

THE CHRONOLOGY OF THE LEVANTINE MIDDLE PALAEOLITHIC

La cronología del Paleolítico Medio levantino

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RESUMEN: La cronología del Paleolítico Medio levantino está basada en conjuntos musterienses estratificados de diversas cuevas, así como en biozonas que vienen dadas por asociaciones de microfauna, y en una serie de dataciones por Termoluminiscencia (TL) y Electron Spin Resonance (ESR). Según las últimas revisiones, los tipos básicos de los conjuntos líticos procedentes de los niveles más significativos de la Cueva de Tabun, Tabun B, C y D, pertenecen a una única secuencia cultural regional. La fase inicial, también conocida como Abu-Sifiense (al sur) y Hummaliense (al norte), refleja variabilidad intrarregional. Las dos fases siguientes también se ven caracterizadas por fenómenos similares. Hay pocos restos humanos en la fase inicial, mientras que el conjunto de restos de *Homo sapiens* arcaicos pertenecientes al grupo de Skhul-Qafzeh corresponden a la segunda fase. Los restos humanos del oeste asiático que han sido reconocidos morfológicamente como neandertales por la mayoría de los investigadores fueron descubiertos en depósitos de la fase más tardía (Tabun B).

Palabras clave: Levante, Paleolítico Medio, Musteriense, TL, ESR.

ABSTRACT: The chronology of the Levantine Middle Paleolithic is based on stratified Mousterian assemblages in several cave sites, bio-zones of microfaunal associations, and series of Thermoluminescence (TL) and Electron Spin Resonance (ESR) dates. Current revisions indicate that the basic assemblage types, named after the main layers of Tabun cave, as Tabun B, C, and D-type form a common regional cultural sequence. The early phase, also known as Abu-Sifian (in the south) and Hummalian (in the north), reflects the intra-regional lithic variability. Similar phenomena characterize the later two phases. Human remains are rare in the early phase, while the suite of skeletal remains of archaic modern humans, known as the Skhul-Qafzeh group are dated to the middle phase. The western Asian Neandertals as morphologically defined by most scholars were uncovered in the deposits the later phase ("Tabun B-type").

Key words: Levant, Middle Paleolithic, Mousterian, TL, ESR.

1. Introduction

The eastern Mediterranean Levant is the region that lies from the Taurus-Zagros arc southward all the way to the tip of the Sinai Peninsula. It has wet winters and dry summers, and this climatic pattern was essentially the same during the Middle and Upper Pleistocene. Pluvial periods enjoyed higher precipitation than today while drier periods were more desertic in nature (Horowitz, 1979; Bar-Mathews *et al.*, 1997). The

coastal mountain and hilly ranges are comprised of limestone rocks (mainly of Triassic through Upper Cretaceous ages) and it is there that numerous karstic caves were inhabited during prehistoric times. Given the generally favorable climatic conditions, Levantine caves were occupied for long periods, and therefore became targets for systematic excavations. In several cave sites, a series of repeated field operations were conducted by more than one generation of archaeologists.

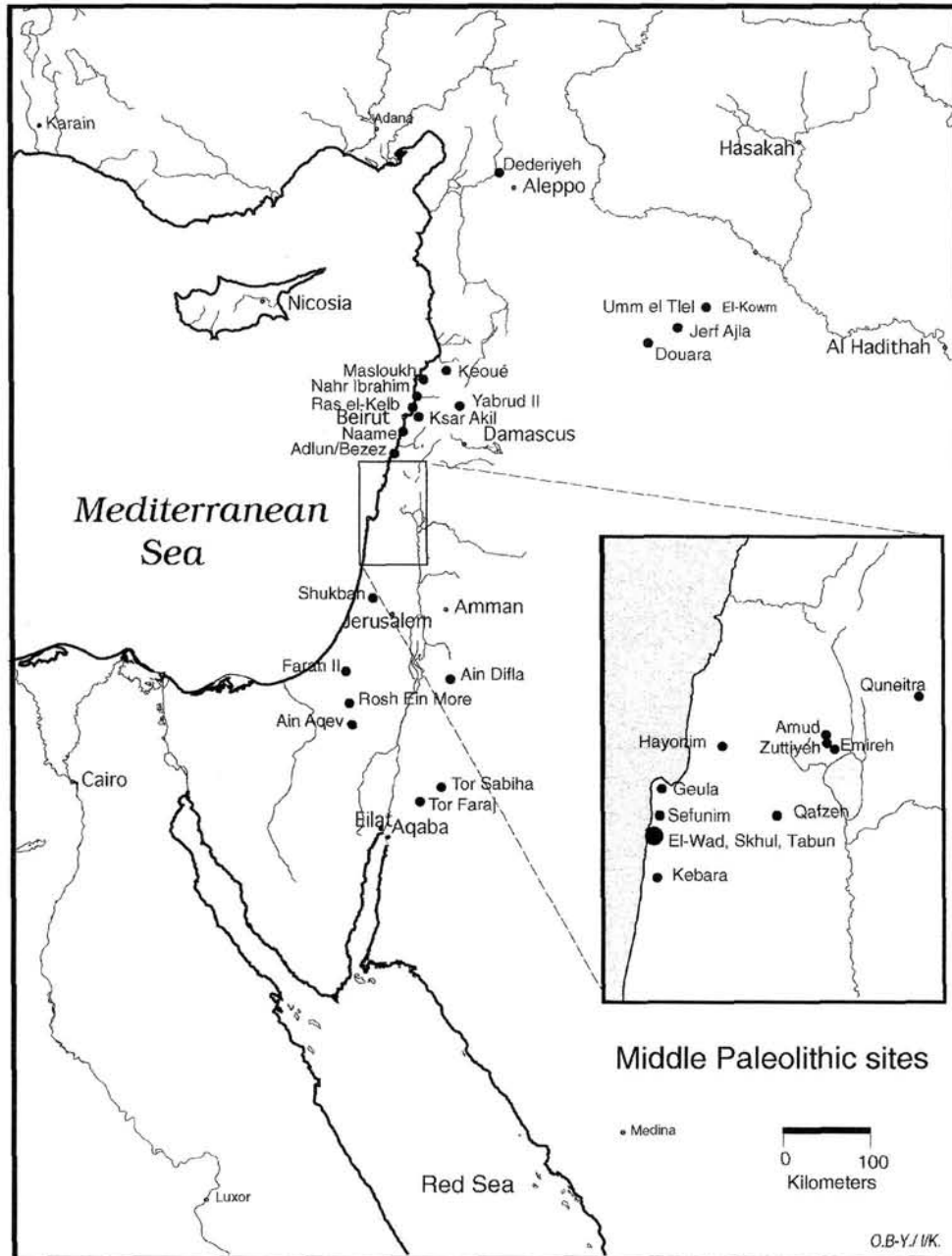


FIG. 1. A map of the Levant showing the location of Middle Palaeolithic sites mentioned in the text.

The Levantine human fossils have attracted attention since F. Turville-Petre first discovered a fragmented skull in Zuttiyeh cave in Wadi Amud in 1925. D. Garrod, T. McCown, R. Neuville and M. Stekelis subsequently considerably increased the sample size while digging in Tabun, Skhul and Qafzeh caves (Fig. 1). Since the 1960s additional renewed excavations in Qafzeh and

Kebara caves, as well as the new projects in Amud and Dederiyeh caves, uncovered additional fossils. The debates concerning these human relics were and are centered on the issue of whether they can be classified as members of one or two different populations. Categorized as two groups, several scholars consider the fossils to represent a few local Neanderthals, while other

fossils represent the descendents of Modern humans who originated in Africa. Adherents to a different interpretation prefer to view the entire collection of fossils as *one population* that displays wide range of morphological variability.

Finally, a specific aspect that is often argued in the context of potential evolutionary scenarios, is the dates of the fossils, who while living occupied a region at the African-Eurasian cross-road. In addition, their relationship to the different Levantine Mousterian industries is constantly re-examined. Given the ambiguities as will be described below, the palaeo-demographic interpretations are quite variable. Certain authors would like to see a long co-existence between the two populations in the order of 40-50.000 years. Others see a double replacement. First Neanderthals took over the Levant from some early populations and later Cro-Magnons replaced the local Neanderthals. Under every circumstance, cultural continuity cannot be demonstrated as will be shown below.

The current richness of molecular and nuclear genetic evidence points to sub-Saharan Africa as the origin of Modern humans. This population, whether or not defined as Cro-Magnons, dispersed at least in part through the Levant into Eurasia. Whether the new migrants encountered the Neanderthals already in the Near East (as expected by the holders of the more common morphological classification of the fossils) or only later in Europe, is yet an unresolved question. The current chronology, as presented below, if accepted, will indicate that the Neanderthals were latecomers into the Levant and probably the Zagros mountains (where they were found in Shanidar cave) and effectively, upon arrival, pushed the archaic Modern humans back south.

In the following pages I explore the current various proposals for dating the archaeological deposits in which the Levantine human fossils were incorporated. Only lately has direct dating of the fossils provided apparent dates although several chronological ambiguities continue to linger.

Figure 2 summarizes the currently available TL and ESR chronology (updated version from Bar-Yosef 1998), while taking into account additional dates and potential errors as expressed recently in several cautionary remarks (e.g., Schwarcz & Rink, 1998; Millard & Pike, 1999; Grün & Stringer, 2000).

It is important to remember that the relative chronology of the Middle Palaeolithic as defined on the basis of the lithic industries endures across the entire Levant. The Acheulo-Yabrudian entity, once considered an integral part of the Middle Palaeolithic (Jelinek, 1982a, b; Copeland & Hours, 1983), is seen today as the latest within the Lower Palaeolithic. The term Middle Palaeolithic in the Levant is therefore employed interchangeably with the term Mousterian.

2. The Mousterian Industries

Currently, the common terminology employed for subdividing the Levantine Mousterian is in direct reference to the stratigraphy of Tabun cave. This is not to say that all the phases and variants known today are present in this site. With every additional excavated and published site, the picture becomes richer in terms of technological and typological variability. However, in the absence of commonly accepted terms for prehistoric entities, the term "Tabun D-type", "Tabun C-type", and "Tabun B-type" are temporarily used in the literature. It was observed that the differences between these entities are expressed in the use of different *chaîne opératoire*, either one or a maximum of two.

The analysis of *chaîne opératoire* was adopted from the anthropology of technology (Lemonnier 1992; Pfaffenberger 1992) as archaeologists are interested in the ways in which a given technology was a social production or represented a human agent. Such an endeavor is difficult because we cannot observe the knappers while they work. We also wish to know the reasons for adopting one manufacturing technique of stone artifacts rather than another. We wonder if it was related to constraints imposed by the available raw material, its mechanical and physical properties as well as procurement energy expenditures. In addition, we need to realize that the artisan was limited by the knowledge (*savoir faire*) of knapping methods. Such variable constraints emerged not only from the nature of the given environment, the functional needs, and the knowledge of the producer, but also from the social system within which a particular *chaîne opératoire* was practiced. The latter issues, are rarely given

Isotope Stage	Ka B.P.	ENTITIES	TL and ESR based chronology	ESR Chronology in Tabun Cave	HOMINIDS Based on TL
3	38/36	Early Ahmarian		UPPER PALAEO LITHIC	<i>Ksar Akil</i> <i>Qafzeh UP</i>
	46/47	Emiran			
4	50	"Tabun B-type"	Quneitra Amud Dederiyeh Kebara Tor Sabiha Tabun B Tor Faraj	Layer B	<i>Dederiyeh</i> <i>Amud</i> <i>Kebara</i> <i>Tabun Woman?</i>
5			Qafzeh Skhul		
6	100	"Tabun C-type"	Tabun C Hayonim E	Layer D	<i>Tabun II (jaw)</i>
7	150		Ain Difla ? Ain Aqev ? Douara ? Yabrud I (1-10)? Rosh Ein Mor		
8	200	"Tabun D-type" & Hummalian	Tabun D	Layer F (Late Acheulian)	<i>fragments in Tabun E</i> <i>Zuttiyeh</i>
9	250	Acheulo-Yabrudian	Tabun E Yabrud I (11-25)		
10	300		Late Acheulian		
	350				

O.B-Y

FIG. 2. The chronological chart of the late Lower Palaeolithic and the Middle Palaeolithic of the Levant. Modified after Bar-Yosef, 1998.

a second thought (but see Goren-Inbar & Belfer Cohen, 1998; Hovers, 1998).

The basic definition and the descriptive language for the study of *chaîne opératoire*, aiming to adequately describe the phases in the operational sequence, was developed in recent years

(e.g., Boëda *et al.*, 1990; Geneste, 1990; Perlès, 1992; Pigeot, 1991; Meignen, 1995; Schlanger, 1996; Kerry & Henry, 2000). It encompasses a detailed description of the various stages of tool production and use: from the gathering of raw material nodules and testing them, to the shaping

of the core and systematic production of blanks, and finally to secondary modification of selected blanks, their use, and discard. The descriptive terminology is generally detailed for each of the main core reduction steps with additional terms that define the various methods. Through the use of this knowledge, the recently excavated assemblages were described, and the overall picture obtained for the Levantine Mousterian industries is given here:

1. "Tabun D type" is the earliest Middle Palaeolithic complex characterized by the production of elongated blanks, and short Levallois blanks, often of triangular shape. The lithic products demonstrate a strategy of blade production aimed at producing elongated, narrow and thick blades, with triangular or trapezoidal cross-sections. The elongated blanks are frequently retouched into points known as Abu-Sif points (Meignen, 1998a, b, 2000; Marks & Monigal, 1995). The cores are either uni- or bi-directional. The assemblages included in this category were recorded in Tabun D (or unit IX of Jelinek), Yabrud I, Hayonim lower E and F, Douara IV, and Abu-Sif. As fig. 2 shows this entity is dated by TL to ca. 260,000-180,000 (Mercier *et al.*, 1995a, b; Valladas *et al.*, 1998). Rosh Ein Mor, an open air site in the Negev with the same industry, was recently dated by U-series on ostrich eggshell to ca. 210,000 (Marks & Schwarcz, 1999: 189). The date of Nahal Aqev, a locality in the same area, from where a somewhat similar industry was reported, is yet unknown.

In the northern Levant the Hummalian industry seems to have been contemporary with the "Tabun D-type" industry". The difference between the two in the lithic production, is that the Hummalian was manufactured by only the laminar method as shown in Hummal Ia (Boëda 1995).

2. "Tabun C-type" assemblages are characterized by the dominance of oval-rectangular short blanks. The common production

of sub-oval and sub-quadrangular flakes, infrequently of large dimensions, was removed from Levallois cores through centripetal and/or bi-directional *chaîne opératoire*. Triangular points appear in small numbers and in definite horizons, such as in layer XV in Qafzeh (Meignen, 1995; Boutié, 1989; Hovers, 1997; Hovers & Ravch, 2000).

This type of industry was recorded in Qafzeh, Skhul, Naamé, Hayonim upper E, Tabun I 18-26 (layer C in Garrod's excavations), Skhul layer B, Ras el Kelb, as well as Ksar 'Akil XXVI (Marks & Volkman, 1986).

The currently available dates range from 92,000 through 170,000 with a majority indicating the time of OIS 5. The main exception is the open-air site of Quneitra where the lithic assemblage demonstrates particular traits (Goren-Inbar, 1990), and dated to $53,900 \pm 5,900$ by ESR (Ziaei *et al.*, 1990).

3. "Tabun B-type" is known from Kebara, Amud, Tor Faraj, and Tor Sabiha in southern Jordan. These assemblages are dominated by the production of sub-triangular short blanks, mainly flakes and points, generally detached from unidirectional convergent Levallois cores. There is a large range of variability within the morphologies of the sub-triangular products. In Kebara cave (units IX-X), Tor Faraj, and in Tabun I 1-17 (layer B in Garrod's excavations), the typical broad-based Levallois points with the classical *chapeau de gendarme*-striking platform are found. In the Kebara assemblages, these points often display the special 'Concorde' tilted profile when viewed from the side (Meignen, 1991, 1995). In Amud and Tor Sabiha, a somewhat different way of reducing the unidirectional convergent strategy resulted in narrower and more elongated triangular flakes called 'leaf shaped flakes' (Watanabe, 1968; Meignen, 1995, 1998a; Hovers, 1998; Henry, 1995).

Low frequencies of blades occur in the assemblages of "Tabun B-type", rarely reaching

up to 25% of the blanks (Kebara unit XII; Amud B1). Similar assemblages were uncovered in Bezez B (Meignen & Bar-Yosef, 1992a, b: 142-43 –*contra* Copeland, 1983, 1975), Sefunim (Ronen, 1984), layer H at Erq el Ahmar, possibly in Dederiyeh, and Ksar 'Akil XXVIII (Meignen, 1992 –*contra* Marks & Volkman, 1986).

In addition to the dominant unidirectional convergent core reduction, one finds the centripetal exploitation strategy, which increases in the upper Mousterian units (VII-VIII) of the Kebara sequence (Meignen & Bar-Yosef, 1991; Meignen, 1995). This tendency is clearer in Ksar 'Akil XXVII. However, the dominant trait of this late Mousterian industry is the manufacturing of narrow flakes by unidirectional convergent mode. Copeland (1975) and recently Meignen (personal communication) suggested that this industry could have been the technological forerunner of the bladey Initial Upper Palaeolithic assemblages at Ksar 'Akil, and possibly in other sites in the Levant. If supported by further evidence, this proposal would mean that the shift in knapping techniques toward the Upper Palaeolithic was first expressed in the Levant, in spite of the proposed alternative geographical core area (Bar-Yosef, 2000).

3. The Mousterian Chronology

The first chronologies for the Middle Palaeolithic were formulated on the basis of Quaternary palaeoclimatic research. From coastal and cave sediments, fluvial terraces and faunal assemblages various chrono-charts were constructed in the past (e.g., Farrand, 1979; Tchernov, 1981, 1994; Bar-Yosef & Vandermeersch, 1981), but it was only with the introduction of the radiometric techniques that we witnessed a breakthrough.

The excavations in Kebara cave (Bar-Yosef *et al.*, 1992) were the first to provide a series of TL dates. The Mousterian sequence of about 4.5 m thick suggested a range from 60 ± 3 Ka. in Unit XII to 48.3 ± 3.5 Ka. in Unit VI. This latter unit is overlain by another Mousterian unit (V) and covered by Upper Palaeolithic deposits (Bar-Yosef *et al.*, 1996). Most importantly the TL dates placed the Neanderthal burial at around

59.9 ± 3.5 Ka. ESR readings (on gazelle teeth from Unit X) suggested Early Uptake (EU) date of 60.0 ± 6 Ka. and a Linear Uptake (LU) date of 64 ± 4 Ka. Hence, both ESR and TL produced similar results.

Of great interest were the human fossil bearing layers at Qafzeh where the TL indicated an average age of 92.0 ± 5 ka (Valladas *et al.* 1988). Similarly ESR readings (averaged as 96 ± 13 Ka. (EU) and 115 ± 15 (LU)). Uranium series on the same samples simply affirmed the previous readings and suggested that ESR Early Uptake is probably more accurate than Linear Uptake.

The TL date from Skhul (Mercier *et al.*, 1993) supported the attribution of the Qafzeh-Skhul group of hominids to the Last Interglacial with an average age of 119 ± 18 Ka. The ESR dates ranged from 65-102 Ka. (Mc Dermott *et al.*, 1993).

Needless to stress that given the importance of the assemblages from Tabun cave, the dates from this site were awaited by all parties concerned. Unfortunately, as sometimes happens in scientific investigations, there are certain discrepancies between the ESR and the TL dates.

Based on museum collections of teeth from Garrod's excavations ESR dates from Tabun cave (Grün *et al.*, 1991; Grün & Stringer, 2000), averaged as follows: in layer B the EU readings gave 86 ± 11 while the LU 103 ± 18 Ka.; layer C produced EU 102 ± 17 and LU as 119 ± 11 Ka.; in layer D the EU was 122 ± 20 and the LU gave 166 ± 20 Ka. Not less important was the date for the top Acheulo-Yabrudian layer (Ea) which provided an EU date of 154 ± 34 Ka. and a LU date as 188 ± 31 Ka. (see Fig. 2). Recently published new calculations of ESR (Grün & Stringer, 2000), place the same layer at 208 Ka.

A later study of the TL dates from the excavations of Jelinek and thus without samples from layer B suggested a much longer chronology. Hence Tabun C (unit I) was dated to 171 ± 17 , Units II-V (C/D) to 212 ± 22 and 244 ± 28 , while layer D to 263 ± 27 ka.

It should be noted that the main difference is in dating is the onset of the earliest Mousterian ("Tabun D-type"). According to the ESR readings indicated that the Mousterian began around 200 Ka. while the TL dates suggest an earlier age around 270/250 Ka. The latter is

supported by the $^{230}\text{Th}/^{234}\text{U}$ date of >220 Ka. for the flowstone in Jamal cave (that lies a few meters away from Tabun) which covers an Acheulo-Yabrudian layer. The differences between the two sets of dates could have resulted from the higher concentration of uranium in the sediments attached to the teeth taken from the museum collections and underestimates of the amount of humidity in the deposits (Meignen *et al.*, 2000). Worth mentioning is that the TL age for Tabun D is now supported by TL dates from Hayonim cave, as well as the ESR readings from this site where a similar industry was reported (e.g., Valladas *et al.*, 1998; Schwarcz & Rink, 1998; Meignen, 1998a).

4. The Cultural Attribution of the Human Fossils

As mentioned above, the palaeo-anthropological interpretation of the Levantine fossil was complex beginning with the early 1930s (e.g., Bar-Yosef & Callander, 1999). The possible co-existence of two populations was already recognized by McCown and D. Garrod after digging in Skhul and Tabun caves. In the final publication McCown and Keith (1939) grouped the human remains from Mt. Carmel under the term *Paleanthropus palestinensis*. However, the variability among these hominids, and their array of modern morphological features, led a revised definition of the fossils from Skhul and Qafzeh as “proto-Cro-Magnons”, a distinction held with further discoveries in the latter site (Vandermeersch, 1981).

All contemporary scholars noticed that anatomically modern humans were the manufacturers of the Mousterian industries in the Levant. Indeed, in order to reconcile the morphological resemblance to ‘modern humans’ with their Mousterian stone artifacts, they were chronologically attributed to the period immediately prior to the Upper Palaeolithic around 50-40,000 years ago. The picture changed with the introduction of the radiometric techniques.

Fig. 2 exhibits the new chronology with the placement of the hominids in relation to sites and assemblages. The attribution of the woman from Tabun to the later Mousterian industry is

based on the re-analysis of the conceptual evolutionary framework of D. Garrod, T. D. McCown and A. Keith at the time of the discovery (Bar-Yosef & Callander, 1999). The woman from Tabun was considered as Neanderthal and thus she joins other similar discoveries such as Amud, Kebara and Dederiyeh caves as well as Shanidar in the Zagros (Solecki & Solecki, 1993). TL and ESR dates from Amud cave (Valladas *et al.*, 1999; Schwarcz & Rink, 1998) support the contention that the site, which contains a similar industry to Kebara, is also roughly contemporary. In addition, Tor Faraj and Tor Sabiha with the same general assemblages of the “Tabun B-type” were dated to the same time range. Hence, except for the ambiguities involved in the position and date of the Tabun woman, all human relics identified as Neanderthals were contemporary with the “Tabun B-type” industry.

The “Tabun C-type” hominids include those from Qafzeh, Skuhl, the Tabun C2 mandible, and skeleton from Dederiyeh. The TL dates would place Qafzeh and Skhul as mentioned above in the last Interglacial. The isolated jaw from Tabun C, known as C2, should belong to an older period by TL but would be of the same age as the other according to the ESR. At that point it should be worth mentioning that this jaw is seen as belonging to Modern humans by some (Rak, 1998; Quam & Smith, 1998) or attributed to the Neanderthals by others (Stefan & Trinkaus, 1998).

In sum, it appears that in spite of the chronological ambiguities, archaic human types related to Modern humans who migrated out of Africa at an unknown age –sometime between 300-100 Ka.– formed the early population of the Levant. The absence of human fossils from all “Tabun D-type” and Hummalian contexts excavated to date preclude further interpretations concerning what type of fossil should we expect. There is no obvious continuity between the populations as well as between the early Mousterian industries and those classified as “Tabun C and B-types”. Instead of co-existence it would be probably more appropriate to describe the prehistoric situation as determined by competition and conflicts.

5. Conclusions

The new radiometric chronology provided new meanings to old observations, including those made by Quaternary geologists. For example, the presence of the "Tabun C-type" industry above the *Strombus* shoreline in Lebanon now indicates an age during the Last Interglacial, or a time range from OIS 5 (ca. 130-75 Ka.). It facilitates revising and reviving the chronology of the Pleistocene shorelines, which would have impact on other assemblages recovered from these marine terraces.

Another implication would be for the chronology of the Acheulo-Yabrudian entity. Whether following the ESR shorter chronology or the TL longer one, the human skull from Zuttiyeh is now either dated to OIS 7 (250-200 Ka.) or to an earlier time within the Middle Pleistocene. In addition, the full sequence in Tabun cave, by the TL technique is much older than previously thought (Mercier *et al.*, 2000).

As for the Mousterian industries, questions concerning proposals to view a general cultural continuity, are now being raised (e.g., Bar-Yosef, 1998, 2000). The use of the Levallois concept in knapping modes could have been practiced, adopted and modified, by various populations. The continuity of the behavioral patterns as expressed in the material culture over tens of thousands of years should motivate us to search for the demographic and social explanations of these phenomena. Simply stressing the recorded technical variability within each of these prehistoric entities, without measuring and comparing its nature and degree to other phenomena in other regions or later periods, we remain at the level of basic observations, with no explanations. Summarizing the lithic records of the Middle Palaeolithic of the Levant, as done by some authors, and suggesting that all humans produced exactly the same stone tools hampers motivation for further research. There are definitely differences between the industries as mentioned above, but the richness in final, retouched products is probably less than in certain regions of Europe or Africa. Perhaps the differences in the lithic assemblages between these people were more subtle, and instead of looking for a positive

correlation between human morphological types and a particular industry, as done in the past, we should include in the analysis additional elements such as distances to raw material, differences between occupations (in spite of the difficulties to sort out the palimpsests in the caves), changes in hunting techniques and game preference, as well as potential routes of movement across the landscape. This variability that perhaps expressed the social conditions, different human agents, social structures, and adaptation to changing environments, discloses a richness not always obvious during raging debates regarding hominids and their dates.

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References

- AKAZAWA, T.; MUHESEN, S.; ISHIDA, H.; KONDO, O. y GRIGGO, C. (1999): "New discovery of a Neanderthal child burial from the Dederiyeh Cave in Syria", *Paléorient*, 25 (2), pp. 129-142.
- BAR-MATHEWS, M.; AYALON, A. y KAUFMAN, A. (1997): "Late Quaternary paleoclimate in the eastern Mediterranean region from stable isotope analysis of speleothems at Soreq Cave, Israel", *Quaternary Research*, 47, pp. 155-168.
- BAR-YOSEF, O. (1992): "The role of Western Asia in modern human origins", *Philosophical Transactions of the Royal Society, B* (London) 337, pp. 193-200.
- (1998): "The Chronology of the Middle Paleolithic of the Levant". En AKAZAWA, T.; AOKI, K. y BAR-YOSEF, O. (eds.): *Neandertals and Modern Humans in Western Asia*. New York: Plenum Press, pp. 39-56.
- (2000): "The Middle and Early Upper Paleolithic in Southwest Asia and Neighboring Regions". En BAR YOSEF, O. y PILBEAM, D. (eds.): *The*

- Geography of Neandertals and Modern Humans in Europe and the Greater Mediterranean*. Cambridge, MA: Peabody Museum, Harvard University, pp. 107-156.
- BAR-YOSEF, O.; ARNOLD, M.; BELFER-COHEN, A.; GOLDBERG, P.; HOUSLEY, R.; LAVILLE, H.; MEIGNEN, L.; MERCIER, N.; VOGEL, J. C. y VANDERMEERSCH, B. (1996): "The dating of the Upper Paleolithic layers in Kebara Cave, Mount Carmel", *Journal of Archaeological Science*, 23, pp. 297-306.
- BAR-YOSEF, O. y CALLANDER, J. (1999): "The Woman from Tabun: Garrod's Doubts in Historical Perspective", *Journal of Human Evolution*, 37 (6 December), pp. 879-885.
- BAR-YOSEF, O. y VANDERMEERSCH, B. (1981): "Notes concerning the possible age of the Mousterian Layers at Qafzeh Cave". En CAUVIN, J. y SANLAVILLE, P. (eds.): *Préhistoire du Levant*. Paris: CNRS, pp. 555-569.
- BAR-YOSEF, O.; VANDERMEERSCH, B.; ARENSBURG, B.; BELFER-COHEN, A.; GOLDBERG, P.; LAVILLE, H.; MEIGNEN, L.; RAK, Y.; SPETH, J. D.; TCHERNOV, E.; TILLIER, A. M. y WEINER, S. (1992): "The excavations in Kebara Cave, Mount Carmel", *Current Anthropology*, 33 (5), pp. 497-550.
- BOËDA, E. (1995): "Levallois: A volumetric construction, methods, a technique". En DIBBLE, H. L. y BAR-YOSEF, O. (eds.): *The Definition and Interpretation of Levallois Technology*. Madison: Prehistory Press, pp. 41-68.
- BOËDA, E.; GENESTE, J. M. y MEIGNEN, L. (1990): "Identification de chaînes opératoires lithiques du Paléolithique ancien et moyen", *Paléo*, 2, pp. 43-80.
- BOUTIÉ, P. (1989): "Étude technologique de l'industrie Moustérienne de la grotte de Qafzeh" (près de Nazareth, Israël). En BAR-YOSEF, O. y VANDERMEERSCH, B. (eds.): *Investigations in South Levantine Prehistory: Préhistoire du Sud-Levant*. Oxford: BAR International Series 497, pp. 213-229.
- COPELAND, L. (1975): "The Middle and Upper Palaeolithic of Lebanon and Syria in the light of recent research". En WENDORF, F. y MARKS, A. E. (eds.): *Problems in Prehistory: North Africa and the Levant*. Dallas: SMU Press, pp. 317-350.
- (1983): "The Palaeolithic industries at Adlun". En ROE, D. (ed.): *Adlun in the Stone Age: The Excavations of D. A. E. Garrod in the Lebanon, 1958-1963*. Oxford: BAR International Series 159 (i-ii), pp. 89-366.
- (1998a): "The Lower Paleolithic of Jordan". En HENRY, D. O. (ed.): *The Prehistoric Archaeology of Jordan*. Oxford: Archaeopress, pp. 5-22.
- (1998b): "The Middle Palaeolithic Flint Industry of Ras el-Kelb". En COPELAND, L. y MOLONEY, N. (eds.): *The Mousterian Site of Ras el-Kelb, Lebanon*. Oxford: Archaeopress, pp. 73-175.
- COPELAND, L. y HOURS, F. (1983): "Le Yabroudien d'El Kowm (Syrie) et sa place dans le Paléolithique du Levant", *Paléorient*, 9, pp. 21-37.
- FARRAND, W. R. (1979): "Chronology and paleoenvironment of Levantine prehistoric sites as seen from sediment studies", *Journal of Archaeological Science*, 6, pp. 369-392.
- FLEISCH, S. J. (1970): "Les habitats du Paléolithique moyen à Naamé, (Liban)", *Bulletin du Musée de Beyrouth*, 23, pp. 25-98.
- GENESTE, J. M. (1990): "Développement des systèmes de production lithique au cours du paléolithique moyen en Aquitaine septentrionale". En C. FARIZY (ed.): *Paleolithique moyen récent et Paleolithique supérieur ancien en Europe: Ruptures et transitions*, vol. 3. Musée de Préhistoire d'Ile-de-France. Nemours: APRAIF, pp. 203-213.
- GOREN-INBAR, N. (1990): *Quneitra: A Mousterian Site on the Golan Heights*. Jerusalem: Hebrew University.
- GOREN-INBAR, N. y BELFER-COHEN, A. (1998): "The Technological Abilities of the Levantine Mousterians: Cultural and Mental Capacities". En AKAZAWA, T., AOKI, K. y BAR-YOSEF, O. (eds.): *Neandertals and Modern Humans in Western Asia*. New York: Plenum Press, pp. 205-221.
- GRÜN, R.; SCHWARCZ, H. P. y STRINGER, C. B. (1991): "ESR dating of teeth from Garrod's Tabun cave collection", *Journal of Human Evolution*, 20 (3), pp. 231-248.
- GRÜN, R. y STRINGER, C. B. (2000): "Tabun revisited: revised ESR chronology and new ESR and U-series analyses of dental material from Tabun C1", *Journal of Human Evolution*, 39, pp. 601-612.
- HARPENDING, H.; BATZER, M.; GURVEN, M.; JORDE, L.; ROGERS, A. y SHERRY, S. (1998): "Genetic traces of ancient demography", *Proceedings of the National Academy of Science USA*, 95, pp. 1961-1967.
- HENRY, D. O. (1995): *Prehistoric Cultural Ecology and Evolution*. New York: Plenum Press.
- HOROWITZ, A. (1979): *The Quaternary of Israel*. New York: Academic Press.
- HOVERS, E. (1997): *Variability of Levantine Mousterian Assemblages and Settlement Patterns: Implications for the Development of Human Behavior*. Ph. D. dissertation. Hebrew University: Jerusalem.
- (1998): "The Lithic Assemblages of Amud Cave: Implications for Understanding the End of the Mousterian in the Levant". En AKAZAWA, T.;

- AOKI, K. y BAR-YOSEF, O. (eds.): *Neandertals and Modern Humans in Western Asia*. New York: Plenum Press, pp. 143-163.
- HOVERS, E.; RAK, Y.; LAVI R.; y KIMBEL, W. H. (1995): "Hominid remains from Amud Cave in the context of the Levantine Middle Paleolithic", *Paléorient*, 21 (2), pp. 47-62.
- HOVERS, E. y RAVEH, A. (2000): "The Use of a Multivariate Graphic Display Technique as an Exploratory Tool in the Analysis of Inter-Assemblage Lithic Variability: a Case Study from Qafzeh Cave, Israel", *Journal of Archaeological Science*, 27, pp. 1023-1038.
- HOWELL, F. C. (1951): "The place of Neanderthal Man in human evolution", *American Journal of Physical Anthropology*, 9, pp. 379-416.
- (1958): "Upper Pleistocene men of southwest Asian Mousterian". En KOENIGSWALD, G. H. R. von (ed.): *Hundert Jahre Neanderthaler*. Utrecht: Kemik en zoon, pp. 185-198.
- JELINEK, A. J. (1982a): "The Middle Palaeolithic in the southern Levant with comments on the appearance of modern *Homo sapiens*". En RONEN, A. (ed.): *The Transition from Lower to Middle Palaeolithic and the Origin of Modern Man*. Oxford: BAR International Series 151, pp. 57-104.
- (1982b): "The Tabun Cave and Paleolithic Man in the Levant", *Science*, 216, pp. 1369-1375.
- KERRY, K. W. y HENRY, D. O. (2000): "Conceptual domains, competence, and *Chaîne Opératoire* in the Levantine Mousterian". En STAGER, L. E. GREENE, J. A. y COOGAN, M. (eds.): *The Archaeology of Jordan and Beyond: Essays in Honor of James A. Sauer*. Eisenbrauns, Winona Lake, Indiana. D., pp. 238-254.
- LEMONNIER, P. (1992): *Elements for an Anthropology of Technology*. Ann Arbor: University of Michigan.
- MARKS, A. E. y MONIGAL, K. (1995): "Modeling the production of elongated blanks from the Early Levantine Mousterian at Rosh Ein Mor". En DIBBLE, H. y BAR-YOSEF, O. (eds.): *The Definition and Interpretation of Levallois Technology*. Madison: Prehistory Press, pp. 267-278.
- MARKS, A. E. y SCHWARCZ, H. P. (1999): *Dating the Middle Paleolithic of the Central Negev: an Ongoing Effort*. Presented at Paper presented at 64th Annual Meeting, Society for American Archaeology, Baltimore.
- MARKS, A. E. y VOLKMAN, P. (1986): "The Mousterian of Ksar Akil", *Paléorient*, 12, pp. 5-20.
- MC DERMOTT, F.; GRÜN, R.; STRINGER, C. B. y HAWKESWORTH, C. J. (1993): "Mass spectrometric U-series dates for Israeli Neanderthal/early modern hominid sites", *Nature*, 363, pp. 252-255.
- MC COWN, T. D. y KEITH, A. (1939): *The Stone Age of Mount Carmel II: The fossil human remains from the Levallois-Mousterian*. Oxford: Clarendon Press.
- MEIGNEN, L. (1995): "Levallois lithic production systems in the Middle Paleolithic of the Near East: The case of the unidirectional method". En DIBBLE, H. y BAR-YOSEF, O. (eds.): *The Definition and Interpretation of Levallois Technology*. Madison: Prehistory Press, pp. 361-380.
- (1998a): "Le Paléolithique moyen au Levant sud et central: que nous apprennent les données récentes?". En OTTE, M. (ed.): *Préhistoire d'Anatolie: Genèse de deux mondes. Actes du colloque international. Liège, 28 avril - 3 mai 1997*. Liège: ERAUL 85, pp. 685-708.
- (1998b): "Hayonim Cave Lithic Assemblages in the Context of the Near Eastern Middle Paleolithic: A Preliminary Report". En AKAZAWA, T.; AOKI, K. y BAR-YOSEF, O. (eds.): *Neandertals and Modern Humans in Western Asia*. New York: Plenum Press, pp. 165-180.
- (2000): "Early Middle Palaeolithic Blade Technology in Southwestern Asia", *Acta Anthropologica Sinica*, 19, pp. 158-168.
- MEIGNEN, L. y BAR-YOSEF, O. (1991): "Les outillages lithiques moustériens de Kébara". En O. BAR-YOSEF y B. VANDERMEERSCH (eds.): *Le Squelette Moustérien de Kebara 2, Mt. Carmel, Israël*. Paris: CNRS, pp. 49-76.
- MEIGNEN, L. y BAR-YOSEF, O. (1992): "Middle Paleolithic variability in Kebara Cave, Israel". En AKAZAWA, T.; AOKI, K. y KIMURA, T. (eds.): *The Evolution and Dispersal of Modern Humans in Asia*. Tokyo: Hokusensha, pp. 129-148.
- MEIGNEN, L.; BAR-YOSEF, O.; MERCIER, N.; VALLADAS, H.; GOLDBERG, P. y VANDERMEERSCH, B. (2001): "Apport des datations au problème de l'origine des Hommes modernes au Proche-Orient". En BARRANDON, J. N.; GUIBERT, P. y MICHEL, V. (eds.): *In Datation. XXI^e Rencontres Intern. d'archéologie et d'histoire d'Antibes*. Antibes: Association pour la Promotion et la Diffusion des Connaissances Archéologiques (APDCA), pp. 295-313.
- MERCIER, N.; VALLADAS, H.; FROGET, L.; JORON, J. L. y RONEN, A. (2000): "Datation par la thermoluminescence de la base du gisement paléolithique de Tabun (Mont Carmel, Israël)", *Comptes Rendus Academie des Sciences*, 330, pp. 731-738.
- MERCIER, N.; VALLADAS, H. y VALLADAS, G. (1995): "Flint thermoluminescence dates from the CFR Laboratory at Gif: Contributions to the study of the chronology of the Middle Palaeolithic", *Quaternary Science Reviews* 14 (4), pp. 351-364.

- MERCIER, N.; VALLADAS, H.; VALLADAS, G.; REYSS, J. L.; JELINEK, A.; MEIGNEN, L. y JORON, J. L. (1995): "TL dates of burnt flints from Jelinek's excavations at Tabun and their implications", *Journal of Archaeological Science*, 22 (4), pp. 495-510.
- MILLARD, A. R. y PIKE, A. W. G. (1999): "Uranium-series dating of the Tabun Neanderthal: a cautionary note", *Journal of Human Evolution*, 36, pp. 581-586.
- NEUVILLE, R. (1951): *Le Paléolithique et le Mésolithique de Désert de Judée*. Paris: Masson et Cie, Éditeurs.
- PERLÈS, C. (1992): *In search of lithic strategies: A cognitive approach to prehistoric chipped stone assemblages in Representations in Archaeology*. En GARDIN, J. C. y PEEBLES, C. S. (eds.): Bloomington: Indiana University Press, pp. 223-247.
- PIGEOT, N. (1991): "Reflexions sur l'histoire technique de l'homme: De l'évolution cognitive a l'évolution culturelle", *Paleo*, 3, pp. 167-200.
- PFaffenBERGER, B. (1992): "Social anthropology of technology", *Annual Review of Anthropology*, 21, pp. 491-516.
- QUAM, R. M. y SMITH, F. H. (1998): "A Reassessment of the Tabun C2 Mandible". En AKAZAWA, T.; AOKI, K. y BAR-YOSEF, O. (eds.): *Neandertals and Modern Humans in Western Asia*. New York: Plenum Press, pp. 405-421.
- RAK, Y. (1998): "Does any Mousterian Cave Present Evidence of Two Hominid Species?". En AKAZAWA, T.; AOKI, K. y BAR-YOSEF, O. (eds.): *Neandertals and Modern Humans in Western Asia*. New York: Plenum Press, pp. 353-366.
- RONEN, A. (1984): *Sefunim Prehistoric Sites, Mount Carmel, Israel*. Oxford: British Archaeological Reports International Series 230.
- SCHLANGER, N. (1996): "Understanding Levallois: Lithic technology and cognitive archaeology", *Cambridge Archaeological Journal*, 6 (2), pp. 231-254.
- SCHWARCZ, H. P.; BUHAY, W. M.; GRÜN, R.; VALLADAS, H.; TCHERNOV, E. BAR-YOSEF, O. y VANDERMEERSCH, B. (1989): "ESR dating of the Neanderthal site, Kebara Cave, Israel", *Journal of Archaeological Science*, 16, pp. 653-659.
- SCHWARCZ, H. P.; GRÜN, R.; VANDERMEERSCH, B.; BAR-YOSEF, O. VALLADAS, H. y TCHERNOV, E. (1988): "ESR dates for the hominid burial site of Qafzeh in Israel", *Journal of Human Evolution*, 17, pp. 733-737.
- (1988): "ESR dates for the hominid burial site of Qafzeh in Israel", *Journal of Human Evolution*, 17, pp. 33-737.
- SCHWARCZ, H. P. y RINK, W. J. (1998): "Progress in ESR and U-Series Chronology of the Levantine Paleolithic", en AKAZAWA, T.; AOKI, K. y BAR-YOSEF, O. (eds.): *Neandertals and Modern Humans in Western Asia*. New York: Plenum Press, pp. 57-67.
- SOLECKI, R. S. y SOLECKI, R. L. (1993): "The pointed tools from the Mousterian occupations of Shanidar Cave, Northern Iraq". En OLSZEWSKI, D. I. y DIBBLE, H. L. *The Paleolithic Prehistory of the Zagros-Taurus*. Philadelphia, The University Museum, University of Pennsylvania, pp. 119-146.
- STEFAN, V. H. y TRINKAUS, E. (1998): "Discrete trait and morphometric affinities of the Tabun 2 mandible (hu970210)", *Journal of Human Evolution*, 34 (5), pp. 443-468.
- TCHERNOV, E. (1981): "The biostratigraphy of the Levant". En CAUVIN, J. y SANLAVILLE, P. (eds.): *Préhistoire du Levant. Chronologie et Organisation de l'Espace depuis les Origines jusqu'au VI^e Millénaire*. Paris: CNRS, pp. 67-97.
- (1994): "New comments on the biostratigraphy of the Middle and Upper Pleistocene of the southern Levant". En BAR-YOSEF, O. y KRA, R. S. (eds.): *Late Quaternary Chronology and Paleoclimates of the Eastern Mediterranean*. Tucson: Radiocarbon and the Peabody Museum, pp. 333-350.
- VALLADAS, H.; REYSS, J. L.; JORON, J. L.; VALLADAS, G.; BAR-YOSEF, O. y VANDERMEERSCH, B. (1988): "Thermoluminescence dating of Mousterian 'Proto-Cro-Magnon' remains from Israel and the origin of modern man", *Nature*, 331, pp. 614-615.
- VALLADAS, H.; JORON, J. L.; VALLADAS, G.; ARENSBURG, B.; BAR-YOSEF, O.; BELFER-COHEN, A.; GOLDBERG, P.; LAVILLE, H.; MEIGNEN, L.; RAK, Y.; TCHERNOV, E.; TILLIER, A. M. y VANDERMEERSCH, B. (1987): "Thermoluminescence dates for the Neanderthal burial site at Kebara in Israel", *Nature*, 330, pp. 159-160.
- VALLADAS, H.; MERCIER, N.; JORON, J. L. y REYSS, J. L. (1998): "GIF Laboratory Dates for Middle Paleolithic Levant". En AKAZAWA, T.; AOKI, K. y BAR-YOSEF, O. (eds.): *Neandertals and Modern Humans in Western Asia*. New York: Plenum Press, pp. 69-75.
- VALLADAS, H.; MERCIER, N.; HOVERS, E.; FROGET, L.; JORON, J. L.; KIMBEL, W. H. y RAK, Y. (1999): "TL Dates for the Neanderthal Site of the Amud Cave, Israel", *Journal of Archaeological Science*, 26 (3), pp. 259-268.
- VALLADAS, H.; MERCIER, N.; JORON, J. L. y REYSS, J. L. (1998): "GIF Laboratory Dates for Middle Paleolithic Levant". En AKAZAWA, T.; AOKI, K. y BAR-YOSEF, O. (eds.): *Neandertals and Modern Humans in Western Asia*. New York: Plenum Press, pp. 69-75.

- VANDERMEERSCH, B. (1981): *Les Hommes Fossiles de Qafzeh* (Israel). Paris: CNRS.
- WATANABE, H. (1968): "Flake production in a transitional industry from the Amud Cave, a statistical approach to Paleolithic typology". En *La Préhistoire: Problèmes et Tendances*. F. Bordes. Paris: CNRS, pp. 499-509.
- ZIAEI, M., SCHWARCZ, H. P., HALL, C. M. y GRÜN, R. (1990): "Radiometric dating of the Mousterian site at Quneitra, Quneitra: a Mousterian Site on the Golan Heights". GOREN-INBAR, N. (ed.): *QEDEM*, Monographs of the Institute of Archaeology 31. Jerusalem: Hebrew University, pp. 232-235.