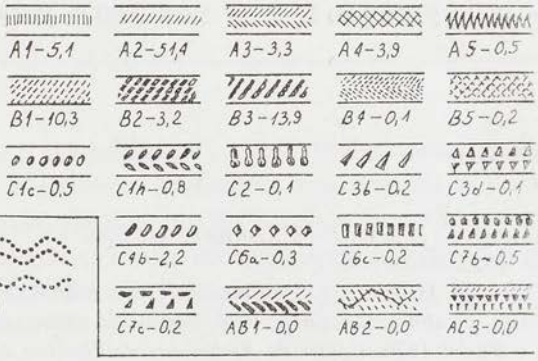

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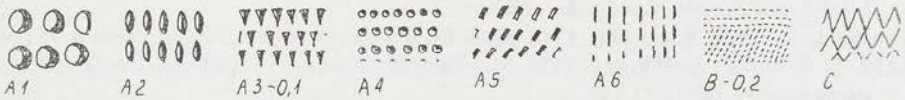



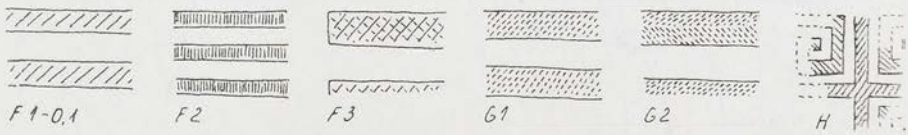



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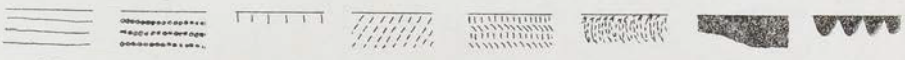

The studies on the Kadero pottery shed also some light on the relative chronology of this site. In general, on the basis of the typological composition of the pottery, it seems that the time of the functioning of the settlements at Esh Shaheinab and Kadero may have been in part contemporaneous, which may explain their stylistic similarities; it seems that the Esh Shaheinab settlement may have come into existence earlier and it may have functioned long enough to be contemporary with earlier phase of the Kadero settlement (Krzyżaniak, 1978: 171). The available radiocarbon measurements of these two sites seem to be in agreement with this suggestion. The time-span for Esh Shaheinab settlement is now dated to about 5,370±80 B. P. – 5,240±80 B. P. (Haaland, 1979: 56), and that of the Kadero development is dated to about 5,260±90 B. P. – 5,030±70 B. P. (Krzyżaniak, 1978: 171).

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JACEK NOWAKOWSKI

The typology of lithic implements from the Neolithic settlement at Kadero (Central Sudan)

The aim of this work is to present the preliminary results of the research on the Neolithic lithic assemblage from the settlement at Kadero. Materials for this study were excavated by L. Krzyżaniak during the first four field-seasons from the southern settlement deposit (Fig. 1), where the area of 336 sq. ms. was tested. As a result, a rich assemblage of lithic artefacts was obtained.

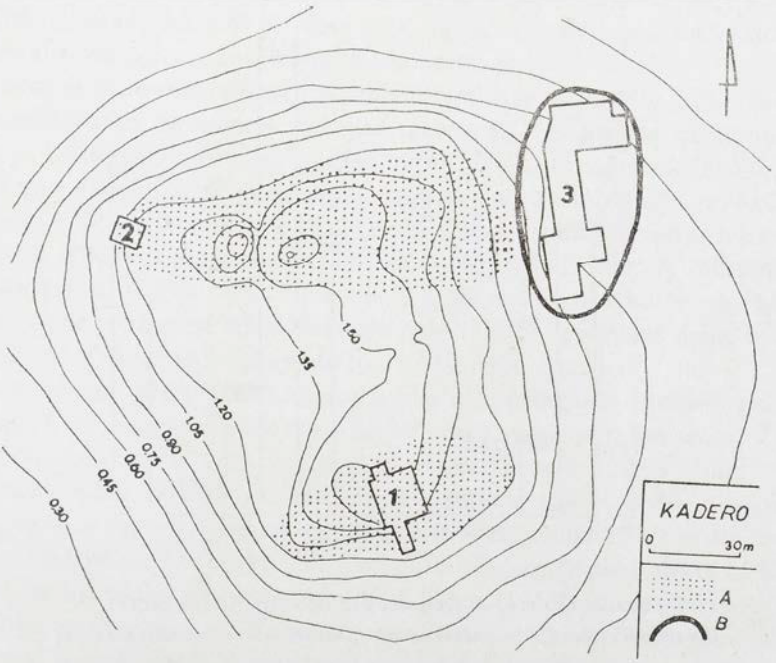

FIG. 1. Kadero. Plan of the site (after L. Krzyżaniak)
A: dwelling area; *B*: burial ground

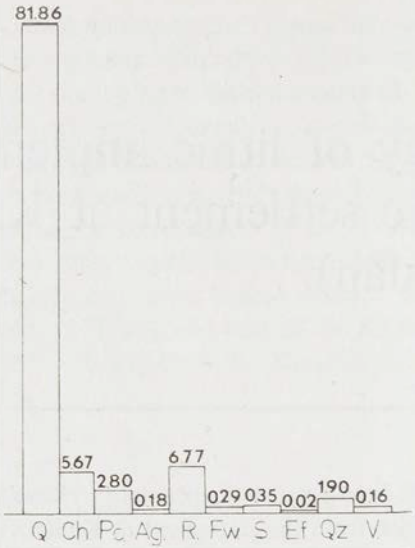

FIG. 2. Kadero. Frequency of lithic raw materials (in per cent)

Q: quartz; *Ch*: chert; *Pc*: precambrian rock; *Ag*: agate; *R*: rhyolite; *Fw*: fossil wood; *S*: sandstone; *Ef*: Egyptian flint; *Qz*: quartzite; *V*: varia

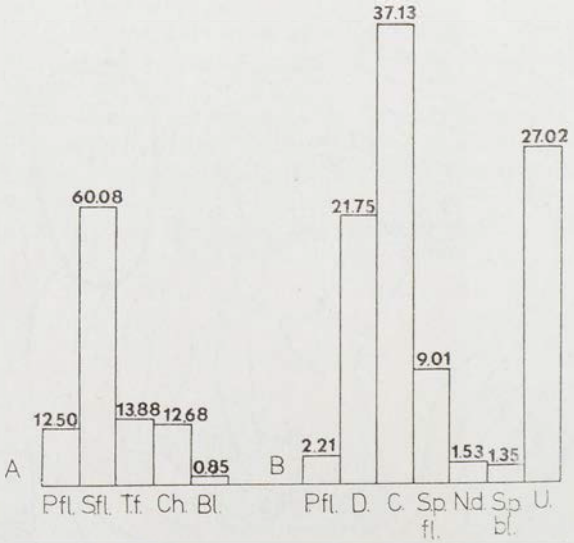

FIG. 3. Kadero. *A*: frequency of débitage (in per cent)

P.fl.: primary flake; *S.fl.*: secondary flake; *T.f.*: tertiary flake; *Ch*: chunks; *Bl.*: blade;

B: frequency of cores (in per cent)

P.fl.: primary flake cores; *D*: discoidal cores; *C*: circumference cores; *S.p.fl.*: single platform flake cores; *Nd.*: ninety degree cores; *S.p.bl.*: single platform blade cores; *U*: undefinable cores

The raw materials utilized in the Neolithic settlement at Kadero can be divided into seven rocks: precambrian rocks, the Nile pebbles (chert, agate), quartz and quartzite, rhyolite, fossil wood, sandstone and, possibly, Egyptian flint. The intensity of use of individual raw materials was differentiated (Fig. 2) but quartz is clearly predominant (81.86%); rhyolite, chert and precambrian rocks were also used in considerable amounts. The majority of these raw materials occured in the neighbourhood of this settlement. Many of them occur in the Nubian sandstone (Whiteman, 1971). Rhyolite was accessible in the area of the Sixth Cataract, situated some 60 kms to the north of the settlement. The possible find of Egyptian flint could have been, however, an import, as its nearest deposits are situated in the region of Sinn-el-Kaddab, in the area of the Second Cataract (Haaland, 1972: 97).

The Kadero assemblage has a typical flake character, with only a small amount of blade and bladelets (Fig. 3). The débitage is characterized by the exceptionally large amount of quartz (85.33%). The presence of side blow flakes is interesting although their number is very small.

The cores are represented mainly by flake cores (98.65%) and there exists a small frequency of used cores for the manufacturing of blades and bladelets (1.35%). A characteristic feature is the predominance of circumference and discoidal cores, and the low participation of single platform cores for manufacturing flakes. Cores of ninety degree type occur in small amounts. Double platform cores were not discovered. The prevailing amount of cores were made of quartz and the almost total absence of rhyolite cores is striking in this assemblage.

The number of tools found in the lithic assemblage amount to 1,387 specimens. After the elimination of severely damaged specimens, of unsound cognitive value, as much as 1,226 specimens were studied in full. It was found that flake forms are prevalent among tools (56.69%), while the frequency of core tools amounts to 22.59%. The number of blade tools is 12.39%, and the frequency of geometric microliths is low (7.34%). The tool assemblage is characterized by a completely different structure of raw materials from that of the whole lithic sample of Kadero, as 56.45% of tools were made of rhyolite while there are only 18.67% specimens made of quartz; the frequeucy of chert tools amounts to 18.67% (Fig. 4).

The assemblage of tools is characterized by a considerable morphological differentiation. The typology of tools from Kadero took in account the series of indices of morphologically close types grouped in larger taxonomic unit groups. Ninety seven percent of the tools are included in these groups while tools that are not diagnostic have been excluded. The morphological indexes presented below are constructed on the basis of the list of types of tools from Kadero (Nowakowski, 1979), with the use of the list of the types proposed by J. Tixier (1963) as an example.

The lithic assemblage from Kadero is characterized by a high index of notches and denticulates, piercing tools, gouges, and partially retouched flakes and blades. The differences between these indices are not significant. Exceptionally low indices of backed bladelets, truncations and most of all, burins, is a characteristic feature at Ka-

dero. The assemblage is also characterised by a low index of end scrapers, side scrapers, segments and celts (Fig. 5). The comparative analysis of this assemblage shows its similarity to other assemblages known from Central Sudan.

The largest number of common traits can be observed in comparison to the lithic assemblage excavated at Esh Shaheinab (Arkell, 1953). The following traits are considered as common for these two sites:

1. Use of identical raw material,
2. Use of flake technique,
3. Very low index of burins,
4. Very low index of backed bladelets,
5. Considerable frequency of polished celts and gouges of similar morphology,
6. Presence of double-backed perforators and borers, more frequent at Kadero,
7. Morphologically similar scraping tools, more frequent at Kadero,
8. Presence of side blow flakes.

Both assemblages, however, differ significantly as regards the frequency of segments, which constitute only 6.93% of all the tools at Kadero, while at Shaheinab they amount to about 70%. There is also a much lower index of notches and denticulates at Shaheinab than at Kadero.

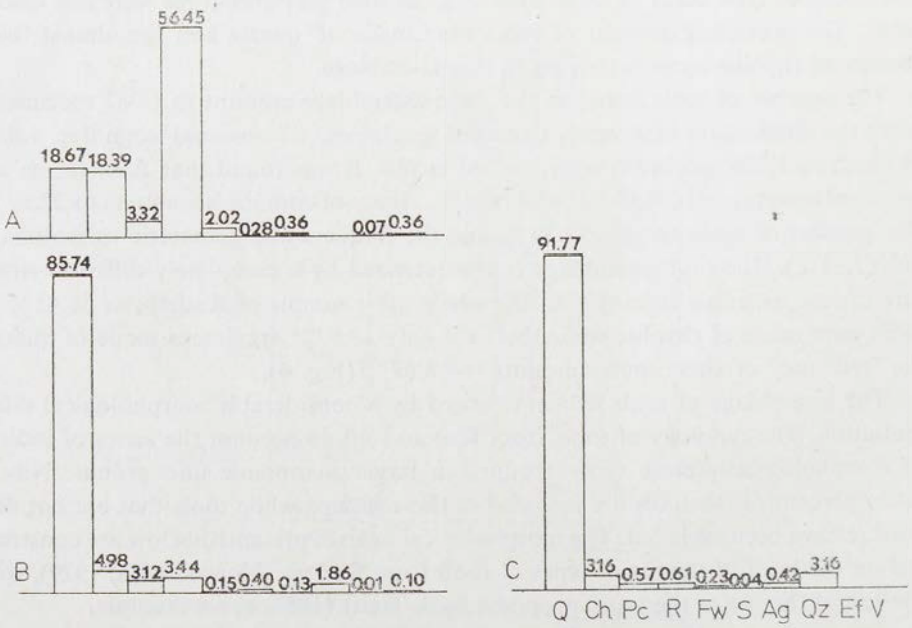

FIG. 4. Kadero. Frequency of lithic raw materials (in per cent)

A: tools; *B*: débitage; *C*: cores

Q: quartz; *Ch*: chert; *Pc*: precambrian rock; *R*: rhyolite; *Fw.*: fossil wood; *S*: sandstone; *Ag.*: agate; *Qz*: quartzite; *Ef.* Egyptian flint; *V*: varia

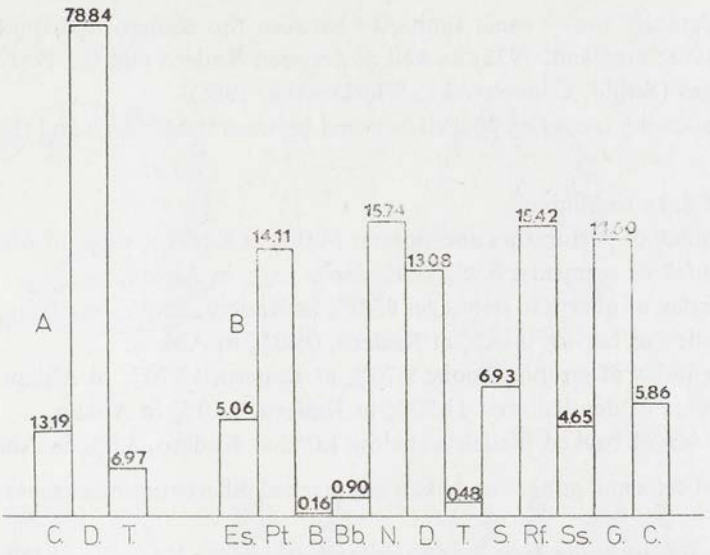

FIG. 5. Kadero. *A*: composition of the lithic assemblage (in per cent)
C: cores; *D*: débitage; *T*: tools
B: frequency of the different types of tools (in per cent)
Es. endscrapers; *Pt.*: piercing tools; *B*: burins; *Bb.*: backed bladelets; *N.*: notches; *D.*: denticulates; *T.*: truncation; *S*: segments; *Rf.*: retouched flakes; *Ss.*. sidescrapers; *G*: gouges; *C*: celts

The lithic assemblage excavated at the Khartoum Hospital site of "Early Khartoum" tradition was also compared to that of Kadero. The common traits between these two are as follows:

1. Use of flake technique,
2. Very low index of burins,
3. Similar indexes of double-backed perforators and borers,
4. Morphologically similar types of scraping tools, more frequent at Khartoum Hospital.

The following different frequencies between these two sites were found:

1. Higher index of backed bladelets at Khartoum Hospital,
2. The frequency of segments in Kadero amounts to 6.93%, while at Khartoum Hospital they constitute the largest group of tools,
3. Lack of gouges and celts at Khartoum Hospital,
4. Lack of denticulates and notches at Khartoum Hospital.

The comparative analysis indicates that these three assemblages are related to a different extent, as regards their contents. The differences in the structure of the tool group may be explained by their chronological differences and as a result of a different type of exploitation of the natural environment.

A comparison of the Kadero assemblage to those known from the region of the

Second Cataract shows some similarity between the Kadero and the later Abkan (Shiner, 1968; Haaland, 1972) as well as between Kadero and the Post-Shamarkian assemblages (Schild, Chmielewska, Więckowska, 1968).

The following traits can be distinguished between the Kadero and the late Abkan phase:

1. Use of flake technique,
2. High index of perforators and borers: 14.0% at Kadero, 4.0% in Abkan,
3. Low index of segments: 6.9% at Kadero, 3.8% in Abkan,
4. High index of quartz in débitage: 85.0% at Kadero, 58.0% in Abkan,
5. Low index of burins: 0.16% at Kadero, 0.40% in Abkan,
6. Similar index of scraping tools: 9.70% at Kadero, 12.70% in Abkan,
7. High index of denticulates: 11.70% at Kadero, 13.0% in Abkan,
8. Low index of backed bladelets: below 1.0% at Kadero, 3.8% in Abkan.

The lack of celts and gouges in Abkan is a marked differentiating element from Kadero.

The following traits seem to be similar between the Kadero and Dibeira West 4 and Dibeira West 50 assemblages of Post-Shamarkian tradition (Schild, Chmielewska, Więckowska, 1968):

1. Use of flake technique,
2. Similar notches index,
3. Similar denticulates index,
4. High frequency of quartz in débitage,
5. High index of partially retouched flakes,
6. Presence of side blow flakes,
7. Presence of unpolished celts.

The lack of polished celts and gouges in these essemblages is a differentiating element from Kadero.

The comparative analysis seems to show that there is a certain relationship between the lithic assemblages from the Kadero settlement and those of the other sites from the Sudan. However, the Kadero assemblage is clearly related to that originating from Shaheinab.

The common elements between the Kadero and Abkan and Post-Shamarkian assemblages seem to be the similar tendency in the development of the lithic industry which was manifested by:

1. Increase of quartz in débitage,
2. Increase of backed bladelets frequency,
3. Clear decrease of burin frequency,
4. Considerable increase of groovers and borers.

This tendency may be the result of similar changes in the method of the environmen exploitation (Haaland, 1972), with the Nile Valley acting as a unificating factor. Thte

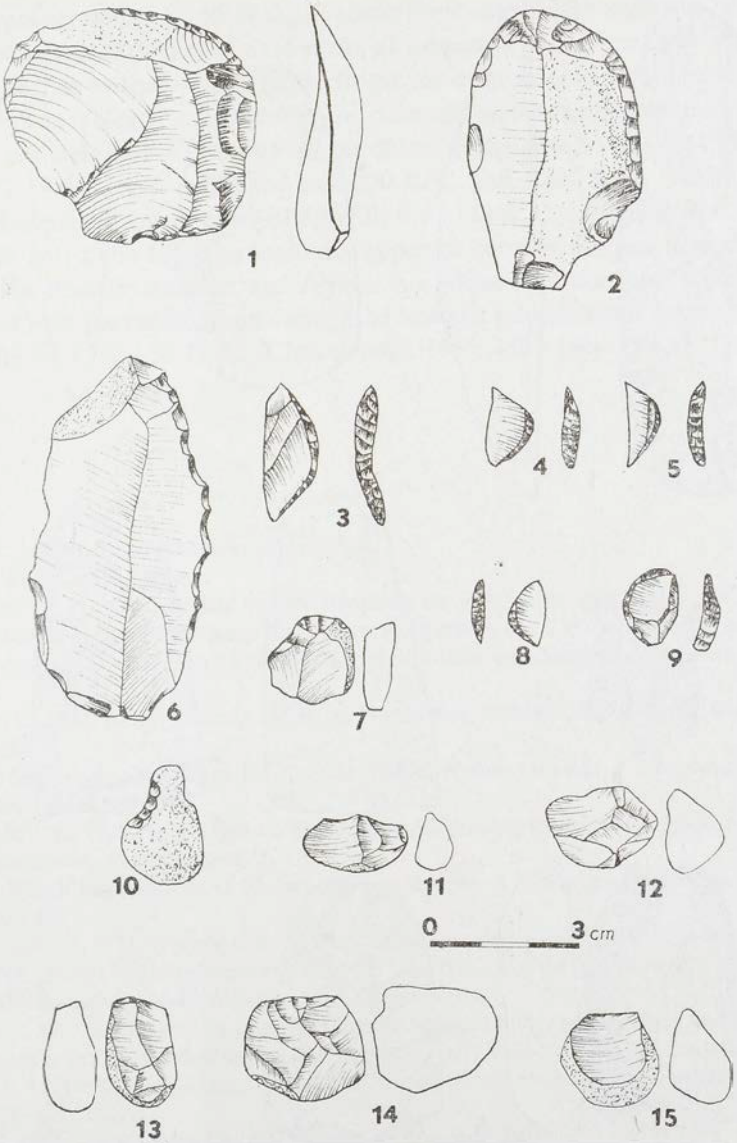

FIG. 6. Kadero. Lithic assemblage

1 - 2, 7: End scrapers; *3 - 5, 8, 9*: Segments; *6*: Denticulate; *10*: Notch; *11 - 15*: Cores

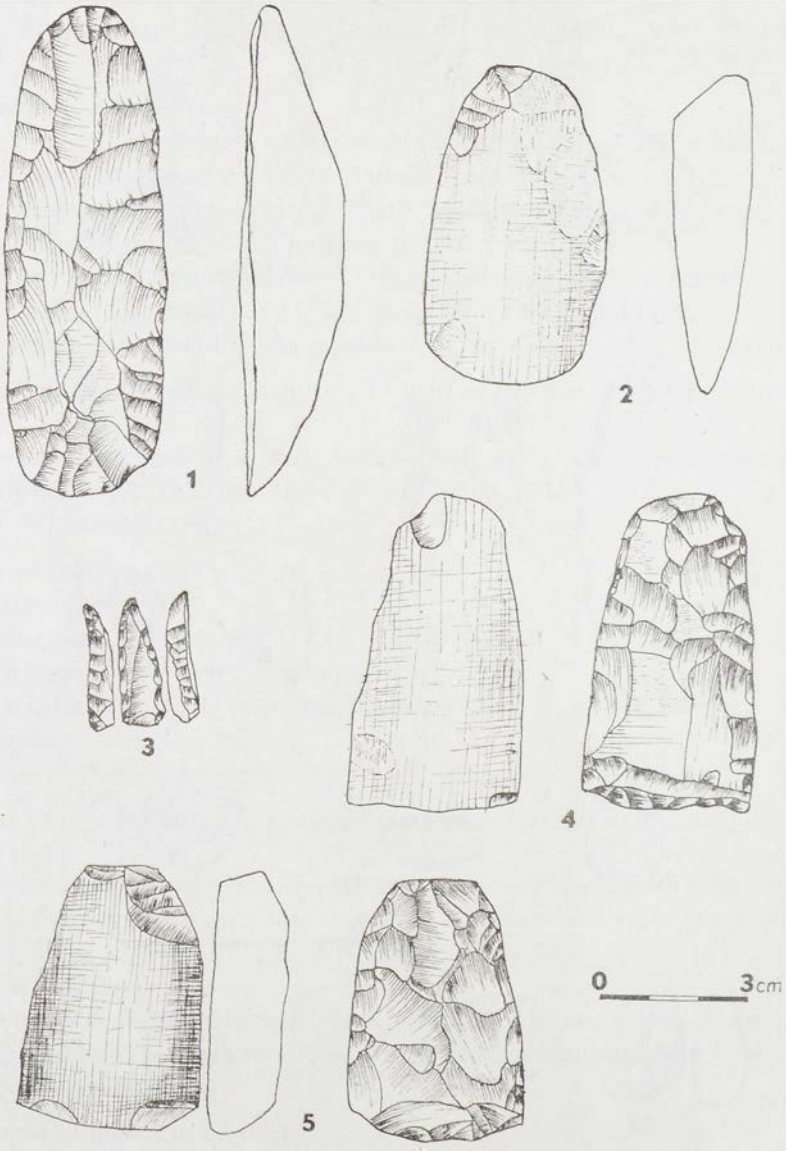

FIG. 7. Kadero. Lithic assemblage

1: Unpolished celt; *2*: Polished celt; *3*: Groover; *4 - 5*: Gouges

hypothetic presence of Egyptian flint at Kadero would be in harmony with the other traits of northern origin known from this Neolithic site (Krzyżaniak, 1978).

The typology composition of the Kadero lithic assemblage seems to be younger in its development than that of Shaheinab, as suggested by the low frequency of segments, as well as by the increase in the frequency of groovers and borers at Kadero. This conclusion is clearly confirmed by the radiocarbon chronology of these two sites. Presently available isotopic measurements date the Shaheinab to ca 3,445 B. C. and 3,110 B. C. (Arkell, 1953: 107) and ca 3,290 B. C. and 3,420 B. C. (Haaland, 1979: 56). The Kadero settlement dates ca 3,310 B. C., 3,110 B. C. and 3,330 B. C. (Krzyżaniak, 1978: 161; 1979: 68). The similarity apparent between Kadero assemblage and those of the Post-Shamarkian and Abkan late phase tradition also seem to be in accordance with the radiocarbon dating; the isotopic measurement dates the Dibeira West 4 site to 3,270±50 B. C. (Chmielewski, 1965: 159 - 161).

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ISABELLA CANEVA

Early Neolithic settlement and later cemetery at Geili (Central Sudan)

The Italian Mission for Prehistoric Research in Egypt and the Sudan has been conducting excavations on the site of Geili since 1973 (Caneva, 1978). The site is situated on the eastern bank of the Nile, 47 km north of Khartoum and about 2 km from the river. In the course of five seasons 368 sq.m. have been excavated, to an average depth of 1.2 m. The stratigraphy of the site is complex, testifying to the fact that the site was exploited for a long period of time, both as a settlement and as a cemetery. So far 124 graves have been excavated. Some of these graves reach the dimensions of 2.5 × 2 m. and a depth of 1.2 m. disturbing the earlier settlement deposits.

The site appears to have been used as a cemetery for a long time. Intervals must have separated the periods of its use, so that burials had often been destroyed when a new human group came to the site: graves of different periods often overlap, with frequent re-use of older pits and re-burial of previous skeletons. Only Christian and Islamic graves were intact; this suggests a continuity of use by corresponding communities. Extended burials in narrow, long and deep graves, often with a lateral step, are characteristic of both. They only differ in orientation: north-south in the Islamic graves and east-west in the Christian ones. All Islamic graves were left in place after being documented. Few grave goods accompanied Christian burials, such as clothes, glass pots, necklaces of vitreous paste, iron crosses and ear rings (Fig. 1).

The Meroitic period is represented by several contracted burials in small, deep graves. A wide step runs along the lateral sides, sometimes ending in a ramp (Fig. 1 : 1). Orientation varies as does the side on which the body was laid. Grave furnishings consisted of necklaces, iron ankle rings, copper bowls and pottery, and characteristic flask-shaped, decorated pots which were found in several graves (Fig. 1: 2, 5, 6). Similar objects occur in the Meroitic necropolis of Soleb (Schiff-Giorgini, 1964) and at el-Kadada (Geus, 1977) where, however, the funeral rites as well as the form of the graves appear to be different.

A small number of graves found at Geili have not yet been culturally classified because of lack of grave goods or other diagnostic traits. The presence of some enig-



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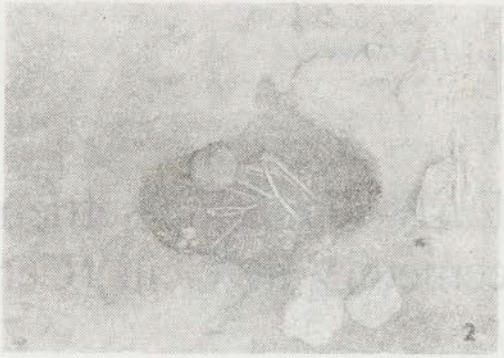

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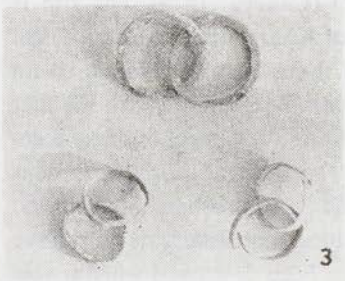

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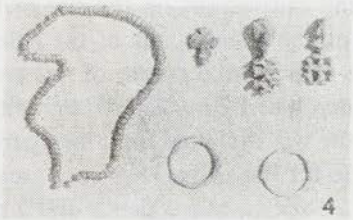

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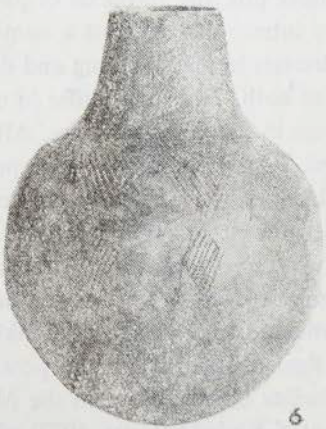

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FIG. 1. Geili. Meroitic/Christian graves and materials

matic social groups, perhaps nomads coming seasonally to the river, could account for some of them.

The most ancient assemblage represented in the necropolis at Geili can clearly be ascribed to the Late Neolithic culture, originally identified by Arkell (1949) at Omdurman and classified under the broad definition of „Protodynastic". These graves at Geili are oval. They were very shallow because of surface erosion. The skeletons lie in a contracted position, on the right side, oriented roughly W/E or E/W (Fig. 2: 1). The bones were always in very bad condition, but not fossilized. As far as these features are concerned, the evidence from Geili corresponds exactly to that of "Protodynastic" graves from Shaheinab (Arkell, 1953). Grave goods include pottery, necklaces of carnelian, amazon stone and ostrich-egg beads and pendants; there are also quartz-diorite palettes and rhyolite, disk-shaped mace-heads (Fig. 2). Recent excavations at el-Kadada have revealed graves apparently belonging to the same culture. Such features as the grave shape and the position of the skeleton are broadly similar to those observed at Geili; grave goods are sometimes identical (Geus, 1977: Pl. VIII, IX, XI; *id.* 1979: Pl. VI.). As regards the pottery, sherds of shallow plates, spheric or ovoid pots and hemispherical bowls were found at Geili. The surfaces are always burnished, often decorated with impressed or incised motifs; the most characteristic decoration was obtained by slipping and burnishing a previously combed surface ("rippled ware") (Fig. 5: 12).

The settlement at Geili yielded an amount of potsherds and lithic implements which constitute a very typical Khartoum Neolithic assemblage. The lithic industry includes quartz microlithic tools (crescents, borers, end-scrapers; Fig. 3: 1 - 11). A number of rhyolite tools are also represented, mostly scrapers, points and polished gouges (Fig. 3: 12 - 20). Grinding equipment is characterized by small grinding and pounding stones. Among the bone objects a pottery comb and a few harpoons and perforators were found.

The pottery is the most distinctive trait of this culture. If vessel shapes are simple, including globular pots or hemispherical bowls, their surface decoration is so variable that a simple description of the motifs is meaningless. We therefore made a comprehensive attempt to gain insight in the different technologies underlying the currently used typology (*e.g.*, that of Hays, 1974). This also implied laboratory reconstruction of objects to be tested against the originals. Except for a low percentage of red-slipped and burnished wares, the pottery shows impressed decoration executed with three main techniques (Fig. 4):

1. The most frequent – the rocker technique, employing two kinds of tools: a bent or straight comb, either notched or not, and a forked stick. It produces zig-zag motifs (Fig. 5: 1 - 3, 7) and coupled rows of dots or vees (Fig. 5: 5, 6),
2. The simple impression – realized with the same combs, producing dotted or plain lines (Fig. 5: 9), Very characteristic of this technique is the "dotted wavy line" motif (Fig. 5: 10),

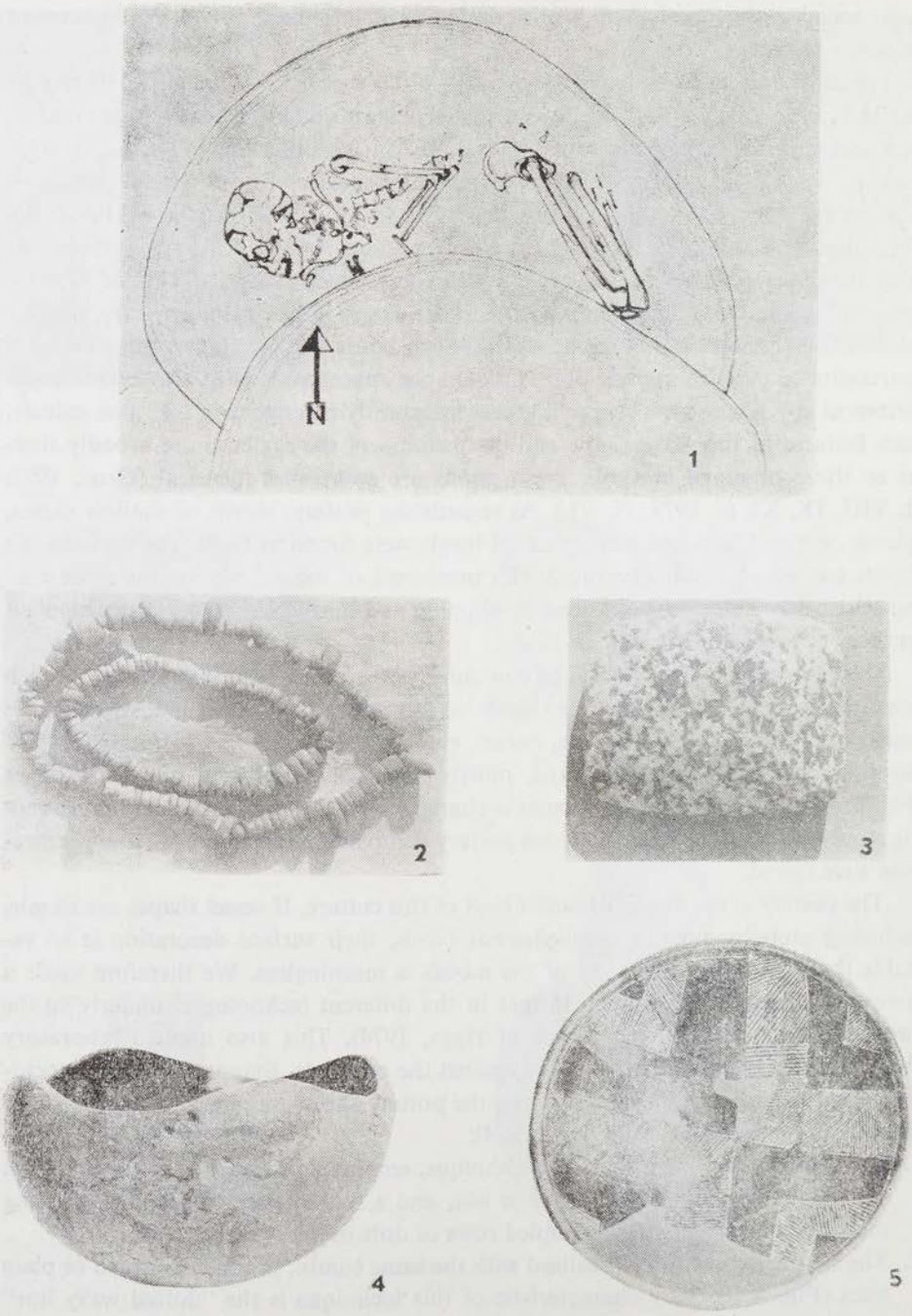

FIG. 2. Geili. Late Neolithic grave and goods

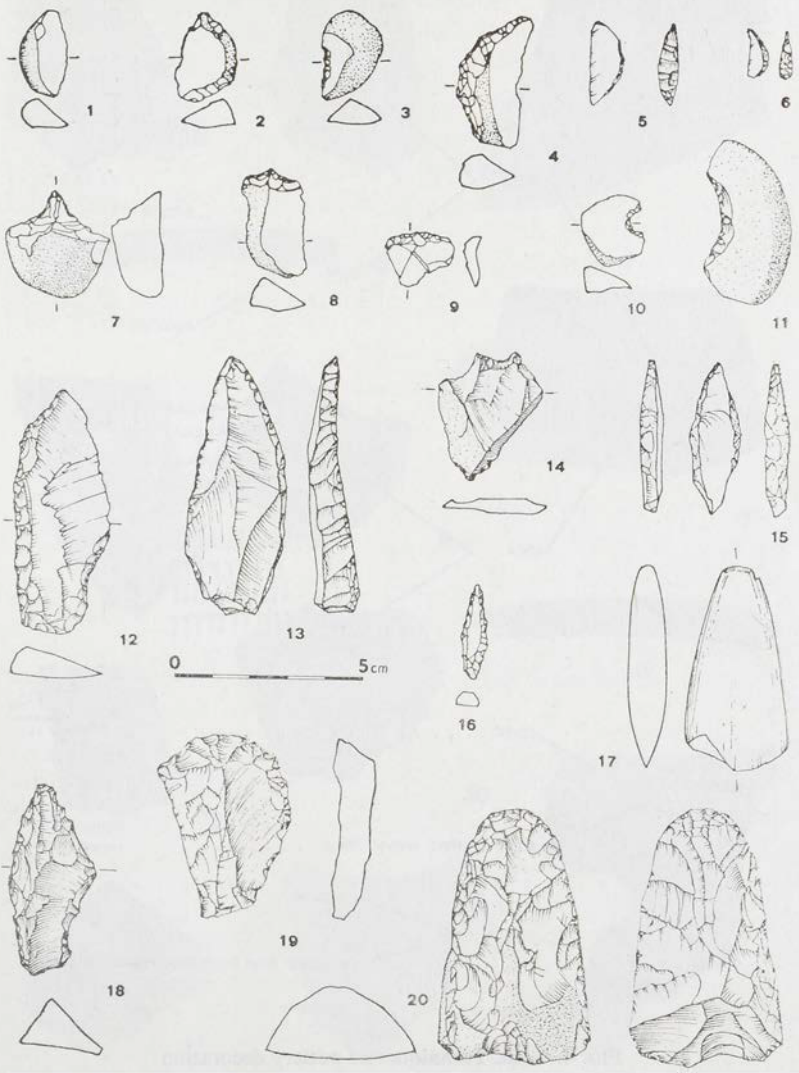

FIG. 3. Geili. Lithic industry from the Early Neolithic settlement

3. The incision – this produces coupled horizontal lines or a vertically combed surface which usually was slipped and burnished afterwards (Fig. 5: 8, 11, 12, 13).

Surfaces are always burnished. Decoration usually covers the upper third of the body, including the rim; rarely the whole surface. Motifs are various but usually depend on the technique employed.

Two chronological phases of the settlement at Geili appear to be represented. The more recent one is characterized by the presence of gouges and other rhyolite tools

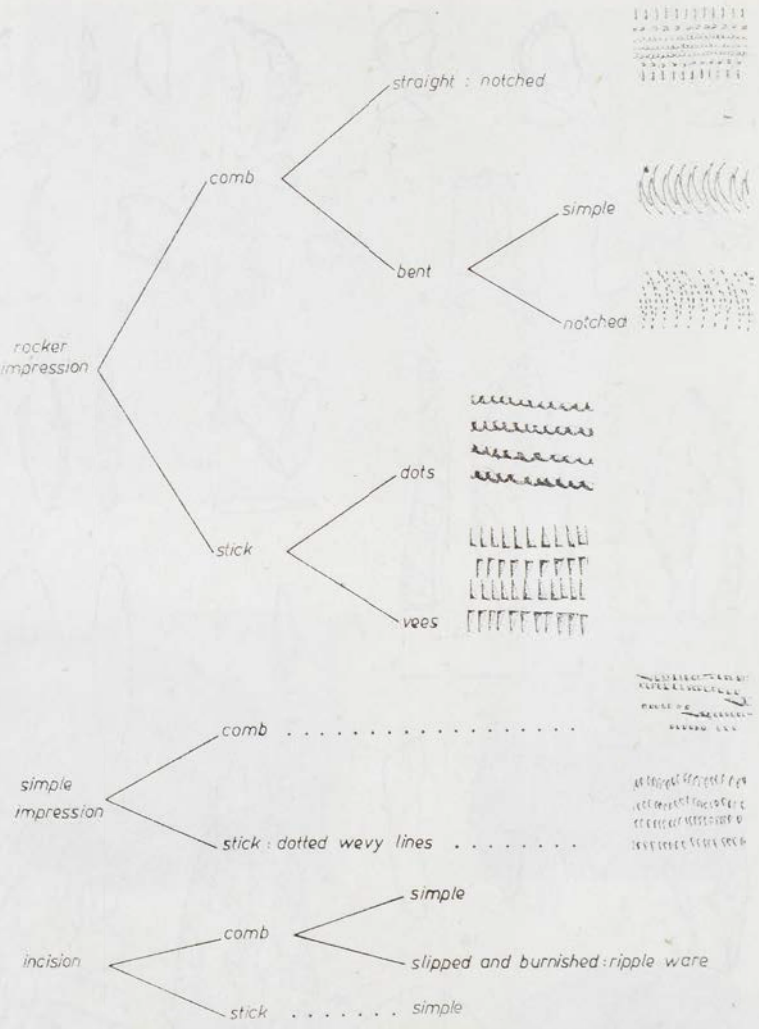

FIG. 4. Geili. Techniques of pottery decoration

which are lacking in the earlier one. The fauna of this recent phase consists of freshwater molluscs, landsnails, freshwater fish (mainly catfish), monitor lizard (*Varanus*) and crocodile. Most of the mammalian remains are poorly preserved and seem to pertain to game animals including a large bovid, possibly buffalo (? *Syncerus* sp.). Small livestock may also be present, since some remains can be ascribed to domestic goat[1]. Hence subsistence activities of this Early Neolithic community appear to have

[1] Preliminary identifications of the fauna were made by Cesare Placidi, comments by Dr. Achilles Gautier (Gent, Belgium) were added.

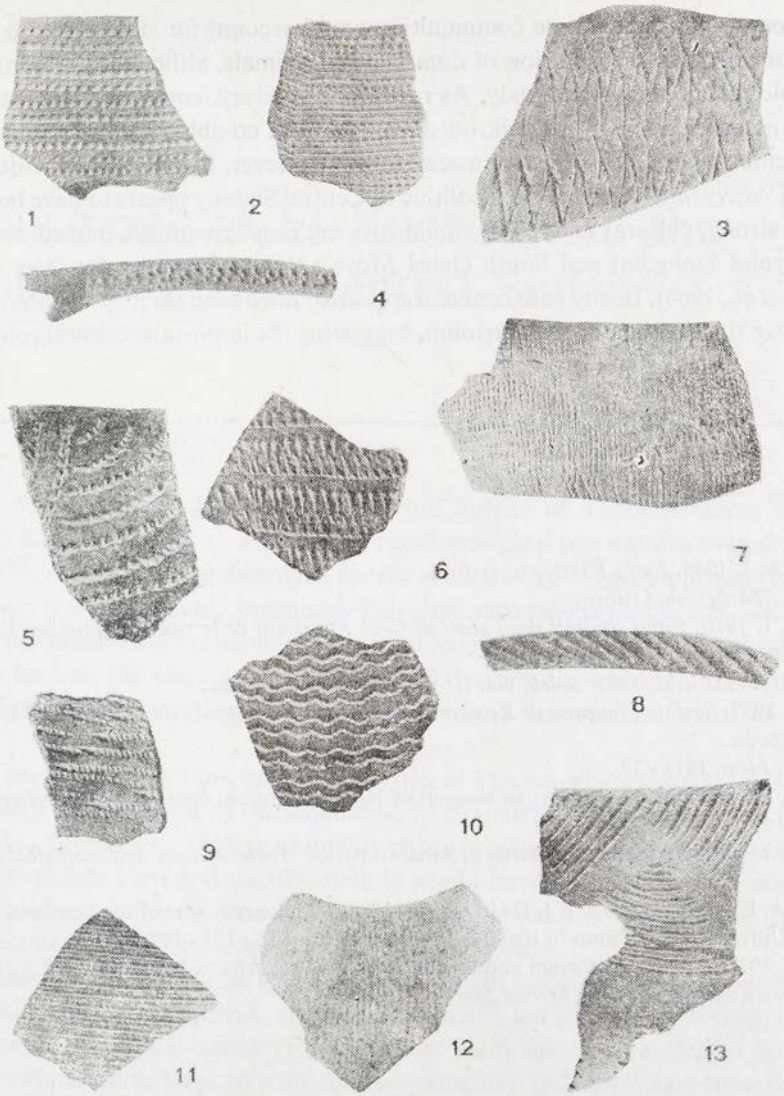

FIG. 5. Geili. Pottery from the Early Neolithic settlement

been based on hunting, fishing and gathering. In Geili we seem to be dealing with the beginning of changes in economic activities towards food production which probably was merely an addition to the dominating food-gathering pattern.

As stressed by Hays (1975) and Shaw (1977), there was a broad continuity in lithic and pottery style between "Mesolithic" and Neolithic complexes in Sub-Saharan areas: the latter just added burnishing of pottery and introduced some elements in the tool kit suggesting an expansion of economic activities but this remained within a continuous, indigenous development. Cultural contacts of the Central Suda-

nese groups with the Saharan communities would account for similarities in pottery decoration and for the diffusion of domesticated animals, although this last mentioned topic still needs further study. As regards the pottery, correlations are still difficult to make because of the lack od documentation combined with the inadequate classification of Neolithic pottery assemblages. However, in spite of the wide occurrence of "wavy line" pottery, the Neolithic of Central Sudan appears to have been a region of strong, cultural unity. The similarities are mostly with the immediate North (not beyond Dongola) and South (Jebel Moya); this also applies for later periods (Marks *et al.*, 1968). In any case contacts appear to have been indirect: similarities are stronger in the sites nearer to Khartoum, suggesting the important cultural role of this area.

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FRANCIS GEUS

Excavations at El Kadada and the Neolithic of the Central Sudan

El Kadada is situated in the Sudan, in the district of Taragma, some 200 km. north of Khartoum (Fig. 1). An extensive archaeological site was discovered there in April 1976. As it was being destroyed for the setting of an irrigation project, a rescue excavation was immediately organized. This gave such results that it was followed by three other excavation campaigns, for a total length of approximately eight months. It since became the main research project of the French Archaeological Research Unit of the Directorate General for Antiquities and National Museums in the Sudan [1].

The site lays on the right bank of the Nile, in an area where the river flows from west to east. It is still used by the inhabitants of the surrounding villages as their burial place. This, together with the poor quality of the local ground, certainly explains why it was left uninhabited and uncultivated. It would have been safe from destructions if not choosen for the construction of the pump, of the starting point of the main canal and of the staff buildings of the irrigation project.

During the first campaign, which we first thought would be the only one, the site was divided into 50 m. squares, numbered as from 1, ten for each E-W strip, starting therefore from the N-E corner (Fig. 2). These main squares are divided into 2 m. squares, which are referred to with their co-ordinates: A-Z from east to west (I not included); 1 - 25 from north to south. So far three main areas have been investigated: 12 - 22 - 32; 75 - 76 - 85 - 86; 107. The three of them include remains of a Neolithic layer as well as Neolithic, Meroitic and Post-Meroitic graves [2].

12 - 22 - 32 was first appearing as a large low mound, the northern part of which had been destroyed for preparing the site of the pump. At the same time the remaining

[1] The preliminary results of the campaigns are published every year in an illustrated report issued by the French Unit and distributed free of charge. Anyone interested should send his address to: French Archaeological Research Unit, Directorate General for Antiquities and National Museums, P.O. Box 178, Khartoum, Sudan.

[2] Geus, 1976; 1977; 1978; 1980a; 1980b; Geus and Reinold, 1979.

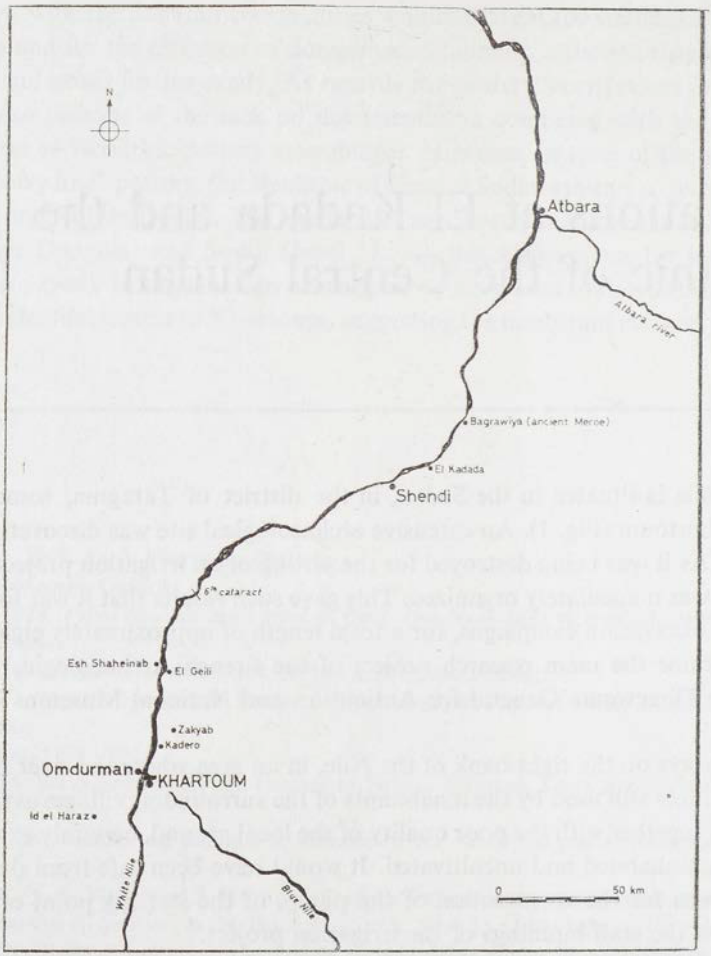

FIG. 1. Major sites in the Central Sudan

part had been superficially disturbed and, as a consequence, a lot of archaeological fragments were appearing on the surface. The mound was thought to be a settlement site. The excavations quickly showed that it was also an important burial ground.

The settlement remains appear as a rather thick light grey layer, containing a lot of archaeological fragments. No stratigraphy may be worked out, as it has been disturbed since the Neolithic occupation by the digging of graves. One area seemed to be better preserved, but it was found too late in the campaign and it could not be excavated before the final destruction of the site, in February 1977. Most of the material collected from the layer, which is packed in thousands of bags, is now under study. So far we may express only some preliminary impressions:

– no habitation structures found;

– lithic industry characterized by (a) numerous sandstone grinding tools, (b) heavy quartz and chert flaking associated with few finished or retouched pieces;
– bone harpoons (Fig. 3: *1 - 3*); shell fish-hooks (Fig. 3: *4 - 6*); amazonite, carnelian, bone and ostrich egg-shell beads;
– large quantity of pottery sherds, mainly black wares, plain and decorated;
– large quantities of shells and fragmentary animal bones.

The graves include pot burials and pit burials. Pot burials (Fig. 3: *7 - 8*;) were used for newborn children and infants. The pots containing the burials are ge-

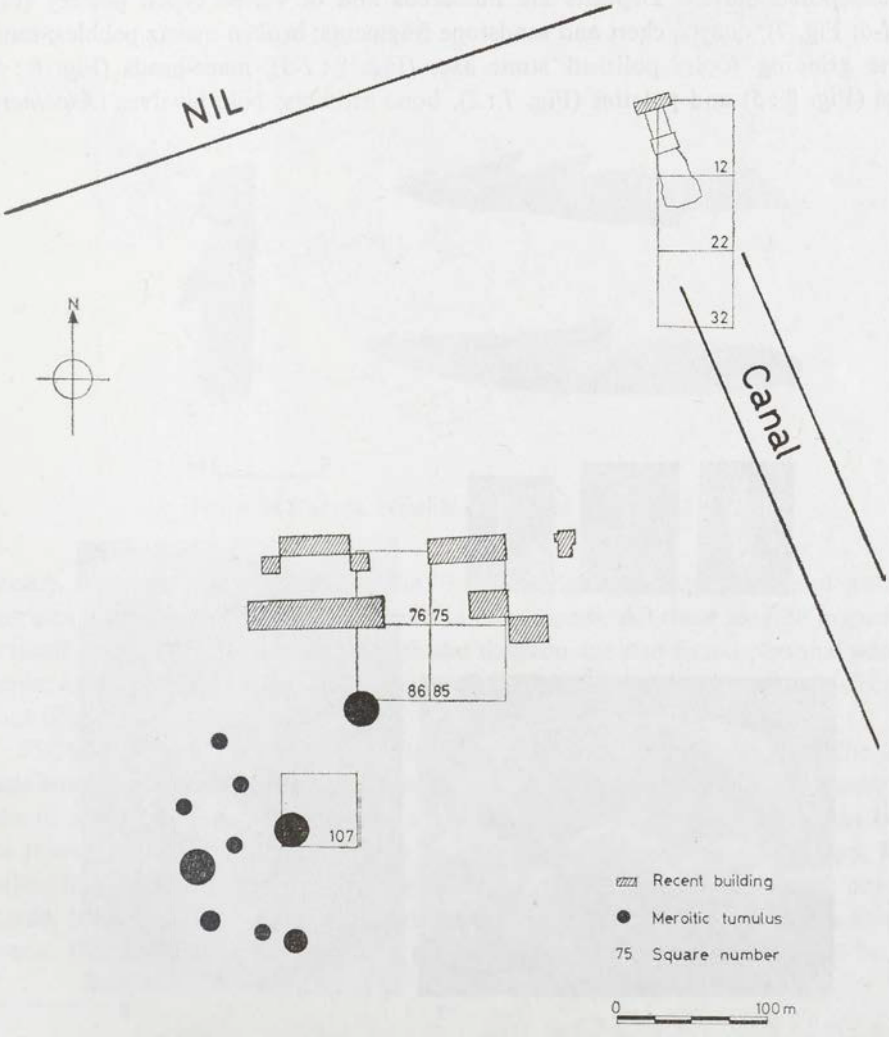

FIG. 2. El Kadada. Distribution of archaeological areas

nerally large, hemispherical, decorated. Some offerings may be found inside and outside the pot: pottery vessels, ostrich eggs, Nile bivalves (*Aspatharia rubens*), beads. In several cases one pot contains the bones of several individuals. Pot burials are most often disturbed.

In the other type of burial the pit is circular or subcircular. Sometimes it is shapeless, as a result of successive diggings for superimposed burials. The skeleton lays generally on its side, in a more or less contracted position, without any specific orientation (Fig. 5). Traces of red ochre may be found on the bones and sometimes the light remains of what may have been a mat helps differenciating between two superimposed burials. Deposits are numerous and of varied types: pottery (Fig. 6 : *1-6*; Fig. 7); quartz, chert and sandstone fragments; broken quartz pebbles; sandstone grinding tools; polished stone axes (Fig. 8 : *1-3*), mace-heads (Fig. 8 : *4*), discs (Fig. 8 : *5*) and palettes (Fig. 7 : *2*), bone artifacts; Nile bivalves (*Aspatharia*

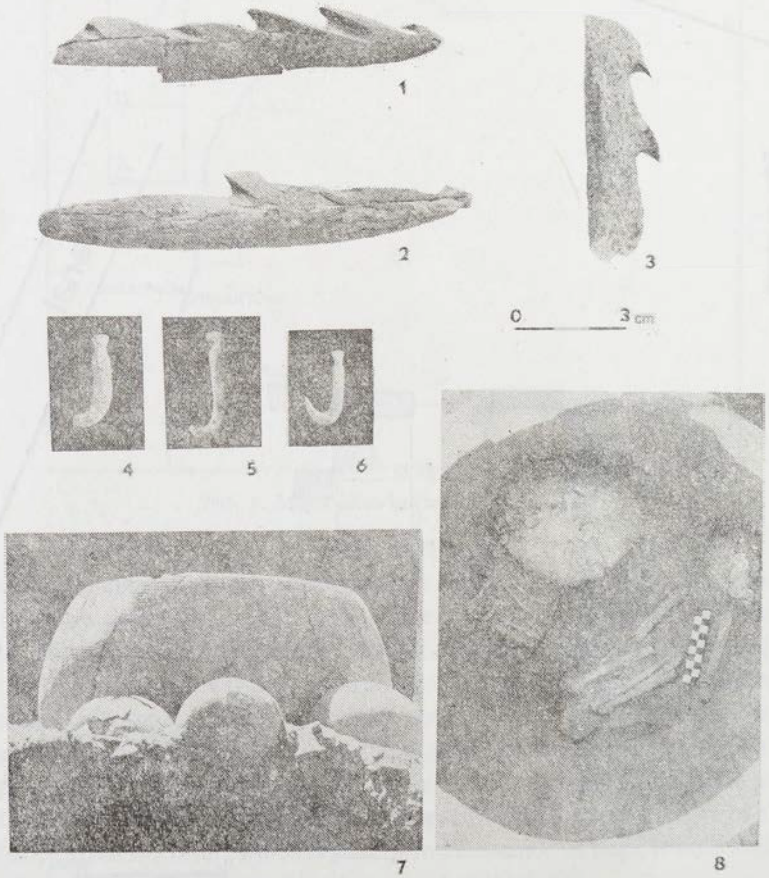

FIG. 3. El Kadada. Neolithic bone harpoons (*1 - 3*), shell fish-hooks (*4 - 6*) and pot burial viewed from side (*7*) and top (*8*)

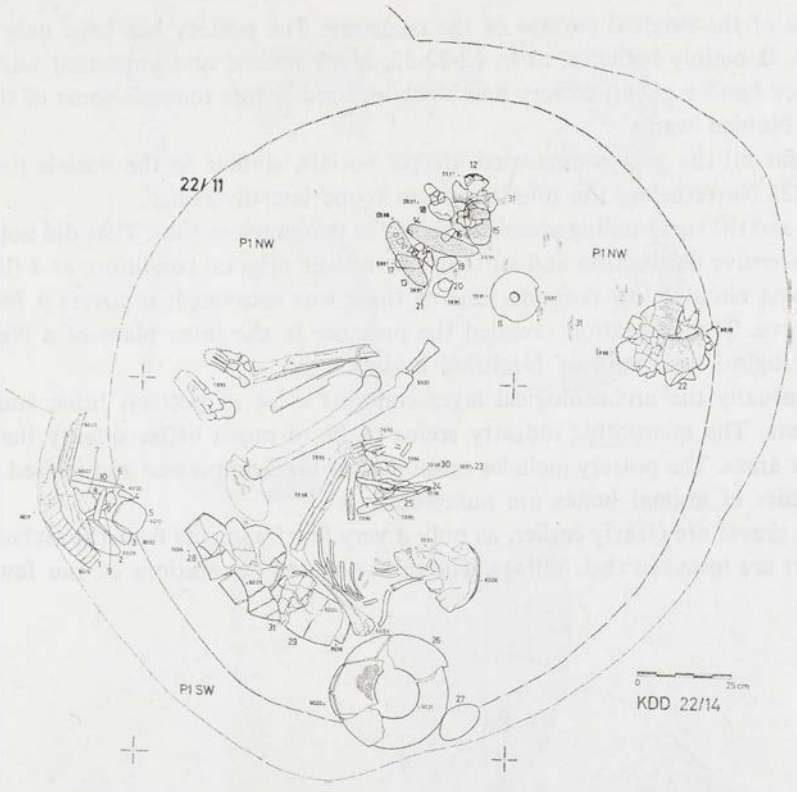

FIG. 4. El Kadada. Neolithic pot burial KDD 22/14

rubens), some with serrated edges (Fig. 9 : *1*); ostrich eggs; sandstone and pottery figurines (Fig. 9 : *2*); red ochre fragments; animal bones. All these may be organized as small heaps. Directly associated with the skeleton are also found personal adornments: amazonite, carnelian, bone and ostrich egg-shell beads; lip or nose decorations (Fig. 9 : *3-5*); ivory rings [3].

75-76-85-86 had already been flattened when we discovered the site. The first finds were made near foundation trenches, which were being dug for the construction of some buildings. On this site a homogenous archaeological layer has been cut through by burials, most of them belonging to the Neolithic occupation. It is rather thin and contains fragmentary grinding tools made of sandstone, pottery sherds, lithic material with a higher index of finished or retouched pieces, animal bones. This suggests that it may be a settlement layer, but it could also just be the

[3] In squares 75 - 76 - 85 - 86, although some of the rings are of ivory, others have been identified by A. Gautier (Gent University) as being made out of large sea shells (Fig. 9 : 6 - 7).

remains of the original surface of the cemetery. The pottery has been only partly studied. It mainly includes, as in 12-22-32, black incised and impressed wares. On the other hand a group of very fine black and red sherds reminds some of the best of the Nubian wares.

So far all the graves excavated are pit burials, similar to the burials found in 12-22-32. Nevertheless the offerings seem to be less diversified.

107 and the surrounding area differ from the two previous sites. They did not suffer from extensive destruction and still appear in their original condition, as a flat area with some circular low mounds. One of these was excavated: it covers a Meroitic cave grave. The excavation revealed the presence in the same place of a Neolithic archaeological layer and of Neolithic burials.

As usually the archaeological layer contains a lot of pottery, lithic and bone fragments. The microlithic industry seems to be of much better quality than it is in other areas. The pottery includes again mainly black impressed and incised wares. Fragments of animal bones are numerous.

The graves are clearly earlier, as only a very few fragments from the archaeological layer are found in their fillings. The positions and orientations of the few exca-

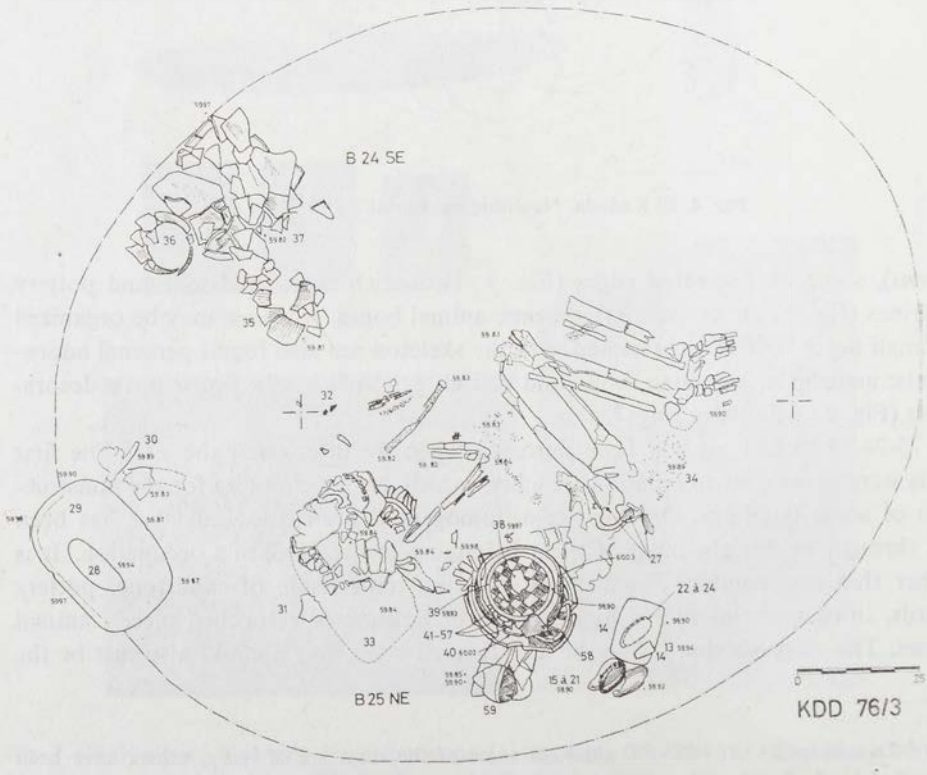

FIG. 5. El Kadada. Neolithic pit burial KDD 76/3

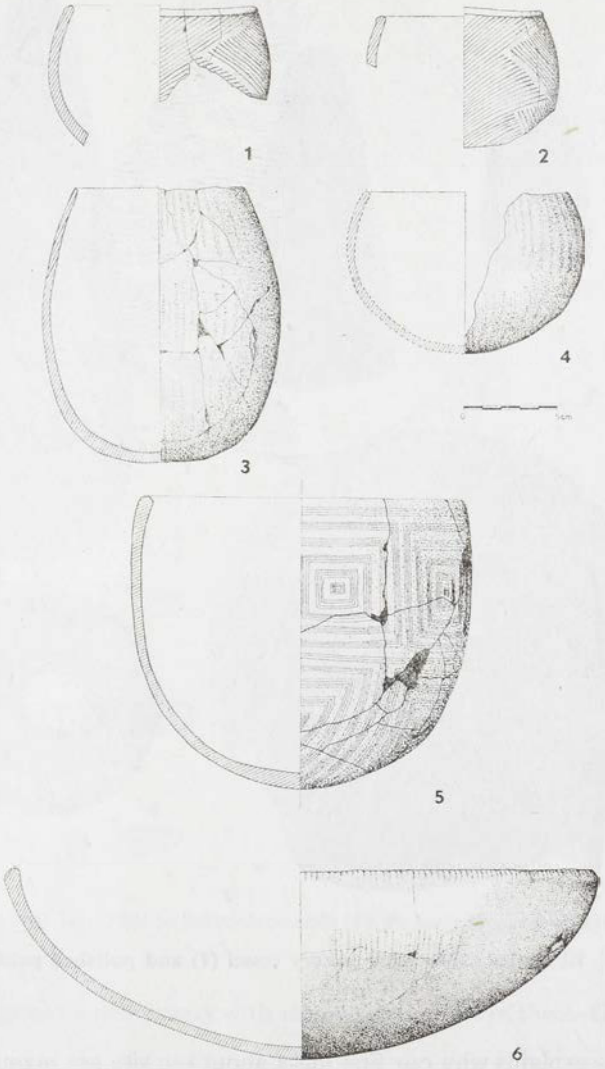

FIG. 6. El Kadada. Neolithic pottery vessels

vated burials are as in the other areas, but only single inhumation were found so far with only a few pottery vessels as deposits. These vessels differ from the pottery found in the other graves.

This short and incomplete description of our discoveries at el Kadada gives an idea of the extension of the archaeological site and of its complexity. Years of field and laboratory research will still be necessary to obtain a reliable picture of the Neolithic occupation. So far our work concerned mainly the Neolithic and Meroitic

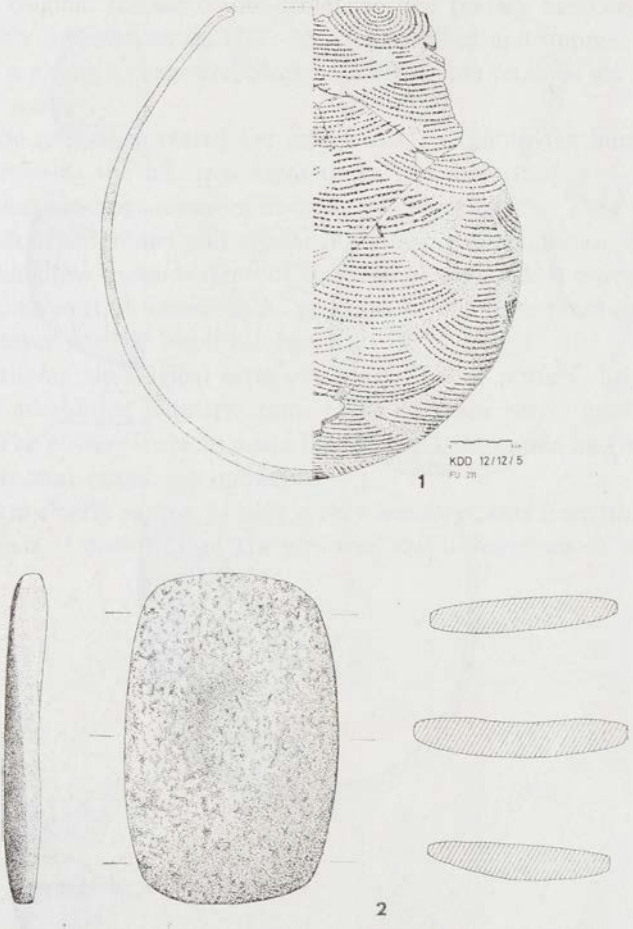

FIG. 7. El Kadada. Neolithic pottery vessel (*1*) and polished palette (*2*)

burials and this explains why our first ideas about the site are mainly based on the material culture and on the funerary customs.

Most of the material found at el Kadada shows that it belongs to a late and brilliant development of the Central Sudanese Neolithic, presenting a number of affinities with the A-Group and C-Group cultures of Lower Nubia. The only C-14 datation we got so far (4,630±60 B.P., uncalibrated-conventional)[4] shows that this

[4] This date has been obtained from a sample of river shells (*Aspatharia rubens*) from inside a grave (Geus, 1980a : 15). A new date (4,830±50 B.P.) has since been obtained from shells of the same type found inside a pot burial.

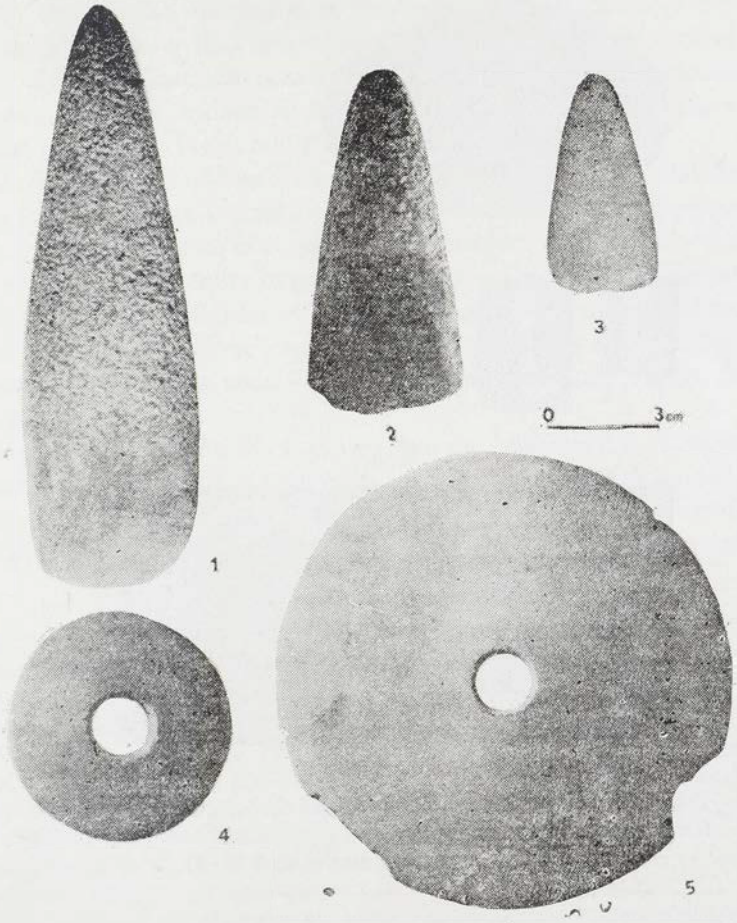

FIG. 8. El Kadada. Late Neolithic polished axe-heads (*1 - 3*), mace head (*4*) and perforated disc (*5*)

development must be contemporary with the classical phase of the A-Group in Lower Nubia[5].

The similarities with the Shaheinab Neolithic are mainly due to the presence of some specific objects: serrated Nile bivalves (*Aspatharia rubens*), amazonite beads, lip-plugs, barbed bone harpoons, shell fish-hooks. For the rest the differences are numerous. On one hand, although they show affinities, the ceramic assemblages of the two sites differ: at Esh Shaheinab the bulk of the pottery is made of burnished red and brown sherds, with mostly impressed decorations, whereas at el Kadada, although a dark red wash is sometimes used, on rippled pottery mostly, black wares

[5] Ollson in Nordström, 1972: 251. For the classic A-group the weighted mean value of the four C-14 determinations is 4,655 ± 80 B.P. (uncalibrated – conventional).

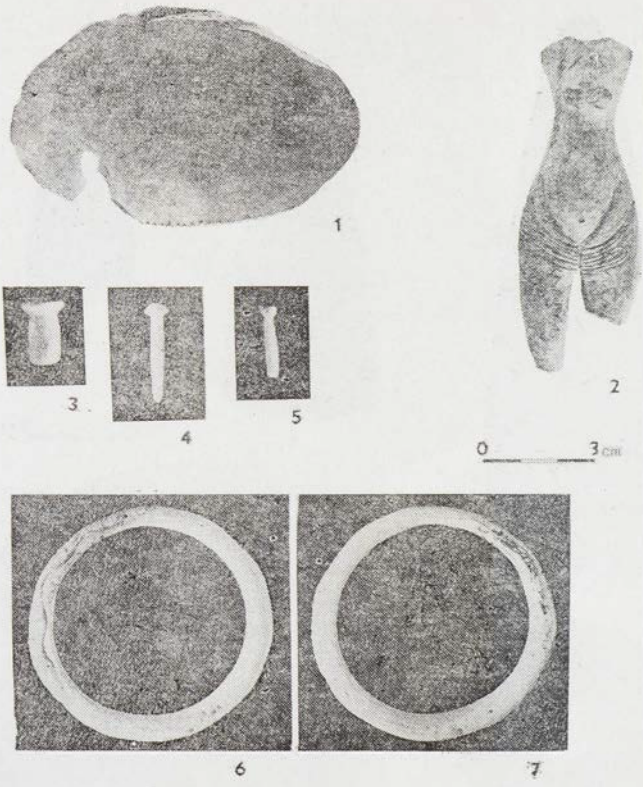

FIG. 9. El Kadada. Late Neolithic serrated shell *Aspatharia rubens* (*1*), terracota figurine viewed from front (*2*), lip- and nose-plugs (*3 - 5*) and rings made of marine shell (*6 - 7*)

with both impressed and incised designs predominate. On the other hand at el Kadada microliths are few and hard stone polished implements of excellent quality numerous, whereas at Esh Shaheinab the situation is just the opposite[6]. Another point to be considered is the total absence at el Kadada of the gouge, a typical tool of Esh Shaheinab.

Funerary customs and pottery show more affinities with the burials found at Esh Shaheinab and near Omdurman Bridge, which Arkell thought to be possibly of Protodynastic date[7]. Nevertheless here again differences are striking: at esh Shaheinab, where a good number of graves have been excavated, although grave shafts

[6] Polished artifacts made from hard stone are few and their types differ from those found at el Kadada, except for some fragments of discs which Arkell do not associate with the main occupation of the site.

[7] Arkell (1953 : 82) insists on the differences between the graves of the two sites, concluding that the esh Shaheinab ones are possibly earlier.

are generally circular, the orientation of the bodies seems to be more precise, the offerings are much poorer and superimposed burials are few and limited to two individuals only. In fact recent excavations at el Geili, where some graves containing goods identical to the el Kadada finds have been found, show that it is a specific culture which extended as far as in the Khartoum area [8].

In the A-Group graves of Lower Nubia the grave goods are less diversified and burials are following more precise orientations. Nevertheless they present many similarities: frequent occurence of circular or sub-circular grave shafts[9] and of superimposed burials[10], large quantity of grave goods inside the shafts. On the other hand many of the objects show affinities with the el Kadada material: polished hard stone discs[11] and palettes[12], sandstone lower grindstones[13], pottery figurines. The shapes, surface treatments – rippled ware – and decorations[14] of the pottery show also a number of affinities.

These are much fewer with the C-Group, but the common use of circular grave shafts in the early C-Group, the abundance at el Kadada of black incised pottery, sometimes with white filling, show that they should by no means be excluded[15] as should not be excluded a comparative study with the cultures of Predynastic Egypt[16].

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[8] The graves excavated at el Geili contain goods which are exactly similar to those found at el Kadada: hard stone palettes and perforated discs; pottery with incised decoration. They are still unpublished, but photographs of some of them were presented in a temporary exhibition, held in Khartoum National Museum in 1980. On the other hand finds from Kadero include a palette of the same type (Chittick, 1955 : 79 - 81 and Pl. VII) and Arkell, found at Zakyab, Id el Haraz, Omdurman Bridge, Khartoum Hospital and Esh Shaheinab fragments of perforated discs which he did not associate with any precise occupation of the sites (Arkell 1949 : 135; 1953 : 50).

[9] Nordström, 1972 : Pl. 64, 78.

[10] Nordström, 1972 : Pl. 131, table 4.

[11] Reisner, 1910 : Pl. 62c, 2 - 4 and 10 - 12: Pl. 63d, 5, 10. The el Kadada perforated discs are of various sizes, the maximum diameter found so far being 24 cm. Profiles may differ. We could not yet precise what they were used for. We are using here the term „mace-head" for related objects which look more like rings, although the passage from a disc to a mace-head remains still to be defined.

[12] Firth, 1927 : Pl. 21d, 3 and 9 - 12; Nordström, 1972 : Pl. 137, 13.

[13] Reisner, 1910 : Pl. 26c; Firth, 1912 : Pl. 14b; Firth, 1915 - Pl. 5f.

[14] Semi-circular patterns (Firth, 1927 : Pl. 19c - f; Nordström, 1962 : Pl. XI); rocking impressions (Adams and Nordström, 1963 Pl. Ia; Nordström, 1966 : p. 6 and fig. 1); superimposed horizontal lines of triangles (Firth, 1927 : Pl. 19a - b).

[15] C-Group graves contain also pottery figurines (Firth, 1912 : Pl. 39a - b), sandstone grindstones (Steindorf, 1935 : Pl. 68), bone tools (Steindorf, 1935 : Pl. 16), Nile bivalves (Steindorf, 1935 : Pl. 68).

[16] Although this point does not need to be developed here, the following resemblances may be mentioned for the pottery: usual shapes (Brunton, 1937 : Pl. XVII); rippling (*id.* : 28, Pl. XII and XIV); beakers with flaring openings (*i.d.*, Pl. XII). Similar beakers have also been published for Lower Nubia: Firth, 1915 : Pl. 27f (archaic pottery); 1927 : Pl. 25a, 3 (Early C-group). For the stone palettes see also Chittick, 1955 : 80 - 81.

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ROMUALD SCHILD and FRED WENDORF

The earliest, Holocene production of cereals in the Egyptian Sahara

In 1972 the Combined Prehistoric Expedition began a longterm project concen trated on prehistory and the reconstruction of paleoenvironments of the Western Desert of Egypt. Quaternary climatic fluctuations in this part of the world, today one of the driest areas of the Sahara, had deep repercussions in the floral, animal and human history of the area. A record of past climates and environments is preserved in the sediments which usually tend to be removed or severely damaged during arid episodes. Hence, the latest wet periods are often better represented and seem to be more complex than the older or dryer ones. In spite of the fact that the researches of CPE unearthed the evidence of at least four major wetter periods, the last one, occurring during Final Pleistocene and Early Holocene, is obviously better studied and understood. It also coincides with the main subject of our conference.

Recent researches of the CPE in the Western Desert of Egypt included both stationary work, in selected areas, as well as intensive surveys of the desert in the vicinity and beyond the worked areas (Wendorf and Schild, 1980). Most of the work concentrated in the central and southern part of the Western Desert, generally south of the Eocene Plateau, at Dakhla (1972 season), Kharga (1976 season), vicinity of Gebel Nabta (1974, 1975 and 1977 seasons), Bir Sahara (1973 and 1974 seasons), Bir Tarfawi (1974 season), and vicinity of Bir Kiseiba (1979 and 1980 seasons). Some additional work was also done in the Dyke Area (1972 season), south of Dakhla, and in the Gilf el Kebir (1975 season). Although almost every area yielded some information on the last wet episode of the Western Desert and associated archaeology, two areas (vicinity of Gebel Nabta and Bir Kiseiba) provided the main bulk of data serving as a base for this presentation of the results obtained.

About 100 km west and slightly north of Abu Simbel, and 60 km north of the border of Sudan, a high Nubian Sandstone gebel with Kurkur Limestone cap – Gebel Nabta – provides a prominent landmark. Extensive flat areas, remnants of former internally drained enclosed basins filled with clays, silts or fine sands, form a huge lacustrine system composed of several adjoining and isolated playas. The

sediments are highly deflated, and usually preserved only in deeper sections of these former lakes. Numerous prehistoric sites, of various ages, occur on the surface, in most cases in a typical lag position, while some are still embedded in the original sediments.

Three separate basins were worked in the vicinity of Gebel Nabta during the 1974, 1975 and 1976 field seasons. Most of the research was done at Nabta Playa where five sites were excavated, all during the three seasons mentioned. Two remaining, smaller basins, (El Kortein Playa, some 20 km to the north of Gebel Nabta, and El Gebel El Beid Playa, 10 km north of El Kortein) were examined during the 1977 season. Three sites were excavated and collected at the El Kortein and one at the El Gebal El Beid Playa.

Another large area, investigated during the 1979 and 1980 seasons, extends along the Kiseiba Scarp where several fossil lakes developed during the Early and Middle Holocene. The lakes occupy the lowest and northernmost end of the huge Nakhlai--Sheb pediplain bordered on the north by the Kiseiba Scarp, standing some 90 m high. Here too, the basins form a system of interconnected or separated waterbodies, today highly deflated and destroyed. Sands, clays and silts fill the deepest part of the lakes while many prehistoric sites occur on their shores or within the basins. Thirteen prehistoric sites located within the Kiseiba, El Ghorab, El Gebel El Fil and El Adam Playas were extensively worked throughout these two seasons. Additionally, a detailed survey of the plateau beyond the scarp was undertaken in the 1980 season, as well as a brief visit to and sampling of two sites in the Bir Mur area.

Three other areas, Kharga Oasis (1976), the Dyke Area (1972) and Wadi Bakht (1975) yielded additional sites associated with the Holocene wet periods. At Kharga four sites were most extensively studied (E-76-2, E-76-6, E-76-7a and E-76-7). Three of them are associated with small spring-fed basins, while one occurs in a large playa, near the village of Ezbet Mokhamed Khalil (E-76-2). At the Dyke Area, some 195 km south of the village of Balat in Dakhla Oasis, a single, rich concentration associated with a small enclosed, sandy basin was investigated during the 1972 season (E-72-5). In the Gilf El Kabir, the known site of Mayers in Wadi Bakht was briefly visited. A small collection of artifacts and some materials for radiocarbon dating were taken in the 1975 season.

The playas occurring south of the Kiseiba scarp are characterized by smooth and hard surfaces, lack of salt crusts, in most cases, and apparent impermeability due to fine-grained elastic sediments within the group of clay, silt and fine sands. The formation of these playas in today's rainless desert was caused by surface floods and resulting redeposition of surrounding sediments which were gravitationaly sorted. This type of playas, according to the classification of Motts (1965), is called a "total surface-water discharge playa". They are usually characterized by the distribution of the vegetation in the form of a ring around the periphery of the basin with the central area barren, as the result of contraction of the clays in the central portion caused by alternating wet and dry seasons. Similar playas are seen today in the northwestern

desert of Egypt, south of the littoral belt and in northern Sudan (Northern Darfur Province), south of the high desert and on its fringe, all in an area with weak – 50 to 200 mm – rainfall *per annum*.

The lithostratigraphy of the excavated playas reflect pronounced environmental fluctuations recorded in the periods of lacustrine accumulation, deflation, down-cutting or dune formation. There are at least three wet pulsations recorded, all separated by arid intervals. The chronology of these is the following:

Playa I	ca. 10–11,000 – 8,200 B.P.	(this one contains at least three pulsations)
First Arid Interval	around 8,200 B.P.	
Playa II	8,200 – 7,700 B.P.	
Second Arid Interval	around 7,700 B.P.	
Playa III	7,700 – 5,500 B.P.	

The sediments associated with the first humid pulsation are usually sandy or silty with lenses of silts and clays, clearly suggesting larger capacity and velocity of the surface runoff, resulting quite possible from scarcer vegetation and more torrential rains. On the other hand, disregarding facial variability of the deposits, the later playas are more often composed of silts and clays.

Rich faunal samples assembled at most of the sites (Gautier, 1980), clearly indicate an overwhelming predominance of small gazelles (*Gazella dorcas*) and hare (*Lepus capensis*). There are occasional large gazelles (*Gazella dama*?), rare large bovids (domestic cattle), wild cat, striped hyenas, a single warthog, porcupine, hedgehog, canids and rodents. Except for the *Bos*, to be discussed later, there is a total lack of megafauna and the predominance of *Gazella dorcas* and hare indicate a generally dry environment – that of the desert or semidesert. Today, the southern limit of the *Gazella dorcas* lies in the central western Sudan. The rainfall in the area where *Gazella dorcas* occure is between 0 mm and 300-400 mm in the south.

Limited floral evidence (macro-remains) gathered mostly at two sites of Nabta (E-75-6 and E-75-8), indicate the presence of acacia, salsola, tamarisks, dom palm and a date palme as well as several varieties of grases and weeds, all fitting very well in the presented evinronmental reconstruction (analysis by M. Nabil El Hadidi).

In short, all of the available data suggest that the area south of the Kiseiba Scarp should be classified as "semi-desert of Sudan" whose northern limit coincides with the 80 to 90 mm isohyet, while its southern limit lies between 300 and 400 mm of rainfall *per annum*. The vegetation in this zone is mainly composed of acacias (mostly shrubs), herbs and rare larger trees usually occurring along the water courses and playas.

It is highly conceivable that during most of the humid pulsations of the Holocene, the southern Western Desert of Egypt was dotted with rather numerous playas surrounded by semi-woodland vegetation, shrubs and grasses with rare permanent pools, as indicated by occasional presence of catfish bones(?). Extensive grasslands

extended on the sandy plains beyond the playas. Barren, exposed surfaces of Nubian Sandstone and Eocene Limestone occurred here and there on the gebels.

Although it is most likely that the magnitude of each wet pulastion was different, it seems that all of them were generally similar. Farther north, beyond the Kiseiba Scarp, in the Oasis of Kharga, they seem to coincide with the increased discharge of natural, artesian springs. Similarly, the date from the Gilf El Kebir show increasing precipitation following an arid phase which can be compared with Playa III of the south Western Desert.

Recently gathered data from the northern Western Desert (Hassan, 1976; 1978) at Siwa and Gara Oases, seem to indicate that the northern portion of the Western Desert was much more arid than the southern one during the early Holocene. Furthermore, the available dating permits the assertion that the onset of rainfall in the south Western Desert preceeds that of the northern portion by at least 1,000 years. Although the data at hand are not entirely conclusive, it is quite possible that the wet pulsation recorded at Gara and Siwa are off phase with those in the south. Obviously, all these data suggest primary association of the rainfall in the south Western Desert with summer and the monsoonal belt.

Until recently (1979), it was believed that the earliest Holocene occupation of the south Western Desert was that of Terminal Palaeolithic which began almost immediately after the onset of more humid environmental conditions. The sites of this period seemed to extend chronologically from around 9,000 B.P. (E-77-7, El Gebel El Beid) and lasted, according to the radiocarbon dating, until ca. 7,900 B.P. (E-76-6 at Kharga). These numerous Terminal Palaeolithic sites apparently did not contain any pottery and only occasionally showed the presence of more permanent structures, as well as grain processing equipment (E-72-5, Dyke Area). Some sites contained bones of a Bovid which, because of the poor environmental conditions, could have been domesticated. The sites were usually much smaller and thinner than the Neolithic ones and in most cases consisted of one to a few relatively thin concentrations of lithic artifacts. There were at least four clear taxonomic entities defined on the basis of technology and/or of co-occurrence of various tool classes.

These Terminal Palaeolithic sites seemed to be followed by the Neolithic whose earliest occurrences were contemporaneous with some of the late Terminal Palaeolithic ones. The oldest site (E-75-6, Upper Layer), dated to around 8,100 B.P. (by ten radiocarbon dates) contained pottery of the Early Khartoum general type, naked and hulled barley (Stemler and Falk, 1980) and consisted of at least two rows of circular huts with adjacent bell-shaped storage pits, post holes and a deep well. The latest sites at Nabta (E-75-8, Upper Layers) and Kharga (E-76-7), date ca. 5,800 B.P. and 5,500 B.P. respectively, and are associated with pottery different from that of the Early Khartoum, general type. The presence of goat or sheep is noted for the first time in a later Neolithic horizon – although still with an Early Khartoum style pottery – at Site E-75-8, Lower Cultural Horizon, dated between 7,100 and 6,600

B.P. It also contained hulled barley as well as a grain of wheat, similar to emmer (Stemler and Falk, 1980).

There are several Neolithic taxonomic entities differentiated both by individual styles of pottery as well as by the character of their tool kits. The earliest group of units, although internally highly differentiated, is within the so-called Early Khartoum or Saharo-Sudanese tradition. The pottery from the Upper Cultural Complex of Site E-75-8, at Nabta, seems to be within the variability range of the Abkan Neolithic in the Nubian Nile Valley. The relatively late Neolithic from Kharga (E-76-7) is within the so called "Peasant Neolithic" of Caton-Thompson and contains pottery which do not seems to have analogies either in the Nile Valley or the Western Desert (for pottery styles see K. Banks, this volume).

The Neolithic sites associated with playas occur usually in two different geomorphic settings: the first are the seettlements located at the playa edge, usually large and often presenting organized, planned spacing of structures and/or the presence of various pits (*e.g.*, E-75-6 and E-75-8 at Nabta, or E-79-4 and E-79-6 at Bir Kiseiba); the second are within the playas, often near the center and consist of isolated structures with rare artifacts (E-77-5A) or isolated, richer concentrations with house or tent-like structures (E-77-5).

The latest results of the excavations of the sites occurring in the playas, just south of the Kiseiba Scarp, make the clustering of the Holocene archaeological materials from the Western Desert into two basic, chrono-economic units dubious. At Sites E-79-8 and E-80-4, El Adam Playa, a series of cultural lenses (Fig. 1) with seemingly Terminal Palaeolithic stone assemblages contained also a technologically well advanced pottery with a Saharo-Sudanese design (compare K. Banks, this volume). A series of eight radiocarbon dates place the occupations between 9,840±380 years B.P. (SMU-858) and 8,920±130 years B.P. (SMU-757). The dates near and within the level containing pottery are around 9,400-9,200 years B.P. Numerous bones found at this site contained also some which are certainly those of Bovid, most probably domesticated (see Gautier, this volume).

At another site in this area (El Ghorab Playa, Site E-79-4) an apparently Terminal Palaeolithic layer (Lower Layer), with a chipped tool assemblage similar or identical to one of the previously recognized entities, also yielded two potsherds. A radiocarbon date from this horizon is of 8,250±140 years B.P. (SMU-750).

Some major points of the recent research conducted by the Combined Prehistoric Expedition in the Western Desert of Egypt could be summarized as follows:

1. Latest results suggest that all TP entities knew pottery.
2. It is most probable that they also had domesticated animals (cattle) and cereals, as suggested by faunal remains and the presence of grinding equipment (E-72-5). The latter is additionally supported by early dates for the already domesticated cereals at Site E-75-6, near Gebel Nabta.
3. It is suggested that the so-called TP assemblages, in fact, represent early colonization of the Desert which began already during a dryer, early phase of the Holo-

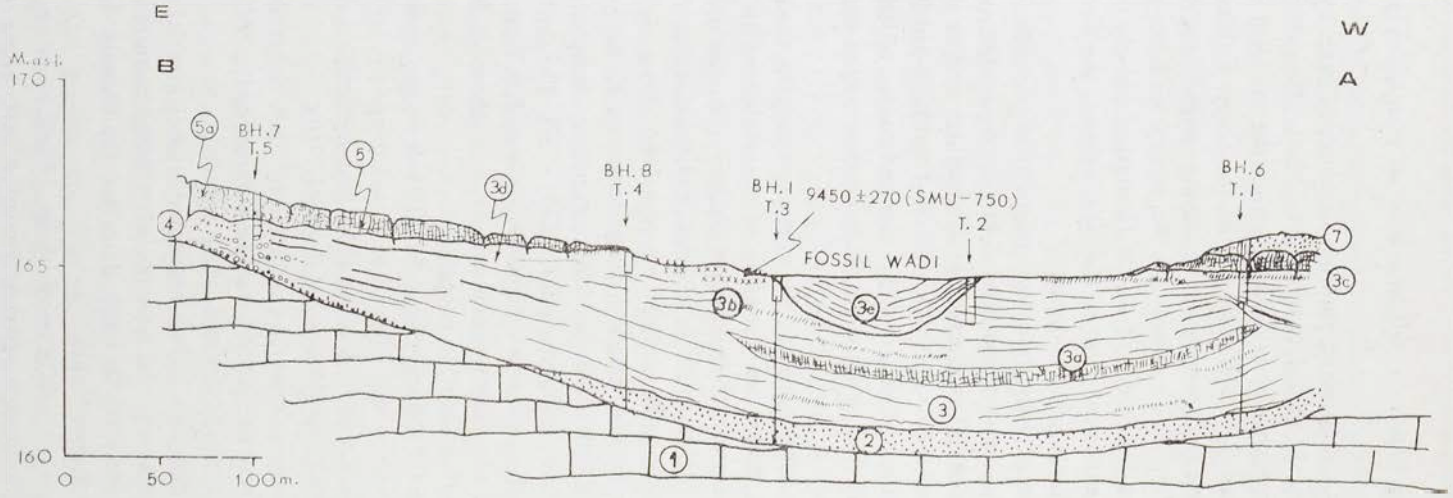

FIG. 1. General cross-section through El Adam Playa in the East-West direction

1: Nubia sandstone; *2*: Yellow, friable sand with occasional gravel; *3*: Silty sands and sandy silts with occasional lenses of finer material; *3a*: Clay; *3b*: Sandy silts with silt laminae and cultural layers of Site E - 78 - 8 at topmost 80 cm; *3c*: Sandy clay horizons; *3d*: Yellow, laminated sand grading laterally into "*4*"; *3e*: Fossil wadi, cut into "*3*"; *4*: Coarse-grained sand with gravel and pebble beds, friable, grading upslope into slope wash; *5*: Brown, cemented clay with poligonal desiccation cracks, grading upslope into "*5*"; *5a*: Silty sand with Neolithic cultural layer at base, same as at Site E - 80 - 3; at Site E - 80 - 1 the cultural layer at the base of brown clay is radiocarbon dated between 8,122±78 (SMU - 915) and 7,884±212 (hummate fraction – SMU – 926) years B.P.; *7*: Recent, eolian sand sheet

cene wet pulsation. It is quite likely that these early occupations are only associated with seasonal grazing and hunting limited to the post-rain season, as it is today in the Maydub area of the Northern Darfur. The youngest T.P. sites, certainly contemporaneous with the earliest so-called Neolithic, most possibly represent differential use of the area. The sites belonging to the same taxonomic unit may contain dense, rich artifact concentrations, structures and apparently agriculture-related equipment (*e.g.* E-72-5, in the Dyke Area), on one hand, or appear as small short-lived concentrations without any traces of grinding pieces (E-76-6 in Kharga), on the other.

4. The agricultural use of playas was probably generally similar to that of modern playa agriculture of Northern Darfur.

5. The colonization of the south Western Desert is most certainly associated with the movement of the monsoonal belt toward the north and colonization of the new areas by populations moving with the rain belt. The new available land was first seasonally penetrated by hunting and grazing communities. Later, after further amelioration of the climate, the playas would be used for agriculture and villages would appear near the edge of certain playas.

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BURCHARD BRENTJES

Agriculture, domestication and the rock-art

The great treasures of the Saharan rock-art are filled with problems still awaiting further analysis. The main problem is the dating of the different styles but it is also felt that we need more research on the information contained in the rock-art pertaining to the economy of the peoples of the Sahara who created it. The majority of the researchers study the rock-art only as pieces of art and mostly neglect the fact that they also contain an amount of data on the different aspects of life of a given society, including those of economic importance.

This situation has also affected the accuracy of dating the rock-art. The most productive work in this field was accomplished by Mori (1979) who found the first definitive proof in favor for an "earlier" chronology of the style of the Cattle Breeders period. At the bottom of the cave at Uan Muhuggiag he found a piece of rock with the figures of two oxen painted in typical style; the stone was found under a fireplace dated by 14C to 2,780±310 B.C. This date is in agreement with several other 14C determinations from the same cave of 5,488±220 to 3,455 ±180 B.C. which pertain to the deposit left by the presumed Cattle Breeders. Other sites of this cultural entity are giving similar dates thus enabling us, *e.g.* to date this style of rock-art found in the Tassili by Lhote (Lajoux, 1962). Mori's chronology could be, therefore, accepted as true and valid for a greater part of North Africa and not only to the Acacus Mountains. The most recently presented chronological and cultural sequence by Mori (1979: 261) known to this writer is indicating on Table 1.

This sequence is based on radiocarbon dates and on instances of superimposition as well as on cultural and historical arguments such as the frequency of a given domestic animal in the art of the period. An interesting point is that the change of the ethnic type is apparent with each period, and that there is almost a lack of small domestic animals (sheep and goat) which are thought to have played a considerable role in the early period of animal husbandry, similarly to some African societies investigated by ethnographers. The development of animal husbandry from 5th-4th millennium B.C. to 1st millennium A.D. seems here to have been mirrored, more or less, in contemporary rock-art; the question remains, however, if we also have evidence in the Sahara of semi-nomadic groups of herders of sheep and goat, such a characteristic feature of the Middle East in the 10th-7th millennia B.C.

Table 1

Chronological and cultural sequence in the rock-art of the Acacus Mountains

Chronology		Cultural and stylistic traits	
Calendar B.C.	14 - C B.C. (uncal.)		
100	–	Camel Period. Paintings and engravings	
1,500	–	Horse Period. Mediterranean peoples. Paintings and engravings	
–	2,780		– later phase: tall Cattle Breeders of Ti-n-Lalan type
–	3,455	Cattle Breeders Period/Style	– middle phase: Negroid breeders of the Uan-Tabu type
–	4,002 4,804 5,095	Paintings and Engravings	– early phase: Mediterranean breeders of the Uan Hamil type
–	6,122		– end: polychrome paintings. Negroid peoples
		Round-Head Period/Style Mainly Paintings	– beginnings: paintings in lines or plain in yellow, green and red
–	–	*Bubalus antiquus* or Big Game Style/Period. Engravings.	

The infiltration of cattle breeders into North Africa did not take place before 6,000 B.C. This phenomenon brought to an end the Round-Head style in the Sahara. We should thus accept two pre-cattle phases in the development of the Saharan rock-art, but how they should be dated and with what precise kind of style should the periods be associated? Let us try to explain this development against the background of contemporary natural conditions in the Sahara. The detailed chronodiagram from the Tibesti area published by Jäkel (1979: 396) is very helpful in this respect. It is based on the study of levels of sedimentation in the fluviatal system in Zoumri-Bardaqué-Arayé. The following fluctuations of wet and dry phases in the Tibesti may help us in understanding local conditions:

1. In the wet phase lasting from 16,500 B.C. until 5,300 B.C., the Tibesti area had a cool and wet climate with sharply marked fluctuations: 14,000-12,500 B.C. – wet; 12,500-12,000 B.C. – dry; 12,000-11,000 B.C. – wet; 11,000-10,800 B.C. – dry; 10,800-9,500 B.C. – wet; 9,500-9,200 B.C. – dry; 9,200-8,850 B.C. – wet; 8,850-8,700 B.C. – mixed conditions; 8,700-8,400 B.C. – wet; 8,400-8,300 B.C. – mixed conditions; 8,300-8,100 B.C. – dry; 8,100-7,150 B.C. – wet optimum; 7,150--7,000 B.C. – increasing aridity; 7,000-6,550 B.C. – wet; 6,550-6,400 B.C. – dry; 6,400-6,100 B.C. – wet; 6,100-ca 4,000 B.C. – increasingly dry with wetter intervals; ca 4,000-2,100 B.C. – wet. Therefore, two main wet periods can be distinguished in this area: in 14,000-5,000 B.C. (wet and cool) and 4,000-2,100 B.C. (wet and warm). The earlier part of the first wet phase was the natural background to both the pre-

-cattle periods of the Saharan rock-art, when humidity was brought into the then dry desert. The "Ethiopian" fauna moved northwards with the then moving Sahel zone – and was followed by the Negroid hunters who developed the first phase of rock-art in the Sahara – the *Bubalus antiquus* or "Big Game" style engravings. To this period the Qadan culture is dated, the first step towards the agriculture on the Middle Nile (Wendorf, 1968).

2. A second climatic phase can be distinguished in the Sahara when both climatic trends met in the mountainous region, such as the massives of Tibesti; this occured between 8,000 and 6,000 B.C. The contemporary cultural development is known as the Saharan Neolithic (Kuper, 1979) or Aqualithic (Sutton, 1977), based on hunting, fishing and, perhaps, also on gathering and planting of millet (Kuper, 1979: 68) but without the presence of domestic goat and sheep, *i.e.* animals which did not have their wild progenitors in Africa available for potential domestication. The sites of the Saharan Neolithic were found recently mainly in such areas as Tibesti (Gabriel, 1979) and Hoggar (Camps, 1979) but Sutton (1977) extends them as far as the Nile and Niger.

The rise of aridity in the late 7th millennium B.C., which caused the desertification of the steppes and ramification of hunting areas, intensified the process of increased exploitation of plants and, subsequently, led to an incipient agriculture. Some animals of the Sahara like the *Bubalus antiquus* even became extinct, others moved to the south. In the higher massives of the Sahara where cooler and more humid conditions still prevailed, people of African origin (Negroids) may, however, have continued their settlement.

The 5th millennium B. C. again witnessed a rapid increase of humidity in the Sahara; this period was marked by the infiltration of cattle breeders, Europoid in the physical type who were moving both into the mountainous areas and into the lowlands, as can be seen from the distribution of the camp sites found by Gabriel (1979) in the now desert areas of Egypt, Libya and Algeria. Two periods of this occupation are evident: Neolithic and Medieval. The Neolithic is divided in three phases: early of 5,500-3,700 B.C., middle of 3,700-3,400 B.C. and late lasting until 2,000 B.C. This Neolithic covers the whole period of time of Cattle Breeders style of the rock-art. It is interesting to note that in the middle phase the intensivity of occupation was 6-7 times larger than in the two other phases; it was also the time of the main humidity in the Sahara. This Neolithic development was terminated by a new rise of aridity about 2,000 B.C.

With the Europoid invaders (Fig. 1) a new economy also spread over North Africa – the cultivation of barley which, however, may have earlier originated independently in North-West Africa. The newcomers developed a new art style which form the bulk of the famous art of Tassili and Acacus. But the indigenous inhabitants (Fig. 2) of these massives who quickly adopted the new economy and seem to had defended, for a quite a long time, these mountainous areas also created an excellent art style which is visible in the rock-art of Tassili, Hoggar and even in the



FIG. 1. Sefar, Tassili. Cattle-rider with child (after Preußner, 1979: No. 20)

Tadrart Acacus. In general, these indigenous groups seem to have been forced to move – together with some of the invaders – to the south, west and east in 3rd-2nd millennium B.C., and to take refuge in the most remote parts of the massives.



FIG. 2. African type in Algerian rock-art. Late Round-Head period (after Brentjes, 1965: Pl. 21)

A new phase of humidity which occured in the 2nd millennium B.C. enabled the groups of the Horse Breeders to roam across the Sahara and, since the climate was still deteriorating, forced them in the lst millennium B.C. to adopt the camel as the main beast burden (Fig. 3); it soon became also a theme of the rock-art of these human groups.

This writer believes that a discussion on the problem of sheep and goat in the rock-art of the Sahara should follow in the final part of this paper. As was already

mentioned, there was no sheep/goat-breeders period in the development of the Saharan rock-art, although the presence of these domestic animals on the North African littoral, in Cyrenaica, is confirmed by the bones of these species found in the cave of Haua Fteah and dated to 6,400-4,750 B.C.; no cattle bones were found with them (Smith, 1979). It is clear that animal domestication came to the Sahara with the domestic cattle. There have been many attempts to argue for an independent centre of cattle domestication in North Africa based on the fact that *Bos primigenius* was a part



FIG. 3. Thagit. Camel rider. Recent rock drawing (after Brentjes, 1965: No. 56)

of the local wild fauna since the Pleistocene. However, all sources available at present date the earliest domestic cattle in North Africa to about one thousand years later than in South-Eastern Europe and South-Western Asia, where it was present by about 7,000 B.C. I am inclined to see the expansion of the domestic cattle from its centre in South-West Asia towards Europe, Central Asia and North Africa as virtually concomitant (Brentjes, 1968). One of the main arguments in favor of an Asiatic origin of the domesticated sheep and goat are their representations in rock paintings of the Cattle Breeders style in the Tassili in such localities as Iheren (Fig. 4), Rhardes and elsewhere (Lhote, after Mensching, 1979: Fig. 8, 10, 16 u.a.o.)

Wild sheep and goat of the form susceptible for potential domestication are not known to have ever existed in Africa. Therefore, the only place of origin of their domestic forms must be South-West Asia where they are believed to have been tamed in the 10th millennium B.C. and subsequently domesticated by the societies practicing likewise the harvesting of wild cereals leading also to their domestication. The sheep of Iheren and other sites in the Tassili is also of a hairy form with mouflon--like horns – and this creates a new problem. Sheep with mouflon-like horns were not known in Egypt before the Middle Kingdom times (ca 2,000 B.C.) The earlier Egyptian representations depict a hairy sheep with shrewed horns, the form still existing in the Sudan. It originated in Mesopotamia where it was dominant in the



FIG. 4. Iheran, Tassili. Sheep and goat in a camp of cattle breeder (after Lhote, 1979: No. 1)

3rd millennium B.C. Therefore, the source of the Saharan sheep could not be Egypt, and the colours of the sheep from Iheren demonstrate that their domestication was accomplished much earlier.



FIG. 5. Sefar, Tassili. The two-fold protome (after Preußner, 1979: No. 23)

Did this form of the domestic Tassili sheep reach Africa from Crete – via the Mediterranean? If it did this could explain the many astonishing parallels visible between the Saharan rock-art and the Minoan paintings (Brentjes, 1979), such as the Minoan-like demon of Tin Tarleften, the double-cow from Sefar (Fig. 5) and other

motives. Their presence in the Sahara could have been the result of Cretan trade, with the peoples of the African coast, which surely was being developed in the 2nd millennium B.C., *i.e.*, during the Horse Breeders times in the Sahara.

The non-Egyptian origin of the Saharan sheep – being thus contrary to my earlier belief expressed 15 years ago (Brentjes, 1965) – forces me to re-evaluate the problem of the "ram with the sun disc" (Fig. 6), the painting of the ram often depicted in the rock-art of Algeria, in localities like Fedjetel Kheil and elsewhere (Cf. Brentjes, 1965: Pl. 20).

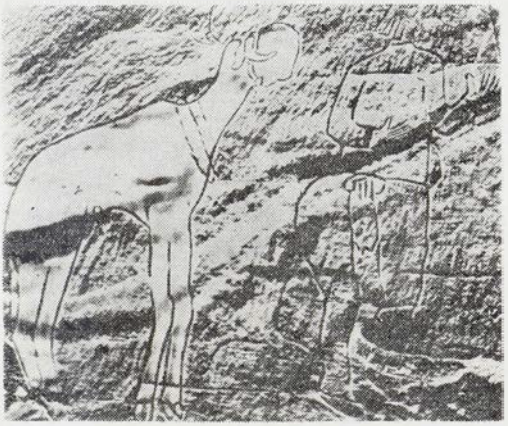

FIG. 6. Fedjetel Kheil, Algeria. Ram with the sun--disc (after Brentjes, 1965: Pl. 20)

The symbolism of the sun-god bearing the disc on his head is typical in Egypt and is not known in Asia, although there were many Asiatic sun gods venerated in antiquity. In Egypt, the Amon-ram with sun disc appears *ca* 2,000 B.C. and is of the shrewed-horned type. This indicated that the pattern of the sun-ram with a disc on its head represented in the Sahara could not be derived from Egypt because it seems to have occured earlier in the deserts. The symbolics of the horned animal or of a "goddess" could be found even among the best pieces of art from the period of the Round-Head style in the Tassili, *e.g.* the "white lady of Auanrhet" (Fig. 7) (Lhote, 1964: 168); the female carries a bunch of grain, which could be millet, between the horns. In Egypt, similar pictures occur only in scenes of Nubian tribute in the 18th dynasty. In the grave of Merga at Amarna (Frobenius, 1933: Fig. 28) the cattle carry several symbols between their horns, such as a complete garden, a symbol of foreign origin in Egypt, and certainly pointing to the areas to the west (Brentjes, 1962). We should regard the Amon-ram, therefore, as a component of Egyptian art developed in the rock-art of the Sahara.

The following main points can be formulated in conclusion of this paper:

1. The social and economic development in the Sahara, including the development of rock-art, depended greatly on the natural conditions.



FIG. 7. Auanrhet, Tassili. The "white lady" (after Brentjes, 1965: Pl. 22)

2. Five periods of the development of the Saharan rock-art can be distinguished as related to the corresponding economy:
   a) earlier phase of hunting economy exploiting the "Ethiopian" fauna; *Bubalus* style,
   b) later phase of hunting economy mixed with incipient agriculture; Round--Head style,
   c) introduction of cattle breeding and cultivation of barley; Cattle Breeders style,
   d) Horse Breeders style,
   e) Camel Breeders style.

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BALDUR GABRIEL

Great plains and mountain areas as habitats for the Neolithic man in the Sahara

In the Sahara besides hilly and broken land we find vast areas which are flat and normally covered with alluvial sediments. These so-called *serir* or *reg* can be more than 500 km. in diameter like Tanezrouft, Ténéré or Serir Tibesti. Usually, their elevation is below 500 m. In contrast to them the mountain areas, of which Hoggar and Tibesti are the largest, reach up to 3,415 m above sea level in their peaks. But they comprise also large plateaus elevated between 2,000 and 2,500 m, built up by volcanic lava.

Most of the mountain areas are dissected by numerous valleys. Their slopes are steep and, when are build of magmatic rock or schists, are covered by debris. Sandstone areas are often decomposed into small massifs with sandy alluvial plains around and between them. At the foot of the vertical sandstone walls we find rock shelters which are less frequent in other geological structures.

The great plains or mountain areas; which, of these two different types of landscape, were more favourable for man during Neolithic times? This does not seem to pose a serious question. When we consider only the number of sites and the amount of Neolithic remains, we will find that Acacus, Tassili, Tibesti, Ennedi and Uweinat abound in these relics. The same is true only for a few plain areas, mainly for Serir Tibesti and Ténéré, where people lived on the edges of small lakes or swamps. So Balout and Roubet (1980: 170) are convinced (like most authors) that the Saharan Neolithisation could have reached its climax only in the higher mountain areas. This is surely true. But let us point out that some of these massifs like Air, Adrar of the Iforas and Hoggar do not seem to be as rich in Neolithic material or rock art, and let us ask what role did the great plains, without permanent freshwater lakes, play for Neolithic man.

A decisive factor for him were certainaly those environments where he could get, or produce, sufficient food and where he could find a good water supply. Therefore, the prime factor must have been the climate as fundamental for soil formation, and vegetation cover, and consequently for collecting, hunting, herding and agricultural activities; it was also responsible for lack or abundance of drinking water.

We can also assume that too low or too high a temperature did not restrict the habitat of man (with the exception of regions above 2,500 m); the most important climatic element was unquestionably the degree of aridity or humidity.

Climate must have influenced the settlement behaviour of prehistoric man more than the relief could do, though impenetrable mountain areas with steep slopes and narrow gorges were usually avoided. Man tends to desire open plains for traffic and trade, for movement and communication, for agriculture and horticulture. Therefore, he looks in the mountains at least for large valleys, river terraces, easy passages over mountain ridges, wide pediments or sandy alluvial plains, accessible plateaus or other kinds of flat surfaces.

There are further aspects to be considered. The severe, sometimes, lack of rock material on the plains covered by mud, sand or gravel deposits, must have been a considerable problem for prehistoric people. In Palaeolithic times they used mainly quartzite as a raw material which, by its resistance against weathering can be seen as outcrops even in lower regions; such raw materials as basalt and rhyolith could have been collected in volcanic areas. Ziegert (1976) describes obvious mining activity of Palaeolithic man for a good quartzite in Fezzan.

In Neolithic times people looked particularly for flint, obsidian and other kinds of stone which facilitated the manufacture of small implements like arrow heads, needles or microliths with scrupulous, subtle retouches. Sandstone or volcanic rock were also still in use, *e.g.* for portable hand mills and grinding stones which are found hundreds of kilometers from the nearest outcrops of these rocks. They must have been, therefore, transported and they certainly were precious possessions on the stoneless plains.

Much of the Tibesti obsidian has been found in the Neolithic sites (but not in the earlier ones) of the Central and Eastern Sahara. No other source locality of this raw material is known to exist in this area. Obsidian mines can be seen in Tibesti in volcanic layers of Trou au Natron and Tarso Yega. Amazonite mines occur in the Djebel Eghei of northern Tibesti. This green variant of feldspar was used for making jewellery (beads, etc.) during the Neolithic, Pharaonic and later times. It is presumed that all its pieces came from the mines in Eghei Zouma (Cf. Monod, 1974), but I found a similar kind of green stone also in the region of Djebel Uweinat (near Peter and Paul); therefore, we cannot exclude its different place of origin.

In addition to being raw material for making various artifacts, the stone played an important role in the whole spectrum of life of the people of the Stone Age. They used it to build fireplaces, wind shelters and small houses, traps and fences for game and cattle, or for grinding corn with hand mills made of hard rock. Stone could also have been used in their art and worship. In the mountain areas stone monuments like tombs occur as well as sanctuaries, monoliths and triliths, grooved stones and mobile pieces of rock art. It is almost impossible to find a source of these raws in vast areas covered with fine grain sandy deposits. The people must have – if at all – worked many of their objects from perishable material like wood, bone or leather.

If there had been tumuli made of mud or sand on the plains at least some of them would have survived; but there is nothing to be found. Perhaps graves with such a tumulus would not have saved the dead from being disturbed by hyenas, jackals or other beast of prey and, therefore, the people brought their dead for interment to mountain areas where tumuli are in abundance. But they might have had open-air funeral places so that nothing was left of the corpses. In dried up swamps to the north of Tibesti I investigated several Neolithic skeletons in contracted position obviously originally submerged in the mud. Their bones were exposed by wind deflation in recent times (Gabriel, 1970; Herrmann and Gabriel, 1972).

There are only a few traces of cult and aesthetics of the people living in the plains: in Erg d'Admer, at the foot of Tassili n'Ajjer, several mobile stone sculptures showing animals were found; in the area of the Capsian Neolithic decorations of ostrich eggs, bones and pottery are also known (Camps-Fabrer, 1966).

Huge tomb constructions as in Fadnoun (Savary, 1966) or Tibesti (Gabriel, 1984) are in contrast to the situation in the plains: building of megalithic monuments is not possible in the plains.

The mountainous landscape may also have affected the mythology and animistic imagination concerning single peaks or the custom of adoring gods in high places. Such places can still be seen, *e.g.*, near Pic Toussidé in Tibesti. Moreover, volcanic areas as the Tibesti can produce hot springs like in Soborom (Bruschek, 1972), where the Tibbu go since immemorial times to cure sickness and disease. Normally, such medical customs are linked with transcendental attitudes.

Nevertheless, these circumstances of geology and relief have surely been of secondary importance. With regard to climate the mountain areas are nearly always favourable. Windward slopes get additional rainfall because air masses are compelled to ascend and form clouds. Besides, high mountains ascend through several climatic zones and they have various meso- and microclimates while the plains are subjected to homogenous atmospheric conditions. The vertical gradient of temperature in Hoggar and Tibesti is of about 0.7°C to 0.8°C for 100 m (Heckendorff, 1977: 66). In more humid periods it might have been somewhat lower (Cf. Messerli, 1972) but at least today the upper areas are more than 10°C cooler than the lower ones. A similar situation exists as regards precipitation. In Tibesti it rises from about 25 mm/year in the lower parts (800 - 1,000 m) to nearly 100 mm/year in altitudes of 2,400 m. During Neolithic times it might have ranged (after several indices, Cf. Gabriel, 1977: 75) between 600 and 1,000 mm/year according to altitude.

The hypsometric differentiation of rainfall and temperature must have varied living conditions for vegetation, animal and man. The wadis were fed by precipitations in the summit zones. Runoff occurred throughout the year or periodically. Geomorphologists have even found relics of small glaciers and something like peat-bog in the summit areas (Messerli, 1972; Rognon, 1967; Gavrilović, personal communication) so that we can assume the existence of a broad spectrum of ecological niches in the mountains.

The evidence points to the existence of Neolithic lakes in Tibesti. They were situated in volcanic craters such as Trou au Natron or Tarso Yega, or were made by the running waters in the wadi channels which were barred by calcareous tufa banks across the valleys. It is thought that in the cooler summit zones, above 2,000 m, calcium was dissolved while the water became saturated in warmer zones, around and below 1,000 m, by evaporation and loss of carbondioxide. This happens especially at the start of narrow ravines or at rapids as well as by the existence of various aquatic flora which can be traced in fossilized prints preserved in the tufa deposits (Gabriel, 1977).

Due to the broad diversity of living conditions it must have been the mountain areas where during the process of desiccation man found still the possibilities to survive as he does today, too. Therefore the mountains must have been settled for longer periods, they must have served as retreats in arid phases.

But did annual wet and dry seasons exist actually in the Sahara during Neolithic times and did people retreat to the sheltering valleys and moister heights accordingly? Did they really practise transhumance, as Balout and Roubet (1980: 169), Camps (1974: 247), Van Noten (1978: 15ff) and others believe? It is indeed difficult to accept that precipitation in the plains was occurring during all seasons. If humidity came from the westerlies of the polar front, rain must have fallen usually in winter. If it came from the monsoonal tropics, summer was moist. There is every indication (Gabriel, 1977: 74 and 79) that after 7,000 B. P. the climatic regime of the Sahara changed from temperate non-tropical to a lateron tropical character. Maybe during the temperate period and during the time of transition distinct annual dry seasons had not developed. We find much evidence from these times that the plains were inhabited, and that the people living there were quite different from those in the mountains, as regards their cultural development and, perhaps, even their race (cf. Gabriel, 1977: 20ff.).

I found literally thousands of fireplaces in the great plains which are interpreted as being mostly the remains of the camp sites of the Neolithic cattle herdsmen (Gabriel, 1973; 1976; 1977). I called them "stone places" or "stone sites". They are to be found in sometimes surprising quantities, especially on the flat *serirs* or *regs* covered with soil and alluvium, often too far away from mountains as to explain them as relics of people practising the transhumance.

On the basis of more than 30 radiocarbon dates, the Neolithic "stone places" of the Sahara can be classified into three stages: an initial between 8,500 and 5,800 B. P. (roughly), a main between 5,800 and 5,300 B. P. and a final between 5,300 and 3,800 B. P. (Table 1). The quantitative proportion of "stone places" during these three stages is approximately 1 : 5 : 1 per unit.

There is no doubt that the producers of the "stone places" were nomads. Very rarely do we find layers of kitchen midden or other remains that could indicate longer occupation of the site. As in the African Sahel today people must have migrated from one water-hole to another when their cattle could not find enough pasture in the area.

Table 1

Radiocarbon chronology of the Neolithic "stone places" in the Sahara

Stage	Age B.P.	Duration in years	Number of dates	Average time interval in years
Initial	8,550	2,715	11	247
Main	5,835 - 5,355	480	12	40
Final	3,830	1,525	8	191

In Tidikelt, I found concentrations of more than 300 "stone places" within an area of about one acre. Five radiocarbon datings from such a field gave dates ranging from the beginning of the initial to the end of the final stage (Table 2). This confirmed my o pinion that such concentrations were not the contemporanous camp sites of a large

Table 2

Radiocarbon dates from a "stone place" site in Tidikelt (Algeria, 27°12′ N – 01°21′ E; samples processed by M. A. Geyh, Hannover)

(Hv 9696) 8,550 ± 335 B.P.
(Hv 9693) 8,165 ± 200 B.P.
(Hv 9692) 7,000 ± 365 B.P.
(Hv 9694) 5,355 ± 115 B.P.
(Hv 9695) 4,200 ± 190 B.P.

group with every family having their own fireplace, but that the "stone places" are concentrated in localities where, during some millennia of the Neolithic wet phase, people returned from time to time because of favourable circumstances: that is, they were visiting their water-points.

Cattle is not a mountain animal, it does not like to climb like sheep or goats. It prefers open country such as prairies, savannahs and steppes, Pampa or Puszta, *i.e.* open grassland, marshland and lowland. Within steep and narrow mountain valleys, where good pasture can only be found on the bottom of the valley, the herds are not flexible enough in case of emergency. That the Neolithic ecology of the plains was favorable for the existence of cattle can be ascertained by several indications: bones of big mammals like elephants demonstrate that fastidious fauna could survive there (Gabriel, 1977: 39 ff.). Lake deposits as well as fluvial channels report relatively humid conditions at the time (Pachur, 1974). The lakes, after all, do not show signs of seasonal desiccation. The fundamental disparity of the people in the plains from those in the mountains is mainly marked by their different cultural remains: archaeological strata beneath rock shelters, stone houses on fluvial terraces and sandy alluvial plains, deep hollowed mills in hard rock and abundance of pottery characterize a more sedentary life in the mountains. On the other hand, "stone places" (which were probably used as earth ovens) and arrow heads are rare here, while they abound on the plains where the "stone places" are almost always accompanied by

ostrich egg shells and often by grinding stones. But we do not find much pottery in these assemblages.

It is not certain if people on the plains already knew some kind of agriculture as Hester and Hobler (1969: 169) advocate. Their economic basis was surely a nomadic one, composed of hunting, herding cattle and possibly collecting food.

One might rise objections against the interpretation of the "stone places". For example one might be astonished that bones of domesticated cattle are rarely associated with the "stone places". But we must keep in mind that still today the cattle herders very exceptionally slaughter their animals. They live mostly from their milk and blood. Or one might stress the fact that the famous rock art of the pastoral period does only exist in the mountains. But this is no wonder, for the only possibility to paint or delineate on imperishable material exists on rock walls! Besides, Lhote (1962: 210 f.) points out that rock art of the pastoral people is especially arranged on the margin zones of massifs, not in their interior. Surely there must have been contact areas between the two different cultural zones. Furthermore, Camps (1974: 245) believes that most of the Tassili bovine pictures are products of the final phase of this period, and Maitre (1971: 68 ff.) emphasizes that the cattle herdsmen penetrated the mountains (Hoggar – Tefedest) only during the major desiccation *i.e.* in the final Neolithic; the plains' inhabitants mixed with the people of the Saharo-Sudanese tradition.

This author agrees with this theory and concludes: transhumance might have been practised locally but most of the cattle herdsmen were real nomads, distinct from the sedentary, pottery producing, probably Negroid, people of the Saharo-Sudanese tradition in the mountains.

The "stone place" people lived in a savannah-like habitat. There was enough surface drinking water for men and animals alike. Annual precipitation can be estimated at 300 - 400 mm. Along wetter river beds or channels a higher-growing tree and shrub vegetation must have extended over the large plains which could have fed the herds of elephant, giraffe and buffalo. The plains situated between the drainage lines were covered with thornbush steppe and grassland. Assemblages of limnetic freshwater molluscs found in different places can only be explained as the remains of lakes which, in all probability, did not dry up for decades at least.

In the mountain areas many rivers were barred by calcareous tufa banks or sinter dams. Lacustrine molluscs and diatomea in the sediments as well as imprints of plants (reeds) in the tufas and many pollen relics of various kinds of trees (mostly of Mediterranean or temperate character) give evidence of good living conditions. A brownish soil was accumulated on the valley bottoms. Their slopes were probably covered by a macchia-like plant formation.

Rock pictures of the hunters' period show mainly big African game: elephant, giraffe, buffalo, rhinoceros. Already before 8,000 B. P. people advanced to a new stage of social and economic organization (Gabriel, 1972; 1977; 1978a-b), as they did, too, in the Near East at the same time. They produced technically remarkably good

pottery (with dotted wavy line decoration) and probably began fairly early to cultivate the plants. During the following millennia pottery and rock art prospered and differentiated into many styles (cf. Gabriel, 1981). People lived in small huts on the lower river terraces, on the sandy alluvial plains or under the rock shelters. An exact chronological differentiation within the mountain people is however difficult to organize at this stage.

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Barbara E. Barich

The Epipalaeolithic-ceramic groups of Libyan Sahara: notes for an economic model of the cultural development in the West-Central Sahara

A model classifying societies according to the system of subsistence has lately gained hold. The theoretical debates of the last few years (Binford, 1972; Flannery, 1969; Higgs and Jarman, 1969; Harris, 1969) identify in the beginnings of food production one of the basic themes of the cultural change. As it is well known, however, the distinction between Mesolithic and Neolithic period, between gathering and producing economy, is neither clear-cut nor evident.

Taking advantage of the numerous acquisitions of multidisciplinary approaches, studies on food-producing development have presently rectified the traditional conception which viewed "culture" as a whole which is transmitted onwards, so that "similarity" is a synonym of "uniformity of development" and "difference" – a sign of interruption in the development – is explained by recourse to stimuli, influences and migrations. Conversely, the systematic explanation (Von Bertalanffy, 1950; Buckley, 1967; Bennett, 1976) states that disequilibrium among subsystems, or among the systemic components and the environment, may bring about cultural changes as a readjustment phenomenon founded on an adaptive procedure.

The conditions of the Palaeolithic-Mesolithic society are the premises which, under specific spurs, caused the system to move towards a change: but this occurred within the system and not outside it.

We believe that the Western Sahara territory, and specifically the area of the Hoggar-Tassili-Acacus massifs, may offer quite an interesting contribution to the change in the passage to food-producing activities. We would like to propose, within this framework, the hypothesis of an economic model such as might have been achieved in the area that is the center of our research effort, which might eventually be extended to others connected to it from a cultural point of view.

Reporting on the results obtained by the Mission of the University of Rome in the Ti-n-Torha (Acacus) area (Barich, 1974), we purpose to define the economic profile relying on palaeoecologic evidence rather than on technologic proofs, and in par-

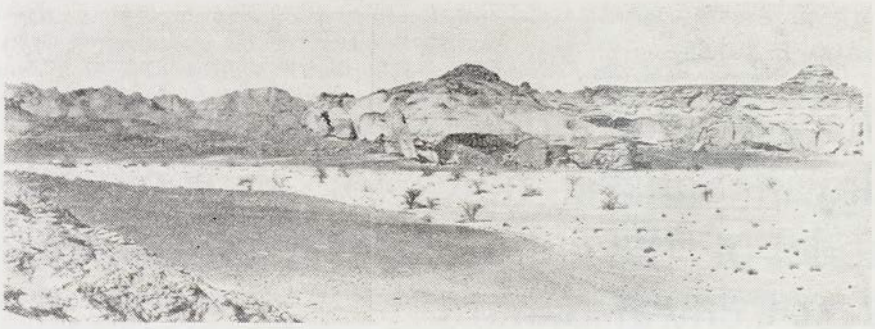

FIG. 1. Wadi Ti-n-Torha, Tadrart Acacus (Libya)

ticular on the presence of pottery. As a matter of fact, our definition of "Epipalaeolithic-ceramic" tends to signify that the mere presence of pottery is not sufficient to prove a change in a structure, which is still Palaeolithical.

In 1978 our Mission started excavating a new deposit sited a little distance away from Torha East, which was named "Ti-n-Torha Two Caves" (Fig. 1).

The results, which are presently being studied, provide confirmation of the definition of "Epipalaeolithic groups with a preliminary experience in ceramics" which had already been applied to the Torha East facies and allow for the following propositions:

1. The area of the Sahara being studied presents itself as a generalized ecosystem of hunters and hunters-gatherers-fishermen aiming at exploiting, on an extensive scale, the resources supplied by the biome. The groups inhabiting it are viewed as small aggregations of people with an inherent knowledge of the land who, however, due to their possibility of exploitation of an extensive range of resources, were not compelled to too frequent shiftings and whose settlements were of a semi-residential character.

2. The reduced nomadism, and the inherent knowledge of a restricted area, give evidence of incipient domestication of botanical or animal species in the small mountain valleys or in the more open plains that mark the edge of the geographic region which are dominated by savannah-type vegetation. It would appear easy to combine, in this area, the gathering of animal proteins, supplied by hunting and fishing with the gathering of vegetal proteins supplied by wild plants.

These propositions lead to the formulation of a working hypothesis that groups being studied had succeeded in realizing a pre-domestication economy. At a system level, this economy would be comparable with the intermediate moment in the taxonomy of the recently reconstructed Syrian-Palestinian economic development.

This hypothesis may be tested with recourse to the plentiful analytical data of the *in situ* works (1971 - 1978 excavations). From necessity, we shall report them in a schematical form relative to the various documentation sectors.

1. Settlements

Encampments are sited along the "uidian" sides, in a position suitable for living purposes and at quite a higher level, with respect to the valley-bottom, for obvious protection against floods.

The anthropic deposit thickness and the structural adaptations bear witness to a settlement continuity. The unmistakable use of stone, both as a defence wall and as a partition of space that was already known at Torha East, was found once again at Torha – Two Caves.

Furthermore, due attention should be given to the possibility of division of living spaces, where heaps of materials or greater concentrations of worked wastes suggest a workshop area. Generally, the large amount of residual products prove that litho-technical activities were practiced on the spot, using local raw material – quartz and sandstones – which were obviously plentifull.

The possible alternation, however, in the use of the sites, some designated more for working activities than for living and vice versa cannot be ignored.

The residential form conceived by the groups under considerations is symptomatic of a tradition on the site, as proved by the absolute dating series covering a time period extending from the 8th to the 6th millennium B. C.

2. The environment and the fauna

The Ti-n-Torha, affluent of the larger Auis, is cut into the lower part of the "Tadrart formation" (Devonian series). The clayey strata, that are typical of the basic part of the series, crop up in a few places and represent the impermeable level of presently temporary springs. The wadi has a very young morphology, due to a series of collapses that followed successively – throughout the whole Holocene. The presence of impermeable clayey strata, covered by a large volume of sandstones which acted as tanks, leads to the supposition that at a time when the climate was less dry than at present, the area was transversed by watercourses and small ponds.

Faunal remains gave evidence of a less arid climate. All the levels of Torha East have shown the presence of two molluscs (*Caracollina amanda* and *Bulimus brondelianus*) which denote a hot climate with a high degree of humidity. From the Torha East faunal determination list an articulated picture can be drawn of the species with the presence of moufflons (*Ammotragus*), gazelles, hedgehogs, porcupines, jackals, foxes and mongooses. In addition to the afore-mentioned animals were rodents, *Ophidia* and birds that confirm a savanna framework with good rainfall levels, although in a decreasing phase.

The Torha–Two Caves faunas are presently being studied. According to preliminary examination the presence of fish is clearly evident. The prevailingly bones

refer to small animals; the almost complete absence of parts such as jaws and teeth has also been observed. This may signify that the animals were not hunted directly on the site but that they were brought there after a preliminary selection. This fact confirms the aspect of the settlements as "home bases".

3. Technology

The stone industry – on strongly compact sandstones, quartzrocks and quartz – specialized in tools and implements for hunters and hunter-fishers. In the lower levels there is a very strong incidence of the laminar types, related to small cores with lengthened strucks and a high percentage of microlithic flakes, among which there are, in particular, the pointed-backed bladelets with abrupt retouch. These artifacts are particularly significant for the proper setting of the complex, corresponding in full to the Epipalaeolithic model; of no lesser significance, for the same purpose, are the geometrics (Fig. 2). In the upper part of the deposit (in relation to the lithic structures) a greater relevance is acquired by the macroimplements (side- and end-scrapers, denticulates) obtained through direct percussion from stones that, at times, determine their shape. At the same time arrow-heads are quite frequent (Fig. 3).

The Table that summarizes the list of Torha East types and the relative presences within the complex framework shows the incidence of the "blade group", which is 90,7% (general index). Within this group, the class of the pointed backed bladelets, with a 12% percentage index, is among the most significant for the complex setting (Fig. 4).

It is well known that any debate on the possibility of comparison of industries must be founded on specific statistical proofs which might facilitate evaluation of the utilization covariances. Obviously, our documentation is presently inadequate to formulate a multivariate analysis and, on this account, our indications will require further control. It goes without saying that the reference to the Ibero-Maurusian environment appears to be the most enticing one, even in the light of the most recent findings in the Atlantic Sahara belonging to the same cultural environment (Collina-Girard, 1977; Heddouche, 1977). Taking into account the extreme antiquity of our industry, its location, the inferable economic system, it appears to us that the Upper Palaeolithic hunters' environment, of the western Sahara, is the milieu one more reasonably turns to.

4. Broadened considerations

In view of the specific environmental requirements and the location aspect, one may hypothesize that the groups had attained a pre-domestication condition (Jarman, 1969) assimilable, at a system level, with the Near-Eastern examples. We are refer-

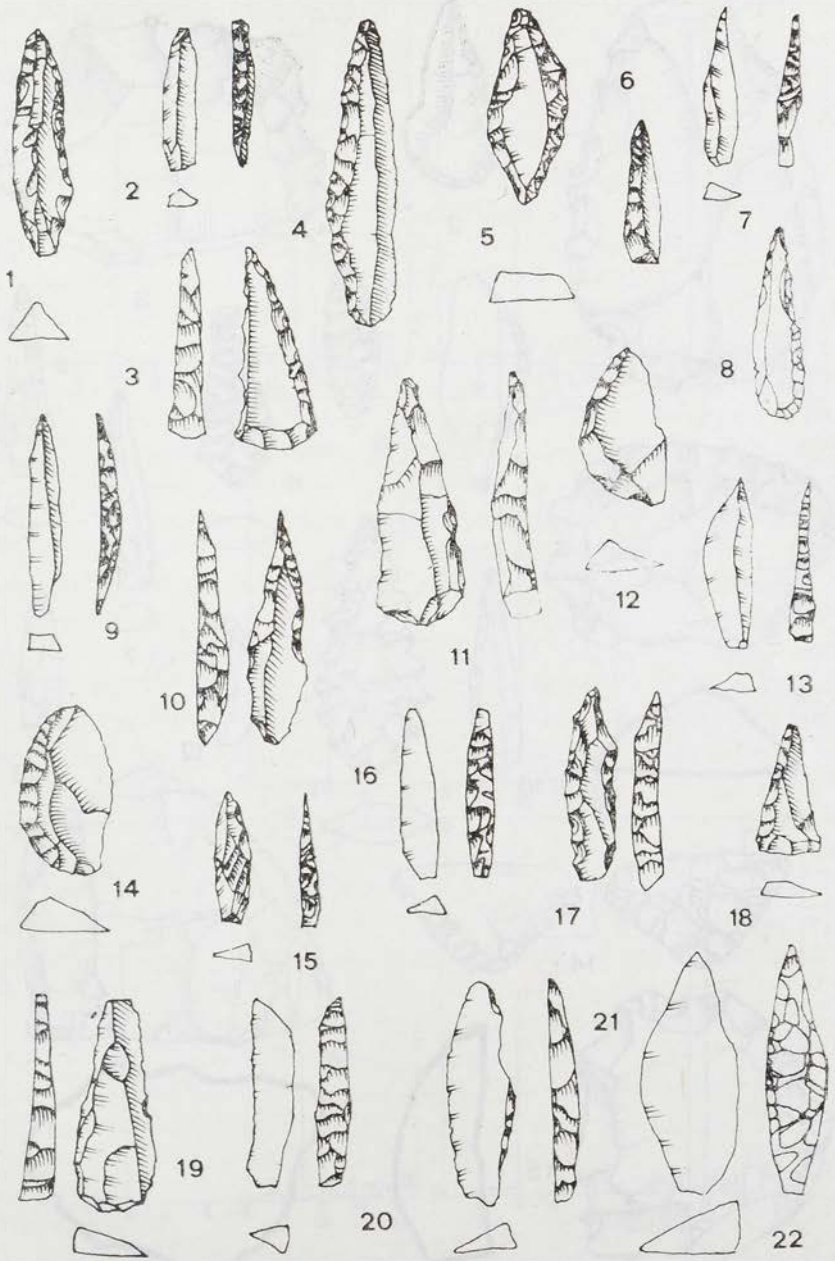

FIG. 2. Wadi Ti-n-Torha, Tadrart Acacus (Libya). East Shelter: stone tools (after Barich, 1974)

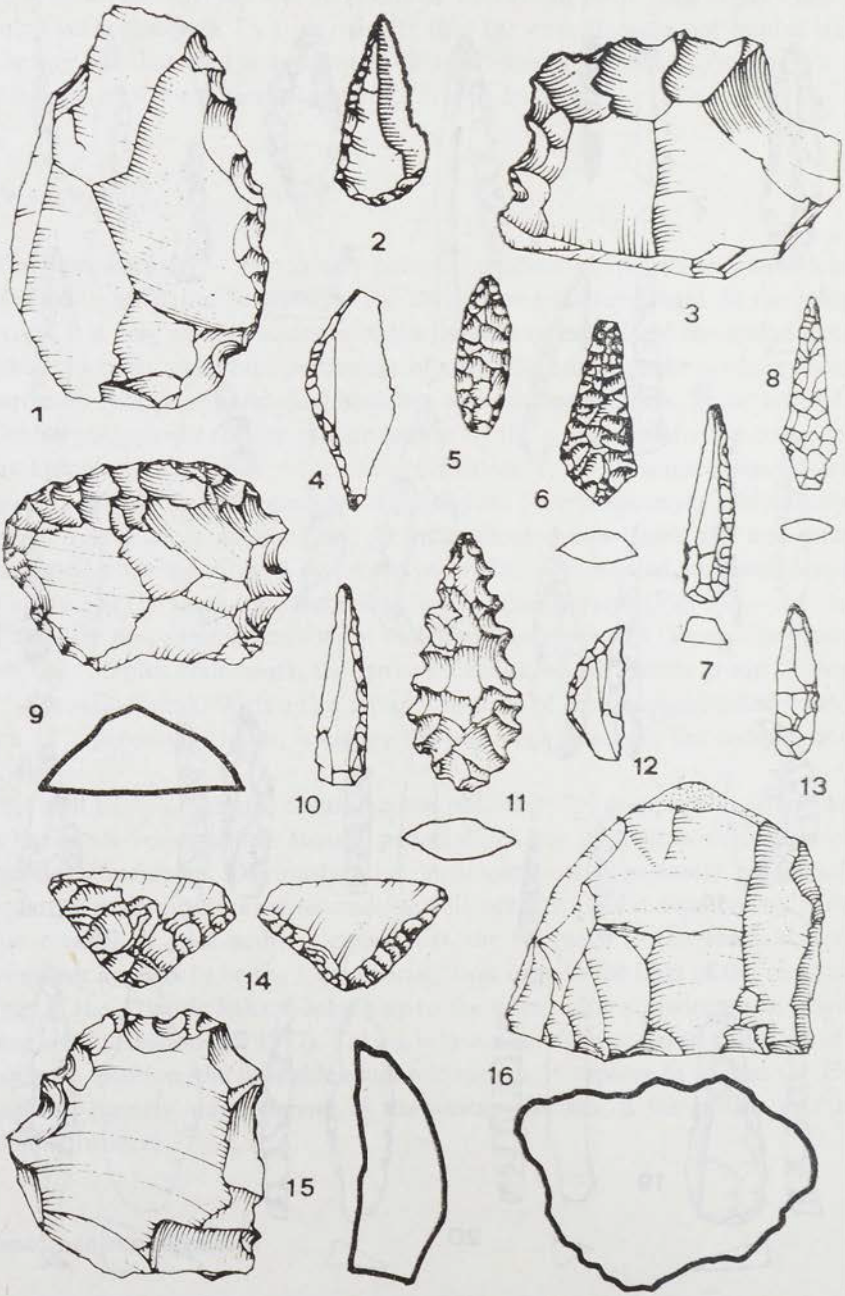

FIG. 3. Wadi Ti-n-Torha, Tadrart Acacus (Libya). East Shelter: stone tools (after Barich, 1974)

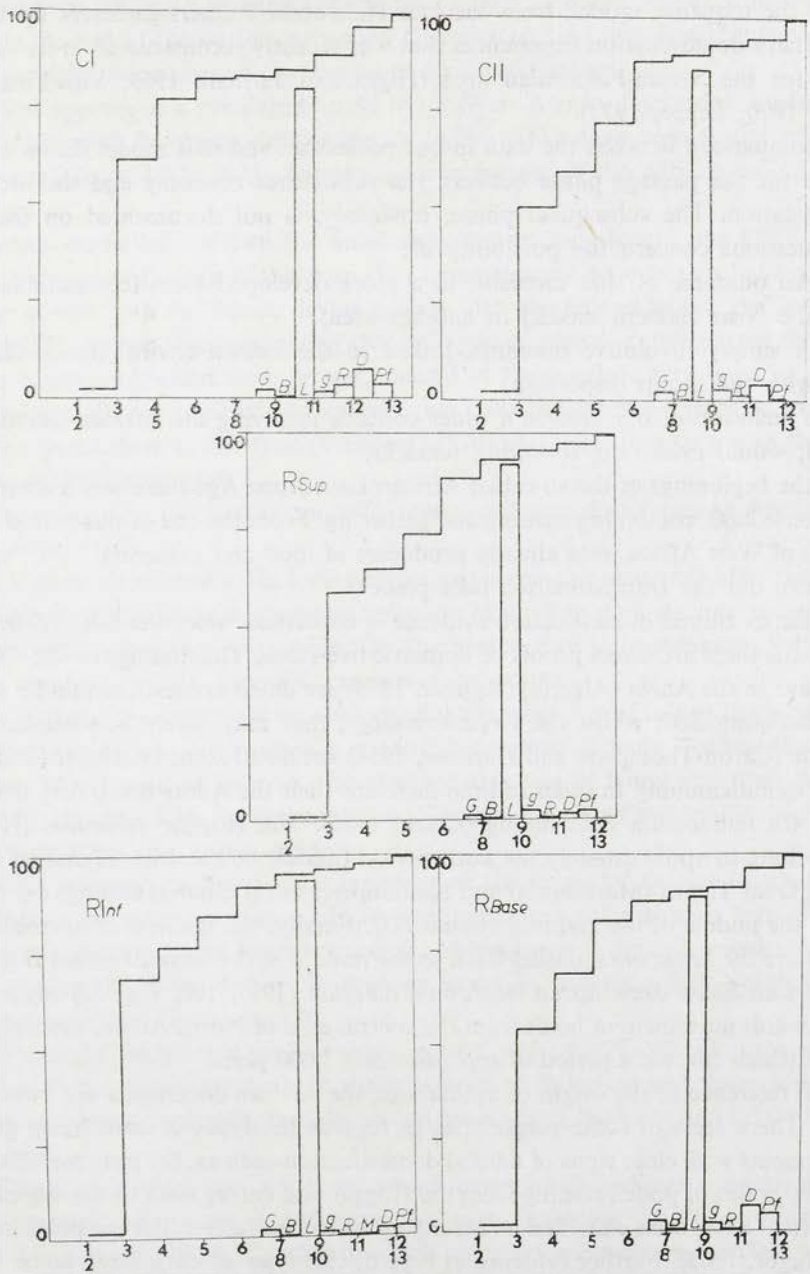

FIG. 4. Wadi Ti-n-Torha, Tadrart Acacus (Libya). East Shelter. Diagram of the lithic industry (after Barich, 1974)

CI: Level 1; CII: Level 2; R*Sup*: Level 3; R*Inf*: Level 4; R *Base*: Basis of level 4
G: Scrapers; *B*: Burins; *L*: Blades; *g*: Geometrics; *R*: side-Scrapers; *M*: micro-Burins; *D*: Denticulates; *Pf*: Arrow-heads

ring to the sequence model, from the late Pleistocene hunters-gatherers up to the preliminary domestication experiences that was recently reconstructed in its various stages for the Syrian-Palestinian area (Higgs and Jarman, 1969; Vita-Finzi and Higgs, 1970; Legge, 1977).

A comparison between the data in our possession and that model shows a coincidence for the passage phase between the subsistence economy and the incipient domestication. The subsequent phase, obviously, is not documented on the site. Our questions concern the possibility of:

1. An outcome of that moment, in a more developed form (comparable with the Near Eastern model) in another area;
2. A simply involutive outcome, linked to the known environmental factors, with the group dispersion.

The inclusion of our data in a wider context, involving the African situation in general, would evoke the following remarks.

At the beginnings of the so-called African Late Stone Age there was a diversified subsistence base, combining hunting and gathering. From the end of this period a few peoples of West Africa were already producers of food and gatherers.

Where did the transformation take place?

As far as animal domestication evidence is concerned, since the 5th mill.B.C. in the Acacus there are direct proofs of domestic live-stock. The findings of the Cappelletti Cave in the Aurès (Algeria) (Roubet, 1979) are dated around the middle of the 5th millennium B.C. whilst the Fayum findings, that may safely be considered as domestic (Caton-Thompson and Gardner, 1934) are dated somewhat later (2nd half of the 5th millennium). In order of time there are then the Adrar Bous, Air, findings with a 4th millennium B.C. dating (Clark, 1971). The Hoggar evidences (Hugot, 1963) belong to approximately the same period (middle of the 4th millennium B.C.) and the Dhar Tichitt (Mauritania) and Kintampo (central Ghana) findings are dated around the middle of the 2nd millennium B.C. Finally, the findings of northeastern Nigeria are the latest ones, dating back to the middle of the lst millennium B.C.

Thurstan Shaw drew up an isochronic diagram (1977: 108, Fig. 33) suggesting a southwards movement of herds from the central area of North Africa, the development of which covered a period of approximately 3,000 years.

With reference to the origin of agriculture, the African documents are extremely scanty. There are still some perplexities as regards the types of corn being grown in settlements with clear signs of animal domestication such as, for instance, Shaheinab. Two grains of pollen coming from the Hoggar and dating back to the 4th millennium B.C. have been classified as belonging to the bulrush millet (or pearl millet) type (Hugot, 1963). Further evidence as regards this type of corn have come from Dhar Tichitt (Mauretania) and thus for a significantly later period (middle of the 2nd millennium B.C.) In this location it has been possible to observe the progressive increase of bulrush millet growing during the entire settlement period (from the middle of the 2nd to the middle of the lst millennium B.C.), following the progressive

passage from still wild-growing corn types to fully domestic forms which appear towards the end of the settlement period (7th phase). Undoubtedly, this is a domestication elaboration area of the species under consideration.

Millet appears as a privileged cereal in the West African territories. Evidence of a probably wild *Brachiana deflexa* species (4,000 B.C.) have been found at Adrar Bous, Aïr (Clark, 1971; 1973), but the most important of the African millets is the sorghum.

Recent works have shown the Sahel region, stretching from Lake Chad to the Nile, as the area of origin of this corn. The domestication process may have received greater stimuli with the Sahara drying process after the second half of the 3rd millennium B.C., rather than conceiving cultural type of stimuli coming from the areas where barley and wheat were grown, located in the north-eastern area of Africa.

Substantially, as regards wild species, two clear-cut spheres appear to exist: the barley-wheat sphere to the East (Wendorf, 1979) and the millet sphere to the West of the African continent.

Obviously, the distribution of wild species influenced subsequent development and propensities.

It is more plausible that the local populations coming immediately after the Palaeolithic hunters started with a gradual selection of local species, such as millet. A key to the explanation may be provided by the presence of semi-sedentary ways of living, required to gain domestic experience on plants.

It is, therefore, important to acknowledge the existence of fishers in an extensive area crossing Africa – from the Atlantic to Ethiopia and Uganda – where the groups became accustomed at least to a semi-residential way of living and their diet was partially integrated by the consumption of wild herbaceous species. Such situation is exactly what our results suggest.

With reference to the virtual taxonomy of the stages of the food-gathering to production passage, our data could represent the terminal gathering level. Instead, insofar as the subsequent levels are concerned (proto- or incipient agriculture; actual village agriculture) we do not deem it necessary to underline their absence in the sequence we have reconstructed.

We might bridge this gap by recourse to Legge's (1977) scheme as a synthesis of the latest acquisitions made in the territories of Palestine and Syria where there was a settlement continuity that, in certain cases, dates back to the Middle Palaeolithic age.

The most ancient sites are those within caves which indicate a relatively stable and long-term economic system from Kebaran, including the "pre-pottery Neolithic A" (Kenyon, 1969), a period in which animal domestication is widely accepted, even in relation to species such as the gazelle. Notwithstanding the perplexities that have been voiced to this purpose, it is likely that there was some type of control and deliberate selection relative to gazelles and just as likely to plants which were grown for the benefit of human life (Legge, 1977: 59).

Parallel to the last part of the cave occupation (Mesolithic and pre-pottery Early Neolithic) the first dwelling on the sites developed which, later on, became residential "tells". Even though the economic model – in terms of species being utilized – shows little changes, there is a clear difference in the scale of settlements and in the economic potential of the areas where they are located. Furthermore, it is essential to note the different emphasis placed on the exploitation of local resources that at that time aimed prevailingly at botanical species (Legge, 1977: 62).

The Jericho, Hureira and Mureybet sites are, as a matter of fact, located in areas where preference had to be given to crop growing owing to the high potential of the soil.

It was estimated that the PPNA levels of Jericho must have supported a population of 2-3 thousand heads (Kenyon, 1969) and even the similar levels at Abu Hureyra had had an "extremely numerous" population (Moore, 1974) although their resources were essentially similar to those available, at the same time, on the Natufian levels. As Kenyon has suggested, it is quite difficult to imagine that this might have been attained without an agricultural type organization. Therefore, if we accept the hypothesis of agriculture of morphologically wild species as PPNA base, no different from those available to the Natufians, we should ascribe the same possibility to the latter. One should clearly consider as completely different the type of organization being realized, with special emphasis on crop-growing and the consequent reduction of animal domestication.

Going back to the African territory, for a long time the occurrence of domestication was explained by the diffusion mechanism. Since, as we have already mentioned above, domestic animals spread to the interior of Sub-Saharan Africa, it would have been enticing to think that even cereal agriculture in Africa followed the same process. However, lacking any evidence on shifts of farmers, the explanation may be only domestication on local species.

As we have already stated, one has to abandon the assumption that agriculture marked the end of a nomadic-type of life. We have shown the middle part of Sahara as the area where fishing practices had accustomed the groups to a semi-sedentary way of living. By determining a reduction of the water zones, the land drying-out process may have led to overexploitation of the available fish resources. In turn, this may have led to emphasise of gathering as a diet-integrating element, although the drying up would result in the doing away of those very species. These circumstances might have acted as a stimuli for the artificial growth of grasses all around the areas where fish was still available (Shaw, 1977).

Likewise, in view of the fact, that as we have already mentioned, wild cattle was present in Africa and in the Nile Valley (to the North of the Tropic of Cancer) during the Early Holocene, one should not rule out the possibility of a North African local cattle domestication. However, the relation between the preliminary experiences on local species and the mature phase, that could really be a Nile Valley phenomenon, needs further investigation.

By way of a conclusion the picture by Desmond Clark (1976) seems appropriate. Starting from 4,000 B. C. the dryingup process led to an increase of diversified activities: livestock concentration – smaller animals at first (sheep-goat) and later cattle, that allowed the groups to preserve their dwellings on the site until the deterioration of the climate compelled them to move away (in various direction: to the desert massifs, to the North African coasts, to the Sahel and to the South-Western savannah, in the Nile Valley).

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Ecological and cultural relevance of the recent new radiocarbon dates from Libyan Sahara

During the 1970's the Mission of the Istituto di Paletnologia of the University of Rome [1] carried out systematic exploration of the Auis area, on the eastern side of Tadrart Acacus, discovering settlements of which a complete report has been made in an earlier work (Barich, 1974).

The paper quotes an interesting series of dates belonging to 7th millennium B.C. Such an antiquity has been backed up by the results of a new deposit located during the 1978 campaign in the Wadi Ti-n-Torha II, an overall exploration of which is under way. Therefore, here we shall deal only with a presentation of the new series of dates and their comments on the ecological-cultural level. Further details are in preparation for publishing.

The material studied in this paper, coming from the settlement called "Ti-n-Torha--Two Caves", consists of nine charcoal samples. The dates have been processed by Belluomini-Alessio-Manfra in the ^{14}C Laboratory of the Istitute di Geochimica and Fisica of the University of Rome (Belluomini *et al.*, 1978).

During the excavation the deposit was divided into three sectors: west, centre and east (Table 1). In particular, 5 samples from the west sector have been analyzed (R-1407 and R-1405 from level 1; R-1408 from level 2; R-1404 *bis* from level 3). Four samples have dated the east sector (R-1403 from level 1; R-1406 and R-1409 from level 2; R-1402 from level 3). Unfortunately, no datings of the centre sector have been possible because of the poor quantity of carbonaceous presence in every sample, mostly made of earthly material.

The samples of the west sector show ages comprised in a small range of time, about the middle of the 7th millennium B. C. The samples from the eastern sector levels, however, show a significant chronological difference, their ages ranging from the middle of the 8th to the end of the 5th millennium B. C. Sample R-1403 in particular

[1] The Mission acts as a multidisciplinary group under the supervision of Prof. F. Mori (Section of prehistoric art) and Doc. B. E. Barich (Section of excavations).

Table 1

Radi ocarbon dates from Wadi Ti-n-Torha Two Caves (Tadrart Acacus, Libya)

Sample (all charcoal)	Location	5,568 Half-life		5,730 Half-life	
		B.P. 1950	B.C.	B.P. 1950	B.C.
R-1405	West Sector Level 1, sieve	8,840 ± 60*	6,890	9,110 ± 60	7,160
R-1407	West Sector Level 1, layer	8,520 ± 60	6,570	8,780 ± 60	6,830
R-1408	West Sector Level 2, layer −38 cm	8,450 ± 60	6,500	8,700 ± 60	6,750
R-1404	West Sector Level 3, layer −70 cm	8,630 ± 50	6,680	8,890 ± 50	6,940
R-1404 bis	West Sector Level 3, sieve	8,400 ± 90	6,450	8,650 ± 90	6,700
R-1403	East Sector Level 1, layer	6,230 ± 50	4,280	6,420 ± 50	4,470
R-1406	East Sector Level 2 base, layer −35 cm	8,620 ± 50	6,670	8,880 ± 50	6,930
R-1409	East Sector Level 2, layer −40 cm	8,650 ± 105	6,700	8,900 ± 105	6,950
R-1402	East Sector Level 3, sieve	9,350 ± 110	7,400	9,630 ± 110	7,680

* The one-sigma (1σ) error term indicates a 68.3% probability that the radiocarbon date lies between the upper and lower limits of the error bar

gives an age of about the end of the 5th millennium, significantly younger than the rest of the samples of the whole site. The samples of level 2 (R-1406 and R-1409) show the same age of the western sector samples. Sample R-1402 from level 3, the deepest one, belongs to the middle of the 8th millennium B. C. and, therefore, is one of the oldest known findings from the Acacus massif and the whole of the "Saharo-Sudanese" sphere.

These results indicate that people must have been present in this area mostly around the middle of the 8th millennium B. C. On the other hand, the two samples (R-1402 and R-1403) show the presence of a population in a much wider range of time (from the 8th to the 5th millennium B. C.) This is compatible with previous data obtained for two neighbouring archaeological sites (named "North Shelter", see Table 2 and "East Shelter", see Table 3; (Belluomini *et al.*, in: Barich, 1974). The data reported in Tables 1 - 3 show that the Two Caves and East Shelter samples, mainly ranging from the 8th and the 7th millennium B. C., are homogeneous and earlier than the "North Shelter" samples, ranging from the end of the 6th to the 4th millennium B. C.

The ages presented in this work concord with the 14C dates obtained by other scientists for settlements containing pottery and located few kilometers away from Ti-n-Torha (see Table 4).

It is particularly interesting to note the age of sample R-1402 (see Tab. 1), of about the middle of the 8th millennium B. C., one of the earliest, as mentioned above,

Table 2

Radiocarbon dates from Wadi Ti-n-Torha (Tadrart Acacus, Libya), North Shelter

Sample	Material	5,568 Half-life		5,730 Half-life		MASCA correction B.C.
		B.P. 1950	B.C.	B.P. 1950	B.C.	
R-1028	Pen	5,600 ± 50	3,650	5,770 ± 50	3,820	4,520 – 4,440
R-1029	Pen	5,260 ± 130	3,310	5,420 ± 130	3,470	4,350 – 3,930
R-1030	Pen	5,360 ± 120	3,410	5,520 ± 120	3,570	4,410 – 4,040
R-1031α	Charcoal	5,970 ± 50	4,020	6,120 ± 50	4,170	4,960 – 4,730
R-1164α	Charcoal	6,540 ± 50	4,590	6,740 ± 50	4,790	> 5350
R-1032	Charcoal	7,070 ± 60	5,120	7,290 ± 60	5,340	–

Table 3

Radiocarbon dates from Wadi Ti-n-Torha (Tadrart Acacus, Libya), East Shelter

Sample (all charcoal)	5,568 Half-life		5,730 Half-life	
	B.P. 1950	B.C.	B.P. 1950	B.C.
R-1033α	8,460 ± 60	6,510	8,650 ± 60	6,700
R-1034α	7,990 ± 70	6,040	8,230 ± 70	6,280
R-1035α	8,640 ± 70	6,690	8,910 ± 70	6,960
R-1036α	9,080 ± 70	7,130	9,350 ± 70	7,400
R-1158α	7,330 ± 80	5,380	7,550 ± 80	5,600
R-1160α	8,540 ± 140	6,590	8,800 ± 140	6,850
R-1161α	8,460 ± 50	6,510	8,710 ± 50	6,760
R-1162α	8,440 ± 50	6,490	8,690 ± 50	6,740
R-1163α	8,670 ± 60	6,720	8,930 ± 60	6,980

Table 4

Libyan Sahara radiocarbon dates

Sample	Location	B.P. age	B.C. age	Material
Geo	Uan Telocat	6,745 ± 175	4,795	Charcoal
Geo	Uan Muhuggiag	4,730 ± 310	2,780	Charcoal
Pi	Uan Muhuggiag	5,405 ± 180	3,455	Leather
Pi	Uan Muhuggiag	5,952 ± 120	4,002	Charcoal
Pi	Uan Muhuggiag	7,438 ± 120	5,488	Charcoal
Geo	Uan Tabu	7,045 ± 175	5,095	Charcoal
Pi	Fozzigiaren sup.	7,900	5,950	Charcoal
Pi	Fozzigiaren inf.	8,072 ± 100	6,122	Charcoal

Geo: Geochron Laboratories Cambridge, Mass., USA
Pi: Pisa

among those studied in the Acacus massif. That value confirms the age previously found for the sample R-1036 (see Tab. 3) of East Shelter and both make acceptable those obtained by some samples of Site Launay (Ahaggar) and Tamaya Mellet (Niger), of 7,260±115 and 7,400±170 B. C. respectively (Belluomini *et al., op. cit.*). Till now these datings have been believed to be too early for pottery cultures.

The interpretation of our data from the palaeoecological point of view promotes a widening of our study towards the more central-Saharan areas, particularly to the Chad-Tibesti system. It is known that during one of the coldest moments in the last glaciation, Lake Chad must have been a very large inner sea (similar to the actual Caspian Sea). Some of its branches extended to 10°N 18°E, 13°N 11°E, 18°N 14°E and from there to 20°E (nearly lapping the Tibesti region) with a shoreline at least 50 m above the present level. It seems that these sizes did not change until 8,500 years ago.

Precipitations must have been greater in that period in the central Sahara plateau than today and the water contribution to Lake Chad from the north must have come from regions like Tibesti, Ahaggar and Acacus. We must also emphasize the fact that most of this contribution came, perhaps, from the South. Such a large extent of water near the regions we are interested in justifies the supposition (expressed in some of our previous works) of the presence of very rich vegetation in the Wadi Ti-n--Torha, the centre of our most recent research, favourable – at the beginning – to a hunting and hunting-fishing economy and later, around 6,000 years ago, to the development of stock-raising.

Variations of the Chad lake level must also be noted, the sharpest of which was recorded between 4,000 and 3,000 years ago (Fig. 1).

Moreover, if we take into consideration the climatic evolution of Tibesti, we find some important climatic stages which are strictly related to Lake Chad events, and to those which were observed in the Ti-n-Torha area. These climatic events can be deduced exclusively from the palaeomorphology, from faunal findings and from the position of dwellings relative to the base level of wadi surrounding the archaeological site. The pollen diagrams, which could better illustrate the climatic evolution, are still lacking.

Aridity periods of Tibesti, with consequent erosion, have been dated at 9,300 - - 9,200 B. P. and 7,600 - 7,300 B. P. (period D; Maley, 1977). Such two aridity periods correspond to Lake Chad decrease which, in any case, was still higher than at present.

"Huts" of the kind already noted in the near Torha East Shelter – also found in the new Two Caves settlement – have been discovered in the wadi bottom of this period. The climate ranged from levels with a high degree of humidity (between 10,000 B.P. and 8,000 B.P.) which correspond to high levels of Lake Chad (+40 m more than the present one), to drier stages which did not reach the present climatic conditions. Both the fish remains (*Clarias* sp.) which have been found in Torha East levels (Cassoli-Durante, in: Barich, 1974), which show that streams ware present

in this zone, and the bird and mammal fauna (*Francolinus*, *Panthera leo*, *Ammotragus*) indicate a close resemblance with the fauna of the present tropical Eastern African savanna.

Conglomerates (6,500 B. P.) have been found in the Middle Terrace series of Tibesti which indicate a recurrence of strong and abundant precipitations at the end of this period and hence the return of a damp climate. From this time there was a swelling of Lake Chad and an increase of stream levels in our zone with consequent abandonment of "huts".

The possibility of exploiting water sources, available in abundance around 9,000 years ago, induced semi-sedentary settlement. At first this occured in the form of dwellings at the wadi bottom without protection, then stone screens and defences were introduced with the increase of abundant precipitation, as testified by the Middle Terrace of Tibesti (7th millennium B. P.).

The kind of economy based on small animal hunting and on hunting-fishing practised in lake basins and in the rivers is proved by the type of stone industry which specialized in microlithic backed bladelets for utilization in series in tools like harpoons as well as by the faunal remains.

Taking into account the antiquity of our industry, its location, the inferable economic system, it appears that the Upper Palaeolithic hunters' environment of the

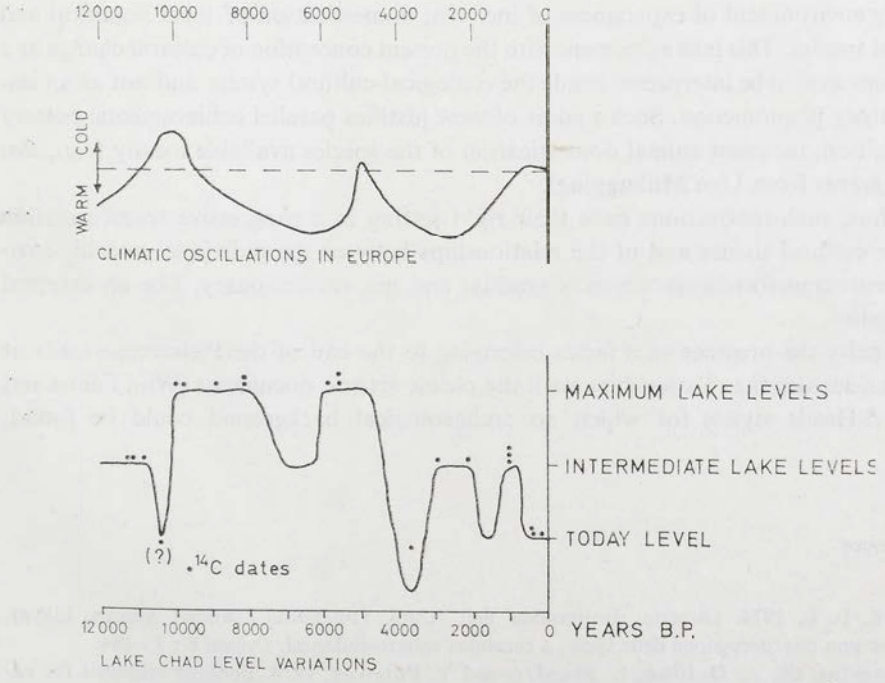

FIG. 1. Comparison between climate of temperate regions and level variations of Lake Chad from 12,000 years B. P. until today (data from Lamb, 1977; Jeje, 1980)

Western Sahara is the milieu one more reasonably turns to. On the other hand, we consider the reference to the so-called "Epi-gravettiens Africains" complexes, whose pluriform aspect is emphasized by Camps (1974) to be very vague, as is the claim of special facies (Elkabien, Natufian) which show immediate and easy similarities with our industry. As regards this subject, we find ourselves in agreement with Vermeersch (1979) that a direct contact between the Nile Valley Epipalaeolithic and the Iberomaurusian or Upper Capsian is quite unlikely and that one should, in this case, look into the hows and whys of the multiplicity of bladelet industries.

On the plane of more general comments, the Ti-n-Torha facies authorizes various study perspectives.

The peopling of 9,000 - 6,000 years ago confirms the hypothesis of the considerable antiquity of the western Saharan groups, as it could already be inferred from findings like Amekni, Site Launey and Tamaya Mellet. This at first leads to a different reflection of the central Saharan cultures, challenging the artificious unity of the "Saharo-Sudanese" area and leading to a better definition of the development and of the enucleation of each cultural group. Consequently, the problem arises of the substratum to which the groups with bladelet technique must be connected, because we go back to immediately post-Pleistocene spheres.

The semi-sedentary characteristics which are mentioned above (and on which we dwell in another paper included in these Proceedings) lead us to think of a preparatory environment of experiences of incipient domestication of local botanical and faunal species. This is in agreement with the present conception of cultural change as a phenomenon to be interpreted inside the ecological-cultural system and not as an immigratory phenomenon. Such a point of view justifies parallel achievements: pottery acquisition, incipient animal domestication of the species available locally (*e.g.*, *Bos brachyceros* from Uan Muhuggiag).

Thus, such innovations have their right setting in a progressive transformation of the cultural tissues and of the relationships between the individual and his environment: transformation which is gradual and not revolutionary, like an external immission.

Finally the presence of a facies belonging to the end of the Pleistocene leads us to consider also the relationships with the oldest artistic documents (Wild Fauna and Round-Heads styles) for which no archaeological background could be found.

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GINETTE AUMASSIP

Modes de vie néolithique dans le Sahara Oriental Algérien

Entre les parallèles 27° et 35° N, et les méridiens 1° et 12°E, s'étend un vaste bassin désertique, le Bas-Sahara, où seules des sources artésiennes font vivre aujourd' hui quelques oasis.

Les pierres taillées sont nombreuses à la surface des *regs*. L'essentiel date du Néolithique; l'Epipaléolithique ne se rencontrant que sporadiquement, et surtout dans la partie septentrionale, le Paléolithique étant fort rare. Dans la plupart des gisements, en effet, figurent des têtes de flèche, souvent des tessons de poterie qui les uns ou les autres caractérisent les industries néolithiques. On ne saurait ici faire appel à un critère autre qu'archéologique[1] pour apprécier le caractère néolithique d'un gisement. En milieu saharien, plus qu'ailleurs, la recherche préhistorique est entravée par une réduction extrême des données inhérente aux conditions de gisements et de conservation. Un milieu acide, une forte déflation ont détruit les substances autres que minérales, déchiqueté la microflore. L'analyse est ainsi amputée de l'étude du matérial osseux, handicapée par la rareté et le mauvais état des pollens. Néanmoins l'exposition en surface de tout ou partie des objets offre divers avantages, les détails caractéristiques de l'outillage, les distributions spatiales sont aisées à appréhender et, outre l'identification culturelle, ils permettent de préciser la distribution géographique de chaque culture, les particularités du mode de vie. C'est ainsi que durant le Néolithique des groupes humains sédentaires pour les uns, nomades pour les autres et qui ne procèdent pas des mêmes cultures ont été reconnus dans cette région. Une spécialisation des tâches, un colportage ont été perçus dans certains gisements.

[1] A diverses reprises, G. Camps a souligné la valeur du critère archéologique pour définir le Néolithique, Cf. 1969 : 203 - 205; 1974 b.

1. Sedentaires et nomades

1.1. Des populations sédentaires

La sédentarité est impliquée par l'aspect de certains sites (Aumassip, 1970) aux dimensions modestes, aux limites bien circonscrites, dont la surface est couverte d'une chappe de silex taillés. Produite par le télescopage du matérial archéologique sous l'effet de la déflation jusqu'à rendre celle-ci inefficace, cette chappe protège souvent la base de l'occupation.

Si à l'épaisseur de la couche résiduelle on ajoute celle que l'on peut induire de la densité du débitage, on peut proposer une épaisseur totale des dépôts qui pouvait, à l'origine, atteindre 0,80 à 1 m voire davantage avec constamment des limites nettes tant dans la couleur des matrices que dans la distribution des objets (Fig. 1). Dans les gisements hadjariens (Aumassip, 1972) s'observent des cercles de 3 m de diamètre, distants de 2 à 4 m renfermant des sédiments sombres, cendreux, qui contrastent fortement avec le sédiment beige environnant. L'intérieur du cercle est riche en matériel archéologique; son centre est occupé par un foyer. Seules des palissades bien entretenues, restées longtemps en même position, peuvent rendre compte de ces traits. Ceci dénote une implantation humaine de longue durée.

1.2. Des populations nomades

Bien des gisements ne comportent ni couche archéologique enterrée, ni chappe de pierres taillées. Ils consistent en foyers, amas de pierres brûlées, qu'entourent quelques pierres taillées et quelques tessons de poterie (Fig. 1). Les plus petites stations comprennent de 1 à 3 foyers. Souvent ils sont une dizaine formant un arc de cercle plus ou moins fermé au centre duquel peut figurer un foyer comparable. Le nombre d'outils récolté dans de tels gisements ne saurait traduire une occupation de plus d'une saison.

D'autres gisements s'étendent sur plusieurs hectares. Les foyers sont apparemment sans ordre, diversement éloignés, parfois imbriqués les uns dans les autres. Des silex taillés très clairsemés et de densité irrégulière jonchent le sol. Ces traits appellent des lieux de campement privilégiés où à maintes reprises vint s'installer un groupe humain, sans que l'on puisse préciser l'importance du groupe ni la durée d'occupation des lieux.

1.3. Coexistence de deux cultures

1.3.1. Synchronisme

Malgré le peu de dates disponibles (Camps, 1974 a: 1975; Camps *et al.*, 1973; Aumassip, 1979), la radiochronologie montre la grande ancienneté et la coexistence

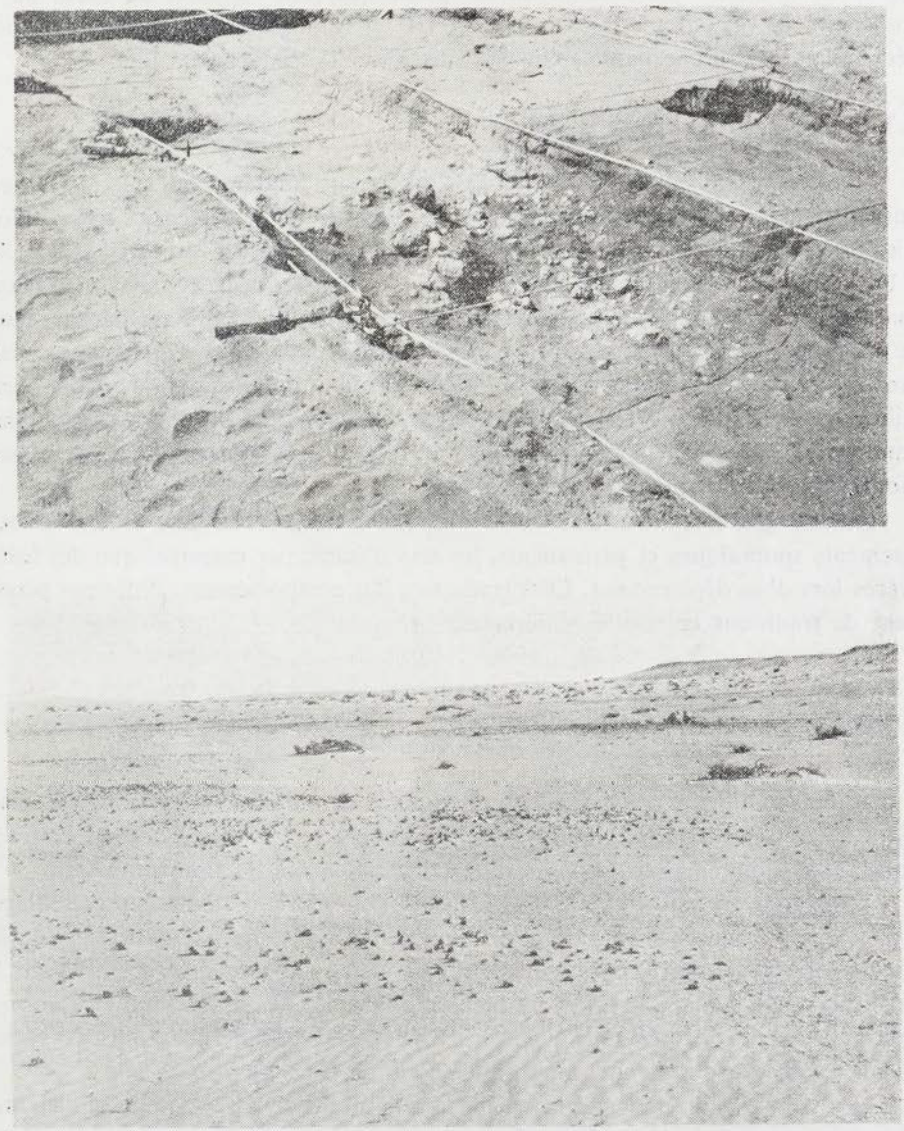

FIG. 1. Habitats néolithiques du Bas-Sahara. En haut, les fouilles du site 6910 montrent bien la limite franche entre les dépôts cendreux, riches en matériel archéologique et les dépôts seulement sableux, clairs, qui en étaient pauvres. L'épaisseur de la discontinuité rapporte une occupation de longue durée, sans hiatus. En bas, mêlés au matériel archéologique, d'innombrables pierres brûlées, foyers démantelés, disposés sans ordre, jonchant le sol sur de vastes surfaces, rapportent des lieux très fréquentés, sans continuité d'occupation

des deux modes de vie. Des gisements sporadiques ont été datés du début du V° millénaire B. C., on en connaît aux IV°, III° et II° millénaires B. C. Les habitats sédentaires sont d'une haute fréquence aux V° et IV° millénaires B. C.

1.3.2. Oppositions culturelles

Le matériel archéologique traduit des différences fondamentales entre les deux ensembles. Dans les habitats sporadiques les pièces à coche forment le groupe d'outils dominant, les perçoirs et racloirs des groupes secondaires très étoffés. Les lamelles à bord abattu et les microlithes géométriques y manquent (ou n'y sont représentés que par quelques unités), alors qu'ils constituent le fond de l'outillage dans les habitats permanents. Il ne peut s'agir d'expressions différentes d'un même faciès s'adaptant à des milieux dissemblables. La poterie introduit de véritables incompatibilités culturelles. C'est dans un cas, une poterie à fond conique montée aux colombins, entièrement ou largement décorée, dans l'autre cas, la forme est sphérique, la base moulée, le décor réduit ou souvent absent.

Ces divergences dans la tradition céramique excluent l'existence d'un lien entre gisements sporadiques et permanents, les uns n'étant, par exemple, que des haltes brèves lors d'un déplacement. Elles traduisent des comportements différents procédant de traditions culturelles différentes.

2. Specialisation et colportage

On ne saurait cependant retenir une absence de mobilité des populations dites sédentaires. Certains détails notés dans les habitats permanents montrent des relations parfois lointaines et supposent des individus ou des fractions itinérants.

Le matérial archéologique renferme des objects d'origine lointaine (coquillages divers parmi lesquels *Spatha cailliaudi* qui est une espèce de la Mer Rouge) ou de facture allochtone (hache à gorge, rondin de pierre qui sont bien connus dans le Néolithique du Sahara Central) ou façonnés dans des matériaux étrangers au secteur où ils ont été retrouvés tels que micaschistes, bois silicifiés, roches vertes diverses ou mieux encore obsidienne, amazonite, péridote (Fig. 2).

On y trouve aussi des nucleus en mître qui, en raison de la similitude de leurs formes et surtout de leurs dimensions ont suggéré depuis longtemps l'idée d'une fabrication „en série" et d'un colportage.

Ces gisements possèdent également des tessons d'une poterie sombre, de forme simple, à fond conique et ouverture évasée dont le diamètre oscille entre 16 et 20 cm. Elle est décorée sur toute sa surface d'un motif pseudo-cordé (Camps-Fabrer, 1966: 437) passant près de l'orifice à une bande de chevrons ou croisillons. D'un gisement à l'autre, ne se notent pas plus de variantes qu'au sein d'un même gisement; elles résultent de l'emploi d'instruments (toujours demi-tige creuse) qui varient légèrement

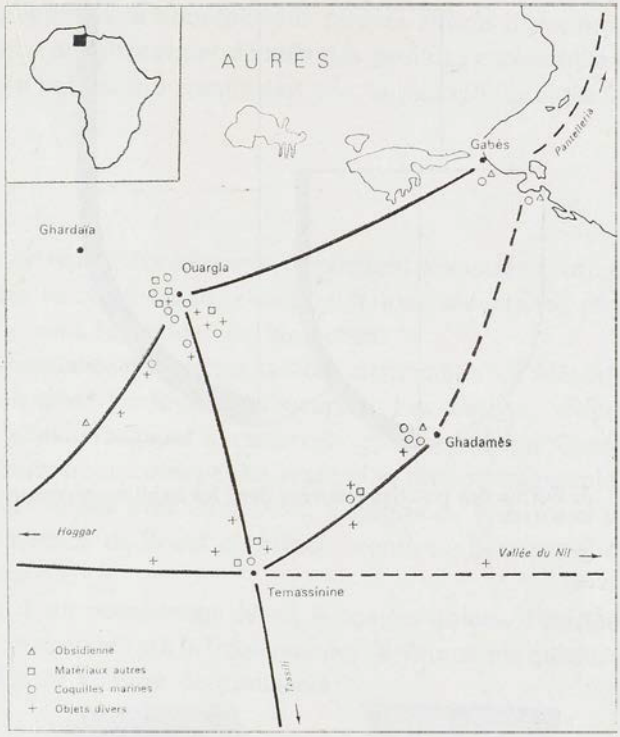

FIG. 2. Relations trans-sahariennes au IV° millénaire, établies d'après les objets allochtones trouvés dans les gisements

par leur largeur, leur arcure et d'un mouvement (impression pivotante) qui peut-être plus ou moins ample, plus ou moins appuyé. Une poterie aussi fortement stéréotypée dans sa forme, son décor, sa cuisson ne peut être qu'une production de série (Fig. 3 - 4).

L'analyse chimique des pâtes offre une très grande dispersion des résultats et parfois des similitudes entre la poterie sombre à décor pseudo-cordé et la poterie autre trouvée dans un même gisement. Ceci donne plus de poids à l'idée d'une „tribu" itinérante qu'à celle d'un „atelier" de fabrication de cette poterie.

Les concentrations d'outils semblables corroborent par ailleurs une spécialisation des tâches dès le Néolithique. Dès 1881, L. Rabourdin remarquait dans le gisement d'Hassi Retmaïa un „tri" affectant non le volume des objects mais leur forme (Rabourdin, 1881). Les couteaux, grattoirs, flèches y étaient chacun regroupés en un même point. Divers autres auteurs ont noté des concentrations semblables (Basset, 1926; Bourcart, 1923; Morel, 1946). A Bordj Mellala, J. Tixier (1976) a pu donner une étude détaillée de la distribution au sol du matériel. Deux surfaces comportaient essentiellement des microlithes géométriques, une troisième des rectangles. Les rac-

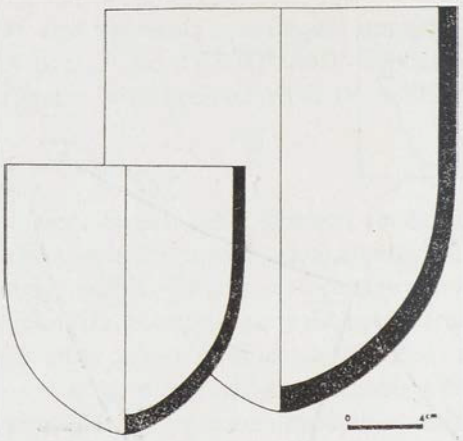

FIG. 3. Forme des poteries trouvées dans les habitats permanents



FIG. 4. Decors des poteries trouvées dans les habitats permanents

cords entre ces objets et des microburins trouvés auprès d'eux montrent bien qu'il s'agissait d'un lieu de fabrication; de même la position excentrique de ces restes par rapport à l'aire d'habitat qui comportait elle, la panoplie lithique habituelle.

Conclusion

Un véritable artisanat, des échanges, impliquant des sociétés fortement structurées, existent ainsi dès le Néolithique. Des populations sédentaires et nomades qui se côtoient y préfigurent les modes de vie actuels.

Souvent l' abondance des pierres taillées attribuables au Néolithique a fait songer à une région alors verdoyante et peuplée. Les analyses sédimentologiques et palynologiques n'invitent guère à renforcer cette hypothèse. Quand on extrait les éléments allochtones transportés par les vents, elles rapportent pour le début de l' Holocène, un milieu dégradé avec Graminées, Composées, *Ephedra* cf *alata*, sans strate arborée. La fréquence de l'oeuf d'autruche confirme l'existence d'un milieu, au mieux, steppique.

Bien plus qu' à un peuplement dense, à des conditions d'existence faciles, c'est au mode de vie, en particulier à la fréquence des déplacements qu'entraîne le nomadisme, que l'on doit le nombre de gisements [2].

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[2] Pour apprécier la densité des restes préhistoriques récents dans cette partie du Sahara, on ne saurait oublier que la quasi-totalité des vestiges gît en surface, ce qui offre au premier regard quelques 10 millénaires d'occupation humaine télescopée.

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Mark A. W. Milburn

Some enigmatic stone artifacts of the Eastern Sahara: "rondins de pierre"

Introduction

During Saharan travels whose object was not the documentation of lithic industry I have seen a number of long stone rods, generally occurring in seeming connection with grinding equipment thought to be Neolithic (Clark, 1973: 283; Smith, 1980: 455), especially in a Tenerian context. Tenerian industry is not seen as being found to west of Aïr (Smith, *op. cit*), i.e., in the "Ténéré de l'Ouest", although stone rods lie abandoned both there and in the Ténéré Tafessasset to eastward of Aïr. Some works written in the first half of this century hardly mention them: it seems that larger numbers have come to light with the advent of modern cross-country vehicles. Tourists normally on the lookout for projectile points can easily spot such large conspicuous objects.

A future paper could be devoted to distribution zones, once it has been possible to ascertain whether regional shapes occur: I thank J. D. Clark for a suggestion along these lines. Uses of varying shapes remain to be determined, if indeed all were functional. The wide geographical dispersion of material currently renders its laboratory inspection problematical, however vital this may be. I should welcome constructive comments on the terminology here used, whose inadequacy is apparent: news of further finds would be gratefully received. Lack of space prevents the inclusion of all bibliographical references known to me.

French terminology

The word "pilon" means pestle and has been widely-employed hitherto: I shall use it, as well as "ronde-bosse" (R-B), when French-language texts render this desirable, otherwise prefering the expression "rondin de pierre" (RP) suggested by Gast (1965). "Pestle" will only be written when its use as such seems beyond doubt.

Typology

A provisional list of three main types of RP:

Type 1: "Oval-ended" (Fig. 1 : *6*). Relativly symmetrical and well made: one or both ends oval in shape.

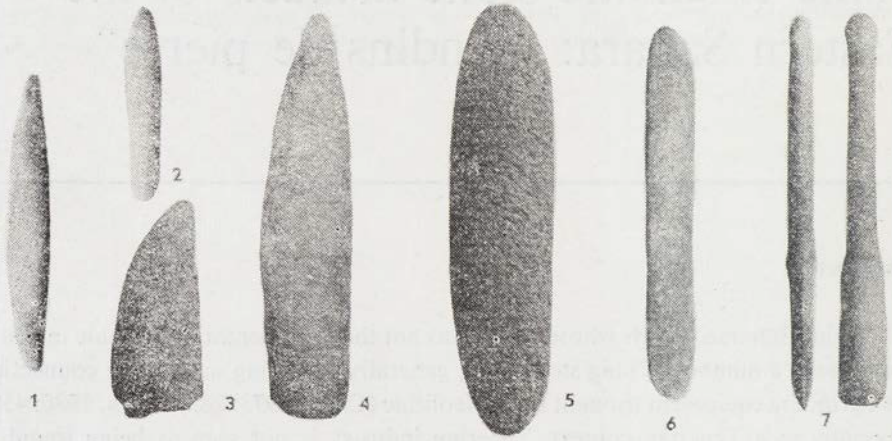

FIG. 1. "Rondins de pierre"

1 - 2: Type 3; *3*: A fragment seen in Qued Igharghar, Tefedest; *4*: An object seen in Mauretania, between Choum and Nouadhibou (Pk. 318); *5*: An object seen in Timersoi, Niger (Cf. Fig. 4); *6*: Type 1; *7*: An interesting model from Tibesti (after Jackel)

Type 2: "Blunt pencil" (Fig. 2). Relatively symmetrical, probably the thinnest of all known types. Very well made in general. One or both ends shaped something like a very blunt pencil, whose "point" may be off-centre, as well as like a "knife-edge". Cf. Savary (1965: Fig. 2. Nos 4, 5 and 8 and page 233).

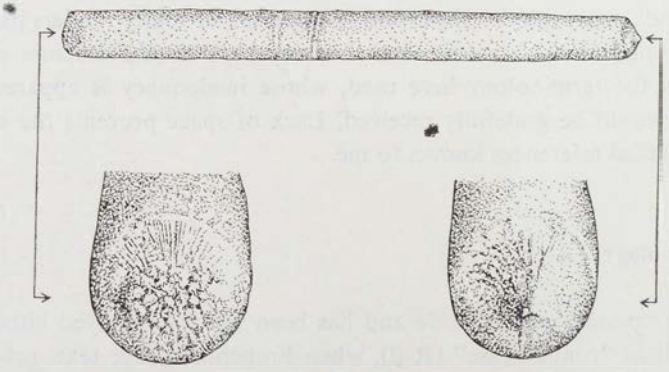

FIG. 2. An unsual Type 2 model. Each end is different. Lenght 77.5 cm (after a drawing by W. Godwin)

Type 3: All other shapes (Fig. 1 : *1 - 2*). Basically asymmetrical and ungainly. In an unfinished and/or eroded state this appearance may be enhanced.

Further finds may enable the formulation of others in due course.

Inventory

The evident need to compile an inventory of specimens is hindered by lack of precise information and descriptions can prove bewildering. Gast (1965: 319 - 324) publishes a list of sixteen RPs in the Bardo Museum, Algiers. Camps-Fabrer (1966: 252 - 255), apparently not mentioning Gast (1965) bibliographically, nor RPs in her index, publishes some "pilons" also in the Bardo, which I cannot so far equate with those of Gast. One of her "pilons" is shown, only a few pages earlier, as a "sculpture en ronde-bosse... representing a woman dressed in veils or a phallus?" (1965: 252 and Pl. XVIII: 1). Dubief (1947: Pl. II and 189 - 190) previously described the same RP as being very like a short "pilon" adding that some "similar objects" (not illustrated) had been found in 1928... in the eastern buttresses of Mt. Gréboun (Aïr) and in the Tassili-n-Ajjer (S. E. Algeria).

Terrain in which found

Maître, who has spent much time on foot, believes that RPs are absent or rare in the massifs, being for some obscure reason more typical of cultures of the low zones like Tanezrouft, between S. Algeria and N. Mali, and Ténéré Tafessasset, Niger (1972: 135). On the same page he notes that a good R-P makes an excellent sugar--hammer, being picked up for this purpose, then lost further on. (If tea and sugar were introduced only in the last few centuries, then numerous R-Ps may have travelled away from their ancient sites quite recently; Cf. Gast (1965: 324) on modern use in Ahaggar). In an older context, Camps (1974: 249) sees some Tenerian querns having notched edges to facilitate their transport on ox pack-saddles. Why should un-notched querns and RPs not also have been moved around, especially when Gabriel (this volume) knows of portable hand mills and grinding stones hundreds of kilometres distant from formations from whose sandstone or volcanic rock they could have been manufactured?

Material

Suggestions seen hitherto seem to imply quartzite, sandstone or volcanic rock as favoured material, especially the former (Gabriel, 1977: 45; Gast, 1965: 313).

Countries where found

Algeria, Chad, Mali, Mauritania, Niger. B. Barich informed me (September, 1980) that she has seen none in the Libyan Tadrart Acacus, though F. de Carranza y Manzano verbally reported (1974) seeing objects roughly similar to that shown in Fig. 1 : 4, within former Spanish territory.

Age

Though various authors clearly consider this as "Neolithic", I am aware of only one case where some estimate of age has been possible, anyway in respect of an apparently non-typical specimen (Jaekel, 1978: 329) and suggested as lying between 4,000 and 3,300 B. P. (Fig. 1 : 7). A camel carved upon another RP, at right-angles to five further carvings on the same artifact (Aumassip, 1973: 33) suggests that the camel, if not the RP itself, was produced around the time of Christ or later (Fig. 3).

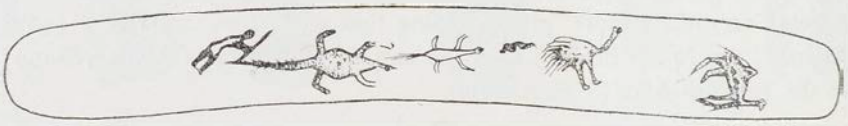

FIG. 3. Carved type "Rondin de pierre" (after Aumassip ,Trécolle and Vimont-Vicary)

Dimensions

A very few dimensions and weights are given in Table 1.

The true pestle

This seems to be attested in Palestine around 15,000 years B. P. (Ronen, 1976: 68). The apparent oldest mortar, with its pestle, is illustrated by Stekelis and Bar Yosef

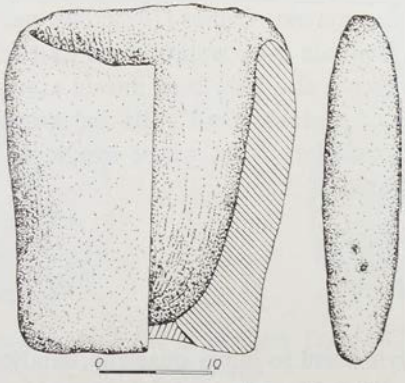

FIG. 4. Palestinian pestle and mortar (after Stekelis and Bar Josef)

Table 1

Dimensions and weights of "rondins de pierre"

Type	Zone	Length	Width	Circumference	Weight	Author
1	"Tamrit"	53.6 cm	–	18.3 - 19.3 cm	2,100 g	Aumassip (1973 : 32)
	"Bardagué"	98.8 cm	5 - 5.5 cm	–	5,035 g	Gabriel (1977 : 45)
	Tassili-ouan-Ahaggar	30.5 cm (61 cm)	ca 7.5 cm	22 cm at estimated centre	2,415 g (4,830 g)	Unpublished. Fragment only[1]
2	W. Ténéré (Taf)	77.5 cm	6.25 cm av.	–	5,470 g	Unpublished. Weight calculated by W. Godwin. Two rings to left of centre. LH end may be non-typical (Fig. 2)
	Arlit	75.5 cm	6 cm av.	18 - 18.8 cm	–	Origin "unknown". Unpublished
	Iferouane	71.5 cm	8.1 cm av.	–	–	Origin "unknown". Unpublished
	W. Ténéré (Taf)	65 cm	6 cm av.	17.5 - 18.5 cm	ca 3,820 g	Unpublished
3	Mauritania	ca 59 cm	–	–	–	Seen near railway km 318. Unpublished (Fig. 1 : 4)[2]

[1] Since this object seems to be broken at its rough centre, to judge by circumference, figures in brackets show the possible total length and weight, assuming relative symmetry.

[2] The weight of this object, whose dimensions are ca 60 cm long by 12.3 cm wide at lower end, is likely to exceed that of any others listed in types 1 and 2 above. Cf also Fig. 1 : 1 - 2. What sort of human could wield either as a pestle?

(1965: fig. 4): the pestle is 30 cm long, while a further pestle, larger though broken, was found nearby. The bottom of the mortar was thought to have been holed during use (Fig. 4).

From the Ténéré Tafessasset (Adrar Bous III) are reported two stumpy Neolithic pestles (Tixier, 1962: 342 and Fig. VIII), whose length probably does not exceed 15 cm. Their function as pestles appears probable: of the "broyeur" of Dalloni (1935: Fig. 63.a). Meanwhile the use of wooden pestles and mortars is shown in Ahaggar to-day (Gast, 1965: 311 - 313; 1968: 344 - 350), while their occurrence in the modern Sahel is too well-known merit comment. I have a picture of similar equipment in Sahelian use in 1807, though I have been unable to trace it further back in the time available (October 1980). The principal function of a pestle seems to be twofold (Gast, 1965: 313): to transmit a violent perpendicular blow to a substance which yields or to place a pestle on the substance to be treated and then to rotate the pestle in conjunction with the use of some oblique pressure.

Grinding

It is recorded that "in Neolithic times... man enlarged the friction surfaces on pestles... and plaques... giving higher efficiency in terms of quality and time of work (Semenov, 1976: 200). Disregarding the term "pilons broyeurs" of Bessac (1951: 33), used in an apparent protohistoric context in Mauritania, the action of "broyage", using a "meule" and "molette", is illustrated by Gast (1968: Pl. LIX and Fig. 23). A further action and one which might fit the idea of RPs of types 1 and 2 being used something like modern rolling-pins, is described by Hugot (1963: 116) as "a combined movement of pressure and rotation (rolling) of an elongated stone cylinder"; cf. the object in Fig. 4. Might it, notwithstanding its short length, prove as efficient, and easier to use, as a type 2 or type 3 RP?

"Abnormal RPs"

The object shown by Jaekel (1978:329) may be unique (Fig. 1 : *7*). Its finder mentions the problem of not knowing whether to identify it as a digging-implement, a club or a wand of office; cf. a "large hoe made of dolérite", 36 cm long, whose sharp end is something like that of the above example: here, however, the likeness ends. The "hoe" is from sub-Saharan Fangala, Mali (Vaufrey, 1969: Pl. XVII, XVIII).

The writer saw in Oued Igharghar (Tefedest) the object illustrated in Fig. 1 : *3*, whose end is like the front part of a rough shoe. From its diameter (9.5 cm) and general dimensions, one may postulate a probable total original length, before breakage, of some 40 cm, if this does not represent too conservative an estimate. I think that an artifact this long, even if tapering at the oposite end, like that shown by Vaufrey could prove to be quite heavy.

Some opinions and some problems

Dalloni (1935: 191 - 192) illustrates a fragment of a large "pilon", going on to say that similar objects are known throughout the "Soudan", where the inhabitants still use them to crush grain in their stone mortars. It has not proved possible to find further references to such equipment; Cf. Gast (1968: 314, note 1) and Morris and Milburn (1977: 143) on deep cylindrical shafts in rock surfaces, not proven to be worked by RPs. However, there have been numerous objections to the use of long stone rods as antique pestles: a non-exhaustive list might include the following:

a) A stone "pilon" would smash a stone mortar or vice versa. Stone mortars have not been found,
b) Even wooden pestles break up a wooden mortar eventually (Gast, 1968: 315),
c) A functional object like a "pilon", once decorated, becomes an artistic and cultural object, even an idol (Camps-Fabrer, 1966: 277). The decoration involved is given as the carved head of a bull or sheep or a line of cup-marks,
d) Savary (1965: 231) remarks that decoration on the end of a "pilon" would be spoilt, were it to be used as a pestle. Camps-Fabrer (1966: 276 - 277) cites H. Lhote's preoccupation with the idea that some Post-Neolithic Saharan inhabitants even to-day smash objects, due to superstitious fear of "ancient idols", adding nonetheless that inspection of such finds indicates – to judge from the patina – that the breakages are not recent; cf. remarks above on the suitability of RPs used as sugar-hammers, noting also the probable difficulty of smashing one found in a sandy waste devoid of other stones. Some locals I met in 1979 possessed a fine type 2 RP which they wished neither to smash up nor to dispose of. A secondary use of long pieces of RPs as head and/or foot stones on Islamic graves is reported in Mauritania (J. Spruytte, personal communication) and I have seen it in Oued Igharghar, Tefedest,
e) Three cases of one apparently similar form of breakage have been noted, each involving a long splinter of stone from a RP. Gast (1965: 321) attributes his example to a violent blow, though noting elsewhere (1965:317 - 318) the supreme unsuitability of RPs for use as pestles. Aumassip, Trecolle and Vimont-Vicary (1974: 169 - 170) state that the lower face of their broken part is less-patinated than the remainder (Fig. 5 : *1*). The third example was shown to me near Frankfurt am Main, the splintered part extending well over half the total length of the RP, or about 27 cm, though it seems not to affect the end of this artifact, as in the two previous cases. Without being able to suggest any explanation as to the cause or shape of these breakages, an interesting wooden utensil is shown by Gast and Adrian (1967: 29), known as "aséroui" and used for stirring millet (Fig. 5 : *2*).
f) Various shapes shown by Savary (1965: 232) can be noted elsewhere. The notch on his No. 2 may be a mint example of others I have seen on type 3 RPs, all very worn. His Nos. 4,5 and 8 all come within the limits of features already mentioned:

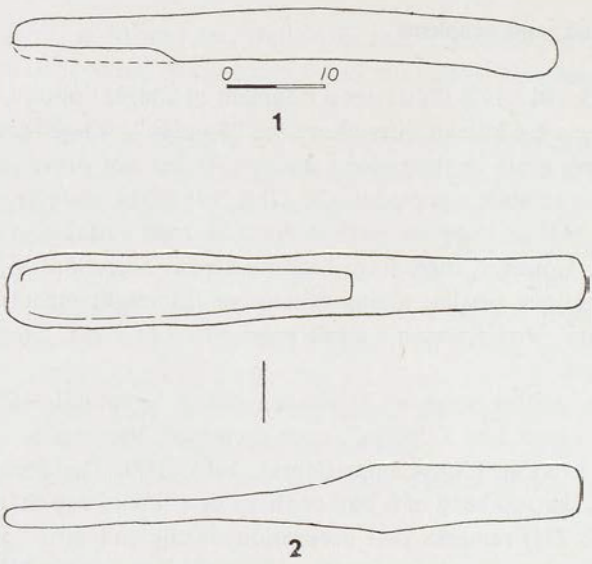

FIG. 5. *1*: A splintered "rondin de pierre" (after Aumassip, Trecolle and Vimont-Vicary). *2*: Aséroui. Length 40 cm (after Gast and Adrian)

his curved No. 6 can be compared with one from Tibesti (Gabriel, 1977: 45). I have seen a photo of a RP with a set of cup-marks in line (cf. his No. 3, also Camps-Fabrer, 1979: 26): it should be ascertained whether such cups are decorative or functional,

g) The observations of Gast (1965; 1968), on archaic RPs and modern pestles respectively, merit detailed scrutiny. Notwithstanding the evident unsuitability of RPs for use as pestles, it is recorded (Aumassip, Trecolle and Vimont-Vicary, 1974: 174) that J. Tixier concluded that the ends of their RP were used to crush grain. They qualify this by adding that their own study of the ends of all the RPs described by Gast (1965) indicate that the majority are not the same as their own, it being sometimes difficult to determine whether markings are caused by use or by their having been hammered.

Conclusion

While agreeing with Gast (1965: 317) on the comparative rarity of "pilons", it may be that many more than those studied, far less mentioned in print, were known to "sahariens" of the first half of the century, who may not have felt it necessary to report them; cf. Dubief (1947: 189): "these pilons found so frequently in the Sahara". Tourist activity may soon make further examples available. It remains to determine the exact characteristics of differing types, as well as their possible use(s). My future

experiments show that, while the first main use of a pestle proposed by Gast (1965: 312), that of transmitting a violent perpendicular blow, is unacceptable in respect of RPs, there may be grounds for accepting the suitability of some types for the second rôle he suggests, namely that of placing a pestle on the substance to be treated and then rotating it in conjunction with oblique pressure?

To end on a note of caution, the words of Maître (1972:135), some of whose remarks appear to attract adverse comment from Camps (1975: 130), express admirably our present lack of knowledge: "A ce sujet, vouloir identifier à tout prix un objet préhistorique me paraît être une démarche bien périlleuse, souvent d'ailleurs à l'origine d'interminables querelles entre spécialistes" [1].

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Colette Roubet et Patrick L. Carter

La domestication au Maghreb: état de la question

Depuis plusieurs années, les recherches sur le problème de la néolithisation, ses phénomènes et leur propagation aboutissent à une connaissance plus précise du Néolithique de tradition capsienne en Afrique du Nord, désormais centrée sur la définition du régime économique et culturel (Roubet, 1979).

On devait à R. Vaufrey la nomination de ce faciès lancée en 1933 non sans s'appuyer sur les résultats de nombreux pionniers maghrébins. Bien que privée de contenu trés précis, cette appellation avait été plus ou moins retenue et adoptée jusqu'en 1955 pour qualifier tout le Néolithique nord-africain. Pour R. Vaufrey, le Capsien couvre plusieurs millénaires et représente à lui seul l'Epipaléolithique et le Néolithique tout entiers. R. Vaufrey „capsianisait" ainsi le Maghreb et peu à peu le Sahara et l'Afrique. Les arguments de sa démonstration étaient les suivants: sur un substrat capsien, d'aspect microlithique, viennent tardivement se greffer des atttributs néolithiques (pierre polie, céramique, armatures, art) qui ne font jamais disparaitre ce fonds culturel capsien. Ainsi, par additions successives, R. Vaufrey parvenait-il à étendre une théorie de plus en plus fragile et inconsistante à l'Afrique entière (Fig. 1).

1. Recentes recherches sur le N. T. C. (1960 - 1980)

Des travaux récents, conduits dans diverses régions du Maghreb (Oranie, Constantinois, Atlas saharien) et du Sahara (Erg Iguidi, Erg oriental: Izimane) modifient peu à peu le schéma initial, simplifié. Mais c'est en Algérie orientale que des recherches plus approfondies ont eté entreprises (Contantinois, Tébessa, Aurès); elles parviennent à fournir maintenant les fondements d'une définition complète.

1.1. En 1968: la première monographie des Monts de Tébessa que je présente est consacrée aux abris sous roche du Damous el Ahmar: grottes anciennement fouillées (1912) qui livrent un abondant mobilier. De nouvelles fouilles en 1964, 1973, con-

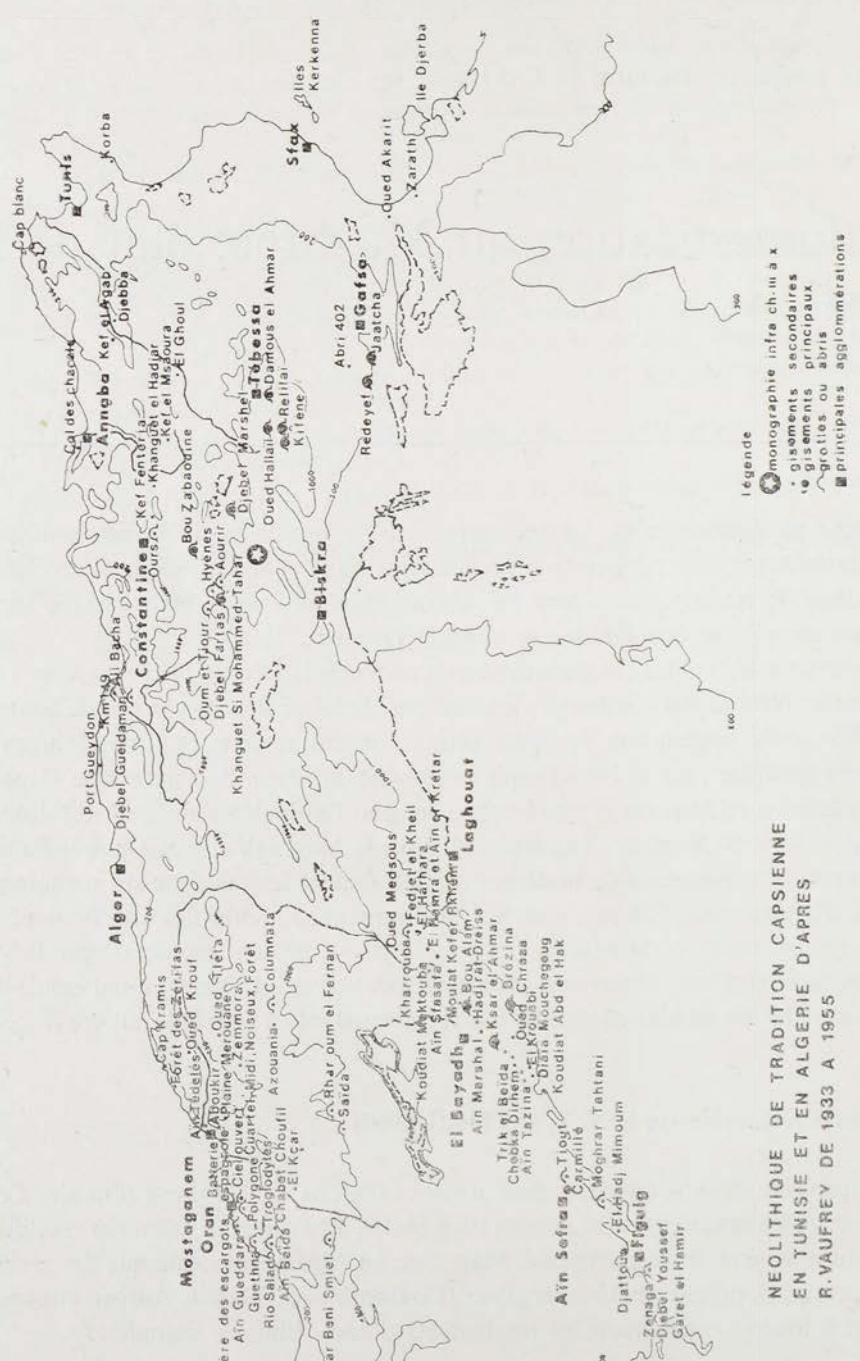

FIG. 1. Le Maghreb néolithique

firment les indications inédites et livrent un squelette humain. La révision et l'étude complète de tous les documents (3,000 environ), datés par le 14C, limitent considérablement l'acception culturelle du Néolithique de tradition capsienne (Roubet, 1968; 1969; 1979).

Les recherches dans le Constantinois (à Ain M'Lila: grottes de Bou Zabaouine I et II, grotte du Djebel Marhsel, grotte du Djebel Fartas, grotte des Ours, grotte des Pigeons, grotte des Hyènes) renforcent progressivement l'hypothèse d'une néolithisation plus affinée qu'on ne l'avait dit, marquée par une certaine diversité du mobilier archéologique (B. Dedieu, 1965; C. Roubet, 1968; 1979).

1.2. De 1968 à 1974: Enfin de très importants travaux sont conduits dans le Massif de l'Aurès, notamment dans la grotte Capéletti, et donnent lieu à la deuxième monographie sur le N.T.C. Située dans les gorges du torrent Berbaga, qui coule dans le défilé du Khanguet si Mohamed Tahar, la grotte Capéletti occupe une position privilégiée en altitude (1.580 m), sur le versant septentrional très arrosé de l'Aurès. L'application de méthodes modernes, tant sur le terrain (carroyage repérage des documents en stratigraphie, prélèvement divers) qu'en laboratoire (restauration, identification de dermatoglyphes) facilite l'interpretation du mobilier archéologique, mais permet surtout de recréer dans ses grandes lignes un "milieu" disparu, son cadre végétal, animal et humain: *un microcosme néolithique* (C. Roubet, 1969; 1971; F. E. Roubet, 1972).

Le cadre géologique, géomorphologique et écologique est étudié en détail. Une étude de l'ensoleillement apporte les informations capitales sur la durée d'habitabilité du site et le rythme de fréquentation de celui-ci. Un cadre chronologique situe entre le Ve et IIIe millénaire B.C., l'occupation temporaire de cette grotte ou refuge pastoral exclusivement néolithique, qui renferme les vestiges de 4 séries distinctes d'occupation.

9.329 documents archéologiques sont au total analysés: objets lithiques, osseux, restes de récipients en céramique, en derme ossifié de tortue terrestre, et en tests d'oeuf d'autruche, objets de parure et matières colorantes.

L'homme néolithique, placé dans ce cadre montagnard, appréhende un monde animal et végétal, totalement différent de l'actuel. 12.050 restes identifiés de mammiféres, reptiles et oiseaux sont répartis dans les quatre séries d'occupation: 8.146 documents intacts malacologiques sont identifiés témoignant de récoltes saisonnières de gastéropodes. Mais c'est sans conteste l'abondance (entre 70 et 90%) des restes osseux d'ovinés et caprinés (moutons et quelque chèvres) qui donnent à ce N.T.C. son principal caractère, son faciés pastoral (Fig. 2).

Plusieurs milliers de documents paléobotaniques recueillis dans les sédiments soit par prélèvement direct, soit par tamisage, soit par flottation, permettent non seulement de définir la nature et l'importance des faits de préhensions mais plus encore les traits majeurs du paysage végétal de ce secteur septentrional de l'Aurès.

Les pollens se rattachent à deux ensembles, l'un à caractère boréal, l'autre à caractère méditerranéen. La strate herbacée livre des indications plaidant en faveur de collectes sélectives (fougères, graminées et composées très abondantes).

Les macro-restes végétaux, fruits, graines, coques, empreintes, précisent le biotope; il s'agit d'un site à *Taxus baccata* comportant une chênaie ballota *à quercus* (glands doux) avec vigne sauvage et autres arbres fruitiers sauvages (prunes). Par en-

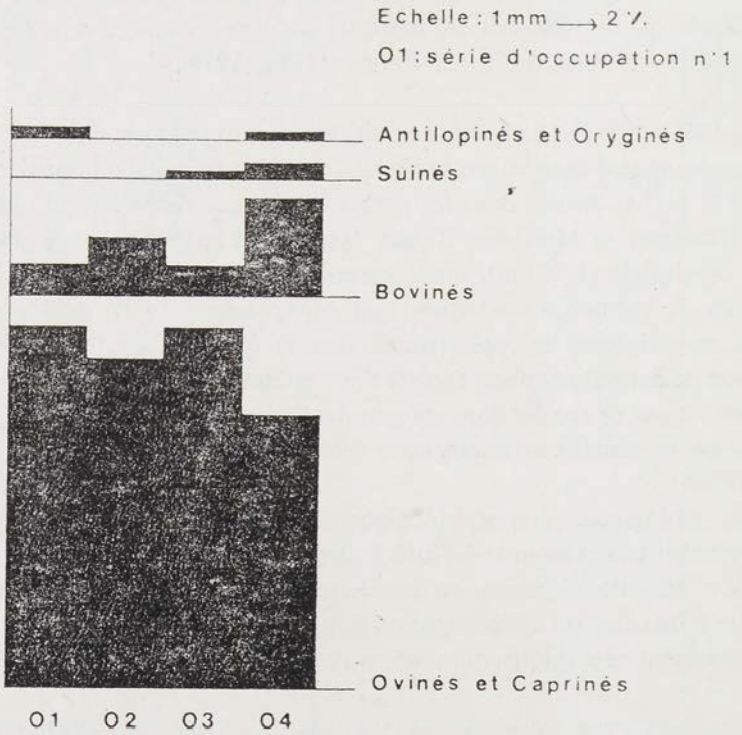

FIG. 2. La faune de Vertèbrés consommés dans la grotte Capéletti. Répartition des restes osseux dans chaque série d'occupation

droit s'étendent des prairies d'altitude; l'on découvre encore toutes sortes de plantes ripicoles près du Berbaga. Les très nombreux glands doux apportent surtout la preuve d'une glandée automnale. Le cortège des végétaux identifiés, dénombrés et pesés (charbons), aboutit à une interprétation palethnologique de faciès du Néolithique de tradition capsienne (C. Roubet, 1979).

Une révision de tous les restes anthropologiques rapportés au Néolithique de tradition capsienne conduit à constater une carence en vestiges humains, difficilement explicable, et qui s'oppose aux nécropoles ou inhumations ibéromaurusiennes et capsiennes d'une part, et aux nécropoles protohistoriques d'autre part, bien attestées dans ce Maghreb oriental.

2. Definition économique du N. T. C. (1979)

Toutes les données établies et controlées par plus de 24 spécialistes concourent à une définition complète et économique du N.T.C. La preuve est faite de l'instauration d'un nouveau système économique, capital pour des populations à caractère montagnard.

Dès le Ve millénaire B.C. au moins (VIIe millénaire B.P.) apparaît, se maintient puis se développe jusqu'au IIIe millénaire B.C. (Ve millénaire B.P.) un régime économique reposant sur: un élevage ovin intensif et une glandée automnale systématique.

2.1. L'élevage ovin, qui s'inscrit à l'intérieur d'un cycle de transhumances inverses et saisonnières, assure d'abord la satisfaction de besoins alimentaires, et semble permettre par voie d'échange l'acqusition de produits d'origine maritime (coquilles: éléments de parure).

Ce système pastoral fondamental, particuilèrement bien adapté au relief, fait l'originalité de ces premières communautés semi-nomades qui se fixent et s'énracinent dans ce territoire. Toujours valorisé, ce système reste en vigueur de nos jours.

2.2. La production des premières semoules et farines dans ces paysages montagnards couverts de forêts, reposé sur la récolte systèmatique des glands doux. Toujours consommés (animaux), les glands doux représentent l'unique ressource alimentaire en période de disette (début du XXe siécle). Bien que relevant de procédés pré-agricoles, ce système assure une alimentation de base, capitale (farine, semoule), qui préfigure celle des populations rurales actuelles et contribute au maintien (enracinement) et à la défense d'un territoire géographique très favorable.

Dès lors s'installent, à la faveur de ce régime économique (élevage et glandée), de petites communautés qui défendent farouchement le massif et s'y cantonnent entretenant aujourd'hui une réalité berbère, d'origine néolithique.

Le N.T.C. n'est donc pas le dernier faciès capsien cher à R. Vaufrey, mais le premier qui témoigne d'une irréversible néolithisation inaugurant dans le Maghreb oriental un nouveau genre de vie.

Son régime productif repose sur la mise en pratique de la vie pastorale et implique un élevage ovin; il s'appuie en outre sur la cueillette fructale et recourt systématiquement à la glandée saisonnière, génératrice de semoules et de farines.

Les deux bases complémentaires et capitales de cette économie montagnarde néolithique constituent les fondements même de ce régime de production, promises à un très long avenir.

3. La domestication au Maghreb

Traiter avec précision du problème que soulève la domestication des animaux et des plantes au Maghreb est une gageure non soutenable, dans l'état actuel de nos connaissances. Pourquoi? Comment peut-on aborder le sujet?

3.1. Le pari non tenu

Cela tient à plusieurs causes qui ont toutes une explication valable, mais non satisfaisante dans le cas présent.

3.1.1 Documentation zoologique

a) absence de collection zoologique: fouilles anciennes (Constantinois, Atlas saharien);

b) collections dispersées, sélectives, mélangées, non marquées fouilles anciennes (Oranie, Algérie, Constantinois);

c) collections récentes sélectives, médiocrité de l'état de conservation; les informations sont à leur sujet partielles, non quantifiées, non détaillées, approximatives et anciennes (Pallary, Doumergue, Arambourg, Vaufrey, Joleaud). Aucune révision n'a été entreprise, mais elle est envisagée.

3.1.2. Art rupestre et mobilier examiné dans une perspective économique

Ce point de vue ne prévaut pas dans les publications mêmes récentes et si nous le soulignons, c'est pour montrer l'intérêt très divers que cet art revêt (problèmes nombreux qu'il soulève et orientations de recherches qu'il propose) par opposition au rôle secondaire qu'y joue la domestication.

Nombre d'obstacles limitent donc cette approche de la néolithisation aussi, allons-nous tenter d'aborder le sujet en procédant à une révision objective.

3.2. Revision des données

Nul doute que de toutes les informations disponibles, les plus fiables soient d'ordre zoologique.

3.2.1. Cas de la partie orientale de l'Afrique du Nord et de la Libye

Pour l'Algérie orientale, on doit à mon ami le Dr P. L. Carter, sous l'égide du cher Pr. Higgs, l'étude de la faune que j'avais receueillie dans l'Aurès. La domestication des ovins et caprins y est bien établie, celle des bovidés y est moins affirmée, mais tout aussi significative. La faune des Monts de Tébessa (Damous el Ahmar) comporte également ovins et caprins domestiqués. Celle des grottes de Bou Zabaouine, non encore étudiée en détail, renfermerait également des ossements d'ovins et caprins. Ce territoire du Maghreb peut donc être considéré comme plus ou moins largement fréquenté par des populations néolithiques pastorales (Fig. 3 et 4).

En Tunisie, rien de récent n'a été publié à ce sujet et pourtant l'approche du Néolithique retient l'attention de nos collègues.

En Cyrénaïque: on doit au Pr. Higgs la mise en évidence dans les couches néo-

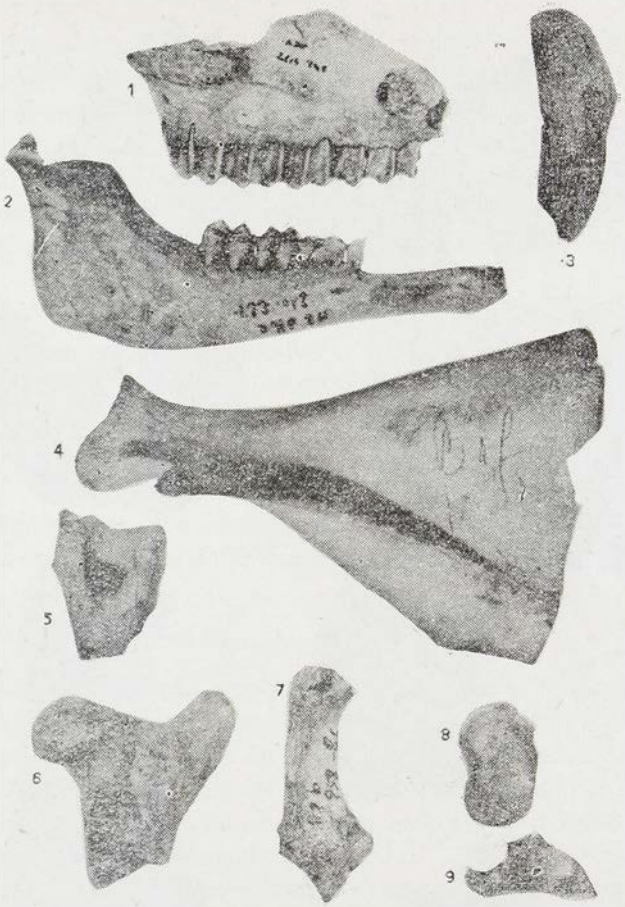

FIG. 3. Ossements d'*Ovis* sp. de la grotte Capéletti. (Cl. Downing College, Cambridge, G. B.)

1: Fragment de maxillaire droit ayant conservé sa série dentaire de P2 à M3 (A2e, 245 - 248 cm); *2*: Fragment de mandibule droite ayant conservé sa série dentaire lactéale de m1 à m3 et la prémière molaire permanente M1 (A2k, é, 210 - 227 cm); *3*: Extrémité distale d'une cheville osseuse (B3j, 142 - 145 cm); *4*: Omoplate droite B1f, 100 - 110 cm); *5*: Extrémité distale d'une humerus ossifié (B1k, 90 - 100 cm); *6*: Extrémité proximale d'un fémur gauche ossifié (A3i, 260 - 265 cm); *7*: Calcanéum gauche (B1m, 208 - 210 cm); *8*: Astragale droit (B2e, 115 - 120 cm); *9*: Phalange unguéale (B2b, 270 - 278 cm)

lithiques de Haua Fteah, d'une faune ovine domestique ne comportant pas de restes osseux de bovidés domestiqués. Dans l'Acacus, *Bos brachyceros* est bien attesté (Mori, 1965).

En schématisant un peu la situation, nous pouvons provisoirement admettre que la néolithisation des secteurs montagneux s'étendant de la partie orientale de l'Afr e que du Nord à la Libye, coïncide avec l'introduction d'un bétail ovin domestiqu's entre le VI-Ve millénaire B.C. Ovins et caprins dominent d'abord, bovidés, suidé- et canidés sont attestés à partir du IVe millénaire B.C.



FIG. 4. Ossements de *Bos* sp. de la grotte Capéletti (Cl. Downing College, Cambridge, G. B.)
1: Fragment droit d'une mandibule ayant conservé sa série dentaire M1 à M3 (M3 perçant l'alvéole); *2*: Extrémité distale d'un humérus gauche (B20, 240 - 242 cm); *3*: Extrémité distale d'un radius non ossifié (J3f, 116 - 118 cm); *4*: Astragale gauche (B3i, 152 - 155 cm); *5*: Phalange unguéale (A3a, surface); *6*: Calcaneum (C3p, 42 - 45 cm)

3.2.2. Cas de la partie occidentale de l'Afrique du Nord

Pour l'Oranie, la documentation de F. Doumergue et de R. Vaufrey n'a pas encore donné lieu à révision sérieuse, si bien que tout commentaire à ce sujet reste fragile. Toutefois, je voudrais mentionner le résultat préliminaire d'observations directes faites par mon mari F. E. Roubet et mon ami le Dr P. L. Carter au Musée d'Oran en 1973. Examinant lors d'une mission commune la faune étiquetée et exposée depuis

F. Doumergue, il est apparu comme probable que certains documents du site d'Er Rahel (près de Lourmel) pouvaient appartenir à des animaux domestiqués. On sait depuis les découvertes minutieuses faites par F. Doumergue, que de nombreux restes osseux de bovidés, parfois maintenus en connexion anatomique, représentaient une vingtaine d'individus au moins. Il n'est pas impossible, pense P. Carter, que leur étude nous réserve des surprises. Mais pour pouvoir les apprécier à leur juste valeur, encore faudrait-il pouvoir les replacer dans un contexte complet, chronologiquement précisé.

Quant au Maroc, on ne dispose d'aucune étude anatomique récente des restes de mammifères rattachés au Néolithique.

Un vaste territoire occidental reste donc à exploiter en ce qui concerne la domestication des animaux.

3.2.3. Cas de l'Atlas saharien

D'Est en Ouest, tout reste à faire, seule l'étude de l'art rupestre donne dans ce domaine quelques indications diversement exploitées et interprétées.

3.3. Domestication et art rupestre

L'art rupestre nord-africain n'est jamais littoral et ne se développe que dans les massifs montagneux qui composent l'Atlas saharien. Celui-ci s'étire de la Tunisie à l'Anti-Atlas marocain selon une direction approximativement N.E. – S.W. Dans la partie occidentale de l'Afrique du Nord, deux axes majeurs, l'un plus au Nord (le Tell), l'autre faisant face au désert saharien, enserrent une région de hauts plateaux qui s'étend jusqu'au Constantinois (Fig. 1).

Les témoignages de l'art rupestre couvrent inégalement ces chainons et à l'exception de quelques-uns tous portent peu ou prou gravures ou peintures relevant d'époques préhistoriques et protohistoriques.

Depuis longtemps déjà, les chercheurs s'accordent à considérer comme chronologiquement le plus ancien, le grand art naturaliste ou style naturaliste monumental, manifesté de belle manière, sur les parois du Sud-oranais. On doit à R. Vaufrey, le premier album de qualité faisant largement connaitre ces fresques gravées si originales, qu'il rattacha d'emblée au N.T.C. (Vaufrey, 1939).

Il n'est pas nécessaire de rappeler toutes les hypothéses qui ont été proposées à leur sujet. Je ne retiendrai que les plus récentes de H. Lhote (1970) et G. Camps (1980).

M. Lhote, qui est sans conteste l'explorateur le plus chanceux ayant vécu le plus longtemps dans l'intimité des gravures rupestres, tant au Maghreb qu'au Sahara, a fait quelques commentaires sur le statut non domestique des béliers dits à "sphéroïdes" qui ne sont pas dénués d'intérêt.

Bien que leurs arguments avancés ne soient pas des plus convaincants, je voudrais avancer les remarques suivantes relatives à l'apparat ornemental de la tête et du cou du mouton (Fig. 5 et 6) t l'absence de troupeau.



FIG. 5. Gada el Kharrouba. Bélier à sphéroide avec jugulaire et appendices uraeiformes, double collier d'epaule. On peut notér la presence d'un cache-sexe sur l'homme qui précéde l'animal. Une coiffure masque peut être sa chevelure (d'après Vaufrey, 1939)

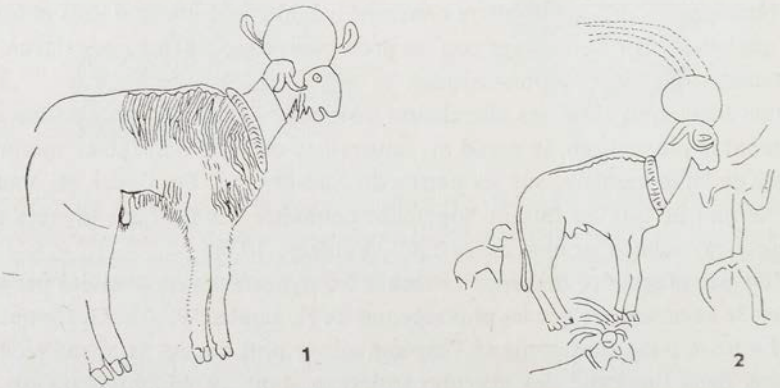

FIG. 6. *1*: Bou Alem. Le bélier dont la tête est ornée porte une jugulaire, des ornements uraeiformes, une gaine au cou, un collier vers l'épaule, son dos parâit couvert d'une piêce de cuir dentelé. *2*: Guelmouz el Abiod Le bélier décoré d'une sphère à plumes (?) a le dos également couvert d'une pièce de cuir dentelée. Le personnage qui précède semble n'être pas en relation avec l'animal (dessins d'après R. Vaufrey, 1939)

La tête, le cou, plus rarement l'échine du bélier sont, après étude approfondie des représentations les mieux conservées de l'Atlas, des régions anatomiquement bien rendues par les gravures. Les animaux sont ornés d'attributs caractéristiques assez constants dans leur morphologie générale, cette parure se compose: pour la tête, d'une sorte de sphère ou de cercle rigide occupant la région frontale, associée à une jugulaire rigide, étroite, enserrant le cou d'où pendent franges, cordes ou agrément végétal imprécis. Le cou porte un collier, parfois tressé, sur les épaules et le dos une pièce de cuir étroite, simplement jetée sur deux animaux.

L'animal dressé, gravé en position statique, au port de tête parfois altier, le plus souvent voûté en avant, semble cheminer sans appréhension. Pour un observateur moderne, il ne fait aucun doute que cet animal non rétif est domestique. Mais ne pourrait-il pas s'agir d'un animal apprivoisé? Aucun autre animal semblablement paré ne l'accompagne. Il est seul.

Sa représentation très solennelle, celle très spéciale de sa parure exceptionnelle, contrastent avec les oeuvres animales ou humaines qui l'entourent sur les parois et qui par certains aspects techniques remontent à la même époque stylistique.

Pour ces raisons, je pense qu'il s'agit d'animaux plutôt apprivoisés que domestigués, déjà asservis et maîtrisés par l'homme au point d'être élevés au rang d'animal cultuel. Rien n'attestant le sacrifice, je n'oserai pas envisager qu'il s'agit d'une représentation symbolique d'un moment de peu, antérieur au sacrifice sanglant. D'ailleurs la plupart des scènes associant l'animal à l'homme place celui-ci dans des positions. curieuses (tournant le dos, avec un bouclier, etc.) sans rapport évident avec lui. C'est pour ces raisons que nous ne suivrons pas G. Camps dans son hypothése récemment exprimée: "Les précisions des attributs dans les oeuvres majeures montrent bien que ces béliers sont des animaux parés suivant un rituel assez précis et destiné vraisemblablement à être sacrifiés à la fin d'une cérémonie. Pour donner plus de prestance à l'animal, un agencement a été conçu pour l'obliger à redresser la tête. Sa parure de tête et souvent son gigantisme par rapport à l'homme ont pour but de magnifier la victime offerte à la divinité. Les gravures étaient peut-être destinées à matérialiser le sacrifice et à perpétuer son souvenir et donc son efficacité".

Ces béliers à sphéroides témoignent certes de pratiques cultuelles anciennes (grand art monumental) très tardivement tombées en décadence. Mais, en aucune manière, ils n'attestent l'existence sur place d'un élevage ovin. Ces manifestations artistiques pourraient même être sans rapport direct avec l'entretien de troupeaux.

La notion de troupeau, qui seule rend compte de l'instinct éminent grégaire d'ovins domestiques, splendidement rendu dans nombre de fresques sahariennes, fait ici complétement défaut. Alors que l'on compte par dizaines les autruches sur certaines parois constantinoises.

Cette notion de troupeau nous paraît capitale, son indéniable absence à de quoi surprendre. L'art rupestre de l'Atlas saharien n'apporte donc pas dans le cas de la domestication des ovins, les réponses attendues et que dire des caprins encore plus rares puisque deux exemplaires seulement sont gravés, tous deux localisés dans le

Sud-oranais? Pourtant ovins et caprins participent conjointement à cette néolithisation initiale du Maghreb.

Laissant de côté le thème d'ovin domestique à travers l'Atlas, ou peut se demander qu'elle serait la reponse apportée par l'étude exhaustive d'un petit territoire du Sud-oranais.

Le tout récent exemple fourni par l'étude du Père François Cominardi (1980) dans la Gouret Bent Saloul, 4e Gara, façade occidentale, apporte bien des informations de première main, scientifiquement classées et exploitables. Décomptes et tableaux fournissent, après analyses, le meilleur de l'étude.

L'étude statistique orientée vers une représentation de toute la faune gravée montre que Ovinés, Bovinés, Canidés, Suidés et Equidés apparaissent et disparaissent dans des proportions très variables. Si l'on prend comme base d'étude stylistique de d'ecoupage en 5 étages établi par H. Lhote; ces données s'ordonnent comme suit:

		Ovinés	Bovinés	Canidés	Suidés	Equidés
1	N.G.D.	18	7	7.5	3.5	27
2	N.P.D.	5	25	4	1	11.5
3	B.D.	1	15	7	–	6
4	B.	–	20	–	–	1.5
5	C.Sch.	–	9.3	9	–	7

(N.G.D.: naturaliste de grandes dimensions; N.P.D.: naturalistes de petites dimensions; B.D.: bubalin décadent; B: bovidien; C.Sch.: char schématique).

On reconnait donc dans l'art rupestre:

1 – Naturaliste de grandes dimensions:	48 % *d'Homoioceras antiquus*
	41 % d'éléphants
2 – Naturaliste de petites dimensions	90 % d'antilopes
3 – Bubalin décadent	34 % d'autruches
	31 % de Félidés
4 – Bovidien	20 % de Bovidés
5 – Chars schématiques	90 % d'autruches

Cette étude chiffrée, tenant compte de toutes les représentations, montre que les représentations mésestiment la domestication en général et celle d'ovins, caprins et bovins en particulier. Elle met en évidence un certain milieu animal, sauvage, dans lequel l'homme est parfois absent.

F. Cominardi établit également un indice de domestication fondé sur l'absence ou la présence de traits caractéristiques (attributs) comme les colliers, laisses, brides, caparaçons, selles, etc., sur les gravures d'ovinés, bovinés, canidés et équidés. Son étude rejoint notre hypothèse de pratiques vraisemblablement plus cultuelles ou cérémonielles que fonctionnelles.

Conclusion

Aborder la néolithisation consiste à étudier sous tous ses aspects les effects de la domestication animale et végétale. En Afrique du Nord, ce sujet n'a pas encore été systématiquement étudié. Des réponses partielles et ponctuelles sont toutefois apportées qui placent déjà cette façade méditerranéenne de l'Afrique à l'intérieur des grands courants de migration des idées et des hommes.

Ces réponses s'appuient sur des études zoologiques et botaniques récentes ainsi que sur le réexamen de l'art rupestre.

Actuellement, le Maghreb oriental livre suffisamment d'indications précises sur le régime économique adopté à partir du VI-Ve millénaire B.C. Un genre de vie pastoral s'installe dans les montagnes (grottes et abris). Ovins et caprins dominent d'abord dans l'Aurès, bovins, porcs et chiens viennent ensuite. La domestication animale entraîne l'élevage, assure une bonne subsistance (lait, viande, laine, peaux), favorise le troc de produits convoités et engendre une réalité économique typique d'une semi-sédentarisation.

L'Art rupestre nord-africain n'apporte hélas aucune preuve décisive et directe sur le sujet. Le thème du bélier à sphéroides n'est pas du tout convaincant.

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David Lubell

The Capsian palaeoeconomy in the Maghreb

Abstract

Capsian groups were hunter-gatherers; there is no evidence that they practiced agriculture. Some very late Capsian groups (called Neolithic of Capsian Tradition) appear to have practiced transhumant pastoralism with domestic sheep and goat which were not derived from species native to the Maghreb. In general, the Capsian diet included several species of land snails in addition to *Bos primigenius*, *Equus mauritanicus*, *Alcelaphus buselaphus*, *Gazella* spp., and lagomorphs. Almost nothing is known of the plants which were used and eaten. Capsian settlement patterns have been variously described as sedentary, semi-sedentary and nomadic on largely circumstantial evidence.

Research undertaken in the Bahiret Télidjène (Wilaya de Tébessa, Algeria) since 1972 has demonstrated the following:

1. At least two major periods of Capsian occupation are present: an earlier one (ca. 10,000 to 8,000 B.P.) and a later one (ca. 8,000 to at least 6,000 B.P.)

2. Environmental conditions during the earlier period were more humid and became increasingly arid at about 8,000 B.P. While there is evidence for subsequent amelioration, it seems the landscape did not recover sufficiently to support large herds of herbivores.

3. At the site of Ain Misteheyia this change at ca. 8,000 B.P. is marked by the following trends:

- reduced frequencies of larger land snails (*Helix melanostoma*) and increased frequencies of smaller, more arid-adapted species (*Helicella sitifensis*, *Leucochroa candidissima*);
- reduced frequencies of larger herbivores (*Bos*, *Equus*) and increased frequencies of smaller, more arid-adapted species (*Gazella*, lagomorphs) although *Alcelaphus* remains the most abundant species;
- reduction in the overall size of retouched tools as well as change in the frequencies of certain tool classes – burins backed blades and endscrapers are

common in the earlier assemblage, while notches, denticulates and geometric microliths are common in the later one;
- changes in the granulometry and geochemistry of the deposits consonant with an hypothesis of (at least local) environmental change.

4. At the site of Kef Zoura D, two assemblages are also present:
- an earlier one (ca. 9,000 B.P. and known so far only from the *in situ* deposits on the slope in front of the shelter) which contains abundant and large burins and backed blades in association with a fauna of large herbivores;
- a later one (ca. 6,000 B.P. known so far only from within the shelter) which contains abundant notches, denticulates and geometric microliths in association with a fauna composed almost exclusively of *Gazella* and lagomorphs.

5. Taphonomical studies of the deposits at both sites leads us to conclude that they were not occupied year-round, but rather for short periods at, perhaps, widely spaced intervals. We conclude that most, if not all, Capsian sites do not represent sedentary occupations, a reconstruction which agrees with modern ethnographic data on hunter-gatherers in semi-arid environments.

6. Based on these two sites we suggest that:
- Capsian assemblages with larger tools and high frequencies of burins (Typical Capsian) should be associated with a fauna composed primarily of larger herbivores;
- Capsian assemblages with smaller tools and high frequencies of notches, denticulates and geometric microliths (Upper Capsian) should be associated with a fauna composed primarily of smaller mammals;
- when both kinds of Capsian occur in the same site, "Typical" should be stratigraphically earlier than "Upper".

We also suggest that Capsian groups were small, mobile, and that their economy was based on a widely spaced seasonal round (*i.e.* one which included several environmental regions), and that this constituted a very flexible economic pattern which was not strongly affected by localized environmental changes during the Holocene in the Maghreb.

We conclude that, on present evidence, food production was a late (post 5,000 B.P.) development in the Maghreb because: (a) the Capsian palaeoeconomy was flexible and thus permitted long-term stability and continuity; and (b) the apparent absence of a suite of sufficiently nutritious plants (e.g. wheats and barley) did not permit the type of sedentary occupation which is a necessary adjunct to an agricultural mode of production.

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Diane P. Gifford-González and John Kimengich

Faunal evidence for early stock-keeping in the Central Rift of Kenya: preliminary findings

It was only during the mid-1960s that archaeologists working in East Africa fully recognized that remains of domestic animals occurred with wholly stone-based industries in many parts of the region. Since then, numerous excavations have been conducted in Kenya and Tanzania to investigate the distribution, environmental settings, artifactual variability, and internal organization of sites containing these earliest traces of the use of domestic stock in East Africa (see Bower; Nelson and Kimengich; Phillipson; this volume). While our knowledge of this phase of East African history is still sketchy and open to various interpretations, some basic aspects of the record have, over the past ten years, become clearer.

This paper reports on the faunal evidence from these sites that lie in the Central Rift region of Kenya. Since 1974, the senior author has analysed faunal remains from some seven sites in this region, and the junior author has analyzed bones from three others. In addition, we summarize the unpublished analyses of Drs. P. Carter and J. Harris of the fauna from Ngenyin, kindly furnished by Dr. F. Hivernel, the site's excavator. We have drawn also on published materials on Narosura (Gramly, 1972), which the senior author has recently re-analyzed. All opinions concerning the significance of these remains are those of the senior author.

The Central Rift region: environment and archaeological evidence

The Central Rift region of Kenya consists of a high (1,600 m.) valley bounded on both sides by steep escarpments that rise to over 3,000 m. Within the space of some 40 km at its narrowest segment, vegetation grades from open grasslands through savannah woodlands up through various forest types to alpine meadows. The bottom of the valley is dotted by a series of nonoutlet lakes, including, from north to south, Baringo, Bogoria, Nakuru, Elmenteita, and Naivasha. The Nakuru-Naivasha region is today considered prime ranchland, and archaeological evidence attests to heavy reliance on domestic stock in the area at least 3,000 years ago, when the regional climate was apparently similar to that today (Richardson and Richardson, 1972).

Early sites yielding remains of domestic animals, namely caprines and *Bos taurus*, have recently been referred to the "Pastoral Neolithic" by archaeologists working with them (*e.g.*, Bower *et al.*, 1977; Bower and Nelson, 1979; Ambrose, 1984). The majority of these sites have yielded radiocarbon dates ranging from 3,000 to 1,800 B.P., antedating the first clear Iron Age occupations in the region by at least 600 years.

There appear to be at least two industrial variants in this set of archaeological occurrences. Sites lying in more open country yield numerous geometric microliths (predominantly crescents), small scrapers, larger heavy duty tools, ground stone "axes", palettes, bowls, and ceramics. Some pottery is undecorated, while other decorated types have been classed in a series of "wares" with typical patterns of motif execution and placement (Wandibba, 1977).

Bower and Nelson (Bower *et al.*, 1977; Bower and Nelson, 1979) refer this suite of sites to a "Savannah-oriented Pastoral Neolithic" (SPN) cultural entity, in contrast to the Elmenteitan, to be discussed below. Ambrose (1984; personal communication) further subdivides the SPN sites into two groups on the basis of location and lithic "style": the SPN proper and Eburran 5, which he sees as descended from the early Holocene Eburran (formerly Kenya Capsian, Leakey, 1931) industry. In this paper we will merely note these differences in intepretation of the lithic assemblages, without venturing opinions as to the merits of these claims.

In the more closed environments of the Mau Escarpment, west of Lake Naiwasha, sites lying on the lower borders of the forests as well as along montane meadows, have yielded contemporaneous but different lithic assemblages, characterized by the presence of long blades. Associated with these is a distinctive type of decorated ceramic "ware". These have been referred to the Elmenteitan industry, as first described by L. S. B. Leakey (1931; Bower *et al.*, 1977; Ambrose, 1981; 1984). Thus far, we have analyzed fauna from only one Elmenteitan site, Maasai Gorge Rockshelter.

We have included one site, Narosura, that does not actually lie in the Central Rift but rather at the edge of the Mara Plains in the Loita hills. Since Narosura is the type-site for pottery found in many SPN sites of the Central Rift, it is culturally logical to include it.

Notes on comparability of assemblages

Before discussing our findings, we wish to stress that the sites present several problems of comparability and that our conclusions are therefore most tentative. First, some faunal samples are quite large, totalling many thousands of bones. These include the Prolonged Drift, Crescent Island Main, and Crescent Island Causeway sites. Other sites are much smaller, with under 1,000 pieces all told, including Akira, Ndibibi, Maringishu, Ngenyin. Otheres, such as Narosura, present special problems,

in that only those bones of maximum taxonomic value were saved, so that well over 90 percent of the site's 1,500 or so specimens can be attributed to a species.

The stratified site of Salasun, with dates ranging back to nearly 8,000 B. P. presents its own problems. With little more than 60 elements per cultural horizon, and 5–16 taxonomically diagnostic pieces among these, great caution should be exercised in interpreting the evidence. This site will be discussed in more detail later.

Because these samples are of such different sizes and were recovered under such different conditions, we have not attempted elaborate statistical comparisons. The excavations that produced these assemblages were essentially exploratory, and our findings are the first stage of a research program that should emphasize controlled and comparable recovery of large faunal samples from "Pastoral Neolithic" sites.

Data from the sites, when available, is given both in the form of raw counts and minimum number of individuals (MNI). Recently, several faunal analysts have pointed out the statistical problems involved in the use of the MNI statistic, which relatively overrepresents rare species (*e. g.* Grayson, 1978; Holtzman, 1979). We nonetheless include it here as a measure with which most archaeologists are familiar. We have also given the actual counts of elements per taxon, so that readers may assess the degree of bias in the MNI statistics within and among sites.

The sites

The faunal assemblages discussed, and details of their excavation and analysis are given in Appendix 1. They are arranged from north to south.

Implications of the data

Contrary to the general impression created by the early publication of Narosura (Odner, 1972; Gramly, 1972), and that of Gramly in light of the Lukenya material (Gramly, 1975), there is a striking amount of variation in the faunal assemblages among SPN sites, even when one confines one's attention primarily to the larger assemblages. One may divide these into two major groups. The first consists of those SPN sites at which cattle and sheep/goat do truly predominate. These include Crescent Island Causeway and Narosura. This group may also include Ndabibi and Maringishu, and is similar to the Lukenya Hill sites GvJm44, 48, and 52.

Single elements of wild species do occur in the Crescent Island Main and Causeway site assemblages. This may be simple "natural background noise", but a number of these elements are burned (and the assemblage as a whole is not), indicating human processing. Full elucidation of this matter must await further analysis.

Another group of sites yield a mixture of both domestic stock and a good proportion of wild animals, primarily the medium to large ungulates. These include

Prolonged Drift, Naivasha Railway, probably Ngenyn Phases 2 and 3, and possibly Akira. Among these, wild migratory grazers predominate at Prolonged Drift, while resident ungulates are much rarer; cattle, however, are the most number identifiable taxon from that site. The Naivasha Railway fauna contains more closed country resident species, as might be expected from its location near the present-day ecotone between open country and bush.

At this point, we can only speculate about the factors conditioning this variability in such a small geographic area. On typological grounds, Ambrose (1984) argues that at least some of the variation is due to cultural differences in disparate ethnic groups in the area, with Eburran 5 "peoples" creating such sites as Naivasha Railway Shelter. The Eburran 5 typology cross-cuts this faunal boundary, however, and any explanation of these differences must therefore include other factors as well. One possibility is that local people varied their diet through the seasons, taking advantage of migratory game while it was in the area and then falling back on the slaughter of livestock and hunting of resident game the rest of the year (Gifford *et al.*, 1980). Future investigations in the region should make every attempt to determine season of occupation of such sites.

We don't yet fully understand the patterns of herd management practised by these early stock-keepers, but there are some interesting hints at a different pattern than the modern East African pastoralists. Dental samples of *Bos* from Narosura and Prolonged Drift, and the Crescent Island sites as well, show a bimodal distribution of age at death, with a substantial number of very worn dentitions, but another cluster in the 24 - 36 months age range. This latter peak would not be expected to result from contemporary herd management practices in East Africa, in which females are kept alive until the end of their reproductive spans, but most males are killed well before reaching physical maturity. The 24 - 36 month "peak" may indicate that early pastoral stock managers allowed males to achieve considerable size (and potential meat yield) before slaughter. We can speculate that this pattern could occur under less stringently competitive grazing conditions than those obtaining today.

The single Elmenteitan occurrence yet fully analyzed, Maasai Gorge Rockshelter, is dominated by domesticates, especially caprines. Of interest is the fact that a number of the younger animals' teeth bear several bands of enamel hypoplasia (J. R. Baker, personal communication) which indicates severe physical stress during the period of dental growth. The multiple bands were not observed in any frequency on the caprine dentitions from other, SPN, assemblages I have analyzed. It remains to be seen whether this pattern is found in other Elmenteitan assemblages, or if it can be discerned in any SPN assemblages under review.

We have not aimed in this paper to trace the cultural evolutionary sequence that led up to the florescence of stock-keeping economies in the Central Rift or adjacent regions (see Nelson and Kimengich, this volume). However, since the stratified site of Salasun has yielded radiocarbon dates of some age, its faunal evidence bears

discussion. Table 10 presents in detail the exact nature of the finds, by cultural horizon. Bones of domestic animals have been recovered from even the deepest excavated levels of the site. This may indicate the presence of domestic stock in the region during earlier Holocene times. The senior author would, however, urge caution in the intepretation of these finds, in view of the extremely small size of the sample. Another factor to take into account when interpreting the occurrence of such low numbers of "diagnostic" finds, is the presence, throughout the sequence, of remains of the burrowing mole rat (*Tachyoryctes splendens*). We presently understand very little of the actual processes of formation of stratified deposits. Recovery of much larger faunal and artifactual samples from sites such as Salasun would seem the only way to feel reasonably confident of our inferences about early Holocene economy.

Conclusions

At present we do know that between the fourth millennium B. C. and first millennium A. D. peoples in the Central Rift were heavily reliant on domestic sheep, goats, and cattle. We also know that wild game formed a more substantial component in this ancient adaptive system than it did in pastoral adaptations of later times in the same region. While we are not yet sure of the best model for explaining the variability in faunal assemblages from this period, there are hints that the Elmenteitan industry may well be associated with a different pastoral strategy than that evidenced in savannah sites. Herd management patterns in the savannah zone may differ considerably from those of modern pastoralists' in East Africa, a point which merits further investigation.

Our next round of research in Central Kenya should focus on understanding subsistence systems and settlement arrangements in greater detail. This will require greater areal excavation of sites, recovery of large faunal samples, and emphasis on recovery of data relevant to understanding cultural contact and economic exchange (*e.g.*, obsidian and ceramics). These should help us understand the nature of this early phase of food production in East Africa [1].

Appendix

Ngenyn. On slopes west of Lake Baringo. Excavated by Hivernel (1978). A stratified open site with at least two PN occurrences, one dating 2,020 ± 130, the other 1,970 ± 130 B. P. Fauna analyzed by P. Carter and J. Harris, only a species list presented

[1] We would like to thank Stanley Ambrose, John Bower, Barbara Green, Françoise Hivernel, Glynn Isaac, Fiona Marshall, and Charles Nelson for supplying unpublished data, labor, and various other forms of support for these analyses. We are grateful to the Kenya National Museum and Field Museum of Natural History for use of comparative materials.

Table 1

Ngenyn	Number	MNI
Phase One		
Ovis aries	1	1
Gazella sp.	3	1
Total	4	2
Phase Two		
Capra hircus	1	1
Gazella sp.	2	1
Bos taurus	11	2
Hippotragus equinus	1	1
Phacochoerus aethiopicus	21	1
Potamochoerus porcus	1	1
Nonidentifiable/less identifiable	2	
Total	39	7
Phase Three		
Madoqua kirki	6	1
Madoqua sp.	4	1
Rhynchotragus guentheri smithii	3	1
Nesotragus moschatus	2	1
Cephalophini	1	1
Capra hircus	8	1
Ovis aries	2	1
Gazella thomsoni	1	1
Gazella sp.	4	3
Aepyceros melampus	2	1
Tragelaphus scriptus	1	1
Kobus ellipsiprymmus	1	1
Bos taurus	19	1
Alcelaphus buselaphus	2	1
Connochaetes taurinus	3	1
Hippotragus equinus	1	1
Oryx gazella	2	1
Taurotragus oryx	3	1
Phacochoerus aethiopicus	14	1
Equus cf. *burchelli*	5	1
Colobus sp.	2	1
Genetta sp.	1	1
Crocuta crocuta	1	1
Hystrix cristata	1	1
Tachyoryctes splendens	1	1
Phoeniconaias minor	3	1
Crocodylus niloticus	1	1
Testudinae sp.	1	1
Serpentes sp.	1	1
Nonidentifiable/less identifiable	36	
Total	132	31

Plus an untabulated number of very small nonidentifiable scraps in all three phases.

in publication. Original notes reworked by Gifford. Assemblages small, about 40 and 130 elements, respectively. SPN, with Akira, Narosura, perhaps Remnant wares (Table 1).

Maringishu (GqJi16). South 20 km of Lake Bogoria. Excavated by Bower (Bower *et al.*, 1977). A single component open site, with a radiocarbon determination of 1,695±105 B. P. Fauna analyzed by Gifford, assemblage small, 42 pieces of identifiable bone (Table 2). SPN, with distinctive standardized ware, named after site.

Table 2

Maringishu (GqJi16)	Number	MNI
Bos taurus	9	3
Nonidentifiable/less identifiable	33	
Total	42	3

Plus an untabulated number of very small nonidentifiable scraps.

Prolonged Drift (cf. Long's Drift) (GrJi1). On Nderit River floodplain, southwest of Lake Nakuru. Excavated by G. Isaac and C. Nelson. A single component open site, possibly one of a cluster of middens and living areas in the vicinity. Fauna analyzed by Gifford (Gifford *et al.*, 1980). Radiocarbon determinations on elephant ivory pestle of 2,530±160 B. P. and 2,315±150 B. P. are deemed reasonable (*ibid.*). Assemblage very large, over 165,000 pieces of bone (Table 3). SPN, Narosura ware.

Table 3

Prolonged Drift (cf. Long's Drift, GrJi1)	Number	MNI
Bos taurus	252	22
Connochaetes taurinus	243	19
Alcelaphus buselaphus	138	18
Equus burchelli	478	16
Gazella thomsoni	165	15
Gazella granti	122	11
Aepyceros melampus	35	7
Caprini	46	5
Taurotragus oryx	37	4
Syncerus caffer	11	2
Phacochoerus aethiopicus	14	1
Giraffa camelopardalis	6	1
Ceratotherium simum	4	1
Tachyoryctes splendens	28	5
Acomys sp.	6	2
Lepus capensis	1	1
Total identifiable	1,586	130
Nonidentifiable/less identifiable	163,840	
Total	165,426	130

Crescent Island, Main Site. On southeast side of Lake Naivasha. Excavated by J. Onyango-Abuje (1977a, 1977b). Probable single component open site, perhaps one of a cluster of middens in area. Fauna analyzed by J. Kimengich; records reviewed and retabulated by Gifford. Radiocarbon dates of 2,795±155, 2,660±160, 2,660 ±120, 2,535±140, 2,405±150 B. P. Assemblage very large, probably over 100,000 pieces of bone (525 taxonomically diagnostic pieces), (Table 4). SPN with Narosura Ware.

Table 4

Crescent Island Main Site	Number	MNI
Bos taurus	330	16
Caprini	98	6
Equus burchelli	22	4
Hippopotamus amphibius	50	2
Alcelaphus buselaphus	4	2
Connochaetes taurinus	3	1
Taurotragus oryx	1	1
Tragelaphus scriptus	1	1
Gazella thomsoni	2	1
Madoqua sp.	1	1
Sylvicapra grimmia	2	1
Raphicerus campestris	1	1
Giraffa camelopardalis	1	1
Phacochoerus aethiopicus	1	1
Potamochoerus porcus	1	1
Aves sp.	1	1
Acomys sp.	1	1
Tachyoryctes splendens	4	1
Rattus sp.	1	1
Total	525	44

Plus an untabulated number of very small nonidentifiable scraps.

Causeway Site, Crescent Island (GtJj3). As above, only a short distance from the Main Site. Excavated by C. Nelson. Open site, probably a cluster of single-episode occurrences; most bone from a probable midden, which also yielded Narosura Ware. Fauna partially analyzed (teeth and diagnostic postcranial) by J. Kimengich; records reviewed and retabulated by Gifford. Radiocarbon determination of 2,045 ±125 B. P. Moderate sized assemblage, perhaps several tens of thousands of pieces (392 taxonomically diagnostic pieces) (Table 5). SPN, with Narosura Ware, according to Bower *et al.*, 1977; Ambrose (1984) argues this is an Eburran 5 site. **Naivasha Railway Shelter** (GtJk21). At base of slope of eastern side of Rift, less than 10 km east of Lake Naivasha. Excavated by M. D. Leakey, lithics analyzed by C. Nelson (1973), ceramics by J. Onyango-Abuje (1977a), fauna by J. Kimengich (Onyango-Abuje, 1977a). Faunal records reviewed and retabulated by Gifford. Stratified open site, with four strata of PN occurrences, which have been called Eburran 5 by Ambrose (1984) and are at any rate more similar to SPN assemblages.

Table 5

Causeway Site, Crescent Island (GtJj3)	Number	MNI
Bos taurus	220	12
Caprini	141	12
Equus burchelli	6	2
Hippopotamus amphibius	7	2
Alcelaphus buselaphus	7	2
Raphicerus campestris	1	1
Giraffa camelopardalis	2	1
Loxodonta africana	1	1
Tachyoryctes splendens	3	1
Leptoptilos crumeniferus	4	1
Total	392	35

Plus an untabulated number of very small nonidentifiable scraps.

Narosura ware is present. Radiocarbon determination from PN material of 2,000 ±135 B. P. Faunal assemblage very large, several thousand pieces (276 taxonomically diagnostic pieces) (Table 6).

Table 6

Naivasha Railway Shelter (GtJk21)	Number	MNI
Alcelaphus buselaphus	52	4
Gazella thomsoni	33	4
Caprini	46	3
Bos taurus	10	2
Raphicerus campestris	3	2
Connochaetes taurinus	11	1
Tragelaphus scriptus	1	1
Taurotragus oryx	1	1
Gazella granti	1	1
Aepyceros melampus	2	1
Sylvicapra grimmia	3	1
Redunca redunca	2	1
Phacochoerus aethiopicus	2	1
Equus burchelli	8	1
Heterohyrax brucei	1	1
Lepus capensis	2	1
Cercopithecus mitis	1	1
Panthera pardus	1	1
Crocuta crocuta	1	1
Tachyoryctes splendens	85	10
Rattus rattus	7	2
Tatera nigricaudata	1	1
Arvicanthis abyssinicus	1	1
Otomys sp.	1	1
Total	276	45

Plus an untabulated number of very small nonidentifiable scraps.

Maasai Gorge Rockshelter (GsJj25). At base of Mt. Eburru, facing east to Lake Naivasha. Stratified rockshelter deposits of Eburran, Elmenteitan, and Iron Age. Excavated by Ambrose and Nelson (Bower *et al.*, 1977; Ambrose 1980). Fauna originally analyzed by Ambrose and Green (1980), further identification by Gifford. Radiocarbon determinations from Elmenteitan strata: 1,545±135, 1,560±135, 2,325±145, 2,515±140, 2,595±135 B. P. Assemblage small, slightly over 350 identifiable pieces, mainly from the Elmenteitan strata. Elmenteitan, Remnant Ware (Table 7).

Table 7

Maasai Gorge Rockshelter (GsJj25)	Number	MNI
Elementeitan Strata		
Caprini	80	8
Bos taurus	30	3
Suidae	4	
Equus burchelli	1	1
Nonidentifiable/less identifiable	196	
Total	319	13

Plus an untabulated number of very small nonidentifiable scraps.

Ndabibi (GtJi3). West of Lake Naivasha, between the lake and the Mau Escarpment. Excavated by J. Bower, fauna analyzed by Gifford. Apparently single component, but extremely disturbed by rodents, open site (J. Bower, personal communication). Radiocarbon determinations for the site range over a considerable span: 1,415±150, 1,665±145, 2,225±155 B. P. (Bower *et al.*, 1977). Faunal assemblage is small, with some 300 pieces, only 116 taxonomically diagnostic (Table 8). SPN with Narosura Ware.

Table 8

Ndabibi (GtJi3)	Number	MNI
Caprini	45	1
Capra hircus	13	3
Ovis aries	1	1
Gazella thomsoni	4	2
Gazella granti	3	1
Bos taurus	20	3
Bovini	1	
Large carnivore	1	1
Small primate	1	1
Lepus capensis	1	1
Small insectivore	1	1
Pedetes surdaster	1	1
Tachyoryctes splendens	23	6
Nonidentifiable/less identifiable	115	
Total	191	22

Akira (GuJj2). On northwestern slopes of Mount Suswa. Excavated by J. Bower, fauna analyzed by Gifford. A stratified open site, with Pastoral Iron Age overlying SPN. Radiocarbon determinations for the site's SPN component are 1,255±140, 1,775±150, 1,965±140 B. P. Faunal assemblage is small, with slightly over 350 elements, only 101 taxonomically diagnostic (Table 9). SPN, type site of Akira Ware.

Table 9

Akira (GuJj2) Iron Age (0 - 24 cm)		Number	MNI
Small bovid		16	
Caprini		7	(2)*
Capra hircus		6	1
Medium bovid		3	
Large bovid		6	
Bos taurus		4	2
Alcelaphini		4	2
Mammal, size indet.		2	
Small mammal		3	
Medium mammal		5	
Large mammal		6	
Very large mammal		6	
	Level total	68	7
„Sterile" (25 - 74 cm)			
Small bovid		10	
Caprini		17	3
Gazella granti		1	1
Medium bovid		2	
Large bovid		8	
Bos taurus		6	2
Alcelaphini		2	1
Small mammal		1	
Medium mammal		2	
Large mammal		1	
Very large mammal		4	
	Level total	54	7
Akira (75 - 169 cm)			
Bovid, size indet.		1	
Small bovid		11	
Medium bovid		3	
Large bovid		24	
Bos taurus		1	1
Alcelaphini		10	(1)**
Alcelaphus buselapus		2	(1)**
Very large bovid		2	
Equus sp.		2	
Equus burchelli		4	1
Cercopithecid sp.		1	1
Mammal, size indet.		4	

cont. Table 9

Medium mammal		2	
Large mammal		3	
Very large mammal		1	
	Level total	71	5
Akira/Elmenteitan (170 - 200+cm)			
Very small bovid		2	
Small bovid		10	
Caprini		2	1
Gazella granti		1	1
Medium bovid		1	
Large bovid		19	
Bovini		2	
Bos taurus		1	1
Alcelaphini		11	
Alcelaphus buselaphus		3	2
Equus sp.		2	
Equus burchelli		4	1
Rodent sp.		2	1
Mammal, size indet.		1	
Medium mammal		1	
Large mammal		6	
Very large mammal		4	
	Level total	72	7
	Total	265	26

* Two juvenile elements not represented in *Capra hircus*.

** Each represented by adult left M-3̄.

Salasun (GuJj13). Within the Mount Suswa caldera, on the northern side. Excavated by J. Bower, fauna analyzed by Gifford. A stratified open site close to a rockshelter; at least 5 major archaeological horizons, spanning over 7,000 years (Bower *et al.*, 1977; Bower and Nelson, 1979). PN levels characterized by Narosura Ware and undecorated ware; radiocarbon determinations for PN levels: 2,990±170, 2,680±150 B. P. Layers below have yielded pottery and domestic animal elements (Table 10). Total faunal assemblage extremely small, about 283 pieces (only 68 taxonomically diagnostic) distributed through the archaeological horizons.

Table 10

Identifiable fauna from Salasun (GuJj13), by level

Cm depth	Cultural affinities (Bower and Nelson, 1979; Bower, personal communication)	14C B.P.	Diagnostic elements
0 - 4	Maasai-modern		Caprini: DP^3-, patella *Bos*: P_2-, 2x M_3-

cont. Table 10

5 - 39	Pastoral Iron Age	1,185 ± 140	Caprini: metacarpal; patella; 2x phalanx 2 *Bos*: cheektooth fr.; phalanx 1 *Tachyoryctes*: mandible
40 - 74	PN-Narosura + undecorated ceramics	2,990 ± 170	Caprini: metacarpal; patella; phalanx 1 *Gazella thomsoni*: phalanx 2; 2x phalanx 3 Bovini: cheektooth fragment *Bos*: P_4-, unciform *Connochaetes*: M_1- *Tachyoryctes*: 3x incisor, 1 molar; cranium; 5x mandible
75 - 95	LSA + Narosura + undecorated ceramics	2,680 + 150	Caprini: lateral cuneiform *G. thomsoni*: phalanx 3 *Bos*: M_1-, astragalus Alcelaphini : humerus
96 - 125	LSA + punctate-decorated ceramics	6,595 ± 235	Caprini: $DP^{2,3,4}$; P^2; M^1; phalanx 3 *G. thomsoni*: 5x phalanx 3 *Bos*: M? Alcelaphini: 2xM?, tibia *Connochaetes*: M^3; M? *Lepus*: humerus *Tachyoryctes*: incisor *Achatina*: shell fragment
126 - 149	LSA + indeterminate ceramics	–	Caprini: DP^2-; M?; dentary + DP_3- *G. thomsoni*: phalanx 2, 4x phalanx 3 *G. granti*: phalanx 3 Alcelaphini: M_3- *Alcelaphus*: M^1 *Connochaetes*: $M^{1/2}$
150 - 235	LSA cf Eburran + 2 sherds indeterminate ceramics	7,255 ± 225	cm 150 *G. thomsoni*: phalanx 3 155 *G. thomsoni*: phalanx 2,3 *Bos*: P_4- 160 Caprini: DP^3- *G. thomsoni*: phalanx 3

cont. Table 10

			170 Caprini: phalanx 3 *Phacochoerus*: molar fragment 180 *Connochaetes*: M_3- 205 *Redunca redunca*: M_1- Alcelaphini: naviculo-cuboid *Tachyoryctes*: incisor 225 *Tachyoryctes*: mandible 230 *Tachyoryctes*: cranium 235 Caprini: magnum *Tachyoryctes*: incisor 245 *Tachyoryctes*: cranium

Plus an untabulated number of very small nonidentifiable scraps for all depths.

Narosura. On Narosura River, in Narok region on the west side of Mau Escarpment Excavated by Odner (1972); fauna analyzed by Gramly (1972). Open site, apparent longterm occupation with structural remains. Radiocarbon determinations: 2,360 ±110, 2,640±115, 2,660±115, 2,760±115 B. P. Assemblage of moderate size, about 1,600 pieces of taxonomically diagnostic cranial and postcranial elements, other bone not saved, reanalyzed by Gifford, 1980 (Gramly's analysis included only .teeth). SPN, type site of Narosura Ware (Table 11).

Table 11

Narosura	Number	MNI
Madoqua sp.	1	1
Caprini	447	47
Capra hircus	31	5
Ovis aries	14	2
Gazella thomsoni	10	4
Gazella granti	1	1
Bovini	11	
Bos taurus	881	41
Kobus ellipsiprymnus	2	1
Alcelaphini	2	
Connochaetes taurinus	11	1
Phacochoerus aethiopicus	1	1
Giraffa camelopardalis	1	1
Equus sp.	3	
Equus asinus	2	1
Equus burchelli	6	2
Diceros bicornis	2	1
Total identifiable	1,442	109
Nonidentifiable/less identifiable	387	
Total	1,829	

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JOHN R. F. BOWER

Subsistence-settlement systems of the Pastoral Neolithic in East Africa

Introduction

Knowledge of the Pastoral Neolithic in East Africa, the region's first set of cultural adaptations to a food-producing way of life, has accumulated rapidly during recent years (Bower *et al.*, 1977; Bower and Nelson, 1979; Onyango-Abuje, 1977). Unfortunately, as is frequently, the case during the "boom" phase of research on a new topic, the effort has often been rather haphazard, and our understanding of the data has lagged substantially behind its accumulation. Other participants in the conference will deal with Pastoral Neolithic (PN) culture history and subsistence patterns; this paper is aimed at understanding PN settlement practises. Specifically, my objectives are:

1. to list and evaluate data that may shed light on PN subsistence-settlement systems and
2. to generate a series of models for such systems which are compatible with existing archaeological and ethnographic data and can be tested archaeologically.

Before proceeding toward these objectives, I must interject a few words of caution. The task at hand is fraught with difficulties, some of which are essentially empirical and will probably be eased in due course as a result of more and better field studies, but some are conceptual and may ultimately prove more intractable. Included among the first category is the fact that few PN sites have been dug, not more than three dozen scattered from northern Kenya to central Tanzania (not counting outliers such as Lukenya Hill), and the excavations have usually been very limited, sampling only a small fraction of the site. Moreover, the data yield from the sites has often been poor, sometimes because of limited sampling but too frequently because the excavated material has been inadequately collected and/or analyzed. A particularly serious deficiency is that hardly any effort has been made to obtain information on plant remains from PN sites, other than the charred material from the crematorium at Njoro River Cave (Leakey and Leakey, 1950).

A problem which stems largely from the impoverished nature of the PN data base and the general lack of extensively excavated sites is that of establishing the specific cultural identity and chronological position of archaeological debris. Although it is often possible to attribute materials confidently to the Pastoral Neolithic, recent work suggests that this entity includes a variety of (ceramically defined) cultures and spans a very large range of time, from perhaps 8,000 - 1,200 radiocarbon years ago. Not only is there evidence to suggest considerable variety in adaptations among the cultures, but some of them apparently persisted over many centuries, during which they probably experienced substantial re-adaptation. This implies that material broadly identified as Pastoral Neolithic may be of little value in drawing inferences about specific cultural systems. And such broad identifications are often the only ones possible in dealing with surface occurrences or sparsely excavated sites.

Among the many conceptual problems that beset efforts to derive testable models of PN subsistence-settlement systems, two deserve special mention. One stems from the bewildering variety of settlement practises observed among contemporary East African pastoralists (Turner, 1969), which makes it difficult to use ethnographic information in the modelling process. The problem, which has yet to be effectively tackled, is to identify a limited number of axes of variation that can account for most of the formal differences observed among the settlement practises of different pastoral cultures. The other major problem in a sense stems from the resolution of the first, namely, that the use of ethnographic information in model building rests upon uniformitarian assumptions. This is, of course, an old problem in archaeology, but it is especially troublesome in the present context because a growing body of evidence suggests that some of the PN cultural adaptations may have been utterly unlike any ethnographically known pastoral cultures of East Africa (cf. Gifford and Kimengich, this volume). Thus, the use of ethnographic information in constructing models of PN subsistence-settlement systems may introduce unwarranted constraints.

Nature of the data

Before identifying the specific kinds of data available for constructing models of PN subsistence-settlement systems, it will be useful to summarize their general characteristics, particularly their broad geographic and cultural attributes and some of the problems that arise in applying them to the issue at hand. The data come from extensive ecologicaly stratified surveys and limited test excavations in two contrasting regions: (1) the Central Rift Valley of Kenya and adjoining lands and (2) the Serengeti National Park, Tanzania (Bower *et al.*, 1977; Bower and Gogan-Porter, 1981). Apart from geographic separation, the main difference between these regions is that the former is a complex, ecological mosaic, wherein ecozone boundaries are often abrupt, while the latter is not only ecologically simpler but also exhibits

gradual change from zone to zone. Included in the data are surface observations and collections from about 130 sites and excavated information from about a dozen sites. In addition, I have considered data from about half a dozen sites, such as Narosura, excavated by others in or near the Kenya Rift. Despite the geographic breadth and ecological diversity of the material, there is substantial overlap in PN cultures between the two regions. For instance, at least three of the PN ceramic wares commonly found in the Kenya Rift and adjoing areas – Akira, Narosura and Nderit – also occur in the Serengeti region.

The occurrence of given cultural entities in ecologically distinct regions offers interesting possibilities for comparative studies of subsistence-settlement systems. However, the prospects are presently clouded by the incomparability of data from different research projects. The reason for this is that sampling procedures, data collection methods and analytical systems often vary markedly from project to project. Thus, although some attempts at comparison will be undertaken here, they are regarded as highly tenuous and will be limited to those classes of data which appear to be least affected by differences in sampling procedures, etc. Four classes of data that seem to meet this criterion are: (1) site size, (2) stone tool frequencies (3) variety of artifact classes and (4) intensity of occurrence of pottery. The omission of faunal data from the list may seem odd; this is due not only to their being included in Gifford's and Kimengich's contribution (this volume) but also to the fact that the problems of comparability outlined above apply to them with special force.

The site size datum is based upon measurement of the maximum observable dimension of a site. The relevance of this datum to subsistence-settlement systems rests on the assumption that site area is a gross relative measure of population among PN settlement, and that area is positively correlated with maximum dimension. While it is obviously preferable to use a direct measurement of area for assessing relative settlement population, few such measurements are available. On the other hand, there are data on maximum dimension for all of the sites found in surface investigations in the Kenya Rift and Serengeti regions. (Since this is not true of the excavated sites, no attempt has been made to estimate their relative sizes.)

The data on stone tool frequencies are limited to relative values (*i.e.*, percentages) among three broadly defined categories: scrapers, backed pieces and *outils écaillés*. Again, the great breadth of the data "mesh" is designed to maximize comparability. The relevance of tool frequency data to the issue at hand depends upon the assumption that differences among sites reflect variation in activities, which is in turn related to the use of different resources in different ecological settings and/or during different phases of a settlement cycle.

Artifact variety is intended to provide an estimate of the relative "functional size" of sites (Johnson, 1977), which is more or less the reciprocal of site specialization – *i.e.*, if one site exhibits greater "functional size" than another, it is also less specialized. While it may be possible to identify a series of artifact classes whose presence or absence would serve to estimate relative "functional size", expediency has

dictated limiting the list to one: the stone bowl. Although the funtcion of stone bowls in PN cultures remains enigmatic, they do occur in at least several, if not all, of the cultures and they seem likely to reflect specialized (ritual?) activities. Because of the generally low, but extremely varied, intensity of sampling in the surface investigation, data on "functional size" are restricted to the excavated material.

The intensity of occurrence of pottery was measured differently in surface investigations and test excavations. In the former, it was estimated by computing the ratio of pottery sherds to shaped stone tools, while in the latter it was measured in terms of the ratio of pottery sherds to all stone artifacts. However, in each case differences among the ratios were assumed to reflect differences in mobility, with lower ratios expressing greater nomadism.

Since space limitations preclude a detailed tabulation of the data in each of the four classes, a general summary will be provided. The summary is divided into two sections, one dealing with survey data and the other with excavated information; in addition, each summary will be organized so as to reflect comparison between the two regions involved, the Kenya Rift and the Serengeti.

In considering the survey data, it is important to note that the sample from the Kenya Rift, representing somewhere between 51 and 85 PN sites, has greater statistical utility than the Serengeti sample, which represents a mere 11 to 14 sites. Moreover, the data for measuring the intensity of occurrence of pottery are unavailable from the Serengeti, and, as was indicated earlier, "functional size" is altogether omitted from the summary of survey data.

The survey data from the Serengeti suggest that the largest sites occur in the arid, short-grass plains, while the size distribution may be "primate" – that is, the large sites are larger and small ones smaller than would be expected if rank and size were linearly related. The data from the Kenya Rift suggest a markedly different situation, wherein the larger sites are concentrated in the wetter, more heavily forested ecozones and the size distribution more nearly approaches a rank-size rule (site of rank x is 1/x the size of the largest site). As for stone tool frequencies, the only clear pattern to emerge from the Serengeti data refers to backed pieces, which are abundant in sites on the short-grass plains, scarce in wooded regions and totally absent from sites in the intermediate zone, namely, the tall-grass plains. In the Kenya Rift, a broadly parallel situation occurs: that is, backed pieces tend to be more abundantly represented in the drier, more open environments, although they are not absent from any of the ecozones recognized in the study, while the frequencies of scrapers and *outils écaillés* show no pattern with respect to environment. Finally, the intensity of occurrence of pottery in the Kenya Rift sites also does not appear to vary systematically with environment (or anything else, for that matter).

The data from excavated sites is summarized largely in Table 1, which includes information from three sites in the Serengeti (HbJd1, HbJd3 and HcJe1), two sites in the Western Highlands of Kenya (Tunnel and Muringa Rockshelters; Sutton, 1973) and sites in or on the edge of the Central Rift Valley, Kenya. In most cases,

the summaries include the entire sample of excavated material from the site; the sole exception is HbJdl, the Seronera Game Lodge site, where a major cultural break was observed between levels 2 and 3 at SE-2 (Bower, 1973). That is, the pottery from levels 1 and 2 was predominantly Akira ware, while the sherds from level 3 were

Table 1

Summary of excavated data: Serengeti and Kenya Rift

Provenience	Tool ratios scrapers backed pieces/OE	Stone bowls	Pottery/stone
HbJd1 (SE-2, lev. 1)	.55/1/.36	?	.07
HbJd1 (SE-2, lev. 2)	.72/1/.52	?	.10
HbJd1 (SE-2, lev. 3)	1/.84/.69	?	.03
HbJd3 (SRI Kopjes)	1/.86/.85	–	< .01
HcJe1 (Gol Kopjes)	1/.26/.82	–	.02
Tunnel Rockshelter	.54/1/.59	–	.05
Muringa Rockshelter	.04/1/.04	–	< .01
Hyrax Hill (PN)	.05/1/.02	×	.03
GqJc6 (Maringishu)		×	.29
GsJh1 (Remnant)	.34/1/.04	–	.36
GsjJ25 (Maasai Gorge)	1/.89/.11	–	
GtJi3 (Ndabibi)		–	< .01 - .03
Crescent Island	1/.25/.03	×	.09
GuJj2 (Akira)		–	.10
GuJj13 (Salasun)		×	< .01 - .03
Narosura	.26/1/.25	×	.28

mainly Nderit ware (Actually, level 2 is probably best viewed as transitional between Akira and Nderit). The question marks concerning stone bowls at Seronera reflect the fact that all of the bowls recovered at the site came from disturbed contexts, such that it is impossible to determine their associations. Crosses indicate presence, bars absence; blank cells represent missing data.

Evaluation of data

Although data suitable for testing the assumptions underlying the interpretation of site size are not yet available, some preliminary evaluation of the other three data classes is possible. As regards the significance of tool frequencies, the broad similarity in covariation between backed pieces and environmental parameters in the Serengeti and Kenya Rift surveys noted earlier lends support to the assumption that this tool category is more or less functionally specific. What seems to have

happened is that PN cultures in both of these widely separated regions varied the intensity with which they used backed pieces in response to the same kinds of environmental circumstances, and this suggests that the tools were used for a similar, rather narrowly defined range of purposes in both regions. The fact that scraper frequencies do not exhibit any readily discernible pattern of variation, but rather seem to vary more or less haphazardly, suggests either that the tool may have served a multitude of purposes or that the purpose(s) it served were not environmentally determined. This observation may also apply to *outils écaillés*, a category which appears to grade into bipolar cores and may, in fact, often embrace substantial quantities of the latter.

More focussed light can be shed on the assumption regarding tool frequency by considering the excavated data. What apprears to emerge here is that, for a given culture in a particular environmental setting, the ratios of tool frequencies are more or less stable, but they fluctuate widely when either of the other variables is altered. Thus, for example, the ratios in the Akira levels (1 and 2) at HbJd1 are closely similar, as are the ratios at level 3 of the same site and HbJd3, which occupy about the same range of time, seem to include broadly similar wares and lie within the same ecozone. On the other hand, Narosura and Crescent Island, which have virtually identical pottery but occur in markedly different environments, differ strikingly in tool ratios.

The assumptions concerning "functional size" and the ratio of pottery to tools are, to some extent, mutually supportive. That is, one would expect specialized sites to be occupied episodically and thus to exhibit a low ratio of pottery to stone artifacts coupled with small "functional size". In addition, sites with evidence of prolonged, possibly continuous, occupation would be expected to contain a high ratio of pottery to tools and evidence of substantial "functional size". Both of these expectations are largely fulfilled in the excavated data. Sites that lack stone bowls generally have low pottery to tool ratios, and, although the converse is not consistently true, one of the exceptions (Salasun) has yielded only one stone bowl fragment. The only site (Remnant) which lacks stone bowls yet has a high ratio of pottery to tools also contained structural features suggestive of prolonged or continual occupation. On the other hand, it must be admitted that the Gol Kopjes site, HcJe1 which has a very low ratio of pottery to tools, also includes impressive structura, features in the form of boulder lines (Bower and Gogan-Porter, 1981). However, the sampling intensity was exceptionally low at HcJe1, and it is possible that the pottery/tool ratio is not representative. While this may sound like special pleading, the reader is reminded of the shortcomings in the data enumerated earlier, of which the present case is a specific example.

The models

In an earlier work (Bower *n. d.*), I proposed two models for Pastoral Neolithic subsistence-settlement systems, one called the Transhumant Pastoralist (TP) mo-

del and the other, the Peripatetic Pastoralist (PP) model. It now seems clear that no such simple scheme will suffice for so complex a phenomenon as the PN. But, despite the need for additional models, it remains likely that PN cultures in the two regions considered here differed fundamentally in their subsistence-settlement systems. This is evident in, for example, the more or less reciprocal patterns of site size distribution in the Kenya Rift and in the Serengeti. In this section, I shall outline a series of models with illustrations of specific archaeological occurrences that may fit them.

The TP model is broadly analogous to the Nuer system (Evans-Pritchard, 1940), except that game substitutes for fish. Subsistence depended largely on livestock (and possibly cereals) during the wet season, when settlement was essentially confined to large villages with sharply defined territories. During the dry season, subsistence shifted to wild game, and this involved a phased movement from large villages on the short-grass plains to ephemeral camps in the woodlands. This model may be illustrated in the Serengeti by the three sites mentioned earlier: HcJe1, HbJd1 and HbJd3. The first is a large site with evidence of permanency, such as boulder structures, and indications of territoriality, including the fact that raw materials for stone-tool manufacture are largely restricted to locally available quartz. Of the remaining two sites, HbJd3 appears to be a small hunting camp, while HbJd1 seems to be a larger site, embracing numerous activities and containing evidence that occupation was restricted to the wet season. At both HbJd1 and 3, there are substantial quantities of exotic stone, suggesting wider range of interaction among social units.

At high elevations, there may have been a variant of the TP model in which populations aggregated in relatively wet areas during the dry season and dispersed in drier regions during the wet season. The Remnant and Maasai Gorge sites, respectively, may reflect the two seasonal phases of this model (Ambrose, 1980).

The PP model is one for which no modern analogue exists. Subsistence may have broadly paralleled that of such contemporary East African hunter-gatheres as the Hadza, with the addition of small numbers of livestock. The range of a given social unit was probably large, but territories were not defended and settlement mobility perhaps was geared to the migration of prey herds. Settlements representing this model might tend to be monotonous and should contain abundant remains of wild game together with small quantities of domestic fauna. Examples might include Ndabibi, Akira (both the type site and the Akira levels at HbJdl), Salasun and the Naivasha Railway site (cf. Gifford and Kimengich, this volume). This model, too, is likely to have had variants, although it is presently impossible to specify their attributes.

Another model that emerges from both logical and empirical considerations can be called the Stationary Pastoralist (SP) model. It involved fixed settlement and subsistence based upon a combination of domestic livestock, wild game and perhaps crops. Modern parallels for this system can be found among various cultures borde-

ring the Kenya Rift, including several identified as Kalenjin (Sutton, 1973). Prehistoric sites illustrating the system might include Narosura and Prospect Farm (cf. Gifford and Kimengich, this volume). Again, one might suppose that the model included variants.

Conclusions

While it is obviously impossible to test the models for PN subsistence-settlement systems adequately on the basis of present data, it seems fair to conclude that data suited to this purpose are available in and on the ground. What seems to be needed is a series of intensive, small-scale regional studies of PN cultures aimed at generating reliable data on site size, activities, catchment, range of interaction, season of occupation and, above all, subsistence practises.

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CHARLES M. NELSON and JOHN KIMENGICH

Early phases of pastoral adaptation in the Central Highlands of Kenya

Introduction

Early pastoral adaptations are known from two localities: Mt. Suswa in the Rift Valley 70 kilometers northwest of Nairobi, and Lukenya Hill 40 kilometers east of Nairobi. Successions at these localities demonstrate that pastoral adaptations are in place no later than 7,000 B.P. Between 7,000 and 3,500 B.P. domestic animals were kept as a supplement to hunting and gathering. Around 3,500 B.P. there is a shift in settlement location accompanied by the appearence of the first sites which are structured around the maintenance of domestic stock. Between 500 and 1,000 years later complex Pastoral Neolithic adaptations emerge and spread over wide areas in East Africa.

Mt. Suswa succession

The site of Salasun (GuJj13) is situated in the outer caldera of Mt. Suswa (Bower and Nelson, 1979). It contains 260 cm. of cultural deposits and was occupied, probably on a sporadic seasonal basis, from ca. 8,000 to 1,000 B.P. The earlier series of horizons is capped by a greyish-green volcanic ash at 96 cm. These horizons have associated 14C dates on bone apatite ranging from 6,595 to 7,980 B.P. (Table 1). Due to the slow deposition rate (ca. 8.5 cm. per 100 years), faunal remains were highly comminuted on the surface prior to burial. Identifiable specimens are uncommon (ca. 5/cubic meter), but include the remains of domestic ovicaprids and cattle to a depth of 160 cm. (D. Gifford-Gonzalez and Kimengich, this volume). Though the earliest sherd was found *in situ* below 200 cm., ceramics do not become common until 150 cm. Stone bowl and platter fragments also occur in the upper portion of the succession between 170 and 110 cm. There is a single lithic industry represented at Salasun from the onset of occupation to the introduction of Iron Age technology, about 1,350 B.P.

Table 1

Radiocarbon dates from Salasun and Lukenya Hill, Kenya

A – apatite; G – gelatin; C – collagen; Ch – bone charcoal; without letter – wood charcoal. All 14-C dates are 13-C corrected and given in radiocarbon years before present (B.P. = 1950 A.D.)

Salasun (GuJj13), on Mt. Suswa, Kenya		
GX-4420A	1,185 ± 140	DS 10 - 20 cm, weighted center 15.0 cm.
GX-4468A	2,990 ± 170	DS 40 - 50 cm, weighted center 45.0 cm.
GX-4421A	2,680 ± 235	DS 70 - 90 cm, weighted center 77.8 cm.
GX-4469A	6,595 ± 235	DS 90 - 120 cm, weighted center 109.6 cm.
GX-4422A	7,255 ± 225	DS 130 - 160 cm, weighted center 143.7 cm.
GX-6519A	6,840 ± 450	DS 200 - 215 cm, weighted center 206.7 cm. Earliest ceramics at site, *in situ*.
GX-6520A	7,980 ± 380	DS 240 - 260 cm. weighted center 245.9 cm. Possible ovicaprid (?) bone present at 235 - 240 cm. Base of site is 260 cm.
GX-5806	3,970 ± 125	DS 100 - 110 cm, weighted center 105 cm. Secondary carbonates at top of Stratum V. Date indicates that contamination due to soil carbonates may make the determinations below 100 cm. appear more recent than the bones which they date.
Lukenya Hill. 40 km. east of Nairobi, Kenya		
GX-5350A	19,330 ± 945	GvJm46. DS 51 - 54 cm. Microlith-rich LSA;
GX-5349A	20,780 ± 1050	GvJm46. DS 87 - 90 cm. Microlith-rich LSA; Overlies 110 cm. of deposits containing the same industry.
GX-5773Ch	11,950 ± 460	GvJm62. DS 130 - 140 cm. Same microlith-rich industry as at GvJm46.
GX-5773A	12,195 ± 330	*Ditto*. On bone apatite rather than bone charcoal.
GX-5774A	21,535 ± 980	GvJm62. DS 220 - 230. Transition between early LSA industry containing large microliths to later LSA industry with small microliths as at GvJm46. Overlies 4 to 6 meters of this LSA industry with large microliths.
GX-6754A	4,145 ± 240	GvJm19. DS 25 - 30 cm; cattle.
GX-6755A	6,040 ± 225	GvJm19. DS 50 - 55 cm; first cattle recovered at 50 cm.
GX-6756A	6,770 ± 225	GvJm19. DS 70 - 75. Ceramics become common at this point.
GX-6757G	8,170 ± 1500	GvJm19. *Ditto*, but on bone gelatin. Sample extremely small, less than 0.05 g. of recovered carbon; counted two days, average reported.
GX-6757A	8,010 ± 340	GvJm19. DS 90 - 95. First ceramics, a single sherd, appears 10 cm. below this sample.
GX-6758A	13,705 ± 430	GvJm19. DS 115 - 120 cm. Overlies 0.95+m. of the same microlith-rich industry as is represented at GvJm62 and GvJm46.
GX-7416	4,200 ± 155	GvJm19. DS 85 - 90 cm. Soil carbonate. Indicates carbonate contamination in the bone samples, may make dates appear more recent than the actual age of the bones which they date.
GX-7417	4,490 ± 160	GvJm19. DS 115 - 120 cm. Soil carbonate. *Ditto*.
GX-4160C	1,710 ± 135	GvJm44. Horizon 5. Unfiltered collagen, generally less reliable than apatite or gelatin. Cattle and ovicaprids.
GX-4160A	2,085 ± 135	GvJm44. *Ditto*, but apatite.
GX-5138	2,415 ± 155	GvJm44. *Ditto*, but wood charcoal. This sample helps measure

cont. Table 1

		the error due to contamination in the apatite and collagen determinations.
GX-4507A	2,030±125	GvJm44. Horizon 3. Cattle and ovicaprids.
GX-4507G	1,775±150	GvJm44. *Ditto*, but on gelatin.
GX-5348	3,290±145	GvJm44. Horizon 2, wood charcoal. Cattle and ovicaprids account for 78% of identifiable faunal remains. Traded obsidian abundant for first time. Industry represented at top of GvJm19 and GvJm62 is here undergoing transformation. Sample overlies 20 cm. of deposit containing cattle and ovicaprids.
GX5775A	12,770±650	GvJm48. Bone charcoal and apatite. Same microlith-rich industry as that present at GvJm19, GvJm62 and GvJm46; underlies PN on western margin of site.
GX-5347A	1,600±130	GvJm48. Cattle and ovicaprids, large open site with heaps at margin, ceramics as GvJm44 Horizon 5.
GX-5347G	1,810±135	*Ditto*, but on gelatin.
GX-5772A	1,840±140	GvJm52. Cattle and ovicaprids, large open site with ash heaps, ceramics as at GvJm44, Horizon 5. No gelatin recovered from this sample.
GX-5774A	1,930±175	GvJm184. Cattle and ovicaprids, large open site with ash heaps, ceramics as at GvJm44, Horizon 5.
GX-5774G	2,115±130	*Ditto*, but on gelatin.
GX-7414A	2,045±125	GvJm202. Burial in rock shelter adjacent to GvJm184.
GX-7414G	2,295±135	*Ditto*, but on gelatin.
GX-4161C	970±130	GvJm47. Cattle. Date is on unfiltered collagen. Sample from shallow exposures along road cut. Ceramics as at GvJm44 Horizon 5, plus new ceramic type.
GX-4161A	1,340±145	*Ditto*, but on apatite.
GX-4506A	1,240±145	GvJm41E. Iron age burial with iron ring.
GX-4506G	1,250±115	*Ditto*, on gelatin.

Interpretation of data from Salasun is complicated by two factors: krotovinas and sample size. Krotovinas are common in the sediments, so it is fair to ask if the domestic remains in the earlier horizons were introduced by burrowing animals. This is not possible because burrows originating higher in the stratigraphy must pass through the greyish green ash covering the earlier sediments. Krotovinas in these early sediments, which date more recently than ca. 6,000 B.P., contain inclusions of the ash and are easily seggregated in the course of excavation. It is possible, however, that some earlier krotovinas may have gone undetected, and this makes it difficult to assess the distribution of domestic remains in the earlier horizons. It is very unlikely, however, that all of the remains were introduced from the 6,000 B.P. level. Ovicaprids, cattle, ceramics and stone bowl technology cluster stratigraphically, and there are consistent changes in type frequencies and tool styles which would have been obliterated by undetected mixing if it had occurred on a scale large enough to account for the entire distribution of domestic remains between 165 and 100 cm.

The density of lithic and faunal debris below 165 cm. is less than one-tenth that of overlying levels. In addition, the lower levels were exposed in areas of less than one-half those of higher levels. Thus, if the frequency of domestic animal remains were constant throughout the early occupation at Salasun, we could expect no more than one such specimen below 165 cm. for every 20 above this level. Since the total number of domestic remains above 165 cm. is substantially less than 20, the probability of having recovered similar remains below 165 cm. is quite low. Therefore, we do not know if domestic fauna was in use during the early occupation of the site between 7,000 and 8,000 B.P. This is important because it would be useful to know if the initial occupation represented a shift in settlement patterns in response to the introduction of domestic stock, or if domestic stock was introduced later and had no effect on the location and structure of the site. Fortunately, such questions are more easily answered at Lukenya Hill, about 110 kilometers east and south.

Lukenya Hill succession

The Lukenya Hill succession is long and complex. Here, a Later Stone Age Industry introduced more than 20,000 years ago (Miller, 1979) is relatively stable until ca. 3,500 B.P. By 15,000 B.P. (Tables 1-3) a broad-based hunting adaptation is associated with this industry. It focuses on small and medium-sized antelope, zebra and wildebeest. By 7,000 to 8,000 B.P., wildebeest are beginning to disappear from the faunal inventory as ceramics become common. By 6,000 B.P., they have been replaced by cattle, which constitute eight percent of the faunal remains until settlement patterns shift around 3,500 B.P. with the abandonment of GvJm62 and GvJm19. No ovicaprids are present in the early portion of the succession, but this may be a matter of small sample sizes. The highest ratio of ovicaprids to cattle in later components at Lukenya Hill is 2 : 7 and it is usually less than 1 : 20. Thus, samples from the early phases are not large enough to rule out the presence of ovicaprids (see Tables 2-3). In addition, if cattle were present in the assemblages prior to 6,000 to 7,000 B.P. (Table 1) in frequencies of less than five precent, their presence might not be detected with the samples currently on hand. This is an important point, because it leaves in doubt the exact relationship between the emergence of cattle and ceramics on the one hand and the decline of wildebeest on the other.

At about 3,500 B.P., GvJm19 and GvJm62 are abandoned while occupation begins or intensifies at other sites such as GvJm14 (Tables 1 and 3) and GvJm22 (Gramly, 1975). Domestic stock became abundant at some sites such as GvJm44. The stone tool industry begins to change rapidly and in fundamental ways. Large-scale obsidian trade begins and soon displaces the local raw materials almost completely. Some sites are for the first time structured obviously to keep sizeable herds of domestic stock. Ceramics become much more abundant and undergo a series of changes (Bower *et al.*, 1977).

Table 2

Percentage of animals represented in the faunal assemblages from GvJm62, Lukenya Hill

x – present but sample too small to compute percentages

Species	Depth in cm.						
	0	50	90	150	210	250	380
Cattle	82						
Ovicaprid							
Rhinoceros							
Giraffe							
Buffalo					2		
Grevy's zebra			2		7	4	
Common zebra						11	
Equid			8	x	22	11	
Eland							
Wildebeest							
Kongoni			8		10	7	
Topi	4		2			4	
Alcelaphini			16		16	7	
Grant's gazelle			10		2	4	
Impala			23		7	14	
Thomson's gazelle			17		22	14	
Reedbuck							
Klipspringer							
Duiker (Ceph.)					2		
Oribi							
Steinbok							
Grimm's duiker							
Dik dik			8	x	2		
Wart hog					3	11	
Bush pig							
Suid							
Lion							
Caracal							
Cat (*Felis* sp.)					2		
Hyena					2		
Honey badger							
Banded mongoose							
Mongoose		x	6	x		7	
Baboon							
Vervet							
Aardvark							
Hare							
Spring hare	14		2	x	3	7	
Sample size	28	1	52	11	59	28	

Table 3

Percentages of animals represented in the faunal assemblages from two sites at Lukeya Hill, Kenya

—: present in frequencies of less than 0.5 per cent; × present but sample too small to compute p ercentages

Species	Site and level or depth (cm.)													
	GvJm44					GvJm19								
	5	4	3	2	1	0	30	50	70	80	90	100	110	120	150
Cattle	98	92	70	67	×	8	8								
Ovicaprid	1	6	18	11	×	?									
Rhinoceros					×										
Giraffe											1				
Buffalo															
Grevy's zebra							2				6		8	8	
Common zebra		1	3	8			2				3	3	18		
Equid	—		3	1		5	10	5	2	2	9	19	19	21	
Eland													18		
Wildebeest								1	6	11	10	20	14	9	
Waterbuck															
Kongoni				4		5	2	5	10	10	11	2	4	4	
Topi								4							
Alcelaphini						24	18	20	22	13	9	12	14	21	
Grant's gazelle							2	1							
Impala						3	2	3				2			
Thomson's gazelle	—	1	3	8	×	21	21	12	10	9	9	14	6	4	
Reedbuck						5	2	12	15	13	11	7		1	
Klipspringer						13	5	12	8	7	3	7			
Duiker (Ceph.)	—					3	7		3		2	2			
Oribi							5	4	8	10	15	2	1	4	
Steinbok				1			2	4	5	8	3		3	1	
Grimm's duiker								2	5			2	4	8	
Dik dik			3	1		8	3	3	1	1	1		1	3	
Wart hog							3		2			2	3		
Bush pig										1					
Suid								1			2			1	
Lion									1		1				
Caracal										1					
Cat (*Felis* sp.)							2		3			2			
Honey badger								1						3	
Banded mongoose										1					
Mongoose							2	1	1	1	1	2			
Baboon							3	1	1						
Vervet													1		
Aardvark											1				
Hare						3		3		7		2		1	
Spring hare		1				3	3	5		7	1	2	1	11	
Sample size	536	109	33	93	9	38	60	97	107	92	91	59	79	76	

Around 2,400 B.P. ceramic, lithic and faunal assemblages stabilize as settlement patterns again change with the occupation of a series of large Pastoral Neolithic sites, the latest of which is abandoned about 1,300 B.P. Cattle dominate the faunal assemblages (98 percent or more).

One of the most interesting aspects of the early succession is that cattle are introduced into a local hunting and gathering adaptation and have little effect on hunting patterns, site densities or settlement patterns for more than 3,500 years. This occurs at a time for which we have no evidence of environmental deterioration. Thus, the beginnings of food production as documented at Lukenya Hill do not suggest population stress and do not lead quickly to larger human populations or more complex societies.

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David W. Phillipson

Aspects of early food production in Northern Kenya

Six years ago, virtually nothing was known about the later prehistory of northern Kenya – the low lying arid plains bordered on the north by the Ethiopian escarpment, on the south by the Mount Kenya highlands and on the west by Lake Turkana. In the lakeside areas, the work of the National Museum of Kenya's Koobi Fora Research Project, although concerned primarily with Plio/Pleistocene and lower Pleistocene materials, revealed the presence of barbed bone harpoon heads along the high beach levels of the early Holocene lake, and of stone bowls akin to those well known from pastoralist contexts of the last millennium B.C. in the highlands adjacent to the Rift Valley in southern Kenya and northern Tanzania. To the east of the lake-side area, however, no significant archaeological investigations had been undertaken prior to 1974.

There seemed to be two main reasons for the potential importance of the north Kenya plains in the early development of East African food-production. Although the area is now extremely arid and supports only a sparse, predominantly nomadic, pastoralist population, there are indications (to be described in somewhat greater detail below) that it was formerly much better watered. Secondly, it seemed probable that the "Late Stone Age" pastoralists of southern Kenya obtained their domestic stock from a northerly direction – a view that received some degree of support from linguistic studies (*eg*. Ehret, 1974; see also Phillipson, 1977a: 82-4). In 1974, therefore, when I was Assistant Director of the British Institute in Eastern Africa, I embarked upon an investigation of the later prehistory of this region. In this paper it is proposed to give brief details of excavations conducted at North Horr and at Kulchurdo rock-shelter on Mount Marsabit in 1974, and at the Ele Bor rockshelters west of Sololo in 1976. The preliminary results of these excavations, with those from other sites both in northern Kenya and in adjacent areas, will be used to form a provisional outline picture of early food-production in the region.

Ele Bor

These sites may be considered first, since they have yielded the longest sequence. The name Ele Bor refers to a cluster of rocky outcrops located some 12 km south of the Kenya/Ethiopia frontier and 220 km east of the eastern shore of Lake Turkana. The outcrops rise from the Ngaso plain which here lies at about 800 m above sea level. The Pleistocene basalts which cover the plain are interrupted at Ele Bor by a low dome of sandy soils derived by weathering from the basement gneisses and magmatites of the outcrops. These outcrops cover an area of some 25 sq km and rise to a maximum height of 210 m above the plain.

The vegetation of the area today consists of very sparse low scrub on the basalts, with thicker thornbush on the sandy soils surrounding the Ele Bor outcrops. To the north and north-east, where run-off from the foothills of the Ethiopian escarpment provides more plentiful surface water, the vegetation is more dense. Game is not plentiful, being largely restricted to the smaller antelope. The area is exploited today by small numbers of nomadic camel- and small-stock-herding Gabbra and by itinerant collectors of gum arabic. At the foot of the rocky outcrops at Ele Bor are several shallow water holes which function for only a few weeks after heavy rain. At other times water is obtained from a borehole on the Walde *laga*, 30 km to the east. A total of twenty archaeological sites was located at Ele Bor, and two rockshelters (designated A and M) were excavated in some detail.

Site M yielded a predominantly lava industry of "Middle Stone Age" type, overlain by microlithic material which, in the highest part of the deposit, was associated with pottery. Here, however, we are primarily concerned with site Ele Bor A, which is a large and impressive shelter located on the north-east side of a small domed rock outcrop. The main overhang extends to a maximum length of 49 m and is up to 13 m deep. The total area of protected living space thus amounts to about 450 sq m of which, however, only about one third consists of level floor retaining archaeological deposit. A faint rock painting of five connected roughly circular outlines in faded red is visible on the shelter roof at a point where this may easily be reached from the shelter floor.

An excavation 18 sq m in extent revealed four superimposed stratigraphic horizons. Ten radiocarbon age determinations have been obtained. The sequence, from the top downwards, may be summarized as follows.

Horizon A consisted of brown, dusty fine-textured soil with ash lenses, almost stoneless at the top but becoming progressively more stony with increased depth. The total thickeness of the horizon varied from 26 to 40 cm. Throughout, it contained potsherds, chipped stone artefacts, bone fragments and occasional seeds. For purposes of the analysis of this material, the horizon was arbitrarily subdivided into two components – the upper 20 cm with few stones (horizon A1) and the stonier remainder (horizon A2). A single charcoal sample from Horizon A1 has yielded an uncalibrated radiocarbon date of A.D. 1,320±50 years while two similarly based dates for hori-

zon A2 are in the first half of the first millennium A.D. Horizon A as a whole may thus confidently be attributed to the last two thousand years.

Horizon B was of dark grey humic soil, 16 to 50 cm in thickness, with few stones. Its artefact content was basically similar to that of the higher level. Three samples of bone apatite (there being no charcoal) gave two dates in the early and middle centuries of the second millennium B.C. and one date (from near the base of the horizon) in the late fourth millennium B.C.

Horizon C was a paler grey, hard, gravelly deposit, 6 to 42 cm thick. Bone fragments and stone artefacts were still plentiful but there was no pottery. Two bone apatite samples yielded dates in the mid to late fifth millennium B.C., but the gelatin fraction of one of these samples gave a result one thousand years younger.

Horizon D was a gritty consolidated deposit of decomposed rock, slightly humic in the top 20 cm where it contained some faunal and artefactual material: below this it was yellow-orange in colour and archaeologically sterile. A 60 cm sounding revealed no base or change to the latter deposit. Two bone apatite samples from the top, humic, part of the horizon have been dated to the seventh millennium B.C. and the start of the sixth, and this is accepted as a good estimate for the start of human occupation at Ele Bor A.

I am unable to offer a confident estimate as to whether the site's occupation was continuous; but I feel that, despite the absence of sterile layers, the balance of probability is that it was not. The chronological distribution of the radiocarbon dates, together with the clarity of distinction between the horizons suggest that substantial hiatuses in occupation may well have taken place.

The chipped stone industry has not yet been quantified in detail, but was of basically similar aspect throughout the occupation, with backed microliths in quartz, obsidian and other fine-grained materials and a variety of scrapers, never numerous, in the local lava. Pottery makes its appearance at the bottom of horizon B (that is, probably in about the fourth millennium B.C.) and shows a variety of decorative motifs, based mainly on incision. No metal objects were recovered. Particular interest attaches to a substantial series of both upper and lower grindstones which occurred mainly in horizon B. Similar grindstones, some of large size, were exposed in undated surface occurrences in other parts of the Ele Bor area and included one example whose form approximated to that of a shallow stone bowl. Clearly, whatever purpose these grindstones had served had been connected with an activity which had been practised on a substantial scale for a limited period.

A series of seeds recovered by flotation from soil samples taken from horizons A and B have been examined by Dr Glyn Jones of Royal Holloway College, University of London. A good proportion of the specimens have not yet been identified, but both horizons yielded fruits of a species of *Cyperus*. Horizon B produced a grain of *Eragrostis*, perhaps *E. perbella*, while a specimen from the interface between Horizons A2 and B is possibly a species of *Sporobolus*. There thus seems to be a strong possibility that the inhabitants of Ele Bor during the second millennium B.C. and

possibly as early as the late fourth millennium, were intensively exploiting local wild cereals. This achievement was broadly contemporary with the first local appearance of pottery. Further research will be necessary to ascertain whether or not this practice developed into an incipient form of agriculture.

For intensive work on the faunal remains at Ele Bor I am indebted to Dr Diane Gifford of the University of California at Santa Cruz. The fauna throughout the sequence is predominantly wild. In the three lowest horizons, D to B inclusive, the composition of the faunal assemblage shows little significant change, being based upon small and medium-sized bovids, with the latter dominant. A somewhat moister climate than that of the present is suggested. The impression gained is of a broad--spectrum hunting strategy: several edible birds were also taken. The only domestic animal remains from these lower horizons came from horizon B which yielded a molar and cuneiform bone fragment of camel and a probable sheep/goat lower incisor. In horizon A there is a marked increase in frequency of the smallest wild bovids, and the onset of arid climatic conditions similar to the present is indicated. Small stock are again represented, but no other domestic species.

Points which should be stressed in connexion with the Ele Bor sequence are its basic continuity through the last nine thousand years, the survival of a predominantly hunting economy well into the present millennium, and the existence of a phase of intensive cereal exploitation linked with the first appearance of pottery between the fourth and the second millennia B.C. at which time camels are also attested.

North Horr

North Horr is a small administrative and trading post located in the north Kenya plains 150 km north-west of Marsabit and 90 km east of Lake Turkana. It lies in what is now semi-desert country 550-600 m above sea level, on the north-western margin of the old lake basin known as the Chalbi Desert, now a bare salt-encrusted plain completely devoid of vegetation and several hundreds of sq km in extent. The modern settlement is set among sand dunes overlooking a permanent water hole which serves the nomadic population of a very large area, the economy of which is exclusively pastoralist.

Examination of the sand dunes around North Horr revealed the presence of abundant microlithic artefacts in apparent association with pottery and, at one location, with stone bowl fragments. In several cases artefacts were exposed on the surface of deflated areas and could be seen eroding from horizons in the adjacent dunes. Two sites were selected for excavation. Surface indications suggested that North Horr site I covered an area of some 25,000 sq m. Ten trenches each of 4 sq m were excavated in that part of the site which retained its dune cover. These revealed a maximum of 1.5 m of dune sand with up to three ill-defined discontinuous land surfaces, the whole overlying a calcareous deposit which apparently formed on the retreating

margin of the old Chalbi lake. Stone artefacts, predominantly microlithic and of finegrained materials, but with some lava scrapers, were abundant, as was pottery finer than that from Ele Bor and decorated with a wider variety of techniques and motifs. Disc beads of ostrich egg-shell were numerous, and had demonstrably been manufactured on the site: there were also a few stone beads. Organic material was very poorly preserved and all bone was severely comminuted. Radiocarbon dates had perforce to be obtained on samples of ostrich egg-shell: by this means the base of the deposit was placed in the mid-third millennium B.C. and the top in the mid--second millennium B.C.

Little can, with any certainty, be said concerning the economic bases of the North Horr I settlement. It has not yet proved possible to obtain specific identifications from any of the bone fragments. Seeds were not preserved, but it may be noted that grindstones, such as were abundant in the contemporary Horizon B at Ele Bor A, were here completely absent. Attention must, however, be drawn to the very large size of the site and to the apparently long duration of settlement there. It cannot, of course, be assumed either that occupation was continuous or that the whole of the 2.5 ha site was in use at any one time. The great concentration of artefacts and the abundance of fine pottery are, however, strongly indicative of at least semi-permanent settlement and it is suggested that pastoralism may have been practised.

The same rather unsatisfactory state of knowledge applies to the North Horr II site which was smaller (12,000 sq m) and later in date (c. fifth to fourteenth centuries A.D.). Although also clearly a lakeside settlement it had a lower location than North Horr I, indicating the extent to which the Chalbi lake had retreated during the intervening period. The predominantly microlithic stone industry was basically the same as that from the earlier site but the pottery showed significant differences, including a very fine red-burnished ware on which decoration was engraved after the clay was dry. Despite the late date of this site, there is no evidence that its inhabitants were acquainted with the use of metals.

It may be noted that Dr Daniel Stiles of the University of Nairobi has recently undertaken further archaeological fieldwork in the North Horr area. It is to be hoped that he will succeed in throwing more light upon this series of settlements.

Kulchurdo

The last site which I propose to describe is in a markedly different environment, on Mount Marsabit. Mount Marsabit rises in the centre of the north Kenya plains to an altitude of over 1700 m above sea level, the height of the surrounding plains being only 450-500 m. The structure of the mountain is exclusively volcanic and most of the surface features are of Pleistocene or Holocene age. The mountain attracts from the prevailing easterly winds a rainfall considerably higher than that received by the

surrounding plains: damp cold mist swirls around its summits and sometimes does not disperse until noon. The eastern slopes of the mountain are covered with dense forest which contrasts sharply with the open grassland of the western slopes. Today, dead trees indicate that the confines of Marsabit Forest are retreating quite rapidly and that it formerly extended down to at least the higher altitutes of the western slopes of the mountain.

No signs of prehistoric occupation could be found within the present confines of the forest. Reconnaissance of the northern and western slopes of the mountain revealed a number of sparse artefact occurrences in both lava and obsidian: it was noteworthy that the exclusively microlithic obsidian artefacts occurred only at higher altitudes, never more than 6 km from the present forest edge.

Kulchurdo rockshelter lies on the western slope of Mount Marsabit, at an altitude of about 1,230 m above sea level, 1,5 km west of the forest edge. The shelter was formed as a large bubble in extruded lava now exposed at the top of a small conical hill. The maximum depth of the shelter is 12 m and its width 50 m, but most of the floor is bare rock and the pockets of earthy deposits cover only some 80 sq m in surface area. A total of 15 sq m was excavated. Beneath modern debris the deposit was homogenous to a maximum depth of 48 cm. Charcoal from a sealed ash lens near the base yielded a single radiocarbon date in the fifteenth century A.D.

The artefacts recovered were almost exclusively of chipped stone. Of 770 specimens recovered, 87% were of lava, 12% quartz and less than 1% obsidian, reflecting the relative propinquity of the sources. Of the retouched tools 65% are large flake scrapers (all but one being of lava) and 22% are backed microliths (all but one of obsidian.) Only one tiny undecorated potsherd was found.

The bone assemblage, severely comminuted and burned, has been examined by Dr Diane Gifford. Domestic cattle and small stock are both represented, alongside wild bovids and equids.

The Kulchurdo site is best interpreted as having been used for temporary accommodation by nomadic pastoralists who also obtained food by hunting – a life style still followed by the present inhabitants of Mount Marsabit. Settlement of the higher altitudes of the mountain appears to have been a relatively recent phenomenon, following the retreat of the forest. A full report on this site has now been published (Philipson and Gifford, 1981).

Conclusions

1. A formerly moister climate in north Kenya is indicated by the faunal remains at Ele Bor, by lake levels at North Horr and by the once more extensive forest on Mount Marsabit. Deterioration is attested from at least the second millennium B.C., continuing but not reaching the currently severe conditions until the present mille-

nnium. It seems likely that the adoption and development of pastoralism may have contributed to this increasing aridity.

2. Although pottery had been known on fishing settlements beside Lake Turkana since at least 6,000 B.C. (*e.g.* Phillipson, 1977b), on the plains away from the lake the earliest pottery appears to coincide with the advent of food production in about the third millennium B.C., when a large lakeside settlement at North Horr is contemporary with pastoralist sites with stone bowls recorded by Barthelme (1977) near the north-eastern shore of Lake Turkana. Away from the lakes, at Ele Bor, this period saw intensive cereal use by people who still obtained most of their meat by hunting. Camels are indicated at this surprisingly early date, but the evidence parallels that from Gobedra in northern Ethiopia (Phillipson, 1977c). Bulliet (1975) has also argued for an early date for camels in the Horn and adjacent regions, and the date also receives support from Heine's linguistic work (1978) on the common ancestor of Somali and Rendille languages.

3. Later developments in the region witnessed the continuation of microlithic technology and pottery use on lakeside settlements at North Horr into the present millennium. Pastoralism now became general, although use of iron tools remained very rare until recent times. The development of a nomadic pastoral life-style led to the abandonment of pottery by most groups during the last few centuries.

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Epilogue

In expressing my thanks to Dr. Lech Krzyżaniak for inviting me to give this overview of the conference I would also at the same time like to offer my apologies for its shortcomings of which I am only too aware. So energetically have we pursued our discussions often deep into the night, and so warm has been the hospitality we have experienced here at Dymaczewo that there has been little time in which to marshall one's thoughts on the great amount of information and ideas that have been put before us during the last five days. Never before has there been a major conference as this one, devoted to understanding more about the special circumstances relating to the spread of early food production in Africa. An earlier conference, leading to the publication of the volume *Origins of African Plant Domestication* (J. R. Harlan, J. M. J. de Wett and A. B. L. Stemler [eds.], 1976) dealt with what was known or could be inferred about indigenous food plants up to that time. It took, however, little or no account of the animal domesticates and the direct and indirect effects the possession of these may have had on bringing about the transition from collecting to cultivating some of the plants that were staple foods for the late Quaternary hunting/gathering populations. It is important that both plants and animals have been covered in this present conference, therefore. In fact, there has probably been greater stress on the animal domesticates here than on plant cultivation, not only because of the greater visibility of faunal remains in the archaeological record, and because the pastoral way of life is a more viable one in the largely arid northeastern parts of the continent with which we have been dealing but, also because, except where special circumstances, such as the presence of tsetse fly, preclude the keeping of stock, mixed farming is always likely to have been the best insurance against economic adversity. It is also clear, from the way many of the papers stress the economic data, that this dual emphasis has been the right one and it is the direct evidence of the animals and plants themselves rather than the indirect, from cultural remains or historical linguistics for example, that must always be decisive in showing the true nature of prehistoric economies.

Even with the special expertise many archaeologists possess today it is often difficult, if not impossible, for prehistorians alone to deal adequately with the amount of data the new excavating and recording techniques make available today and more than ever it is necessary to seek the aid of other specialists. This conference has brou-

ght together people who have never talked to each other before – prehistorians, Egyptologists, botanists, palaeontologists, to mention but a few – and it has emphasised that there are many common interests and problems on which light can be thrown by concerted common action through the interdisciplinary approach.

Our meeting here has shown also that science and prehistory are international and are the interest and concern of every scholar working to understand better the record of the past, regardless of nationality. It is the interdisciplinary and international approach to solving our problems and learning more about how domestication came to Africa, the sharing and pooling of expertise and resources that is the surest way to succeed in our goal to solve or get closer to solving some of the problems concerned with the why, when and wherefore of the domestication process. With the dedication and expertise that have been demonstrated here and the friendships that have been made, we can hope to develop new approaches and new teams which will have greatly expanded our understanding of the domestication processes when this conference meets again, as we all hope it will, in four years time.

One might say it is remarkable that we have been able in these four and a half days to say so much about so little. I do not mean this in a slighting way but I think everyone realises that we have so few data that we naturally try to stretch them further than they will really go. One of the most urgent necessities is, I believe, for more evidence obtained through more planned, systematic investigation. We need the empirical evidence from survey and excavation of sediments that will give insight into the life-style of individual groups and communities but the way to obtain this we have found is not through opportunistic digging, just because a site happens to exist in one's study area. If it is the archaeological data that are the cornerstone of our interpretation, it is the planned approach and the use of frameworks provided by hypotheses and the models these suggest that – this conference has shown – is likely to be one of the most profitable research strategies in the future. That we need more evidence is only too true but we should not make this an excuse for not trying to look at that which we already have in the light of behavioural models derived from hypotheses generated by the whole extent of the archaeological data and ethnographic analogies. Models are not interpretations of what went on at a site. We are probably never likely to know this precisely. They are only, as the name implies, models that can be tested against the evidence coming from the sites themselves but which can help towards a better understanding of the roles these sites played in the total procurement pattern of the inhabitants.

Another thing that I think, therefore, came out of this conference is the fact that the site we excavate is but one small surviving material part of a system of social and economic behaviour of a prehistoric group of people – men, women and children. How did they use their resources and what was the rest of the area like over which they ranged? Why was the site located where it is? And what were the respective roles played by its inhabitants? We cannot try to answer these questions unless we look at the way our prehistoric populations used their space. This has been very

well demonstrated by the work about which we have heard of the Combined Prehistoric Expedition, of the Polish team at Kadero and of those working in the Acacus and in East Africa. We can only succeed in analysis of space through the interdisciplinary approach. What were the resources that were exploited from a particular site? Was exploitation the reason why the site was situated where it is or was it for social, religious or other purposes? Knowledge of palaeogeography, hydrology, fauna, flora, raw materials and many more of the phenomena that go to compose the ecosystem is what is needed in order to be able to try to reconstruct the ways in which the land and its resources were used; it is the behaviour behind the artifacts that is important and exciting and not the tools or pots themselves.

So again, we come back to the team approach and the need for archaeologists to become acquinted with and knowledgeable about the plants and animals and human adaptations in the area today as well as the extent to which these may have differed in the past. Ethnography is the key to understanding human behaviour just as geomorphology can provide basic knowledge of the palaeoenvironment that is an essential clue to understanding prehistoric adaptations. Several speakers called attention to and made good use of ethnography and the interpretations ethnoarchaeology makes possible but there has not, I feel, been nearly enough of this especially since a number of the papers presented have emphasised the extraordinary continuity of culture and ethnicity in the areas with which we have been dealing. If it is the natural sciences that give us our methodology it is anthropology that enables us to interpret the evidence in terms of human behaviour. While it is clear that we could make far more use of ethnographic evidence than has been done up to now, we should remember that we are never likely to find a one to one relationship between ethnographic analogy and any past situation. It does, however, enable us to identify with people, their societies and human reactions and so enables us to narrow down considerably the possible intepretations of the archeological record.

To turn to a few of the highlights and specifics: — we have all been greatly impressed by the exciting evidence from Wadi Kubbaniya and sites in the Western Desert of Egypt, from Capeletti Cave and other sites in the Maghreb and by that from those pastoral settlements along the Nile in the Sudan and in East Africa that have produced some of the first direct evidence of domesticated animals and plants. But what is a domesticate? animal or plant — and what are the genetic and other processes that have to be gone through before demestication is arrived at and which leave a recognisable record? To this, I suggest, we have not given enough attention. Are the animals and plants from the early sites we have been hearing about indeed domestic forms, or could the evidence be interpreted in some other way? How much manipulation by humans is first necessary to produce a cultigen or domestic animal, and how long does this process take? It rests for further research — the recovery of more complete remains, better dated samples, in even better contexts — to show how far our interpretations today will be confirmed or will need amendment.

The palaeobotanists and palaeontologists have told us of the problems they have

in making positive determinations as between wild and domestic forms on the basis of the fragmentary archaeological remains and especially in the case of plants, from pollens and impressions in pottery. We should take due heed of their warnings against jumping to over-optimistic or too hasty conclusions while, at the same time, redoubling our efforts to obtain additional and more complete remains in archaeological contexts that can provide the crucial evidence needed for specific identifications. In the predominantly arid environment of northeast Africa, there is good reason to expect that, so far as plant remains are concerned, our efforts will be rewarded by the routine and regular use of flotation and dry sieving methods in all future excavation of early Holocene settlement sites.

There seems to be emerging in northern Africa, in the millennia between 7,000 and 3,000 B. C., evidence of two major prehistoric Culture Areas, and, if we look at the continent as a whole, we can see at least two more – those of West and East Africa. The northernmost lies in the winter rainfall region between c. 20°N latitude and the Mediterranean coast. This is characterised by small blade technologies and the adoption of domestic animals (first small stock and then cattle), little evidence for cultivation except in the Mediterranean coastal region, and an emphasis on hunting and, probably, on a very mobile social organization. In the inland region of the Maghreb and the northern Sahara this cultural entity is characterised by the Neolithic of Capsian Tradition and in Upper Egypt and Nubia by several comparable and local small blade industries.

The Culture Area immediately south of this occupied the summer rainfall region south of the 20°N line and stretching south to the West African Sahel. Since the northern boundary of summer rains extended further north in the early Holocene than it does today, this boundary in Egypt was probably around the latitude of Aswan and it is likely that these northern parts of the central Sahara received rain in both the summer and winter months. If the number of sites in the desert is any indication, this area must have been a highly favourable environment for humans and animals at this time. The many lakes and streams that now filled the basins and depressions in the central and southern Sahara provided an abundance of localized water sources that contrasts with the generally drier habitats of the Neolithic populations in the northern Sahara and produced a different kind of economic adaptation that made extensive use of aquatic resources wherever these existed. Was this hunting/fishing/collecting economy one that developed independently of those in the north and was it the use of water resources (fish in particular) that was the crucial factor leading on to domestication there in the late seventh millennium B. C.? If so, did domestication spread northwest into Upper Egypt and the Delta as the few dates we have at present suggest might have happened? Perhaps; but maybe new findings will decide otherwise and the new work now beginning on the Predynastic settlements in Egypt could turn up evidence for farming as early as any to the south and shed light on the extent to which external influence and/or migration may have had a hand in introducing agriculture to the Nile. With all the new work going on

and projected in the desert and along the Nile we should, in four years' time, be nearer to answering some of these questions that we have no means of answering today.

Since cattle and small stock in East Africa had to come from the north, clearly the chronology for domestication along the Upper Nile and in Ethiopia is the key to the chronology of domestication in the tropical highlands and the northern desert of Kenya. At present, 8 - 7,000 years B. P. seems rather too early a date for the introduction of cattle to East Africa; 4,000 years B. P. presents no problem; but we need to find and identify the people who brought the stock into East Africa and the Horn. Was this a matter of migration or of stimulus diffusion? The concept of the "advancing frontier" provides a useful framework within which to examine the evidence and the knowledge coming from ethnography, which indicates that we can expect to find different peoples and different economies juxtaposed in the same region of East Africa, helps to confirm the mosaic nature of the prehistoric pattern that is emerging.

Impressive also are the population studies on the human skeletal material we have heard about and the way pathology and age studies of human bone can provide clues to nutrition and so to changes in the staples used from the balanced diet of hunter-gatherers to the more unbalanced one sometimes found with food producers. The great abundance of skeletal material provides a tremendous opportunity to learn more about nutrition when examined in conjunction with the understanding of the cultural changes that the archaeologists can provide and one should urge that further studies of this kind be undertaken in the future. We as prehistorians have a duty to show the physical anthropologists the nature of the food base and diet the results of which are manifest in the skeletal remains they are studying.

What of the future? Where have the proccedings of this conference suggested that we might focus some of our energies? To mention a few – a filling in of the "two thousand year gap" in the Sudan; continuing and developing research on the Predynastic settlements and the demographic patterning in the Egyptian Nile; concentrating more on learning what the settlements were like and the technologies involved rather than digging more graves and cemeteries for the pots and other objects they contain; learning more of the patterning and use of valley and desert resources through the use of ethno-botany and animal behaviour studies. Again, tracing the direction of movement between desert and Nile; was this a pattern of lateral movement in and out of the valley to the desert and back, or alternatively was it a movement up and down the Nile or, again, a combination of both? As we have heard, a clue to movement is provided by the distribution of raw material sources and this is likely to be one of the best ways in which we might determine territorial ranges and, when analysis of style in lithic and ceramic artifacts is included, in which we might identify ethnic boundaries. Next, development of spatial analysis studies is clearly essential to show prehistoric patterns of land use. We need to be more carefully selective of sites for excavation for what they can yield and it is clear that substantial parts of the site will need to be excavated to show the plan of the settlement,

house plans, and social patterning, to distinguish different activity areas and to determine from faunal and plant analysis the economic base. Developing taphonomy studies identifying the different agencies and phenomena that have been at work in accumulating and dispersing the archaeological residues is another way in which we can greatly expand information about a site. We should pay just as much attention to the areas of low density remains as to those of high concentrations since only in this way can we hope to understand the overall pattern of a camp or settlement and its significance within the whole exploitation system.

Experimental archaeology along the lines of that described for the Predynastic knife can also make a significant contribution. That is to say experimentation in the manufacture of artifacts, in understanding the reduction process and the range of artifacts that result; experiment also in the way artifacts were hafted and used. This leads on to edge-wear studies, of course, and this is, I believe, one of the most significant breakthroughs of the 20th century. Now we can begin to know something about the functions of the stone tool equipment. But it will not be easy and, so far as edge-polish studies are concerned, no small amount of experience and skill are essential before identifications will be made in which we can have confidence. With edge-damage studies goes that of conjoining pieces – of stone artifacts in particular. The recently published work on the Terminal Palaeolithic site at Meer (Belgium) shows what exciting new potential for knowing the nature, number, and sequence of activities engaged exists in this kind of study. Also an urgent need for palaeo-environmental evidence is the recovery of cores from lakes and other favourable localities to provide the climatic reconstruction and chronology of the last 10,000 years. The core from Selima Oasis could be most significant here and the crater lake at Jebel Mara is another possibility for obtaining a core to show late Quaternary climate and environment. We need to know what was growing round the settlements that we think contain domestic plants and animals. We need pollen evidence, therefore, and the study of phytoliths could also help not a little.

It has been a very great pleasure to meet and hear from Egyptologists. They have a major contribution to make to understanding the domestication process along the Nile and the part played in this by the desert or by exotic influences from outside the continent. It is of great importance to interest them in our problems and to enlist their support. We prehistorians, in turn, can be of no small help to them in providing an understanding of the cultural substratum antecedant to the Predynastic. Some of the methods developed to help prehistorians – such as thermo-luminescence dating and neutron activation analysis of pottery to determine age and sources – can also be of use to Egyptologists. With the growing interest in the way in which Ancient Egyptians lived, rather than in what happened to them when they died, we should be able to look forward to a new collaboration between Egyptologists and prehistorians in the years ahead.

In conclusion, if the amount of substantial evidence still leaves much to be desired, its very paucity helps us to value and appreciate all the more the contributions

of those to whom we owe that which we do already possess. Not only is this the cornerstone on which our constructs depend but it serves, also, to confirm that the evidence is surely there to be found and provides the incentive to make us go out and find more of it and recognise its worth. Knowledge and understanding are unlikely to come quickly but each new piece of evidence will have its place in helping to reconstruct the Neolithic way of life. Whatever the discipline we represent we are here because of our active research interests in learning more about how food production came to Africa. To me, and I hope to all of you, this is one of the most exciting and challenging problems in African prehistory today and, with the number of new studies projected or already under way, we can be certain of even more eventful discoveries in the next four years as knowledge of palaeoclimates in northern Africa becomes more precise and the new technique of recovery and analysis adopted by the archaeologists are put into more general practice to produce more meaningful reconstructions.

This has been a great conference and the informal and most friendly atmosphere in which our meetings have been conducted has, I think, gone a long way to advancing the work and to informing us on where we stand today in our attempts to trace the pattern of domestication in northeast Africa. We owe this to the foresight, energy and excellent administration of Dr. Lech Krzyżaniak and Dr. Michał Kobusiewicz. We are greatly endebted to them and to their charming and efficient staff of helpers for the conception of the conference and for making it possible for us to be here. Especially do we thank them for all that they have done in making us so welcome and helping forward our deliberations to a clearer understanding of what the Neolithic is all about. We will carry away the most pleasureable memories of the hospitality and kindness that we received during our stay in Poland and will look forward with anticipation to the appearance of the Proceedings that will be the definitive statement and record of the extent of our knowledge and ideas at this time.

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The participants offer their sincere thanks and congratulations to the Polish Academy of Sciences for the organisation by its Poznań Branch of the highly succesful International Symposium on the Origin and Early Development of Food Production in North-Eastern Africa held at Dymaczewo, 9 - 13 September 1980. We welcome the initiative of Dr. Lech Krzyżaniak and Dr. Michał Kobusiewicz and their collegues in organizing this symposium and express the hope that future meeting on this and allied themes will continue the scientific advances made at Dymaczewo and assist the dissemination of knowledge in these fields. The participants recommend that future meetings will continue to be sponsored by the International Union of Prehistoric and Protohistoric Sciences.

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