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BIOCHRONOLOGY OF THE MIDDLE PALAEOLITHIC AND DISPERSAL EVENTS OF HOMINIDS IN THE LEVANT

by

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A. The Problem

The emergence of anatomically modern humans in the Middle Palaeolithic of the Levant and its bearing on the later phases of human evolution has been for a long time a controversal issue. Sufficient anthropological evidences have been accumulated during the last years to clearly indicate that two types of humans alternatively occupied the south-west Asian terrain during the first part of the Upper Pleistocene: an archaic type of modern *Homo sapiens* and the so called "advanced Neanderthals". This controversy is expressed at present mainly by two conflicting interpretations. One maintains that a gradual phylogenetic transformation from Neanderthal forms into modern Man took place around 40-50.000 years ago. This view is mainly held by WOLPOFF (1981) and JELINEK (1981, 1982) who argued that there are sufficient evidences to support the idea of unilinear cultural and physical continuity from a Neanderthaloid stage to anatomically modern *Homo sapiens* ; it is sometimes known as the continuity model. JELINEK (1982) more specifically notified that the chronological ordering of the various Levantine sites, as based on the Tabun (Mt. Carmel) sequence (width/ thickness ratio of unretouched flakes), suggests that the Neanderthals of Tabun and Amud (Galilee) are earlier than the more modern (= progressive) hominids of Skhul (Mt. Carmel) and Qafzeh (Galilee, northern Israel). TRINKAUS (1983), on the basis of the lithic similarity with Skhul, has also supported a later date for the hominids recovered from Qafzeh and proposed a "somewhat less than 50.000 years". He questioned all other biostratigraphic and sedimentological evidences which advocated a much earlier date for the Mousterian complex of Qafzeh.

The other hypothesis regards the Neanderthaloid stage as a specialized side-branch of the more generalized archaic *Homo sapiens* (HOWELL, 1959; COON, 1962; HOWELLS, 1976; RAK, 1986; BAR-YOSEF, in press), which by way of southern dispersal from northern homelands, found his way in later stages of the Mousterian, some 70,000 years ago, to the Levant. This event may be well correlated with Oxygen Isotope Stage 4, associated in Europe by significant environmental and biotic changes.

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While Neanderthals were already known in western Europe during Emiliani Stage 6 (Riss III in French terminology), there is at least one record of an archaic type of *Homo sapiens* from the Acheulo-Yabrudian (or the Mugharan Tradition) in the deposits of el-Zuttiyeh, to which GISSIS and BAR-YOSEF (1974) attributed roughly a Stage 5 age. SCHWARCZ *et al.* (1980) dated the deposits as 148.000 to 85.000 years. It is, hence, generally accepted that the appearance of Neanderthals in south-west Asia was very much retarded. The dominance of Neanderthals in this region was a temporary episode and they were to be soon replaced by a fully modern *Homo sapiens*, some 40.000 years ago.

The dispute over the right order of the phylogenetic events of hominids in the Levant stems from the unclear sequence of the fossil record. A population of hominid remains was uncovered by VANDERMEERSCH (1981) from the Mousterian deposits of Qafzeh (Galilee). From later stages of the Mousterian (Tabun D and C, and Amud B), typical Neanderthals were recovered, while the population of hominids from the latest Mousterian stage of Skhul (40-50.000 B.P.) is generally accepted as related to a more "progressive" type of humans. Since the population of Qafzeh was morphologically assigned to a modern type of *Homo sapiens* (BAR-YOSEF and VANDERMEERSCH, 1981; VANDERMEERSCH, 1981; BAR-YOSEF, in press), it became obvious that the dating of these deposits is critical to solve this argument. If the Mousterian deposit of Qafzeh is late, it will well agree with the notion that the transformation of Neanderthals to modern *Homo sapiens* was indeed gradual and fits its cultural elaboration and typological diversity as seen by Jelinek along the sequence of Tabun of Mt. Carmel. However, the acceptance of Qafzeh's hominid burials as of an early Mousterian period will support the other scenario visioning the Neanderthals in the Levant as a late Mousterian dispersal event of a European specialized race which temporarily replaced the indigenous populations of archaic *Homo s. sapiens*. Moreover, it will support the idea that Sapienoids and Neanderthaloids were contemporaneous, parapatric in distribution and their lithic industries were not necessarily unilinear.

Little agreement concerning the chronological interpretations of the available geomorphological and faunal data prevented any established understanding of the right sequence of the Mousterian events (BAR-YOSEF, in press). Thus the efforts for a reliable chronology of the Levantine Middle Palaeolithic became inseparable from the efforts to understand the evolution of modern humans. It is especially the scarcity of pre-C^{14} period in the Middle East which hampers sound long-range correlations and enforced us the use of relative dating methods. In this domain the faunal spectra of micromammals are used to build up a sequence in which late Acheulian, Acheulo-Yabrudian and Mousterian sites are ordered according to faunal events.

When dealing with the southern Levant (for definition of area see BUTZER, 1978), we have to consider that the magnitude of environmental changes were not steep enough, as in northern latitudes, to cause a large scale biotic turnover. The large mammals of this province can only scarcely be used for biostratigraphic correlations. It is mostly the micromammals which have shown a more dynamic changes and therefore may be more efficiently used for a comparative biochronology.

A long cultural Mousterian sequence has been revealed in the Mediterranean zone of the southern Levant. None of these Mousterian sites, however, contained a continuous undisturbed depositional and/or cultural sequence; small to large hiatuses in the stratigraphy or erosional gaps always exist. Therefore cultural and biotic correlations and temporal relationships between the sites is difficult. In some of the sites like Kebara in Mount Carmel and Hayonim in western Galilee, the base of the Middle Palaeolithic has not yet been unearthed.

Beside temporal relationships of the successive geological and cultural events and the evolution of hominid types in the eastern Mediterranean, there are plenty of additional problems which were not yet resolved. A complete and well determined faunal list for all the Mousterian sites is not yet available. The faunal succession and its biochronology, the sequence of palaeoenvironmental changes in relation with the successive climatic changes, as well as other environmental factors, are still in question. A palaeoecological reconstruction of the Mousterian period in this region was never thoroughly attempted, or if done, it has been based on scanty fossil material. The study of how animals were integrated into the techno-environmental systems of Mousterian societies and the scavenging strategies of these human communities are still enigmatic.

A more complete knowledge of the Mousterian palaeocommunities, the biochronology and the development of human-animal interactions will be made possible only when the faunal remains of older excavated sites, like Tabun, will be revised, older Middle Palaeolithic sequences will be recovered from eastern Mediterranean sites like Hayonim (Galilee) and Kebara (Mt. Carmel), and analysis of the faunas of more recently excavated sites, like Qafzeh (Galilee), will be brought to completion.

B. Methods

Our main sources of information concerning the fossil faunas of Acheulo-Yabrudian and Middle Palaeolithic cultural sequences are due to the efforts of the following scholars: D.M.A. BATE, who first analysed the faunal remains of most of he British excavations in Palestine during the first half of this century, mainly those published in 1927 (Mugharet-el-Zuttiyeh, eastern Galilee) and in 1937, 1937a, 1942, and 1943 for Mt. Carmel caves. The poor recovery techniques, especially where preservation was bad, as in layers F and G of Tabun, affected the sample size, in particular of micromammals, and obliterated the presence of rare species. G. HAAS contributed to our basic knowledge during the next 30 years, but of special importance is his description of the microfauna of Oumm-Qatafa (1951).R. VAUFREY (1951) has published the fauna from Neuville's excavations in the Judean Desert. In 1961 D.A. HOOIJER published the fauna of Ksar-akil (Lebanon) and in 1965 B. KURTEN published a detailed study on the Pleistocene carnivores from Israel. Other contributions are: J. BOUCHUD (1974) for Qafzeh, S. DAVIS (1977) for Kebara, J. HELLER (1970) for the cave of Geula, SAXON (1974) for Turville-Petre's excavations in collections from Kebara, A. GARRARD (1982) for Wadi el-Mughara caves and E. TCHERNOV (1968, 1979, 1981) for different sites, and in 1984, for Sefunim. Older excavations of Hayonim cave and recent excavations of the deeply stratified cave site of Kebara, carried out by the Franco-Israeli expedition, have yielded a long sequence of Middle and Upper Palaeolithic accumulations of faunal remains and cultural technologies. Analysis of the fauna upon completion may fill in some gaps in the biochronology of the eastern Mediterranean Middle Palaeolithic. The updated information on the mammalian assemblages which will be represented here is not final, but already sufficient to draw a general outline of the sequence of different mammalian communities from Late Acheulian to Upper Paleolithic.

Although the formation of the eastern Mediterranean caves and the depositional filling may be complex, the Mousterian sites have basically undergone through the same generalized stages of evolution. In all of them the microvertebrate component (mainly the micromammals, the passeriform birds, some of the smaller species of reptiles, amphibians, as well as most of the terrestrial gastropods) was essentially of non-anthropogenic deposition. The osseous debris, which includes the larger vertebrates, were deposited in cave sites in a variety of ways, but mainly by humans. It seems that the distribution of the macromammalian component is by and large not natural while the temporal and spatial distribution of the microfaunas may be simply correlated with the roosting place of birds of prey, mainly strigiforms.

All the small mammals dealt with in this study were most probably deposited by birds of prey, mainly owls. Recent analyses of pellets from various caves in Israel revealed (TCHERNOV, 1984a) that at present all small birds and mammals in the vicinity of a given site sooner or later fall a prey to owl's claws, most commonly to the barn owl (*Tyto alba's*). As an extremely opportunistic predator the composition of *Tyto albus* pellets may faithfully reflect the natural distribution of small animals around the site. Assuming that its predatory behavior did not change during the Pleistocene, preferences for preying in certain habitats and/or species are constant. Hence the biased proportions of species represented in a certain layer are also constant. Once a species becomes more abundant in the ecosystem, its representation in the pellets will proportionally increase. The representation of small vertebrates in cave sediments may well reflect the community structure in the surrounding of the site, and hence a tool for estimating the composition and the relative abundance of fossil small mammals in the palaeocommunities.

Grosso modo the larger mammals of the levantine province can only scarcely be efficiently used for biostratigraphic correlations. It is mostly the rodent group which has shown much more dynamic turnovers in the Middle East, and hence has a more rigorous biostratigraphic usage. It is just because of this relative constancy of the mammalian communities in these latitudes that each faunal change which eventually did occur in the past is of great biostratigraphic importance and usually designate a significant event.

The dynamics of immigration and exclusion of species during the late Middle Pleistocene and the first half of the Upper Pleistocene will be now discussed.

C. The Sites Involved

Oumm-Qatafa is situated in the Judean Desert not far south of Jerusalem, and was excavated by NEUVILLE (1951), who described a long sequence of prehistoric cultures from this site. Faunal remains were found in layer F (Tayacian), E (Tayacian), (Tayacian and Acheulian) and D (Acheulian and Micoquian). The fauna itself contradicts the notion that the various layers have accumulated over a long period (HAAS, 1951; TCHERNOV, 1968). Analysis of the faunal remains both in view of population variability throughout the sequence of each species as well as the faunal assemblage of each layer, revealed no changes whatsoever. Assuming the fauna to have been distributed over the entire time-depth of -200.000 - 250.000 proposed by NEUVILLE (1951), changes of fauna and ranges of variabilities should have been in evidence. The micromammalian fauna does not show any interstage changes; the relationship between species hardly changes in each separately examined layer and the range of variabilities of populations throughout the sequence is only slightly wider than in a zero-time population. The faunistic picture is extremely uniform throughout the levels. The time span of the bone-bearing sediments should therefore be much shorter than proposed by Neuville.

RUST (1950) pointed out that the Oumm-Qatafa cultural stages are at least in part older than the Yabrudian industry and hence presumably pre-Würm in age. The composition of Oumm-Qatafa rodents is reminiscent of the faunal assemblage described by BATE (1937, 1942, 1943) from level G of Tabun (= Tayacian), claimed by FARRAND (1979) to be warm and dry.

HOWELL (1959, p. 11) believed that layer E represented a pluvial stage prior to the "Last Interpluvial" and therefore corresponded to some part of the late Riss glacial age of Europe. WOLDSTAEDT (1962), however, argued that maximal absolute age possible for Oumm-Qatafa, assuming that it does not antedate the Eem Interglacial (excluding layers C and B, which are sterile), is 120.000 years.

On the basis of the relative antiquity of its microfaunal assemblage (*Rattus haasi*, Muridae; *Myomimus judaicus*, Gliridae; *Ochotona* sp., Ochotonidae), a group of species which were never recovered from later lithic deposits (TCHERNOV, 1981), it seems that the faunal bearing beds of Oumm Qatafa predate all the Acheulo-Yabrudian, or, following JELINEK (1981), the "Mogharan Tradition" lithic accumulations in the Levantine region. The microfaunal community of Oumm-Qatafa may be best correlated with Tabun G (FARRAND, 1979; JELINEK, 1982) or Yabrud I rockshelter (BAR-YOSEF, in press), for all of which an early Stage 6 may be assigned. Hence, Oumm-Qatafa may delineate a biostratigraphic base-line for all the later Acheulo-Yabrudian and Mousterian faunal sequences. There is no definite date for the termination of the Upper Acheulian. The following cultural entity, the Acheulo-Yabrudian (= Mogharan Tradition), was only recovered in the northern part, on the non-arid region, of the southern Levant. Uranium series dates place the Mogharan Tradition between 100.000-150.000 years hence well within the Last Interglacial, or Stage 5. COPELAND and HOURS (1983) have argued for a 140-150.000 years for the Acheulo-Yabrudian. In a few sites the Acheulo-Yabrudian deposits are directly overlain by Mousterian assemblages, as in Zuttiyeh, Tabun, Yabrud I, Hammal I and Bezez.

The Acheulo-Yabrudian fauna of Mugharet-el-Zuttiyeh (BATE, 1927) might be correlated with Tabun F and E, yet the paucity of the faunal remains does not allow finer correlation. SCHWARCZ *et al.* (1980) dated the deposits as 148.000 to 85.000 years.

During this period there is a replacement of two species of *Myomimus* (Gliridae) and a complete extinction of *Allocricetus jesreelicus* (Cricetidae).

The Enfean II transgressive shoreline along the Lebanese coast gave a radiometric age of around 100.000 years, which well corresponded with the Uranium-series dates of the Mousterian age-travertine in Zuttiyeh cave (northern Israel) and Ain Aqev (southern Israel) where dates of ca. 90-97.000 years were indicated (SCHWARCZ *et al.*, 1980). The right sequential events of the rest of the Mousterian phases (ca. 95.000 through ca. 40.000 years B.C.) are less clear, as only scarcely was this long period radiometrically dated. The biochronological relative methods is complied here in order to better understand the Mousterian sequence in the eastern Mediterranean region.

The Levantine Mousterian sequence was traditionally divided on the basis of well stratified sites of which Tabun cave was used as the main archaeological reference. Unique and isolated assemblages, as well as most other Levantine sites, were frequently correlated with the long archaeological sequence of Tabun. The Levantine Mousterian was schematized into 9 entities: "Tabun D", "Tabun C" and "Tabun B" (COPELAND, 1975). This was further substantiated by JELINEK (1977, 1981, 1982), based on the progressive changes in the width thickness ratio of unretouched flakes along the sequence of Tabun.

Our research of the microfaunal turnovers and the biochronological events in this area made use of all the pre-Mousterian micromammal assemblages of the following cave sites: Qafzeh, Amud, Shovakh (= Shubbabik), Tabun, Sefunim, Geula, Hayonim and Kebara; all of them are located within the Mediterranean region of Israel (Mt. Carmel and Galilee).

II. RESULTS

D. Faunal Turnovers and Biostratigraphic Sequence

The micromammals of the Mousterian deposits of Qafzeh exhibit a great similarity with the Acheulo-Yabrudian faunas of Tabun F and E (Table 1). It is of great significance that the rodent community of Qafzeh still includes two different archaic forms of Muridae: *Mastomys* and *Arvicanthis*. The subgenus *Mastomys*, as well as the genus *Praomys* to which it belongs, is endemic to Africa, mainly south of the Sahara. The first record of a multimammate mouse outside Africa has been described by BATE (1942) from the Acheulo-Yabrudian (= Mogharan Tradition) and early Mousterian of Tabun cave (Tabun D). TCHERNOV (1968) described it as a new endemic species - *Mastomys batei*. No *Mastomys* occurs in the Middle East or elsewhere, outside Africa, above the lower levels of the mousterian period (TCHERNOV, 1981). *Mastomys nazerensis* has been described by HAAS (1972) as an endemic species in the Mousterian deposits of Qafzeh, but it was found to be well within the size and morphological variability of *Mastomys batei*.

BATE (1942) has also described another African murid, *Arvicanthis ectos* from layer F and E of Tabun. This was the first record of this genus outside Africa (apart from *Arvicanthis niloticus naso* from southern Arabia). *A. ectos* was also recorded from Oumm-Qatafa (HAAS, 1951) and from Qafzeh (HAAS, 1972) where it was found to be very common.

Outside Africa these two genera are only known from the Middle East ever since the early Pleistocene (TCHERNOV, in press), where they became extinct during the Mousterian. Qafzeh is hence the only known site, outside Africa, where these two genera were ever recorded in a Mousterian period. JELINEK (1982) has argued that the existence of these archaic African forms only in the Mousterian deposits of Qafzeh is due to the close proximity of the site to the "refugium" of the Jordan Rift Valley, a region which according to him retains archaic elements. Yet, none of the Mousterian sites which are located in the Jordan Valley, like Shovakh (= Shubbabik) (BINFORD, 1966), have yielded any remnants of *Mastomys* or *Arvicanthis* (Fig. 1).

Therefore we believe that the unique existence of these archaic murids in Qafzeh is not a matter of ecological preference but due to the great antiquity of the mousterian deposits of Qafzeh, which faunistically and palaeoecologically, but not culturally, are affiliated with the Acheulo-Yabrudian period, or the last interglacial. In Oumm-Qatafa, Tabun F, E and Qafzeh, there existed a special form of a glirid genus *Myomimus*, which was identified both by HAAS (1972, 1973) and DAAMS (1981) as an endemic species (Table 1, Fig. 1). Once again Qafzeh is the only Mousterian site where this unique form is known. In all the other Mousterian sites, and later deposits, this dormouse was replaced by a modern form known as *Myomimus roachi roachi* (= *M. personatus*) (TCHERNOV, in press).

The extinct genus *Allocricetus* is of much importance for biostratigraphic correlations. The early Pleistocene *Allocricetus bursae* continued to survive in the eastern Mediterranean until the Middle Pleistocene (TCHERNOV, 1968a and in press) long after it became extinct elsewhere. During the Middle Pleistocene it probably underwent a swift *in situ* speciation into two different species: *Allocricetus magnus* (TCHERNOV, 1968) and *Allocricetus jesreelicus* (BATE, 1943). The latter species became extinct at the turn of the last Interglacial while *C. magnus* only during the later part of the Mousterian (Table 1), coinciding more or less with the invasion of *Cricetulus migratorius* into the region. The appearance of *Cricetulus* in the southern Levant may be considered as a valuable biochronological event. It is at present the only surviving cricetine in Israel (Fig. 1).

Cricetines are completely absent from the Mousterian deposits of Qafzeh. This phenomenon cannot be due to local ecological circumstances, as cricetines (*Mesocricetus* and *Cricetulus*) do occur in the Upper Palaeolithic deposits of this site (TCHERNOV, 1981). Neither can it be explained by the size of the sample as, using careful methods of sifting, many thousands of rodent remains were retrieved from the Mousterian levels of Qafzeh. HAAS (1972) has found this phenomenon "a very surprising fact" but did not attempt to explain it. A more detailed discussion of this issue, which has its own biochronological importance, will be given below.

Ellobius fuscocapillus (Microtinae) was recovered and described by BATE (1937) from layers E, D and C of Tabun as *Ellobius pedorychus*. It has been found (TCHERNOV, 1968) to be identical in all its morphological traits to the living Mesopotamian species *Ellobius fuscocapillus*. HAAS (1951) has attributed a few remains from Oumm-Qatafa to *Ellobius talpinus*, but they did not show any differences from all the other fossil populations of *Ellobius* in Israel. *Ellobius fuscocapillus* was also recovered from lower E of Hayonim (Table 1, Fig. 1).

Gerbillus dasyurus (Gerbillidae) is known from 'Ubeidiya Formation (TCHERNOV, in press) and Give'at Shaul Fissure Filling (TCHERNOV, 1968a). The next time that this species is retrieved comes from the Upper Acheulian deposits of Oumm-Qatafa (TCHERNOV, 1968). From Mousterian deposits this species is only known from Qafzeh and lower layer E of Hayonim; in both sites it appears to be uncommon. It has never been recovered from other Mousterian or later Mousterian layers, or Upper Palaeolithic deposits in the eastern Mediterranean. It is only during the late Epipalaeolithic when *Gerbillus dasyurus* reappears in the Mediterranean region of the Levant (Kebara and Hayonim layer B). Its complete absence during middle and late Würm is not well understood. Its episodic existence along the Mediterranean belt of the Levant is probably negatively correlated with the amount of vegetation cover. A large scale reduction of Mediterranean growth could have encouraged this species to re-occupy desiccating Mediterranean landscapes during relatively dry periods.

The spatio-chronological distribution of the lagomorphs in Israel is strange. *Lepus* replaced the primitive genus *Ochotona* in post-Acheulian period (Tabun F, E). Since the early Mousterian *Lepus* is the only lagomorph known from the eastern Mediterranean (TCHERNOV, 1981). The invasion of *Ochotona* into the southern Levant was confined to a relatively very short episode (Table 1) and hence may designate a significant biochronological stage in this region.

Remains of *Lepus* are not common in Mt. Carmel cave deposits (BATE, 1937); the remains from Hayonim cave, Oumm-Qatafa and Kebara have shown it to belong to the widely distributed *Lepus capensis*.

The genus *Suncus* is unknown from the Acheulian and Acheulo-Yabrudian deposits of the eastern Mediterranean (Table 1) and first appeared as *Suncus etruscus* in Mousterian deposits (Tabun C, Qafzeh, Hayonim E). It is only in the Mousterian deposits of Qafzeh where another species of *Suncus*, apparently related to the Arabian form *Suncus murimus*, where a giant form, not yet fully described, was found (HAAS, 1972).

The only representative of the Talpidae in the southern Levant is *Talpa chthonia,* first described by BATE (1932, 1937a). This endemic species was identified from Tabun F; it is absent from Tabun D (HAAS, in JELINEK *et al.*, 1973) and Qafzeh but reappears in Tabun C. The same species is also known from the lower levels of Hayonim E. Its absence from Tabun D, as well as from Qafzeh, could have been the result of a temporary withdrawal from the region.

It is worth noting that the rodent assemblage of Qafzeh has yielded relatively many desert to semi-desert mammals, and the community is predominated by open-country, or steppe species, the Arabian *Gerbillus dasyurus* as well as the giant Arabian shrew, *Suncus* sp. (cf. *murimus*), the savanna rodents *Mastomys* and *Arvicanthis* which are associated with *Alcelaphus buselaphus* and *Camelus*, probably *dromedarius* (PAYNE and GARRARD, 1983). If we add to this list the complete absence of the arboreal *Apodemus flavicollis* and all the cricetines from the rodent community of Qafzeh we may come to the conclusion that the early Mousterian of this site was deposited under relatively arid climate and may be correlated with the late Stage 3 (Figs. 1, 2), or to the end phase of the last Interglacial.

It is only in Tabun D period that several archaic species of micromammals became extinct or were eliminated from the Levantine scenario: *Myomimus kafzensis, Mastomys batei, Arvicanthis ectos, Suncus* (cf. *murimus*), and temporarily also *Gerbillus dasyurus* and probably *Camelus dromedarius*. On the other hand other species which are connected with more mesic environment or arboreal habitats appear: *Myomimus roachi, Apodemus flavicollis* and all the cricetines (Figs. 1, 3).

It is difficult to accept a later Mousterian date for the hominid and bone bearing layers of Qafzeh, as argued by JELINEK (1982), when about 40 % of the micromammals are different from any Mousterian assemblage anywhere in the Levant. If there was any intra-Mousterian faunal break in the southern Levant it definitely took place during the transition from the Mousterian complex of Qafzeh to Tabun D, or from Stage 5 to Stage 4 (Figs. 1, 3).

If the Mousterian of Qafzeh antedates Tabun D it may fill in the stratigraphic hiatus between Tabun D and Tabun E (Fig. 1), as claimed by FARRAND (1979), JELINEK *et al.* (1973) and JELINEK (1982), and explains the uniqueness of Qafzeh's archaic microfaunal community.

Therefore we believe that if the faunal assemblage and the hominid remains of Qafzeh (XV-XXIV) may be most appropriately placed after Tabun E, and apparently still within the pre-Glacial period, a fully modern Man roamed around the Levant before any Neanderthal came for a visit.

Late intra-Mousterian faunal changes are scarce and mainly occur in the time interval between Tabun D and Tabun G, or between the lower and upper Mousterian complexes of Hayonim cave, when *Talpa chthonia* (a close relative to the European mole), the genus *Allocricetus* became extinct, and the vole mole *Ellobius fuscocapillus* retreated to northern latitudes (Fig. 1). It seems that during the later part of the Mousterian the faunal communities in the southern Levant became more stabilized and almost no faunal changes were recorded in the transition from the Middle to the Upper Palaeolithic. In general, no strict correlation exists between the rate of mammalian turnover (extinction *versus* immigration) and Pleistocene environmental changes in the eastern Mediterranean region. Greater correlation is usually shown (TCHERNOV, 1981, 1984b) between the relative frequencies of species on body sizes as the climatic changes worked more specifically on the population level in a way that each species responded by shifting into another ecological regime or changed its ecological amplitude. A population may either follow its optimal valence (ENDLER, 1977) through spatial changes or stick to its place by adjusting its phenotypic characters to the changing environment. The magnitude of environmental changes in the Levant were steep enough to usually affect the genetic construction of the population and, unlike the situation in northern (more catastrophic) latitudes, was not always effective enough to cause an overall faunal turnover.

E. Conclusions: The Spatio-Chronological Distribution of Hominids in the Levant

The updated information on the mammalian assemblages is certainly not final but already sufficient to draw a general outline of the sequences of different mammalian lineages during the last Interglacial and Upper Pleistocene periods. There are several points which should attract our attention:

a. The fossiliferous beds of Oumm-Qatafa have actually a limited time range within the earliest part of the Last Interglacial or within Stage 6. The fauna of Oumm-Qatafa, but in particular the micromammals, may be used as a baseline for all later mammalian lineages in this region.

b. There is a gradual elimination or exclusion of faunal elements from the region rather than faunal breaks. The Middle East communities seem to be temporarily stabilized during the late Mousterian and the Aurignacian.

c. Biochronologically the lower layers in Qafzeh (XIV-XXIV), where a population of archaic *Homo sapiens* was recovered, should be correlated with a very early Mousterian phase which fits in the E-D hiatus in the Tabun sequence. There is a strong interpluvial stamp upon the faunal assemblages of Qafzeh. If the regression from the Enfean II shore-line and the Mousterian occupations of Na'ame are coeval with Tabun D, the Mousterian complex of Qafzeh (which antedate Tabun D) should be placed within an earlier phase.

d. The fauna of Tabun D is typified by the sudden introduction of European species, which were eliminated from the eastern Mediterranean domain during Stage 5. This immigration event was followed by the extinction of two archaic species belonging to African genera. This faunal turnover during the dawn of Stage 4 was also associated with the first appearance of Neanderthals on Levantine terrain.

e. The lower levels of Hayonim E may partly overlap the major hiatus between Tabun D and C.

JELINEK (1985) argued that the absolute dating (through the racemisation of amino-acids) of bones from layer XXII in Qafzeh is 68.000-78.000 years B.P. If this date is valid than it would have confronted the archaic type of *Homo sapiens* from Qafzeh with the Neanderthaloid representatives from Tabun. TRINKAUS (1983) pleaded for a 70.000-80.000 years old (or Tabun D) for the female C1 skeleton of Tabun. However, the main point in this case is that the faunal sequence in the southern Levant places the Mousterian deposits of Qafzeh, and its hominid burials, before Tabun D, and is most probably correlated with the later part of Stage 5, when steppe and somewhat arid conditions endured in the region.

Accepting our chronostratigraphic scheme (Fig. 1) for the Middle Palaeolithic may cast some more light on the hominid lineages in the Levantine province. The find from Zuttiyeh certainly belongs to a very archaic type of *Homo sapiens*, from which the more "modernized" type were (locally?) evolved and dominated the Levant even during the very early Mousterian phase of Qafzeh, or late Stage 5 (Fig. 2). The appearance of Neanderthals in the region took place only during Stage 4 (Fig. 3) as part of a large scale phenomenon, during which a southward dispersal of many Palaeoarctic species occurred in the southern Levant. Some of the Glacial relicts of this event are still found on the mountainous regions of the Negev, Sinai and southern Saudi-Arabia (TCHERNOV, 1981b). During the first part of the Glacial, Stages 4 and 3, the Levantine Neanderthals excluded the sapienoid type, but never succeeded to invade the African domain. Thus, all the typical Neanderthals from Tabun, Amud and Kebara may represent a single local lineage. Skhul finds date probably to a very late Mousterial phase [ca. 41.000 years B.P. (= Tabun B), or somewhat earlier] (FARRAND, *in* JELINEK *et al.*, 1973), and represent the early stage of either transformation, or replacement of the Neanderthals by modern *Homo sapiens*.

There were no sympatric relationships between Neanderthals and sapienoids in the Levant; they simply delineated a typical parapatric distribution. The evolutionary history of the hominids in the Levant draws a non-linear shape and logically explains the temporary existence of Neanderthals in the eastern Mediterranean during a cooler and wetter phase of the Middle Palaeolithic.

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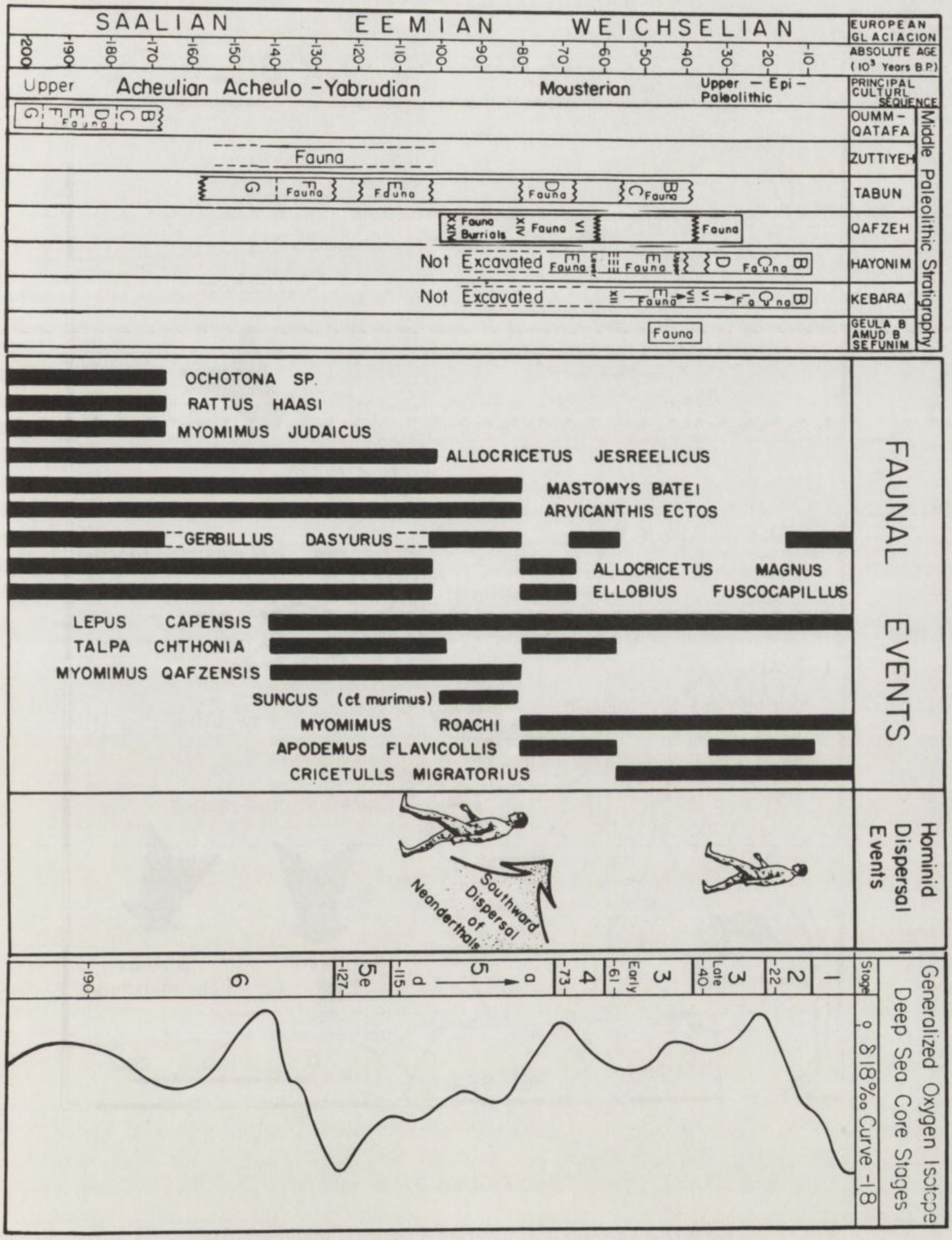

FIGURE 1 – Proposed correlation of major Upper Pleistocene cultural units, based on micromammalian sequences in south-west Asian cave deposits.

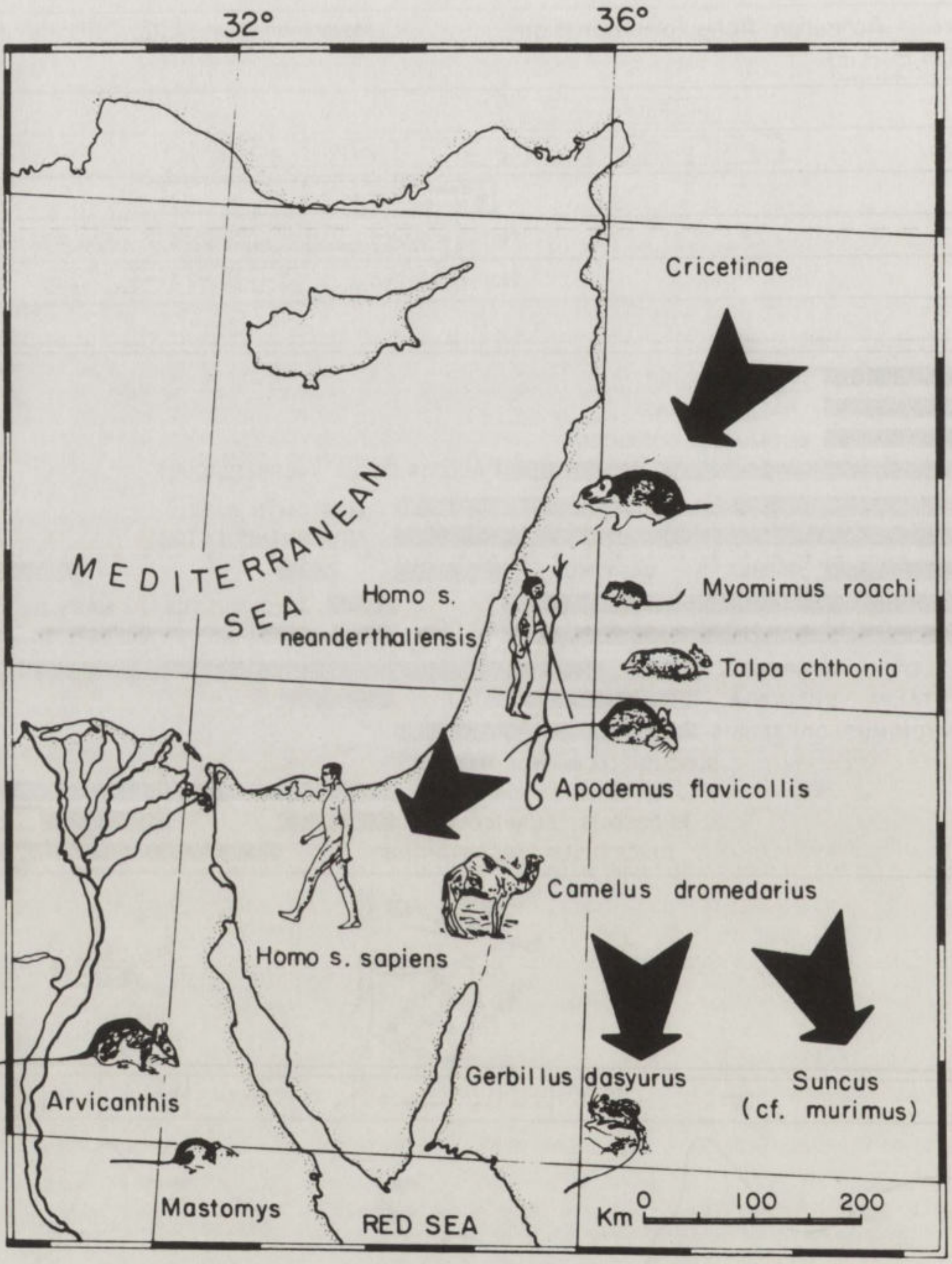

FIGURE 2

Early Glacial Stage 4, Mousterian scenario in south-west Asia, as shown by the fauna of Tabun (layer D) (Mt. Carmel, Israel)

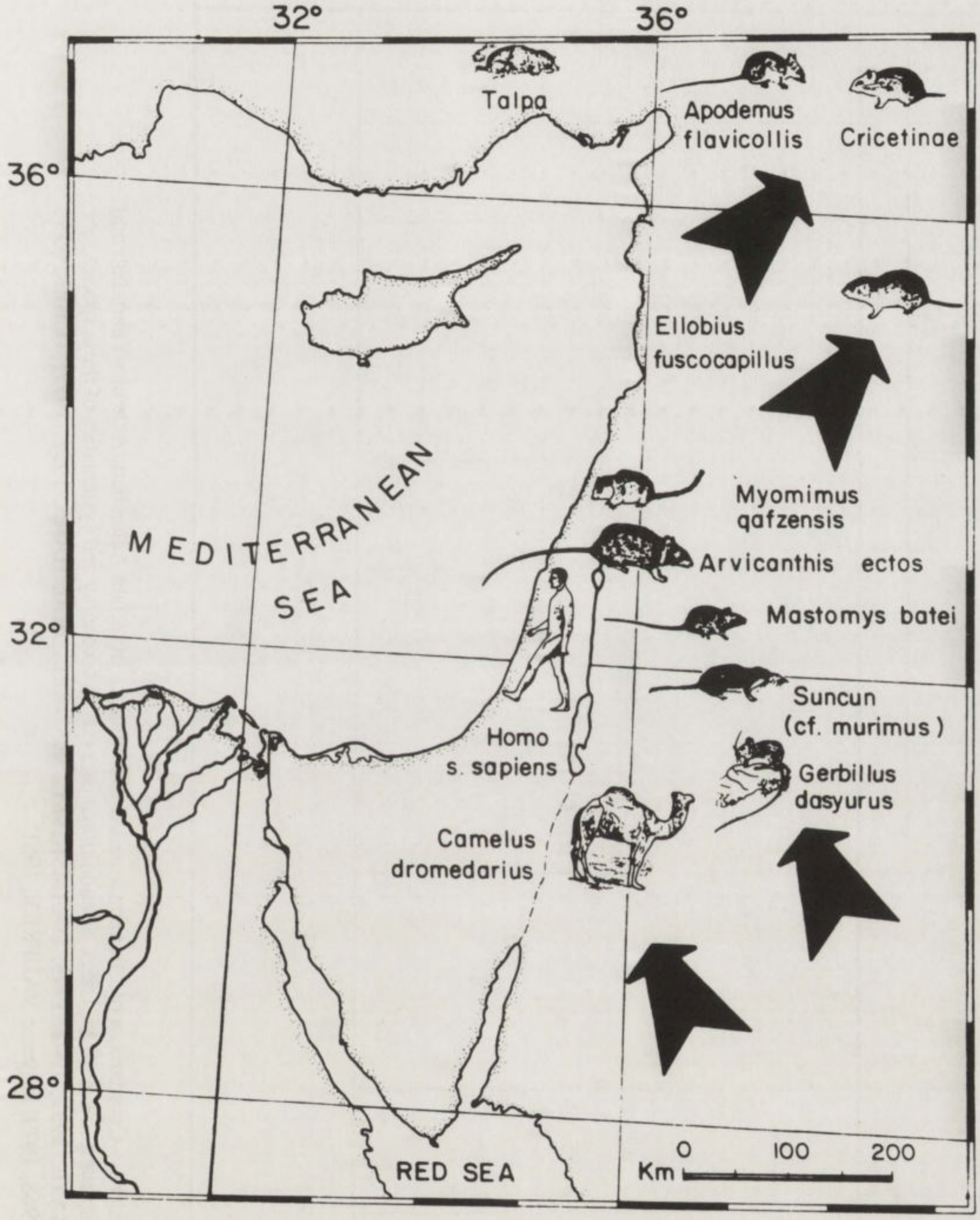

FIGURE 3

Late Interglacial, Stage 5^3, early Mousterian scenario in south-west Asian as shown by the fauna of Qafzeh (Galilee, Israel)

Species	Qumm-Qatafa	Tabun F	Tabun E	Qafzeh XV-XXIV	Tabun D	Hayonim Lower E	Tabun C	Hayonim Upper E	Tabun B	Geula	Shovakh
	Late Acheulian	Acheulo-Yabrudian		Lower Mousterian				Upper Mousterian			
RODENTIA											
Hystrix indica	+++++	..?..	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	..?..
Sciurus anomalus		..?..	+++++	+++++	..?..	+++++	..?..	+++++	+++++	+++++	+++++
Mesocricetus auratus		+++++	+++++		+++++	+++++	+++++	+++++	+++++	+++++	+++++
Allocricetus jesreelicus	+++++	+++++	+++++								
Allocricetus magnus	+++++	+++++	+++++		+++++	+++++					
Cricetulus migratorius						+++++	+++++	+++++	+++++	+++++	+++++
Rattus haasi	+++++										
Mastomys batei	+++++	..?..	+++++	+++++							
Arvicanthis ectos	+++++	+++++	+++++	+++++							
Apodemus mystacinus	+++++	+++++	+++++	+++++	+++++						
Apodemus sylvaticus	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
Apodemus flavicollis					+++++	+++++	+++++	+++++	+++++	+++++	+++++
Mus musculus	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
Gerbillus dasyurus	+++++			+++++		+++++					
Meriones tristrami	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
Psammomys obesus	+++++										
Ellobius fuscocapillus	+++++	..?..	+++++		+++++	+++++					
Microtus guentheri	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
Spalax ehrenbergi	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
Myomimus roachi gafzensis	+++++	+++++	+++++	+++++							
Myomimus roachi roachi					+++++	+++++	+++++	+++++	+++++	+++++	+++++
LAGOMORPHA											
Ochotona sp (=Lagomys)	+++++										
INSECTIVORA											
Suncus etruscus				+++++	+++++	+++++	+++++	+++++	+++++	+++++	..?..
Suncus sp. (cf. murimus)				+++++							

Table 1: Comparison of micromammalian assemblages from late Acheulian, Acheulo-Yabrudian and Mousterian sites from Israel. For additional data on the taxonomy and systematics of these speciess, see Bate, 1937, 1942, 1943; Daams, 1981; Frankel, 1970; Haas, 1951, 1972; Tchernov, 1968, 1979, in press; Vaufrey, 1951.

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