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The Lower Paleolithic of the Near East

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The Near East forms the geographic crossroads between Africa, Asia and Europe and was certainly a main route for the dispersal of Homo erectus *into Eurasia. The study of Lower Paleolithic sites in this region and in the neighboring Caucasus area sheds some light on several potential colonization events. Sites such as 'Ubeidiya (Jordan Valley) and Dmanisi (Georgia) suggest the early sorties took place around 1.4–1.0 Ma. Despite the lack of radiometric dates, sequences of raised beaches, marine deposits, river terraces, and paleolake formations have enabled various investigators to identify several series of major aggradation and erosion periods within the Pleistocene. Lithic assemblages derived from a few systematic excavations and collections from stratigraphically dated outcrops led to a threefold subdivision of the Acheulian sequence into the Lower, Middle, and Upper Acheulian. The study of nonbiface assemblages, however, has not resolved the question of whether these assemblages deserve inclusion as separate entities or should be viewed as sites within the Acheulian settlement pattern. While the typotechnological definitions of each major phase can be compared to what is known from other regions of the Old World, the Acheulo-Yabrudian (or the Mugharan Tradition) is seen as a local entity. Rare human remains and scarce data concerning subsistence activities do not warrant a comparative discussion with what is known from African and some European sites.*

KEY WORDS: Near East; Lower Paleolithic; *Homo erectus*; Acheulian; Acheulo-Yabrudian; Lower and Middle Pleistocene.

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INTRODUCTION

The Near East occupies an important geographic position among Africa, Asia, and Europe: It forms the only secure terrestrial bridge through which animals could have crossed between the continents during the Plio-Pleistocene. Until convincing evidence for early crossings from Africa to Europe through Sicily or the Gibraltar Straits are presented, the Near East will remain the only potential corridor for hominid migration out of Africa. The successful adaptation of hominids in Western Asia facilitated their movement farther into southeast Asia as well as their later occupation of the European temperate belt. Therefore, locating the earliest sites in the Near East that mark the path of *Homo erectus* populations into Eurasia is of great importance. Such sites may provide clues to when these movements took place, as well as to the habitats that enabled essentially tropical and subtropical hominids to survive in Mediterranean and Asian temperate belts.

A survey of Lower Paleolithic sites in the Near East must begin by raising several questions concerning the circumstances that led to early *Homo erectus* sorties from their African homeland. This homeland, where several species evolved from 3.7 to 2.0 Ma, is on a continental scale but is limited to a narrow ecological province (Fig. 1). *Homo erectus* was the first hominid species that ventured into other regions, crossing the boundaries of vegetational belts. Therefore, the questions that must be asked are the following: (1) When did *Homo erectus* (or *Homo ergaster*) emerge as a new species? (2) What caused groups of *Homo erectus* to emigrate? Was it an environmental challenge expressed in decreasing food resources that enhanced interspecies or intergroup competition or a new distribution of vegetal and animal resources that resulted from the realignment the plant associations? (3) Alternatively, were these movements a series of departures of small, isolated groups motivated by curiosity and innovative approach and not driven by biological or environmental circumstances? (4) Was the migration of *Homo erectus* groups incremental, driven by a slow population increase, or did it take the form of a series of events? (5) Did *Homo erectus* populations, while still in Africa, develop the skills necessary to occupy Eurasia and were they thus "preadapted" to the new environmental challenges? (6) Or did they simply adapt by "trial and error" as expressed in lineage extinctions (evidenced by the gaps in the archaeological sequences)? While answering these questions in full is beyond the scope of this paper, in examining the Lower Paleolithic records of Western Asia insights can be gained into the early phases of *Homo erectus* evolution and their behavioral capacities while colonizing this region.

If confirmed by further fieldwork, the new dates for the Javanese human fossils (Swisher *et al.*, 1994) would indicate that *Homo erectus* arrived in southeast Asia some 1.8 Ma. Such a date for the first movement out of Africa, earlier

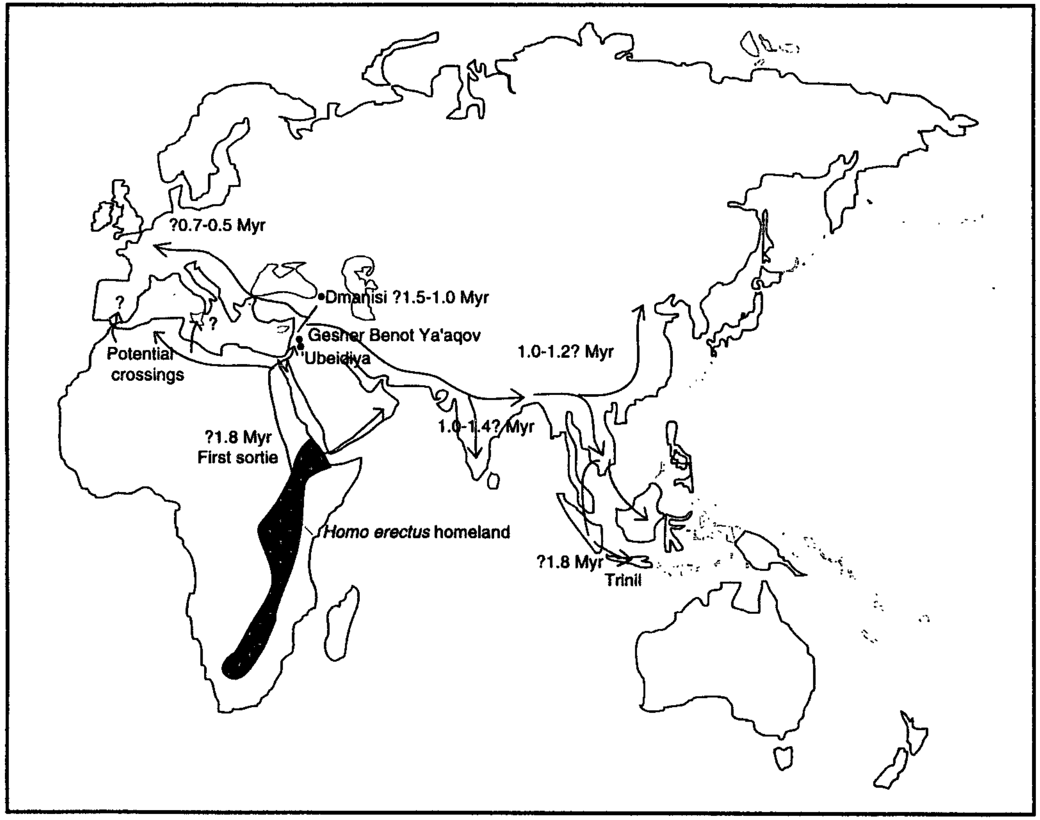

Fig. 1. A map of the Old World indicating the dates of early *Homo erectus* sites including several controversial ones.

than the 1.0-Ma date which numerous scholars have supported, was hinted at by the publication of the detailed faunal reports from 'Ubeidiya (Tchernov, 1986), by the possible early industries on the Israeli coastal plain, the shorelines of Lebanon and the fluvial terraces of Nahr el-Kebir in Syria (Horowitz, 1979; Hours, 1975, 1981; Copeland and Hours, 1979, 1993), and by the site of Dmanisi in Georgia (Dzaparidze *et al.*, 1989) where a *Homo erectus* jaw was recently discovered. Figure 1 illustrates the potential early dates for *Homo erectus* movements and alternative routes.

This leads to the proposal that *Homo erectus* first emerged as a species with innovative abilities and general adaptive skills either during or immediately after the Olduvai subchron. This major paleomagnetic event is currently dated to 2.01/1.98–1.75 Ma (Cande and Kent, 1992). The major climatic fluctuation to drier conditions occurred between Tuffs IC and IF and lasted about 10,000 years (Walter *et al.*, 1991), with a temporary return to higher lake levels (Tuff IF) and subsequent aridification with the Lemuta member in the lower part of Bed II. The Olduvai subchron also marks an increase in the activities of the glacial cycles. It is therefore suggested that early dispersals of *Homo erectus* could have begun after 1.8 Ma with the first occupations in South Africa, North Africa, and Western Asia (Klein, 1989). Therefore, the early part of the Lower Pleistocene, about 1.8–1.4, was the crucial formative period for *Homo erectus* populations.

Geographic dispersals of *Homo erectus* groups could have been in response to climatic changes expressed in the northern hemisphere by the glacial cycles. Alternatively, Turner (1992) proposed a model suggesting that scavenging opportunities for early hominids were limited when carcass-destroying carnivores, for example, hyenas and large canids, outnumbered carcass-producers, such as machairont and feline cats.

In light of the ambiguities in the dating of early sites in North Africa (e.g., Biberson, 1961; Jaeger, 1975; Texier *et al.*, 1992), it is not impossible that the first hominid movements took place along the Syro–African Rift (known now as the Dead Sea system), or along the Nile valley as indicated by the site of Abassiyeh (Bovier-Lapierre, 1926), into the Levant and only later to the Maghreb.

It has also been hypothesized that during the Lower Pleistocene and even the early part of the Middle Pleistocene some *Homo erectus* lineages became extinct, leaving behind clear gaps in the archaeological sequences of the regions where they formerly survived. Modified views suggest that the colonization of Europe took longer than previously estimated (Roebroeks, 1994; Roberts *et al.*, 1994). The current interpretation is that hominids reached temperate Europe only around 0.5 Ma. This does not preclude the possibility that hominids could have ventured into the Mediterranean belt of this continent earlier. Thus, better dating of known sites as well as an understanding of the behavior, technical skills, and social organization of *Homo erectus* and Archaic *Homo sapiens* populations is imperative (Tooby and DeVore, 1987; Mithen, 1994 with comments; Gamble, 1994).

Unfortunately, we have only limited knowledge about the technical abilities of African *Homo erectus* populations that could have facilitated colonization. The paucity of clear evidence concerning group size, inter- and intragroup social organization, elements of group identity (if they ever existed and/or can be detected from archaeological remains), together with the limited interpretations of excavated late Pliocene and Lower Pleistocene sites, leave us with solely what is known from the typotechnological studies of lithic industries (e.g., Isaac, 1986; Schick and Toth, 1994; Gowlett, 1986, 1990). Furthermore, archaeological data are prone to contradictory interpretations. Behavioral models drawn from analogy to modern or historical hunter-gatherers are sometimes extended far back into the past, and models derived from primate studies are viewed as potential explanations for *Homo erectus* material remains (e.g., Tooby and DeVore, 1987). As pointed out by these authors, the lack of referential models of human behavior for such a long time span (from about 2.0/1.9 to about 0.5/0.3 Ma, when most scholars discern the presence of archaic *Homo sapiens* in several regions) is disturbing.

"Choices" among nonhuman primate groups have been noted (e.g., McGrew, 1992), and the existence of learning and active teaching roles among primates is supported by field observations. But nonhuman primates' apparent limitations in stone toolmaking have also been demonstrated through experimental studies (Toth *et al.*, 1993). It has been suggested that the Oldowan can be viewed as an industry produced by a chimp-like hominid (Wynn and McGrew, 1989). However, the differences between the lithic industries of *Homo habilis* (and perhaps *Australopithecus robustus*) and those of chimpanzees are more than a matter of degree (Toth *et al.*, 1993). While living primates exhibit short-term teaching, early hominids seem to have more systematic learning.

A slight increase in required knowledge marks the appearance of Early Acheulian and Developed Oldowan (Leakey, 1975) assemblages. Within the long period from 1.7 or 1.5 to about 0.3 Ma, stone-knapping techniques became slightly more diversified, including the Kombewa (Balout, 1967) technique. Nevertheless, this technique does not demonstrate the presence of a complex operational sequence (*chaîne opératoire*) compared to later ones in South Africa and, especially, the Levallois methods (e.g., Boëda *et al.*, 1990).

Schematically, the lithic assemblages of the Lower Paleolithic since 2.5 Ma have been classified as Oldowan [also referred to as Mode 1 by Toth and Schick (1993; Schick and Toth, 1994)]. If the emergence of *Homo erectus* occurred some 1.9/1.8 Ma ago, as it seems now, similar core-chopper industries were produced by these later hominids as well. Somewhat later, around 1.7/1.6 Ma, the Early Acheulian, indicated by the presence of bifaces (including the

Developed Oldowan and, especially, the Developed Oldowan B), commenced. Cumulative experience studying both primate activities and replication of chipping methods indicates that the dominant artifact forms were based on variable learned behavioral traditions, as opposed to limitations imposed by raw material or the presence of a "genetic template."

Fieldwork in Africa during the last three decades has been instructive concerning the capacities of early hominids. Early hominids were essentially opportunistic scavengers and gatherers of plant food, who favored riverine and patchy woodland/parkland associations where carnivore activity left numerous carcasses. Local hard rocks were randomly grabbed for making artifacts, which enabled the hominids to process animal tissues and, more rarely, to treat vegetal elements such as branches or bark (e.g., Binford, 1981; Isaac, 1984; Potts, 1988; Blumenschine, 1991; Stern, 1993; Sept. 1992). It is still debated to what extent these hominids maintained a base camp ("central place foraging"), to which they transported artifacts, animal tissues, and where they cached stone objects, used organic substances for making tools, and slept on the ground as opposed to in trees.

Site formations processes are only partially understood. Fieldwork in Africa has concentrated on the main natural agencies responsible for the accumulations of bones, stones and their modifications (e.g., Isaac, 1984). Sites are often classified according to their depositional environment, but the details concerning the microprocesses of accumulation and destruction are not yet fully understood (Bar-Yosef, 1993). In order to unveil these aspects micromorphology will be extremely useful. Thin sections analyses may answer questions concerning bioturbation, movement of artifacts, and formation of "living floors" (Courty *et al.*, 1989), thus providing additional information to distinguish anthropogenic activities from other natural, nonhuman, processes.

NEAR EASTERN ENVIRONMENTS

The dominant geographical features of the Near East consist of a topographic combination of mountains (mostly of the Alpine Orogenesis), plateaus, alluvial plains, and desert landscapes including oases. The coastal plains are often very narrow in comparison to those of other continents. The Anatolian plateau is bounded by the Pontain mountains on the north and the Taurus mountains on the south, each range about 1500 km long. Both join the northwestern end of the 1800-km-long Zagros chain, which, together with the Caucasus mountains, creates a deeply dissected land mass. The Iranian plateau is bounded by the Zagros mountains in the west and south, the Elburz and Kopet Dagh mountains in the north, and the Khurasan and Baluchistan mountains in the east. The Mesopotamian plain stretches and descends from the foothills of the Zagros and Taurus into the Persian Gulf. It is bounded on the west by the Syro-Arabian desert, which stretches into the Arabian peninsula. The Mediterranean Levant is a special zone within western asia and covers an area about 1100 km long and 250–350 km wide. Topographically, it includes the coastal mountain range (overall lower than the Taurus), the Dead Sea System or the Rift of the Orontes-Jordan Valleys, inland mountain ranges, and the eastward-sloping plateau, which is dissected by many wadis flowing eastward into the Syro-Arabian desert.

Today the climate of the Near East is dominated by two seasons: cool, rainy winters and hot, dry summers. Winter temperatures are milder in the coastal ranges and more severe inland or at higher elevations. Precipitation is affected by distance from the sea and by altitude, with the central Anatolian and Iranian plateaus, the Syro-Arabian desert, and Mesopotamia being the driest zones. In the Mediterranean Levant, rainfall decreases in a north–south direction from the Taurus mountains to the Sinai peninsula. That zone is characterized by Eu-Mediterranean vegetation, consisting of woodlands or open parklands on and along the coastal ranges. In contrast, western Anatolia is covered with broad-leafed and needle-leafed trees and shrubs resistant to cold, while a cold-adapted deciduous broad-leafed woodland characterizes the eastern mountains and large areas of the Zagros. Dwarf shrubland and steppic vegetation (Irano-Turanian) dominate the eastern Anatolian plateau and form a wide arching belt south of the northern Levantine, Taurus, and northern Zagros hilly ranges. Farther south, open xeromorphic dwarf shrubland and desert plant associations (Saharo-Arabian) cover areas with an annual precipitation of less than 300–400 mm (Zohary, 1973).

The current complex climatic system of western Asia makes it difficult to reconstruct the patterns of the past. Presently, large annual fluctuations in rainfall characterize the region with storm tracks following various paths. Those that carry humidity along the Mediterranean Sea move in a southerly direction, toward more arid areas. The second series of cyclones descend through Europe and then turn east, leaving most of the southern Near East dry. Chemical studies of Lake Lisan in the Jordan Valley have demonstrated that Upper Pleistocene rainfall distributions were similar to those of today. Rather than temperature changes, decadal and centennial fluctuations in the amount of precipitation were responsible for the expansion and contraction of vegetational belts recorded in the palynological sequences and lake levels (van Zeist and Bottema, 1991; Roberts and Wright, 1993; Yechieli *et al.*, 1993).

The southern portion of the Arabian peninsula receives summer rains from the monsoonal system. In the past, the boundary between the winter cyclones and the summer monsoon shifted considerably, and during some periods, the belt where the two overlapped could have been wider than it is today.

QUATERNARY CHRONOLOGY

The geochronology of the Near Eastern Quaternary is based on the correlation of coastal, raised beaches, and inland fluviolacustrine sequences. The relative ages of the different formations are often based on their biostratigraphic positions, interpretations of their paleoclimates, and possible correlations with the isotope Stages. Until quite recently, the Quaternary terminology was adopted from the Alpine sequence, especially as it was understood in the French literature and generally correlated with the central European loess cycles. Furthermore, the equation of glacial with pluvial was used in Near Eastern literature until the 1950s. In the 1960s and 1970s, due to a research strategy that stressed establishing regional sequences, especially in Europe and North America, a similar approach was adopted in the Near East (e.g., Kukla, 1975; Horowitz, 1979; Sanlaville, 1981, 1988, 1993; Besançon, 1981; Besançon *et al.*, 1988; Sanlaville *et al.*, 1993).

The main problem in obtaining secure dates is the rarity of the tuffs and lava flows necessary for radiopotassium dating techniques. Nor are sufficient paleomagnetic readings available. Therefore, local sequences of marine shorelines, coastal formations, and inland fluvial and paleolake sequences, from which artifacts and fauna have been retrieved, form the basis of the Quaternary subdivisions. Their relative or absolute ages are based on either correlations with known paleoclimatic chronologies derived from deep-sea cores or the more detailed European terrestrial sequences (e.g., Horowitz, 1979; Sanlaville, 1988; Besançon *et al.*, 1988; Tchernov, 1986, 1987). Palynological correlations have also been suggested between the Israeli record and the Japanese Biwa borehole (Fuji and Horowitz, 1989).

Given the variability of the Near Eastern landscape, Quaternary cycles have been divided into marine raised beaches and coastal sequences, on one hand (e.g., Issar, 1979, 1980; Sanlaville, 1977, 1981; Horowitz, 1979), and inland sequences, often based on the study of wadi and river terraces (e.g. Besançon, 1981; Sanlaville *et al.*, 1993), on the other. Among the main valleys studied are Nahr el-Kebir (which provided direct correlation between marine and fluvial formations), the Orontes, the Middle Euphrates, the Jordan Valley, and the Kura valley in Georgia, as well as a few riverine and wadi localities in Turkey and Jordan (e.g., Besançon and Sanlaville, 1988; Minzoni-Deroche and Sanlaville, 1988; Albrecht and Miller-Beck, 1988; Henry, 1986). Inland basins in which lakes were present are less well-known from the earlier periods (Copeland and Hours, 1988).

Extant lakes in the Near East are often located in tectonic basins. Major tectonic movements took place during the Plio-Pleistocene but later and smaller ones also affected the landscape. In particular, the role of tectonic movements was important in the formation and subsequent changes along the Syro-African rift valley, causing older lakes to disappear and new ones to form (e.g., Horowitz, 1979; Sanlaville, 1988). Thus, efforts to correlate marine coastal cycles and inland fluvial-lacustrine cycles are often hampered by the results of tectonic activities. Paleoclimatic correlations, therefore, may not always be feasible until new or improved dating techniques make possible the dating of stratified sequences which lack volcanic tuffs and lava flows. Without a chronological control to provide the subdivision of the Lower and Middle Pleistocene, correlation is still a puzzle of relative stratigraphy, general subdivisions of faunas into biozones, and paleoclimatic interpretations.

Figure 2 presents a suggested correlation between marine cycles and fluvial and lacustrine cycles in the Levant. It is based on the works of Picard (1943, 1965), Issar (1968, 1980), Besançon (1981), Besançon *et al.* (1982), Sanlaville (1977, 1981), Sanlaville *et al.* (1993), Horowitz (1979), and Tchernov (1986, 1987, 1992a). It should be noted that marine transgressions and regressions played different roles along the Syrian–Lebanese coast and on the Israeli coast. While the latter is relatively flat and the changes in sea level affected the width of the coastal plain, shorelines along the mountainous coastal strip of Syria and Lebanon are often expressed in series of raised beaches or benches. However, the main sediments, whether the kurkar (sandstone) dunes or sandy beaches or the hamra (red loam deposits), are present everywhere along the Mediterranean shores. Figure 3 presents the sites mentioned in the text.

The topographic and climatic heterogeneity of the Near East is expressed in its faunal history (e.g., Tchernov, 1988; Uerpmann, 1987). The region is situated on the crossroads of the Palearctic, Oriental, and African zoogeographic zones and, therefore, has preserved a mixture of mammals, reptiles, birds, and mollusks that demonstrate the coexistence of various groups of species. A number of species are characteristic of the Mediterranean basin, where local climatic conditions facilitated the emergence of endemic species, especially during the heights of the glacial periods when the desertic belts reached their maximum expansion and many areas were isolated from each other. Today, given the available results of fieldwork, the subdivision of the Quaternary on the basis of biozones is based on two areas alone: the Caucasus (e.g., Gabunia and Vekua, 1990; Vekua, 1987), which is not discussed in detail in this paper as it lies just beyond the Near East, and the central Levant (e.g., Tchernov, 1986, 1987, 1992a,b).

Sites where faunal assemblages accumulated due to the activities of natural agencies, including carnivores, are rarely found in the Near East (Fig. 3). The only such site from which animal bones have been recovered in systematic excavations is in Bethlehem, which now lies 790 m above sea level. The deposit consisted of numerous rock fragments incorporated in clay containing numerous bones (Hooijer, 1958; Clark 1961). Among the bones, a few fractured specimens were collected by the excavators, but reanalysis by Clark (1961) demonstrated that they are naturally flaked. Earlier analysis had shown that the fractured bones were not products of hominid activities. The fauna of Bethlehem is generally considered to be the earliest known assemblage in the Levant, and is attributed to the Late Pliocene, when the Transjordanian heights and the Judean hills

Israeli Coastal Ingressions	Lebanese Coast	Nahl El-Kebir	Orontes Valley	Euphrates Valley	Southeast Turkey	Jordan Valley Formations North	Jordan Valley Formations South	Main Excavations	Industries	Approx. Date (Ma)
Poleg Ramat Gan Kurkar	"Naamean" "Enfean" II "Enfean" I Transgression	Jraimaqiye Ech Chir a, b	Sarout	Abu Chaari a, b, c	Cedide	Ayeleth Hashahar			Mousterian	0.075 0.20
Holon* Hamra	Koura Regression sequence	Jinderiyé* (Fl.)	Jrabiyate*	Abou Jemaa*	Nizip	Dan Travertine*	Naharayim	Zuttiyeh Tabun E Yabrud I	Acheulo-Yabrudian	
Azor Gedera Kurkar	Jbailian I, II Transgressions	Hennadi (M.) Khellale (Fl.-M.)	Erosion	Erosion				Gharmachi Ib Berekhat Ram Holon Nadaouiyeh Tabun F Umm Qatafa D,E Ras Beirut Ib Wadi Aabet	Upper Acheulian	
Dorot* Hamra	Regression Sequence	Berzine* (Fl.)	Latamné*	Chniné	Kale Köy	Gesher* Benot Ya'aqov		Gesher Benot Ya'aqov Latamne	Middle Acheulian	
						Yarda + Yarmuk B				
En Besor Tell Fara Kurkar	Zaqrounian I, II, III Transgressions	Baksa (M.)* Jabal Idriss (Fl.-M.)	Erosion							-0.70
Hasi Hamra	Regression Sequence	Sitt Markho* (Fl.)	Khattab*		Tilmgara	Mishmar* Hayarden*	Ubeidiya*	Evron-Quarry Joub Jannine II		~1.00±
Eyal Gerar Kurkar	"Chaabian" or "Mcherfian"	Mcherfet es-Samouk			Hancagiz			'Ubeidiya	Lower Acheulian	
Zeelim Hamra						Erq El-Ahmar				
"Calabrian" Haruvit K.					Il Dagi					1.70-2.00

Fl. = Fluvial Deposits
M. = Marine Deposits
* = Sites

Fig. 2. Tentative chronological correlations between Quaternary formations in the Levant, main excavated sites and a time scale. (Sources: Horowitz, 1979; Tchernov, 1987; Besançon *et al*, 1988; Guérin and Faure, 1988; Sanlaville *et al.*, 1993.)

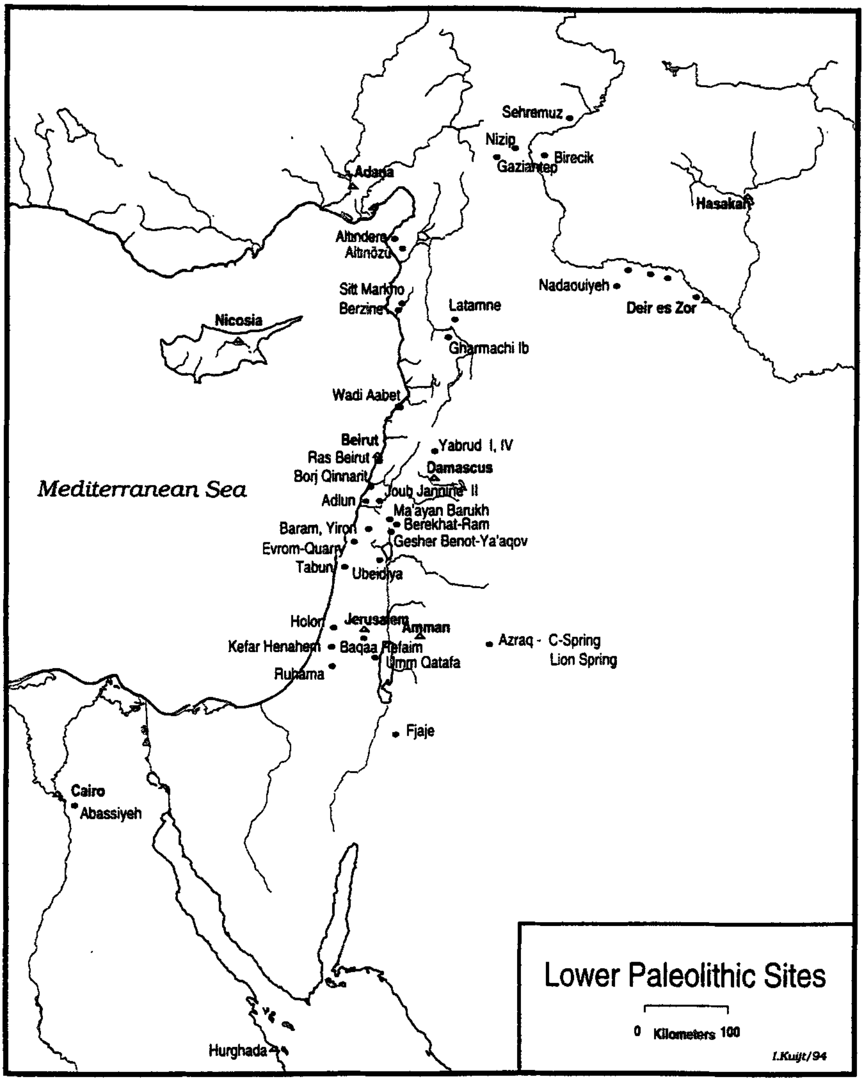

Fig. 3. The location of Levantine Lower Paleolithic sites mentioned in the text. Black dots indicate the positions of Lower Paleolithic find-spots.

formed one plateau (Horowitz, 1979). As shown in Fig. 4, it also serves as a baseline for comparisons between the various sites discussed below.

A BRIEF HISTORY OF RESEARCH

In summarizing field studies, especially on the basis of published reports, research approaches should first be examined. The Near East is an unusual region in that the study of its archaeology has been conducted by various schools which have for decades practiced fieldwork throughout the region. We should bear in mind, however, that not every Near Eastern country has been open for systematic field research during this time. Therefore, the following summary is undoubtedly biased, as it represents only those parts of the region which have received the attention of archaeologists during the past 50 years or so. Nevertheless, in order to understand the variability of the records and the currently used terminology, a brief historical survey is appropriate.

Lower Paleolithic artifacts, particularly handaxes, were noted in the nineteenth century by European travelers mostly interested in historical antiquities, and surface collections accumulated in institutions in Beirut, Damascus, and Jerusalem. However, the main thrust for prehistoric research began only with the "golden period" of Levantine archaeology between the two world wars. Excavations and surveys were carried out in Palestine by Turville-Petre, Garrod and her associates, Picard, Neuville, and Stekelis and in Lebanon by Doherty, Murphy, Ewing, and Fleisch, to mention only a few. The main trends toward intensive fieldwork in Israel, Lebanon, Syria, and later Jordan continued after the second world war, with more limited field research in Iraq, Iran, and Turkey (e.g., Braidwood and Howe, 1960; Yalçinkaya, 1981; Smith, 1986). Fieldwork in Georgia and Armenia was done mostly after the second world war by local and Russian scholars but was poorly known in the west until recent changes in the political atmosphere permitted better communication (e.g., Liubin, 1989, 1993). The result of these circumstances is that the richest records are available from Lebanon, Syria, Israel, and Jordan, with fewer known sites and publications from the Caucasus region and scanty information from Turkey, Iraq and Iran (e.g., Smith, 1986).

Most of our current knowledge concerning Lower Paleolithic sites is derived from surface collections, grab samples from wadi and river terraces, and a relatively small number of excavations in open-air sites and caves. The number of systematic excavations is small and the main ones are reported below.

On the Lebanese coast, the area of Ras Beirut has been a target for many surface collections and the excavation of two localities on the +52-m raised beach. These were Ras Beirut Ib and Wadi Aabet, the latter located about 50 km north of Beirut. The assemblages from these sites, partially rolled and abraded, were classified as Middle Acheulian (Fleisch and Sanlaville, 1974).

Bethlehem	Ubeidiya	Latamne	Evron Quarry	Gesher Benot Ya'aqov
–	Macaca sylvana	–	–	–
–	Ursus etruscus	–	–	–
–	Canis cf. amensis	–	–	–
–	Canis sp. (size falconeri)	Canis sp.	–	
Nyctereutes megamastoides	–	–	–	–
–	Vulpes sp.		–	–
–	Lutra sp.	–	–	–
–	Pannonictis ardea	–	–	–
–	Vormela cf. pereguana	–	–	–
–	Megantereon cf. cultridens	–	–	–
Homotherium sp.	–	–	–	–
–	Panthera gombaszaegensis	–	–	–
–	Lynx sp.	–	–	–
–	Felis sp. (size chaus)	–	–	–
–	Crocuta crocuta	Crocuta crocruta	Crocuta or Hyaena	–
–	Herpestes sp.	–	–	–
–	Kolpochoerus olduvaiensis	–	Kolpochoerus evronensis	–
Sus cf. strozzi	Sus cf. strozzi	–	–	–
–	–	–	–	Sus cf. scrofa
–	–	Stegodon cf. trigonocephalus	Stegodon sp.	Stegodon sp.
–	Hippopotamus behemoth	Hippopotamus cf. behemoth	Hippopotamus sp.	Hippopotamus (?) amphibius
–	Hippopotamus gorgops	–	–	–
–	Camelus sp.	Camelus sp.	–	–
Giraffa cf. camelopardalis	Undet. Giraffidae	Giraffa camelopardalis	–	–
–	Praemegaceros verticornis	Praemegaceros verticornis	–	Capra sp.
–	Ined. Cervidae	–	cf. Cervus (?) elaphus	Cervus cf. elaphus
–	–	Dama mesopotamica		Dama cf. mesopotamica
	–	–	Capreolus sp.	–
–	–	–	–	–
–	Pelovoris oldowayensis	–	–	–
Leptobos sp.	Bos sp.	–	–	Bos sp.
–	–	Bos primigenius	Bos cf. primigenius	–
–	–	Bison priscus	–	–
–	Oryx sp.	–	–	–
–	–	–	cf. Alcelaphus sp.	–
–	–	cf. Pontocerus sp.	–	–
–	Gazella cf. gazella	–	Gazella cf. gazella	Gazella cf. gazella
Gazellospira torticornis	Gazellospira torticornis	–	–	–
–	–	Gazella cf. soemmeringi	–	–
–	–	Dicerorhinus hemitoechus	–	Dicerorhinus hemitoechus
Dicerorhinus etruscus	Dicerorhinus etruscus	–	–	–
Hipparion sp.	–		–	–
–	Equus cf. tabeti	Equus cf. altidens	–	Equus sp.
–	Equus cf. caballus	–	–	–
Elephas planifrons	–	–	Elephas sp.	Elephas antiquus
–	–	–	–	–
–	Mammuthus meridionalis	–	–	–
–	–	Mammuthus trogontherii	–	–
	[selected rodents]			
	Parameriones obeidiensis	Meriones maghrebianus	cf. Gerbillius sp. (cf. dasyurus)	Gerbillus cf. dasyurus
	Gerbillus dasyurus			
	Laguradon arankae	Laguradon arankae		
	Arvicola jordanica			

Fig. 4. The faunal assemblages as reported from the main Levantine excavations excluding most rodents, birds, insectivors, and reptiles. (Sources: Hooijer, 1962, Tchernov, 1986, 1987; Guérin and Faure, 1988; Sanlaville *et al.*, 1993; Tchernov *et al.*, 1994.)

Systematic fieldwork carried out in Lebanon by the team of Besançon, Sanlaville, Hours, and Copeland produced collections from numerous localities embedded within Quaternary sequences (e.g., Sanlaville, 1977, 1979; Besançon *et al.*, 1982; Hours, 1975, 1981; Copeland and Hours, 1989; Sanlaville *et al.*, 1993). Noteworthy among these is the site of Joub Jannine II, which contanined an industry that closely resembles that of 'Ubiediya (Besançon *et al.*, 1970).

Cursory fieldwork by van Lierre in Syria (1960/1961) culminated with the excavations in Latamne by Clark (1967, 1968). Latamne became a type-site for the inland Middle Acheulian (Sanlaville *et al.*, 1993). In the following years, systematic surveys were conducted by the same team of Besançon, Sanlaville, Hours, and Copeland in Nahr el-Kebir, the Middle Euphrates, and the Orontes valley and the basin of El-Kowm (Sanlaville, 1979, 1993; Besançon *et al.*, 1982; Copeland and Hours, 1981, 1988, 1993). Their fieldwork resulted in the excavation of Gharmachi Ib, an Upper Acheulian site in the Orontes (Muhesen, 1985, 1993). Excavations in the Anti-Lebanon mountains took place in Yabrud rock shelters I and IV (Rust, 1950; Solecki, 1968), exposing both Upper Acheulian and Acheulo-Yabrudian industries as well as the Shemsi flake industry.

The surveys in Israel and the discovery of Gesher Benot Ya'aqov before the second world war (Stekelis, 1960) added earlier aspects of the Acheulian record to what had already been exposed in Tabun and Umm Qatafa caves by Garrod and Neuville (Garrod and Bate, 1937; Neuville, 1951). Additional fieldwork and accidental finds led to the excavations in 'Ubeidiya (Stekelis, 1966, Stekelis *et al.*, 1969; Bar-Yosef and Goren-Inbar, 1993), Evron-Quarry (Ronen and Amiel, 1974; Ronen, 1991), Holon (Yizraeli, 1967), and Kefar Menachem (Gilead and Israel, 1975) and, recently, to the renewal of the fieldwork in Gesher Benot Ya'aqov (Goren-Inbar *et al.*, 1992).

On the Golan Heights, surface collections of one site (Goren, 1979) led to more systematic research and the excavations at Berekhat Ram, where an Upper Acheulian site was radiometrically dated to >233 Ka (Goren-Inbar, 1985).

In Jordan, a series of surface collections provided both Middle and Upper Acheulian assemblages (Rollefson, 1981, 1983). However, the excavations in the C-Spring in the Azraq basin are well recorded (Copeland and Hours, 1989) and provide some insights on Upper Acheulian context in an oasis situation.

The number of Lower Paleolithic sites in Iraq and Iran is still rather small (Braidwood and Howe, 1960; Smith, 1986). A similar situation still prevails in Turkey (Yalçinkaya, 1981), where most of the finds are surface occurrences and often of isolated bifaces or core-choppers. Surveys in the Arabian peninsula summarized by Abdul-Nayeem (1990) recorded numerous find spots of bifaces and core-choppers. The excavations in Saffaqah, near the Red Sea (Whalen *et al.*, 1983, 1984), where a Middle Acheulian assemblage was excavated, are exceptional.

In Georgia, in addition to a series of surface occurrences, better-known Upper Acheulian assemblages were recovered in the caves of Tsona and Koudaro (e.g., Liubin, 1989, 1993). Also, the site of Dmanisi, long known for its paleontological assemblages, has recently provided artifacts and a hominid jaw

(Dzaparidze *et al.*, 1989) and may represent one of the earliest sites in the entire region to date.

SAMPLING PROBLEMS, TECHNOTYPOLOGY, AND TERMINOLOGY

Given the varied activities of different schools of archaeology and the current limitations imposed by geopolitical conditions, it is all the more surprising that the definitions of the industries within the Lower Paleolithic of the Near East vary so little. The most schematic, simplified taxonomy identifies a core-chopper industry (also called "Tayacian," "Tabunian" or "Shemsi," and "Para-Acheulian"), Early Acheulian, Middle Acheulian, Upper Acheulian, and Acheulo-Yabrudian or the "Mugharan Tradition" (e.g., Garrod, 1956; Howell, 1959; Solecki, 1968; Gilead, 1970; Hours, 1975; Hours *et al.*, 1973; Copeland and Hours, 1981; Bar-Yosef, 1975; Jelinek, 1981, 1982).

Technological studies and typological determinations of artifacts followed the basic schemes suggested by Bordes (1961) and Roe (1964). Subdivision of the Acheulian sequence in the southern Levant was done on the basis of the degree of elaboration of handax manufacture (Gilead, 1970) and followed the same scheme (e.g., Bar-Yosef, 1975; Ronen, 1979).

The detailed geomorphological investigations of marine beaches and fluvial terraces in Syria and Lebanon enabled Hours and Copeland to propose the subdivision of the Acheulian sequence, while comparing assemblages from different environments. This subdivision, if the excavated assemblages from Israel are taken into account, would be as follows.

Early Acheulian, also named "Early Lower Paleolithic" by Hours (1981), is defined as an industry with high frequencies of core-choppers, polyhedrons, spheroids, crude handaxes exhibiting twisted edges and large scars, trihedrals and tetrahedrals, a few picks, and heavy-duty scrapers with a large component of each assemblage composed of flakes (e.g., Bar-Yosef and Goren-Inbar, 1993). In several localities, the small samples provided only core-choppers and flakes, but it is assumed that additional fieldwork would discover the rare bifaces. However, in view of the presence of the nonbiface Karari Industry during 1.5–1.1 Ma in East Africa, certain sorties of *Homo erectus* could have been made by those who were the knappers of nonhandax assemblages.

The Middle Acheulian (or "Middle Lower Paleolithic") occurrences are defined on the basis of similarities to the Latamne assemblage (Clark, 1967, 1968; Hours, 1981; Copeland and Hours, 1993) or Joub Jannine II (Besançon *et al.*, 1970). The inland sites contain some core-choppers and polyhedrons, lanceolate bifaces, trihedrals, picks, and flake assemblages. The Middle Acheulian along the coast (such as Ras Beirut Ib, Wadi Aabet, Berzine) produced more amaygdaloid and oval bifaces. These assemblages could be somewhat later

(Copeland and Hours, 1993), or this typological variability could have arisen from differences in the available raw materials.

The "Upper Acheulian" is known from numerous sites and its assemblages can be divided into those where the oval forms dominate and those with more pointed forms (Fig. 5), as well as "facies" with and without the use of the Levallois technique. Apparent intentional use of the Levallois technique is still debated, although it is documented from the excavated assemblage of Berekhat Ram (Goren-Inbar, 1985). Most investigators agree that the Upper Acheulian bifaces are considerably more symmetrical and refined than are those of the older assemblages.

Finally, the Acheulo-Yabrudian or the Mugharan Tradition, so named by Jelinek (1981), is included here. In the recent past, archaeologists tended to follow the influence of Bordes, who saw the similarity between the thick Yabrudian scrapers and the Quina scrapers as indicating that the Acheulo-Yabrudian should be included within the Mousterian sequence or contemporaneous Middle Paleolithic assemblages (e.g., Bordes, 1977; Farrand, 1979). Recent TL dates from Tabun cave (Mercier and Valladas, 1994), however, demonstrate that this entity (older than 270 Ka) precedes the Mousterian and can be grouped again with the Lower Paleolithic assemblages. Nevertheless, this is merely a terminological game since the separation between the Middle and the Lower Paleolithic has never been established as a major dividing line, except when the Mousterian was thought to begin only with the Last (Würm) glaciation. Otherwise, it was often seen as a convenient subdivision. Recently, there is a growing awareness that major changes took place during the Last Glaciation and perhaps especially in the period 60–45 Ka. Thus, if the Mousterian sequence began in the Near East and Europe some 250 Ka, it would be practical to include once again the Acheulo-Yabrudian in a survey of the Lower Paleolithic. As in Africa, core-chopper and Acheulian industries were interspersed in time and space, while the Acheulo-Yabrudian seems to have been a local, Levantine entity preceding the Mousterian. Only well-dated sequences will enable us to establish chronological correspondences across the entire region. Until now, the more fully known sequences are confined to the Levant.

Figure 5 summarizes the chronology of the Lower Paleolithic and in the following pages, each of the main sites, or local sequences, is presented.

THE MAIN LOWER PALEOLITHIC SITES

Dmanisi

The site of Dmanisi is situated on a basaltic block bordered by two tributaries of the larger Kura River. It was first excavated in the course of paleontological investigations (Vekua, 1987; Gabunia and Vekua, 1990). The stratified

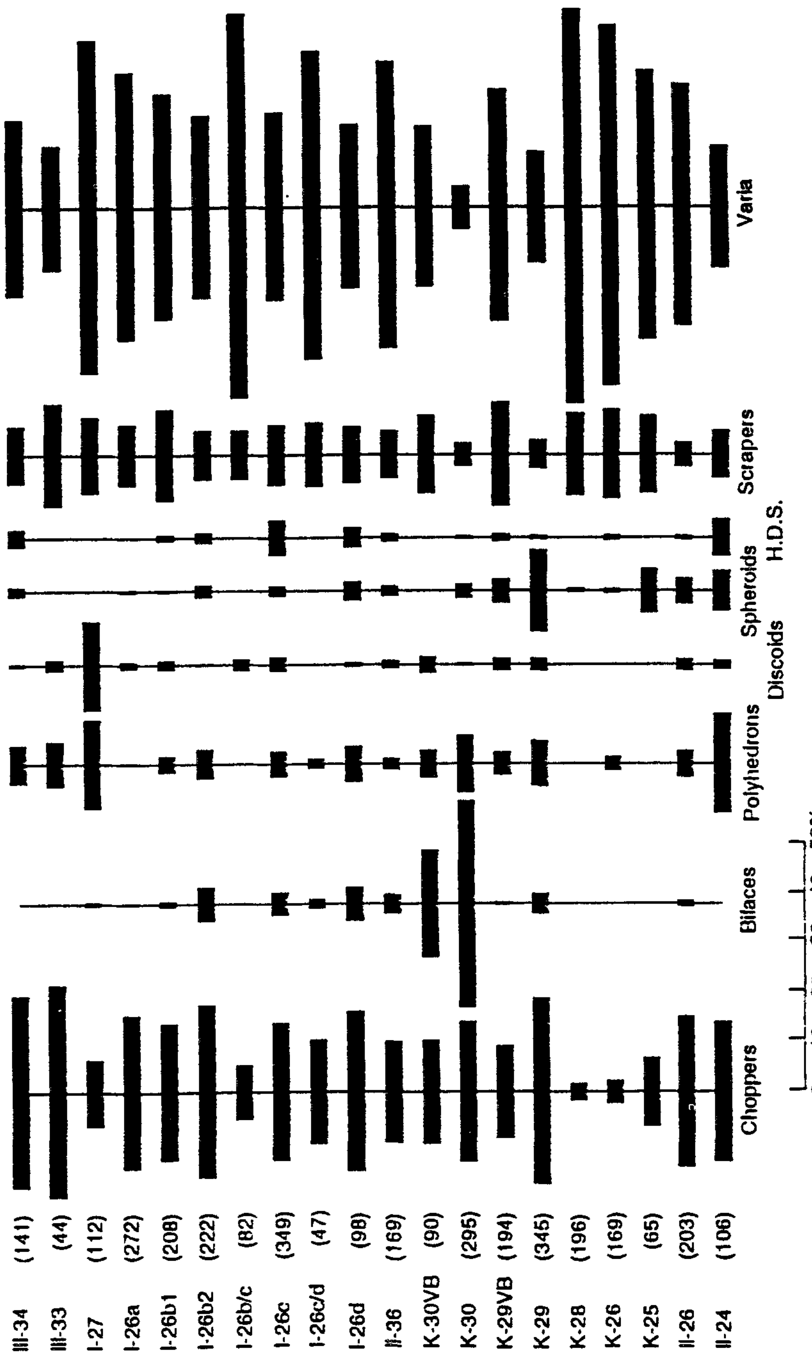

Fig. 5. The typological composition of the 'Ubeidiya assemblages (from Bar-Yosef and Goren-Inbar, 1993).

faunal assemblages, which immediately overlie a lava flow, are associated with a lithic industry consisting primarily of core-choppers and lacking bifaces (Dzaparidze *et al.*, 1989; except perhaps for one piece in Fig. 38). Among the reported flakes are retouched pieces that can be classified as scrapers, one burin, and a few worked bone objects.

Preliminary study of pollen preserved in coprolites indicates that the area around the site was forested with the following trees: *Abies*, *Pinus*, *Fagus*, *Alnus*, *Castanea*, *Tilia*, *Betula*, *Carpinus*, and rare *Ulmus* and *Salix*. Among the bushes were rhododendron, corylus, and myrtle, while the herbaceous vegetation was dominated by Cyperaceae, Gramineae, and Polygonaceae. The overall reconstructed environment consists of high mountains with Alpine associations and the well-watered woodland of an inland basin. This relatively wet environment is corroborated by the list of the fauna that also supports a Lower Pleistocene date (Dzaparidze *et al.*, 1989). The list includes the following species: *Struthio dmanisensis*, *Ursus etruscus*, *Canis etruscus*, *Pachycrocuta* sp., *Homotherium* sp., *Megantereon* cf. *megantereon*, *Archidiscodon meridionalis*, *Equus* cf. *stenonis*, *Equus* cf. *altidens*, *Dicerorhinus etruscus etruscus*, *Sus* sp., *Dama* cf. *nestii*, *Cervus* sp., *Dmanisibos georgicus*, Caprini gen., *Ovis* sp., Leporinae gen., *Cricetulus* sp., and *Marmota* sp.

Originally, the fauna from Dmanisi was attributed to the Upper Apscheronian or the Upper Villafranchian as defined in the western Mediterranean basin (Gabunia and Vekua, 1990). While reevaluating the assemblage following the discovery of the hominid mandible, comparisons with fauna from Europe and from the site of 'Ubeidiya led the investigators (Dzaparidze *et al.*, 1989) to suggest that the Dmanisi assemblage is contemporary with the Odessa fauna from southern Russia, considered to be slightly earlier than faunas of Senèze and Le Coupet and, thus, earlier than 'Ubeidiya. However, the remains of the *Archidiscodon meridionalis* in Dmanisi are considered to be slightly more primitive than the one described by Beden (1986) from 'Ubeidiya. Therefore, Gabunia (in Dzaparidze *et al.*, 1989) estimates that the site should be dated to the Olduvai subchron. According to the excavators the latter attribution is supported by the normal polarity of the site, although the possible effects of demagnetization have not yet been taken into account. The lava flow under the site has provided one K/Ar date of 1.8 ± 0.1 Ma, which is also cited to support the site's placement within the Olduvai subchron. Unfortunately the lack of direct dating of the bone-bearing layers raises the possibility that they accumulated over a long period of time. Estimating the age of the site within the time range of 1.5–1.0 Ma would be reasonable.

'Ubeidiya

The site of 'Ubeidiya lies 3 km south of the Sea of Galilee on the flanks of the western escarpment of the Jordan Rift. With the aid of heavy machinery, several geological trenches (numbered I–V, K and Ka) were excavated to a total length of about 1100 m (Picard and Baida, 1966a,b; Bar-Yosef and Tchernov, 1972). The geological structure, as observed in these artificial exposures, is an anticline with several undulations and faults (Fig. 7). The numerous layers in the trenches were numbered from the observed earliest to the latest over a total thickness of 154 m. The observed sequence was subdivided into four cycles: two limnic (Li and Lu) and two terrestrial (Fi and Fu) by Picard and Baida (1966a) as follows (Fig. 7).

The Li cycle, characterized by clays, silts, and limestone, terminates with laminated silts, rich with freshwater mollusks and fish remains. One layer (III-12) contained mammalian bones and some artifacts and provided the only pollen spectrum indicating forest cover on the flanks of the Jordan Valley (Bar-Yosef and Tchernov, 1972; Tchernov, 1986; Bar-Yosef and Goren-Inbar, 1993).

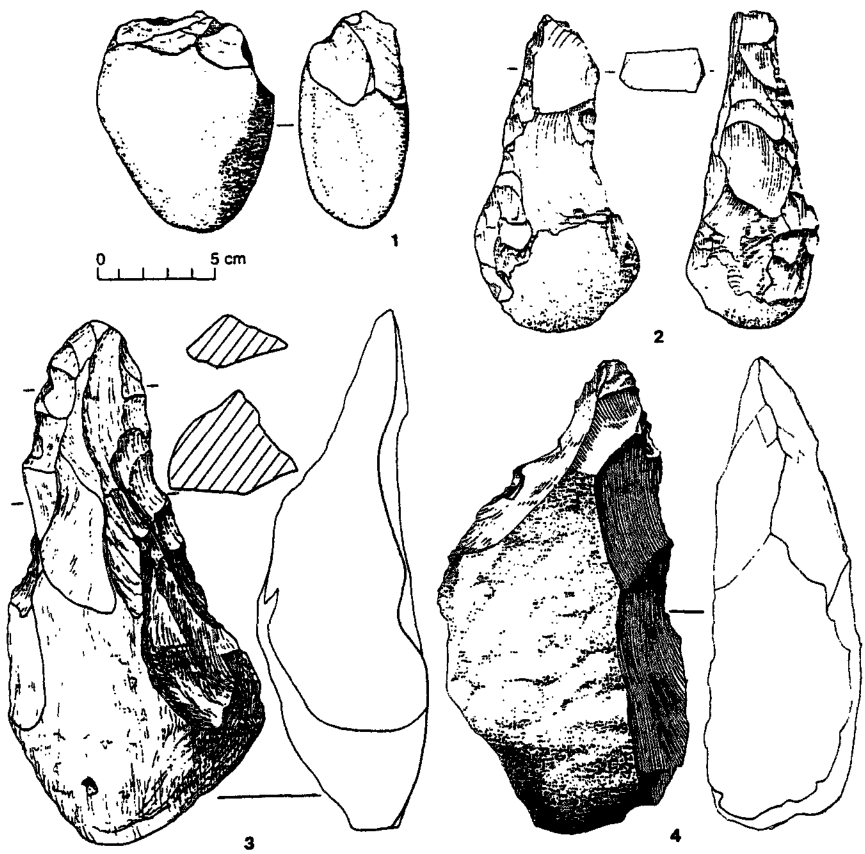

Fig. 6. Artifacts from 'Ubeidiya (from Bar-Yosef and Goren-Inbar, 1993). (1) Core chopper; (2) quadrihedral (flint); (3) biface (basalt); (4) biface (flint).

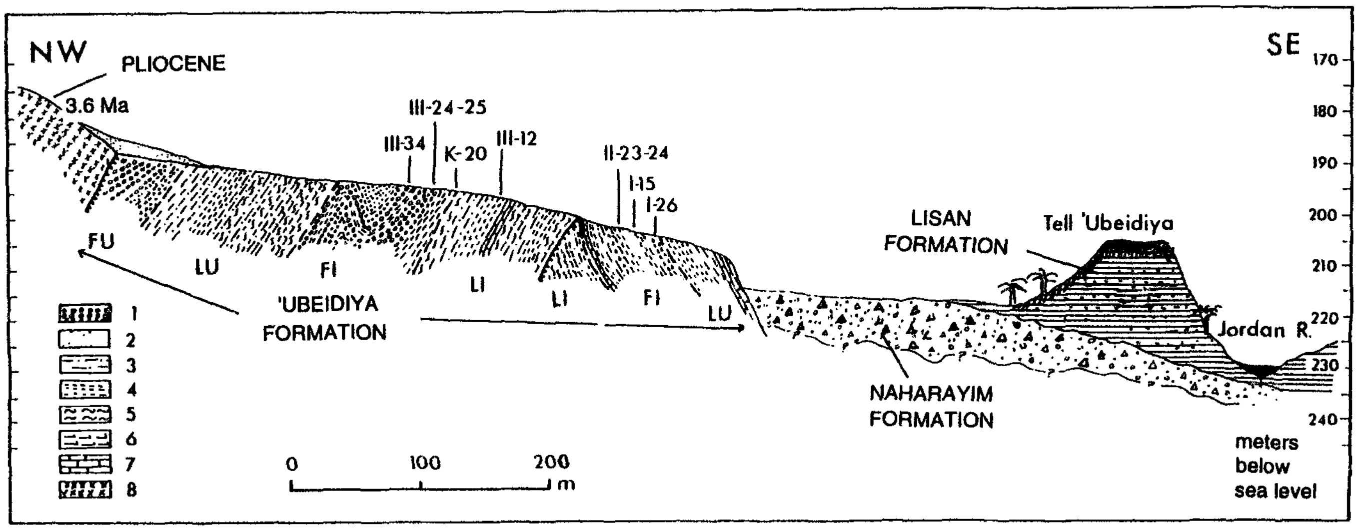

Fig. 7. A generalized geological cross section of the site of 'Ubeidiya (from Bar-Yosef and Goren-Inbar, 1993). (1) Conglomerate; (2) sand; (3) silt; (4) clay; (5) marl; (6) chalk; (7) limestone; (8) basalt.

The Fi cycle is built of clays and conglomerates, mainly beach deposits. Most of the archaeological finds and faunal remains were obtained from this member, beginning with layer II-21 through III-64 (Bar-Yosef and Goren-Inbar, 1993).

The Lu cycle is the upper limnic member and consists of two parts: The lower part is essentially clays and chalks, while the upper part is a white-grayish-yellow silty series. Only a few artifacts were encountered in this unit.

The Fu cycle consists mainly of conglomerates, some of which are large basalt boulders. No artifacts or mollusks were found in this member. Presumably it represents the regression or even total disappearance of Lake 'Ubeidiya due to tectonic movement. This member is overlain by a Pliocene overthrusted block within which the basaltic flow was K/Ar dated to 3.6 Ma (Curtis, 1965).

The paleoenvironments of 'Ubeidiya were reconstructed on the basis of the different lithologies and the malacological and faunal assemblages (Bar-Yosef and Tchernov, 1972). The results indicate that the site was located within a sequence of complex alluvial and deltaic history, recording lakeshores fluctuations. During the early phase, the lake reached as far as the escarpment of the Jordan Rift. Later (Fi), it receded and early humans camped on the lake shores, at the edges of the alluvial fan, and on mud flats or temporarily dried swamps. From the hilly area, several lithic assemblages were washed and redeposited within a wadi infilling (in particular layers K-29, K-30, and III-34, 35). The lake transgressed again (Lu) and then regressed (Fu), this time probably as a result of the beginning of the tectonic movement that caused the folding of the formation and the slumping of the Pliocene block on top of its younger member.

The archaeological excavations at 'Ubeidiya uncovered many layers with artifacts (Bar-Yosef and Goren-Inbar, 1993). Field observations indicate that the same layers can be traced on both sides of the main anticline. However, in order to avoid unwarranted correlations, layers were numbered separately in relation to each geological trench (Bar-Yosef and Tchernov, 1986). Of the 65 observed layers, 15 can be considered major archaeological horizons and were each excavated in a sufficiently large exposure to provide a fairly large lithic and faunal assemblage (Fig. 5) (Tchernov, 1986; Bar-Yosef and Goren-Inbar, 1993). They can be divided on the basis of their depositional environment as follows:

(1) within or on top of a swampy layer with very few pebbles or cobbles (K-12 = III-12, III-20–22; II-23, II-24, II-25, II-36, K-20);
(2) within the lake beaches that pass laterally into the lake or swampy deposit, as incorporated elements together with pebbles and cobbles (II-26 = I-15, II-28, I-26d, I-26c, I-26b, I-26a); and
(3) within a fluvial conglomerate, as elements of the gravel deposit (K-29, K-30, III-34).

Occasional artifacts were encountered in different layers, reminiscent of the sparse finds in FLK, Olduvai Gorge, above the Zinj. floor (Leakey, 1971, pp. 58–60) and directly related to the "scatter between the patches" (Isaac, 1986). While this phenomenon seems to indicate the presence of hominids in the area, given the tilted nature of the 'Ubeidiya layers, it would be difficult to expose large surfaces and make a significant contribution to the discussion concerning the nature of these occurrences (e.g., Stern, 1993).

The raw materials used for the manufacture of artifacts were lava (basalt), flint, and limestone. The basalt occurs as pebbles, cobbles, boulders, and scree components; the limestone, as cobbles within the beach and wadi deposits; and the flint in the same enivronments, as small pebbles and cobbles. Early hominids used each type of rock for different tool types (Stekelis *et al.*, 1969; Bar-Yosef and Goren-Inbar, 1993). Core-choppers and light-duty tools were made of flint, spheroids mainly of limestone (Fig. 8), and the handax group of basalt, with a few of flint and limestone (Fig. 6). There is a direct correlation between the size of the tool category and the type of common raw material. In every lithological facies the common one is the basalt. However the most abundant tool type is the core-chopper made on flint. Needless to say, flint provides a generally more stable sharp edge than basalt or limestone.

The dating of 'Ubeidiya is currently based on the revised faunal studies by Tchernov and his associates, who concluded that the site should be dated to 1.4–1.0 Ma (Tchernov, 1986, 1987, 1992a,b), with a higher probability of a date around 1.4 Ma (Tchernov, 1992a,b). Chronological considerations are based on the following observations and/or age determinations of geologic formations below and above the site.

(1) The major tectonic activities which formed the Jordan Rift Valley (Dead Sea Rift System) postdate the deposition of the Cover Basalt. This complex formation, around Lake Kinneret (Sea of Galilee), is currently dated to 3.11 $\pm$ 0.18 Ma (Mor and Steinitz, 1982).

(2) The lacustrine and fluvial sediments of the Erq el-Ahmar Formation were recently dated by paleomagnetic reversals (Verosoub and Tchernov, 1991) to have lasted from the late Gilbert chron through the early part of the Matuyama chron. A few core-choppers and flakes were found in its upper part, which is considered to be slightly later than the Olduvai subchron.

(3) The latter formation was dated by the presence of *Hydrobia acuta* and *Dreissena chantrei* in its molluscan assemblage (Tchernov, 1975) to the late Pliocene. Furthermore, it contained eight extinct species of mollusks not found in 'Ubeidiya or in later localities (Picard, 1943; Tchernov, 1975, 1986) and therefore indicates a hiatus between these two freshwater lakes formations.

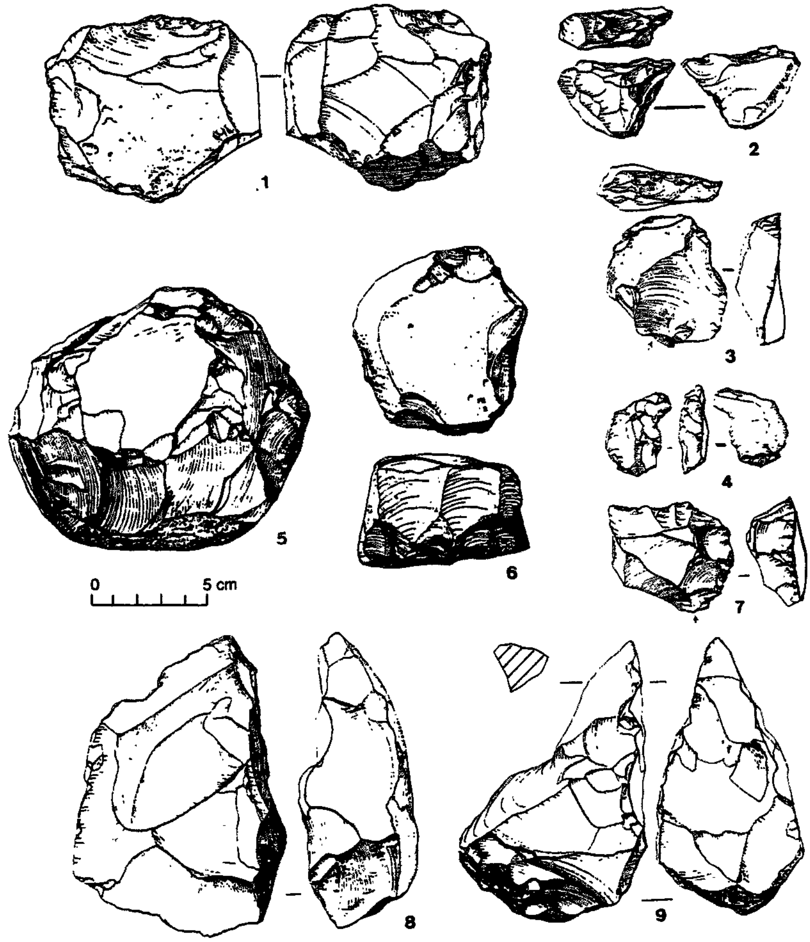

Fig. 8. Artifacts from 'Ubeidiya: (1) polyhedron; (2, 4, 7) retouched flakes; (5) spheroid; (6) heavy duty scraper; (8) core; (9) trihedral pick. (from Bar-Yosef and Goren-Inbar 1993)

(4) The 'Ubeidiya Formation was deposited following a tectonic movement that contorted the Erq el-Ahmar Formation. The deposition of the 'Ubeidiya Formation was halted by another tectonic movement which folded and faulted the Yarmuk Basalt (see below).

(5) Unfortunately, the Yarmuk Basalt does not directly overlie the 'Ubeidiya Formation. Nevertheless, it is considered to postdate the latter on the basis of geologic correlations (Horowitz, 1979). It was first K/Ar dated to 0.6 ± 0.05 and 0.64 ± 0.12 Ma (Horowitz *et al.*, 1973), and later nine samples were averaged to a date of 0.79 ± 0.17 Ma (Mor

and Steinitz, 1985). Given the date for the Bruhnes/Matuyama boundary recalculated at 0.78 Ma (Tauxe *et al.*, 1992), it is not surprising that a normal polarity for flows of the Yarmuk Basalt was reported. The reversed paleomagnetic situation at 'Ubeidiya only indicates an age within the Matuyama chron (Opdyke *et al.*, 1985).

The date of the site relies on faunal correlations with European assemblages of known ages (Fig. 9) (Eisenman *et al.*, 1983; Tchernov, 1986, 1988, 1992a,b; Guérin and Faure, 1988). The presence of the following species, with reference to the biozones as defined by Guérin (1982), is currently considered to be the best indication of the site's age.

(1) The younger species (Zone 19 and later; estimated age, 1.5 Ma and younger)

Lagurodon arankae (Zone 19, Final Villafranchian)
Mammuthus meridionalis cf. *tamanensis* (Zone 19 and early 20, Final Villafranchian and earliest Mid-Pleistocene)
Praemegaceros verticornis (Mid-Pleistocene in Eurasia)
Canis arnensis (Zones 19–20)
Pelorovis oldowayensis (present from mid-Bed II through Bed III in Olduvai, 1.4–0.7 Ma)
Apodemus (Sylvaticus) sylvaticus (reached Europe by Mid-Pleistocene from the Near East)
Apodemus flavicollis (same as *A. sylvaticus*)

(2) The older species (Zone 18 and younger, or since 1.9 Ma)

Dicerorhinus etruscus [form of the latest evolutionary phase (Guérin, 1986)]
Panthera gombaszoegensis (Zones 18–20, Upper Villafranchian to Mid-Pleistocene)
Kolpochoerus oldowayensis (in Shungura G and Olduvai I–IV)
Hippopotamus gorgops (present in the entire sequence of Olduvai)
Hippopotamus behemoth [endemic species (Faure, 1986)]

(3) The archaic species (Zone 16 through Zone 19 or later)

Hypolagus brachygmathus (Zones 16–20)
Allocricetus bursae (in Eurasia from Zone 17 to Zone 21, seemingly survived later in the Near East)
Cricetus (since Zone 17, Middle Villafranchian)
Gazellospira torticornis (through the entire Villafranchian)
Sus strozzii (from Zone 16 through Zone 20)
Ursus etruscus (through the entire Villafranchian)

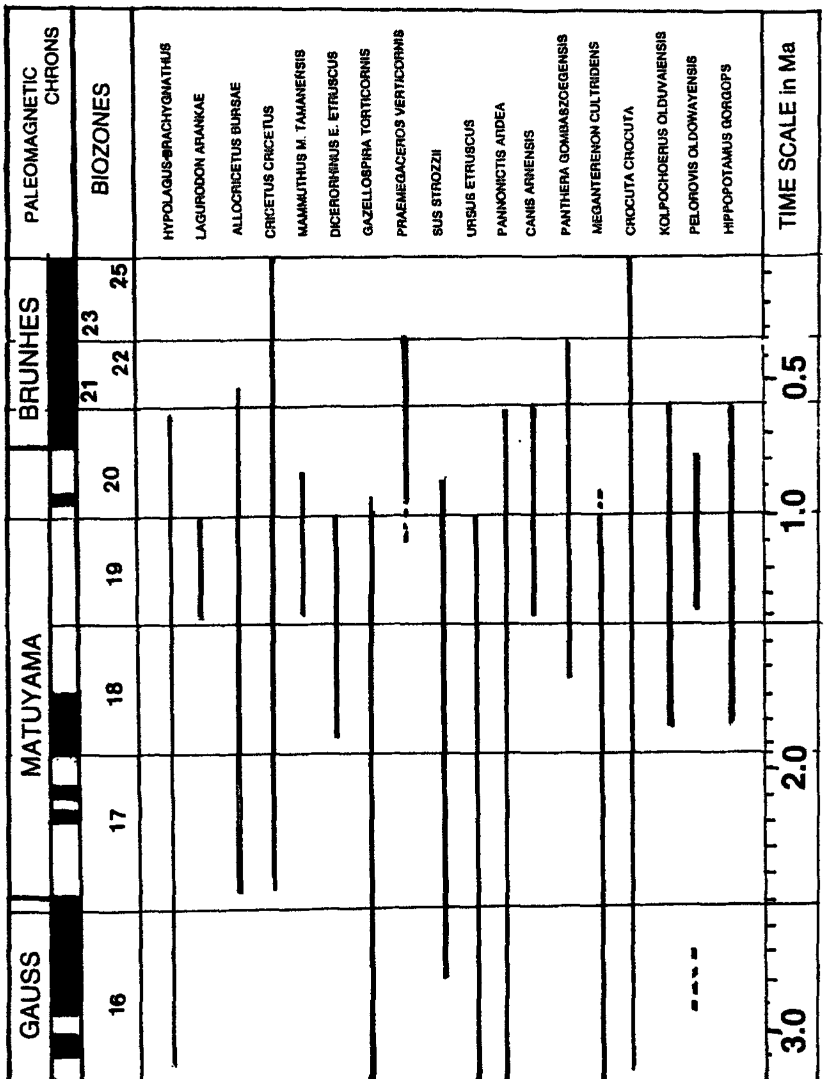

Fig. 9. The main faunal elements considered as chronological makers (after Tchernov, 1986, 1987; Guérin and Faure, 1988).

Pannonictis ardea (through the entire Villafranchian into the Mid-Pleistocene)
Megantereon cultridens (Zones 16 through 19)
Crocuta crocuta (since Shungura B)
Herpestes sp. (since the Pliocene in Africa)

The fauna of 'Ubeidiya is essentially Late Villafranchian, with a few Galerian elements. The earliest layers (K/III-12, III-2022, II-23, 24) contain an abundance of core-choppers, polyhedrons, and spheroids but lack bifaces (Fig. 10). The samples are large enough to suggest that these assemblages may indicate the presence of an early group of *Homo erectus*. The rest of the sequence contains bifaces in varying frequencies and can be called Early Acheulian (Bar-Yosef and Goren-Inbar, 1993). Using the Olduvai terminology, those with few

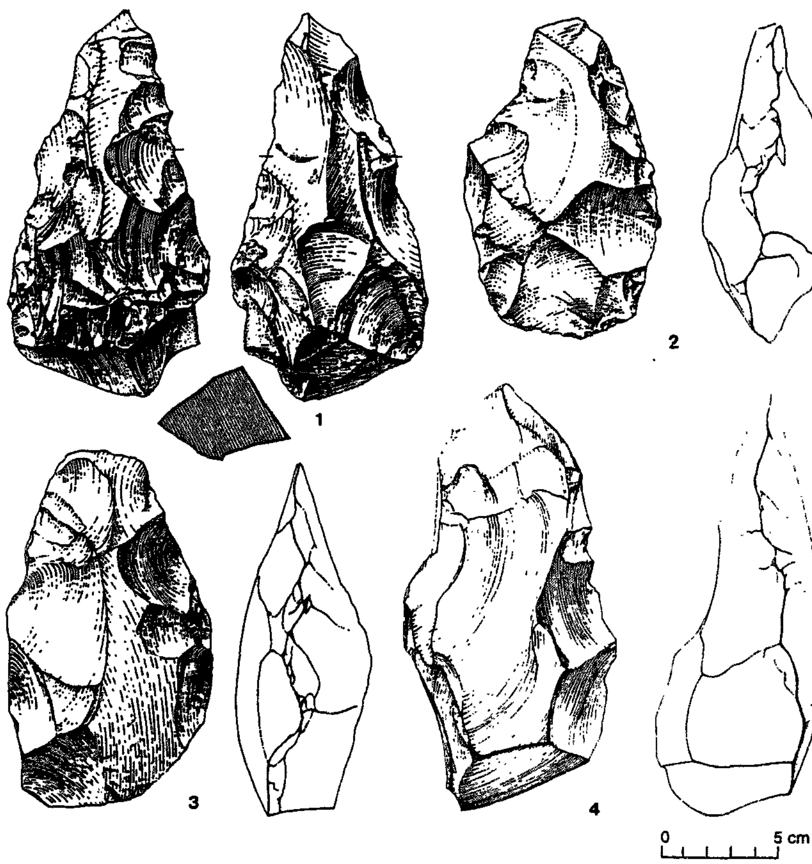

Fig. 10. Bifaces from Evron-Quarry (after Gilead and Ronen, 1977).

bifaces would fall into the category of "Developed Oldowan." In spite of the considerable similarity in the basic knapping techniques between the non-Acheulian and the Acheulian assemblages, the presence or absence of bifaces, as explained above, is taken to designate different groups of people.

Thus, 'Ubeidiya and Dmanisi seem to mark stations in human dispersals from Africa into Eurasia. The "Levantine Corridor," as defined by the paleontologists (e.g., Thomas, 1985), is often reconstructed as leading from the Afar Rift into the southeastern corner of the Arabian peninsula. It continues along the Red Sea into the Levant and from there spreads both eastward and westward. The existence of the Saharan desertic belt since the end of the Miocene excludes the interior of the Arabian peninsula from the Levantine Corridor. Under interglacial conditions, the northern penetration of the monsoonal system drastically changed the potential for increasing amounts of resources in eastern Sahara (e.g., Neumann, 1989) and could have permitted an alternative route for *Homo erectus* or Archaic *Homo sapiens* groups. The Lower Paleolithic assemblages in el Abassieh in Cairo (Bovier-Lapierre, 1926), therefore, may indicate that the Nile Valley should not be excluded as a potential migration route.

Evron-Quarry

The site of Evron-Quarry is located in the coastal plain of the western Galilee and was discovered when a sandstone quarry was opened in the 1960s. Surface collections were followed by systematic excavations (Ronen, 1991). The exposed site lies on a Miocene clay and contains alternating deposits of sandstone (kurkar) sometimes up to 3 m thick and red-brown loams (hamra) as either isolated lenses or layers up to about 1–4 m thick. The layer that contains the Middle Acheulian horizon is separated by another deep red loamy clay layer, with two distinct horizons of calcareous concretions, occasional artifacts, and sandy clay lenses with pebbles (2–3 m thick) from the dark brown-black clay (2 m thick) that contained Upper Acheulian artifacts and a few animal bones.

The archaeological horizon contained small pebbles of quartz, limestone, and flint, with most of the artifacts made of the last. No bifaces were found in the excavated areas, although earlier searches in the quarry dumps recovered 20 bifaces. These are large (140–220 mm) and demonstrate a relatively crude workmanship that resembles that of the handaxes from 'Ubeidiya and Latamne (Ronen, 1991). Their absence from the excavated area is considered to have resulted from the spatial distribution of hominid activities. The vertical distribution of the artifacts within the archaeological horizon was 15–25 cm and is interpreted to be the result of repeated occupations. Similar to the large cobbles from which the bifaces were made, a group of hard calcite geodes, the heaviest of which was 580 g, was brought to the site by the occupants from about 5 km away. The spatial distribution within the main excavation area does not indicate any effect of water flow, although it seems that a lower level that was exposed during the last season (1985) was affected by overbank flooding.

The excavated lithic assemblage contained flint artifacts in mint condition, although alternating retouch indicates some kind of trampling. The total excavated assemblage amounts to 383 pieces. Except for the bifaces, the flint artifacts are relatively small (Fig. 10). Most of the core choppers do not exceed 35 mm in length, while the various flakes, including retouched pieces, are on average between 22 and 26 mm in length. Among the retouched pieces, as at 'Ubeidiya, denticulates, notches, and retouched flakes, some resembling end or side scrapers, were described.

The revised faunal list is given in Fig. 4 (Tchernov *et al.*, 1994). According to this most recent revision, the assemblage from Evron-Quarry is closer to those from Latamne and 'Ubeidiya and differs from that from Gesher Benot-Ya'aqov. The fauna indicate a mixture of woodland environment on the coastal plain.

OTHER LOWER PALEOLITHIC LEVANTINE COASTAL OCCURRENCES

Various surveys along the eastern Mediterranean coastal plain and terraced shore lines have located a few occurrences which, on the basis of geological observations, appear to be of great antiquity, although dating is rather tenuous due to lack of datable materials. The identification of shore lines by their elevation above sea level was once the basis for formulating a chronostratigraphic sequence, incorporating marine foraminifera and shell assemblages. Along the Syrian-Lebanese-Israeli mountainous front, artifacts are sometimes found on terraces as high as 120 m above sea level, and a few older shorelines have been noted.

Noteworthy among the find-spots on the high Lebanese shore line is Borj Qinnarit, where a few core-choppers and flakes were found. Hours (1975) originally named this nonbiface industrial facies "Para-Acheulian" but later, recognizing the sampling biases, grouped all the earliest find-spots and scatters under the term of "Early Lower Paleolithic" (Hours, 1981) or Early Acheulian (Besançon *et al.*, 1988).

Kefar Menachem is among the earliest coastal sites in Israel. Excavations and surface collections were made in an area nicknamed "Halulim" (Gilead and Israel, 1975). This site is embedded in red loam assigned by Horowitz (1979) to Dorot Hamra. The traditional Alpine-oriented dating of this formation was to the "Mindel" period, falling sometime between 0.9/0.8 and 0.5 Ma. However, in the absence of faunal remains or paleomagnetic readings, correlation with other sites is precluded. Only the position of the site in what is considered the earliest hamra may indicate an even earlier age.

The lithic assemblage of the "Halulim" site is composed of numerous core-choppers, flakes, and some flake tools (classified as end-scrapers, side scrapers, burins, notches, and denticulates). The use of direct, hard-hammer percussion is dominant. To date, a few bifaces have been found on the surface. These are described as a mixture of crudely made items with a few which demonstrate better craftsmanship. Gilead and Israel (1975, p. 8) defined them as "irregular ovates, oblong picks, long thick lanceolate pieces, backed bifaces, specimens with reserved butts and minimally trimmed bifaces on tabular slabs." The excavators related this industry tentatively to the Early Acheulian.

INLAND LOWER PALEOLITHIC SITES

Latamne

The terraces of the Orontes River provided a sparsely distributed core-chopper assemblage, collected in the gravels of the Khattab Formation in Rastan (Sanlaville *et al.*, 1993). The earlier assemblage, also called "Khattabian," was compared by the investigators to both 'Ubeidiya and Sitt Markho in the Nahr el-Kebir terraces. The site of Latamne was discovered in the 1960s by van Liere, who collected artifacts, mainly handaxes, in gravel quarries near the village of Latamne. Excavations were carried out by Clark (1967, 1969) and additional fieldwork was done by Sanlaville and his associates (1993).

The archaeological horizon of Latamne lay in the midsequence of what was later defined as the Latamne Formation. It contained the *in situ* assemblage of the Latamne "occupation floor," a silty layer only a few centimeters thick (up to 10 cm) capped by sandy–silty bedding with traces of rootlets. The sequence was interrupted by the erosion and deposition of a fluviatile sandy member, about 10 m thick, capped by a lacustrine member. Palynological samples from the Latamne Formation (in the Miramil section) indicate that the mountain slopes were forested by broad-leafed trees such as *Quercus*, *Carpinus*, *Tilia*, *Juglans*, *Ulmus*, *Corylus*, and *Betula* and coniferous species such as *Pinus* and *Cupressus* (Dodonov *et al.*, 1993).

Geomorphological observations indicate that the archaeological horizon excavated by Clark resulted from a low-energy waterflow responsible for the deposition of the artifacts and their pattern of spatial distribution. About one-third of the total 3724 recorded artifacts were classified as slightly abraded or abraded. Water activity in leaching the sediments, as well as the weathering caused by chemical reactions, destroyed most of the bones, so only a very few bone fragments and isolated teeth were recovered. Most of the well-preserved and identifiable specimens came from the gravels beneath the archaeological horizon. These were first identified by Hooijer (1962) and were later reexamined by Guérin *et al.* (1993), who, together with Mein and Besançon (1993), added the newly found micromammals to create a list as follows (Fig. 4): *Stegodon* cf. *trigonocephalus* (elephant), *Elephas trogontherii* (elephant), currently classified as *Mammuthus trogontherii*, *Equus* cf. *altidens* (horse), *Dicerorhinus* cf. *Hemitoechus* (rhinoceros), *Hippopotamus amphibius* (hippo), reclassified as *Hippopotamus* cf. *behemoth*, *Orthogonocerus verticornis* (a large deer), currently classified as *Praemegaceros P. verticornis*, *Camelus* sp. (wild camel), *Giraffa camelopardalis*, an undetermined antelope, perhaps *Pontoceros*? *Bos primigenius*, *Bison* cf. *priscus* (bison, the earliest positively identified in the Levant), *Canis* cf. *aureus* (golden jackal), *Crocuta crocuta* (spotted hyena), the insectivore *Crocidura sauveolis*, and the rodents *Apodemus flavicollis*, *Arvicola jordanica*, *Meriones maghrebianus*, and *Lagurodon arankae*. During the excavations it appeared that the most common bone fragments belonged to the equids and elephant types, although the presence of two additional species was suggested: *Dama mesopotamica* (fallow deer) and *Gazella soemmeringi* (a type of gazelle).

Hooijer (1962) assigned the overall assemblages to the "Mindel-Riss" Interglacial in relation to the Western European faunal biostratigraphy. A reexamination of the material and the newly discovered rodents (Guérin *et al.*, 1993; Mein and Besançon, 1993) suggest that there is a greater similarity than previously thought between the fauna of Latamne and that of 'Ubeidiya. At the same time, however, the authors viewed 500 Ka as potentially the latest date for the site. With a TL date of 560 Ka for the Latamne Formation, the proposed dates for the entire sequence would be 700–500 Ka (Copeland, 1988; Sanlaville, 1988; Sanlaville *et al.*, 1993).

Clark noted that most of the artifacts from Latamne were made of raw materials available on the spot: flint, a few of limestone, and three of basalt. Large flint cobbles could easily have been knapped, generally by hard-hammer percussion, although scars on several bifaces indicate the occasional use of soft hammer.

The major categories of shaped tools (370) are composed of almost 36% bifaces, 38% light-duty scrapers, about 13% heavy-duty tools, and 5% spheroids (Fig. 11) (Clark, 1969). Among the handaxes, there are a few trihedral picks, similar to those found at 'Ubeidiya. Spheroids were made on limestone and basalt. Choppers comprise only 4.5%. However, if we increase the part of the assemblage that is categorized as "shaped pieces" and include all the cores (126) as part of the category of core choppers, the core-choppers amount to 35% of the shaped tools. This shift in frequencies would make the Latamne assemblage closer to some of the 'Ubeidiya assemblages.

A unique Middle Acheulian occurrence was surface collected at Joub Jannine II, near the Litani River, although the artifacts clearly eroded from a definable formation (Besançon *et al.*, 1970; Hours, 1975; Copeland and Hours, 1993). Typologically, the lithic assemblage of Joub Jannine II (Fig. 12) resembles the 'Ubeidiya series more than it does the assemblage of Latamne. It

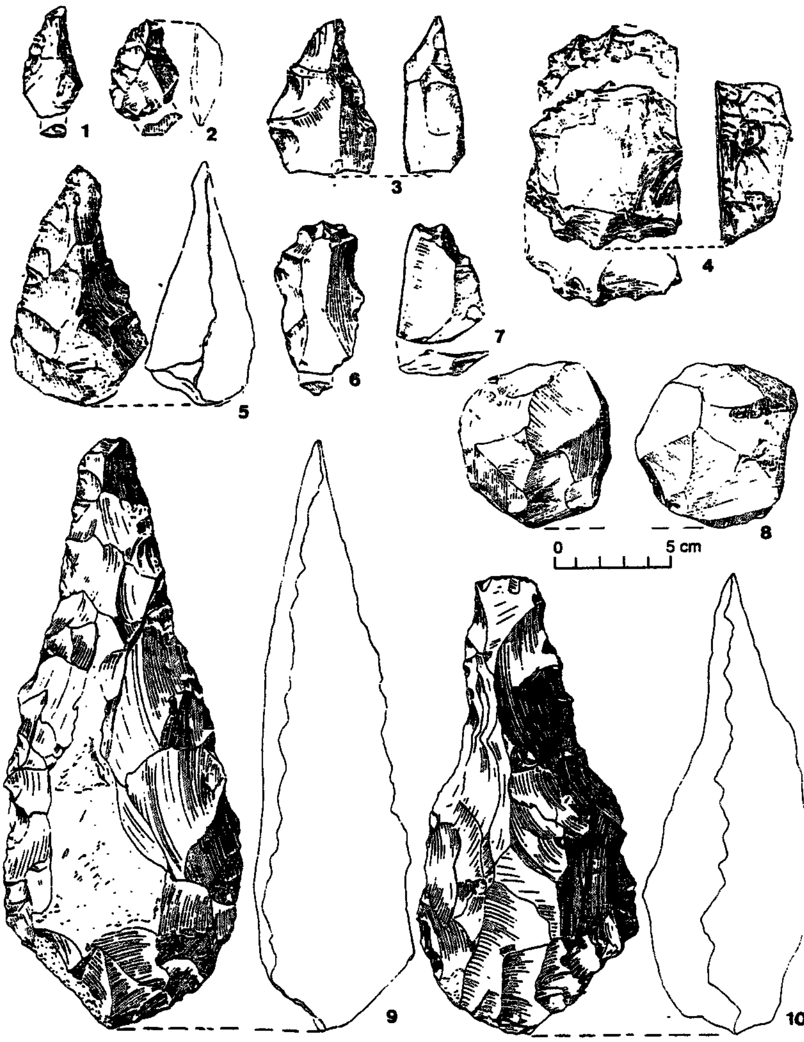

Fig. 11. Selected artifacts from Latamne (after Clark, 1967, 1969). (1–4, 6, 7) Retouched flakes; (5, 9, 10) bifaces; (8) spheroid.

comprises high frequencies of lanceolate bifaces and trihedrals along with polyhedrons and core-choppers (Hours, 1981).

Gesher Benot Ya'aqov

The site of Gesher Benot Ya'aqov lies on the eastern edge of a vast basalt covered area (Gebel Druz and the Black Desert) within southern Syria and northern Jordan. It is unique in the Near Easter Lower Paleolithic: The exca-

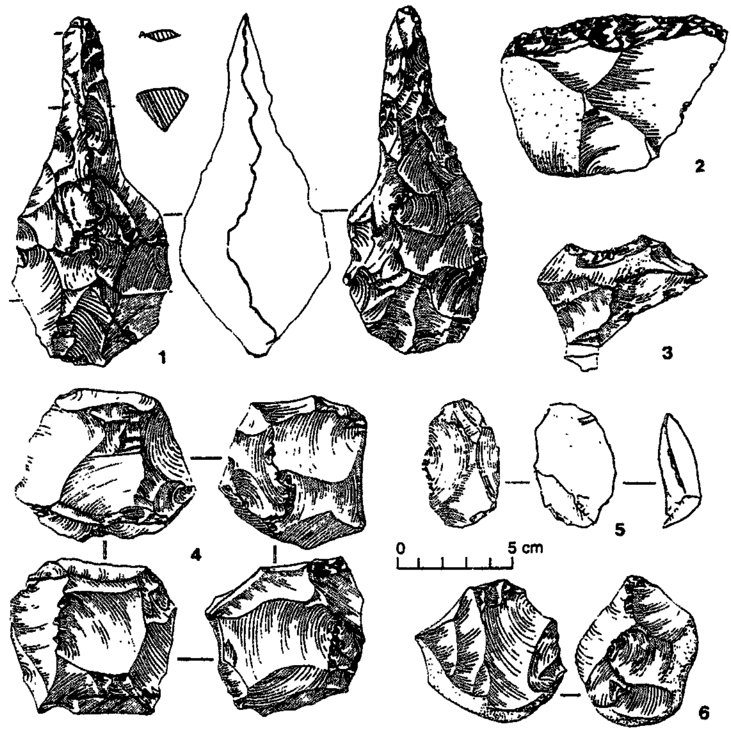

Fig. 12. Artifacts from Joub Jannine II (from Hours, 1975). (1) Biface/trihedral; (2, 3, 5) retouched flakes; (4) polyhedron; (6) core-chopper.

vations in the 1930s by Stekelis (1960) and recently by Goren-Inbar *et al.* (1991, 1992a) yielded an African-type assemblage of cleavers and bifaces that is unknown from any of the other 170 Acheulian sites either from surface or excavated occurrences (e.g., Gilead, 1970; Hours, 1975, 1981; Bar-Yosef, 1975, 1987; Goren-Inbar *et al.*, 1992a,b). The site is located in the gorge of the upper Jordan Valley and the available outcrops along the gorge form the type section for the Benot Ya'aqov Formation (Horowitz, 1979). The nature of the deposits and the malacological assemblages, dominated by *Viviparus apameae*, indicate that the archaeological assemblages accumulated on the shores of an expanding lake that flooded the gorge.

The complex stratigraphic sequence encompasses early layers with an African type industry (Stekelis VI–V) dominated by the production of cleavers and bifaces from basalt (Stekelis, 1960), although recently, flint and limestone tools have also been found in these layers (Goren-Inbar *et al.*, 1991, 1992a). The cleavers were made by the Kombewa technique (Fig. 13) (Goren-Inbar *et al.*, 1991). The upper layers in the Stekelis excavations (IV–II) contained bifaces

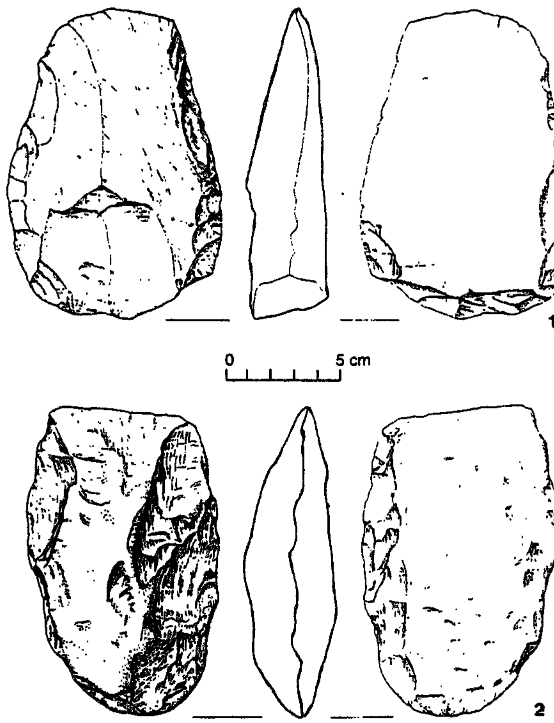

Fig. 13. Two basalt cleavers from Gesher Benot Ya'aqov (from Goren-Inbar *et al.*, 1992b).

made of flint, similar in form to other known Upper Acheulian assemblages in the Levant (Stekelis, 1960). Despite the fact that other parts of the Levant (such as in southern Jordan or the eastern Galilee in Israel) are also covered by more limited lava flows, none of the surface surveys of these areas located Acheulian assemblages made on lava. On the contrary, in most cases flint nodules derived from island outcrops, often of Eocene rocks, served as raw material for handaxes (e.g., Goren, 1979; Goren-Inbar, 1985; Ohel, 1991).

The archaeological horizons of Gesher Benot Ya'aqov are embedded in a depositional sequence that accumulated above a lava flow with normal polarity. The lava flow, designated the Yarda Basalt, was first K/Ar dated to 0.68 ± 0.12 Ma (Horowitz *et al.*, 1973) and later to 0.9 ± 0.15 Ma (Goren-Inbar *et al.*, 1992a). The fauna from both the lower layers of the Stekelis excavations in the 1930s and the new excavations are included in the revised list given in Fig. 4 (Hooijer, 1959, 1960; Goren-Inbar, 1992b, Tchernov *et al.*, 1994). This assemblage falls within the general definition of the Galerian fauna that replaced the Late Villafranchian association around 0.9–0.7 Ma (Azzaroli *et al.*, 1988).

It should be noted that two broken femora, the exact proveniences of which within the site are unknown, have been attributed to *Homo erectus* (Geraads and Tchernov, 1983).

The site of Gesher Benot Ya'aqov is interpreted as the remains of a group of hominids that migrated from Africa. It has been suggested (Bar-Yosef, 1994) that this move was triggered by environmental change that occurred around the Jaramillo subchron or the Brunhes/Matuyama boundary. Paleoclimatic conditions in the northern hemisphere, as recorded by deep sea cores and terrestrial fauna, reflect a clear increase in the intensity of the glacial cycles (e.g., Thunnell and Williams, 1983; Azzaroli *et al.*, 1988; Forsten, 1988). Such cumulative change probably caused increased periods of aridity on the African continent. Given the level of the available food acquisition techniques of late Lower or early Middle Pleistocene groups, a major climatic change probably led to intense competition for resources that forced the group to look for alternative foraging grounds. Although it is not known from where in the African continent this group came, the long tradition of cleaver production in Acheulian assemblages of North Africa makes this region the likely point of origin.

One may speculate that after a period of undetermined length, the Gesher Benot Ya'aqov hominids either disappeared, assimilated with other contemporary Near Eastern groups, or adopted the common local techniques for producing handaxes from flint.

THE MIDDLE ACHEULIAN IN THE NORTHERN LEVANT

As mentioned above, most of what is known from the areas of Lebanon and Syria was obtained through the study of the terraces of Nahr el-Kebir, the Orontes, and the Middle Euphrates (Hours, 1975, 1981; Besançon *et al.*, 1978, 1980; Muhesen, 1993; Sanlaville, 1988; Sanlaville *et al.*, 1993). The majority of the occurrences has been classified as Early and Middle Acheulian, including Ouadi Aabet and Ras Beyrouth Ib, both on the Lebanese coat and the sites of Latamne and Joub Jannine II, described above (e.g., Fleisch, 1962; Fleisch and Sanlaville, 1969; Clark, 1967, 1968; Besançon *et al.*, 1970, 1982; Besançon and Hours, 1970).

All samples were derived from the riverine terrace deposits along the Nahr el-Kebir and the Orontes rivers and were collected systematically. Rare finds were retrieved in the Euphrates Valley, some in the Beqa'a Valley. Chronologically, they were assigned to the Qf IV-III, Qm III-II stages (see Fig. 2) or, in other words, to the Lower and Middle Pleistocene. Unfortunately, no radiometric dates are available to support this chronological scale.

Among these, the Berzine assemblage exemplifies the different "facies" or the coastal "facies" of the Middle Acheulian (Fig. 14). The site is a remnant of a river terrace in the valley of Nahr el-Kebir. The lithic collection is mostly

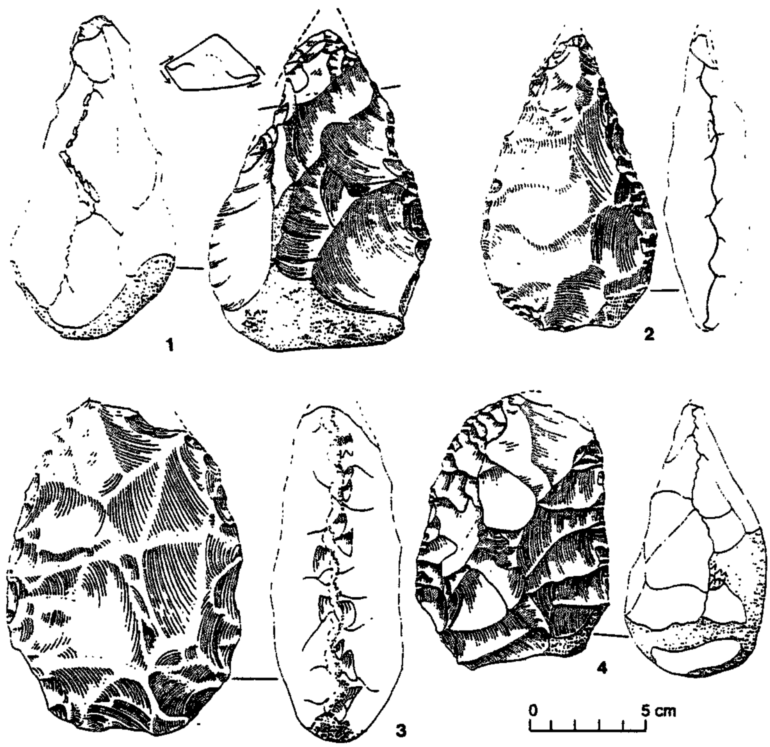

Fig. 14. Berzine Middle Acheulian bifaces (after Sanlaville, 1979). Note the rolled piece (4) and the partially rolled piece (2).

abraded and contained high frequencies of bifaces (as flakes were washed way) with shapes dominated by oval and amygdaloid forms and fewer lanceolates and no trihedrals (Copeland and Hours, 1979; Hours, 1981). Including the site of Ouadi Aabet (Fleisch and Sanlaville, 1974), the coastal Middle Acheulian contain more amygdaloid and oval bifaces, while the inland sites such as Joub Jannine II and Latamne have more lanceolates and trihedrals. Recent work along the Nizip river, a tributary of the Euphrates in Turkey (Minzoni-Deroche and Sanlaville, 1988), revealed a similar picture, with the same Middle Acheulian in the QfIII deposits. It is not known to what extent the typological diversity between coastal and inland sites arises from diachronic difference (the inland sites being earlier) or simply from the use of raw material that differs especially in terms of cobble sizes. The gravel quarries in Latamne and the size of available raw material near Joub Jannine (the Beqa'a Valley) convey the impression that the actual variability emanates from the differences between the large Eocene flint cobbles found inland and the somewhat smaller Jurassic and Cenomanian–Turonian cobbles employed along the coast.

THE MIDDLE ACHEULIAN IN THE SOUTHERN LEVANT

The term "Middle Acheulian" has been used in the literature of the southern Levant. Assemblages such as Holon (Yizraeli, 1967) give some idea of the nature of an open-air Acheulian site, classified as Middle Acheulian following the definition of Umm Qatafa Layer E (Neuville, 1931, 1951).

The site of Holon is embedded in marshy deposits (Noy, 1967; Nir and Bar-Yosef, 1976), overlaying an abraded kurkar ridge dated by Horowitz (1979) to the "Rissian" pluvial, potentially around 400–500 Ka. The site contained more than one level but the preliminary report describes the artifacts obtained from the main level only. There, bifaces, mostly pointed and rounded, side-scrapers, denticulates, and notches, were retrieved along with cores and debitage products.

The animal bones were identified primarily as of elephant (including an entire tusk), hippopotamus, wild oxen, equids, deer, and fragments of *Trionyx* sp. shell (a freshwater turtle). The dominance of large animals may have resulted from human scavenging activities in an environment where carcasses were in abundance.

Other open-air sites did not yield faunal remains, with two exceptions. The first is near Ruhama (Fig. 3), where small artifacts (core-choppers and retouched flakes along with unretouched pieces) were surface collected from an outcrop of a paludal facies of "Holon Member" (Horowitz, 1979). Although no systematic excavation was carried out and no handaxes were found, the bones were identified as equid and elephant and the industry was named "Nagilan" by Ronen (1979; Lamdan *et al.*, 1977). The other site, tested by Gilead and not yet published, is located near Tel Hesi. The industry contained many core choppers and was wrongly assigned by Issar (1980) to the "Pebble Culture." Broken tips of typical Upper Acheulian bifaces were uncovered *in situ* along with fragmentary bones of equids. The deposit in which the cluster of artifacts and bones were embedded in a sandy–clayey layer, situated, like Holon, near the course of a major wadi.

THE UPPER ACHEULIAN IN THE NORTHERN LEVANT

A large number of find-spots and a few larger occurrences have been found in the northern Levant (Hours, 1981), mainly in the lower reaches of Nahr el-Kebir, the Sajour (a tributary of the Euphrates), the middle Euphrates, and the Orontes rivers. Several sites have been excavated, including Gharmacjhi Ib (Muhesen, 1985, 1993), Nadaouiyeh in the El-Kowm basin (Hours *et al.*, 1983), and Yabrud rockshelter I. Hours (1981) subdivided the entire sequence into "Late Lower Paleolithic" (or Upper Acheulian), "Evolved Upper Acheulian" and "Terminal Acheulian"; both could be included under the term Upper/Late and Final Acheulian.

Excavations are currently in progress at Nadaouiyeh and other Lower Paleolithic sites in the El-Kowm basin. Nadaouiyeh I is an alternate accumulation of clayey layers capped by sandy layers near an artesian spring. It seems that the sandy deposits mark an increased inward erosion into the spring's basin. The site had several occupational horizons. Numerous artifacts were collected from the dumps which resulted from the recent enlargement and deepening activities. The excavations demonstrated the presence of *in situ* assemblages. Bifaces, generally amygdaloid, were accompanied by a rich flake industry in all of the six layers tested. The presence of the Levallois technique was noted, but at low frequencies. Unfortunately, no bones were preserved.

Correlation between the Nadaouiyeh spring deposits and those of Hummal spring (9 km away) is uncertain. The latter provided stratified Yabrudian and Mousterian industries. Contrary to published Th/U dates of about 150,000 B.P. (Hours, 1982; Henning and Hours, 1982), recent work and new dates indicate that this industry is of an earlier age (Mercier and Valladas, personal communication).

The importance of excavations in oases cannot be exaggerated. Dated Acheulian from El-Kowm and other oases in the Near East, such as Palmyra and Azraq, may provide further insights into the abilities of *Homo erectus* or Archaic *Homo sapiens* to colonize and maintain biological viability while exploiting these isolated ecological niches.

Among the riverine sites, the excavations at Gharmachi Ib, although devoid of bones, provided a rich lithic assemblage, with about 2000 pieces (Muhesen, 1985) including 140 bifaces (Fig. 15). About one-quarter of the retouched pieces are side scrapers. The bifaces are mainly ovoid and amygdaloid. The spatial distribution within the excavated area is interpreted as indicating the presence of a main occupation, with concentrations of limestone blocks, and an area where most of the knapping activities took place. The suggested age of the site, based on its stratigraphic position on the river terrace of the Orontes, is the second phase of the Jrabiyat formation (QfII in Fig. 2).

The observed general technological tendency through the Upper and Final Acheulian is toward the greater use of soft-hammer percussion and what seems to be the appearance of the Levallois technique. However, in no one assemblage does the percentage of pieces defined on typological grounds as Levallois products surpass 12%, although Levallois cores may be more numerous among the core category. Typologically, the disappearance of core-choppers is noticeable. The cordiform and amygdaloid bifaces outnumber the ovates. Generally the

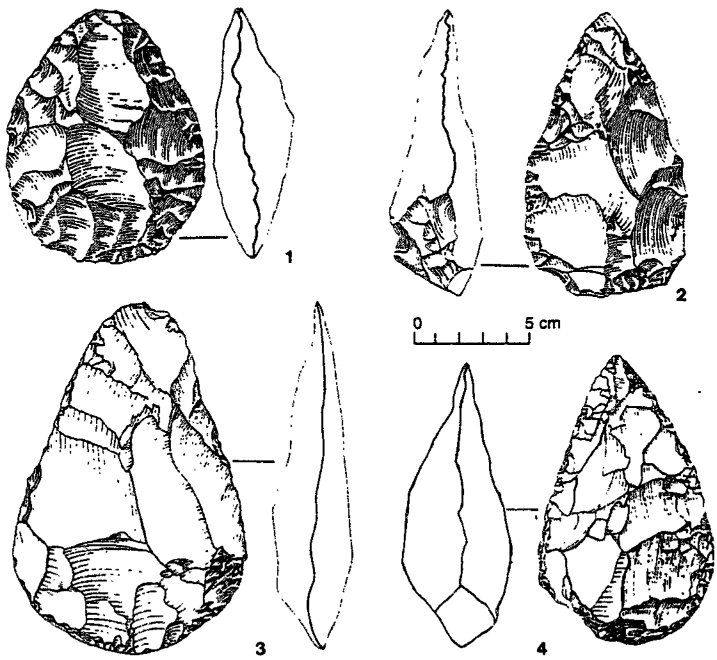

Fig. 15. Upper Acheulian bifaces from Gharmachi IB (1 and 2 from Hours, 1981) and Ma'ayan Baruch (from Stekelis and Gilead, 1966).

length of the handaxes decreases, a tendency noted by Gilead (1970) for the southern Levantine samples.

A special facies of the Late Acheulian was recognized near the outlet of Nahr el-Kebir. Four localities produced small choppers, small bifaces (45–90 mm in length), and a large number of cores. The Levallois technique was apparent in 40% of the cores and 20% of the products (Muhesen, 1981). The patina was the same for all pieces and the artifacts were reported as in fresh condition. The industry was named "Samoukian," from the type site of Mchairfet es-Samouk. It seems that the pebbly raw material, in this specific situation where fluviatile terraces intermingle with marine terraces, influenced on the composition of the industry.

Reports concerning several assemblages, mostly surface collected in the same area, which presumably originated in the Saroute Formation, are intriguing. These assemblages are composed of ovate bifaces and, often, small and relatively rare Levallois elements. The industry has been named "Defaian," after the main factory site, Tulu Defai (Muhesen, 1981).

Given the uncertainties in detailed intraregional geochronological correlations across the Levant, it is safest to assume for now that the various facies of the Upper/Late Acheulian preceded the Acheulo-Yabrudian sequence. This interpretation raises the possibility of an apparent discontinuity between the Late Acheulian assemblages which, according to several authors, contains evidence for the use of the Levallois technique and the Levantine Mousterian, in which this technique was quite dominant. Unfortunately, the lack of both radiometric dates and a better scale of relative dates based on faunal assemblages precludes further affirmations. The current debate on the definition of various Levallois methods requires clearer resolution.

UPPER ACHEULIAN IN THE SOUTHERN LEVANT

The Upper Acheulian is known mostly from numerous surface collections and from a few excavations. The cave sites of Umm Qatafa (Neuville, 1931, 1951) and Tabun cave in Mount Carmel (Garrod and Bate, 1937) provided the first insights into the composition of Upper Acheulian assemblages. Layers E and D in Umm Qatafa contained two slightly different assemblages. In the earlier one, amygdaloid–cordiform and lanceolate bifaces are more or less of similar frequencies, while in the upper assemblages (D2, D1) their percentages and overall size decrease (Neuville, 1951; Gilead, 1970). The assemblage of Layer F at Tabun is characterized by rounded bifaces (Fig. 8). In both sites, faunal remains permit a tentative chronological correlation with other sites (Fig. 2).

A unique open-air site was excavated on the edge of Brekhat Ram, a small lake in the volcanic area of the Golan Heights (Goren-Inbar, 1985). In addition to the lithic assemblage, this site provided a human figurine (Goren-Inbar, 1986). The archaeological horizon, in which bones were not preserved, was in a colluvial–alluvial deposit of red clay. The overlying lava flow was $^{40}Ar/^{39}Ar$ dated to 233 $\pm$ 3 Ka (Feraud *et al.*, 1983), while the underlying basalt layer provided an average age of about 800 Ka (Goren-Inbar, 1985). The rich assemblage is defined as Upper Acheulian. It contains 6405 artifacts, mostly in fresh condition, with 404 tools including 8 small bifaces and 53 side scrapers of various shapes. The makers of the industry used the Levallois radial technique to some extent (Goren-Inbar, 1985). Although it is premature to propose a more accurate date for the site, it seems that given the recently obtained dates for the Acheulo-Yabrudian, it would fall within the range of 350–500 Ka.

The basic synthesis by Gilead (1970) still serves as a framework for seriating the Upper Acheulian in the southern Levant (Bar-Yosef, 1975, 1980). Using a large series of surface collections in which bifaces were the main artifact class, he subdivided the Acheulian into three groups as follows (Bar-Yosef, 1977, Fig. 4.).

(1) The Ma'ayan Barukh group (MB) is characterized by the dominance of cordiforms (including amygdaloids, cordiforms, and subtriangulars) up to about 40–50% (Fig. 15). Ovoids form 20–25%, along with a few pointed bifaces and some cleavers. The assemblage of Umm Qatafa D2 is included.

(2) The Evron-Kissufim group (EK) is, on the basis of stratigraphic evidence, later than the MB group. It contains a richer flake-tool component, up to 30–60%, with clear evidence of the use of the Levallois technique. The bifaces show a decrease in rounded forms (ovates and discoids) and a slight increase in pointed forms.
(3) The Sahel el-Khoussin-Yiron group (SY) is mostly assemblages surface-collected in the hilly areas and flanks. The bifaces are somewhat cruder than those of the other groups, with an occasional dominance of rounded over the cordiform shapes (Yiron, Beith Uziel, Baqaa-Rafaim etc.). As in the EK group, the Levallois technique was practiced in some sites. It is worth noting that, despite the hilly distribution, these assemblages are not present in the three caves where Upper Acheulian layers were uncovered (Tabun F, Abu Sif, Umm Qatafa D).

It seems that, in part, the variability in metrical attributes among the assemblages reflects differences in the size of the raw materials available in the vicinity of the sites. Many, although not all, of the assemblages of the SY group are made on the so-called "brecciated" Campagnian (Senonian) flint. This flint is more difficult to knap because of its uneven nature and breakage planes. The frequencies of refinement index (thickness/breadth × 100) generally demonstrate the differences among the sites (Gilead, 1977, Fig. 3). The same is probably true when the mean length among Upper Acheulian sites is considered. Wherever large cobbles were available, there was a tendency towards larger bifaces. It should be stressed in this context that long handaxes are common in some Early Acheulian and a few Middle Acheulian sites. One can point to a general decrease in biface lengths which may indicate the increasing frequency of resharpening (perhaps longer curation?) in the Upper Acheulian.

The flake industry of most of the Upper Acheulian occurrences is not very well-known. In some places, such as Ma'ayan Barukh, where literally thousands of bifaces were found, the number of flakes cannot account for their manufacture, which may have taken place in a more northward area near the Litani river. The flakes collected from the same surface clusters could indicate some resharpening (although small flakes and chips are not easy to retrieve in the deep red soil of these hills). It seems that the concentration of bifaces near the Hula Lake shores on the interfluves of freshwater creeks may represent repeated butchering activities in a lush environment.

At other sites, such as on the Baram-Yiron plateau, where Ohel (1979, 1980, 1981, 1986, 1990) made intensive systematic surface collections, Evron-Zinat (Gilead and Ronen, 1977), and Kissufim (Ronen *et al.*, 1972), the flake industry is quite variable. Unfortunately, in many of the surface occurrences, whether in coastal or hilly locations, we are not sure to what extent a possible admixture of Mousterian artifacts with earlier Acheulian assemblages may have increased the flake tool component as well as the evidence for Levallois technique.

In general, Upper Acheulian sites can be found across the Near East in every environment including the coastal plain, hilly areas, intermontane valleys, including oases. The best example to date from an oasis situation is the series of Upper Acheulian assemblages characterized by high frequencies of bifacial cleavers uncovered in the Azraq basin (Copeland and Hours, 1989). Among these, the sounding at Lion Spring provided stratified lithic assemblages characterized by ovate, amygdaloid, and cordiform bifaces, with a rich flake industry (Fig. 16). In the absence of precise dating and on the basis of comparisons with the occupations of other oases in the Near East in later periods, it seems that all Upper Achuelian occupation should be correlated to periods of wetter conditions.

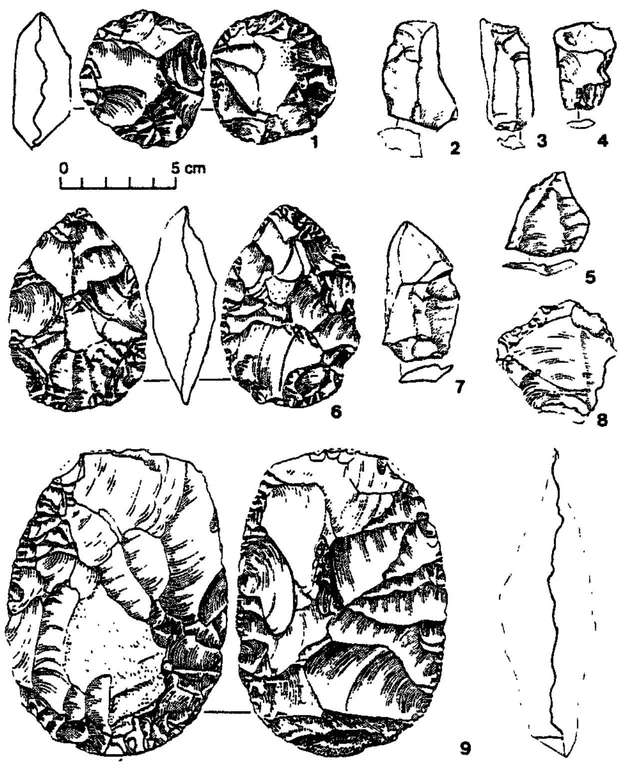

Fig. 16. Lion Spring, Azraq (after Copeland and Hours, 1989). (1) discoid biface: (2–4) flakes; (5) Levallios point; (6) biface; (7) flake; (8) retouched flake; (9) oval biface.

THE LOWER PALEOLITHIC OF IRAQ, IRAN, AND THE ARABIAN PENINSULA

The vast geographic area summarized here is poorly known. In general, the scanty evidence from Turkey on one end of the region and India on the other, with a few recorded find spots from Iran (Smith, 1986) and from the Arabian peninsula (Zarins *et al.*, 1979, 1980, 1982; Whalen *et al.*, 1983, 1984; Abdul Nayeem, 1990), indicate that bifaces can be found everywhere. The distribution toward the northern edges of the Near East has implications for the reexamination of the "Movius line" (Schick, 1994).

In Iraq, little is known beyond the site of Barda Balka, in the Chemchemal valley, in Kurdistan, collected and excavated by Howe (Braidwood and Howe, 1960). This predominantly flake assemblage may be of Middle Paleolithic age. Iranian finds are few and far apart. In Khorasan, on the edge of a dried-up lake, quartzite and andesite core-choppers were collected (Ariai and Thibault, 1975/77). In the absence of dates, the investigators related the assemblage to the Late Pliocene on typological grounds. Isolated bifaces have been collected in various places in Iran (Smith, 1986). To the east, the Ladizian industry in Baluchistan (Hume, 1976) should be mentioned briefly. It is defined on the basis of scatters of lithic on old river terraces and is a core-chopper industry with retouched pieces but no bifaces. Hume (1976) proposed a late Middle Pleistocene age for the Ladizian.

Regional surveys in the Arabian peninsula have led to the identification of find spots and the collection of lithic assemblages with and without bifaces. Bifaces are reported solely from the various western subzones, where they are made on a variety of raw materials such as flint, basalt, and metamorphic rocks. No bifaces have yet been found in that part of eastern Arabia that borders the Persian gulf, known also as the Arabian Shelf (Potts, 1990). Of special interest are the reports concerning sites or find spots along the Red Sea, another potential route of *Homo erectus*. The excavation (Whalen *et al.*, 1983, 1984) at Saffaqah provided a rich Middle Acheulian assemblage made primarily of andesite, with bifaces, cleavers, and numerous flakes. The depth of the deposits that contain artifacts amounts to about 90 cm, indicating numerous repeated occupations. Farther south in Yemen, excavations of open-air sites embedded in Pleistocene formations, many rich in gravels or angular rock fragments, unearthed several series of core-chopper and biface assemblages without animal bones (Amirkhanov, 1991). In addition, surface collections clearly indicate the presence of Upper Acheulian industry.

THE ACHEULO-YABRUDIAN

The Acheulo-Yabrudian, renamed the "Mugharan Tradition" by Jelinek (1981, 1982a,b) is currently known only from the northern and central Levant (Fig. 3). Among the major sites from which this entity is known are El-Kowm, Yabrud I, the Adlun caves, Zuttiyeh cave (Fig. 17), and Tabun cave. Despite intensive surveys, it has not been found in either the Negev and Sinai or the desert region of southern Jordan. Three facies, which some investigators consider independent industries, have been defined on the basis of quantitative studies. The "Yabrudian facies" contains numerous side-scrapers, often made on thick flakes, thus resulting in relatively high frequencies of Quina and demi-Quina retouch, with a few Upper Paleolithic tools and rare blades (Copeland and Hours, 1983; Jelinek, 1982a). While typologically, Levallois-type products have sometimes been identified, a clearly Levallois method has not been identified through the reconstruction of operational sequences. The "Acheulian facies" is considered by Jelinek (1982a) to consist of up to 15% bifaces, with numerous scrapers fashioned in the same manner as the Yabrudian ones. The "Amudian facies" is characterized by end scrapers, burins, backed knives, and rare bifaces and was therefore originally called "Pre-Aurignacian" in the sense that it was pre-Upper Paleolithic (as before the second world war the term "Aurignacian" was used to refer to all early Upper Paleolithic industries in the Near East). This facies, following the Tabun excavations, seems to be closer typologically to the Acheulian than to the Yabrudian and contains evidence for limited practice of the Levallois technique (Jelinek, 1982a).

The question of how to define Levallois techniques is beyond the scope of this paper. In current literature on the Near East, the use of this set of methods is identified only on the basis of operational sequences (*chaînes opératoires*), through either refitting or detailed study of the various products that designate

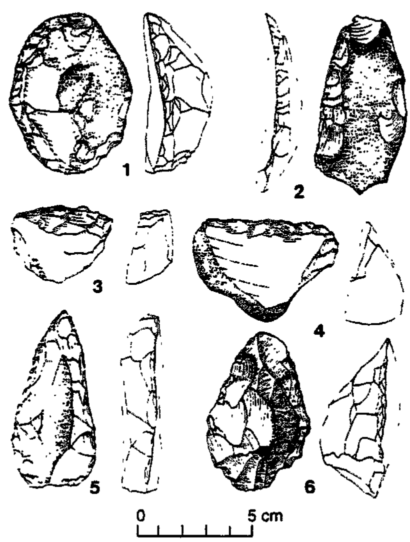

Fig. 17. Acheulo-Yabrudian scrapers from Zuttiyeh (after Gisis and Bar-Yosef, 1974).

the various stages of each sequence (see, e.g., Boëda *et al.*, 1990; Bar-Yosef and Meignen, 1992).

For observations concerning the potential relationship between the various Acheulo-Yabrudian facies and climatic conditions, Jelinek (1982a,b) should be reviewed with the new chronology in mind. Despite several efforts, correlations between changes of environmental conditions and the emergence of different kinds of stone tool assemblages have never been demonstrated to be real (e.g., Collins, 1969; Mithen, 1994).

The possibility of a smooth transition between the Acheulo-Yabrudian and the ensuing Mousterian was proposed by Jelinek (1982a,b) on the basis of the lithics from the Transitional Unit (X) in Tabun. However, the increasing frequencies of Levallois products and decreasing Acheulo-Yabrudian elements over the thickness of this unit seem to have been the result of a slow, cumulative mixing between the old and the new industries within a basin-shaped area in the cave.

HUMAN REMAINS AND SUBSISTENCE

It is very unfortunate that the Lower Paleolithic sequence of the Near East is known mainly from the lithic assemblages as described above. Only a small number of sites produced assemblages of animal bones, and even fewer fragmentary hominid remains.

The available human remains from this long period are scanty and a few are surface finds. At 'Ubeidiya only one tooth, an incisor, was unearthed during the excavations; the other pieces are surface finds (Tobias, 1966). They could not be clearly identified with a particular hominid type. Two broken femora from Gesher Benot Ya'aqov (Geraads and Tchernov, 1983) were identified in the collections of animal bones made at the site when the deepening of the Jordan River channel took place; they were attributed to *Homo erectus*. A broken femur was uncovered in Tabun cave layer E (McCown and Keith 1939) within the Acheulo-Yabrudian assemblage. It thus occupies the same stratigraphic and chronological position as the fragmentary skull from Zuttiyeh (Gisis and Bar-Yosef, 1974). The latter is considered as an example of an Archaic *Homo sapiens* (Vandermeersch, 1989) and could have been one of the potential ancestors of the later Qafzeh-Skhul group. Recently, this fragmentary skull has been compared to the Zhoukoudian human remains and interpreted as belonging to a generalized Middle Pleistocene Asian population (Sohn and Wolpoff, 1993).

Similarly, there is little evidence concerning subsistence activities of early hominids in the Near East. Animal bones in most sites are taken to indicate the procurement of animal tissues. As in most African sites of that period, cut marks on bones at 'Ubeidiya may indicate scavenging. Bone assemblages from Upper/ Later Acheulian sites are few and far between; the rich cave sites of the Caucasus, such as Koudaro, are currently the exceptions. Small faunal assemblages have been recovered from the caves of Tabun (layer F) and Umm Qatafa and from the open-air sites of Evron-Quarry and Holon. Therefore, the identification of food acquisition techniques such as scavenging, hunting, and gathering cannot be studied because we lack sufficiently large samples. Only Acheulo-Yabrudian sites such as Zuttiyeh, Masloukh, and the Adlun caves produced somewhat larger assemblages (e.g., Garrard, 1983). These faunal lists may indicate some attention to medium- and large-sized animals in Masloukh, but Abri Zumoffen and Tabun E produced assemblages that do not differ from those of the Mousterian ones (Bar-Yosef, 1989).

Nothing is known yet about plant gathering, although in Mediterranean environments basic survival probably relied on the gathering of fruits, seeds, leaves, and a few tubers. The well-preserved plant assemblage at Gesher Benot Ya'aqov promises to be informative in this respect (Goren-Inbar *et al.*, 1992). In addition, the site produced the only known shaped wooden object (Belitzky *et al.*, 1991).

DISCUSSION

The early evolution of *Homo erectus* in sub-Saharan Africa is currently a major subject for discussion (e.g., Klein, 1989; Rightmire, 1990). It seems that the emergence of *Homo erectus* was triggered by climatic changes that occurred around 1.8 Ma. This was followed by outward migrations into North Africa and Eurasia, probably punctuated by climatic fluctuations of the various glacial cycles as well as by changes in the carnivore communities (Turner, 1992). The evidence from Lower Paleolithic sites in western Asia suggests that both 'Ubeidiya and Dmanisi were among the first stations of *Homo erectus* in Eurasia and can be dated to 1.0–1.4 Ma. While the dating of these and other sites requires further investigation, it is possible that the first groups of *Homo erectus* to leave their homeland were the bearers of a core-chopper industry, and not the manufacturers of Acheulian bifaces. We often tend to forget that sub-Saharan hominids produced both industries, and in Koobi Fora, the nonbiface industry was the Karari Industry (e.g., Isaac, 1986). Accepting this notion would better explain the core-chopper assemblages from the lowermost levels at 'Ubeidiya and the assemblage of Layer V at Dmanisi. The same could hold for the sequence of the Maghreb if Biberson's (1961) observations are supported by further fieldwork. Bearers of this nonbiface industry could have been among the first to colonize southeastern Asia (Schick and Zhuan, 1993) and among those who ventured northward to colonize western Europe. The earliest dates for such trials are still debatable, although according to Roebroeks (1994), the current consensus is that there were no humans in Europe prior to 0.5 Ma (Roberts *et al.*, 1994). The Middle Pleistocene inhabitants of central and eastern Europe, from the Elba River to the Bosphoros straights, made stone assemblages without bifaces, except for rare sites such as Korolevo in Transcarpathia, which is dated to around 0.35 Ma (Gladiline and Sitlivy, 1989). Similar isolated occurrences of bifaces have been reported from China (Schick and Zhuan, 1993), while western Europe and western Asia from Anatolia to the Indian subcontinent are strewn with Acheulian occurrences interspersed stratigraphically with a few core-chopper industries. This means that the "Movius line" is in place (Schick, 1994) and should motivate additional research into the causes that underlie the observable variability in knapping traditions.

The earliest period of Near Eastern Lower Paleolithic is poorly known. Claims for occurrences around 2.0 Ma or immediately after the Olduvai subchron are not supported by convincing evidence. The artifacts, small in number and of uncertain provenience, do not compare well with sites rich in fauna and artifacts such as Dmanisi and 'Ubeidiya. The latter are not yet dated by radiometric techniques that would corroborate the age proposed on the basis of long distance faunal correlations. The summary of the current European data (e.g., Roebroeks, 1994; Gamble, 1994) lends support to the long-distance biostratigraphic temporal correlations. The new TL and ESR dates that propose a longer chronology for the Middle Paleolithic and the few paleomagnetic readings from various sites suggest that the Bruhnes/Matuyama boundary should be placed within the late Middle Acheulian sequence. As we have to place the rest of the Middle Acheulian and the Early Acheulian sites with the sequence, this would mean that the suggested time span for Dmanisi and 'Ubeidiya as 1.0–1.4 Ma is reasonable. However, the possibility that a few of the reversed paleomagnetic readings actually document subchrons within the Bruhnes chron (Champion and Lanphere, 1988) should be retained as a viable option that would mean that the late Middle Acheulian could be only about 0.6/0.5 Ma old. In my view, however, the available archaeological and faunal evidence supports *Homo erectus* sorties out of Africa earlier than 1.0 Ma, even if the newly published dates for the Javanese fossils (Swisher *et al.*, 1994) are not confirmed by fieldwork.

Within the assemblages that are grouped as late Middle and Upper Acheulian of the Near East, the site of Saffaq near the Red Sea conveys the impression of an African assemblage that was fabricated from andesite. In the Levant, we note that the basalt cleaver/biface industry of Gesher Benot Ya'aqov stands out as an exception. Despite the fact that large areas of the Levant are covered with lava flows, no similar industry has yet been reported. In areas such as the Golan, Acheulian assemblages are generally made of flint (e.g., Goren-Inbar, 1985). This is not to say that in many occurrences where local flint/chert was exploited, differences in size and perhaps in the quality of workmanship are not discernible. Biface resharpening would account for some changes in the forms, but not for all. The dichotomy between the dominantly pointed and oval bifaces cannot be explained by the availability and accessibility of raw material or even by the amount of resharpening.

In sum, the lithic sequence of the Lower Paleolithic in the Near East can be subdivided into Early and Upper/Late Acheulian or, as was done on the basis of stratified assemblages, into Lower, Middle, and Upper Acheulian. This subdivision, which takes into account the technological and typological attributes mainly of bifaces and, to a lesser extent, of the flake component, should not deter us from the urgent need to obtain radiometric dates. Perhaps the advent of the ESR dating technique for sites that contain well-preserved bones, although few and far apart, together with those sites dated by $^{40}Ar/^{39}Ar$ and K/Ar, will enable us to establish a more solid chronology.

While most Near Eastern Acheulian assemblages have their parallels in Africa and Europe, the Acheulo-Yabrudian entity can be considered local, with a geographic distribution confined within the region.

Finally, the paucity of evidence for subsistence activities precludes the formulation of conclusions concerning the evolution of hunting techniques and the role of scavenging in the Near East. Microwear and edge damage analyses are not available, as they depend, as do many other types of evidence, on future excavations of well-preserved sites. We are thus left with an archaeological sequence that, for the time being, provides a few clues concerning the early colonization of Eurasia by *Homo erectus*.

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