

The Lower to Middle Paleolithic Boundary: A view from the Near East

Abstract Book



University of Haifa, November 2017

MEETING PROGRAM

Sunday, November 5, ARRIVAL

Day One, Monday, November 6

University of Haifa Port Campus

09:00-09:30 Gathering & refreshments

9:30-11:00 – Opening session

Prof. Yossi Ben-Artzi | University of Haifa

Mr. Ariel David

10:00-10:20 Mina Weinstein-Evron | *The Lower and Middle Paleolithic of Misliya Cave Mount Carmel*

10:20-10:40 Israel Hershkovitz | *Human remains of the Late Lower Paleolithic and Early Middle Paleolithic (late Middle Pleistocene) in the Levant*

10:40-11:00 Yossi Zaidner | *The Lower and Middle Paleolithic Boundary: State of the Art and Main Questions of the Workshop*

11:00-11:30 Coffee break

■ Session A: Chronology

Chair: Daniel Kaufman

Papers: 11:30-12:30;
Discussion 12:30-13:00

Naomi Porat | *Chronology of the Levantine late Lower Paleolithic*

Hélène Valladas, Norbert Mercier & Christophe Falguères | *An Overview of the Near Eastern Lower and Middle Paleolithic Sites Chronology by the Dosimetric Dating Methods*

Norbert Mercier | *The Dating of Lower and Middle Paleolithic Sites: What Might Be the Future?*

13:00-14:30 Lunch break

■ Session B: Acheulo-Yabrudian

Chair: Anna Belfer-Cohen

Papers: 14:30-15:30;
Discussion 15:30-16:00

Yoni Parush | *200,000 Years of Flint Recycling at Acheulo-Yabrudian Qesem Cave, Israel*

Ella Assaf | *'Throughout all generations...' - Knowledge Transmission Mechanisms at the End of the Lower Paleolithic: A Case Study from Qesem Cave*

Liliane Meignen & Ofer Bar-Yosef | *The Late Lower Paleolithic and Early Middle Paleolithic Boundary at Hayonim Cave, (Western Galilee, Israel)*

16:00-16:30 Coffee break

■ Session C: Fauna

Chair: Liora Kolska-Horwitz

Papers: 16:30-17:30;
Discussion 17:30-18:00

Reuven Yeshurun | *Explaining the Lower-Middle Paleolithic Transition in the Levant with Zooarchaeological Data*

Lior Weissbrod & Mina Weinstein-Evron | *The Role of Climate Change in Mid-Pleistocene Hominin Dispersal: New Evidence from Micromammalian Fauna in Misliya Cave, Southern Levant*

Antonio Rodríguez-Hidalgo, Palmira Saladié, Andreu Ollé, Marina Mosquera, Xosé Pedro Rodríguez, Paula García-Medrano, Jesús Rodríguez, Esther López-Ortega, Arturo de Lombera-Hermida, Antonella Perdegnana, María Soto-Quesada, Marcos Terradillos, Amelia Bargalló & Eudald Carbonell | *The Lower to Middle Paleolithic Occupations at Gran Dolina cave: A Zooarchaeological View*

18:30 Dinner

Day Two, Tuesday, November 7

University of Haifa, Mount Carmel Campus,
Observation Gallery

09:00-09:30 Gathering & refreshments

■ Session D: EMP

Chair: Omry Barzilai

Papers: 09:30-10:30;
Discussion: 10:30-11:00

Dorota Wojtczak | *New Early Middle Paleolithic Sites from the Jordan Valley and Their Contribution in Understanding of the Lamina Phenomenon in the Levant*

Yossi Zaidner & Mina Weinstein-Evron | *Levallois or Lamina? The Emergence of the Middle Paleolithic Technological Concepts at EMP of the Misliya Cave*

Mae Goder-Goldberger & Ofer Marder | *Does the MP Lamina Technology Draw Upon Earlier Traditions? A View from the EMP Assemblages from Emanuel Cave*

11:00-11:30 Coffee break

■ Session E: Raw Materials and Use-wear

Chair: Avi Gopher

Papers: 11:30-12:50;
Discussion 12:50-13:20

Ron Shimelmitz, Steven, L. Kuhn & Mina Weinstein-Evron | *The Evolution of Raw Material Extraction throughout the Tabun Cave Sequence*

Aviad Agam & Andrea Zupancich | *Quina and Demi-Quina Scrapers at Acheulo-Yabrudian Qesem Cave, Israel: Results of a New Use-wear and Geoarchaeological Study*

Yona Riemer-Gafni, Yossi Zaidner & Mina Weinstein-Evron | *Acheulo-Yabrudian and Early Middle Paleolithic Land-use and Mobility at Misliya Cave, Mount Carmel, Israel, as Reflected in Flint Raw Material Exploitation Strategies*

Iris Groman-Yaroslavski, Yossi Zaidner & Mina Weinstein-Evron | *The Role of Retouching at EMP Misliya Cave, Mount Carmel, Israel*

13:20-14:30 Lunch break

14:30-15:30 Guided Tour at Hecht Museum

■ Session F: Misliya and Tabun caves collections

16:00-18:00 Misliya and Tabun Caves Collections (The Zinman Institute of Archaeology, University of Haifa): Discussion of LP and MP Lithic and Faunal Assemblages

18:30 Dinner

Day three, Wednesday, November 8

Field Excursion to Mount Carmel

08:45-11:30 Misliya Cave

12:00-13:30 Lunch break

13:30-16:30 Nahal Me'arot Caves: Tabun, Jamal, el-Wad and Skhul

Free evening

Day four, Thursday, November 9

University of Haifa Port Campus

09:00-09:30 Gathering & refreshments

■ Session G: Africa

Chair: Nira Alperson-Afil

Papers: 09:30-10:30;
Discussion: 10:30-11:00

Michael Chazan, Liora Kolska-Horwitz & Naomi Porat | *Better Late Than Never: The Levantine Lower Paleolithic to Middle Paleolithic Transition from the Perspective of Southern Africa*

Nicholas Blegen | *Antiquity and Continuity of Human Behaviors in the Middle Pleistocene of Equatorial East Africa*

Sala-Ramos, R.; Arnold, L.; Duval, M.; Parés, J.M.; Benito-Calvo, A.; Álvarez, C.; Piñero, P.; Blain, H.-A.; Soto-Quesada, M.; Rodríguez-Hidalgo, A.; Menéndez, L.; de Lombera, A.; Van der Made, J.; Rivals, F.; Tarriño, A.; Aouraghe, H.; Haddoumi, H.; El Hammouti, K.; Agustí, J.; Chacón-Navarro, M.G. | *The Evolution of Human Settlement and the Transformation of a Lacustrine Basin into a Fluvial One During the Middle Pleistocene: Ain Beni Mathar – Guefait (Eastern Morocco)*

11:00-11:30 Coffee break

■ Session H: Europe

Chair: Gonen Sharon

Papers: 11:30-12:50;
Discussion: 12:50-13:10

Andreu Ollé, Marina Mosquera, Xosé Pedro Rodríguez-Álvarez, Paula García-Medrano, Antonella Pedernana, Arturo de Lombera-Hermida, Esther López-Ortega, Amèlia Bargalló, Marcos Terradillos, María Soto-Quesada, Palmira Saladié, Antonio Rodríguez-Hidalgo, Jesús Rodríguez & Eudald Carbonell | *The Gran Dolina TD10 Lithic Assemblages and the Transition from the Late Acheulean to the Early Middle Paleolithic in Atapuerca*

Deborah Barsky & Miquel Guardiola | *The Shift from Typical Western European Late Acheulean to Micro-lithic Stone Knapping in Level 'D' of the Late Middle Pleistocene Deposits of the Caune de l'Arago (Pyrénées-Orientales, France): An Experimental Approach*

Marie-Hélène Moncel, Marta Arzarello, Nick Ashton, Federica Fontana, Agnès Lamotte, Rebecca Scott, Alain Tuffreau & Carlo Peretto | *Early Levallois Core Technology Between MIS 12 and 9 in Western Europe?*

David Hérison | *Far from the Near East? A View of the Lower to Middle Paleolithic Boundary from Northern France and North-Western Europe*

13:10-14:30 Lunch break

■ Session I: Levant, Caucasus & China

Chair: Isaac Gilead

Papers 14:30-15:30;
Discussion 15:30-16:00

Ariel Malinsky-Buller & Yossi Zaidner | *A Long and Winding Road: A longue durée Perspective on the Emergence of the Levallois Concept*

Daniel S. Adler, Keith Wilkinson, Simon Blockley, Ellery Frahm, Darren Mark, Carolina Mallol, Samvel Nahapetyan, Emily Beverly, Jayson Gill, Monika Knul, Rhys Timms & Boris Gasparyan | *Behavioral and Technological Evolution of Late Middle Pleistocene Hominins in the Southern Caucasus*

Ofer Bar-Yosef | *The Challenge of Chinese Paleolithic to Western Concepts*

16:00-16:30 Coffee break

■ 16:30-18:00 General discussion

19:00-21:30 Farewell dinner

Friday, November 10, DEPARTURE

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Scientific Committee:

Ofer Bar-Yosef, Erella Hovers & Ron Shimelmitz

Workshop Staff:



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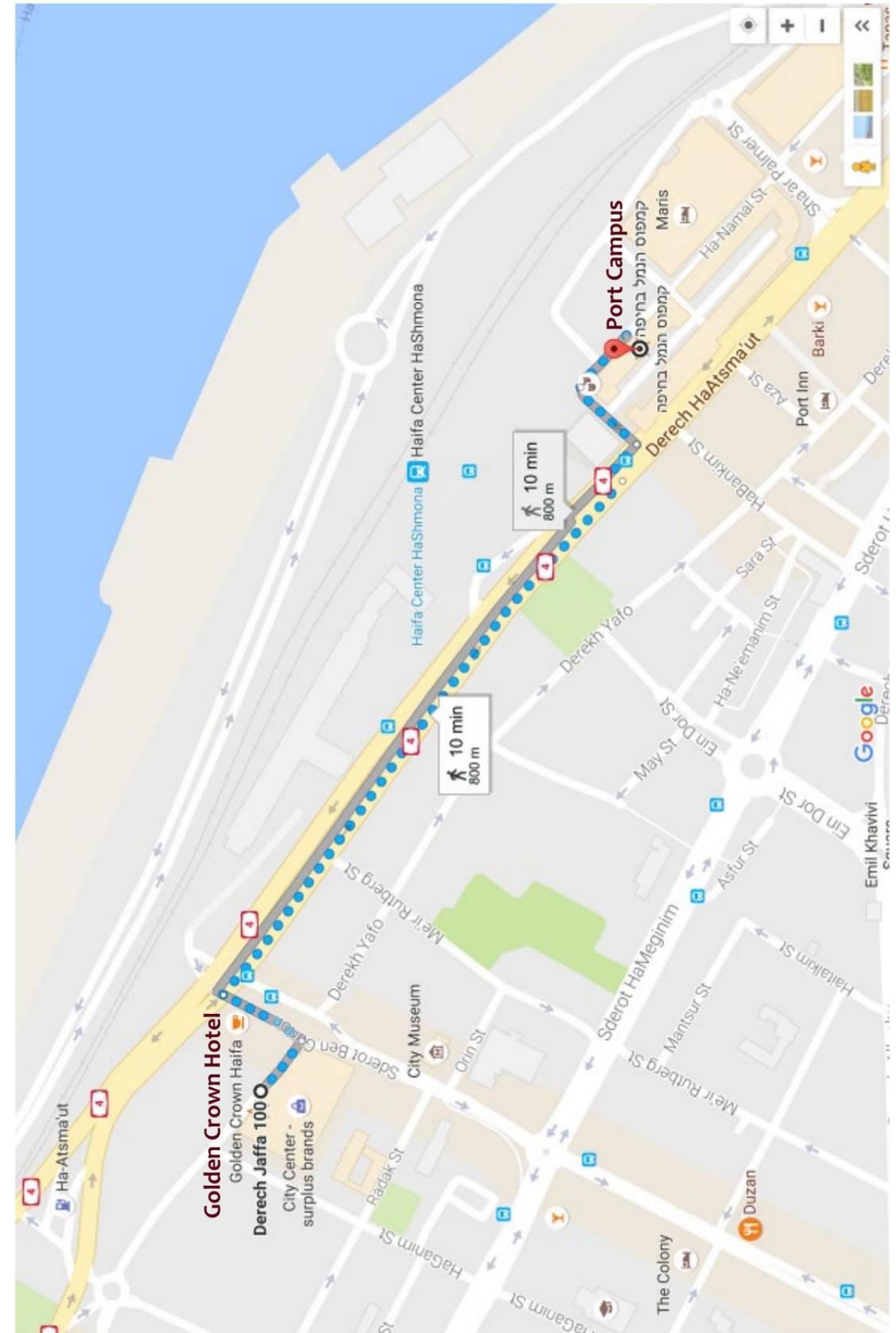
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The Lower to Middle Paleolithic boundary: A view from the Near East

The Zinman Institute of Archaeology, University of Haifa, Haifa, Israel

Greetings and acknowledgements

For the last 15 years we have been researching the late Lower Paleolithic (LP; Acheulo-Yabrudian) – Early Middle Paleolithic (EMP) layers at Misliya Cave, Mount Carmel, Israel, which yielded rich lithic and faunal assemblages, and provided new perspectives on various aspects of the LP–MP transition. In recent years, several other sites containing late LP or early MP layers have been studied in the Near East and nearby regions and old collections were re-analyzed. As evident from the list of participants and subjects, we are confident that the workshop will provide a fertile ground for discussion on pertaining issues of the LP–MP boundary with a special focus on the Near Eastern record, supplemented with contributions and general overviews from Eurasia and Africa.

The workshop will focus on technological, behavioral and cultural changes and innovations at the late LP – early MP boundary, 400-150 ky ago. This period witnessed the evolution of the Neanderthals in Europe and Anatomically Modern Humans in Africa associated with a global burst of innovative behaviors that led to the rise of the MP and the Middle Stone Age. The origins of these new behaviors are under debate and have been argued to result from the out-of-Africa dispersal of Anatomically Modern humans, cultural diffusions, local independent inventions, demographic increase, or anatomic changes in human populations. Discussion of anatomical remains themselves is out of the scope of this workshop, but the underlying behavioral aspects may eventually shed important new light on the still enigmatic relationships among the various human populations.

The processes pertinent to the boundary between the Lower and Middle Paleolithic were always in the spotlight of archaeological and anthropological research. However, for more than 20 years, dedicated scientific meetings on this subject concerning the Near Eastern record were not conducted. Interestingly, one of these, organized by Prof. Avraham Ronen, was also held at the University of Haifa, more than 35 years ago.

This international workshop has been much inspired by our recent project at Misliya Cave, Mount Carmel, funded by the Israel Science Foundation (ISF grant No. 1104/12), and entitled: *Life-Ways and the Cultural Landscape of the Early Middle Paleolithic: Misliya Cave, Mount Carmel, Israel*. The meeting itself is supported by workshop grants from the Israel Science Foundation (No. 341/17) and the Wenner-Gren Foundation (Gr. CONF-753).

It is with deep gratitude that we extend our thanks to Mr. Ariel David, son of the late Dan David, and to the Dan David Foundation, for their generous support of the meeting. The workshop appropriately acknowledges the contribution of Mr. Dan David, a dear friend and enthusiastic supporter of the Misliya Cave project. Dan accompanied the excavations at Misliya Cave closely throughout their duration (2001-2010). Besides the financial support of the Dan David Foundation, Dan's visits to the site, at the end of every field season became a memorable event for all participants, including scholars, students and volunteers.

His prophecy, put in his entry in our visitor's book back in autumn 2007, clearly demonstrates his vision, inspiration and deep involvement: "I still hope that in Misliya we will rewrite human history, that we will find our oldest *Homo sapiens* ancestor who appeared, evolved here and from here started his pilgrimage to all over the world, to be the human, the humanity we are today".

Thanks are also due to:

The Zinman Institute of Archaeology, the University of Haifa, under which auspices this meeting is conducted, and its director, Prof. Ayelet Gilboa, for their logistic and financial support.

The Faculty of Humanities, the University of Haifa, the Dean, Prof. Gur Alroey and the staff, for their logistic and financial support.

Ms. Tamar Lavyel, Faculty of Humanities, University of Haifa, for her invaluable administrative help in organizing the meeting.

Ms. Anat Regev-Gisis, the Zinman Institute of Archaeology, University of Haifa, for the splendid artwork and production of the program, abstract and tour books.

The Hof HaCarmel Regional Council, and especially to Mr. Modi Bracha, for their assistance and support.

The Israel Nature and Parks Authority, and especially the Nahal Me'arot Reserve team, headed by Mr. Eyal Hefets, for their assistance and warm welcome.

Our dedicated students, Shachaf Bar Giora, Ariel Lazari and Yona Riemer Gafni, for their relentless assistance throughout.

**We wish us all an interesting, fruitful and enjoyable meeting,
Mina Weinstein-Evron & Yossi Zaidner**

Day One, Monday, November 6

Session A: Chronology

Chair: Daniel Kaufman

Chronology of the Levantine Late Lower Paleolithic

Naomi Porat

Geological Institute of Israel, Jerusalem, Israel

Lower Paleolithic sites are difficult to date as the available methods are limited in range, precision or accuracy. The methods include paleomagnetic reversals (Brunhes-Matuyama Boundary), cosmogenic radionuclides, U-Th disequilibrium series and the luminescence methods. Many of the late Lower Paleolithic sites in Israel were dated by one or more of these methods. In the talk I will review the ages available for sites younger than the B-M boundary in Israel and the Levant.

An Overview of the Near Eastern Lower and Middle Paleolithic Chronology by Dosimetric Dating Methods

Hélène Valladas¹, Norbert Mercier² & Christophe Falguères³

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- 2 Institut de Recherche sur les Archéomatériaux, Centre de Recherche en Physique Appliquée à l'Archéologie, Pessac, France
- 3 Département Homme et Environnement, Muséum National d'Histoire Naturelle, Institut de paléontologie Humaine, Paris, France

The thermoluminescence (TL) method has been used for several decades to date burnt flint specimens recovered in Near Eastern Paleolithic sites. The exceptional abundance of these samples in Lower and Middle Paleolithic layers renders the TL method particularly appropriate to contribute to establishing the chronology of the human remains and lithic industries. So far a dozen sites (Kebara, Amud, Qafzeh, Tabun, Es Skhul, Hayonim, Qesem, Misliya, Zuttiyeh, Neshar Ramla, Holon and Quneitra) have been studied with dosimetric dating methods (TL, Optical Stimulated Luminescence and Electron Spin Resonance). We will present the main results obtained by the luminescence methods for sites attributed to the late Acheulean, the Yabrudian, the Amudian and to the Mousterian, emphasizing the timing of the transition period between the Early and Middle Paleolithic.

The Dating of Lower and Middle Paleolithic Sites: What Might Be the Future?

Norbert Mercier

Institut de Recherche sur les Archéomatériaux, Centre de Recherche en Physique Appliquée à l'Archéologie, Pessac, France

In the last 30 years, radiometric methods based on dosimetric principles (Thermoluminescence, Electron Spin Resonance, Optically Stimulated Luminescence) have been widely used to date Lower and Middle Paleolithic sites; they were applied mainly to burnt flint artifacts, animal teeth, and sediments.

In the Levant, these methods played a major role in establishing a global chronological framework of the Lower Paleolithic and Middle Paleolithic sites, and contributed to the interpretation of the succession of lithic industries and their boundaries. This framework is based on heterogeneous chronological data which are often too imprecise (with large standard deviations), or even inaccurate (because of unrealistic hypotheses) that may lead to misinterpretations.

In this paper I will discuss the fundamental reasons for such imprecisions and present recent developments which might be applicable to improve the data produced in the future.

Session B: Acheulo-Yabrudian

Chair: Anna Belfer-Cohen

200,000 years of Flint recycling at Acheulo-Yabrudian Qesem Cave, Israel

Yoni Parush

Tel Aviv University, Israel

According to recent studies, the origin of recycling stone and bone can be traced back to at least half a million years and maybe more. The Acheulo-Yabrudian Cultural Complex (AYCC) of the Late Lower Paleolithic in the Levant provides the opportunity to investigate recycling behavior in a time period characterized by new and innovative technologies and behaviors. These include, for example, the habitual use of fire, hearth-centered activities and other functionally distinct activity areas, new hunting and butchering behaviors, sophisticated acquisition of raw material and new lithic technologies (e.g., the production of blades and Quina scrapers).

Lithic recycling can be generally defined by successive stages of modification and use of an artifact for a purpose different than its original purpose. It may be also defined by a phase of discard between the different use events, the original one and the one following the recycling procedure. Recycling is not the extension of the use life of an artifact, but rather the beginning of a new use life. Recycling can be clearly identified in cases patina was formed on the surfaces of the artifact and partly removed at a later stage, but it can also be identified through changes indicating more than one use-phase of the item.

At AYCC Qesem cave both post-patina production as well as the use of a varied array of previously-produced (and sometimes even used) items indicate the use of “old” and perhaps even collected items in order to be used as cores-on-flakes for the production of new sharp small items. Selected parent flakes [cores-on-flakes (COFs)], from inside and outside of the cave, were used in order to produce new sharp items (recycling products) by a recycling procedure. These artifacts are an integral and distinctive component of the lithic *chaîne opératoire* practiced at the cave and appear in all lithic assemblages and archeological contexts in significant numbers. COFs were made on a variety of blanks and former tools, varying in size and patination. Some 30% of the recycling products show double patination, meaning that they were removed from discarded flaked items that were patinated and then selected to be recycled as COFs. In addition, 20% of the recycling products were made on previously discarded tools, as indicated by the presence of previous retouch on the dorsal face of the small item removed from the “parent” blank (COFs). Thus, unlike the concept of ramification, where flakes are produced in a planned and intentional reduction sequence in order

to allow further production of smaller items, at Qesem Cave a variety of items from earlier reduction stages, as well as collected old items, is used in order to obtain new small sharp items (products of recycling). We suggest that the chosen and collected blanks were not produced in order to be transformed into COFs but are by-products of the different productions trajectories practiced on-site (and some were brought in from elsewhere). Thus these items were transformed into COFs in the course of a recycling process after they were previously discarded. After selection, these items constitute a starting point for a new specific *chaîne opératoire* for the production of small sharp (products of recycling) items.

This study presents an analysis of 11 assemblages from clear, well dated archaeological contexts at the cave comprising over 2,000 products of recycling (i.e., blanks produced from COFs). These assemblages originate from different parts of the cave and its stratigraphic sequence. The samples show a range of 4.2% to 9.2% of recycling products out of the débitage in each assemblage.

The assemblages indicate intra-site differentiation between contemporary (synchronous) assemblages in different areas of the cave, as well as diachronic dynamics of the recycling phenomenon. For example, five of the assemblages originate from the top part of the lower stratigraphic sequence of the cave (Hearth, South of the hearth, G19/20, South-western Yabrudian and Shelf Yabrudian) and are roughly contemporaneous, dated to around 300 kyr. The highest frequency of recycling products appears in the hearth and south of the hearth assemblages, while the other three assemblages show significantly lower frequencies of recycling products. A diachronic view shows that the oldest (deep shelf) and the youngest (top level Amudian) assemblages appear to have relatively high frequency of recycling products, indicating no clear quantitative patterns of change in recycling behavior throughout the cave's sequence.

Recycling previously discarded parent blanks for the production of smaller sharp flakes (or blades) at Qesem Cave was not practiced, in our opinion, due to a lack of raw materials, as Qesem is located in a flint-rich environment. Thus, it seems that recycling in Qesem Cave is an example of a specific trajectory for making tool types needed for the tasks at hand. The formal characteristics of these products of recycling were specific and the blanks had sharp and regular edges and a standardized morphology. The combined technological and formal characteristics of these items, as well as their function, highlights Paleolithic recycling behavior and at the same time makes a significant contribution to the reconstruction of activities carried out at the cave. Products of flint recycling at Qesem Cave reflect a repetitive well established behavior practiced throughout the 200,000 years of human occupation at the cave. Moreover, it seems to us that the Qesem Cave knappers had a clear conception of the production of small sharp flakes and blades from existing, larger parent blanks that reflect a deliberate and planned action.

'Throughout all generations...' - Knowledge Transmission Mechanisms at the End of the Lower Paleolithic: A Case Study from Qesem Cave

Ella Assaf

Tel Aviv University, Israel

After a long Lower Paleolithic relative technological and behavioral persistency, hunter-gatherers living in the Levant ca. 400,000 years ago adopted a new set of behaviors: they used fire habitually, hunted prime-aged medium-sized herbivores, roasted and cooked meat, quarried flint from underground sources and knapped tools following complex, innovative technologies (e.g., producing laminar items and Quina-scrapers). These innovations have been accompanied by an evolutionary replacement of the earliest populations of the Levant, most probably *Homo erectus* (*sensu lato*), by a new hominin lineage, and probably accelerated the need of well-established knowledge transmission mechanisms. Data from the site of Qesem Cave (420-200ka) imply that the cave inhabitants regularly shared knowledge and followed traditions passing from generation to generation in all aspects of life.

This study is focused on the identification and characterization of knowledge transmission mechanisms relating to flint knapping as reflected in lithic assemblages of Qesem Cave. It concentrates on technological and raw material aspects of a sample of over one thousand cores and a sample of core trimming elements from various Amudian and Yabrudian contexts within the cave.

The identification of learning processes relating to flint knapping in the prehistoric record is usually based on identifying various levels of knapping skills in lithic assemblages. The basic assumption is that apprentice flint-knappers would be recognized by the quality of their work. At Qesem Cave, less skillful knapping was characterized by knapping mistakes observed on cores, low levels or lack of striking platform preparations and core maintenance, disproportional use of force while striking and the use of low quality materials (that were most probably allocated towards less experienced knappers).

Following the above criteria, the Qesem Cave cores show various levels of knapping skills – some were most probably knapped by skilled knappers, while others were knapped by unskilled knappers, or knappers who are in the process of learning. Moreover, the data suggest that learning processes related to knapping were more intensive in specific areas of the cave. It seems that some of these processes reflect trial and error mechanisms, self-experiencing and practicing of the basics of knapping (as suggested by the presence of cores that were knapped despite obstacles such as disturbances in the raw material, unsuitable angles between the striking platform and the production surface, hinges etc., and by the selection of low quality materials for knapping). An interesting knowledge transmission mechanisms detected at Qesem

involved the sharing of knowledge between knappers in the cave as indicated by a notable presence of specific cores reflecting two “generations” of blank removals: a successful stage followed by an unsuccessful one. These cores appear in all areas of the cave, but more so in specific contexts such as the central hearth area. Their presence might indicate that experienced knappers at Qesem allocated previously shaped, but not fully exploited cores for inexperienced knappers. These were then probably used for learning, practicing and gaining accumulated experience in knapping.

It is accepted that knowledge transmission (relating to knapping, butchering, and to social norms) had a significant role in human evolution. This may have become crucial at “turning points” in human history like the late phase of the Levantine Lower Paleolithic. This form of cooperation is well reflected at Qesem, and flint knapping is but one example. The new hominin lineage inhabiting the cave developed new technological, economic and social traditions transmitted throughout the generations.

The Late Lower Paleolithic and Early Middle Paleolithic Boundary at Hayonim Cave (Western Galilee, Israel)

Liliane Meignen¹ & Ofer Bar-Yosef²

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2 Department of Anthropology, Harvard University, Cambridge, USA

During the renewed excavations at Hayonim cave (1992-2001), the focus on the long stratigraphic sequence (A-G) was the major portion attributed to the Early Middle Paleolithic (Layers Lower E and F). Their assemblage is characterized by a blade component including numerous elongated retouched points. Technological studies demonstrate the coexistence of Levallois and Laminar core reduction strategies and numerous retouched items. This Early Middle Paleolithic sequence is some 5 meters thick and dated by TL readings to ca. 230-140 ka.

In 2000, during the last season of excavations the lower part of a 4 m² deep sounding at the entrance of the cave, an Acheulo-Yabrudian assemblage (layer G) was exposed in a deposit about one meter thick. In spite of the limited size of this exposure, the documented assemblage includes numerous bifaces, a small amount of Yabrudian scrapers and no evidence for Amudian blade technology. Rare Levallois elements could be the result of intrusion from the younger deposits. This paper will be the first publication of the Acheulo-Yabrudian assemblage from Hayonim cave.

During the workshop we will present this assemblage and discuss its stratigraphical context. We will also provide more detailed information concerning the assemblage variability and the already recognized techno-typological changes throughout the long Early Middle Paleolithic sequence in order to better document the relations between the different reduction strategies and tool-kits involved. Such a comparison will add information concerning the evidence of shifting technologies involved in the production strategies that characterize the Acheulo-Yabrudian and the subsequent emergence of the Middle Paleolithic in the Levant.

Session C: Fauna

Chair: Liora Kolska-Horwitz

Explaining the Lower–Middle Paleolithic Transition in the Levant with Zooarchaeological Data

Reuven Yeshurun

Zinman Institute of Archaeology, University of Haifa, Israel

The contribution of zooarchaeology to explaining the LP-MP transition in the Levant is usually hampered by the limited archeofaunal record of the latest Lower Paleolithic and the early Middle Paleolithic. Zooarchaeology-based hypotheses explaining the LP-MP transition include regional environmental change, a shift in environmental exploitation, changes in hunting gear, fluctuations in site-occupation intensity and changes in intra-site patterning and food sharing behavior. Here I use the rich faunal evidence from Misliya Cave (Mount Carmel, Israel), set in its temporal and regional context, to discuss these aspects. Testing these hypotheses with the aid of the (admittedly limited) data has yet to yield conclusive evidence that may explain the LP-MP transition in the Levant. The most conspicuous change seems to be a shift in prey choice that may stem from different weapon technology. However, our limited knowledge of the hunting organization and the bias against open-air sites during the transition period cast doubts on such an explanation.

Situating Misliya Cave in the Biostratigraphic Framework of the Southern Levant and Reassessing the Role of Climate Change in Mid-Pleistocene Hominin Dispersal

Lior Weissbrod & Mina Weinstein-Evron

Zinman Institute of Archaeology, University of Haifa, Haifa, Israel

The impact of climate on hominin evolution, technological development and dispersal continues to be a widely debated issue in Levantine prehistory. Recent research provides high-resolution regional data on past climate dynamics (e.g., cave speleothems or Mediterranean Sea cores), but remains ambiguous as to the nature of correlations between these “off-site” proxies and evidence for hominin response from the cultural record in archaeological sites.

Findings at Misliya Cave (Early Middle Paleolithic [EMP]: 250-160Ky) offer the kind of direct association of cultural material and paleo-environmental proxy data necessary to test models of co-variability of climate and hominin technological and evolutionary shifts. Excavations yielded dense concentrations of micromammalian remains characterized by high taxonomic richness (NTaxa = 12) and representation of all of 17 major elements of the mammalian skeleton. Presence of specimens modified by digestion (22%) indicates accumulation by a Category 3 predator (Strigiformes), whereas modification by burning is also fairly common (4-12% in contexts near and away from hearths), indicating variable human impact. Highly fragmented state of the material (0-2% complete specimens) suggests post-depositional trampling, possibly due to intense human occupation.

The presence of a unique Eurasian (cooler-climate) bio-stratigraphic marker—*Ellobius* sp.—associates the EMP Misliya deposits (MIS7-6), with the layers of Tabun D and Hayonim Lower E, but not with those of late Lower Paleolithic Qesem Cave (MIS8-9). These assemblages also predate those of Skhul and Qafzeh Caves (MIS5) where African (warmer-climate) species were discovered with *Homo sapiens* anatomical remains. Recent findings of Middle Stone Age hominin remains affiliated with *H. sapiens* in northern Africa (315Ky BP) evoke the possibility of an earlier origin and dispersal for our species, and possibly an association with climates of both dry and cold (MIS8, 6) and humid and warm (MIS7, 5) phases in the southern Levant. These data raise questions about existing models of climatically-driven hominin out-of-Africa dispersals.

The Lower to Middle Paleolithic Occupations at Gran Dolina Cave: A Zooarcheological View

Antonio Rodríguez-Hidalgo^{1,2}, Palmira Saladié^{3,4,5,6}, Andreu Ollé^{3,4}, Marina Mosquera^{4,3}, Xosé Pedro Rodríguez^{4,3}, Paula García-Medrano³, Jesús Rodríguez⁷, Esther López-Ortega^{3,4}, Arturo de Lombera-Hermida^{3,4,8}, Antonella Perdegnana³, María Soto-Quesada⁹, Marcos Terradillos¹⁰, Amelia Bargalló¹¹ & Eudald Carbonell^{4,3}

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- 4 Àrea de Prehistòria, Universitat Rovira i Virgili, Tarragona, Spain
- 5 Unit associated to CSIC, Departamento de Paleobiología, Museo Nacional de Ciencias Naturales, Madrid, Spain
- 6 GQP-CG, Grupo Quaternário e Pré-História do Centro de Geociências, Portugal
- 7 National Research Centre on Human Evolution, Burgos, Spain
- 8 Grupo de Estudos para a Prehistoria do Noroeste-Arqueoloxía, Antigüidade e Territorio, Dpto Historia, Universidade de Santiago de Compostela, Santiago de Compostela, Spain
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The two extremes of the Mediterranean Basin, Iberia and Levant have generated significant knowledge we currently have about subsistence dynamics during the early Middle Paleolithic. Zooarcheological research from a holistic perspective (multivariate) is fundamental to try to infer what is new and what is not in such dynamics and consequently for shedding light on the emergence of some behaviors considered signs of “modernity”.

At the west end, the top of the fillings of Gran Dolina site cave in Atapuerca cover a crucial chronological span for understanding the cultural and behavioral changes that characterize the transition from the Lower to Middle Paleolithic. Within a depth of more than 2.5 meters, the lithological unit TD10 contains several human occupations of different nature deposited between MIS 11 and the end of MIS 9, representing one of the largest concentrations of archaeological remains ever recovered for such a crucial period in human evolution.

The technological record is composed of a lithic assemblage that shows certain transitional characteristics from late Acheulian to Middle Paleolithic associated with a huge concentration of ungulate remains, mainly bison, red deer and horses. Bone surface modifications, dominated by cut marks and percussion marks, indicate not only primary access to fleshed carcasses by hominins, but also intensive and systematic exploitation of hides, meat, fat and marrow along the sequence. Conversely, mortality profiles, seasonality, taxonomical diversity and skeletal part representation are highly variable among TD10 Gran Dolina layers. Our zooarcheological and taphonomic analyses

indicate that this diversity can be explained in a more parsimonious way by changes in the functionality of the site than by transformations/innovations in subsistence, behavior or culture.

The lower to Middle Paleolithic Gran Dolina faunal record demonstrates that hominins in the western Mediterranean Basin were prominent hunters of large game that used diverse hunting strategies, techniques and tactics, some of them very sophisticated such as communal hunting, linked with the early emergence of complex behavioral, social and cognitive capacities fully developed in the late Acheulean.

Day Two, Tuesday, November 7

Session D: Early Middle Paleolithic

Chair: Omry Barzilai

New Early Middle Paleolithic Sites from the Jordan Valley and Their Contribution in Understanding of the Laminar Phenomenon in the Levant

Dorota Wojtczak

Integrative Prehistory and Archaeological Science, University of Basel, Switzerland

In Jordan, to date, a blade industry relating to the Early Middle Paleolithic (EMP) has been documented in the Azraq, Tell Khanasiri regions and at the Ain Difla site. This paper reports the discovery of a Hummalian occupation of the Jordan Valley during the 2016 surveys carried out in the Upper Jordan Valley between the Yarmouk River and Deir Alla, by a joint Jordanian-Swiss research team of the University of Basel, Jordan University and Yarmouk University. The newly discovered Hummalian spots can be qualified as factory sites where blanks were mass produced. The typical tools and retouched blades are infrequent. The two most important workshop areas, Zamliyah and Al Munqiah, are in the direct proximity of the outcrops (alluvial deposits). Both site complexes are excellent showcases for landscape evolution and the preservation of old surfaces. Both are still well preserved, in spite of important topographical exposure making them predisposed to destruction and shows that random stabilities can exist in this landscape over surprisingly long time periods. It appears that the people came regularly to these areas to gather blanks for further activities. Away from these workshop sites, which produced substantial output, Hummalian settlements are so far peculiarly absent from the Jordan Valley.

The lithic assemblages from Zamliyah and Al Munqiah sites are very similar on the whole and show a particularly coherent technical unity. The knapping was aimed at producing elongated, converging or parallel blanks. At the same time, the purpose was not to achieve blades of a specific size, as the cores and blanks are extremely variable in length, width and thickness within the assemblages, as well as between them. The common flaking technique was direct percussion with a hard hammer. This specific débitage system seems to be similar to the Hummalian production strategy recognized at the Hummal site in Syria. It offers an original production system in which different core volume management was involved in blank production and, therefore, blanks of different morphology and diverse Core Trimming Elements were manufactured.

Current discoveries in the Jordan Valley with such rich EMP assemblages allow us to continue the discussion of the origin of the laminar phenomenon in the Levant.

The Lower to Middle Paleolithic boundary: A view from the Near East

The Zinman Institute of Archaeology, University of Haifa, Haifa, Israel

Levallois or Laminar? The Emergence of the Middle Paleolithic Technological Concepts at the Early Middle Paleolithic of Misliya Cave

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² Institute of Archaeology, the Hebrew University of Jerusalem, Jerusalem, Israel

Misliya Cave, Mount Carmel, Israel contains rich Acheulo-Yabrudian and Early Middle Paleolithic (EMP) layers. The studied EMP lithic industry of Misliya Cave, dated to ~240-160 ka, comprises ca. 60,000 lithic artifacts derived from various layers along the 1.5 m deep stratigraphic sequence of the main excavation area on the Upper Terrace of the cave. For this presentation, we conducted a detailed analysis of the lithic assemblage from one of the EMP layers (Layer 6c) of the cave, which contains an *in situ* hearth, as well as large lithic and faunal assemblages.

The lithic assemblage of the cave shows evidence for all stages of the reduction sequence, indicating that knapping was conducted at the site. This allows detailed technological study to be conducted. The industry is generally elongated containing 42% of artifacts with blade dimensions. Diverse technologies were used at the site for the production of a wide array of blanks, among them Levallois points, Levallois flakes, and blades. The dominant method of reduction involves preparation of triangular convergent Levallois cores. These cores exhibit flat and slightly convex flaking surface at the proximal part and abrupt triangular section at the distal part of the flaking surface. It is likely that this geometric configuration was achieved during the initial stages of core preparation by the removal of cortical backed plunging flakes that remove significantly larger volume of material from the distal end of the cores. Such a geometric configuration of the core surfaces allowed the production of series of convergent blanks from the center of the flaking surface. The majority of the classical Levallois points and flakes and about half of the blades in the Misliya assemblage were produced by this method of reduction. Classical centripetal oval Levallois flakes are virtually absent in the studied assemblage.

Semi-rotating method of blades production, known from other EMP sites in the region, is attested by the presence of a few offset opposite platform cores and several bidirectional and unidirectional blades with parallel edges. In addition, blades were produced using narrow edges of tabular flint nodules. The toolkit is dominated by a variety of retouched points and blades.

The diversity in knapping methods and types of end-products and retouched tools in the EMP of Misliya Cave is striking in comparison to the preceding Lower Paleolithic and the following Middle Paleolithic sites dated to late MIS 6 and MIS 5. The production of Levallois points and blades and the level of core management involved in the preparation of convergent products point to a major change in comparison to the preceding Acheulo-Yabrudian and Acheulian sites in the region.

The Lower to Middle Paleolithic boundary: A view from the Near East

The Zinman Institute of Archaeology, University of Haifa, Haifa, Israel

Does the MP Laminar Technology Draw Upon Earlier Traditions? A View from the EMP Assemblages from Emanuel Cave

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Department of Bible, Archaeology and the Ancient Near East, Ben Gurion University of the Negev, Israel

A salvage excavation conducted at Emanuel Cave in 2007 revealed a series of short successive Middle Paleolithic occupations. The site is situated in the Samaria hills above Wadi Qana (350 m asl.). The region is rich in karstic caves, many of which were used for variable human activities, including residential and burial practices at different times in history. Emanuel cave is built of two separate chambers both of which contain anthropogenic layers. Several recorded collapse events resulted in the cave filling up with sediments and the entrance sealed. The archaeological assemblages are composed of both animal bones and lithics. The rich faunal assemblage consists of only ungulates, mostly adults with gazelle accounting for 50% of the identified specimens. The lithic assemblages from the two anthropogenic layers exhibit distinct traits of a Levantine Middle Paleolithic industry. In the lower layer there is an Early Middle Paleolithic (EMP) assemblage with a predominant laminar nature, while the upper layer displays more use of the Levallois technology. The elapsed time between the two archaeological layers, separated by sediments resulting from rock fall, is unknown. A speleothem from the cave floor dated to 191 ± 1 Ka (U/Th) is suggested as a *terminus post quem* for the archaeological deposits.

Our presentation will provide a closer look at the laminar technology present in the earlier level of Emanuel Cave alongside the Levallois technology. While not a unique phenomenon, its presence does raise several questions as to its role within the assemblage. Is it a remnant or a descendant of the laminar technology seen in the Amudian industries? Or is it something new used together with the Levallois technologies to produce a separate set of blanks? We will address these questions by comparing the laminar reduction sequence as defined at the site, with published material from sites in the Levant.

Session E: Raw Materials and Use-wear

Chair: Avi Gopher

The Evolution of Raw Material Extraction throughout the Tabun Cave Sequence

Ron Shimelmitz¹, Steven, L. Kuhn² & Mina Weinstein-Evron¹

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Patterns in lithic raw material extraction are argued to provide information about phenomena such as mobility patterns, technological developments and even modes of landscape transformation among Paleolithic and more recent hunter-gatherers. A large number of studies have explored different aspects of raw material extraction in specific Lower and Middle Paleolithic sites. A study of raw material use at Tabun Cave, Israel, including a sequence of ca. 100 superimposed layers covering the Acheulean and the Acheulo-Yabrudian of the late Lower Paleolithic and several stages within the Middle Paleolithic, provides a novel perspective on changes in raw material extraction during the Middle Pleistocene. Mount Carmel is rich in raw material outcrops, some in close vicinity to Tabun Cave. While distinguishing between outcrops can be a major tool for uncovering mobility and other behavioral patterns, in this paper we chose a simpler and a different approach. Our emphasis is on distinguishing between raw material from primary geological sources and raw material from secondary geological sources. This distinction can be made according to the character of the cortical surfaces of artifacts within the assemblages. We distinguish between three broad categories of cortex: (1) calcareous cortex cover, referring to a homogenous cortex structure that lacks evidence of rolling, (2) rolled and pitted surfaces showing evidence of alluvial transport, and (3) patinated surfaces with neocortex developed through surface exposure. While the first category indicates primary geological context, the latter two indicate different sorts of secondary geological contexts, including the recycling of old artifacts. The results of the study indicate a gradual increase over time in the use of flint obtained from primary geological contexts throughout the Tabun sequence. While the frequency of items bearing rolled and patinated cortex cover decline throughout the sequence, the decline in rolled cortex is more pronounced. In all, the study demonstrates an increasing focus on the extraction of flint of primary geological contexts in the Middle Paleolithic, correlating with abundant evidence of flint extraction throughout the Levantine landscape in this period.

Quina and Demi-Quina Scrapers at Acheulo-Yabrudian Qesem Cave, Israel: Results of a New Use-wear and Geoarchaeological Study

Aviad Agam & Andrea Zupancich,

Tel-Aviv University, Israel

Quina scrapers are a well-known component of the European Middle Paleolithic Mousterian Cultural Complex. Interestingly, a similar system of production was also distinctly detected within the lithic assemblages of the Levantine Acheulo-Yabrudian cultural complex (~400-200 kya). This study combines the results of a use-wear analysis and a flint type analysis of 85 Quina scrapers and 123 demi-Quina scrapers originating from Acheulo-Yabrudian Qesem Cave, Israel. The combination of these two analytic methods allows us to underline specific sourcing strategies related directly to the production and use of this unique tool type. Each scraper was examined for use-wear and was assigned, based on visual traits and petrographic data, to a flint type, potential geologic source/s, a group of sources by distance of primary sources from Qesem Cave, as well as to a geologic age: up to 8 km (Turonian); ~12-13 km to the north (Cenomanian / Turonian); ~15 km to the south (Campanian); up to 30 km to the south (Eocene); unknown sources, and unidentified flint types. The use-wear analysis underlined some distinctions between the use of Quina and demi-Quina scrapers. Quina scrapers were mostly exploited in the processing of hard and medium-hard materials through scraping activities, while demi-Quina were used to work softer materials, especially through cutting activities.

The flint type analysis shows differences between Quina scrapers, demi-Quina scrapers, and a large general sample of all techno-typological categories of Qesem Cave. While the general sample presents a strong domination of local Turonian materials other, more distant types, of specific geologic ages (Campanian and Cenomanian/Turonian) are more common among Quina and demi-Quina scrapers. In addition, the frequency of Campanian flint is significantly more pronounced among the Quina scrapers than in the demi-Quina. This implies a preference for these types in manufacturing Quina scrapers, possibly due to certain technological advantages (e.g., ease of knapping, durability). Our results suggest a strong correlation between tool type, tool function and flint types and geologic sources, highlighting a thoughtful and well planned effort invested by the Qesem Cave inhabitants in procuring specific flint types for specific tools, taking into consideration flint qualities, and the future function planned for the tools.

Acheulo-Yabrudian and Early Middle Paleolithic Land-use and Mobility at Misliya Cave ,Mount Carmel ,Israel ,as Reflected in Flint Raw Material Exploitation Strategies

Riemer-Gafni Yona¹, Zaidner Yossi^{1, 2} & Weinstein-Evron Mina¹

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Exploitation of flint raw material sources is an important tool for understanding the mobility and land-use strategies of Paleolithic hunter-gatherers. Misliya Cave (Mount Carmel, Israel) was occupied during the Late Lower Paleolithic (Acheulo-Yabrudian) and Early Middle Paleolithic (EMP), providing a unique opportunity for the study of changes and trends in raw material procurement and exploitation strategies during this sequence. Studies at other Yabrudian (Qesem Cave) and Middle Paleolithic (Hayonim Cave) sites show local as well as non-local exploitation of sources. However, continuity or change in raw material exploitation can be best evaluated in a site with an archeological record of both these cultures, such as Misliya Cave.

Our research was largely based on visual inspection of large, representative flint assemblages of both cultures (884 Acheulo-Yabrudian and 5177 Early Middle Paleolithic (EMP) artifacts, ~40% of each cultural assemblage) including the full range of technological *Chaîne opératoire*, as well as geological flint outcrops of Mount Carmel (some of them newly discovered). Furthermore, the Early Middle Paleolithic sequence enables the investigation of temporal change during the EMP. The visual inspection was complemented by ED-XRF and ICP-MS/OES analyses conducted on selected items.

The results show that during the Acheulo-Yabrudian a wide variety of sources from on the Carmel ridge as well as Ramat Menashe were used. During the EMP two main raw material sources were exploited both located in close proximity of the site and with easy access from the coastal plain (Nahal Galim and Nahal Me'arot). The wide variety of sources used during the Acheulo-Yabrudian occupation of the site, many of which are situated on the mountain and in areas as far away as 20 km, suggests high mobility and wide-range exploitation strategies. Lower mobility and exploitation of nearby areas and local flint sources characterize the EMP phase of the site. The results also suggest different settlement strategies between the cultures; in the Acheulo-Yabrudian the occupation of the cave might have been shorter by highly mobile groups, as also recently suggested for Tabun Cave in the same period. On the other hand, in the EMP of Misliya Cave we encounter a home-base camp site with shorter walking distances to the flint raw material sources. The results show clear differences in land-use and flint resources exploitation-related behaviors between the Acheulo-Yabrudian and the EMP in Misliya Cave.

The Role of Retouching at EMP Misliya Cave ,Mount Carmel ,Israel

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Retouch is a technical process aimed at shaping, re-shaping or rectifying the edge of a blank by additional treatment through small removals in order to modify the item into a 'tool' with a preconceived form and function. The retouch is a basic component of human technological repertoire that was practiced worldwide by different hominin species. By using retouch, humans shaped stone flakes into tools of planned and recurrent morphologies, many of which became the markers of different cultural entities and phases of cultural evolution.

In the Levant, some of the most distinct retouched tool types are identified with the Early Middle Paleolithic. These include Abu-Sif points, retouched blades and scrapers that are characterized by an invasive standardized retouch. Here we present the results of a use-wear analysis of several tool types bearing invasive retouch, including sidescrapers on flakes, blades retouched on one side, blades retouched on both sides and Abu-Sif points retrieved from the EMP layers of Misliya Cave, Mount Carmel. The analysis focused on two main aspects: the function of the tools retouched by invasive retouch and the question of correlation between the morphology of the tools and their function.

The Misliya Cave EMP tools are in an excellent state of preservation, allowing a comprehensive microscopic investigation of their function. A sample from each tool category was analyzed, including an additional sample of marginally retouched blades which was the control group used to test the function of a different type of retouch.

The results clearly show that invasive retouch was used for two main purposes: to create a working edge, and to shape the edge for hafting or prehension. In the EMP tool-kit of Misliya Cave, invasive retouch formed resistant working edges that were frequently used to scrape hard materials such as bone and woody plants. In comparison, marginally retouched blades were used more frequently for cutting soft materials such as herbaceous plants, indicating that invasively-retouched resistant edges were not needed for handling soft materials. Interestingly, no correlation between the morphology of selected tool types and their function was identified, indicating that the shape of the tool played little role in the performed activities. Nonetheless, a correlation was observed between the location of the retouch and shape of the tool, and the mode by which the tool was wielded. For example, blades retouched on one side were used for scraping hide using the sharp edge while retouched edges were hafted or held by hand. Abu-Sif points were used along their lateral retouched edges

and points for working various types of materials, with their proximal area hafted or held by hand.

The function of invasive retouch of the Misliya Cave EMP tool-kit is thus versatile. Retouch was used for creating a working edge to work hard materials, or for shaping edges to fit firmly into a haft or to be held in hand without the risk of injury. Although we acknowledge that both the shape of tools and their intended function are integrated concepts that are taken into account in the process of tool shaping, the use-wear analysis shows that the correlation between the shape of the tool and its function is not significant. It seems that retouch is more important as a technological means that defines the functional quality of the tool, which is most relevant for executing tasks successfully, while the shape of the tool is a cultural rather than purely functional choice.

Session F: Misliya, Tabun and Skhul Caves Collections
The Zinman Institute of Archaeology, University of Haifa

Yossi Zaidner, Ron Shimelmitz, Reuven Yeshurun & Mina Weinstein-Evron

Day Three, Wednesday, November 8

Field Excursion to Mount Carmel Caves

09:00 – 12:00 Misliya Cave (Mina Weinstein-Evron & Yossi Zaidner)

14:00 – 16:30 Tabun, Jamal, Skhul and el-Wad Caves (Mina Weinstein-Evron, Ron Shimelmitz & Reuven Yeshurun)

Day Four, Thursday, November 9

Session G: Africa

Chair: Nira Alperson-Afil

Better Late Than Never: The Levantine Lower Paleolithic to Middle Paleolithic Transition from the Perspective of Southern Africa

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Recent research in Southern Africa points to the emergence during the Fauresmith of prepared core technology, spears, systematic use of specularite and ochre. While the definition and chronology of the Fauresmith is still the subject of ongoing research it seems clear that these developments significantly predate 300,000 years BP and the emergence of industries clearly defined as belonging to the Middle Stone Age as well as the Levantine Lower to Middle Paleolithic transition. This includes evidence for the use and long distance transport of specularite from Kathu Pan 1, Wonderwerk Cave Excavation 6, and Canteen Kopje; the use of a prepared core method of blade and point production at Kathu Pan 1; and use of points for spears at Kathu Pan 1. This paper will present the currently available data on the Fauresmith with particular focus on Wonderwerk Cave and the sites of the Kathu complex. From the perspective of the Fauresmith the Levantine Lower to Middle Paleolithic transition appears to be a very late development. However, it might also be the case that the Fauresmith points to the complexity of the transition from broadly defined Earlier Stone Age/Lower Paleolithic ways of life to the patterns of technology and adaptation that are characteristic of the Middle Stone Age/Middle Paleolithic. This perspective suggests that we reconsider the nature of the Levantine Late Lower Paleolithic in terms of such a lengthy and complex process of transition and question the nature of the Acheulo-Yabrudian as an archaeological construct.

Antiquity and Continuity of Human Behaviors in the Middle Pleistocene of Equatorial East Africa

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The Middle Pleistocene (780–130 ka) of equatorial East Africa is an important time and place for modern human evolution. This period records the survival of Early Stone Age Acheulean technologies as well as the development of new types of tools and techniques for producing them, collectively referred to as Middle Stone Age (MSA) technologies. Equally significant as the events of modern human evolution in East Africa is our ability to accurately date and reconstruct these events in the region. Volcanic ashes (tephras) in East Africa provide the ability to precisely date archaeological sites, and volcanic glass (obsidian) artifacts from the region can be used to determine distances hominins transported raw materials. Recent correlation and dating of East African tephras associated with archaeological sites show Levallois recurrent and blade methods of core preparation were present along with Acheulean tools by 465–396 ka, over 100,000 years older than previously demonstrated in the region. Recent geochemical sourcing of obsidian artifacts shows long-distance raw material transport (>150 km) was a feature of human behavior by ~200 ka, over 150,000 years older than previously demonstrated. New geochemical data further show that by 465–396 ka hominins making Acheulean tools transported obsidian raw materials, from multiple sources, distances of 55–120 km. Thus, in East Africa, both diverse prepared core technologies and long-distance raw material transport appear in the Middle Pleistocene in association with Acheulean tools and persist into the Late Pleistocene (130–10 ka) where these behaviors are found alongside MSA tools. This indicates continuity of several important hominin behaviors across the Acheulean / MSA technological boundary and throughout the period of modern human evolution in East Africa. These behaviors are not tethered to defined typological categories such as Early or Middle Stone Age, nor to a single particular hominin species. Further, by pre-dating technological features of the MSA and biological features of *Homo sapiens* anatomy by ~100,000 years in East Africa, diverse lithic technologies and long-distance raw material transport were likely important selective pressures on the evolution and dispersals of modern humans.

The Evolution of Human Settlement and the Transformation of a Lacustrine Basin into a Fluvial One during the Middle Pleistocene :Ain Beni Mathar – Guefaït (Eastern Morocco)

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- 13 Institute d'Histoire Naturelle de l'Homme Préhistorique, CNRS, Université de Sorbonne and Musée de l'Homme, Paris, France

The Ain Beni Mathar – Guefaït basin provides a long stratigraphic sequence and a faunal record that covers the Early and Middle Pleistocene. During the Pliocene and Early Pleistocene, a fluvio-lacustrine basin developed in the area. This landscape has been occupied by hominin developing a Mode 1 technology. This fluvio-lacustrine basin has its final phase in the early Middle Pleistocene.

During the Middle Pleistocene the lacustrine basin was captured by the Moulouya River and the current Oued Haï-Za began dissecting the previous Plio-Pleistocene infilling. This second phase in the region records the settlement of human communities represented by Lower Paleolithic (Acheulean) assemblages in the upper terraces and Middle Paleolithic assemblages in the lower ones.

The Ain Beni Mathar basin records the passage from the Lower to the Middle Paleolithic within the Middle Pleistocene fluvial phase. There seems to be a transitional stage between a clear Lower Paleolithic phase found in a 0.5 Ma old fluvial terrace and Mode 3 industries in the lower terraces. This transitional stage bearing a non-standardized industry is related to the passage from the Middle to the Upper Pleistocene.

The Lower to Middle Paleolithic boundary: A view from the Near East

The Zinman Institute of Archaeology, University of Haifa, Haifa, Israel

Session H: Europe

Chair: Gonen Sharon

The Gran Dolina TD10 Lithic Assemblages and the Transition from the Late Acheulean to the Early Middle Paleolithic in Atapuerca

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Unit TD10 at Gran Dolina cave (Burgos, Spain) comprises several archaeological layers containing the richest archaeological associations recorded to date in the Sierra de Atapuerca sites. Here we present the technological succession documented in TD10, a 2.5 m thick unit dated from MIS 11 to the end of MIS 9.

The archaeological layers included in unit TD10 were formed as a consequence of several human occupations differing in nature, from short and varied stays in the cave certainly forming palimpsests, to well defined campsites, and to butchery sites in which evidence of communal hunting has been identified. Carnivores are also intermittently present in the archaeological record.

The study of the lithic assemblages coming from these layers enables documenting the technological evolution in the same cavity entrance, and offers a good opportunity to assess technological features with an evolutionary significance. Issues related to raw material management, the representation of the production sequences, the exploitation methods, the shaping patterns for both large cutting tools and small retouched flakes, as well as use-wear data and some cognitive aspects are taken into consideration to draw the aforementioned evolutionary technological assessment. As

The Lower to Middle Paleolithic boundary: A view from the Near East

The Zinman Institute of Archaeology, University of Haifa, Haifa, Israel

a first objective, we aim to discuss whether the differences observed along the TD10 sequence regarding the aforementioned issues can be explained according to functional variables (tactical and strategic responses to subsistence pressures, which for sure affect group mobility and foraging behavior), and which of the observed tendencies can be related to the behavioral and cultural shifts traditionally characterizing the Lower to Middle Paleolithic transition.

By qualitatively comparing our record with the Levantine Acheulo-Yabrudian we also aim to explore how Western Europe (and Iberia in particular) and the opposite end of the Mediterranean basin (the Levant) are coincident with respect to some relevant technological traits commonly pointed to as indicators of an initial Middle Paleolithic, such as the role of the large cutting tools, the complexity of the prepared core reduction systems, the standardization and diversification of the retouched flakes, the hafting techniques, the introduction of tools made of organic materials, and the existence of complex subsistence strategies including specialized hunting, etc. In the end, we aim to discuss the set of technological and behavioral issues commonly taken into account in drawing the transition between the late Acheulean and the early Middle Paleolithic. Such a discussion will contribute to our knowledge of the geographic and temporal variability of this transition.

The Shift from Typical Western European Late Acheulian to Micro-lithic Stone Knapping in Level 'D' of the late Middle Pleistocene Deposits of the Caune de l'Arago (Pyrénées-Orientales, France): An Experimental Approach

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Archeostratigraphic Unit 'D' of the Caune de l'Arago cave (Pyrénées-Orientales, France), situated in the upper part of the depositional sequence of *Ensemble Stratigraphique III*, has yielded a rich Late Acheulian stone-tool assemblage attributed to the upper part of the Middle Pleistocene (end of OIS 12). The site, dating from 690 to 90 Ka, is well known for its significant Acheulian cultural sequence, including some of the oldest evidence so far documented in Western Europe. The accumulation comprises a succession of archeologically-rich occupation levels, some of which have yielded hominin remains (*H. heidelbergensis*). These levels are generally intercalated by sedimentary infill containing sparse artifacts and carnivore fossils. Towards the top of the sequence, from level 'D', while Levallois knapping is extremely rare, other features seem to signal a transition from the Lower to the Middle Paleolithic, including a marked reduction in overall tool size, a shift in raw material exploitation patterns, a reduction in cobble-tool frequencies and more numerous composite light-duty tool types. Handaxes are scarce and display only a low degree of symmetry compared with the older levels of unit 'P'. The most outstanding characteristic of the 'D' level assemblage is that it was knapped predominantly from small-sized quartz cobbles. We present preliminary results from experiments carried out in the aim of better understanding whether the knapping was carried out by direct hard hammer methods or using bipolar-on-anvil technologies. Also, we explore this knapping preference on a regional level, contrasting it with other microlithic praxis observed elsewhere in Europe in a similar timeframe.

Early Levallois Core Technology Between MIS 12 and 9 in Western Europe?

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It is common to date early Levallois core technology in Europe to the end of MIS 9, and especially to the beginning of MIS 8 to MIS 7. This technology is considered as the marker of the transition from Lower to Middle Paleolithic or from Mode 2 to Mode 3 (Clark, 1969), resulting in the general adoption of more complex flaking strategies and a higher standardization of products.

Recent discoveries show that the roots of lithic innovations in the Neanderthal world, appeared actually earlier in Western Europe, from MIS 12 to MIS 9. Associated or not with bifaces, these assemblages yielded some cores and flakes named Levallois, or proto-Levallois, pre-Levallois and “prepared cores”. We have selected well dated assemblages where both Levallois cores and flakes are present in the UK (Purfleet and consideration of other occurrences), France (Cagny la Garenne I-II, Orgnac 3), and Italy (Guado San Nicola, Cave dall'Ollio).

A detailed technological analysis of the lithic evidence will help to characterize this early evidence and discuss the role and origin of this technology among set of behaviors of the MIS 12-9 in Western Europe. Evidence of modifications of behavioural strategies, progressively or gradually, is also recorded around 400 ka through organized hunting strategies, fire management and land-use patterns.

Far from the Near East? A View of the Lower to Middle Paleolithic Boundary from Northern France and North-Western Europe

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Northern France plays a central role in the debate around the Lower to Middle Paleolithic boundary since the first elaborations of the chronological timescale of Prehistory. Based on the discussion around the discovery of the site of Biache-Saint-Vaast in the 1970's, the onset of the Middle Paleolithic was pushed beyond the traditional Eemian limit (MIS 5e). Reinforced by other discoveries in the 1980's and the 1990's, the rich Saalian record of Northern France allowed for proposing a mosaic model of transition – mainly after A. Tuffreau's works. Considering lithic industries, this model implied that during the MIS 8-6 period the coexistence of Upper Acheulean assemblages (numerous bifaces with little standardized retouched flakes), “Epi-Acheuléen” assemblages (rare bifaces and various retouched flakes) and Mousterian assemblages (Levalloisian industries). Since the 2000's, progress in dating methods, the reanalysis of some sites with new views on the sedimentary sequences, the taphonomy, the lithic series as well as discovery of new key-sites like Therdonne or Etricourt-Manancourt provide new insights to our knowledge of this time period. A renewal in research themes has been done at the same time which not only focuses on lithic industries but includes a broader perspective incorporating other behavioural issues.

What are the consequences of the new discoveries, studies and reanalysis concerning the previous transition model(s) established for northern France? Is our periodization still relevant considering new data on technological, behavioral and cultural changes? What does the northern France record tell us about settlement and innovative dynamics compared to neighbouring areas (North-western Europe) and more distant regions like the Near-East?

After presenting a quick historical summary of the previous approaches on the Lower to Middle Paleolithic boundary, we will show that the current Saalian record of northern France is both rich and scarce. It implies some limits but the current record allows us to move forward on some current questions around the onset of the Middle Paleolithic. We will discuss some demographic issues considering low and high densities of humans in the region during the Saalian, taking into account chronoclimatic periods, geomorphological, taphonomic and archaeological data.

Session I: Levant, Caucasus and Asia

Chair: Isaac Gilead

A Long and Winding Road: A *longue durée* Perspective on the Emergence of the Levallois Concept

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In this paper, we aim to promote a long-term chronological perspective for understanding the emergence of the Levallois, covering the Early and Middle Pleistocene sites with an emphasis on a single region, the Levant. Over more than a century, Levallois technology has been perceived as an evolutionary turning point in the cognitive and the knowledge transmission capacities of hominids. This resulted in prolific discourse searching for the roots and the evolution of the Levallois over vast geographical and diachronic scales of the Lower Paleolithic.

During the last three decades, research shifted toward technological perspectives and the definition of Levallois has been reformulated. This led to the broadening of our understanding of the Levallois and triggered debates on what are the “limits of Levallois concept” and which criteria must be applied to identify a Levallois flaking system. Recent studies applying this technological approach to the Lower Paleolithic industries in Africa, the Near East and Europe revealed a common technological conception under a wide range of nomenclatures. In this paper, it will be termed “a hierarchical reduction concept” and we will address this technological concept by its common criterion, i.e., the use of cores with two surfaces in a non-interchangeable manner, with one used as a flaking surface and the other as striking surface. The hierarchical reduction sequences differ from “full-fledged” Levallois by the minimal emphasis on preparation and the lack of maintenance of lateral and distal convexities, resulting in a low degree of control over the end-product shape.

The earliest hierarchical reduction sequences are dated to the Early Pleistocene, and they became more dominant and the technology more refined within Middle Pleistocene assemblages. Our study of the Levantine material and review of the published data reveal no significant conceptual changes in the manner hierarchical reduction concept was applied over a million years of use. We further suggest that the hierarchical reduction is a technological solution that does not require high-fidelity social learning and could have been reinvented, time and again during this long period of time. This avenue of research offers an alternative approach to the common view

of hierarchical reduction concept as a step leading toward the Levallois. Hierarchical reduction sequences are an integral part of the Lower Paleolithic know-how and an essential component of the behavioral repertoire of the Lower Paleolithic hominins in the Levant and most likely in other geographical regions. The concept did not change much through the Lower and Middle Pleistocene, which suggests a conceptual stasis within the Lower Paleolithic. Nonetheless, we do see in the hierarchical reduction concept a common starting point for evolutionary contingencies that enable the eventual emergence and success of the Levallois during late Middle Pleistocene. The emergence of Levallois concept was determined by local circumstances, which shaped the trajectories of cultural evolution in each region differently. It is likely that in the Levant, the Early Middle Paleolithic Levallois core technologies had not developed from the local hierarchical reduction sequences, but arrived from elsewhere as a fully developed technological package.

Behavioral and Technological Evolution of Late Middle Pleistocene Hominins in the Southern Caucasus

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The Middle Pleistocene was a period of profound biological and behavioral change that witnessed the evolution of *Homo sapiens* in Africa and the Neanderthals in Eurasia as well as the transition from the Early Stone Age/Lower Paleolithic to the Middle Stone Age/Middle Paleolithic. This latter change can be broadly characterized by the gradual replacement of large cutting tools and bifaces by points, flakes and blades produced through a variety of hierarchical core strategies (e.g. Levallois). Within the Southern Caucasus, a pivotal geographic region between Africa and Eurasia, little is known about this period. We present new archaeological data from Armenia that documents the local technological transition from the Lower to the Middle Paleolithic and the exploitation of large and diverse territories during several climate intervals.

Nor Geghi 1 (NG1) is an open-air site located within the Hrazdan valley 16 kilometers northeast of Yerevan that currently provides the most secure archaeological and stratigraphic data from the late Middle Pleistocene (LMP) in Armenia. Between 2008 and 2016, several thousand obsidian artifacts were excavated from alluvial sediments deposited on the floodplain and in channels of the paleo-Hrazdan River. The deposits are dated between 440 and 308 ka based on ⁴⁰Ar/³⁹Ar dating of an underlying lava (Lava 7, 440 ka), an overlying lava (Lava 1, 200ka), and sanidine grains from cryptotephra (Unit 1, 308 ka). The sediments result from a complex process of alluviation, lake formation, and landscape stability, the latter represented by at least four paleosols, punctuated by periods of erosion. The youngest paleosol (Units 2–4) dates to MIS 9e and overprints all sediments immediately below Lava 1 across the entire ~100 meter-long exposure. The parent material in which this paleosol formed, and in which the majority of the archaeological material is found, varies in composition and age from

one end of the exposure to the other, with the southern end of the site representing earlier sedimentation (\leq MIS 11) and the northern end later sedimentation (MIS 9). The northern sediments represent the alluvial infilling of a major erosional unconformity that truncated older sediments still preserved in the south.

The two lithic assemblages recovered from the two different stratigraphic locations conform to these geological observations, with an earlier (pre-MIS 9) bifacial and core-on-flake technology recovered in the south, and a younger (MIS 9) derived technology of Levallois and hierarchical cores, flakes, blades, and several bifaces recovered in the north. All artifacts are produced on obsidian, which according to pXRF analyses originate from Gutansar (2–8 km NE), Hatis (12 km E-SE), Pokr Arteni (70 km W), Tsaghkunyats (30 km N), and Sevkar (120 km SE). These sourcing data document the exploitation of territories and environments much larger and more diverse than predicted based on contemporaneous data from other regions, highlighting hominins' deep knowledge of multiple landscapes, the permanent and seasonal distribution of resources, and the social relationships required to navigate said landscapes effectively.

NG1 is among the oldest Eurasian transitional industries with bifacial and Levallois technology recovered from secure archaeological and stratigraphic contexts. The lithic assemblages from NG1 document the local technological evolution from the Lower Paleolithic (bifaces) to the early Middle Paleolithic (Levallois) between \leq MIS 11 and MIS 9. The gradual change from bifacial to Levallois technology, with intermediate core forms and the recycling of bifaces into cores, is consistent with the hypothesis that developments in the technological realm of Middle Pleistocene hominin populations resulted from deep-rooted evolutionary processes based on a common technological ancestry rather than abrupt technological innovations/replacements spread through demographic processes.

At a broader scale, comparisons with LMP sites across Africa, the Levant, and Eurasia suggest that Levallois and other hierarchical core technologies are an inherent property of the LMP (“Acheulean”) that evolves out of the existing, but previously separate technological systems of *façonnage* and *débitage*. This intercontinental transition from biface to Levallois technology appears to have occurred independently and intermittently within geographically and temporally separate hominin populations, with technological convergence, based on a shared LMP ancestry, underwriting this slow shift to the “Middle Paleolithic”. The eventual proliferation of Levallois technology after MIS 8–7 and its continued ubiquity into late MIS 3 establish it as an evolutionarily significant adaptation practiced by diverse hominin populations irrespective of environment, geographic location or taxonomic affiliation. Therefore, variation in lithic technology and typology cannot be used as a proxy for hominin demographic movements or “archaeological cultures” during the LMP or many other periods.

The Challenge of the Chinese Paleolithic to Western Concepts

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Prehistoric investigations in Europe and Western Asia determined the terminology and conceptual frameworks employed in Paleolithic archaeology. The question related to the transition from the Lower to the Middle Paleolithic is a non-issue in mainland China. Attempts to impose the terms of Paleolithic subdivisions and their connotations on the archaeological records of this vast region risk to seriously distort our interpretations of the material culture and a failure to appreciate its significance. Early Pleistocene industries are mostly produced by 'core and flake', Oldowan-type, like in western Asia. The Acheulian tradition represented by the typical bifacial flaking, is present in China, although not in every province, as well as in southeast Asia. Only a few sites are well recorded and dated. Middle Paleolithic assemblages, attributed to the same time as in western Eurasia are often 'core and flake' industries. Some recent efforts are being conducted in order to trace a clearer chronological boundary that may represent a time of behavioral and/or cultural change. Levallois technique was temporarily present in western China (near the Yellow River) but was replaced by the makers of cores and flakes. Another example is the Upper Paleolithic period, recognized as the time from ca. 45/40Ka cal BP when the industries during the first part (up to ca. 22/20 Ka cal BP) in the south and ca. 26 cal BP in the north, are dominated by the production of 'core and flake' assemblages but surprisingly demonstrate the presence of bone tools. Later, in the southern provinces, a cobble industry characterizes the lithic assemblages, with bone and shell tools. In the north of China microblade industries expanded rapidly. In spite of the limited information from mainland China where research began much later than in Western Eurasia or even Africa, samples of assemblages for the timing of the Western Lower and Middle Paleolithic periods will be presented in order to demonstrate how and why the Chinese record is a challenge for behavioral and cultural interpretations.

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