Geoffrey A. Clark
Department of Anthropology
Arizona State University
Tempe AZ 85287, U.S.A.

Nancy R. Coinman
Department of Anthropology
Iowa State University,
Ames IA 50011, U.S.A.

Michael P. Neeley
Department of Anthropology
Montana State University,
Bozeman MT 59717, U.S.A.

Geoffrey A. Clark, Nancy R. Coinman and Michael P. Neeley

The Paleolithic of Jordan in the Levantine Context*

Introduction

This chapter aims to present a current view of the paleolithic of Jordan from earliest times through the Epipaleolithic, and to situate it in the broader context of Levantine prehistory. The essay is organized chronologically, beginning with some observations about the logic of inference in the archaeology of 'deep time' — the Lower and Middle Pleistocene. We tackle the Levantine Lower and Middle Paleolithic next, which, for many practical purposes, can be treated together. We then proceed to a discussion of chronological questions pertinent to Lower and Middle Paleolithic systematics, followed by some remarks on the Middle-Upper Paleolithic transition and the modern human origins controversy. As most of you know, the Levant is a focal point for modern human origins research, given the alleged and prolonged coexistence of neandertals and early moderns there. This will be followed by some observations on the Levantine Upper Paleolithic which, historically, has been somewhat neglected vis à vis the Mousterian. We close with some remarks on the conceptual framework of Epipaleolithic research, which has been undergoing considerable reevaluation in recent years. In all of these early time periods, work in the xeric steppes of Jordan over the past 20 years is changing the picture of paleolithic adaptations in profound ways, based, as it has been, on research in the mesic coastal environments of the northern and central Levant.

The Logic of Inference in the Archaeology of Deep Time

This is archaeology in what Clark (1991) refers to as 'deep time'. Doing archaeology in 'deep time' is by no means a straightforward endeavor since we cannot make all kinds of uniformitarian assumptions about process in contexts removed from the present by tens or even hundreds of millennia. Archaeology was slow to realize this. Over the past 15 years, however, archaeologists are gradually coming to a better understanding of the complex natural and cultural formation processes that have acted in concert to create an ancient archaeopaleontological record. Although we are still in a 'pattern searching' mode, and far from consensus, the important point is that inferences about early archaeology cannot be directly evaluated against construals of pattern in the archaeological record itself. In recent years there has been some recognition of this fact, and a number of workers (e.g., Potts 1988; Gifford-González 1991) have offered protocols designed to make the logic of inference more secure.

One such scheme is that proposed by Richard Potts (1988), an archaeologist at the Smithsonian Institution in Washington, DC. His model is hierarchical and involves three successively more inclusive levels of inference. *First-order inference* constitutes a demonstration that 'sites' actually exist, and that they are at least partly explicable by invoking hominid agency. The existence of sites is established by taphonomic inference whereby the bones and stones are shown to be anomalous concentrations in the paleolandscape that accumulated over a relatively short period of time (most of the 'high resolution' east African sites apparently formed over a minimum of 5-10 years), and that the agents of accumulation can be more or less successfully identified. From the perspective of the late-1990s, these inferences are typically the most

* When DAJ Director General Ghazi Bisheh invited me to present the main lecture on the eighth millennium, I was pleased and flattered that he had thought of me, but also a little puzzled, since most of my work in Jordan has had to do with the Middle, Upper and Epipaleolithic. I subsequently came to appreciate, however, that I was responsible for Jordanian paleolithic archaeology in its entirety. Now that was a pretty tall order, since hominids — probably *Homo erectus* — have been present in the Levant since c. 1.4 million years ago, based on biostratigraphic dating of micromammal assemblages from the site of al-'Ubaydiya/ Ubeidiya, in the northwestern part of the Jordan Rift (Tchernov 1990). Consequently, I prevailed upon two of my former students, Nancy Coinman (who is an Upper Paleolithic specialist) and Michael Neeley (who is interested in Epipaleolithic systematics) to give me a hand. Thankfully, both responded. This essay is the results of that collaborative effort. (G. A. Clark)

secure. Sometimes we can actually show that our 'sites' are sites, and not geological accumulations of artifacts derived from elsewhere.

Second-order inference involves determination of the nature of 'exclusively hominid' activities. Whether hominids hunted or scavenged in order to obtain the bones brought to a site, how much meat or fat might have been extracted from these bones, and when hominids might have had access to carcasses are good examples. Inference here is also grounded in taphonomy (and what Binford [1981] calls 'actualistic' research), although there is as yet little sign of consensus. Whether uniformitarian assumptions about the behavior of present-day, non-human bone accumulators can to extended to their Pleistocene ancestors is, of course, something of an inferential leap. In the end, Potts (1988) recommends evaluating the credibility of second-order inference on a case-by-case basis.

Third-order inference is the most problematic of all. It addresses regional scale process questions relating to how hominids organized their social landscapes. Were they hunting, scavenging, or both? What kinds of constraints operated under what conditions to emphasize one or the other meat procurement system? Who was doing the hunting, scavenging, gathering? Was there food sharing and, if so, what was shared and how was food sharing organized? In addition to the matrifocal unit, what was the composition of the local group? How did it change during the course of an annual round? At the level of generational replacement? What did mating networks look like? Was there adult pair-bonding and, if so, what was the basis for it and how long did it last? What form did kin-based adult co-residence patterns take? Most generally, how can we constrain choice about the forms that early hominid social organization might have taken?

Unlike first- and second-order inference, which are 'site-based', third order inference requires knowledge of regional systems and, given the poor time-space resolution of the Plio-Pleistocene archaeopaleontological record, there are formidable obstacles to subjecting any third-order inference to an empirical test. Consequently, all third-order inference is presently considered unreliable. Several researchers, notably Blumenschine and Potts, have initiated paleolandscape surveys in the hope of identifying the particular topographic and ecological contexts of specific behaviors. This might, in turn, facilitate reconstruction of more complex, social behaviors like food sharing, mate exchange, raw material procurement; day, week and annual ranges; seasonal aggregation and dispersal patterns etc.(Gibbons 1990). Recent work on the paleolithic reflects these concerns.

The Levantine Lower and Middle Paleolithic

The most profound changes in Lower and Middle Paleolithic research over the past two decades have been sweeping conceptual ones, rather than ones arising from surveys or the excavation of single sites. The changes — how to divide up the paleolithic but, more significant, what things are important to look for in attempting to understand early forager adaptations — are partly a consequence of Levantine research, but are mostly due to paradigmatic shifts that have effected the archaeology of early hominids in Europe and America. Major, post-1980 conceptual developments include (1) a de-emphasis on traditional typological systematics (those concerned with the study of retouched stone tools), (2) an emphasis on technology (analysis of the characteristics of the débitage component of lithic assemblages), (3) the rise of archaeotaphonomy (the study of death assemblages), and (4) raw material procurement and processing (esp. in relation to tracking mobility patterns, and in monitoring the spatial extent and temporal duration of site occupations). The advent of thermoluminescence (TL) and electron spin resonance (ESR) dating methods in the middle 1980s has also changed our perceptions of the duration of the early paleolithic stages, and has all but obliterated the conventional boundary between the Lower and the Middle Paleolithic at ca. 100 kyr BP. Levantine research is in the forefront of these developments, since the early paleolithic is exceptionally well-represented there.

Noteworthy Jordanian Lower Paleolithic sites include (1) 28 typologically Lower and Middle Acheulean sites reported by Mujahed Muheisen (1988; 1992), amongst which (2) C-Spring and 'Ayn al-Asad, in the Azraq Basin (Rollefson 1980; 1982; 1983; Copeland 1989; 1991; Hours 1989); (3) Abū Hābīl (Muheisen 1988); (4) Fjāja (Rollefson 1981) and (5) Jabal Qalkha Site J401, in the Wādī Ḥismā drainage (Henry 1995; 1997), are more extensively reported. There are also (6) a number of stratified Acheulean open sites exposed in the cutbanks of the Wādī Ḥammah and its tributaries, as reported by the La Trobe University team currently headed by Phil Edwards (Edwards *et al.* 1988; Macumber and Edwards 1997). Early Acheulean tools and fauna have also been recovered from (7) the Dauqara Formation, in the az-Zarqā' Valley north of 'Ammān, although contexts are still somewhat questionable (Copeland and Hours 1988; Parenti *et al.* 1997). Probably most important, because of their potential for future horizontal exposure, are the recent (summer, 1996), spectacular discoveries of open air Acheulean sites with faunas at 'Ayn Sawda/ Soda, in the Azraq depression (Rollefson *et al.* 1997). In terms of isolated finds, Jordan has produced thousands of handaxes, cleavers, and 'Lower Paleolithic-looking' stone artifacts. Most such sites consist of surface finds of heavily wind-abraded bifaces and large, crude flakes and blades associated with deflated land surfaces on interfluves and highland plateaux (e.g., many of the Wādī az-Zarqā' finds reported by Besançon *et al.* [1984]). Formed on land surfaces that have long since disappeared, they exhibit little in the way of site contextual integrity.

Typological Systematics

Typological systematics were an early casualty of the conceptual changes that took place in paleolithic archaeology during the past 15 years. This approach to the study of the paleolithic arose in France between 1880 and 1920 with the work of pioneers like Gabriel de Mortillet, Denis Peyrony and Henri Breuil, and was brought to its fullest development in the 1950s and 1960s by their intellectual progeny, workers like François Bordes and, in the Levant, Dorothy Garrod, Jean Perrot, Réné Neuville, Jacques Tixier and Francis Hours. It emphasized the study of retouched stone and bone/antler tools to the near exclusion of anything else. The reasoning behind doing this, practically always implicit, was that retouched tool forms were thought to reflect ethnic, linguistic and/or social boundaries of the kinds evident in recent European history (see Clark [1993, 1997] for a deconstruction of the logic of this approach). This culture-historical paradigm, which dominated Old World paleolithic research for more than a century, has, since the early 1980s, come to be viewed as extremely limited in what it can tell us about past human behavior (Binford and Sabloff 1982; Clark and Lindly 1991). Moreover, the logic of treating the formation processes of paleolithic archaeology as if they were analogous to those of history has been called into question (Clark 1993; 1994).

Technological Systematics

Technological studies have tended to gain equal status with, and in some cases to supplant, the traditional emphasis on typology. This is due in part to the loss of faith in the credibility of typological systematics just mentioned, but also to the realization that the débitage component (usually more than 95% of most lithic assemblages) contains information about raw material accessibility, differential transport, patterns of site use, reduction strategies and tool function (e.g., Kuhn 1990; 1991; 1995). These in turn can sometimes be related to, and explained by, changes in generalized mobility strategies. Until fairly recently, with the rise of *chaîne opératoire* approaches (e.g., Boëda 1991; 1993), technology was usually de-emphasized or ignored altogether by European-trained prehistorians, so stringent was their adherence to the typological paradigm. This bias went hand in glove with a tendency to assume that technology and typology covaried in a more or less linear fashion with one another, which has never been shown to be the case (see Marks [e.g., 1983] for a compelling demonstration based on Middle/Upper Paleolithic core reconstructions at the Negev open site of Boker Tachtit). Most paleolithic archaeologists active in Levantine research between 1920 and 1975 were trained in Europe, which tended to look to France, with its strong natural science research tradition, for leadership. Since the mid-1970s, however, French dominance of the field is weakening in the face of increasing numbers of anglo-american trained workers and the rise of indigenous archaeologies, like those in Jordan, characterized by an amalgam of different approaches.

Archaeotaphonomy

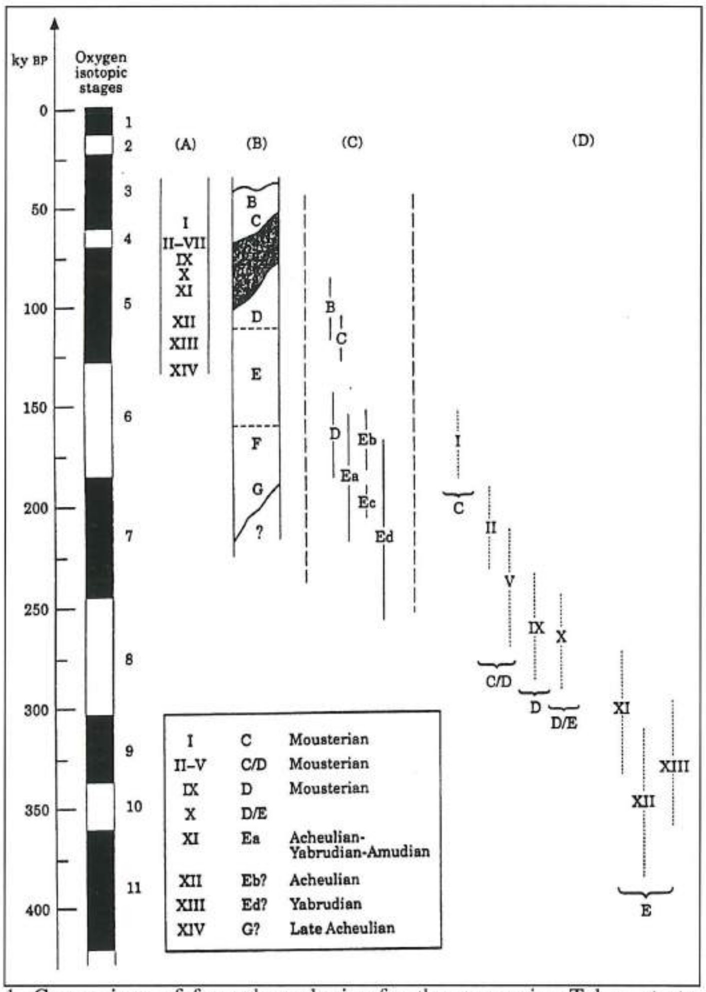
The third major trend in recent paleolithic research is the appearance and rapid development of a subfield called archaeotaphonomy. Archaeotaphonomy is the study of the cultural and natural processes that contribute to the formation of an archaeological record and, more specifically, those processes involved in the accumulation of faunal remains, an area long neglected in traditional research designs (e.g., Binford 1981). Most archaeotaphonomic research is very recent (it dates, at the earliest, to the early 1980s), and it has become really visible in the literature only in the past five years (e.g., Stiner 1994). While still in the pattern searching stages, it has already called into question the human contribution to the formation of faunal assemblages at many 'classic' Lower and Middle Paleolithic sites (e.g., Olduvai Gorge in Tanzania, Torralba and Ambrona in Spain, Swanscombe and Hoxne in England, Zhoukoudian in China, Grotta Guattari in Italy, Latamne in Syria, Klasies River Mouth in South Africa, and practically all of the French Middle Paleolithic neandertal 'burial' sites — Le Moustier, La Ferrassie, Le Regourdou etc.). The general effect on paleolithic research has been to sharpen our perception of the complex series of natural processes that contribute to the formation of early archaeological sites, with the result that the human component in many of them can be shown to have been minimal. This in turn has 'dehumanized' the early hominids involved, who increasingly appear to have exhibited a range of scavenging and foraging behaviours analogous in various ways to those of our closest primate relatives, the great apes, certain Old World monkeys (esp. baboons, mandrils), and social carnivores like hyaenas and wolves (e.g., Binford 1985; Blumenschine 1991; Stiner 1994). That faunal remains associated with stone artifacts in these early sites can be attributed mainly to scavenging activities, rather than to human hunting, is a striking conclusion. It marks the demise of the ethnography-based 'man the hunter' model dominant in the anglo-american research traditions since the late 1960s (e.g., Lee and DeVore 1968).

Raw Material Procurement and Processing

As an outgrowth of the new emphasis on technology, paleolithic archaeologists have been paying increased attention to the factors that govern raw material procurement and processing. This research, which originated with Harold Dibble's work in the mid-1980s (e.g., 1984), showed that the conventional Middle Paleolithic artifact types (mainly sidescrapers) were the results of generalized reduction and resharpening sequences conditioned by the shape of the original blank, rather than idealized tool forms held in the minds of their makers, as was widely believed up until that time (e.g., Bordes and de Sonneville-Bordes 1970). Since about 1987, these avenues of research have expanded to include studies of the size and shape characteristics of flakes, exterior scar morphology (which tells us something about the sequence of detachment), platform preparation attributes (an indication of the size of the original blank and how it was detached), cortex percentages and patterning (which indicate when in a reduction sequence a particular flake was detached), breakage, and the factors that govern variation in the reduction of cores (Kuhn 1995; Dibble 1995). Together with archaeotaphonomy, these new studies have shed considerable light on the duration and periodicity of human site use, stability (or lack thereof) of mobility strategies and, on the intrasite level, activity variation (what particular groups of people were doing within sites). Issues relating to the maintenance, renewal and curation of stone tools have been shown to underlie some of the most pronounced differences in the intensity of reduction among Lower and Middle Paleolithic archaeological assemblages.

Chronology

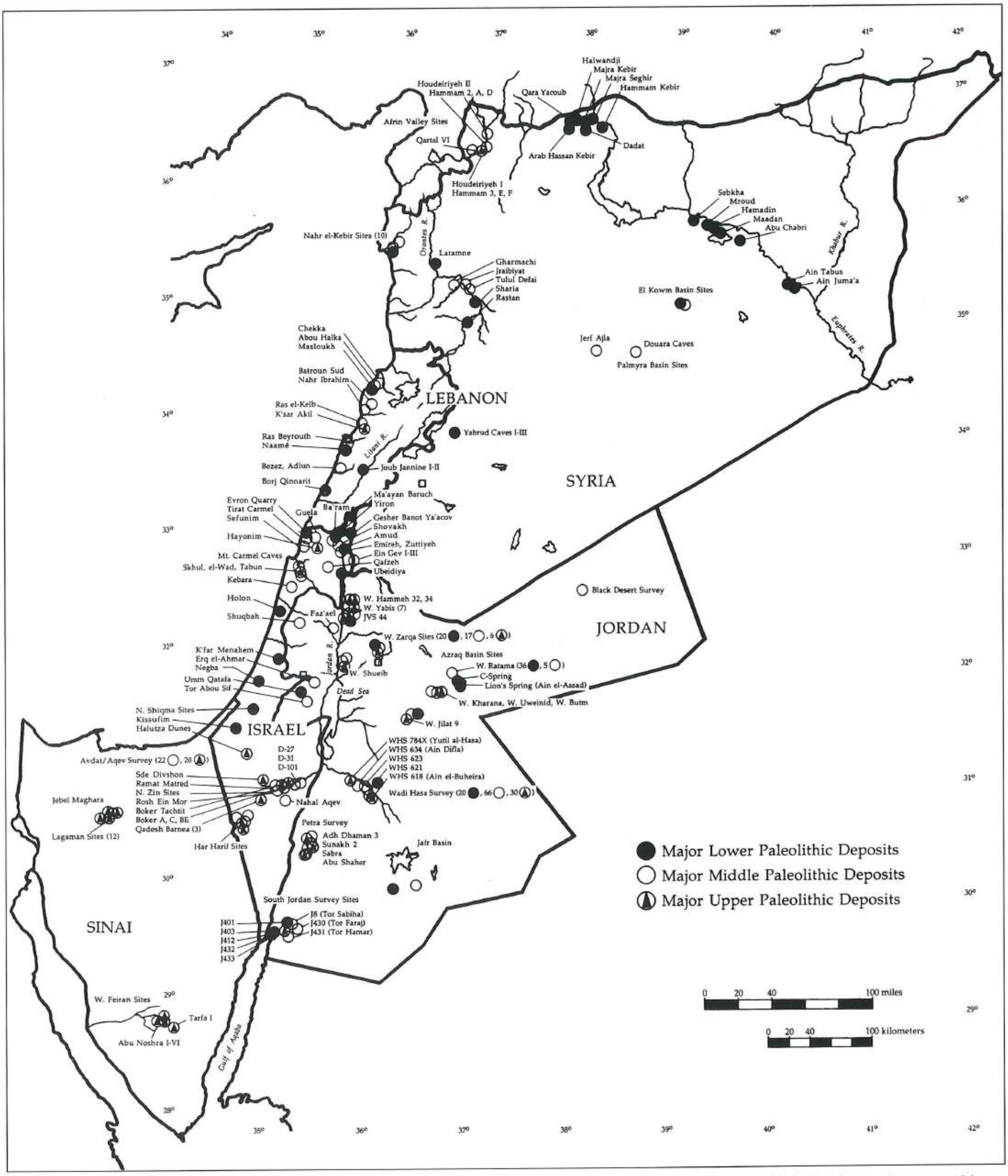
Another major area of radical change has been chronology. Until the mid-1980s, the chronological boundary between the Lower Paleolithic (equated in the Levant with the Acheulean and the Acheulo-Yabrudian — the handaxe industries) and the Middle Paleolithic (the flake and blade-dominated Mousterian) was set by a kind of tacit consensus at ca. 100 kyr BP. Since then, however, the widespread application of TL and ESR dating has more than tripled the time span allotted the Mousterian, and rendered utterly meaningless the conventional chrono-stratigraphic division between the Lower and the Middle Paleolithic. A focus of this research has been Tabun Cave on Mount Carmel, redated no less than four times over the past 16 years (FIG. 1). Handaxe-dominated assemblages can now be shown to have persisted long after 100 kyr BP, and the Mousterian extends well back into the Middle Pleistocene (to at least 250 kyr BP). What is probably the oldest site in the region, 'Ubaydiya, has recently been dated by its micromammal assemblages to 1.4 mya (Tchernov 1990). FIG. 2 shows Lower, Middle and Upper Paleolithic sites that have been restudied, excavated or tested, or re-excavated since the mid-1970s. The



1. Comparison of four chronologies for the successive Tabun strata and associated lithic industries. (A) Jelinek's chronology, (B) Bar-Yosef's chronology, (C) ESR chronology based on a linear uptake model, (D) TL chronology proposed by Mercier *et al.* (1995). Mean TL ages for Jelinek's major units are as follows: I (= Garrod's layer C) = 171 ± 17 kyr BP, II (D/C) = 212 ± 22, V (D/C) = 244 ± 28, IX (D) = 263 ± 27, X (Ea-D) = 270 ± 22, XI (Eb-Ea) = 306 ± 33, XII (Ec?-Eb) = 350 ± 33, and XIII (Ed) = 331 ± 30 (from Mercier *et al.* 1995: 501, 505).

map is noteworthy for the increased tempo of work in Jordan. Prior to the mid-1980s, paleolithic research in the Levant was heavily concentrated in Israel.

Noteworthy Jordanian Middle Paleolithic sites include (1) the Ṭūr Farrāj/ Tor Faraj and Ṭūr Ṣabīḥa rockshelters in Wādī Ḥismā, excavated and extensively reported by Donald Henry (e.g., 1995; 1997); (2) the 'Ayn Difla rockshelter and WHS open site 621, both in the eastern Ḥasā drainage, excavated by the "Wadi Hasa Paleolithic Project" (e.g., Clark *et al.* 1987; 1997; Lindly and Clark 1987); (3) the rockshelter sites of as-Sukhnah and Marazzah South, and the open site of Abū 'Ālūbah, in the eastern foothills of the Jordan Valley north of the Dead Sea (Muheisen 1988), and (4) some recently reported Middle Paleolithic open sites with fauna at 'Ayn Sawda, in the Azraq depression (Rollefson *et al.* 1997). Of the various kinds of Mousterian assemblages defined at the



2. Major Levantine Lower, Middle and Upper Paleolithic sites restudied, excavated, tested or retested since the mid-1970s. Many sites are multi-component. Note the concentration of early sites in Jordan (from Clark *et al.* 1997: 87).

Mughārat aṭ-Ṭābūn type site (Jelinek 1982), by far the most common in Jordan (and in the southern Levant generally) is Tabun D-type elongated levallois Mousterian. Tabun D assemblages are both 'early' and 'late' in the southern Levant, and evidently persisted for hundreds of millennia (Clark *et al.* 1997). Tabun B and C-type industries appear to be relatively rare in the Levantine deserts and steppes (although not completely absent — there is a convincing Tabun B-C assemblage from the eastern Wādī al-Ḥasā at WHS 621 [Clark *et al.* 1987: 23-31]).

Modern Human Origins

Beginning in 1987 and continuing until the present, the Levant has become the major geographical focus of what has come to be known as 'the modern human origins controversy' (Clark and Lindly 1989). Sparked by the implications of the TL and ESR dates from the 'neandertal' sites of Kebara and Tabun, and the 'modern human' sites of Qafzeh and Skhul in Israel (FIGS. 1, 2), the debate centers on two hypotheses offered to describe (and supposedly explain) the transition between archaic and modern humans. The first states that moderns appeared early in the Levant (prior to 100 kyr BP), presumably from Africa, and coexisted there with neandertals, who arrived at a later date (ca. 65 kyr BP). The second states that moderns evolved in the Levant, as elsewhere, from the local archaic *Homo sapiens* stock (TABLE 1). These two perspectives which — in their extreme forms — cannot be reconciled, are sometimes referred to as the 'replacement' and 'continuity' positions (Clark 1992a; 1994). While replacement advocates have claimed that Levantine neandertals are later immigrants from Europe, and are thus unrelated to modern human origins in the Levant (e.g., Bar-Yosef 1994), the weight of the fossil and archaeological evidence, coupled with a much more sophisticated explanatory framework, unequivocally supports the view that modern humans evolved *in situ* in the Levant from their archaic *Homo sapiens* ancestors (Clark and Lindly 1989).

The archaeological aspects of the debate turn on what we might expect would be differences in behaviour and adaptation if in fact two different hominids were occupying the Levant over tens of thousands of years. To argue that the archaeology tells us nothing about adaptation, as some have done, effectively relegates it to a mindless exercise in methodological virtuosity. Differences in adaptation would be expected under all of the replacement scenarios published so far. But when we look for them using the common archaeological monitors of adaptation (i.e., technology, typology, settlement patterns, archaeofaunas etc.), we do not find them. In the Levant, the same kinds of Mousterian assemblages occur at both modern and archaic sites, and the sites themselves are similarly distributed; there is only clinal change in the metrical attributes of lithic technologies; and no differences in raw material procurement, settlement patterns or faunal exploitation are apparent. Typologically identical stone artifacts found at archaic and modern sites exhibit exactly the same kinds of microwear and damage patterns. The essentially 'modern' behaviours in which the Kebara neandertals engaged paint a picture of archaeological continuity that stands in marked contrast to the replacement scenarios proposed by its excavators (Bar-Yosef *et al.* 1992).

There are many issues, questions and problems concerned with the logic of inference in the various aspects of modern human origins research which, unfortunately, we cannot get into here (see Clark and Willermet [1997] for a review of the major conceptual issues). Briefly, though, what we think of as Middle Paleolithic technology almost certainly constituted a range of options very broadly distributed in space and time, held in common by all circum-Mediterranean hominids, and invoked differentially according to context. The challenge of future work is to determine what general contextual factors constrained choice amongst these options. Such factors probably include range and size of and distance to raw materials, forager mobility strategies (conditioned by resource distributions), anticipated tasks, group size and composition, structural pose of the occupants of a site during an annual round and, more generally, duration of site occupation.

The Levantine Upper Paleolithic

The Upper Paleolithic of the Levant is known almost exclusively from its lithic or stone tool assemblages, and, to a lesser degree, from the settlement patterns associated with this time period (c. 40-17 kyr BP). We now know that it only superficially resembles its European counterpart, and does not coincide precisely with it in time. Understanding of the Levantine Upper Paleolithic has also changed dramatically in the decades since pioneers like Dorothy Garrod and Réné Neuville first established an Upper Paleolithic sequence in the 1950s, using the traditional systematics of western Europe. The Upper Paleolithic is no longer perceived as a single, linear evolutionary development emanating from the Levantine Middle Paleolithic. Instead, current interpretations focus on two largely contemporary but different 'cultural traditions' — the Levantine Aurignacian and the Ahmarian (TABLE 2).

Upper Paleolithic research has also undergone important conceptual and methodological changes analogous to those just discussed for the Lower and Middle Paleolithic. These changes include (1) the advent of intensive, systematic regional surveys outside the coastal Mediterranean 'core' areas of the central and northern

TABLE 1. Replacement (no. 1) and continuity (no. 2) hypotheses regarding modern human origins in the Levant, and the major tenets of the extreme versions of each of them (from Clark 1992a: 185-187). Intermediate positions are predicated on the assumption of subspecies (rather than species) differences between 'neandertals' and 'moderns'.

HYPOTHESIS NO. 1

Morphologically modern humans (MMHs) appear early (ca. 90-100 kyr B.P.) in the Levant and co-exist with archaic *Homo sapiens* (AHS) who arrives at a later date (ca. 60 kyr B.P.). AHS eventually 'dies out' and plays no part in modern human origins. Moderns did not evolve from 'Neandertals'.

HYPOTHESIS NO. 2

Moderns evolve in the Levant, as elsewhere, from the local AHS stock. An influx of 'Neandertals' from Europe at ca. 60 kyr B.P. cannot be documented. Local continuity and gene flow across the AHS/MMH transition lead to moderns in the Levant and elsewhere.

REPLACEMENT ADVOCATES

- make a distinction between archaic *Homo sapiens* (AHS) and 'Neandertals'
- postulate a series of adaptive radiations out of Africa, rather than a single, prolonged one
- invoke Cann's rapid mtDNA base substitution rate (2-4%/Mya) to argue for morphologically modern humans (MMHs) evolving in Africa (ca. 300 kyr B.P.)
- ignore grade/clade distinctions
- emphasize cladogenic speciation over anagenic speciation
- invoke 'splitter' taxonomies and dendritic phylogenies
- claim that archaic *Homo sapiens* and *Homo erectus* are replaced throughout their ranges by MMHs between 200-400 kyr B.P.
- claim that there was no admixture between AHS and MMHs (except in Africa, where MMHs evolve from AHS through anagenic speciation)

CONTINUITY ADVOCATES

- do not make a distinction between archaic *Homo sapiens* and 'Neandertals'
- postulate a single, prolonged hominid radiation out of Africa corresponding to the *Homo erectus* grade in human evolution
- invoke Nei's slower mtDNA base substitution rate (0.71%/Mya) to argue for MMHs evolving in Africa ca. 850 kyr B.P.
- emphasize grade/clade distinctions
- emphasize anagenic speciation over cladogenic speciation
- invoke 'lumper' taxonomies and reticulate phylogenies
- claim that MMHs evolved from AHS throughout the range originally colonized by *Homo erectus*
- claim that there was substantial genetic admixture between AHS and MMHs, and that local continuity, rather than replacement, marked the biological transition

TABLE 2. Chronological framework for the Levantine Upper Paleolithic (from Coinman 1998: 39).

Levantine Upper Paleolithic	
Ahmarian	Levantine Aurignacian
Late Ahmarian (c. 20,000 BP)	
*	?
*	*
*	*
*	Levantine Aurignacian
*	(c. 32,000 - c. 26,000 BP?)
*	*
*	*
*	?
*	
Early Ahmarian (c. 38,000 - c. 26,000 BP?)	

Levant, and (2) an increasing emphasis on technological approaches to the study of lithic assemblages that parallels similar developments in early paleolithic research. Surveys in the more marginal, arid regions of the southern and eastern Levant have increasingly emphasized the larger, *regional* scale of paleolithic adaptive systems and the importance of open-air sites in these desert environments. This is in contrast to the historic emphasis on the caves and rockshelters found in the central and northern Levant. The traditional importance placed on tool typologies has shifted to a more behavioral perspective, essential for a better understanding of the technologies that actually structured the production and use of tools within subsistence and settlement systems.

The 'classic' Upper Paleolithic sequence developed by Neuville (1951) and Garrod (1954), with its 'index fossil' tool types and numbered stages, has, since the early 1980s, been replaced by a 'two traditions' model consisting of the Levantine Aurignacian and the Ahmarian. These two 'traditions' are associated, for the most part, with technological and typological differences, although there are disagreements about the behavioral implications and significance of assemblage differences and similarities. Sharp increases in the tempo and volume of Upper Paleolithic research during the last 20 years, especially in Israel and Jordan, have generated much new data and increasingly complex interpretive problems. International conferences in London (1987) and Lyon (1988) focused on efforts to integrate these new data within evolving conceptual frameworks (Bergman and Goring-Morris 1987). The major issue confronting researchers today is whether a 'two traditions' model can adequately accommodate the variability apparent in the archaeological record for these time ranges across the entire Levant. Paradoxically, a major concern is the growing discrepancy between our increasing knowledge of the more recently defined Ahmarian, and the historically-known, but now rarer and more enigmatic Levantine Aurignacian.

The Levantine Aurignacian

At present, there is a growing consensus on the identification, description, and distribution of the more recently identified Ahmarian. In contrast, our knowledge and understanding of the Levantine Aurignacian analytical unit has become less clear as extensive data accumulate from outside the 'core' Mediterranean zone. The Levantine Aurignacian now encompasses significantly greater technological and typological variability than when it was first defined on the basis of cave and rockshelter excavations in Lebanon, Syria, and northern Israel. Exhibiting strong typological affinities with the European Aurignacian, the earlier descriptions of the Levantine Aurignacian featured typical Upper Paleolithic tools, such as endscrapers and burins (esp. 'Aurignacian', carinated and nosed varieties) (Neuville 1934; Garrod 1953; Belfer-Cohen and Bar-Yosef 1981; Belfer-Cohen 1995). In contrast to generalizations about the European variant, core reduction in the Levant focused on the production of flake debitage and tool blanks with low proportions of blades and bladelets. More recently, however, lithic assemblages from the Negev that varied from the Ahmarian have been identified as Levantine Aurignacian and described as having some Aurignacian elements, although they also exhibit a relatively inferior blade technology with large, thick, blades and lack a true bladelet technology (Marks 1976). By the early 1980s the Levantine Aurignacian had been *redefined* on the basis of variability evident in lithic assemblages from outside the Mediterranean coastal area (Marks and Ferring 1988). The geographic distribution represented by these variable Aurignacian assemblages, suggests that the Levantine Aurignacian, as it was *traditionally* defined, might not exist outside the core Mediterranean zone.

The Ahmarian

The Ahmarian is named after the site of 'Irq al-Aḥmar, and was initially identified in Upper Paleolithic levels at sites in the Judean Desert (Neuville 1951; Perrot 1955; Ronen 1976; 1984). Beginning in the late 1960s, it was recognized that Ahmarian assemblages in the Negev and Sinai departed considerably from traditional Aurignacian characteristics and gave rise to a dichotomy between the two Upper Paleolithic 'traditions'. The defining characteristic of the Ahmarian is a well-developed blade technology, dominated by the production of blades and small bladelet tools, many of which are retouched, backed or pointed (Gilead 1981; 1991; Marks 1981). Traditional Upper Paleolithic tools, such as endscrapers and burins, also occur but are thought to be less common than in Levantine Aurignacian assemblages. The Early Ahmarian, c. 38-30 kyr BP, is generally distinguished by various proportions of pointed blades and bladelets, especially "el-Wad" points, whereas Late Ahmarian assemblages, dated between c. 23-17 kyr BP, lack the larger el-Wad points but are characterized by smaller Ouchtata points with extremely fine, graded retouch. Although archaeological sites with Ahmarian assemblages have been identified in the northern and central Levant (e.g., Ksar Akil XVII-XVI, Qafzeh 9-7), the Ahmarian is most extensively documented in open-air sites in the Negev (Ferring 1977; Marks 1977), in Sinai (Bar-Yosef and Phillips 1977; Phillips 1988), including the Lagaman industry (Gilead and Bar-Yosef 1993), and most recently in Wādī al-Ḥasā of west-central Jordan (Coinman 1993; 1997; 1998; n.d.; Olszewski *et al.* 1990; 1998) (see FIG. 3).

Research in Jordan in the last 20 years has been instrumental in expanding our horizons in respect of regional variability in human adaptations across the Levant, providing new data that bear directly on important issues in Levantine Upper Paleolithic chronology and systematics. While interpretations continue to focus on various dichotomous contrasts (e.g., Levantine Aurignacian vs. Ahmarian; coastal Mediterranean woodlands vs. inland desert/steppe phytogeographic zones; northern rockshelters vs. southern open-air sites), the meaning of these contrasts in the Upper Paleolithic record remains unclear. The Upper Paleolithic in Jordan has highlighted some of the interpretive problems and helped to refine some of our models of adaptation, particularly for inland ecological settings which vary significantly from other areas of the Levant over the course of the last 40 millennia of the Upper Pleistocene (Olszewski and Coinman 1998).

Noteworthy Jordanian Upper Paleolithic sites include the early Ahmarian rockshelter sites of Ṭūr Ḥamār (Coinman and Henry 1995), Ṭūr 'Āyid (Williams 1997), and Jabal Ḥumayma (Kerry 1997) in the Rās an-Naqab region on the southern edge of the Jordanian Plateau. The early Ahmarian has also been documented in Wādī al-Ḥasā at the Ṭūr Sadaf rockshelter (WHNBS 8), along with a transitional Middle/Upper Paleolithic component, and at the Thalab al-Buḥayra open site (EHLPP 2) (Coinman *et al.* 1999). The late Ahmarian has been identified at only two sites in Jordan: the multicomponent rockshelter site of Yutil al-Ḥasā (WHS 784) (Olszewski *et al.* 1990; 1994) and the large open site of 'Ayn al-Buḥayra (WHS 618) (Coinman 1993; Olszewski *et al.* 1998). The eastern basin of Wādī al-Ḥasā has been the focus of recent surveys and excavations by the "Wadi Hasa North Bank Survey (WHNBS)" (Clark *et al.* 1992; 1994) and the "Eastern Hasa Late Pleistocene Project" (EHLPP) (Olszewski and Coinman 1998; Olszewski *et al.* n.d.; Coinman *et al.* 1999).

Chronology

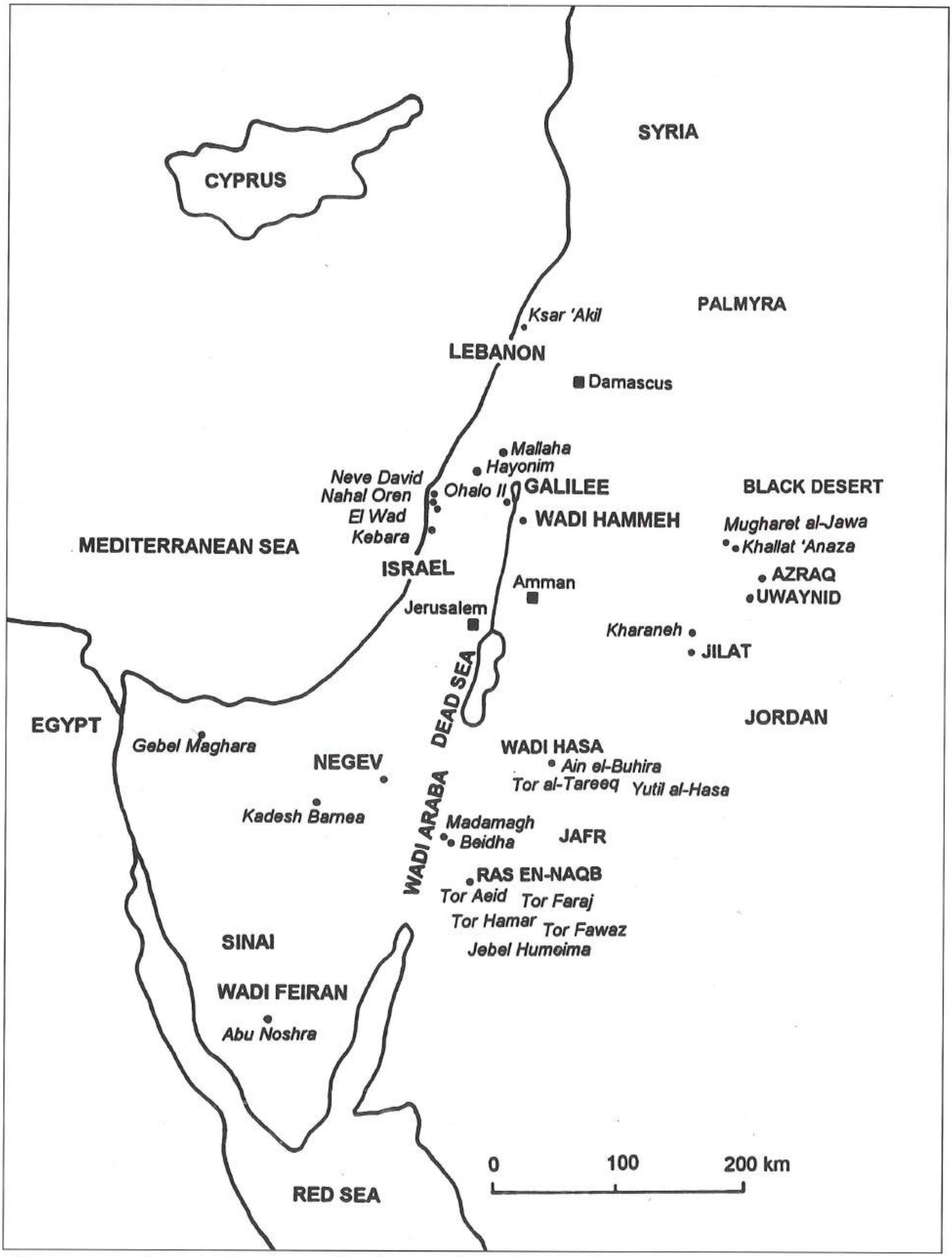
The earliest documented Upper Paleolithic sites in the Levant are associated with the Ahmarian, occurring in the central Negev highlands, in the Sinai Desert and in the Judean Hills, although undated transitional assemblages with Middle Paleolithic and early Ahmarian technological characteristics are reported from Wādī Aghar (J433) in south Jordan (Coinman and Henry 1995) and at Ṭūr Sadaf in Wādī al-Ḥasā, suggesting that the Ahmarian evolves out of local Levantine Levallois Mousterian technologies. In the Negev, the open site of Boker A dates between 38-33 kyr BP (Marks and Ferring 1988), while the Lagaman sites in northern Sinai date between 35-30 kyr BP (Gilead 1991). Early Ahmarian sites in the Qādish Barnia area (N Sinai) date to c. 33 kyr BP (Gilead and Bar-Yosef 1993). In southern Sinai, radiocarbon dates for the Abū Nushra sites range in age from c. 36-29 kyr BP (Phillips 1988).

The latter part of the Ahmarian is known from only a few sites, mainly in Jordan. Late Ahmarian sites in Wādī al-Ḥasā include 'Ayn al-Buḥayra (WHS 618) with dates ranging from c. 25-19 kyr BP (Coinman 1998; n.d.) and Yutil al-Ḥasā (WHS 784), dated to 19 kyr BP (Olszewski 1997).

Levantine Aurignacian sites do not appear to predate 32 kyr BP, and most date after c. 28 kyr BP in Lebanon and Israel. At some sites, Levantine Aurignacian assemblages are stratified above, or are interstratified with, Ahmarian levels (e.g., Qsār 'Aqīl/ K'sar Akil, 'Irq al-Aḥmar, Kabara, Boker BE). The latest known Aurignacian assemblage is at 'Ayn 'Āqib/ Ein Aqev in the central Negev highlands, dated to c. 17 kyr BP (and thus fully contemporary with Epipaleolithic Kebaran assemblages throughout the southern and central Levant).

Settlement Patterns

At present our understanding of the Levantine Upper Paleolithic stems largely from the interpretation of pattern in lithic assemblages, but with on-going surveys and excavations, the data needed to test models of hunter-gatherer settlement patterns has been greatly expanded in recent years. Settlement data in the form of site size and placement, relative to resource distributions are, however, still fairly 'coarse-grained' for the Levantine Upper Paleolithic in general. In recent years, settlement models for the Levantine Upper Paleolithic have been dominated by the 'circulating' model of Marks and Freidel (1977) and Donald Henry's 'transhumance' (e.g.,1994) model, both of which explain important aspects of settlement



3. Map of the Levant showing the locations of some of the Upper and Epipaleolithic sites discussed in the text (from Olszewski and Coinman 1998: 179).

patterns and ecology in the areas where they were developed. Both, however, are too general to explain the potentially diverse mix of adaptive strategies that most likely characterized foragers throughout the approximately 20,000 years of the Upper Paleolithic and across the ecologically diverse landscapes of the Levant. We should expect a range of strategies in terms of settlement mobility and land-use patterns over both the long *and* the short-term, with mobility conceptualized as a dynamic intra-year mix of collecting and foraging systems which are subject to intra- and inter-seasonal shifts in strategy. For the Upper Paleolithic in Wādī al-Ḥasā in west-central Jordan, settlement patterns have been modeled as a set of mobility strategies that responded to fluctuations and changes in the local lake and marsh ecology of Pleistocene Lake Hasa (Olszewski and Coinman 1998). In this model, the late Upper Paleolithic was characterized by logistical residence over multiple seasons. During the winter, foraging from residential bases in the Ḥasā to distant task camps occurred, while during the spring and summer, logistical foraging and collecting from these base-camps might have focused exclusively on the local lake and marsh setting. Late summer and fall would have been periods of movement to residential camps in the highlands and mountains. On-going investigations at Upper Paleolithic sites in the eastern Ḥasā are currently evaluating the adequacy of this model, which should be appropriate to other areas in the Levant that were ecologically similar during the Upper Paleolithic. Lake and marsh environments existed in the southern Sinai, the Azraq and Jafr basins of Jordan, on the shores of ancient Lake Galilee, around Lake Lisan, and in the Palmyra and Damascus basins. Indeed, a large number of Upper Paleolithic sites are associated with lake and marsh environments, although at this point the data are rather uneven across the Upper Paleolithic time range as a whole, and it is unknown to what extent the geographic and topographic distributions known to us at present are representative of the full panoply of Upper Paleolithic land use. However, research in Jordan in the last 20 years has greatly increased our understanding of Upper Paleolithic adaptations and established a significant human presence in inland steppe and desert regions that vary markedly from the Levantine coastal plains upon which traditional Levantine land use models have been based.

The Levantine Epipaleolithic

The history of Epipaleolithic research in the Levant extends back to the 1930s with the work of Bate (1932), Garrod (1932, 1942), Turville-Petre (1932), and Neuville (1934) in the region around Mount Carmel and in the Judean Hills. Like these early excavations, later research tended to be focused on the Mediterranean phytogeographic zone to the west of the Rift Valley (e.g., Bar-Yosef 1970). By the mid-1970s, several large survey and excavation projects had broadened our understanding of Epipaleolithic adaptations in the arid Negev and Sinai Deserts (e.g., Bar-Yosef 1975; 1981; Bar-Yosef and Phillips 1977; Marks 1976; 1977). The prevailing view at the time, and one still held by many scholars, was that observed assemblage differences as determined by the current systematics, were (are) reflections of ethnic identity, resulting in different cultural traditions of tool manufacture.

While developments in the west were advancing rapidly during the 1970s, the eastern Levant remained an enigma. With the exception of a few sites in the south and east (e.g., Madamagh rockshelter, Bayḍā, Ala Safat) reported in a few short articles, very little was known of the Jordanian Epipaleolithic. The little work that had been done was largely descriptive, emphasizing almost exclusively the retouched tools and their relationships to extant collections west of the Rift (e.g., Kirkbride 1958; 1966; Waechter 1948).

Two important factors have affected the development and pace of research on the Epipaleolithic in the eastern Levant. First, the implementation of regional surveys in Jordan during the late 1970s and early 1980s led to an exponential growth in the number of sites known from the period (e.g., Garrard and Price 1975-77; Henry 1982; MacDonald 1982; MacDonald *et al.* 1980; 1982). In many respects, these projects were the intellectual offspring of those conducted in the Sinai and Negev Deserts to the west (Bar-Yosef and Phillips 1977; Marks 1976; 1977; 1983). Second, Epipaleolithic research was also profoundly influenced by conceptual changes regarding (1) the meaning of typological systematics, (2) the new emphasis on technology mentioned above, and (3) the interest in hunter-gatherer mobility and resource procurement behaviours. These conceptual issues have a direct bearing on how we interpret the Epipaleolithic archaeological record and the kinds of information regarded as important for our studies.

Regional Survey

Following on the heels of projects west of the Rift Valley, regional surveys were initiated in Jordan in the late 1970s and early 1980s. Although the Epipaleolithic was by no means the only focus of this research, these projects recorded large numbers of Epipaleolithic sites. The surveys included (1) Donald Henry's work in south Jordan's Wādī Ḥismā and on the edge of the south Jordan plateau (e.g., Henry 1982; 1995), (2) Burton MacDonald's spectacularly successful "Wadi Hasa Survey" (e.g., MacDonald 1988; Clark *et al.* 1987); (3) the work of the University of Sydney team in Wādī al-Ḥammah (e.g., Edwards *et al.* 1988); and the British Institute projects in (4) the Black Desert (e.g., Betts 1988) and in (5) the Azraq Basin (e.g., Garrard *et al.* 1988). In general, the intent was to understand regional systems of forager adaptation and land use employing data from multiple sites and their environmental settings. With their landscape orientation, these surveys constituted a departure from earlier work, which tended to be very 'site centered' and which resulted in rather particularistic views of forager adaptations founded on supposedly diagnostic 'type sites' and 'type sequences'.

In addition to these regional surveys, which were often followed by test excavations at selected sites, there have also been conceptual changes affecting typology, technology, subsistence, raw material procurement and processing, and mobility strategies, each with the potential to alter and enhance our understanding of Epipaleolithic forager adaptations. In some respects, these changes are more important than the shift to a regional focus, because they affect what constitutes relevant data, which data are considered important to monitor over a range of problem domains and, ultimately, how archaeologists assign meaning to an archaeological record.

The constraints of space preclude listing all the Epipaleolithic sites in Jordan. However, noteworthy sites that have been investigated include (1) Jabal Ḥamra (J201), Jabal Mishraq (J504), Jabal Muhaymi (J520), al-Quwayra (J203), Qā' Salab (J202), Ṭūr Ḥamār (J431), Wādī Judayid (J2), and the Jabal Qalkha sites (J24) in southern Jordan (Henry 1982; 1995); (2) Bayḍā (Byrd 1989; Kirkbride 1966), (3) Kharanah IV and Wādī Jīlāt, al-Azraq, and the Wādī 'Uwaynid sites, also in the Azraq Basin (Muheisen 1985; Garrard *et al.* 1988; Byrd and Garrard 1990); (4) the Wādī al-Ḥammah sites in the northern Jordan Valley (Edwards 1990; Edwards *et al.* 1996), and (5) Ṭabaqa (WHS 895), Ṭūr aṭ-Ṭarīq (WHS 1065) and Yutil al-Ḥasā (WHS 784) in Wādī al-Ḥasā, west-central Jordan (Byrd and Colledge 1991; Olszewski *et al.* 1994; Neeley *et al.* n.d.). These sites encompass the entire temporal span represented by the Jordanian Epipaleolithic, from its earliest phases through the Natufian.

Typological Systematics

One of the key conceptual issues affecting Epipaleolithic research involves the meaning of typological systematics. Historically, these systematics were developed from French models and applied along the Mediterranean coast to describe the range of variation in Epipaleolithic assemblages there according to a suite of techno-typological attributes (e.g., Bar-Yosef 1970). With the increasing tempo of research over the past 20 years, it has become apparent that these systematics, as originally defined, are of limited utility due to a lack of consistency in definitional criteria and in application in the various Levantine regions to which they have been extended, affecting, in turn, the consensus definitions of the basic operational taxonomic units themselves. Thus, the terms 'Kebaran', 'Geometric Kebaran', and to a lesser extent, 'Natufian', mean different things to different workers in different regions of the Levant, with the most common referent being a general slice of time and level of cultural development. To force systematics developed elsewhere on the Jordanian Epipaleolithic is, therefore, likely to be both confusing and inaccurate. In response to the limitations of Mediterranean-based systematics, terms such as 'Qalkhan', 'Madamaghan', and 'Hamran' have been introduced by Donald Henry (e.g., 1995) with special reference to the Epipaleolithic of Jordan (TABLE 3).

In recognition of the ambiguity associated with the classification of Epipaleolithic archaeological materials, Henry (1989a; 1995) has proposed a three-tiered hierarchy of *complex, industry* and *phase/facies*, with the complex being the broadest, most inclusive category, and the phase/facies the narrowest. Based largely on the results of his fieldwork in southern Jordan, two major developmental sequences for the Jordanian Epipaleolithic are identified: (1) the Qalkhan-Madamaghan/Mushabian and (2) the Kebaran-Geometric Kebaran-Natufian. The latter, which clearly has its roots in the coastal region, is comprised of a sequence of regionally defined industries which are sorted into temporally distinct units labeled 'Early', 'Middle', 'Late' and 'Final Hamran'. For the Qalkhan-Madamaghan, Henry proposes an industrial affiliation between the two, with the Madamaghan subsumed under the larger Mushabian complex.

In contrast, other researchers in Jordan have been less willing to adopt or create labels of cultural (complex) affiliation, partly due to the so-far limited intra-regional comparative analyses of their materials with those from Henry's work in south Jordan (e.g., Byrd and Garrard 1990; Byrd 1994; Edwards *et al.* 1988). Instead there has been a tendency to continue to use the 'Kebaran' and 'Geometric Kebaran' labels in a generic sense with regard to chronology rather than in accordance with strict techno-typological definitions. Broad terms like 'Non-Natufian Microlithic', 'Non-Microlithic'; 'Early', 'Middle' and 'Late Epipaleolithic' are also in use. All these refer to very general characteristics and/or temporal periods without any of the connotations associated with Henry's 'industry' and 'complex' labels. Apart from terminology, a more profound question is what do the differences and similarities connoted by these terms mean behaviourally (Neeley and Barton 1994; Barton and Neeley 1996)?

Clearly there are differences in the frequency distributions of Epipaleolithic blank morphologies, modes and placements of retouch (largely differentiated in terms of the microlithic component) but, beyond describing these differences statistically (an activity constrained by our a priori classification schemes), where do

TABLE 3. Epipaleolithic cultural and chronostratigraphic analytical units according to Byrd (1994), Henry (1995) and Goring-Morris (1995).

<table>
<tr><th rowspan="2">Kyr</th><th rowspan="2" colspan="2">Western Complexes
(Byrd 1994)</th><th colspan="3">Eastern Complexes (Jordan)</th><th rowspan="2" colspan="2">Levantine Complexes
(Goring-Morris 1995)</th></tr>
<tr><th>(Byrd 1994)</th><th colspan="2">(Henry 1995)</th></tr>
<tr><td>10</td><td colspan="2">Harifian</td><td rowspan="6">Natufian and related industries</td><td colspan="2" rowspan="2">Late Natufian</td><td colspan="2">Final Natufian/Harifian/EpiNatufian</td></tr>
<tr><td></td><td colspan="2" rowspan="4">Natufian</td><td colspan="2">Late Natufian</td></tr>
<tr><td>11</td><td colspan="2" rowspan="3">Early Natufian</td><td rowspan="3">Early Natufian</td><td rowspan="4">Ramonian</td></tr>
<tr><td></td></tr>
<tr><td>12</td></tr>
<tr><td></td><td rowspan="4">Geometric Kebaran</td><td rowspan="4">Mushabian</td><td rowspan="3">?
?
Mushabian/
Madamaghan</td><td rowspan="4">Geometric Kebaran/
Hamran</td><td rowspan="4">Geometric Kebaran</td></tr>
<tr><td>13</td><td rowspan="2">Non-microlithic</td><td rowspan="3">Mushabian</td></tr>
<tr><td></td></tr>
<tr><td>14</td><td rowspan="12">Non-Natufian Microlithic</td><td rowspan="3">?
?</td></tr>
<tr><td></td><td rowspan="9">Kebaran</td><td rowspan="3"></td><td rowspan="3">Kebaran/
Early
Hamran</td><td rowspan="5">Late Kebaran</td><td rowspan="2"></td></tr>
<tr><td>15</td></tr>
<tr><td></td><td rowspan="9">Qalkhan
?
?
?</td><td rowspan="3">Nizzanan</td></tr>
<tr><td>16</td><td rowspan="9"></td><td rowspan="8">?
?
?
?</td></tr>
<tr><td></td></tr>
<tr><td>17</td><td colspan="2" rowspan="3">Early Kebaran
Qalkhan
Nebekian</td></tr>
<tr><td></td></tr>
<tr><td>18</td></tr>
<tr><td></td><td colspan="2" rowspan="3">Masraqan</td></tr>
<tr><td>19</td><td rowspan="3">Late/Terminal Upper Paleolithic</td></tr>
<tr><td></td></tr>
<tr><td>20</td><td colspan="3">Late/Terminal Upper Paleolithic</td><td colspan="2">Late Upper Paleolithic</td></tr>
</table>

we go from here? For purposes of contrast, we can group researchers into two camps: (1) those who view differences as reflections of identity-conscious social units (i.e., ethnicity 'writ small' in the tools — Bar-Yosef [1991]; Henry [1989a; 1995]), and (2) those who view differences as representations of adaptive systems cross-cutting these hypothetical social units, reflecting resource procurement, mobility, use, and discard (i.e., patterns existing above the level of ethnic differences — Binford and Sabloff [1982]; Clark and Lindly [1991]). Untroubled by potential problems with the logic of inference, many workers straddle the line between the two camps. By far the most common approach in the Jordanian Epipaleolithic has been the social identity approach, often identified with Donald Henry (e.g., 1989a). Although it has had some success within the confines of its heavily typological conceptual framework, its ability to answer larger questions of adaptation is very limited. In addition, some of the implicit assumptions about the boundedness of ethnicity are tenuous at best, given our understanding of modern foragers and evolutionary theory, as well as the problems associated with archaeological reconstructions of ethnic groups in deep time (Clark 1989). Instead, explanations of variability in terms of adaptive strategies to changing local environments are favoured, an approach that transcends the various paleolithic stages, and that does not require invoking ethnicity to account for patterned variation.

Technological Systematics
Partly as a reaction to typological excess, there has also been a shift away from the retouched tools as sole sources of data, to a greater emphasis on the organization of technology (Nelson 1991). This can be linked to a realization of the limitations inherent in typological systematics, and to the rise of more inclusive *chaîne opératoire* approaches to understand the process of lithic reduction. By getting a better handle on the decisions and by-products involved in the procurement, manufacture and discard of stone artifacts, technological approaches can further our understanding and interpretation of Epipaleolithic adaptive strategies (e.g., Neeley 1997). Unfortunately, technological approaches have also been used like conventional typologies — to define industrial complexes and to determine ethnic or social affinity amongst assemblages (although, in our view, this practice is questionable for the same reasons enumerated above).

Settlement Patterns
As might be expected from the rise of regional studies in Jordan, there has also been an increase in the study of Epipaleolithic settlement systems. Prior to the shift to a regional perspective, single sites often served as the basis for settlement interpretation. These views tended to be rather rigid, with the early Epipaleolithic characterized by small groups of highly mobile foragers and the late Epipaleolithic (esp. the Natufian) characterized by reduced mobility, larger local groups, the appearance of architecture and cemeteries, and substantially larger settlements. Following Mortensen (1972), Marks and Freidel's (1977) work in the Central Negev Highlands proposed settlement patterns characterized by circulating strategies of residential mobility in the early Epipaleolithic, followed by climatic amelioration and a radiating pattern in the Natufian. A virtue of this model, aside from its empirical basis in a relevant database, is that its implications are readily testable with similar data from other regions. Following the Negev work, Henry (1994; 1995) used an ethnographically-derived transhumance model to characterize Epipaleolithic settlement in the mountainous regions at the south edge of the Jordanian plateau. While general patterns of radiating and circulating mobility resemble the results of the Negev study, the addition of elevation and seasonality variables make this model more fine-grained, yet equally suited to empirical evaluation. Both the Marks and Freidel (1977) and the Henry (1994; 1995) models have been tested with coarse-grained survey data from Wādī al-Ḥasā, yet neither seems to characterize adequately the observed patterns of settlement (Clark 1992b). More recently, Byrd and Garrard (1990), and Olszewski *et al.* (1994) have suggested that the inland lake basin settlement systems might be unique (and likely more stable) than those of the arid highlands. Testing this proposition is a focus of research currently underway in the lower Ḥasā Basin (Olszewski and Coinman 1998). Whatever the outcome of this research, it is pretty clear that Epipaleolithic settlement-subsistence systems in Jordan cannot be characterized by simple, region-wide blanket statements. It would seem that they comprised a mosaic of adaptive strategies, each linked to specific regional topographies and resource distributions. In some contexts, at least, these provided the basis for the emergence of the neolithic, marked by a reorganization of social and land-use strategies associated with earliest agropastoral economies, after about 10,300 years ago.

Procurement and Mobility
Modeling resource procurement and mobility strategies is a comparatively recent (mid-1980s) development in paleolithic archaeology in general, and is an avenue of research not extensively exploited amongst Jordanian Epipaleolithic archaeologists (Neeley 1997). The impetus for this approach can be traced to a series of papers by Lewis Binford (e.g., 1979; 1980) almost 20 years ago, and are currently lumped under the rubric of 'the organization of technology' (Nelson 1991). The focus is on variables like (1) package size, quality of, and distance to

raw material; (2) forager mobility (which varies logistically and on daily, weekly, seasonal, and annual scales, and over the long term — decades, centuries); (3) tool curation (the extent to which shaped stone artifacts are used, recycled and maintained), (4) time stress (often invoked as a reason for the appearance of microlithic technologies), (5) tool design (conditioned by the extent to which tools are made in anticipation of future contingencies, subsequently maintained and reworked, or manufactured on the spot, used and discarded), and (6) reduction strategies (how raw material size, shape and quality affect the production of blanks). Most of the work directed toward identifying and explaining axes of formal variation as they relate to forager procurement and mobility has been carried out in the New World (e.g., Bamforth 1986; 1990), but the approach shows considerable promise in respect of Old World foragers in xeric environments like the Levant, where surveys can recover many aspects of ancient settlement-subsistence systems (Neeley 1997). By focusing on these issues, archaeologists can move beyond the narrow confines of typology and technology to identify and explain the organization of the technological systems by means of which foragers gained their livelihood. An additional advantage is that expectations about behavioural patterns and their archaeological correlates can be generated and tested using existing data, often with unanticipated results (Neeley and Barton 1994; Neeley 1997). These studies emphasize the importance of accounting for sources of variability in lithic assemblages in terms of constraints imposed on mobile foragers faced with the need to solve problems imposed by the uneven spatial and temporal distributions of resources in the environments in which they lived (Jochim 1981). Applications of this approach to the Jordanian Epipaleolithic are still in their infancy (e.g., Henry 1989b; 1995). Although there is usually some acknowledgment of the relative availability of lithic raw materials vis à vis site distributions, it is clear and definite that they were not ubiquitous in the landscape, as had often been assumed by earlier workers.

Concluding Remarks

The years between 1979 and 1985 were a watershed for the development of archaeological research in the Hashemite Kingdom of Jordan (Coinman and Clark 1998). Prior to the late 1970s, almost no archaeological survey had been undertaken in the country, and what few excavations there were focused on the better-known and more visible of Jordan's sites, dating to the Neolithic, Greek, Roman, Nabataean, Byzantine and Islamic periods (Bienkowski 1991). The result was that most of Jordan was effectively unknown archaeologically — even for the later periods of classical antiquity. In marked contrast to work in Israel, the first paleolithic sites were recorded only in the 1960s. The enormous potential of the region for Pleistocene archaeological research went almost completely unrecognized.

The 1970s and early 1980s were also marked by major changes in Levantine archaeology in general, up until that time dominated by research in the mesic coastal environments of Greater Syria. So far as the early time ranges are concerned, perhaps the most important stimulus for change came with the systematic surveys and test excavations in the arid highlands of the central Negev Desert by Anthony Marks and his colleagues (Marks 1976; 1977; 1983). Initiated in the mid-1960s, the work in the central Negev was followed shortly thereafter by surveys and testing programs in other, little-known areas like the Sinai and western Negev (e.g., Bar-Yosef and Phillips 1977; Phillips 1987a; 1987b). As Marks points out in the introduction to the third and last of the *Central Negev Project* volumes (1983: xii), the Negev research not only opened up previously neglected environmental zones (i.e., the xeric steppes, deserts) to Levantine prehistorians, it also carried out systematic surveys at a regional scale, rather than focusing on excavations at single sites, which (in the case of the paleolithic) were typically caves or rockshelters. Open sites had been almost completely ignored (Bar-Yosef 1991; Rosen 1991).

By the mid-1980s, archaeological research in Jordan incorporated new emphases on (1) large, regional, settlement and subsistence systems, (2) on how sites were arrayed in the landscape in relation to one another, and in relation to a succession of changing paleoenvironments and landforms, (3) on site distributions relative to critical resources (e.g., water, flint), and (4) on inter- and intra-site spatial analysis, with the objective of extracting information on forager mobility patterns and activity sets. More than any other single piece of research, the Central Negev Project ushered in a new 'anglo-american' archaeological perspective and, with it, a new generation of archaeologists who have contributed significantly to a better understanding of the ancient prehistory and paleoenvironments of the greater Levant. Much subsequent work in Jordan, including that summarized here, was profoundly influenced by these initial efforts, and by new directions taken by Marks, Phillips, Henry and Bar-Yosef in the xeric regions of the southern Levant.

Acknowledgments

This is Wadi Hasa Paleolithic Project Contribution No. 35, supported by the National Science Foundation, the National Geographic Society, Arizona State University, Iowa State University, and the Chase Bank of Arizona. The support and logistical assistance of the Department of Antiquities of Jordan and the American Center of Oriental Research (Amman) is gratefully acknowledged.

References Cited

Bamforth, D. 1986. Technological Efficiency and Tool Curation. *American Antiquity* 51: 38-50.

——1990. Mobility, Raw Material, and Lithic Procurement in the Central Mojave Desert. *Journal of Anthropological Archaeology* 9: 70-104.

Bar-Yosef, O. 1970. *The Epipaleolithic Cultures of Palestine.* Ph.D thesis, Department of Archaeology, Hebrew University, Jerusalem.

——1975. The Epi-Paleolithic in Palestine and Sinai. Pp. 313-371 in F. Wendorf and A. Marks (eds.), *Problems in Prehistory: North Africa and the Levant.* Dallas: SMU Press.

——1981. The Epi-Paleolithic Complexes in the Southern Levant. Pp. 389-408 in J. Cauvin and P. Sanlaville (eds.), *Préhistoire du Levant.* Paris: Editions du CNRS.

——1991. Stone Tools and Social Context in Levantine Prehistory. Pp. 371-395 in G. Clark (ed.), *Perspectives on the Past.* Philadelphia: University of Pennsylvania Press.

——1994. The Contributions of Southwest Asia to the Study of the Origins of Modern Humans. Pp. 23-66 in M. Nitecki and D. Nitecki (eds.), *Origins of Anatomically Modern Humans.* New York: Plenum.

Bar-Yosef, O. and Phillips, J. (eds.) 1977. *Prehistoric Investigations in Gebel Maghara, Northern Sinai.* Jerusalem: Hebrew University, Monographs of the Institute of Archaeology No. 7.

Bar-Yosef, O. *et al.* 1992. The Excavations in Kebara Cave, Mt. Carmel. *Current Anthropology* 33: 497-550.

Barton, C. M. and Neeley, M. 1996. Phantom Cultures of the Levantine Epipaleolithic. *Antiquity* 70: 139-147.

Bate, D. 1932. A Note on the Fauna of the Athlit Caves. *Journal of the Royal Anthropological Institute of Great Britain and Ireland* 62: 277-279.

Belfer-Cohen, A. 1995. Problems in Defining a Prehistoric Culture: an example from the southern Levant. Pp. 247-259 in M. Otte (ed.), *Nature et Culture.* Liège: ERAUL No. 68.

Belfer-Cohen, A. and Bar-Yosef, O. 1981. The Aurignacian at Hayonim Cave. *Paléorient* 7: 19-42.

Bergman, C. and Goring-Morris, A. N. 1987. Summary of the London Conference on K'sar Akil. *Paléorient* 13: 125-128.

Besançon, J. *et al.* 1984. The Lower and Middle Paleolithic in the Upper Zarqa/Khirbet Samra area of northern Jordan. *ADAJ* 28: 91-142.

Betts, A. 1988. The Black Desert: prehistoric sites and subsistence strategies in eastern Jordan. Pp. 369-391 in A. Garrard and H.-G. Gebel (eds.),*The Prehistory of Jordan.* Oxford: BAR International Series S-396(ii).

Bienkowski, P. 1991. Jordan: Crossroads of the Near East. Pp. 1-30 in P. Bienkowski (ed.), *The Art of Jordan.* Merseyside: National Museums & Galleries.

Binford, L. 1981. *Bones: Ancient Men and Modern Myths.* New York: Academic Press.

——1985. Human Ancestors: changing views of their behavior. *Journal of Anthropological Archaeology* 4: 292-327.

Binford, L. and Sabloff, J. 1982. Paradigms, Systematics and Archaeology. *Journal of Anthropological Research* 38: 137-153.

Blumenschine, R. 1991. Prey Size and Age Models of Prehistoric Hominid Scavenging: test cases from the Serengeti. Pp. 121-147 in M. Stiner (ed.), *Human Predators and Prey Mortality.* Boulder: Westview.

Boëda, E. 1991. Approche de la variabilité des systèmes de production lithique des industries du Paléolithique inférieur et moyen: chronique d'une variabilité attendue. *Techniques et Culture* 17-18: 37-79.

——1993. Le débitage discoïde et le débitage Levallois recurrente centripête. *Bulletin de la Société Préhistorique Française* 90: 392-404.

Bordes, F. and de Sonneville-Bordes, D. 1970. The Significance of Variability in Palaeolithic Assemblages. *World Archaeology* 2: 61-73.

Byrd, B. 1989. *The Natufian Encampment at Beidha: Late Pleistocene Adaptation in the Southern Levant.* Åarhus: Jutland Archaeological Society Publication No. 23.

——1994. Late Quaternary Hunter-Gatherer Complexes in the Levant between 20,000 and 10,000 BP. Pp. 205-226 in O. Bar-Yosef and R. Kra (eds.), *Late Quaternary Chronology and Paleoclimates of the Eastern Mediterranean.* Tucson: Radiocarbon.

Byrd, B. and Colledge, S. 1991. Early Natufian Occupation along the Edge of the Southern Jordanian Steppe. Pp. 265-276 in O. Bar-Yosef and F. Valla (eds.), *The Natufian Culture in the Levant.* Ann Arbor: International Monographs in Prehistory.

Byrd, B. and Garrard, A. 1990. The Last Glacial Maximum in the Jordanian Desert. Pp. 78-96 in C. Gamble and O. Soffer (eds.), *The World at 18,000 BP.* London: Unwin Hyman.

Clark, G. A. 1989. Romancing the Stones: biases, style and lithics at La Riera. Pp. 27-50 in D. Henry and G. Odell (eds.), *Alternative Approaches to Lithic Analysis.* Washington: AP3A No. 1.

——1991. Introduction. Pp. 3-21 in G. Clark (ed.), *Perspectives on the Past.* Philadelphia: University of Pennsylvania Press.

——1992a. Continuity or Replacement? Putting modern human origins in an evolutionary context. Pp. 183-205 in H. Dibble and P. Mellars (eds.), *The Middle Paleolithic: Adaptation, Behavior and Variability.* Philadelphia: University of Pennsylvania Museum.

——1992b. Wadi al-Hasa Palaeolithic Settlement Patterns: Negeb and South Jordan models compared. Pp. 89-96 in *SHAJ* IV. Amman: Department of Antiquities.

——1993. Paradigms in Science and Archaeology. *Journal of Archaeological Research* 1: 203-234.

——1994a. Migration as an Explanatory Concept in Paleolithic Archaeology. *Journal of Archaeological Method and Theory* 1: 305-343.

——1994b. Origine de l'homme: le dialogue de sourds. *La Recherche* 25: 316-321.

——1997a. The Middle-Upper Paleolithic Transition in Europe: an American view. *Norwegian Archaeological Review* 30: 25-53.

——1997b. Through a Glass Darkly: conceptual issues in modern human origins research. Pp. 60-76 in G. Clark and C. Willermet (eds.), *Conceptual Issues in Modern Human Origins Research*. New York: Aldine de Gruyter.

Clark, G. and Lindly, J. 1989a. The Case for Continuity: observations on the biocultural transition in Europe and western Asia. Pp. 626-676 in P. Mellars and C. Stringer (eds.), *The Human Revolution*. Edinburgh: Edinburgh University Press.

——1989b. Modern Human Origins in the Levant and Western Asia: the fossil and archaeological evidence. *American Anthropologist* 91: 962-985.

——1991. Paradigmatic Biases and Paleolithic Research Traditions. *Current Anthropology* 32: 577-587.

Clark, G. *et al.* 1987. Paleolithic Archaeology in the Southern Levant. *ADAJ* 31: 19-78, 547.

——1992. Wadi al-Hasa Paleolithic Project - 1992: preliminary report. *ADAJ* 36: 13-23.

——1994. Survey and Excavation in the Wadi al-Hasa: a preliminary report of the 1993 field season. *ADAJ* 38: 41-55.

——1997. Chronostratigraphic Contexts of Middle Paleolithic Horizons at the Ain Difla Rockshelter (WHS 634), West-Central Jordan. pp. 77-100 in H.-G. Gebel *et al.* (eds.),*The Prehistory of Jordan II: Perspectives from 1997*. Berlin: Ex Oriente.

Clark, G. and Willermet, C. (eds.) 1997. *Conceptual Issues in Modern Human Origins Research*. New York: Aldine de Gruyter.

Coinman, N. R. 1990. *Refiguring the Levantine Upper Paleolithic: a Comparative Examination of Lithic Assemblages from the Southern Levant*. Ph.D dissertation, Arizona State University. Ann Arbor: University Microfilms.

——1993. WHS 618 - Ain el-Buhira: an Upper Paleolithic site in the Wadi Hasa, west-central Jordan. *Paléorient* 19: 17-37.

——1997. Upper Paleolithic of Jordan: evidence from the Wadi el-Hasa and south Jordan. Pp. 209-217 in *SHAJ* VI. Amman: Department of Antiquities.

——1998. The Upper Paleolithic of Jordan. Pp. 39-63 in D. Henry (ed.), *The Prehistoric Archaeology of Jordan*. Oxford: BAR International Series No. 705.

——n.d. The Upper Paleolithic in the Wadi al-Hasa. In N. Coinman (ed.), *The Archaeology of the Wadi al-Hasa, West-Central Jordan, Vol. 2: Excavations in Middle, Upper, and Epipaleolithic Sites*. Tempe: ARP No. 52.

Coinman, N. and Clark, G. 1998. Introduction. Pp. 1-12 in N. Coinman (ed.), *The Archaeology of the Wadi al-Hasa, West-Central Jordan, Vol. 1*. Tempe: ARP No. 50.

Coinman, N. and Henry, D. 1995. The Upper Paleolithic Sites. Pp.133-214 in D. Henry (ed.), *Prehistoric Cultural Ecology and Evolution: Insights from Southern Jordan*. New York: Plenum.

Coinman, N. *et al.* 1999. The Eastern al-Hasa Late Pleistocene Project: preliminary report on the 1998 season. *ADAJ* 43: 9-25.

Copeland, L. 1989a. Analysis of the Paleolithic Artifacts from the Sounding of A. Garrard at C-Spring, 1985 Season. Pp. 325-390 in L. Copeland and F. Hours (eds.), *The Hammer on the Rock*. Oxford: BAR International Series S-540.

——1989b. The Artifacts from the Sounding of D. Kirkbride at Lion's Spring, Azraq, in 1956. Pp.171-212 in L. Copeland and F. Hours (eds.), *The Hammer on the Rock*. Oxford: BAR International Series S-540.

——1991. The late Acheulean Knapping Floor at C-Spring, Azraq Oasis, Jordan. *Levant* 23: 1-6.

——1997. Status, Perspectives and Future Goals in Jordanian Palaeolithic Research. Pp. 183-192 in H.-G. Gebel *et al.* (eds.), *The Prehistory of Jordan II: Perspectives from 1997*. Berlin: Ex Oriente.

Copeland, L. and Hours, F. 1988. The Palaeolithic in North-Central Jordan: an overview of survey results from the Upper Zarqa and Azraq, 1982-1986. Pp. 287-309 in A. Garrard and H.-G. Gebel (eds.), *The Prehistory of Jordan*. Oxford: BAR International Series S-396(ii).

Dibble, H. 1984. Interpreting Typological Variation of Middle Paleolithic Scrapers: function, style, or sequence or reduction? *Journal of Field Archaeology* 11: 431-436.

——1995. Middle Paleolithic Scraper Reduction: background, clarification, and review of the evidence to date. *Journal of Archaeological Method and Theory* 2: 299-368.

Edwards, P. 1990. Kebaran Occupation at the Last Glacial Maximum in Wadi al-Hammeh, Jordan Valley. Pp. 97-118 in C. Gamble and O. Soffer (eds.), *The World at 18,000 BP*. London: Unwin Hyman.

Edwards, P. *et al.* 1988. Late Pleistocene Prehistory in the Wadi el-Hammeh, Jordan Valley. Pp. 525-565 in A. Garrard and H.-G. Gebel (eds.), *The Prehistory of Jordan*. Oxford: BAR International Series S-396(ii).

——1996. The Early Epipaleolithic of Wadi al-Hammeh. *Levant* 28: 115-130.

Ferring, C. 1977. The Late Upper Paleolithic Site of Ein Aqev East. Pp. 81-118 in A. Marks (ed.), *Prehistory and Paleoenvironment in the Central Negev, Israel, Vol. II*. Dallas: Southern Methodist University Press.

Garrard, A. and Price, S. 1975-77. A Survey of Prehistoric Sites in the Azraq Basin, Eastern Jordan. *Paléorient* 3: 109-126.

Garrard, A. *et al.* 1985. Prehistoric Environment and Settlement in the Azraq Basin. *Levant* 18: 5-24.

——1988. Summary of Paleoenvironmental and Prehistoric Investigations in the Azraq Basin. Pp. 311-337 in A. Garrard and H.-G. Gebel (eds.), *The Prehistory of Jordan*. Oxford: BAR International Series S-396(ii).

Garrod, D. 1932. A New Mesolithic Industry: the Natufian of Palestine. *Journal of the Royal Anthropological Institute of Great Britain and Ireland* 62: 257-269.

——1942. Excavations at the Cave of Shukbah, Palestine, 1928. *Proceedings of the Prehistoric Society* 8: 1-20.

——1953. The Relations between Southwest Asia and Europe in the Latter Paleolithic Age. *Journal of World History* 1: 13-38.

——1954. Excavations at Mugharet Kebara, Mount Carmel, 1932: the Aurignacian industry. *Journal of the Royal Anthropological Institute* 85: 141-162.

Gibbons, A. 1990. Paleontology by Bulldozer. *Science* 247: 1407-1409.

Gifford-González, D. 1991. Bones are not Enough: analogues, knowledge and interpretive strategies in zooarchaeology. *Journal of Anthropological Archaeology* 10: 215-254.

Gilead, I. 1981. Upper Paleolithic Tool Assemblages from the Negev and Sinai. Pp. 331-342 in J. Cauvin and P. Sanlaville (eds.), *Préhistoire du Levant*. Paris: Editions du CNRS.

——1991. The Upper Paleolithic Period in the Levant. *Journal of World Prehistory* 5:105-154.

Gilead, I. and Bar-Yosef, O. 1993. Early Upper Paleolithic Sites in the Qadesh Barnea Area, Northeastern Sinai. *Journal of Field Archaeology* 20: 265-280.

Goring-Morris, A. N. 1995. Complex Hunter/Gatherers at the End of the Paleolithic (20,000-10,000 BP). Pp. 141-168 in T. Levy (ed.), *The Archaeology of Society in the Holy Land*. New York: Facts On File.

Henry, D. 1982. The Prehistory of Southern Jordan and Relationships with the Levant. *Journal of Field Archaeology* 9: 417-444.

——1989a. *From Foraging to Agriculture*. Philadelphia: University of Pennsylvania Press.

——1989b. Correlations between Reduction Strategies and Settlement Patterns. Pp. 139-155 in D. Henry and G. Odell (eds.), *Alternative Approaches to Lithic Analysis*. Washington: AP3A No. 1

——1994. *Prehistoric Cultural Ecology in Southern Jordan*. Science 265: 336-341.

——1995. *Prehistoric Cultural Ecology and Evolution*. New York: Plenum.

——1997. Cultural and Geologic Successions of Middle and Upper Paleolithic Deposits in the Jebel Qalkha Area of Southern Jordan. Pp. 69-76 in H.-G. Gebel *et al.* (eds.), *The Prehistory of Jordan II: Perspectives from 1997*. Berlin: Ex Oriente.

Hours, F. 1989. The Paleolithic Industries of Wadi Enoqiyyah, Azraq. Pp.403-450 in L. Copeland and F. Hours (eds.), *The Hammer on the Rock*. Oxford: BAR International Series S-540.

Jelinek, A. 1982. The Tabun Cave and Paleolithic Man in the Levant. *Science* 216: 1369-1375.

Jochim, M. 1981. *Strategies for Survival: Cultural Behavior in an Ecological Context*. New York: Academic Press.

Kerry, K. 1997. Jebel Humeima: a preliminary lithic analysis of an Ahmarian and Levantine Mousterian site in southwest Jordan. Pp. 125-136 in H.-G. Gebel *et al.* (eds.), *The Prehistory of Jordan II: Perspectives from 1997* . Berlin: Ex Oriente.

Kirkbride, D. 1958. A Kebaran Rockshelter in Wadi Madamagh, Near Petra, Jordan. *Journal of the Royal Anthropological Institute of Great Britain and Ireland* 63: 55-58.

——1966. Five Seasons at the Pre-Pottery Neolithic Village of Beidha in Jordan. *PEQ* 98: 8-72.

Kuhn, S. 1990. A Geometric Index of Reduction for Unifacial Stone Tools. *Journal of Archaeological Science* 17: 583-593.

——1991a. Unpacking Reduction: lithic raw material economy in the Mousterian of west-central Italy. *Journal of Anthropological Archaeology* 10: 76-106.

——1991b. New Problems, Old Glasses: methodological implications of an evolutionary paradigm for the study of paleolithic technologies. Pp. 243-257 in G. Clark (ed.), *Perspectives on the Past*. Philadelphia: University of Pennsylvania Press.

——1995. *Mousterian Lithic Technology: an Ecological Perspective*. Princeton: Princeton University Press.

Lee, R. and DeVore, I. (eds.) 1968. *Man the Hunter*. Chicago: Aldine.

Lindly, J. and Clark, G. 1987. A Preliminary Lithic Analysis of the Mousterian Site of Ain Difla (WHS 634) in the Wadi Ali, West-Central Jordan. *Proceedings of the Prehistoric Society* 53: 279-292.

MacDonald, B. 1982. The Wadi al-Hasa Survey 1979 and Previous Archaeological Work in Southern Jordan. *BASOR* 245: 35-52.

——(ed.) 1988. *The Wadi al-Hasa Archaeological Survey (1979-1983), West-Central Jordan*. Waterloo: Wilfrid Laurier University Press.

——(ed.) 1992. *The Southern Ghors and Northeast Arabah Archaeological Survey*. Sheffield: J. R. Collis Publications, Ltd.

MacDonald, B. *et al.* 1980. The Wadi al-Hasa Survey 1979: a preliminary report. *ADAJ* 24: 169-183.

——1982. The Wadi al-Hasa Survey 1981: a preliminary report. *ADAJ* 26: 117-131.

Macumber, P. and Edwards, P. 1997. Preliminary Results from the Acheulian site of Mashari'a 1, and a New Stratigraphic Framework for the Lower Palaeolithic of the East Jordan Valley. Pp. 23-44 in H.-G. Gebel *et al.* (eds.), *The Prehistory of Jordan II: Perspectives from 1997*. Berlin: Ex Oriente.

Marks, A. 1976. Ein Aqev: a late Levantine Upper Paleolithic site in the Nahal Aqev. Pp. 227-292 in A. Marks (ed.), *Prehistory and Paleoenvironments in the Central Negev, Israel, Vol. I*. Dallas: Southern Methodist University Press.

——1977. The Upper Paleolithic Sites of Boker Tachtit and Boker: a preliminary report. Pp. 61-80 in A. Marks (ed.),

Prehistory and Paleoenvironments in the Central Negev, Israel, Vol. II. Dallas: Southern Methodist University Press.
——1981. The Upper Paleolithic of the Negev. Pp. 343-352 in J. Cauvin and P. Sanlaville (eds.), *Préhistoire du Levant*. Paris: Editions du CNRS.
——1983.The Middle-to-Upper Paleolithic Transition in the Levant. *Advances in World Archaeology* 2: 51-98.
——(ed.) 1976, 1977, 1983. *Prehistory and Paleoenvironments in the Central Negev, Israel, Vols. I-III*. Dallas: Southern Methodist University.
Marks, A. and Ferring, C. R. 1988. The Early Upper Paleolithic of the Levant. Pp. 43-72 in J. Hoffecker and C. Wolf (eds.), *The Early Upper Paleolithic: Evidence from Europe and the Near East*. Oxford: BAR International Series No. 437.
Marks, A. and Freidel, D. 1977. Prehistoric Settlement Patterns in the Avdat/Aqev Area. Pp. 131-159 in A. Marks (ed.), *Prehistory and Paleoenvironments in the Central Negev, Israel, Vol. II*. Dallas: Southern Methodist University Press.
Mercier, N. *et al*. 1995. TL Dates of Burnt Flints from Jelinek's Excavations at Tabun and their Implications. *Journal of Archaeological Science* 22: 495-509.
Mortenson, P. 1972. Seasonal Camps and Early Villages in the Zagros. Pp. 293-297 in P. Ucko *et al*. (eds.), *Man, Settlement and Urbanism*. London: Duckworth.
Muheisen, M. 1985. l'Epipaléolithique dans le gisement de Kharaneh IV. *Paléorient* 11: 149-160.
——1988. Survey of Prehistoric Cave Sites in the northern Jordan Valley. Pp. 503-523 in A. Garrard and H.-G. Gebel (eds.), *The Prehistory of Jordan*. Oxford: BAR International Series S-396(ii).
——1992. Répartition des sites du Paléolithique Inférieur en Jordanie. Pp. 97-104 in *SHAJ* IV. Amman: Department of Antiquities.
Neeley, M. 1997. *Assigning Meaning to Lithic Variability in the Epipaleolithic of the Southern Levant*. Ph.D Dissertation, Department of Anthropology, Arizona State University. Ann Arbor: University Microfilms.
Neeley, M. and Barton, C. M. 1994. A New Approach to Interpreting Late Pleistocene Microlithic Industries in Southwest Asia. *Antiquity* 68: 275-288.
Neeley, M. *et al*. n.d. Investigations at Tor al-Tareeq: an Epipaleolithic site in the Wadi al-Hasa, Jordan. *Journal of Field Archaeology* 25.
Nelson, M. 1991. The study of Technological Organization. Pp. 57-100 in M. Schiffer (ed.), *Archaeological Method and Theory, Vol. 3*. Tucson: University of Arizona Press.
Neuville, R. 1934. La préhistoire de Palestine. *RB* 43: 237-259.
——1951. *Le Paléolithique et le Mésolithique du Désert de Judée*. Paris: Archives de l'Institut de Paléontologie Humaine, Mémoire No. 24.
Olszewski, D. 1997. From the Late Ahmarian to the Early Natufian: a summary of hunter-gatherer activities at Yutil al-Hasa, west-central Jordan. Pp. 171-182 in H.-G. Gebel *et al*. (eds.),*The Prehistory of Jordan II: Perspectives from 1997*. Berlin: Ex Oriente.
——n.d. The Palaeolithic of Jordan. In R. Adams *et al*. (eds.), *The Archaeology of Jordan*. Sheffield: University of Sheffield Press.
Olszewski, D. and Coinman, D. 1998. Settlement Patterning during the Late Pleistocene in the Wadi al-Hasa, West-Central Jordan. Pp. 177-204 in N. Coinman (ed.), *The Archaeology of the Wadi al-Hasa, West-Central Jordan, Vol. 1*. Tempe: ARP No. 50.
Olszewski, D. *et al*. 1990. WHS 784x (Yutil al-Hasa): a late Ahmarian site in the Wadi Hasa, west-central Jordan. *Proceedings of the Prehistoric Society* 56: 33-49.
——1994. The 1993 Excavations at Yutil al-Hasa (WHS 784), an Upper-Epipaleolithic Site in West-Central Jordan. *Paléorient* 20: 129-141.
——1998. The Eastern al-Hasa Late Pleistocene Project: a preliminary report on the 1997 Season. *ADAJ* 41: 1-21.
Parenti, F. *et al*. 1997. Early Acheulean Stone Tools and Fossil Faunas from the Dauqara Formation, Upper Zarqa Valley, Jordanian Plateau. Pp. 7-22 in H.-G. Gebel *et al*. (eds.), *The Prehistory of Jordan II: Perspectives from 1997*. Berlin: Ex Oriente.
Perrot, J. 1955. Le paléolithique d'el Quseir et de Masaraq en-Naaj (Palestine). Inventaire de la collection R. Neuville. *Bulletin de la Société Préhistorique Française* 52: 493-506.
Phillips, J. 1987a. Sinai during the Paleolithic: the early periods. Pp. 105-121 in A. Close (ed.), *The Prehistory of Arid North Africa*. Dallas: Southern Methodist University Press.
——1987b. Upper Paleolithic Hunter-Gatherers in the Wadi Feiran, Southern Sinai. Pp. 169-182 in O. Soffer (ed.), *The Pleistocene Old World: Regional Perspectives*. New York: Plenum.
——1988. The Upper Paleolithic of the Wadi Feiran, Southern Sinai. *Paléorient* 14: 183-200.
Potts, R. 1998. *Early Hominid Activities at Olduvai*. New York: Aldine de Gruyter.
Rollefson, G. 1980. The Palaeolithic Industries of Ain el-Assad (Lion's Spring) Near Azraq, Eastern Jordan. *ADAJ* 24: 129-143, 301-309.
——1981. The Late Acheulean Site of Fjaje, Wadi el-Bustan, Southern Jordan. *Paléorient* 7: 5-21.
——1982. Preliminary Report on the 1980 Excavations at Ain el-Assad. *ADAJ* 26: 5-35.
——1983. Two Seasons of Excavation at Ain el-Assad, Eastern Jordan, 1980-81. *BASOR* 252: 25-34.
Rollefson, G. *et al*. 1997. Ain Soda and Ain Qasiya: new late Pleistocene and early Holocene sites in the Azraq Shishan area, eastern Jordan. Pp. 45-58 in H.-G. Gebel *et al*. (eds.),*The Prehistory of Jordan II: Perspectives from 1997*. Berlin: Ex Oriente.
Ronen, A. 1976. The Upper Paleolithic in Northern Israel: Mt. Carmel and Galilee. Pp. 153-186 in *Deuxième Colloque sur la Terminologie de la Préhistoire du Proche-Orient*. Nice:

IXe Congrès International de la Union des Sciences Préhistorique et Protohistorique.

——1984. *Sefunim Prehistoric Sites, Mount Carmel, Israel.* Oxford: BAR International Series S-230 (i,ii).

Rosen, S. 1991. Paradigms and Politics in the Terminal Pleistocene Archaeology of the Levant. Pp. 307-321 in G. Clark (ed.), *Perspectives on the Past.* Philadelphia: University of Pennsylvania Press.

Schuldenrein, J. 1998. Geomorphology and Stratigraphy of Prehistoric Sites along the Wadi al-Hasa. Pp. 205-228 in N. Coinman (ed.), *The Archaeology of the Wadi al-Hasa, West-Central Jordan, Vol. 1.* Tempe: ARP No. 50.

Schuldenrein, J. and Clark, G. 1994. Landscape and Prehistoric Chronology of West-Central Jordan. *Geoarchaeology* 9: 31-55.

Stiner, M. 1994. *Honor Among Thieves: a Zooarchaeological Study of Neandertal Ecology.* Princeton: Princeton University Press.

Tchernov, E. 1990. The Age of the Ubeidiya Formation (Jordan Valley, Israel) and the Earliest Hominids in the Levant. Pp. 63-65 in O. Aurenche *et al.* (eds.), *Préhistoire du Levant: Processus des Changements Culturels.* Paris: Editions du CNRS.

Turville-Petre, F. 1932. Excavations in the Mugharet el-Kebara. *Journal of the Royal Anthropological Institute of Great Britain and Ireland* 62: 271-276.

Waechter, J. 1948. The Excavations at Ala Safat, Transjordan. *Journal of the Palestine Oriental Society* 21: 98-103.

Williams, J. 1997. Tor Aeid: an Upper Paleolithic occupation in southern Jordan. Pp. 137-148 in H.-G. Gebel *et al.* (eds.), *The Prehistory of Jordan II: Perspectives from 1997.* Berlin: Ex Oriente.