ELSEVIER

Archaeology Ethnology & Anthropology of Eurasia 42/1 (2014) 18–32
E-mail: Eurasia@archaeology.nsc.ru

ARCHAEOLOGY, ETHNOLOGY & ANTHROPOLOGY OF EURASIA

PALEOENVIRONMENT. THE STONE AGE

**P. Biagi[1] and E. Starnini[2]**

*[1]Department of Asian and North African Studies, Ca' Foscari University, Ca' Cappello, San Polo 2035, I-30125 Venezia, Italy*
*E-mail: pavelius@unive.it*
*[2]Italian Ministry of Cultural Heritage, National Prehistoric Museum of Balzi Rossi, Archaeological Superintendency of Liguria, Via Balbi 10, I-16126 Genova, Italy*
*E-mail: elisabetta.starnini@beniculturali.it*

# THE LEVALLOIS MOUSTERIAN ASSEMBLAGES OF SINDH (PAKISTAN) AND THEIR RELATIONS WITH THE MIDDLE PALEOLITHIC OF THE INDIAN SUBCONTINENT

*The research carried out in the Indian Subcontinent, Central Asia, Iran, and the Arabian Peninsula has improved our knowledge of the Middle Paleolithic in the regions. However, the southeasternmost distribution of the Levallois Mousterian is still poorly defined. Although typical Levallois industries are known from Iran, Afghanistan, and Uzbekistan, they are almost unknown in the Indian Subcontinent, except for Lower Sindh and the Indus Valley. The evidence from Ongar and other sites in Sindh has shed some light on the possible southeasternmost distribution routes of the Neanderthals that are considered the probable creators of the assemblages included in this study.*

Keywords: *Levallois Mousterian, Middle Paleolithic, Homo neanderthalensis, Sindh, Indus Valley, Indian Subcontinent.*

## Introduction

Several intriguing questions are of major interest in studying the Middle Paleolithic period. A challenging enigma concerns the southeasternmost spread of the Neanderthal sub-groups "which inhabited a vast geographical area extending from Europe to western Asia and the Middle East" (Febre, Condemi, Degioanni, 2009: 1), a topic of major importance, the discussion of which has been avoided by most authors with very few exceptions (see, e.g., (Bar-Yosef, 2011: Fig. 11.1)). The available distribution of *Homo neanderthalensis* fossil remains in Asia covers a wide territory between the Taurus and Zagros Mountains in the west (Trinkaus, Biglari, 2006), former Soviet Central Asia, and Siberia in the east (Viola, 2009), with a wide gap between the latter two regions.

The Levallois Mousterian lithic technology produced by *H. neanderthalensis* that characterises the Middle Paleolithic Eurasian assemblages, is attested indeed from the Iberian Peninsula (Giles Pacheco et al., 2000) to Central Asia and beyond (Krause et al., 2007; Bar-Yosef,


doi:10.1016/j.aeae.2014.10.002

Wang, 2012) in a few regions of which the Neanderthals are thought to have survived up to the beginning of the Upper Paleolithic (Rybin, Kolobova, 2009). Levallois assemblages, although having characteristics different from those of Eurasia (Beyin, 2011: 7), were manufactured also by Middle Paleolithic anatomically modern humans in north and Northeastern Africa (Hublin, 2000: 163). Many authors suggest that the Initial Upper Paleolithic of the Levant developed from Middle Paleolithic Levantine Mousterian complexes (Kuhn et al., 2009) typologically different from those of northeastern Africa (Beyin, 2006: 24). Recent data from Central Asia would support a similar view, according to which anatomically modern humans introduced transitional assemblages with Levallois-like components in the region (Krivoshapkin, Anoikin, Brantinghan, 2006).

Anatomical distinctiveness and relative early divergence from other *Homo* sp. supported by mtDNA evidence, suggest that the Neanderthal lineage probably began its evolution as far back as 600 ka ago (Krings et al., 1997), although classical Neanderthals are considered only those living during the last Ice Age in Europe, from ca 100 to 30 ka BP (Henke, Hardt, 2011: Fig. 3.7), or more broadly in Eurasia from ca 200 ka "before mysteriously disappearing some 28,000 years ago" (Zilhão, 2010a).

The material culture of *H. neanderthalensis* is characterised by different Mousterian complexes, many which show a variable percentage of Levallois artifacts. The Levallois technology is of controversial origin. It developed during Lower, Middle and also Early Upper Paleolithic periods in many regions of Europe, Asia and part of Africa (Foley, Lahr, 1997: 24).

Following a season of studies based mainly on stone tool typology, the processual approach emphasised the operational chain or sequence as the main factor underlying morphological variations in stone by-products. A further step consisted in identifying the debitage variability within the Levallois technology itself (Boëda, 1994), which showed that different methods could produce identical or different types of artifacts (Meignen, 1998). However, in our opinion, the debate concerning interpretation, and ultimate meaning, of the techno-typological variability of the lithic assemblages is still confined within a range of factors that involve chronology, style, function, raw material constraints, use and intensity of utilisation, often avoiding any attempt to relate these factors to the cognitive or cultural behaviour of the human species that produced them. Nevertheless, with the except of the debate on the Mousterian/Aurignacian transition in Europe (Marks, Monigal, 2004), only a few authors consider the diversity of human "cultures" that produced such artifacts, as a key for understanding their variability (Ranov, 1995). Regarding the current palaeoanthropological evidence, in addition to *H. heidelbergensis*, at least five species of the genus *Homo* are thought to have "coexisted" in Eurasia during the Middle Paleolithic: *H. neanderthalensis*, *H. sapiens*, *H. erectus*, *H. denisovensis*, and *H. floresiensis* (Cavalli Sforza, Pievani, 2011).

Given that it is not certain which hominin taxa were responsible for each individual industry and its manufacturing technology, it is impossible to fully understand the significance of the techno-typological variability of the chipped stone assemblages. There are reasons to believe that anatomically and cognitively diverse early human taxa reflect a certain degree of material culture and techno-typological distinctiveness, with special regard to lithic complexes considering "particular industries …associated with specific hominid taxa" (Foley, 1987: 391), although this is not always the case given that "lithic technology is based on learned behavior" (Conard, 2007: 2005).

Following recent climatic reconstructions, certain milder periods of OIS 3 and OIS 5, favored the expansion of Neanderthal communities toward the Russian and Ukrainian plains (Hublin, 2000: 163). According to the available evidence human groups might have followed two main routes to reach the southern regions of Eurasia and the Indian Subcontinent: the first moving along the north Black Sea corridor, which maintained subtropical conditions during OIS 3 (Bar-Yosef, Belfer-Cohen, Adler, 2006: 50); the second across the bridge that connected the Balkans with Anatolia. From the latter the Indian Subcontinent could be reached either across Mesopotamia and the exposed landmass of the Arabian/Persian Gulf, and the Makran coast (Armitage et al., 2011). This hypothesis is to be taken into consideration, given the discovery of both Levallois Mousterian assemblages close to the southern shore of the Gulf in Saudi Arabia (Petraglia et al., 2012) and "typical Mousterian" Middle Paleolithic industries, and/or non-facetted Levallois-like components, along the Yemen-Dhofar coastal belt (Amirkhanov, 2006: 611), although this oversimplified picture is further complicated by the discovery of Levallois Nubian complexes in Dhofar (Rose et al., 2011). Furthermore a Central Asian route cannot be excluded *a priori* (Bar-Yosef, 2011), although the Hindu Kush might have represented an obstacle for a dispersal toward the Subcontinent.

The above data show that the Middle Paleolithic human dispersal was much more complicated than previously suggested. However, a question mark constantly recurs in the Indian Subcontinent distribution maps regarding the spread of *Homo* sp. (Bar-Yosef, 2011: Fig. 11.1; Henke, Hardt, 2011: Fig. 3.8), because of the virtual absence of human remains and our limited knowledge of sites of this period in the entire region (see (Beyin, 2006: Fig. 3)).

## An overview of the Middle/Late Pleistocene lithic technology in the Indian Subcontinent

Research carried out during the last decade in the Indian Subcontinent, Central Asia, Iran, and the Arabian Peninsula has undoubtedly improved our knowledge on the Middle Paleolithic in the above territories, and answered several questions regarding the possible origin and provenance of the Middle Paleolithic complexes (Petraglia, Alsharekh, 2003), their chronology (Petraglia et al., 2012), variable structural composition, and cultural affiliation (Petraglia et al., 2007).

The Indian Middle Paleolithic industries were first defined by B. Allchin as based upon flakes and characterised by a "remarkable absence of formal artifact types such as characterize the Mousterian industries of Europe and other parts of Western Asia" (1992: 70). Following a traditional view, in India "the Acheulian slowly evolved into the Middle Paleolithic by shedding some of the tool types and by incorporating new forms and new techniques" (Misra, 2001: 495); similarly, in western Rajastan, a region bordering Sindh, "the Luni Middle Paleolithic industry is derived from the Acheulian tradition" (Misra, 1977: 37). Similar concepts have been proposed by other authors on the basis of new discoveries of Indian assemblages (Pal, 2002: 67) that show "a gradual *in situ* development of prepared core technology that has its origin in the preceding Acheulian" (James, Petraglia, 2009: 256). The above views contrast with those put forward in the late 1960s (Wainwright, Malik, 1968), correlated with a very precise description of the typology of the chipped stone assemblages recovered *in situ* from other Middle Paleolithic sites.

Given the characteristics of the above complexes, some authors believe that the Mousterian Middle Paleolithic is not represented in the Subcontinent (Allchin B., Goudie, Hedge, 1978: 314), while others attributed the Middle Paleolithic assemblages of peninsular India to the Nevasan (Allchin R., Allchin B., 1997: 55–60). Recently they have been subdivided into three main phases of development (Pal, 2002: 79), from most of which the typical Levallois reduction technique is absent. Where long sequences have been excavated and radiometrically dated, for instance Didwana dune 16R in the Great Indian Desert (Misra, Rajaguru, 1989), the Middle Paleolithic assemblages are stratified between Early (Acheulian) and Late (Upper) Paleolithic (so-called microlithic) complexes (James, Petraglia, 2005), re-utilising a terminology proposed more than 50 years ago (Subbarao, 1956).

According to the few absolute dates available, Middle Paleolithic complexes were present in the region since ca. 150 ka BP. Late (Upper) Paleolithic assemblages made their appearance probably just after 40 ka BP (Chakrabarti, 1999: 75), while the dispersal of modern humans, following a coastal route, supposedly took place some 10 ka before (Field, Petraglia, Mirazón Lahr, 2007). Recent genetic results would indicate an earlier date, between 75 and 60 ka BP (Bulbeck, 2007: 316), although the archaeological evidence supporting this event is very limited (Beyin, 2011: 3). In effect the problem related to the makers of the Middle Paleolithic assemblages is still debated (Haslam et al., 2010), mainly because of the absence of human remains of this period from the entire Subcontinent (Stock, Mirazón Lahr, Kulatilake, 2007).

One of the most important, and neglected issues concerns the southeasternmost spread/distribution of *H. neanderthalensis* and the Levallois. Although typical Levallois Mousterian industries are known from the coast of Iranian Makran (Vita-Finzi, Copeland, 1980), the Hormuz Strait islands (Dashtizadeh, 2010), Iran (Jaubert et al., 2009), Afghanistan (Dupree, 1972), and former Soviet Central Asia (Movius, 1953), characteristic Levallois assemblages are almost unrepresented in the Indian Subcontinent, with the exception of a few surface assemblages and isolated finds from Lower Sindh and the Indus Valley (Biagi, 2006; Biagi, Starnini, 2011), whose significance is discussed in this paper.

## *Research in Sindh*

### *Geographical setting*

Sindh is the southeasternmost province of present-day Pakistan. Its territory is divided into two by the north–south course of the Indus River. The western regions consist of Kirthar, Ranikot, Brahui, and Gaj limestone formations (Blanford, 1880), some of which are very rich in good-quality flint sources (Biagi, Starnini, 2008; Biagi, Nisbet, 2010). The central part of the province is filled with the alluvial plain of the river, the course of which varied greatly through time (Flam, 1999), and the Indus delta, whose fan is continuously widening toward the Arabian Sea (Giosan et al., 2006). The eastern part is covered with Thar or Great Indian Desert dunes, which are dotted with saltwater perennial basins. The Rohri Hills, in Upper Sindh, extend between the course of the Indus and the westernmost fringes of the Thar Desert dunes.

### *The Levallois Mousterian assemblages of Lower Sindh*

At present typical Levallois Mousterian industries are known from a few sites in Lower Sindh, all located west of the Indus (Fig. 1). The most important is Ongar, better

known as Milestone 101 (Allchin B., 1976: 486). It is located some 25 km south–southwest of Hyderabad. It was discovered by W.A. Fairservis Jr. in 1959 (Fairservis, 1975: 76) and later visited, and partly published by B. Allchin in the 1970s (Allchin B., Goudie, Hedge, 1978: 300). On the top of the eastern, horseshoe-shaped limestone terrace (Fig. 2) B. Allchin recovered Paleolithic assemblages and workshops of different ages. One of them, consisting of only 22 artifacts, among which are 5 scrapers, 2 points, 6 blade flakes, 8 flakes of two different types, and one core trimming flake, was attributed to the Middle Paleolithic (Ibid.: Tab. 8.9b).

In the early 1970s, Professor A.R. Khan visited Ongar, when the sites were being destroyed by extensive limestone quarrying. During his rescue fieldwork A.R. Khan collected hundreds of Levallois artifacts, among which were typical turtle-shaped cores with centripetal flake detachments, unretouched and retouched points, flakes, a few blades, and different types of side and transversal scrapers with facetted *chapeau de gendarme* butts, as well as one typical Mousterian point (Fig. 3, 4). This author was the first to report "the presence of the Levalloisian industry in the area beyond any doubt" (Khan, 1979b: 80). Unfortunately, A.R. Khan did not record the precise localities where he collected Levallois tools, given that he only marked on a map the spots from which he recovered Paleolithic finds, nor did he provide any description of his rescue operations apart from those reported in one of his 1979 papers. According to this unpublished map, all the sites are scattered along the southern and eastern fringes of the above-mentioned horse-shaped hill (Ibid.).

The Ongar assemblages collected by A.R. Khan in the 1970s, at present stored in the Museum of Prehistory and Palaeogeography, Department of Geography, Karachi University, consist of dozens of large cotton bags of lithics left in the same condition they were collected some forty years ago. Approximately 300 chipped stone artifacts from

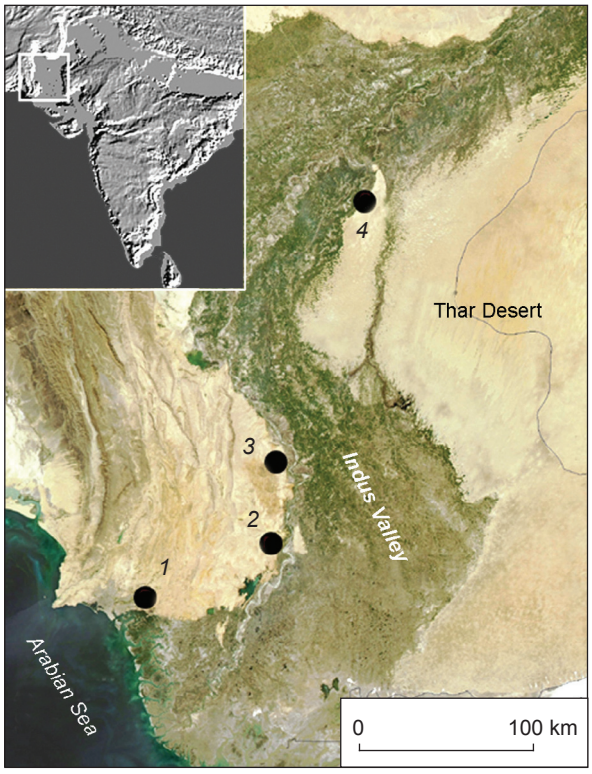


*Fig. 1*. Distribution map of the Levallois Mousterian assemblages in Sindh. Drawing by P. Biagi and E. Starnini. *1* – Karachi and neighbouring sites; *2* – Ongar; *3* – Arzi; *4* – approximate location of the Rohri Hills finds mentioned in the text.


*Fig. 2*. Satellite view of Ongar. The horseshoe terrace surveyed by B. Allchin in the 1970s is on the right. Circle marks the location of the Levallois tools collected in 2006.

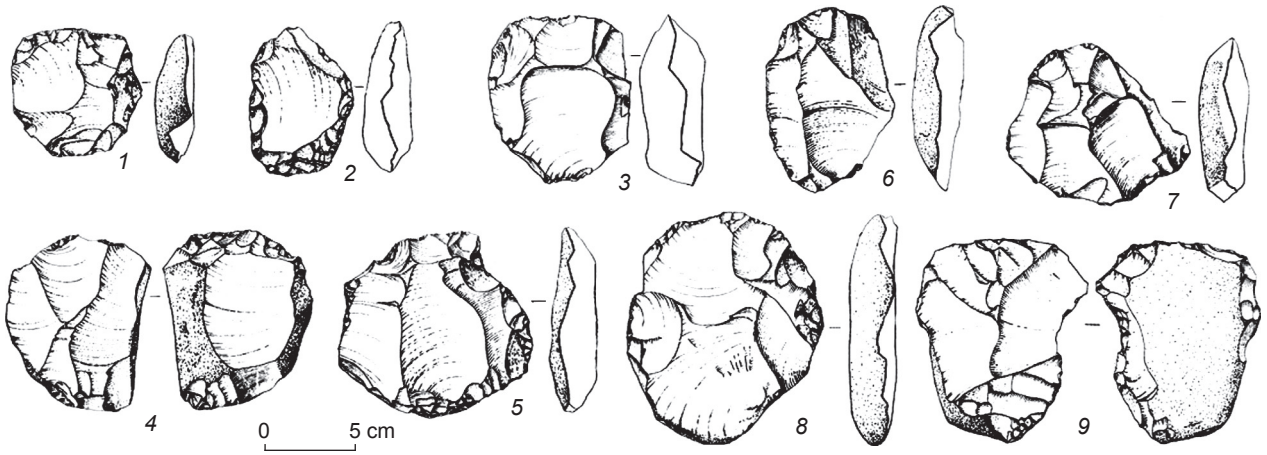


*Fig. 3*. Levallois cores collected by A.R. Khan from Ongar in the 1970s. Drawings by P. Biagi, inking by G. Almerigogna.

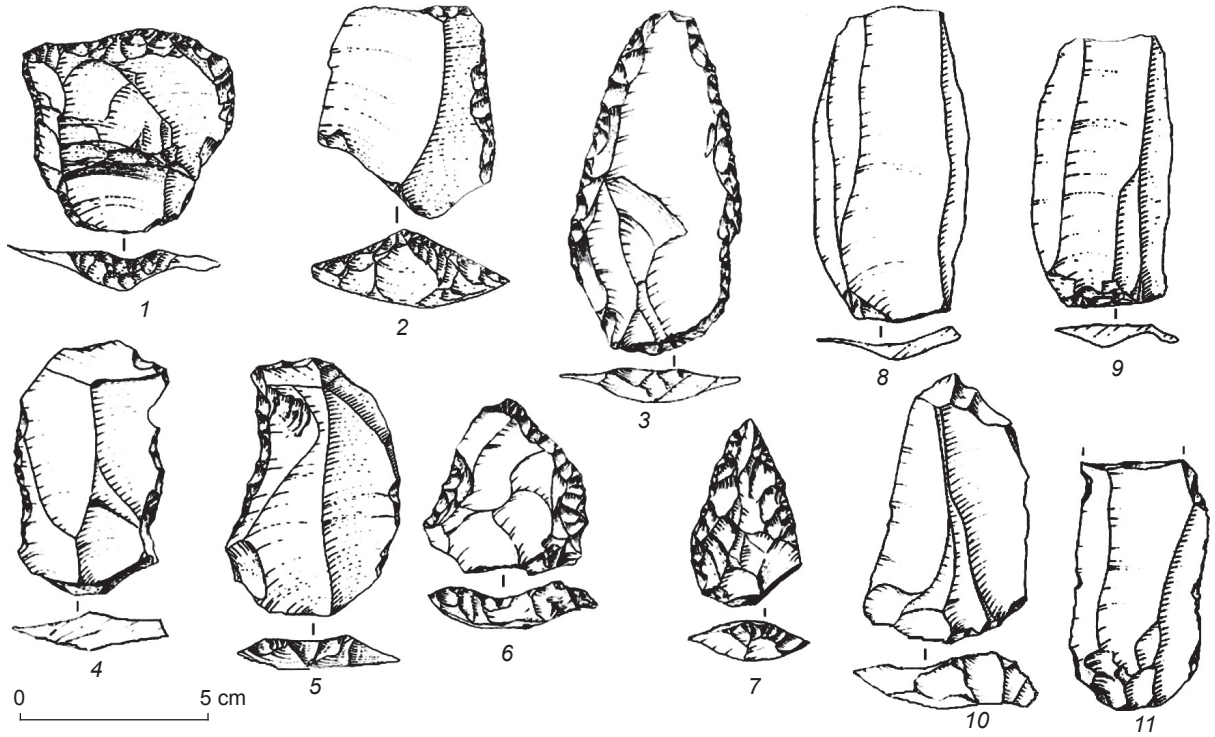


*Fig. 4*. Artifacts collected by A.R. Khan from Ongar in the 1970s. Drawings by P. Biagi, inking by G. Almerigogna.
*1*, *2*, *4–6* – Levallois Mousterian side and transversal scrapers; *3* – retouched Levallois point; *7* – Mousterian straight point; *8*, *9*, *11* – unretouched blade-like flakes; *10* – unretouched Levallois point.

this locality, a few of which were on display in the above-mentioned museum, were given to one of the present authors (P. Biagi) for study. They all are covered with a very pale brown (10YR8/2) patina. They are represented by 11 circular, unifacial, radially prepared, corticated Levallois cores with centripetal flake detachments (Fig. 3); a pseudo-prismatic, flat-platformed, subprismatic core for the detachment of at least 12 cm long blade-like flakes; 4 sidescrapers with unilateral, direct retouch on facetted flakes (Fig. 4, *2*, *4–6*); a side-transversal scraper with direct retouch, on facetted flakes (Fig. 4, *1*); an atypical unretouched Levallois point on a facetted flake (Fig. 4, *10*); a retouched Levallois point on a facetted flake (Fig. 4, *3*); a typical Mousterian point on a facetted flake obtained with bilateral, direct, covering retouch (Fig. 4, *7*). The unretouched artifacts include flakes and blade-like flakes (Fig. 4, *8*, *9*, *11*), some of which were detached from facetted blanks.

After analysing A.R. Khan's collection, between 2005 and 2008 one of the authors (P. Biagi) systematically surveyed the Ongar, Daphro end Bekhain hills, the plain that extends to their west as far as Meting railway station, and the surrounding mesas (Biagi, 2005). During the surveys, assemblages typologically comparable to those collected by A.R. Khan, with the same, characteristic white patina (Fig. 5), were recovered from the upper part of a profile of a low, alluvial terrace incised by a seasonal stream that flows eastwards down to Ongar village and the national road (Biagi, Nisbet, 2011) (Fig. 6). Several tools, including Levallois flake cores, were collected from the surface of one of the mesas.

The first of these two locations yielded only Levallois flakes and blades with facetted, *chapeau de gendarme* butts, all characterised by a thick, white patina. They show just a few, marginal *concassage* detachments Although their absolute chronology is problematic in the absence of datable materials, some technological characteristics of the lithic assemblages, including the presence of a few unretouched, long blades, might point to a late period in the development of the Middle Paleolithic.

Other typical, small Levallois Mousterian assemblages and isolated tools come from other sites located immediately to the east of Karachi, among which are the Mulri Hills, Landhi, Deh Konkar (Khan, 1979a: 13) and the Laki Range (Biagi, 2008). One more characteristic Levallois Mousterian flake with a facetted butt was found

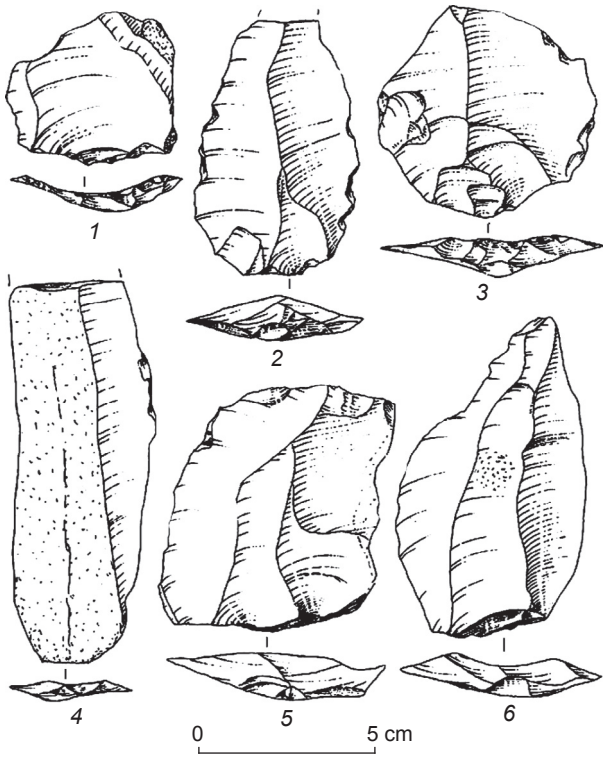


*Fig. 5*. Artifacts collected along the stream banks in 2005–2008 at Ongar. Drawings by P. Biagi, inking by G. Almerigogna.
*1–3*, *5* – Levallois Mousterian flakes; *4* – blade; *6* – point.

*Fig. 6*. Location of the Levallois Mousterian artifacts collected in 2006 (circle) from the top of the horseshoe limestone terrace at Ongar. Photograph by P. Biagi.

on the surface of a limestone terrace close to the Baloch village of Arzi, east of the national road, a few kilometres north of Hyderabad (Biagi, 2010).

### *The Middle Paleolithic assemblages of the Rohri Hills (Upper Sindh) and the Thar Desert (Rajastan)*

Middle Paleolithic finds have been recovered also from the Rohri Hills in Upper Sindh (Allchin B., 1976), whose central-western terraces were systematically surveyed between 1994 and 2002 by members of the Joint Rohri Hills Project (Starnini, Biagi, 2011).

The Rohri Hills extend east of the Indus. At their northern edge the river turns westwards, where it flows across the Bukkur Gorge between Sukkur and Rohri, while their eastern side is marked by the old Hakra riverbed (present-day Nara Canal). They consist of Eocene, Brahui limestone formations very rich in excellent quality flint seams, which started to be exploited during the Early Paleolithic (De Terra, Paterson, 1939: 331). The Rohri hilltops are very rich in archaeological sites, among which are flint knapping workshops of differing ages, from the Acheulian Paleolithic to the Mature Indus period (Biagi, Cremaschi, 1991). The hills landscape is generally described as a steppe desert characterised by very low precipitation (Seth, 1978: Fig. 2), with a June maximum temperature reaching 46 °C (Ahmad, 1951).

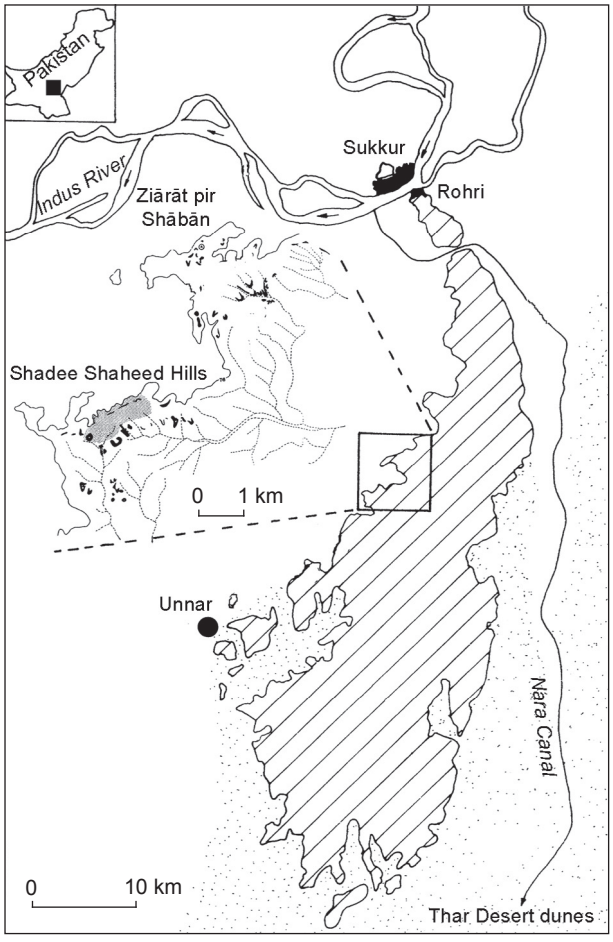


*Fig. 7*. Location of the most important Rohri Hills sites mentioned in the text. Drawing by P. Biagi.

The exploitation of the different Rohri Hills flint sources was not a "continuous" process that took place during the entire Paleolithic, as suggested by P.R. Chauhan (2009: 132); in contrast it occurred at specific periods of the Paleolithic, in well-defined areas of the hilltops, located mainly on the terraces south of Rohri, at the northernmost edge of the hills, the region east of the shrine of Shadee Shaheed, and the tomb of Ziārāt pir Shābān (Fig. 7). The structural and chromatic characteristics of the flint seams vary from plain to striated, according to the location of the outcrops. We know that the sources of the western-central part of the hills (Shadee Shaheed Hills) were exploited during well-defined periods of the Acheulian and Late (Upper) Paleolithic, and mined mainly during the 3rd millennium cal BC Mature Indus Civilisation (Starnini, Biagi, 2006).

A sequence for the Rohri Hills Paleolithic has been proposed thanks to the data gathered from the surveys and excavations carried out between 1994 and 1997 in the Shadee Shaheed Hills. Six main "series" have been defined on the basis of the techno-typological characteristics of the artifacts and their physical status, degree of weathering and thickness of surface patina. Series 5 has been attributed to a recent Middle Paleolithic phase, with just a few artifacts that "resemble Levallois flakes with the presence of dihedral and facetted platforms" and two cores "with centripetal removals, very similar to Levallois types" (Negrino, Kazi, 1996: 32).

According to the above authors, Series 5 is preceded by the Late Acheulian Series 4. A concentration of workshops of this period, for the specific production of bifacial handaxes from large flakes was recovered *in situ* at Ziārāt pir Shābān, partly contained in a thin soil probably to be referred to the first phase of the Last Glaciation (Biagi, Kazi, Negrino, 1996). Series 5 is followed by Series 6, characterised by subconical blade cores, blade-like flakes, and blade by-products recovered *in situ* from hundreds of workshops attributed to the beginning of the Late (Upper) Paleolithic (Biagi et al., 1998–2000). Only a few isolated and Levallois-like artifacts with flat or dihedral platforms, were collected from the surface of Ziārāt pir Shābān (Negrino, Kazi, 1996: Fig. 22).

The eastern and southern fringes of the hills are surrounded by the westernmost dunes of the Thar Desert where many Paleolithic sites have been discovered (Allchin B., Goudie, Hedge, 1978). According to some authors aeolian activity was particularly intense in the region around 150–100 ka BP, followed by aggradation

episodes that eventually led to the formation of calcrete horizons, and again around 60–40 ka BP (Dhir, Singhvi, 2012). The above two arid phases seal most of the Middle/Late Pleistocene horizons. Chipped stone artifacts of this period have been collected from both alluvium and stabilised dune deposits. The lake basins, whose shores are sometimes rich in Paleolithic artifacts, indicate a humid phase that developed in the area around 125–100 ka BP (Deotare et al., 2004: 23), while the red soils have been attributed to 58–39 ka BP (Tandon, Jain, 2001: 19).

Following other authors "the long Middle-Paleolithic humid phase" was a period of soil formation and dune weathering (Allchin B., Goudie, 1978: 309–310), datable after 70 ka, according to the luminescence chronology of the Luni River valley (Jain et al., 1999), while a wet phase developed during OIS 5 at Lake Didwana and other parts of the desert (Deotare et al., 2004).

The Middle Paleolithic assemblages from this region have been described as characterised by different tools among which are a few Levallois artifacts, which show "preparation of the striking platform" (Allchin B., Goudie, Hedge, 1978: 311). In effect typical Levallois cores and tools have never been recovered from any of the Thar Desert sites of Upper Sindh surveyed by the present authors, although they are reported from one Rohri Hills site by Allchin et al. (Ibid.: Tab. 8.3). Their occurrence is nevertheless not reported from Nawab Panjabi (Unnar) and Chancha Baluch, in the southwestern region of the Rohri Hills, or Hokra, Gurha and Shambar Lake in the Indian Thar Desert. The typological list of the chipped stone implements from these latter sites also includes variable percentages of burins, cleavers, handaxes, choppers and chopping tools, but no Levallois or Mousterian tools (Ibid.: Tab. 4.8). According to a recent synthesis of the Thar Desert Paleolithic, the Middle Paleolithic of the region "exhibits continuity from the preceding period" (Petraglia, Groucutt, Blinckhorn, 2013: 72), although the authors do not provide any further detail of the characters on which their assessment is based.

The archaeological sites of Unnar have been totally destroyed by quarrying in the 1980s (Biagi, 2008: Fig. 13). During a survey carried out in January 1986, a few Indus lithic workshops were noticed along the edge of the northwestern part of the hill, where Acheulian handaxes were also collected (Biagi, Cremaschi, 1988: 428). Unnar is of unique importance because it produced one of the most complete palaeopedological sequences of the hills (Biagi, Cremaschi, 1990: 32). Three hundred metres east of Unnar another hill, called "Unnar Hill", yielded many Paleolithic surface finds, among which are a few Levallois-like flakes, most probably incorrectly described as Protolevallois (Biagi, Cremaschi, 1988: 429).

Nothing is known of Chancha Baluch since this locality is not reported from any official 1:50000 Survey of Pakistan map. Its location is unknown to both local authorities and villagers. From Chancha Baluch, supposedly some 4 km from Kot Diji, B. Allchin and his colleagues (Allchin B., Goudie, Hedge, 1978: 284) describe, and partly illustrate, a chipped stone assemblage composed of different types of cores and tools, among which are blades and blade cores, carinated scrapers, burins, adzes, cleavers and chopping tools, which does not find parallels in any assemblage from other sites in the Rohri Hills. The above authors compare these tools with those from Hokra, approximately 5 km northeast of Budha Pushkar in Rajastan and other sites in the same area (Ibid.: Tab. 4.8). Although it is not in the scope of this paper to discuss in detail the old finds, it is nevertheless important to mention them, because the typology and structure of those assemblages is absolutely different from those recovered by A.R. Khan at Ongar. As mentioned above, these latter are represented by circular, turtle-shaped Levalloisian cores with centripetal strokes for the detachment of flakes, different types of side and transversal scrapers on Levallois flakes with *chapeau de gendarme* facetted butt, one typical Mousterian point, typical Levallois flakes and a few (wide) blades. Given the absence of any of the above tools from the sites reported by B. Allchin and his colleagues (Ibid.: Tab. 8.9b), and the heterogeneity of the surface finds, which include also burins, adzes, cleavers and chopping tools (Ibid.: Tab. 8.7), their attribution to the Middle Paleolithic is disputable. According to the characteristics of the assemblages described above, there is no doubt that the techno-typological differences between the Middle Paleolithic of the Thar Desert and the typical Levallois Mousterian assemblages from Ongar and Karachi sites are striking.

## Discussion

The research carried out on the European human fossil remains strongly supports the designation of Neanderthals as a separate species, i.e. *H. neanderthalensis*, which according to the data available just a few years ago, made no contribution to the evolution of modern humans (Krings et al., 1997), while more recent evidence shows their possible interbreeding with modern humans at least in Central Asia (Viola, 2009: 215).

Although the chronology of the Middle to Upper Paleolithic boundary remains unsolved, both lithic techno-typology and the raw materials employed show an abrupt change at the onset of the Aurignacian and Baradostian supporting the impression that Neanderthals were replaced by anatomically modern humans in most of Eurasia (Jöris et al., 2011). The general picture is nevertheless still uncertain and controversial (Zilhão, 2010b), and even more complex moving further to the east

(Glantz et al., 2008), given the presence of transitional (Early Upper Paleolithic and Initial Upper Paleolithic) complexes in many regions that are supposed to have been produced by modern humans, sometimes predating the Aurignacian assemblages *sensu lato* (Bar-Yosef, Pilbeam, 2000).

Nevertheless, the Levallois Mousterian assemblages from Lower Sindh display characteristic techno-typological features, among which are discoid turtle cores with centripetal flake detachment, unretouched Levallois points, side and transversal scrapers, Levallois flakes, and blades with facetted, *chapeau de gendarme* butts, and last but not least the presence of one Mousterian point (Fig. 3–5). The present authors propose that these assemblages mark the southeasternmost spread of *H. neanderthalensis* (Biagi, 2006, 2008; Biagi, Starnini, 2011) who reached the northwestern periphery of the Indian Subcontinent most probably following the Anatolia-Caucasus-Mesopotamia corridor. The fact that the Neanderthals did not move beyond the Indus might suggest the presence of a geographic/ecological barrier, as already put forward in a purely theoretical dispersal route of modern humans (Stock et al., 2007: Fig. 1). Although we know almost nothing of the Late Pleistocene location and environmental characteristics of the Indus delta, however we can argue that during this period the morphology of Lower Sindh was dramatically different from that of both the present and the Hellenistic period (Wilhelmy, 1968; Eggermont, 1975; Biagi, 2011).

Nevertheless, several Levallois-like flakes with flat, oblique platform have been collected from sites located further to the east, for instance Baridhani, and other areas in India (Gordon, 1958: Fig. 2; Allchin B., Goudie, Hedge, 1978: 211). Furthermore, flakes with Levallois-like characteristics were collected from the surface of several Rohri Hills sites, among which is Unnar (Negrino, Kazi, 1996: 31). The occurrence of Levallois cores and flakes has been reported from Sanghao Cave in the North-West Frontier Province (Allchin B., 1973) and the "Late Soan B" of northern Pakistan (Movius, 1948; De Terra, Paterson, 1939: Pl. XLII). Although the term 'Soan' (Paterson, Drummond, 1962) and its subdivision have been recently reconsidered (Chauhan, 2007), some Soanian industries show a general resemblance to the Late Levalloisian of Europe, because of the occurrence of both Levallois core technology and typical Levallois points with facetted platforms (Krishnaswamy, 1947: Fig. 6; Gordon, 1958: 10), which led some authors to hypothesise the possible presence of Neanderthals in the territory (Sen, 1976: 64).

The current evidence from Lower Sindh would suggest the existence of an ideal line marking the southeasternmost distribution of the Levallois technique, roughly from the course of the Malir River (Karachi), in the south, to Arzi, in the north, while at present Levallois tools are not reported from other parts of the Indus Valley, most probably because of the absence of any systematic survey. Whether this boundary is to be related to the southeasternmost spread of *H. neanderthalensis* can be debated, criticised or rejected, although the available evidence would suggest that it exists indeed.

The Levallois Mousterian assemblages discovered along the limestone terraces that extend in a south–north direction just to the west of the Indus alluvial plain in Lower Sindh, might mark the southeasternmost boundary of a Levallois Mousterian cultural province. Levallois Mousterian industries have never been reported from sites located east of the Indus River course, since "the Middle Paleolithic of India is non-Mousterian," as recently agreed also by Boivin and her colleagues (Boivin et al., 2013: Suppl. Material B), on the basis of the evidence provided above (Biagi, 2005, 2006, 2008; Biagi, Starnini, 2011).

The data reported above seem to reinforce a view recently put forward, according to which "the early Middle Paleolithic (or Middle Stone Age) of India and Nepal probably developed indigenously" (Dennell, 2009: 144). This would imply the existence of a clear boundary, possibly marked by the axis of the Indus River, which contrasts with the opinion expressed by V.A. Ranov for Central Asia "of a migration from the west, most likely from the Near East" (2001: 23).

## Conclusion

The Late Pleistocene, Middle Paleolithic chipped stone assemblages of Lower Sindh are represented by typical Levallois Mousterian complexes. Their occurrence along the western side of the Lower Indus Valley is so far unique for the Indian Subcontinent. This evidence opens a debate on a few important topics regarding: (1) the southeasternmost distribution of the Levallois Mousterian and its relationships with the Middle (and Late) Paleolithic of the Indian Subcontinent; (2) the techno-typological and chronological sequence of the Paleolithic complexes of Sindh; (3) the easternmost distribution of the Aurignacian and its comparison with the Late (Upper) Paleolithic industries of India; (4) the definition of the human species responsible for the production of the above chipped stone assemblages; and (5) the chronology of the events that took place in the area during the Middle Paleolithic.

1. The typical Levallois Mousterian industries discovered in Lower Sindh do not find any close parallel in other regions of the Indian Subcontinent. They can be compared with other assemblages from Iran in the west and Central Asia in the north, many of which are attributed to *H. neanderthalensis*. East of the Indus, flake assemblages, sometimes with a low Levallois-

like component, characterise the Middle Paleolithic. As reported above, even the Middle Paleolithic industries from the Rohri Hills and the Thar Desert differ from those from Ongar and Karachi province in the southwest.

2. The Rohri Hills have always been considered the most important lithic resources of the Indus Valley, exploited from the Early Paleolithic to the Bronze Age (Allchin R., Allchin B., 1997: 69), although they had never been systematically surveyed before the 1990s, with the exception of brief visits paid to a few easily accessible areas close to Rohri and the national road to Karachi, around Kot Diji (Allchin B., 1976). Consequently almost nothing was known of the real richness of their archaeology, the characteristics of the innumerable workshops and flint mines scattered at the top of the mesas, and the chrono-cultural attribution of most of the sites. Many Pleistocene flint workshops of the Rohri Hills have been attributed to the Late (Upper) Paleolithic on the basis of the distinctive techno-typological characteristics of the chipped stone artifacts, mainly composed of subconical cores with recurrent blade and blade-like flake detachments, although one single, long end scraper on a blade was also recovered. Furthermore, their attribution to the Late (Upper) Paleolithic (see also (Allchin B., Goudie, Hedge, 1978: 280)) has been based on (a) the thickness and colour of the aeolized, patinated surfaces that differ from those of the Early Paleolithic (Acheulian) and Bronze Age (Indus Civilisation) artifacts (Biagi, Cremaschi, 1988: 426); (b) the stratigraphic position of the assemblages (Biagi et al., 1998–2000); and (c) the occurrence of bifacial picks, most probably utilised to extract flint nodules (Biagi, 2008: Fig. 19). In the Rohri Hills, both Acheulian handaxes, blade and blade-like flakes removed from Late (Upper) Paleolithic subconical cores were obtained by hard-hammering, employing corticated flint pebbles (Biagi, Kazi, Negrino, 1996). Nothing is known of the Middle Paleolithic manufacturing technique, given the absence of flint workshops of this period in the Shadee Shaheed Hills. The geographic distribution of the few Acheulian and the much more numerous Late (Upper) Paleolithic workshops on the hills is very different. A similar situation is known at Ongar, although most of the Levallois assemblages from this area do not come from the hilltops, where Acheulian, Late (Upper) Paleolithic workshop and Indus mines have been mapped, but from one of the lower alluvial terraces (Biagi, Nisbet, 2011).

3. The easternmost distribution of the Aurignacian and Baradostian complexes covers a territory similar to that of the Levallois Mousterian. They are known in Iran (Otte, Kozłowski, 2007) and Central Asia (Otte, Derevianko, 2001; Otte, Kozłowski, 2011: Fig. 8), but are not reported from the Indian Subcontinent, where the beginning of the Late (Upper) Paleolithic is characterised by quite different assemblages (Murty, 1979) and industries with geometric microliths in south-central India (Clarkson et al., 2009). This evidence serves to stimulate the old debate on the continuity/transition or discontinuity/replacement of the Middle-Late (Upper) Paleolithic in this territory of South Asia (Kuhn et al., 2004).

4. The absence of Late Pleistocene human remains in India makes the general picture even more difficult to interpret. Neanderthal bones are known from Iran and Central Asia, where they are associated with Levallois Mousterian assemblages. Most of the Levallois Mousterian sequences in the Zagros are replaced by Aurignacian/Baradostian occupation layers; while, in Central Asia, Initial Upper Paleolithic or Eearly Upper Paleolithic assemblages are considered to be transitional to the Upper Paleolithic. Both Levallois Mousterian and Aurignacian sites are presently unknown in the Indian Subcontinent, where the only exceptions are the sites of Lower Sindh, and the presence of few, typical Levallois tools in the Late Soan of the North-West Frontier Province (De Terra, Paterson, 1939: Pl. XLII), and perhaps Sanghao Cave in north Pakistan (Derevyanko, Lü Zun-E, 1992: Fig. 3). Therefore it seems reasonable to conclude that also in the Indian Subcontinent "without actual, direct fossil association, it is impossible to assign a human type as the matter of most Middle Paleolithic industries in Eastern Europe and Central Asia" (Marks, Monigal, 2004: 78).

5. The Middle (and Late) Paleolithic chronological sequence of the entire Indian Subcontinent is still poorly known, and supported by very few radiometric dates (see (Chakrabarti, 1999: 74)) on which most authors often rely, at least as regards the Thar Desert sites. This is one of the main reasons why it is currently impossible not only to frame the Ongar and other Levallois Mousterian assemblages of Lower Sindh into the general picture of the Indian Middle Paleolithic, but also to follow the sequence of the different cultural event that took place during the Late Pleistocene in most of the study areas.

To sum up, Sindh falls into the complex and fragmentary picture described above of which little is known, and even less is understood (Marks, 2012). In contrast with Lower Sindh, where typical Levallois Mousterian assemblages are present, the chipped stone industries from the Indian Thar Desert and the Rohri Hills sites would point to a different, perhaps independent, development of the Indian Middle and Late Paleolithic.

## Acknowledgments

The authors are very grateful to Prof. A.R. Khan (Karachi University) who promoted and favoured the study of the chipped stone assemblages from Ongar, at present stored in the Geography Department, Karachi University. The 2005–2008 surveys at Ongar were conducted in collaboration between

Ca' Foscari University, Venice (I), and Sindh University, Jamshoro (Pakistan). The authors are very grateful to Mir Atta M. Talpur and Mir Farooq A. Talpur, and all the other people and friends in Sindh who did their best to organise the fieldwork seasons at Ongar. Special thanks are due to Prof. W. Henke (Mainz University, Germany), Prof. J.K. Kozłowski (Krakow University, Poland), Prof. K. Szymczak (Warsaw University, Poland), and two anonymous reviewers for their useful comments and suggestions, as well as to Prof. C. Bonsall (Edinburgh University, United Kingdom) for the revision of the original English text. The research at Ongar has been made possible thanks to the financial support of the Italian Ministry of Foreign Affairs (MAE, Rome), Ca' Foscari University (Venice), and Sindh University (Jamshoro). This paper has been written thanks to a Ca' Foscari University Archaeological Research Grant.

## References

**Ahmad K.S. 1951**
Climatic regions of West Pakistan. *Geographical Review*, vol. 4 (1): 1–35.

**Allchin B. 1973**
Blade and burin industries of West Pakistan and Western India. In *South Asian Archaeology*, N. Hammond (ed.). London: Duckworth, pp. 39–50.

**Allchin B. 1976**
Paleolithic sites in the plains of Sind and their geographical implications. *The Geographical Journal*, vol. 142 (3): 471–489.

**Allchin B. 1992**
Middle Paleolithic cultures. In *History of Civilizations in Central Asia.* Vol. I: The Dawn of Civilization: Earliest Times to 700 BC, H.A. Dani, V.M. Masson (eds.). Paris: UNESCO Publishing, pp. 65–88.

**Allchin R., Allchin B. 1997**
Origins of a Civilization: The Prehistory and Early Archaeology of South Asia. New Delhi: Viking.

**Allchin B., Goudie A. 1978**
Climatic change in the Indian Desert and North-West India during the Late Pleistocene and Early Holocene. In *The Environmental History of the Near and Middle East*, W.C. Brice (ed.). London, New York, San Francisco: Academic Press, pp. 307–318.

**Allchin B., Goudie A., Hedge K. 1978**
The Prehistory and Palaeogeography of the Great Indian Desert. London, New York, San Francisco: Academic Press.

**Amirkhanov H.A. 2006**
Kamenny vek Yuzhnoi Aravii. Moscow: Nauka.

**Armitage S.J., Jasim S.A., Marks A.E., Parker A.G., Usik V.I., Uerpmann H.-P. 2011**
The southern route "Out of Africa": Evidence for an early expansion of modern humans into Arabia. *Science*, vol. 331: 453–456.

**Bar-Yosef O. 2011**
A geographic overview of Neanderthal-Modern Human encounters. In *Casting the Net Wide: Papers in Honor of Glynn Isaac and his Approach to Human Origins Research*, J. Sept, D. Pilbeam (eds.). Oxford, Oakville: Oxbow Books, pp. 193–212. (American School of Prehistoric Research Monograph Ser.).

**Bar-Yosef O., Belfer-Cohen A., Adler D.S. 2006**
The implications of the Middle-Upper Paleolithic chronological boundary in the Caucasus to Eurasian prehistory. *L'Anthropologie*, vol. 44 (1): 49–60.

**Bar-Yosef O., Pilbeam D. 2000**
Afterword. In *The Geography of Neandertals and Modern Humans in Europe and the Greater Mediterranean*, O. Bar-Yosef, D. Pilbeam (eds.). Cambridge, MA: Peabody Museum, Harvard Univ., pp. 182–187. (Peabody Museum Bull.; No. 8).

**Bar-Yosef O., Wang Y. 2012**
Paleolithic archaeology in China. *Annual Review of Anthropology*, vol. 41: 319–335.

**Beyin A. 2006**
The Bab al Mandab vs the Nile-Levant: An appraisal of the two dispersal routes for early modern humans out of Africa. *African Archaeological Review*, vol. 26: 5–30.

**Beyin A. 2011**
Upper Pleistocene human dispersals out of Africa: A review of the current state of the debate. *International Journal of Evolutionary Biology*, vol. 2011: 1–17. DOI: 10.4061/2011/615094

**Biagi P. 2005**
Ongar revisited. *Sindhological Studies*, vol. 21 (1/2): 1–21.

**Biagi P. 2006**
The Levalloisian assemblages of Sindh (Pakistan) and their importance in the Middle Paleolithic of the Indian Subcontinent. In *Archaeology of Early Northeastern Africa. In Memory of Lech Krzyżaniak*, K. Kroeper, M. Chłodnicki, M. Kobusiewicz (eds.). Poznań: Archaeological Museum, pp. 1005–1017. (Studies in African Archaeology; vol. 9).

**Biagi P. 2008**
The Paleolithic settlement of Sindh: A review. *Archäologische Mitteilungen aus Iran and Turan*, vol. 40: 1–26.

**Biagi P. 2010**
Archaeological surveys in Lower Sindh: Preliminary results of the 2009 Season. *Journal of Asian Civilizations*, vol. 33 (1): 1–42.

**Biagi P. 2011**
Changing the prehistory of Sindh and Las Bela coast: Twenty-five years of Italian contribution. *World Archaeology*, vol. 43 (4): 523–537.

**Biagi P., Cremaschi M. 1988**
The early Paleolithic sites of the Rohri Hills (Sind, Pakistan) and their environmental significance. *World Archaeology*, vol. 19 (3): 421–433.

**Biagi P., Cremaschi M. 1990**
Geoarchaeological investigations on the Rohri Hills (Sind, Pakistan). In *South Asian Archaeology 1987. Proceedings of the Ninth International Conference of the Association of South Asian Archaeologists in Western Europe, Held in the Fondazione Giorgio Cini, Island of San Giorgio Maggiore, Venice*, pt. 1, M. Taddei (ed.). Rome: Istituto Italiano per il Medio ed Estremo Oriente, pp. 31–42. (Serie Orientale Roma; vol. 66/1–2)

**Biagi P., Cremaschi M. 1991**
The Harappan flint quarries of the Rohri Hills (Sind, Pakistan). *Antiquity*, vol. 65 (246): 97–102.

**Biagi P., Kazi M.M., Madella M., Ottomano C. 1998-2000**
Excavations at the Late (Upper) Paleolithic site of Ziarat Pir Shaban 2 (ZPS2) in the Rohri Hills, Sindh, Pakistan. *Origini*, vol. 22: 111–132.

**Biagi P., Kazi M.M., Negrino F. 1996**

An Acheulian workshop at Ziarat Pir Shaban on the Rohri Hills, Sindh, Pakistan. *South Asian Studies*, vol. 12: 49–62.

**Biagi P., Nisbet R. 2010**

The prehistoric flint mines at Jhimpir in Lower Sindh (Pakistan). *Antiquity Project Gallery*, vol. 84 (325). URL: http://antiquity.ac.uk/projgall/nisbet325/

**Biagi P., Nisbet R. 2011**

The Paleolithic sites at Ongar in Sindh, Pakistan: A precious archaeological resource in danger. *Antiquity Project Gallery*, vol. 85 (329). URL: http://antiquity.ac.uk/projgall/biagi329/

**Biagi P., Starnini E. 2008**

The Bronze Age Indus quarries of the Rohri Hills and Ongar in Sindh (Pakistan). In *Geoarchaeology and Archaeomineralogy*, R.I. Kostov, B. Gaydarska, M. Gurova (eds.). Sofia: St. Ivan Rilski, pp. 77–82.

**Biagi P., Starnini E. 2011**

Neanderthals at the southeasternmost edge: The spread of Levalloisian Mousterian in the Indian Subcontinent. In *Papers in Honour of Viola T. Dobosi*, K. Biro, M. András (eds.). Budapest: Hungarian National Museum, pp. 5–14.

**Blanford W.T. 1880**

The Geology of Western Sind. *Memoirs of the Geological Survey of India*, (Calcutta), vol. 17 (1): 1–210.

**Boëda E. 1994**

Le concept Levallois: Variabilité des méthodes. Paris: CNRS éditions. (Monographie du CRA; No. 9).

**Boivin N., Fuller D.Q., Dennell R., Allaby R., Petraglia M.D. 2013**

Human dispersal across diverse environments of Asia during the Upper Plesitocene. *Quaternary International*. DOI: 10.1016/j.quaint.2013.01.008.

**Bulbeck D. 2007**

A parsimonious model for *Homo sapiens* colonization of the Indian Ocean Rim and Sahul. *Current Anthropology*, vol. 48 (2): 315–321.

**Cavalli Sforza L.L., Pievani T. 2011**

Homo Sapiens La Grande Storia della Diversa Umanità. Torino: Codice Edizioni.

**Chakrabarti D.L. 1999**

India – An Archaeological History: Paleolithic Beginnings to Early Historic Foundations. New Delhi:Oxford Univ. Press.

**Chauhan P.R. 2007**

Soanian core and core-tools from Toka, northern India: Towards a technological organization. *Journal of Anthropological Archaeology*, vol. 26 (3): 412–441.

**Chauhan P.R. 2009**

The South Asian Paleolithic record and its potential for transitions studies. In *Sourcebook of Paleolithic Transitions Methods, Theories, and Interpretations*, M. Camps, P.R. Chauhan (eds.). Berlin, Heidelberg, New York: Springer, pp. 121–139.

**Clarkson C., Petraglia M., Korisettar R., Haslam M., Boivin N., Crowther A., Ditchfield P., Fuller D., Harris C., Connell K., James H., Koshy J. 2009**

The oldest and longest enduring microlithic sequence in India: 35000 years of modern human occupation and change at the Jwalapuram Locality 9 rock shelter. *Antiquity*, vol. 83: 326–348.

**Conard N. 2007**

Cultural evolution in Africa and Eurasia during the Middle and Late Pleistocene. In *Handbook of Paleoanthropology.* Vol. 3: Phylogeny of Hominids, W. Henke, I. Tatterstal (eds.). Berlin, Heidelberg, New York: Springer, pp. 2001–2037.

**Dashtizadeh A. 2010**

Preliminary report on the discovery of a Late Lower Paleolithic and Middle Paleolithic site on the Island of Qeshm, Persian Gulf. *Iranian Archaeology*, vol. 1 (1): 15–20.

**Dennell R. 2009**

The Paleolithic Settlement of Asia. Cambridge: Cambridge World Archaeology.

**Deotare B.C., Kajale M.D., Rajaguru S.N., Basavaiah N. 2004**

Late Quaternary geomorphology, palynology and magnetic susceptibility of playas in western margin of the Indian Thar Desert. *Journal of Indian Geophysical Union*, vol. 8 (1): 15–25.

**Derevyanko A.P., Lü Zun-E. 1992**

Upper Paleolithic cultures. In *History of Civilizations in Central Asia.* Vol. I: The Dawn of Civilization: Earliest Times to 700 BC, H.A. Dani, V.M. Masson (eds.). Paris: UNESCO Publishing, pp. 89–108.

**De Terra H., Paterson, T.T. 1939**

The Ice Age in the Indian Subcontinent and associated Human Cultures with Special Reference to Jammu, Ladakh, Sind, Liddar and Central & Peninsular India. Washington DC: Carnegie Institute.

**Dhir R.P., Singhvi A.K. 2012**

The Thar Desert and its antiquity. *Current Science*, vol. 102 (7) : 1001–1008.

**Dupree L. 1972**

Prehistoric research in Afghanistan (1959–1966). *Transactions of the American Philosophical Society*, vol. 62 (4): 5–84.

**Eggermont P.H.L. 1975**

Alexander's campaigns in Sind and Balochistan and the siege of the Brahmin town of Harmatelia. Leuven: Leuven Univ. Press. (Orientalia Lovaniensa Analecta; vol. 3).

**Fairservis W.A. Jr. 1975**

The Roots of Ancient India. The Archaeology of Early Indian Civilization. The Chicago, London: Univ. of Chicago Press.

**Febre V., Condemi S., Degioanni A. 2009**

Genetic evidence of geographical groups among Neanderthals. *PLoS ONE*, vol. 4 (4): e5151. DOI: 10.1371/journal.pone. 0005151: 1–8.

**Field J.S., Petraglia M.D., Mirazón Lahr M. 2007**

The southern dispersal hypothesis and the South Asian archaeological record: Examination of dispersal routes through GIS analysis. *Journal of Anthropological Archaeology*, vol. 26: 88–108.

**Flam L. 1999**

The prehistoric Indus River system and the Indus civilization in Sind. *Man and Environment*, vol. 24 (2): 35–69.

**Foley R. 1987**

Hominid species and stone-tool assemblages: how are they related? *Antiquity*, vol. 61 (233): 380–392.

**Foley R., Lahr M.M. 1997**

Mode 3 technologies and the evolution of modern humans. *Cambridge Archaeological Journal*, vol. 7 (1): 3–36.

**Giles Pacheco F., Santiago Perez A., Gutierrez Lopez J.M., Mata Almonte E., Aguilera Rodriguez L. 2000**

The transition from the final Acheulian to the Middle Paleolithic in the south of the Iberian Peninsula. In *Neanderthals on the Edge*, C.B. Stringer, R. N. E. Barton, C. Finlayson (eds.). Oxford: Oxbow Books, pp. 41–48.

**Giosan L., Constantinescu S., Clift P.D., Tabrez A.R., Danish M., Inam A. 2006**

Recent morphodynamics of the Indus delta shore and shelf. *Continental Shelf Research*, vol. 26: 1668–1684.

**Glantz M.M, Viola B., Wrinn P., Chikisheva T., Derevianko A., Krivoshapkin A., Islamov U., Suleimanov R., Ritzman T., 2008**

New hominin remains from Uzbekistan. *Journal of Human Evolution*, vol. 55 (2): 223–237.

**Gordon D.H. 1958**

The Pre-historic Background of the Indian Culture. Bombay: Tripathi Ltd.

**Haslam M., Clarkson C., Petraglia M., Korisettar R., Jones S., Shipton C., Ditchfield P., Ambrose S.H. 2010**

The 74 ka Toba super-eruption and southern Indian hominins: archaeology, lithic technology and environments at Jwalapuram Locality 3. *Journal of Archaeological Science*, vol. 37 (12): 3370–3384.

**Henke W., Hardt T. 2011**

The genus *Homo*: Origin, speciation and dispersal. In *Continuity and Discontinuity in the Peopling of Europe: One Hundred Fifty Years of Neanderthal Study*, S. Condemi, G.-C. Weniger (eds.). Berlin, Heidelberg, New York: Springer, pp. 17–45.

**Hublin J.-J. 2000**

Modern-nonmodern hominid interactions: A Mediterranean perspective. In *The Geography of Neandertals and Modern Humans in Europe and the Greater Mediterranean*, O. Bar-Yosef, D. Pilbeam (eds.). Cambridge, MA: Peabody Museum, Harvard Univ., pp. 157–182. (Peabody Museum Bull.; No. 8).

**Jain M., Tandon S.K., Bhatt S.C., Singhvi A.K., Mishra S. 1999**

Alluvial and aeolian sequences along the River Luni, Barner District: Physical stratigraphy and feasibility of luminescence chronology methods. In *Vedic Sarasvati: Evolutionary History of a Lost River*, B.P. Radhakrishna, S.S. Merh (eds.). Bangalore: Geological Society of India, pp. 273–295. (Memoirs of Geological Society of India; vol. 42).

**James H.V.A. 2007**

The emergence of modern human behavior in South Asia: A review of the current evidence and discussion of its possible implications. In *The Evolution and History of Human Populations in South Asia*, M.D. Petraglia, B. Allchin (eds.). Dordrecht: Springer, pp. 201–227.

**James H.V.A., Petraglia M.D. 2005**

Modern human origins and the evolution of behaviour in the Later Pleistocene record of South Asia. *Current Anthropology*, vol. 46, Suppl.: S3–S27.

**James H.V.A., Petraglia M.D. 2009**

The Lower to Middle Paleolithic transition in South Asia and its implications for hominin cognition and dispersal. In *Sourcebook of Paleolithic Transitions Methods, Theories, and Interpretations*, M. Camps, P.R. Chauhan (eds.). Berlin, Heidelberg, New York: Springer, pp. 255–264.

**Jaubert J., Biglari F., Mourre V., Bruxelles L., Bordes J.-G., Shidrang S., Naderi R., Mashkour M., Maureille B., Mallye J.-B., Quinif Y., Rendu W., Laroulandie V. 2009**

The Middle Paleolithic occupation of Mar Tarik, a New Zagros Mousterian site in Bisotun Massif (Kermanshah, Iran). In *Iran Palaeolithic*, M. Otte, F. Biglari, J. Jaubert (eds.).Oxford: Archaeopress, pp. 7–27. (BAR Internat. Ser.; No. 1968).

**Jöris O., Street M., Terberger T., Weniger B. 2011**

Radiocarbon dating the Middle to Upper Paleolithic transition: The demise of the last Neanderthals and the first appearance of anatomically modern humans in Europe. In *Continuity and Discontinuity in the Peopling of Europe: One Hundred Fifty Years of Neanderthal Study, Vertebrate Paleobiology and Paleoanthropology*, S. Condemi, B. Weniger (eds.). DOI: 10.1007/978-94-007-0492-3_22: 239-298.

**Khan A.R. 1979a**

Ancient settlements in Karachi Region. In *Studies in the Geomorphology and Prehistory of Sind*, A.R. Khan (ed.). Jamshoro: Pakistan Studies Centre, Univ. of Sind, pp. 1–24. (Grassroots; vol. III (2), Special Issue).

**Khan A.R. 1979b**

Paleolithic sites discovered in the Lower Sindh and their significance in the prehistory of the country. In *Studies in the Geomorphology and Prehistory of Sind*, A.R. Khan (ed.). Jamshoro: Pakistan Studies Centre, Univ. of Sind, pp. 80–82. (Grassroots; vol. III (2), Special Issue).

**Krause J., Orlando L., Serre D., Viola B., Prüfer K., Richards M.P., Hublin J.-J., Hänni C., Derevianko A.P., Pääbo S. 2007**

Neanderthals in Central Asia and Siberia. *Nature*, vol. 449: 902–904.

**Krings M., Stone A.C., Schmitz R.W., Krainitzki H., Stoneking M., Pääbo S. 1997**

Neanderthal DNA sequences and the origins of modern humans. *Cell*, vol. 90: 19–30.

**Krishnaswamy V.D. 1947**

Stone Age India. *Ancient India*, vol. 3: 11–57.

**Krivoshapkin A.I., Anoikin A.A., Brantinghan P.J. 2006**

The lithic industry of Obi-Rakhmat Grotto, Uzbekhistan. *Indo-Pacific Prehistory Association Bull.*, vol. 26: 5–19.

**Kuhn S.L., Branthingham P.J., Kerry S.L. 2004**

The Early Upper Paleolithic and the origins of modern human behavior. In *The Early Upper Paleolithic Beyond Western Europe*, P.J. Branthingham, S.L. Kuhn, K.W. Kerry (eds.). Berkeley, Los Angeles, London: Univ. of California Press, pp. 242–248.

**Kuhn S.L., Stiner M.C., Güleç E., Özer I., Yilmaz H., Baykara I., Açikkol A., Goldberg P., Martínez Molina K., Ünay E., Suata-Alpaslan F. 2009**

The Early Upper Paleolithic occupations at Üçağizli Cave (Hatay, Turkey). *Journal of Human Evolution*, vol. 56: 87–113.

**Marks J. 2012**

My ancestors, myself. *Aeon Magazine*, No. 12, Nov.: 1–7.

**Marks A.E., Monigal K. 2004**

Origin of the European Upper Paleolithic, seen from Crimea: Simple myth or complex reality? In *The Early Upper Paleolithic Beyond Western Europe*, P.J. Branthingham, S.L. Kuhn, K.W. Kerry (eds.). Berkeley, Los Angeles, London: Univ. of California Press, pp. 64–79.

**Meignen L. 1988**

Le Paléolithique moyen au Levant sud et central: Que nous apprennent les données récentes ? In *Préhistoire d'Anatolie. Genèse des deux mondes*, M. Otte (ed.). Liége: Univ. de Liége, pp. 685–708. (ERAUL; No. 85 (2)).

**Misra V.N. 1977**

Prehistory and palaeoenvironment of Rajastan. In *Ecology and Archaeology of Western India*, D.P. Agrawal, B.M. Pande (eds.). Delhi: Concept Publishing Company, pp. 31–54.

**Misra V.N. 2001**

Prehistoric human colonization of India. *Journal of Biosciences*, vol. 26 (4): 491–531.

**Misra V.N., Rajaguru S.N. 1989**

Palaeoenvironment and prehistory of the Thar Desert, Rajastan, India. In *South Asian Archaeology 1985*, K. Frifelt, P. Sørensen (eds.). London: Curzon Press, pp. 296–320. (Scandinavian Instit. of Asian Studies Occasional Papers; No. 4).

**Movius H.L. 1948**

The Lower Paleolithic cultures of Southern and Eastern Asia. *Transactions of the American Philosophical Society*, vol. 38 (4): 329–420.

**Movius H.L. 1953**

Paleolithic and Mesolithic sites in Soviet Central Asia. *Proceedings of the American Philosophical Society*, vol. 97 (4): 383–421.

**Murty M.L.K. 1979**

Recent research on the Upper Paleolithic phase in India. *Journal of Field Archaeology*, vol. 6: 301–320.

**Negrino F., Kazi M.M. 1996**

The Paleolithic industries of the Rohri Hills (Sindh, Pakistan). *Ancient Sindh*, vol. 3: 3–78.

**Otte M., Derevianko A. 2001**

The Aurignacian in Altai. *Antiquity*, vol. 75 (287): 44–48.

**Otte M., Kozłowski J.K. 2007**

L'Aurignacien du Zagros. Liége: Univ. de Liége. (ERAUL; No. 118).

**Otte M., Kozłowski J.K. 2011**

La Transition du Moustérien à l'Aurignacien au Zagros. In *The Lower and Middle Palaeolithic in the Middle East and Neighbouring Regions*, J.-M. Le Tensorer, R. Jagher, M. Otte (eds.). Liége: Univ. de Liége, p. 183–195. (ERAUL; No. 126).

**Pal J.N. 2002**

The Middle Paleolithic culture of South Asia. In *Indian Archaeology in Retrospect*. Vol. I: Prehistory, S. Settar, R. Korisettar (eds.). Delhi: Manohar, pp. 67–83. (Archaeology of South Asia, ICHR).

**Paterson T.T., Drummond B.J.H. 1962**

Soan the Paleolithic of Pakistan. Karachi: Ferozsons. (Memoirs of the Department of Archaeology in Pakistan; vol. 2).

**Petraglia M.D., Alsharekh A. 2003**

The Middle Paleolithic of Arabia: Implications for modern human origins, behaviour and dispersal. *Antiquity*, vol. 77 (298): 671–684.

**Petraglia M.D., Alsharekh A. , Breeze P., Clarkson C., Crassard R., Drake N.A., Groucutt H.S., Jennings R., Parker A.G., Parton A., Roberts R.G., Shipton G., Matheson C., al-Omari A., Veall M.-A. 2012**

Hominin dispersal into the Nefud Desert and Middle Paleolithic settlement along the Jubbah Palaeolake, Northern Arabia. *PLoS ONE*, vol. 7 (11): 1–21. DOI: 10.1371/journal. Pone.0049840

**Petraglia M.D., Groucutt H., Blinckhorn J. 2013**

Hominin evolutionary history in the Arabian Desert and the Thar Desert. In *Changing Deserts: Integrating People and Their Environment*, L. Mol, T. Stenberg (eds.). Cambridge: White House Press, pp. 61–82.

**Petraglia M., Korisettar R., Boivin N., Clarkson C., Ditchfield P., Jones S., Koshy J., Mirazón Lahr M., Oppenheimer C., Pyle D., Roberts R., Schwenninger J.-L., Arnold L., White K. 2007**

Middle Paleolithic assemblages from the Indian Subcontinent before and after the Toba super-eruption. *Science*, vol. 317: 114–116.

**Ranov V.A. 1995**

The Levallois paradox. In *The Definition and Interpretation of Levallois Technology*, H.-L. Dibble, O. Bar-Yosef (eds.). Madison, WI: Prehistory Press, pp. 69–78. (Monographs in World Archaeology; vol. 23).

**Ranov V.A. 2001**

Loess-palaeosoil formation of Southern Tajikistan and the Loess Paleolithic. *Praehistoria*, No. 2: 7–27.

**Rose J.I., Usik V.I., Marks A.E., Hilbert Y.H., Galletti C.S., Parton A., Geiling J.M., Černý V., Morley M.W., Roberts R.G. 2011**

The Nubian complex of Dhofar, Oman: An African Middle Stone Age industry in Southern Arabia. *PLoS ONE*, vol. 6 (1): 1–22. DOI: 10.1371/Journal. pone. 0028239

**Rybin E.P., Kolobova K.A. 2009**

Sredny paleolit Altaya: Variabelnost i evolutsiya. *Stratum Plus*, vol. 1 (2005–2009): 33–78.

**Sen D. 1976**

Rethinking on the Lower Paleolithic of the Punjab (India and Pakistan). In *Le Paléolithique Inférieur et Moyen en Inde, en Asie Centrale, en Chine et dans le Sud-Est Asiatique*. *Union Internationale des Sciences Préhistoriques et Protohistoriques, IX^e Congrès*, A.K. Ghosh (ed.). Nice: pp. 60–64.

**Seth S.K. 1978**

The desiccation of the Thar Desert and its environs during protohistorical and historical periods. In *The Environmental History of the Near and Middle East*, W.C. Brice (ed.). London, New York, San Francisco: Academic Press, pp. 279–305.

**Starnini E., Biagi P. 2006**

Excavations at the Harappan flint quarry 862 on the Rohri Hills (Sindh, Pakistan). *Der Anschnitt*, vol. 19: 195–202.

**Starnini E., Biagi P. 2011**

The archaeological record of the Indus (Harappan) lithic production: The excavations of RH862 flint mine and flint knapping workshops on the Rohri Hills (Upper Sind, Pakistan). *Journal of Asian Civilizations*, vol. 34 (2): 1–60.

**Stock J.T., Mirazón Lahr M., Kulatilake S. 2007**

Cranial diversity in South Asia relative to modern human dispersal and global patterns of human variation. In *The*

*Evolution and History of Human Populations in South Asia*, M.D. Petraglia, B. Allchin (eds.). Berlin, Heidelberg, New York: Springer, pp. 245–268.

**Subbarao B. 1956**

Personality of India: A Study in the Development of Material Culture of India and Pakistan. Baroda: Maharaja Sayajirao University of Baroda. (Maharaja Sayajirao Univ. Archaeology Series; No. 3).

**Tandon S.K., Jain M. 2001**

Late Quaternary environments: Focus on the Thar and its western margin. In *First International Symposium on Kāmpilya Project*, B. Marcolongo (ed.). Padua: CNR, pp. 17–24.

**Trinkaus E., Biglari F. 2006**

Middle Paleolithic human remains from Bisutin Cave, Iran. *Paléorient*, vol. 32: 105–111.

**Viola B.T. 2009**

New Hominin Remains from Central Asia and Siberia: The Easternmost Neanderthals? Thesis submitted for Dr. re. Nat. Degree. Vienna: Vienna University, (unpublished).

**Vita-Finzi C., Copeland L. 1980**

Surface finds from Iranian Makran. *Iran*, vol. 18: 149–155.

**Wainwright G.J., Malik S.C. 1968**

Recent field research on the problems of archaeology and Pleistocene chronology in Peninsular India. *Proceedings of the Prehistoric Society*, vol. 33: 132–146.

**Wilhelmy H. 1968**

Indusdelta und Rann of Kutch. *Erdkunde*, vol. 22 (3): 177–191.

**Zilhão J. 2010a**

Did Neanderthals think like us? *Scientific American*, June: 72–75.

**Zilhão J. 2010b**

Neanderthals are us: Genes and cult. *Radical Anthropology*, vol. 4: 5–15.

*Received March 14, 2013.*
*Received in revised form September 2, 2013.*