# The Dan David Center for Human Evolution and Biohistory Research

## ACTIVITY REPORT 2016 – 2017

Submitted by
Prof. Israel Hershkovitz
Sackler Faculty of Medicine

*The new entrance to Manot Cave*

*Entering Har Safsuf Cave*

TEL AVIV UNIVERSITY
אוניברסיטת תל אביב

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# MAJOR ACTIVITIES

## ACTIVE PARTICIPATION IN SCIENTIFIC MEETINGS:

- Vancouver, Canada: Society of American Archaeologists meeting
- Vancouver, Canada: Paleoanthropology Society
- Tel Aviv, Israel: Israel Prehistoric Society
- Toulouse, France: Society of African Archaeologists
- Irvine, California: Israeli American Kavli Frontiers of Science Symposium
- York, UK: PALAEO: The Centre of Human Paleoecology and Evolution Origins, University of York

## COLLABORATIVE WORKS WITH OTHER INSTITUTIONS:

- Harvard Medical School (with Prof. David Reich): aDNA Chalcolithic population of Peki'in.
- Max Planck Institute of Evolutionary Anthropology (Leipzig, Germany) (with Prof. Svante Paabo): aDNA Middle-Upper Paleolithic population from Manot Cave.
- Max Planck Institute for the Science of Human History (Jena, Germany) (with Prof Johanes Kraus) – aDNA of Natufian and Neolithic populations from the Levant
- Max Planck Weizmann Joint Center for Integrative Archaeology and Anthropology (Leipzig, Germany) (Dr. Kornelius Kupzic) – Dental Dietary Signature in Epi-paleolithic to Modern Societies.
- University of Vienna, Austria; Core Facility for Micro-Computed Tomography (Prof. Gerhard Weber)
- Binghamton University (SUNY), USA; Department of Anthropology (Dr. Rolf Quam)
- Case Western Reserve University, Cleveland, USA; Anthropology, Anatomy, and Cognitive Science (Prof. Bruce Latimer)
- Monash University, Australia; Department of Anatomy and Developmental Biology (Dr. Luca Fiorenza)
- Max Planck Weizmann Joint Center for Integrative Archaeology and Anthropology (Leipzig) (with Dr. Kornelius Kupzic): Dental Dietary Signature in Epi-paleolithic to modern societies.
- The Centre of Human Paleoecology and Evolution Origins, University of York (with Prof. Paul O'Higgins): The effect of diet on mandibular morphology using finite element analysis.
- Institute of Evolutionary Medicine, University of Zurich (with Frank Ruhli): The association between the 3D shape of the proximal femur and the risk to manifest hip fracture.
- Max Planck Institute of Evolutionary Anthropology (Leipzig, Germany) (with Prof. Jean-Jacques Hublin) – Changes in 3D shape of the proximal femur during human evolution.
- Center for Functional Anatomy and Evolution, Johns Hopkins School of Medicine (with Christopher Ruff): Physical burden and lower limb bone structure at the origin of agriculture in the Levant.
- Department of Anthropology, University of Vienna (with Gerhard Weber): Origin of Modern Human.

- Department of Paleontology, Complutense University of Madrid (with Juan Luis Arsuaga): Origin of Modern Human.
- Department of Anthropology, University College London (with Maria Martinon-Torres): Origin of Modern Human.

# FILMING:

- The French National TV: Neanderthal documentary
- Japan Broadcasting Corporation: Leaving the Cradle
- National Geographic Documentary: Relics of the True Cross
- Israel National Television: Prehistoric man

# CONSTRUCTIONS:

- Tabun: Access to the Tabun cave was prepared (18 m cage metal ladder: see pictures). All excavators took part in a special training program that will allow them to work at high altitudes.
- Manot: a protecting wall was built along the path that leads to the entrance of the cave (see pictures).

# GRANTS RECEIVED:

- Leakey Foundation
- Care Archaeological Foundation
- Binational Science Foundation
- Israel Science Foundation

# PUBLICATIONS, (PUBLISHED / SUBMITTED) 2016-2017:

*(Senior Researchers: Hershkovitz, May, Sarig)*

1. Tunis TS, Sarig R, Cohen H, Medlej B, Peled N, May H (2017). Sex estimation using computed tomography of the mandible.Int J Legal Med.doi: 10.1007/s00414-017-1554-1. [Epub ahead of print]

2. Cohen H, Kugel C, May H, Medlej B, Stein D, Slon V, Brosh T, Hershkovitz I (2017). The effect of impact tool geometry and soft material covering on long bone fracture patterns in children. Int J Legal Med. doi: 10.1007/s00414-017-1532-7. [Epub ahead of print]

3. Abbas J, Slon V, May H, Peled N, Hershkovitz I, Hamoud K (2016). Paraspinal muscles density: a marker for degenerative lumbar spinal stenosis? BMC Musculoskelet Disord. 17(1):422.

4. Cohen H, Kugel C, May H, Medlej B, Stein D, Slon V, Hershkovitz I, Brosh T (2016). The impact velocity and bone fracture pattern: Forensic perspective.Forensic Sci Int. 266:54-62.

5. May H, Ruff C (2016). Physical burden and lower limb bone structure at the origin of agriculture in the Levant. Am J Phys Anthropol. 161(1):26-36.

6. Sarig, R., Hershkovitz I., Nir, S., May H., Vardimon, A.D. Rate and pattern of Inter-Proximal Dental Attrition. European Journal of Oral Sciences *123*(4), 276-281. 2015.

7. Hardy K., Radini A., Buckley., Sarig R., Copeland L., Gopher A., Barkai R. Dental calculus reveals potential respiratory irritants and ingestion of essential plant-based nutrients at Lower Palaeolithic Qesem Cave Israel. Quaternary International, 30, 1e7. 2015

8. Hershkovitz, I., Weber, G.W., Fornai, C., Gopher, A., Barkai, R., Slon, V., Quam, R., Gabet, Y., Sarig R. New Middle Pleistocene dental remains from Qesem Cave (Israel) Quaternary International, 398, 148-158. 2016.

9. Sarig, R., Gopher, A., Barkai, R., Rosell, J.,Blasco, R., Weber, G.W., Fornai, C., Sella-Tunis, T., Hershkovitz, I. How Did the Qesem Cave People Use their Teeth? Analysis of Dental Wear Patterns. Quaternary International, 398, 136-14. 2016.

10. Weber, G.W. Fornai, C., Gopher, A., Barkai, R., Sarig, R. & Hershkovitz, I. The Qesem cave hominin material (Part 1): A morphometric analysis of the mandibular premolars and molar. Quaternary International, 398, 159-174. 2016.

11. Fornai, C., Benazzi, S., Gopher, A., Barkai, R., Sarig, R., Bookstein, F. L., Hershkovitz, i., Weber, G. W. The Qesem Cave hominin material (part 2): A morphometric analysis of dm 2-QC2 deciduous lower second molar. Quaternary International, 398, 175-189. 2016.

12. Sarig, R., & Tillier, A. M. (2016). Dental wear patterns in early modern humans from Skhul and Qafzeh: A response to Luca Fiorenza and Ottmar Kullmer. HOMO-Journal of Comparative Human Biology, 67(1), 85-87.

13. Tunis, T. S., Sarig, R., Cohen, H., Medlej, B., Peled, N., & May, H. (2017). Sex estimation using computed tomography of the mandible. International Journal of Legal Medicine,1-10.

14. Hershkovitz · B. Latimer · O. Barzilai · O. Marder (2017) Manot 1 calvaria and Recent Modern Human Evolution: an Anthropological Perspective, Bulletins et Memoires de la Société d'Anthropologie de Paris SAS DOI 10.1007/s13219-017-0180-2

15. Abbas J, Slon V, Stein D, Peled N, Hershkovitz I, Hamoud K. (2017) In the quest for degenerative lumbar spinal stenosis etiology: the Schmorl's nodes model. BMC Musculoskelet Disord. 20;18(1):164.

16. Ezra, D., Mashrawi, Y., Salame, K., Slon, V., Alperovitch-Najenson, D., & Hershkovitz, I. (2016). Demographical aspects in cervical vertebral bodies' size and shape (c3-c7): a vertebral study. *The Spine Journal*.

17. Stephens, N. B., Kivell, T. L., Gross, T. Pahr, D. H., Lazenby, R. A., Hublin, J. J., Hershkovitz, I., & Skinner, M. M. (2016). Trabecular architecture in the thumb of Pan and Homo: implications for investigating hand use, loading, and hand preference in the fossil record. *American Journal of Physical Anthropology*.

18. Steinberg, N., Hershkovitz, I., Zeev, N., Rothschild, B., & Siev-Ner, I. (2016). Joint hypermobility and joint range of motion in young dancers. *Journal of Rheumatology, 22*(4), 171-178.

19. Peleg, S., Dar, G., Steinberg, N., Masharawi, Y., & Hershkovitz, I. (2016). Sacral orientation and Sheuermann's kyphosis. *SpringerPlus, 5*(1), 1.

20. Feldman, M., Hershkovitz, I., Sklan, E. H., Bar-Gal, G. K., Pap, I., Szikossy, I., & Rosin-Arbesfeld, R. (2016). Detection of a tumor suppressor gene variant predisposing to colorectal cancer in an 18th century Hungarian mummy. PLoS one, 11(2), e0147217.

21. Slon, V., Peled, N., Abbas, J., Stein, D., Cohen, H., & Hershkovitz, I. (2016). Vertebral hemangiomas and their correlations with other pathologies. *Spine, 41*(8), E481-E488.

22. Slon, V., Glocke, I., Barkai, R., Gopher, A., Hershkovitz, I., & Meyer, M. (2016). Mammalian mitochondrial capture, a tool for rapid screening of DNA preservation in faunal and undiagnostic remains, and its application to Middle Pleistocene specimens from Qesem Cave (Israel). *Quaternary International*, 398, 210-218.

23. Weber, G. W., Fornai, C., Gopher, A., Barkai, R., Sarig, R., & Hershkovitz, I. (2016). The Qesem cave hominin material (Part 1): a morphometric analysis of the mandibular premolars and molar. *Quaternary International*, 398, 159-174.

## *Publications on Manot Cave*

1. Yeshurun, R., Tejero, j.-M., Barzilai, O., Hershkovitz, I. and Marder, O. (2017) Upper Palaeolithic Bone retouchers from Manot Cave (Israel): A preliminary analysis of (as yet) rare phenomenon in the Levant. In Hutson J.H., Gaudzinski-Windheuser S. (eds.). *Retouching the Palaeolithic*. Römish-Germanisches Zentralmuseums, Mainz (in Press)

2. Alex, B. O. Barzilai, I. Hershkovitz, O. Marder, F. Berna, V. Caracuta, T. , Abulafia, L. Davis, M. Goder-Goldberger, R. Lavi, Eugenia Mintz, Lior Regev, D. Bar-Yosef Mayer, J.-M. Tejero, R. Yeshurun, A. Ayalon, M. Bar-Matthews, G. Yasur, A. Frumkin, B. Latimer, M. G. Hans, & E. Boaretto. (2017). Radiocarbon chronology of Manot Cave, Israel and Upper Paleolithic dispersals: Upper Paleolithic Chronology of Manot. *Scientific Advances* (Submitted)

3. Hershkovitz · B. Latimer · O. Barzilai · O. Marder (2017) Manot 1 calvaria and Recent Modern Human Evolution: an Anthropological Perspective, Bulletins et Memoires de la Société d'Anthropologie de Paris SAS DOI 10.1007/s13219-017-0180-2

4. Marder, O., O. Barzilai, T. Abulafia, I. Hershkovitz, M. Goder-Goldberger. (2017). Chrono-cultural considerations of Middle Paleolithic occurrences at Manot Cave (Western Galilee), Israel. *Replacement of Neanderthals by Moderns Humans: Testing Evolutionary Models of Learning*. Springer, Japan (in Press)

5. Barzilai, O., Hershkovitz, I., Marder, O., 2016. The Early Upper Paleolithic Period at Manot Cave, Western Galilee, Israel. *Human Evolution* 31 (1-2):85-100).

6. Weiner S., V. Brumfeld, O. Marder and O. Barzilai. 2015. Heating of Flint Debitage from Upper Palaeolithic Contexts at Manot Cave, Israel: Changes in Atomic Organization Due to Heating Using Infrared Spectroscopy. *Journal of Archaeological Science* 54:45-53.

7. Hershkovitz, I., O. Marder, A. Ayalon, M. Bar-Matthews, G. Yasur, E. Boaretto, V. Caracuta, B. Alex, A. Frumkin, M. Goder-Goldberger, P. Gunz, R.L. Holloway, B. Latimer, R. Lavi, A. Matthews, V. Slon, D. Bar-Yosef Mayer, F. Berna, G. Bar-Oz, R. Yeshurun, H. May, M.G. Hans, G.W. Weber and O. Barzilai. 2015. Levantine cranium from Manot Cave (Israel) foreshadows the first European modern humans. *Nature* 520 (7546), 216-219.

8. Tejero, J-M., R. Yeshurun, O. Marder, O. Barzilai, I. Hershkovitz, , N Schneller-Pels, G Bar-Oz, M Goder-Goldberger, R Lavi. (2015). The Osseous Industry from Manot Cave (Western Galilee. Israel): Technical and conceptual behaviours of bone and antler exploitation in the Levantine Early Upper Palaeolithic. *Quaternary International* http://dx.doi.org/10.1016/j.quaint.2015.11.028

9. Barzilai, O., Marder, O. and Hershkovitz I. (2014). Manot Cave. Seasons 2011-2012. *Hadashot Arkheologiot* 126 http://www.hadashot-esi.org.il

10. Marder, O., Barzilai, O., Hershkovitz, I., and A. Frumkin. (2013). Karst and prehistory in the western Galilee, emphasizing Manot Cave. In *Geological Survey Israel 2013*. pp. 28-36.

11. Marder, O., B. Alex, A. Ayalon, M. Bar-Matthews, G. Bar-Oz, D. Bar-Yosef Mayer, F. Berna, E. Boaretto, V. Caracuta, A. Frumkin, M. Goder-Goldberger, I. Hershkovitz, B. Latimer, R. Lavi, A. Matthews, S. Weiner, U. Weiss, G. Yas'ur, R. Yeshurun and O. Barzilai. (2013). The Upper Palaeolithic of Manot Cave, Western Galilee, Israel: the 2011–12 excavations. *Antiquity 87 (337).* http://www.antiquity.ac.uk

12. Barzilai, O., A. Ayalon, M. Bar-Mathews, G. Bar-Oz, E. Boaretto, F. Berna, A. Frumkin, I. Hershkovitz, H. Khalaily, O. Marder, S. Weiner and R. Yeshurun. (2012). Manot Cave: A prehistoric cave site in the western Galilee, Israel. Hadashot Arkheologiot 124 http://www.hadashot-esi.org.il

# ORGANIZATION:

Organizing the symposium on aDNA with the Dan David Prize laureates

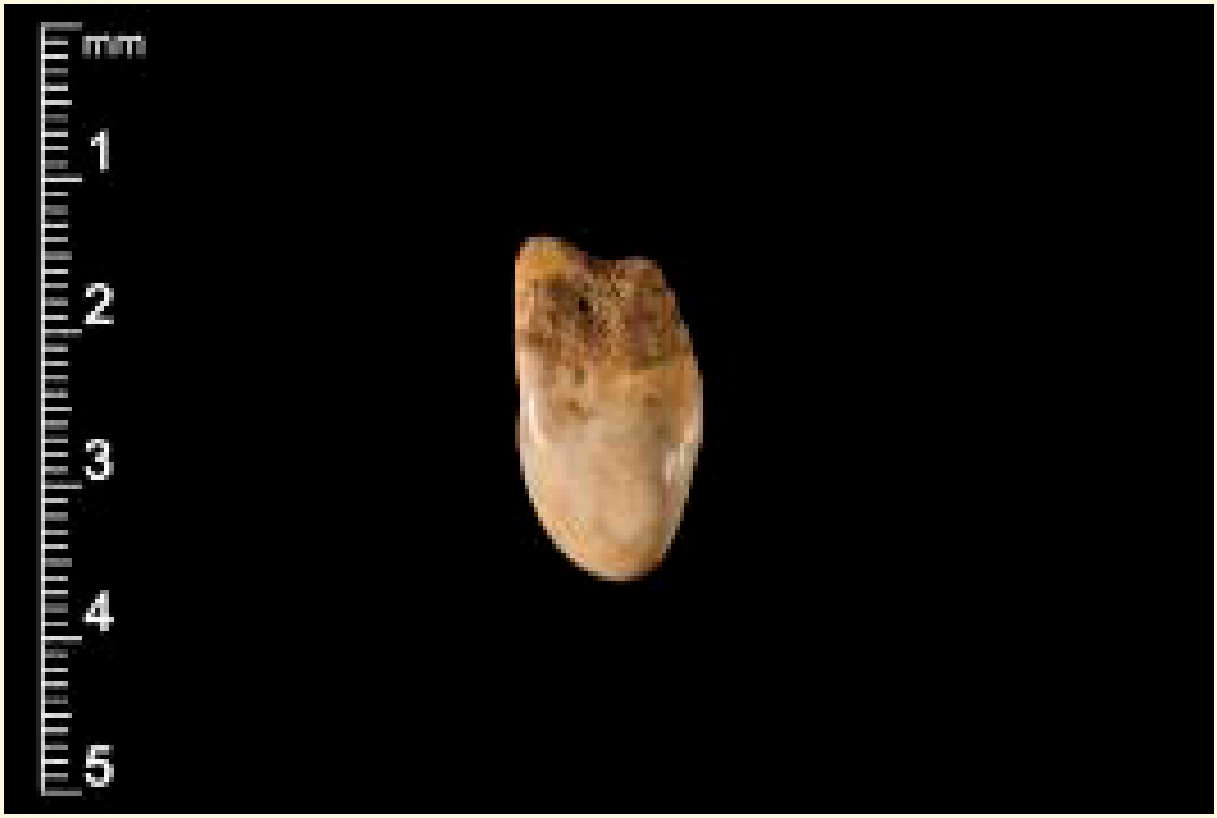
# MUSEUM ACTIVITIES:

Preparing the text for the human evolution and biohistory exhibition, and selecting items for the exhibition

# EXCAVATION REPORTS:

- Manot Cave: *see detailed report below*
- Tinshemet Cave: *see detailed report below*
- Har Safsuf Cave: *see detailed report below*
- Geula Cave: *see detailed report below*
- Tabun Cave: *see detailed report below*

# EXCAVATION REPORTS
## MANOT CAVE




# The 2016 Excavation Seasons at Manot Cave, Western Galilee, Israel (Permit Number G-10)

**In collaboration with Ofer Marder[1] and Omry Barzilai[2]**

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## *Introduction*

The Levantine Upper Palaeolithic plays an important role in understanding the emergence, dispersal, and adaptations of the first Anatomically Modern Human (hereafter AMH) populations outside of Africa (e.g. Bar-Yosef, 2007; Belfer-Cohen and Goring-Morris, 2014a). At least three dispersal events are conceived to be reflected in the early stages of the Levantine Upper Palaeolithic: two from the Levant into Europe (e.g., Hublin, 2015), and one from Europe to the Levant (e.g., Bar-Yosef and Belfer-Cohen, 2010). Similarities found between the Emirian techno-complex and the Bohunician industry (Skrdla, 2003), and between the Ahmarian and Proto-Aurignacian (e.g., Hublin, 2015) were proposed to reflect population movement from the Levant to Eurasia conforming to the "Out of Africa" model (e.g., Stringer, 2001; Mellars, 2006; Fu et al., 2014; Hershkovitz et al., 2015). A later "back migration" of European Aurignacians into the Levant has also been suggested (e.g., Bar-Yosef and Belfer-Cohen, 2010; Belfer-Cohen and Goring-Morris, 2014b).

A different view is proposed by Teyssandier et al. (2010) who suggested a gradual and localized emergence of the traits that constitute "full" behavioral modernity during the European Upper Paleolithic in general and the Aurignacian in particular. The lithic tool production seems to develop in different regions in continuity with local, preexisting populations. In their opinion, the sum of the basic characteristic traits of the Aurignacian was not the result of a full "revolution" but rather a fuller association of ideas, some of which were already expressed in earlier cultural complexes such as the use of projectile weapons. The transition from the Middle Paleolithic to the Upper Paleolithic involved a possible demographic increase (e.g., Shennan 2001; Zilhão 2006) and, as a consequence, an accelerated cultural and genetic intermixing. This led to the reformulation of intergroup relations and, subsequently, to the development and diversification of personal ornaments in the second half of the Aurignacian (ca. 32,000–31,000 BP; Teyssandier 2008; Teyssandier et al. 2010; Zilhão 2006, 2007). In sum, Manot is an excellent case study to examine the hypotheses of replacement versus the in situ evolution of Upper Paleolithic industries in Europe.

## *The Upper Paleolithic Settlement Pattern*

The Upper Paleolithic settlement patterns and seasonal mobility stategies in the Levant are relatively under-studied. The well-preserved rich archaeological accummulation of the early Upper Paleolithic horizons at Manot Cave provide us with an exceptional opportunity for investigating these issues.

In their pionering work, Marks and Friedel (1977) suggested a radiating settlement pattern for the early Middle Paleolithic occupations in the Negev Highland (Avdat/Aqev region) as part of a logistical mobility pattern. The sites of Rosh Ein Mor (D15) and Ein Aqev (D35) functioned as base-camps while other sites were used as specialized sites within a logistical strategy system. However, as the environment became drier during the late Mousterian and early Upper Paleolithic, hunter-gatherers in the region shifted to a strategy of residential, circulating mobility. This interpretation was based on the fact that most of the Upper Paleolithic sites are small (not exceeding 300 $m^2$), and display a low density of artifacts with low intra site vairiabily. In addition, these sites appear to indicate ephemeral and repetetive occupations reflecting a high degree of seasonal mobility. In contrast to Marks and Friedel's model, Coinman et al. (1986), argued that a radiating settlement system remained relatively constant throughout the Upper Pleistocene in the Wadi Hasa, where large sites with diverse lithic assemblages occur only at lower elevations and smaller sites with more limited assemblages are found at higher elevations.

Lieberman and Shea (1994:318) examined the issue of subsistance strategies during the Middle Palaeolithic. Based on the combined data of cementum-increment analysis, and lithic data (mainly on Levallois points) from the Middle paleolithic sites of Kebara, Qafzeh, and Tabun Caves, they suggested that archaic

humans (Neanderthals) at Kebara and Tabun B were less seasonally mobile, and as a consequence, hunted more frequently compared to modern humans at Qafzeh and Tabun C. Furthermore, they suggested that archaic humans practiced a radiating mobility strategy while modern humans largely practiced a circulating mobility strategy. Meignen et al. (2006:149-150) focusing on the sites of Hayonim F and Lower E and Kebara XI-IX sugessted that Hayonim was characterized by more ephemeral visits while Kebara was characterized by intensive repetetive use of the cave. Furthermore, they argue for local demographic changes and population increases between the early to late Middle Paleolithic. This trend was also observed in the four meters deep section of the late Middle Paleolithic of Kebara Cave. The evidence for this demographic change was reflected in Kebara by the high denstiy of flint artifacts (1000-1200 per $m^3$ for 1500 years), and the transport of flint raw materials from within the catchment area (10-15 km from the site). Moreover, this shift is charcterized by a decline in the utilization of large bodied animals (e.g. red deers and aurochs) in favor of juvenile and young adult gazelles. The change in hunting strategy was further observed in the Upper and Epipaleolithic of Hayonim and Meged Cave sites which show a shift to the utilization of small game as a result of the depletion of large mammals communities as early as the late Middle Paleolithic (Stiner 2006:226-228).

When considering the Upper Paleolithic subsistence strategies in general, and particularly the hunter/gatherer mobility pattern at Manot Cave, the following issues need to be investigated: 1) What are the densities of flint and bone artifacts? 2) Are complete core reduction sequences represented at the site? 3)What were the preferred raw materials exploited by the cave's inhabitants? 4) And finally, is there a change in hunting strategies and mobility patterns through the early Upper Paleolithic?

## *Manot Cave*

Manot Cave, located in the western Galilee (Israel), was subjected to seven seasons of excavation (2010-2016). The excavations revealed intensive and dense occupation from the Early Upper Palaeolithic, mainly of the Aurignacian cultural-complex (Barzilai et al. 2016; Marder et al. 2017).

*Fig. 1: Manot Cave general view (view to the east)*

An almost complete human calvaria (Manot 1) of *Homo sapiens* was found in a side chamber extending eastward from the NE wall of the main cave chamber (Hershkovitz et al. 2015: Extended Data Fig. 1). This fossil was dated by uranium–thorium method to a minimum age of 54.7 ±5.5 kya BP (arithmetic mean ± 2 standard deviations). Manot 1 is similar in shape to recent African skulls as well as to European skulls from the Upper Palaeolithic period, but different from most other early anatomically modern humans in the Levant. This suggests that the Manot people could be closely related to the first modern humans who later successfully colonized Europe. Moreover, at present, Manot 1 is the only modern human specimen to provide evidence that during the Middle to Upper Palaeolithic interface, both modern humans and Neanderthals contemporaneously inhabited the southern Levant; close in time to the likely interbreeding event with Neanderthals (Hershkovitz et al. 2015).

*Figure 2: Manot 1 calvaria lateral view*

## *Results of the 2016 Excavation Season*

During the 2016 excavation season, the work concentrated on five different areas (C, E-F). The majority of study focused on Areas E and I where the archaeological horizons were best preserved. In these areas, the excavations have exposed a long and rich archaeological record mainly from the Early Upper Paleolithic Period (mainly Aurignacian techno-complex). However, the recent study also concentrated in other areas. In Area C, units 5-7 were thoroughly investigated in order to clarify the complex stratigraphy of the Talus. Finally, taking into considration that almost all the human remains found at Manot were retrieved from Area C, we made an extra effort to find more human remains that may be connected to the articulated foot, which was found in the 2014 season. An additional important effort was to be conducted in area F in order to trace evidence for the original location of this entrance and for the processes which lead to its sealing.

## Area C

In the 2016 season, there were three main objectives for Area C. One of the objectives was to detect the changes between units 5, 6, and 7. The second objective was to expand and deepen the excavation area at squares J64, K64, J63, K63 in order to reach the Middle Palaeolithic layers (Fig. 1).

Work focused on two main parts of the area, the upper one - square K67, K66, J66, and the lower one - J64c-d, K64b-d, J63, and K63. Artifacts in the upper squares (K67, K66, and J66) were retrieved with coordinates, orientation and position (ventral, dorsal or lateral). The sediments were assigned to a 5 cm excavated spit. As for the lower squares, they were excavated in a 10 cm spit. In addition to those squares, K65 a-b and d were excavated in a 5 cm spit but without taking coordinates for the artifacts. All the sediment, which was endless from all the squares, was wet sieved with a 1 cm and 0.2 mm mesh. Charcoals were collected with coordinates only in squares K67, K66, K65 and J66, and in the rest of the squares only with the basket data (Appendix 3).

*Fig 3: Area C, view to the west (squares J and K)*

### *Stratigraphy*

This season we excavated units 5-7. The units 1-4 and 8 that are presented below are from earlier seasons.

***Unit 1*** – The talus surface which is composed of a thin layer of approximately 5 cm along the complete section.

***Unit 2*** – A concentration of large natural stones forming a thin layer just below the surface. This unit varies from 10 to 20 cm in thickness and in K67 seems to overlay a channel that cuts through.

***Unit 3*** – Loose sediment with few artifacts. The unit tilts lightly to the north interfering by lenses in squares K67, K66, L66, and is cut by a channel through K67 and K66.

***Unit 4*** – This unit was defined by compacted sediment rich in lithic artifacts and bones. This unit also tilts slightly to the north. This unit is approximately 50 cm thick, and thinner as the talus descends. The border between 4 and 5 was defined based on the change in artifact density.

***Unit 5*** – This unit was defined by compacted silty clay sediment, with angular stones and rich in lithic artifacts and bones. The unit thickness ranging from 20 cm in the south to ~40 cm in the north at section J-K67/68, and in the thickest part is approximately 60-70 cm. It seems that this section reflects a combination of colluvium accumulation and water activity.

A large animal burrow, presumably, creates a huge void in the sediment; it cuts units 5-6 and is seen only in section K-J67 (Fig.3). It seems that the burrow goes further west into the talus.

***Unit 6*** – This unit composed by loose reddish silty clay loam sediment with few lithic artifacts and bones. This unit is cut by an old channel; however, it seems there are less stones in comparison to **Units 5 and 7** (especially in square K65a-b). The unit is approximately 40 to 70 cm thick.

***Unit 7*** – This unit in section J66/65 is separated from the overlaying unit 6 by an unconformity in the sediments. This unit is seen in section J66/J65 and is composed of compacted clay and silty clay loam rich in artifacts and stones. Within the unit amongst the stones, there is a looser loam rich in coprolites with a thickness of almost 50 cm, pointing to the presence of a channel, seen more clearly in excavated squares K64a, K65c.

***Unit 8*** – This year unit 8 has not been excavated. The unit comprised of fine clay to silty clay loam. This unit was excavated down to two large rocks, which filled the complete area. This seems not to be the bedrock, but only further excavation will clear this issue. From the lithics retrieved from J65 and J64, it seems that there are more fresh Levallois artifacts. These artifacts seem to be an integral part of the assemblage. At this moment, this unit is uncovered only 10 cm.

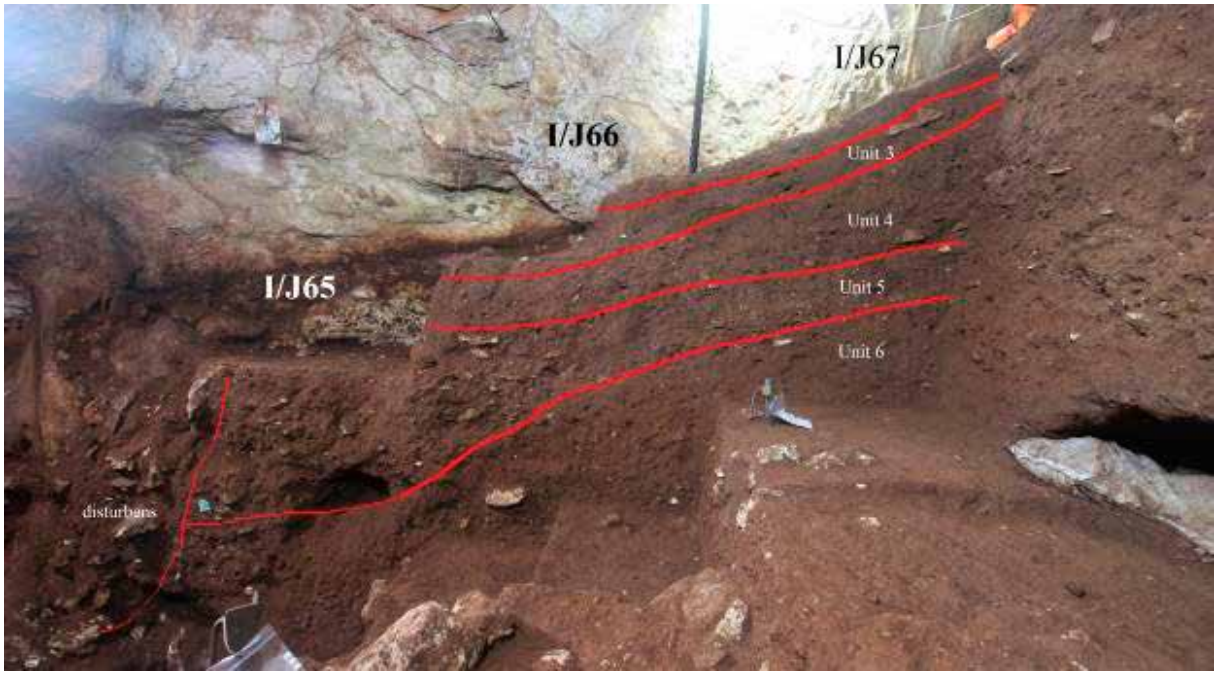



*Fig. 4: Section I/J65-67, according to different stratigraphic units*

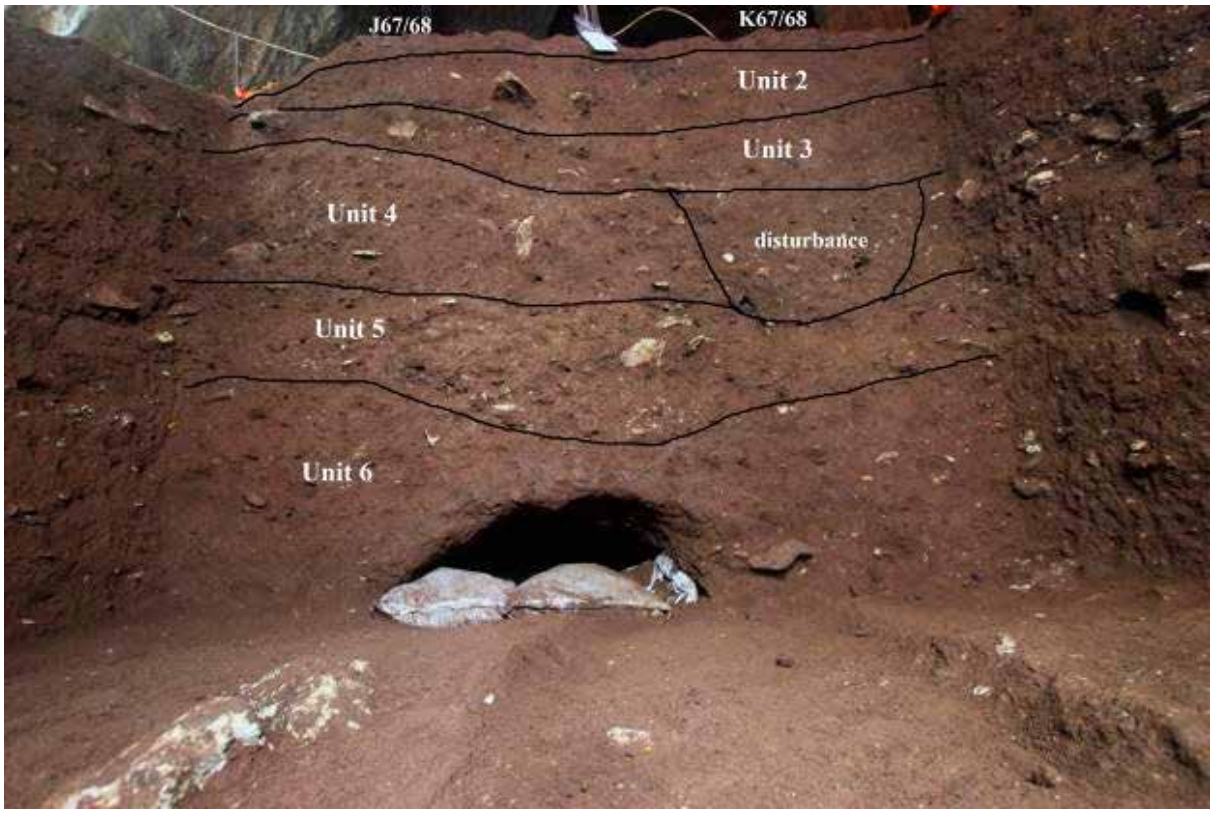



*Fig. 5: Section J-K67/68*

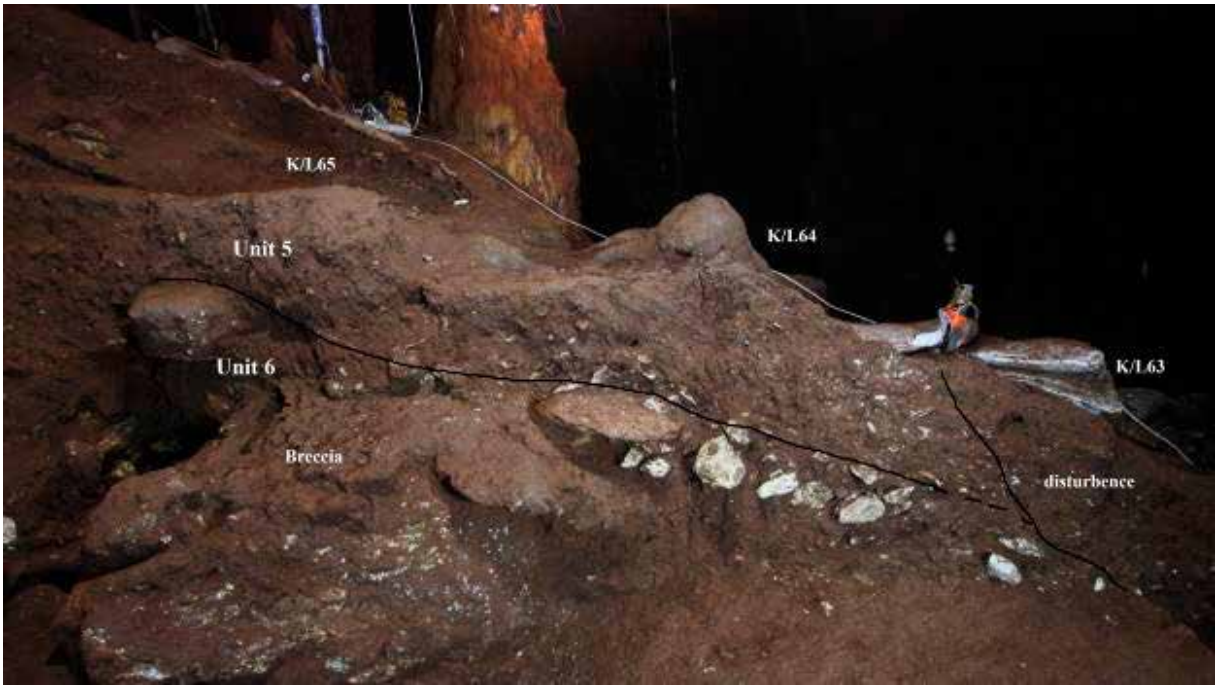



*Fig 6: Section K/L65-64*

## The Excavation

***Square K67*** – This square has been excavated mostly during 2014 season (Fig. 3, 5). In this season, we excavated mostly units 5 and 6, which consist of sediment rich in flint artifacts and bones accumulation. Most of the artifact we observed are lying with the slope direction and most are horizontal. In sub-square K67a, the animal burrow was observed already in the season of 2014 and we uncovered an additional part it.

***Square J/K66*** – In square K66, an old channel was uncovered and was found to contain medium to large angular limestone blocks (15-35 cm). Large bones were trapped between the stones (Fig. 3, 5).

***Square K65*** – This square has been excavated in sub-square a, b, and d. It seems that the sediment in sub-squares a-b is very loose silty-clay and medium stones, rich in large bones, and flint. Sub-square d, with a large rock (maybe fell from the cave ceiling) with breccia layer on top of it (Figs. 6-7), functioned as a natural barrier for stones (as in sub-square a-b).

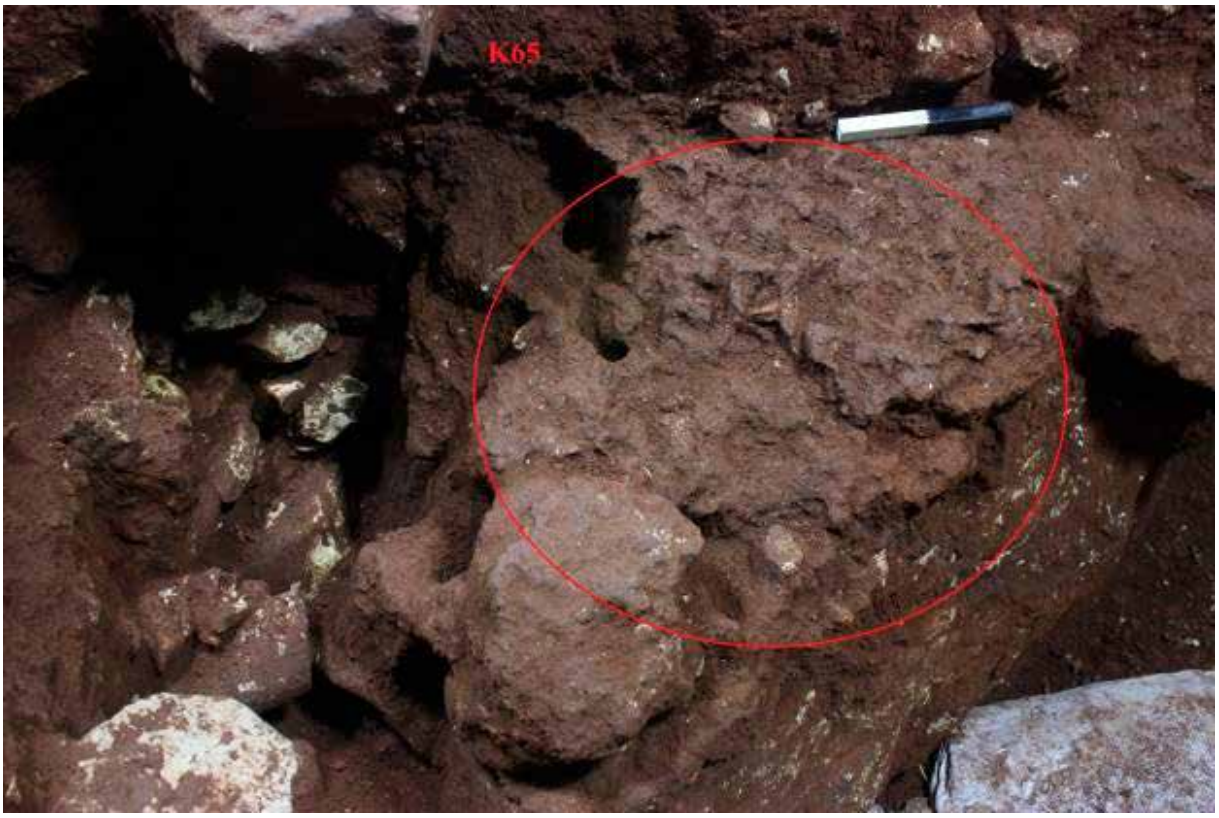



*Fig. 7: Square K65, breccia on a large rock*

***Squares J64-63, K64-63*** – These squares were open at the bottom of the talus almost at the lowest point of the talus slope along the southern cave wall. The main aim was to enable access to the deep sounding, and, in addition, to record the stratigraphy of the lower part of the talus. A full meter was excavated (Appendix 1). At Square J64, we exposed large rocks (Fig. 6) that seem to line the cave wall, which already was familiar from the 2014 season. There were many small to large stones (5-35 cm) and finds within the sediments, which represent movement and mixing processes (Fig. 8). This mixing was due to the water and the sediments that came down with higher velocity along the cave wall. In addition, round flowstone descended along the speleothem on top of the cave floor (until Square K65/64) and acted as a barrier for water and sediment coming down the talus slope (Fig. 6).


*Fig 8: Section J-K64\63, view to the south*

## *The Finds*

### The Lithics

The lithic that was retrieved this season is similar to ones retrieved in previous years. It is worth mentioning that squares J63 and K63 were highly disturbed and mixed. The artifacts in these squares represent a mixing of all three cultures (mainly large cores, scrapers, chunks), without any clearly defined stratigraphy. In the upper squares (Squares K67, K66 and J66), we uncovered mostly blade/lets included in all the stages of the reduction sequence. We managed during the excavation to refit between two items from different squares: a core from K64 (B. 18,006) to a bladelet from J64c-d (B. 18,011).

### The Fauna

The variety and abundance of the fauna in Area C is remarkable. Faunal remains are rich including mainly small to medium size ungulates. In addition, also birds, tortoise, squirrel, and small carnivores were identified. Few bone tools were found (appendix 2) including points made on antler. The bone/antler tools are found mainly in the upper part of unit 6.

## *Appendix 1: Baskets List*

| Basket | Square | Upper elev. | Bottom elev. | Unit | Comments |
|---|---|---|---|---|---|
| 3980 | k65a | 205.3 | 205.27 | | |
| 3981 | k64c | 205.14/205.02 | 205.12/205.00 | | |
| 3982 | k67a | 206.26 | 206.24 | 5 | |
| 3983 | J66a | 205.59 | 205.56 | 6 | |
| 3984 | K65b | 205.3 | 205.27 | | |
| 3985 | J64c-d | 205.34 | 205.24 | | |
| 3986 | K64 | 205.10/205.00 | 205.09/205.00 | | |
| 3987 | J66a | 205.56 | 205.52 | 6 | |
| 3988 | K67a | 206.24 | 206.2 | 5 | |
| 3989 | K65a-b | 205.27 | 205.22 | | |
| 3990 | J64c-d | 205.24 | 205.13 | | |
| 3991 | K64 | 205.09/205.00 | 204.9 | | |
| 3992 | K65a-b | 205.22 | 205.17 | | |
| 3993 | K67a | 206.21 | 206.16 | 6 | |
| 3994 | J66b | 205.61 | 205.59 | 6 | |
| 3995 | J64 | 205.3 | 205.13 | | |
| 3996 | K65a-b | 205.17 | 205.12 | | |
| 3997 | J66b | 205.59 | 205.54 | 6 | |
| 3998 | J64c-d | 205.03 | 204.98 | | |
| 3999 | K65a-b | 205.12 | 205.07 | | |
| 18000 | K64 | 204.9 | 204.84/204.79 | | |
| 18001 | J66b | 205.54 | 205.49 | 6 | |
| 18002 | K65b | 205.18 | 205.13 | | |
| 18003 | K67b | 206.23 | 203.21 | 5 | |
| 18004 | K67b | 206.21 | 206.17 | 6 | |
| 18005 | K65d | 205.13 | 205.08 | | human talus |
| 18006 | K64 | 204.84 | 204.73 | | |
| 18007 | J66a | 205.56 | 205.51 | 6 | |
| 18008 | K67b | 206.17 | 206.16 | 6 | |
| 18009 | K65d | 205.08 | 205.03 | | |
| 18010 | K67b | 206.16 | 206.12 | 6 | |
| 18011 | J64c-d | 204.98 | 204.86 | | |
| 18012 | J66a | 205.51 | 205.48 | 6 | |
| 18013 | K67a | 206.16 | 206.1 | 6 | |
| 18014 | K65a-b | 205.09 | 205.04 | | |
| 18015 | J66a | 205.51 | 205.46 | 6 | |
| 18016 | K64 | 204.76 | 204.66 | | |
| 18017 | J64c-d | 204.86 | 204.79 | | |
| 18018 | K65a-b | 205.04 | 204.97 | | |
| 18019 | K67a | 206.1 | 206.04 | 6 | basalt |
| 18020 | K65d | 205.04 | 204.98 | | |
| 18021 | M/k65 | clean section | | | |
| 18022 | J66b | 205.53/205.50 | 205.47 | 6 | |
| 18023 | J66/67 | clean section | | 6 | |
| 18024 | K64 | 204.7 | 204.6 | | |
| 18025 | K65d | 205.08/204.93 | 204.98 | | |

| Basket | Square | Upper elev. | Bottom elev. | Unit | Comments |
|---|---|---|---|---|---|
| 18026 | J64c-d | 204.79 | 204.66 | | |
| 18027 | J63c-d | 205.03/204.70 | 204.8/204.7 | disturbed | |
| 18028 | K64-K65 | cleaning | | | |
| 18029 | K67b | 206.15 | 206.11 | 6 | |
| 18030 | J63c-d | 204.80/204.70 | 204.7 | disturbed | |
| 18031 | J64c-d | 204.66 | 204.56 | | |
| 18032 | K67b | 206.11 | 206.06 | 6 | |
| 18033 | J63c-d | 204.7 | 204.6 | disturbed | |
| 18034 | K65a-b | 204.97 | 204.9 | | |
| 18035 | J66c | 205.64 | 205.57 | 6 | |
| 18036 | J63c-d | 204.6 | 204.49 | disturbed | |
| 18037 | K67b | 206.06 | 206.01 | 6 | |
| 18038 | K64 | 204.61 | 204.57 | | |
| 18039 | K65a-b | 205.06/204.90 | 204.9 | | |
| 18040 | J63c-d | 204.49 | 204.4 | disturbed | |
| 18041 | K65a-b | 204.89 | 204.84 | 6 | |
| 18042 | K64 | 204.57 | 204.41 | | |
| 18043 | J64c-d | 204.51 | 204.4 | | |
| 18044 | J63c-d | 204.4 | 204.3 | disturbed | many large flint |
| 18045 | K63c-d | 205.1/204.70 | 204.80/204.70 | disturbed | large flint and bones |
| 18046 | J63c-d | 204.3 | 204.2 | disturbed | |
| 18047 | K67b | 206.01 | 205.98 | 6 | |
| 18048 | K63c-d | 204.80/204.70 | 204.7 | disturbed | |
| 18049 | J63c-d | 204.2 | 204.14 | disturbed | |
| 18050 | K65a-b | 204.84 | 204.8 | | |
| 18051 | K63c-d | 204.7 | 204.6 | disturbed | |
| 18052 | K66d | 205.94 | 205.78 | 5 | |
| 18053 | K63c-d | 204.6 | 204.49 | disturbed | |
| 18054 | K67b | 205.98 | 205.93 | 6 | |
| 18055 | J66d | 205.57 | 205.53 | 6 | |
| 18056 | K64 | 204.44 | 204.33 | | |
| 18057 | K65d | 204.93 | 204.87 | disturbed | |
| 18058 | K66d | 205.78 | 205.68 | 5 | |
| 18059 | K63c-d | 204.49 | 204.39 | disturbed | |
| 18060 | K65c | | | | |
| 18061 | K66d | 205.68 | 205.58 | 5 | |
| 18062 | K65a | | | | |
| 18063 | K64 | 204.33 | 204.24 | | |
| 18064 | K67d | 206.23 | 206.21 | 5 | |
| 18065 | K63c-d | 204.39 | 204.37 | disturbed | |
| 18066 | K65c | | | | |
| 18067 | K66c | 205.67 | 205.53 | 6 | |
| 18068 | K67d | 206.23 | 206.17 | 5 | |
| 18069 | J66c | 205.54 | 205.48 | 6 | |
| 18070 | J63a-b | 205.31 | 205.11 | disturbed | |
| 18071 | K63c-d | 205.32/205.12 | 205.08 | disturbed | |
| 18072 | K65a-b | 204.83/204.80 | 204.74 | 6 | |

| Basket | Square | Upper elev. | Bottom elev. | Unit | Comments |
|---|---|---|---|---|---|
| 18073 | K67c | 206.24 | 204.18 | 5 | |
| 18074 | J66d | 205.62 | 205.57 | 5 | |
| 18075 | K63a-b | 205.08 | 204.9 | disturbed | |
| 18076 | J63a-b | 205.11 | 204.91 | disturbed | |
| 18077 | K67c | 206.18 | 206.13 | 6 | |
| 18078 | J66d | 205.57 | 205.51 | 6 | |
| 18079 | K65a | 204.74 | 204.69 | 6 | many large animal bones |
| 18080 | K67c | 206.16 | 206.11 | 6 | |
| 18081 | J66d | 205.52 | 205.47 | 6 | bladelets, Levalloisian core |
| 18082 | K65/66 | clean section | | | |
| 18083 | K67c | 206.11 | 206.06 | 6 | |
| 18084 | K65b | 204.75 | | | |
| 18085 | K63a-b | 204.9 | 204.7 | disturbed | Mousterian side scraper, |
| 18086 | J63a-b | 204.91 | 204.7 | disturbed | |
| 18087 | J66d | 205.47 | 205.43 | 6 | blade cores |
| 18088 | K67d | 206.16 | 206.09 | 6 | |
| 18089 | K66b | 205.95 | 205.89 | 5 | patella |
| 18090 | K67d | 206.09 | 206.04 | 6 | antler point |
| 18091 | J66c | 205.52 | 205.47 | 6 | |
| 18092 | K66b | 205.89 | 205.84 | 5 | |
| 18093 | K67d | 206.05 | 206 | 6 | |
| 18094 | J66c | 205.47 | 205.42 | 6 | |
| 18095 | K63a-b | 204.73 | 204.53 | disturbed | |
| 18096 | J63a-b | 204.76 | 204.57 | disturbed | |
| 18097 | K67c | 206.03 | 205.98 | 6 | |
| 18098 | K66d | 205.4 | 205.35 | | |
| 18099 | K66b | 205.95 | 205.9 | 5 | |
| 18100 | K67a | 206.09 | 206.03 | 6 | |
| 18101 | K67a | 206.03 | 205.98 | 6 | burrow |
| 18102 | K67b | 205.99 | 205.94 | 6 | |
| 18103 | K63a-b | 204.53 | 204.38 | disturbed | |
| 18104 | K66a | 205.9 | 205.85 | 6\5 | |
| 18105 | K67b | 206 | 205.94 | 6 | |
| 18106 | J66c | 205.43 | 205.37 | 6 | |
| 18107 | K67d | 205.99 | 205.96 | 6 | |
| 18108 | K66a | 205.85 | 205.8 | 6 | blade/lets |
| 18109 | K67d | 205.96 | 205.9 | 6 | |
| 18110 | J66d | 205.39 | 205.34 | 6 | |
| 18111 | K67d | 205.9 | 205.85 | 6 | |
| 18112 | K66a | 205.8 | 205.75 | 6 | |
| 18113 | K67b | 205.89 | 205.83 | 6 | |
| 18114 | J66d | 205.34 | 205.3 | 6 | Ahmarian |
| 18115 | K66b | | | | |
| 18116 | K66b | 205.83 | 205.76 | 5 | |
| 18117 | M/K63 | clean section | | | |
| 18118 | J66c | 205.36 | 205.32 | 6 | |
| 18119 | K67a | 205.97 | 205.94 | 6 | Burrow |

| Basket | Square | Upper elev. | Bottom elev. | Unit | Comments |
|---|---|---|---|---|---|
| 18120 | K66a | 205.76 | 205.73 | 6 | blade/lets, R.B |
| 18121 | I/J63 | clean section | | | |
| 18122 | J63a-b/c-d | clean section | | | |
| 18123 | J63/62 | clean section | | | |
| 18124 | K67c | 205.97 | 205.91 | 5\6 | |
| 18125 | J66/67 | clean section | | 6 | |
| 18126 | K67a | 205.92 | 205.87 | 5\6 | blade/lets, blade cores |
| 18127 | K66a | 205.75 | 205.7 | 6 | |
| 18128 | I/J66 | clean section | | | |
| 18129 | K67c | 205.91 | 205.9 | 6 | |
| 18130 | K67/68 | clean section | | | |
| 18131 | K/M67 | clean section | | | |

## *Appendix 2: Bone Tools*

| Basket | Square | Upper elev. | Bottom elev. | unit | tool |
|---|---|---|---|---|---|
| 18080 | K67c | 206.16 | 206.11 | 6 | |
| 18081 | J66d | 205.52 | 205.47 | 6 | |
| 18090 | K67d | 206.09 | 206.04 | 6 | antler |
| 18127 | K66a | 205.75 | 205.7 | 6 | |

## *Appendix 3: Charcoal*

| Basket | Square | X | Y | Z | date |
|---|---|---|---|---|---|
| 3988 | K67a | 43 | 81 | 206.2 | 18.7.16 |
| 3988 | K67a | 12 | 61 | 206.22 | 18.7.16 |
| 3988 | K67a | 13 | 91 | 206.22 | 18.7.16 |
| 3989 | K65a-b | 10 | 75 | 205.22 | 18.7.16 |
| 3989 | K65a-b | 60 | 80 | 205.23 | 18.7.16 |
| 3989 | K65a-b | 8 | 87 | 205.22 | 18.7.16 |
| 3990 | J64c-d | 64 | 14 | 205.23 | 18.7.16 |
| 3990 | J64c-d | 47 | 16 | 205.15 | 19.7.16 |
| 3991 | K64c-d | 17 | 45 | 205.01 | 19.7.16 |
| 3992 | K65a-b | 20 | 87 | 205.18 | 19.7.16 |
| 3992 | K65a-b | 25 | 75 | 205.18 | 19.7.16 |
| 3992 | K65a-b | 33 | 86 | 205.14 | 19.7.16 |
| 3992 | K65a-b | 47 | 57 | 205.17 | 19.7.16 |
| 3993 | K67a | 12 | 72 | 206.21 | 19.7.16 |
| 3993 | K67a | 41 | 68 | 206.2 | 19.7.16 |
| 3993 | K67a | 48 | 67 | 206.19 | 19.7.16 |
| 3993 | K67a | 43 | 82 | 206.19 | 19.7.16 |
| 3993 | K67a | 48 | 67 | 206.19 | 19.7.16 |
| 3993 | K67a | 30 | 65 | 206.17 | 19.7.16 |
| 3993 | K67a | 43 | 35 | 206.2 | 19.7.16 |
| 3996 | K65a-b | 20 | 80 | 205.13 | 19.7.16 |
| 3996 | K65a-b | 55 | 60 | 205.17 | 19.7.16 |

| Basket | Square | X | Y | Z | date |
|---|---|---|---|---|---|
| 3996 | K65a-b | 24 | 63 | 205.16 | 19.7.16 |
| 3996 | K65a-b | 2 | 63 | 205.17 | 19.7.16 |
| 3996 | K65a-b | 25 | 90 | 205.16 | 19.7.16 |
| 3996 | K65a-b | 20 | 80 | 205.14 | 19.7.16 |
| 3999 | K65a-b | 28 | 79 | 205.11 | 20.7.16 |
| 3999 | K65a-b | 36 | 76 | 205.12 | 20.7.16 |
| 18,001 | J66b | 80 | 70 | 205.52 | 20.7.16 |
| 18,001 | J66b | 88 | 54 | 205.51 | 20.7.16 |
| 18,000 | K64c-d | botanic | | 204.90-84 | 20.7.16 |
| 18,006 | K64c-d | botanic | | 204.84 | 21.7.16 |
| 18,007 | J66a | 30 | 74 | 205.55 | 21.7.16 |
| 18,010 | K67b | 85 | 90 | 206.12 | 21.7.16 |
| 18,015 | J66a | 26 | 54 | 205.5 | 25.7.16 |
| 18,016 | K67a | botanic | | | 25.7.16 |
| 18,017 | J64c-d | botanic | | | 25.7.16 |
| 18,022 | J66b | 69 | 55 | 205.55 | 26.7.16 |
| 18,022 | J66b | 95 | 55 | 205.55 | 26.7.16 |
| 18,022 | J66b | 95 | 55 | 205.55 | 26.7.16 |
| 18,022 | J66b | 64 | 60 | 205.47 | 26.7.16 |
| 18,022 | J66b | 52 | 70 | 205.48 | 26.7.16 |
| 18,026 | J64c-d | botanic | | | 26.7.16 |
| 18,031 | J64c-d | botanic | | | 26.7.16 |
| 18,032 | K67b | 66 | 98 | 206.09 | 26.7.16 |
| 18,034 | K65a-b | botanic | | | 26.7.16 |
| 18,037 | K67b | 73 | 55 | 206.02 | 27.7.16 |
| 18,037 | K67b | 100 | 50 | 206.03 | 27.7.16 |
| 18,047 | K67b | 60 | 100 | 206.03 | 28.7.16 |
| 18,061 | K66d | botanic | | | 28.7.16 |
| 18,061 | K66d | botanic | | | 28.7.16 |
| 18,064 | K67d | botanic | | | 28.7.16 |
| 18,078 | J66d | 80 | 42 | 205.53 | 31.7.16 |
| 18,080 | K67c | 48 | 23 | 206.15 | 1.8.16 |
| 18,080 | K67c | 43 | 43 | 206.11 | 1.8.16 |
| 18,089 | K66b | botanic | | | 1.8.16 |
| 18,090 | K67b | 84 | 11 | 206.04 | 1.8.16 |
| 18,090 | K67b | 74 | 73 | 206.07 | 1.8.16 |
| 18,092 | K66d | 77 | 20 | 205.86 | 2.8.16 |
| 18,092 | K66d | 77 | 50 | 205.98 | 2.8.16 |
| 18,092 | K66d | 57 | 38 | 205.87 | 2.8.16 |
| 18,094 | J66c | 6 | 18 | 205.45 | 2.8.16 |
| 18,098 | J66d | 90 | 18 | 205.37 | 2.8.16 |
| 18,098 | J66d | 92 | 40 | 205.4 | 2.8.16 |
| 18103 | K63a-b | botanic | | | 3.8.16 |
| 18,106 | J66c | 9 | 24 | 205.37 | 3.8.16 |
| 18,108 | K66a | 37 | 94 | 205.85 | 3.8.16 |
| 18,108 | K66a | 2 | 90 | 205.82 | 3.8.16 |
| 18,119 | K67a | 1 | 73 | 205.96 | 3.8.16 |

## *Area E*

Area E is located at the western end of the cave, on top of the soil talus, south of the operational entrance to the cave (Fig. 9).

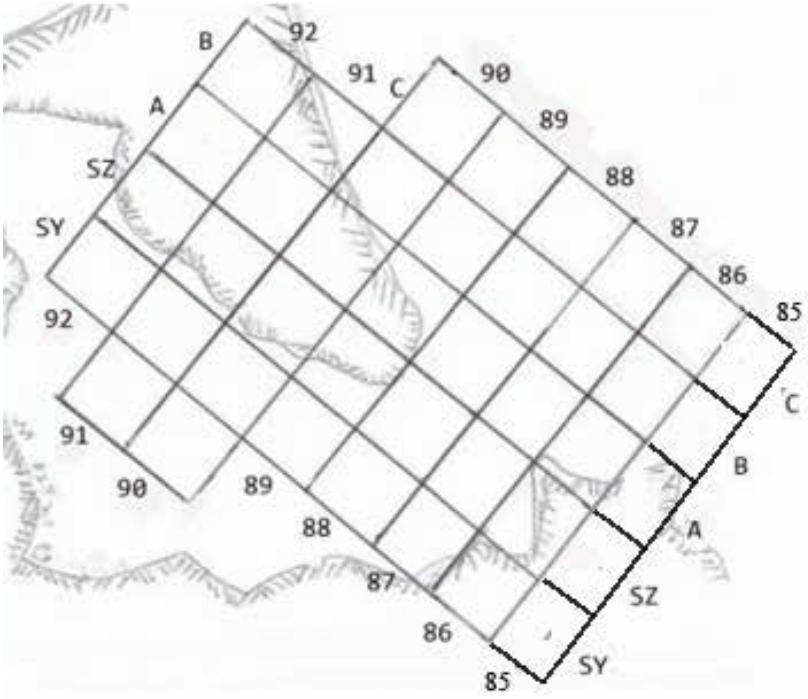



*Fig. 1: A plan of Area E*

A total of 20 squares were excavated this season in four main sub-areas. The main goals were defined as follows:

- Extending the work on Row 85, located at the southern edge of the area, which is close to the sloping ceiling towards the south (Fig. 9). Work in this sub-area was aimed to spatially and vertically define the distribution of Layer IX and to test the stratigraphic correlation between Layer IX, which is considered the lower part of Unit 2, and Unit 3. During the excavation, the top of Layer IX was exposed directly underneath unit 1 sediments (Fig. 10).
- Continue the excavation in Squares A88, A89, B89, in order to verify the exact size, extensions and dimensions of combustion feature L510, which was partially uncovered in the 2015 season and was ascribed to Layer VI.
- Condense work on the southern part of the area (Squares SY, SZ, A, B 86-87) in order to expose and excavate Layer IX, trying to better understand its horizontal distribution, composition, and correlation with the other parts of unit 2.
- Conducting a deep-sounding test pit in order to better determine the chron-stratigraphy of area E/cave entrance by exposing the depth and extent of the archaeological layers in this area. The deep sounding was placed in Squares C 86-87, on the bottom of the slope of Area E in the southeastern part of the area. It was also used to probe into Unit 3, giving an initial indication of its inner stratigraphy.

Some of the goals stated above were not fully reached this season. This especially regards the characterization of Layer IX and Unit 3, and their correlation with the previously defined units/layers.


*Fig. 10: Rows 85 and 86 before the excavation this season; note the darker color of Unit 1 sediments in Row 85; looking south.*

### *Results*

No changes were made to the stratigraphy as was defined at the end of the 2015 season, except for some refinements and clarifications regarding the layers of Unit 2.

## Layer 2-VI

Work in this layer, which proved to be very rich in finds last year, was limited this season, confined to the exploration of combustion feature L510 (in Square B89) which was exposed last season. This included excavations in Squares SZ88, A88, A89 and B89. During the work, a part of L508 (its bottom part, overlying L510) was removed, exposing the rest of combusting feature 510 (Fig.11). The excavation showed that this hearth is a very large one, and is actually a series of hearths, with at least three distinct phases of ash accumulation. Charcoal samples were obtained from the different phases to be used for dating.

*Fig. 11: L510 after the removal of L508; looking south*

## The SZ-B85 Row

These squares were excavated in order to create a section at the southern part of the area, and in order to spatially enlarge the archaeological horizon. In all three squares, the upper part of layer IX was found eroded, with unit 1 sediments directly on top of the eroded surface.

Several big rocks were found embedded within the sediments of Layer 2-IX (Fig. 12). So far, these rocks are concentrated at the southern end of the area, and it is yet to be seen if they are distributed all over the area to the north, or maybe they were concentrated there, at the edge of the slope, intentionally.

On the southern edge of row 85 starts a massive speleothem which slopes all the way south down to Area C, at the bottom of the slope (Figs. 12-13). The relations between the archaeological sediments of unit 2 and the speleothem need to be clarified, and this speleothem needs to be dated in the future.

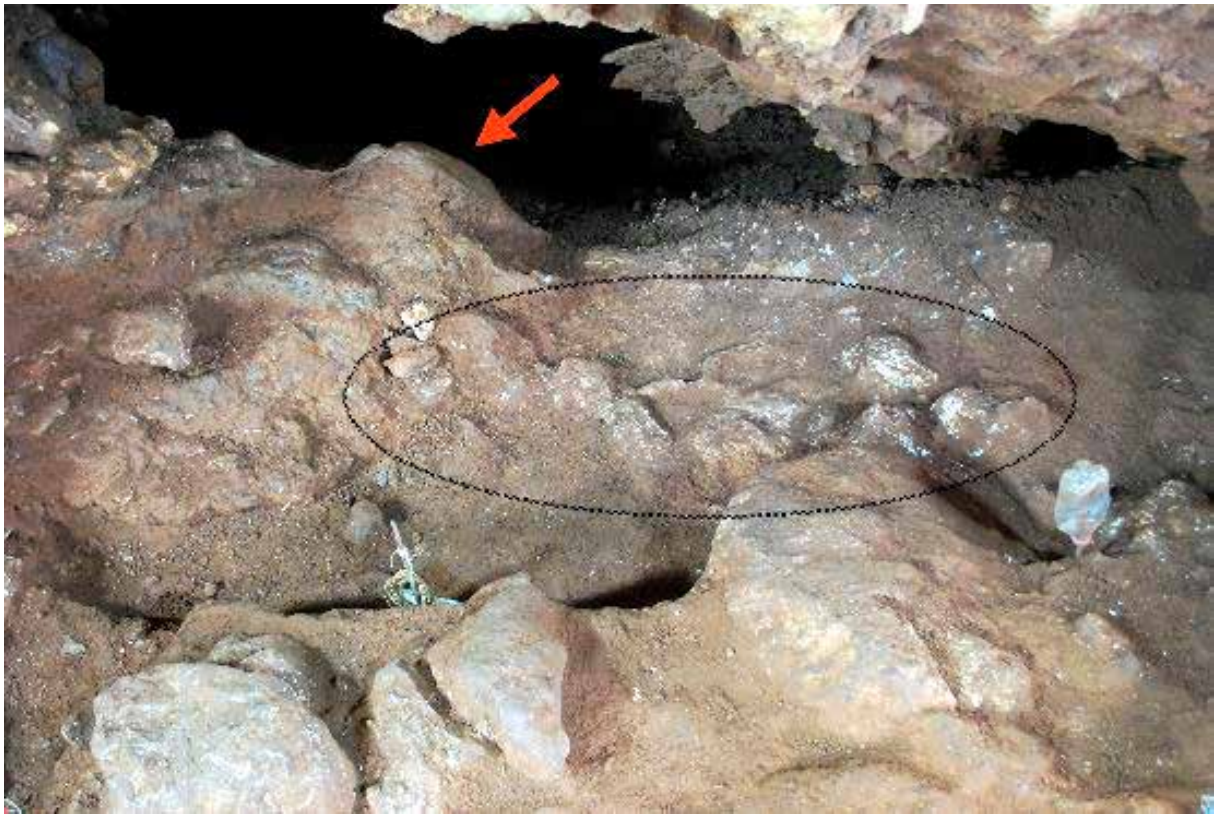


*Fig.12: Concentration of rocks within layer 2-IX sediments, the arrow marks the top of the speleothem sloping southward; looking south*

*Fig. 13: The massive speleothem bordering Area E from the south; looking north-west*

## Layer 2-IX

This layer, which was exposed last year very briefly, was more extensively excavated this year, including squares SY- B 86-87. The area exposed contains a very rich deposit of bones, with a few flint artifacts including a projectile point on an antler, which was found in Square SZ87. Most bones were found crushed or broken. The matrix in which the bones are set is hard, concreted brown-red soil; its thickness is at least 20 cm, although its contact with the underlying layer/unit is not completely clear at this point. In Square SZ-A 86 two thin ash lenses (1-2 cm in thickness) were recorded, which inclined to the south east (Fig. 14).

*Fig. 14: Ash concentration within Layer 2-IX*

## Deep Sounding Squares C 86-87

The deep sounding was conducted in Squares C 86-87, where the cave ceiling is relatively high. The excavation took place inside the hard concerted light brown soil sediments of Unit 3. The method of excavation consisted of arbitrary change of volume of excavation unit (basket) each 10-15 cm deep, and all the sediments retrieved were wet sieved in 5x5 mm as well as 1x1 mm mesh. The deep sounding reached a maximum depth of 1.2m, (218.8-217.6m asl). In the section created by the sounding, 12 subunits were noticed (Fig. 15), which were numbered separately from the general stratigraphy of the area. The subunits were defined as alternating light to dark brown and grey ashy sediments. All subunits were inclined to the southeast at an angle of approximately 60 degrees. The upper subunits (1-9) are showing an alternating sequence between packed, hardened sediments, possibly indicating consolidated ash, and non-consolidated brownish sediment. The lowermost subunits (10-12) are the thickest, consisting of a dark-brown sediment, and seem to be rich in charcoal and organic material. On the top of the deep-sounding there were several mid-size rocks within the sediments (Fig. 16), but most of the sediments in the sounding were void of rocks.

*Figure 15: The western section of the deep-sounding (Section B/C) showing the inclined layers; looking west*

The deep sounding was rich in archaeological finds, although finds density seemed to decrease slightly with depth. Lithic finds included diagnostic Aurignacian artifacts. In addition, several blade elements were also found. It is not clear if these blades are a part of the Aurignacian component, or an indication of an Ahmarian occurrence.

A few special finds were retrieved, including two polished tooth pendants (Figs. 17-18), one possibly with ochre signs, and a fragment of incised scapula (Fig.19). Similar bone pendants and incised bone scapula

were also found in Hayonim Cave (Belfer-Cohen and Bar-Yosef 1981) as well as Kebara Cave (Davis 1971). Of particular note was a worn human tooth (Fig. 20), its presence suggesting a potential for recovering additional human remains in this area.


*Fig. 16: Rocks in square C86 before digging the deep sounding; looking north*


*Fig. 17: A polished tooth pendant*


*Fig.18: A polished tooth pendant*

## *Summary*

The nature of Unit 3 and its correlation to the layered surfaces of Unit 2 are not clear yet. As was previously suggested, one possibility is that Unit 3 represents an episode of accumulation of anthropogenic sediments prior to the deposition of Unit 2 sediments and marks the initial formation of the Talus. Another possibility is that Unit 3 is part of the Unit 2 sediments, which had undergone a post-depositional process that created the various sloping crusts (water activity, possibly). Finally, the exposure of the inclined subunits in the deep-sounding could indicate the edge of the Aurignacian habitat area and their use as reuse dumping.

In order to decide which option is more likely, and to test the above-mentioned hypothesis, we need to carefully observe the finds from all the baskets associated with Unit 3 and compare that with Unit 2. This year's excavation in Areas E and I (see Goder-Goldberger 2016, Internal Report) have indicated the large extent of the Aurignacian occupation away from the cave entrance, distributed on an area of at least 80 sq. meters. The deep soundings in Areas E and I, located ca 11.5m apart (direct line), indicate approximately 2 m of Aurignacian accumulation (Fig. 21). Together with the uncovering of polished pendants and incised scapula alongside a human tooth suggests a high intensity of occupation during the early Upper Paleolithic.

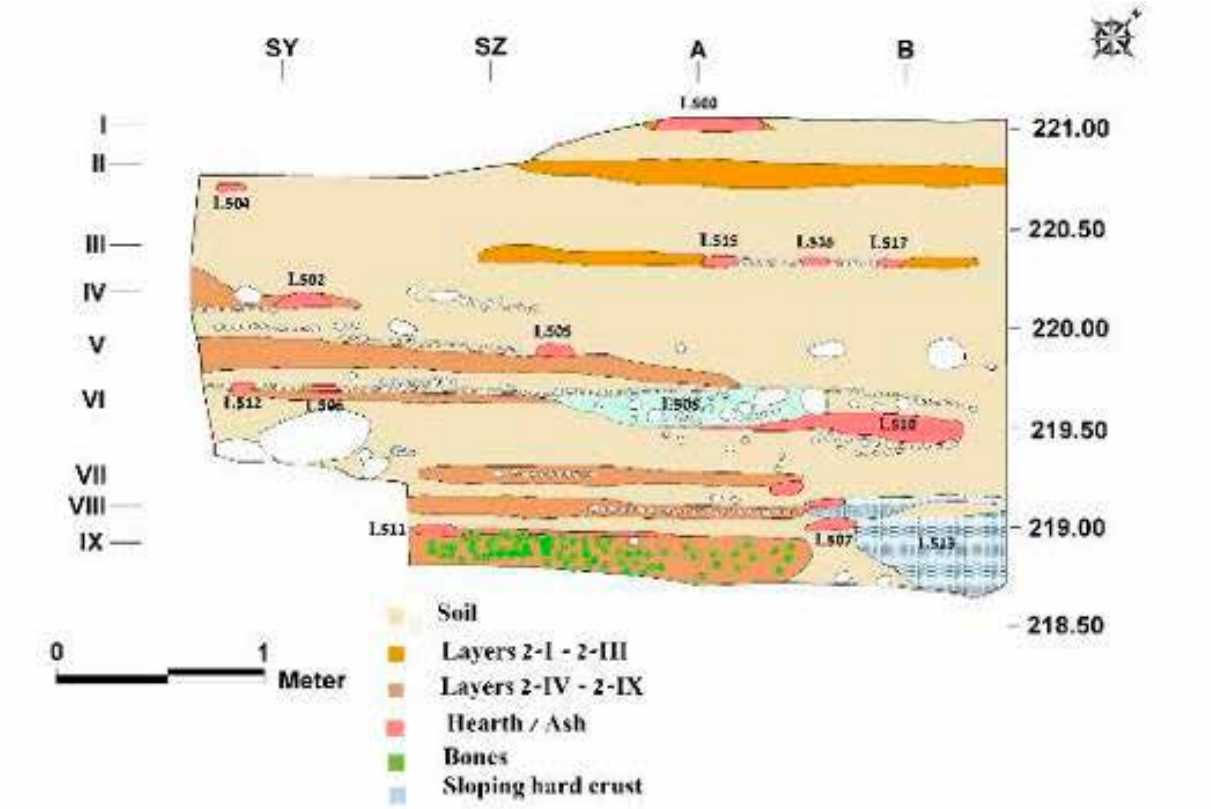



*Fig. 21: A composite section of Area E; the deep sounding is located at the lower right corner, under L513*

## *Manot 2016 Area I*

Area I is located along the northern wall (Fig. 22). Following the evidence of residual combustion features last season, the aim this year was to get a better understanding of the extent of these features and associated archaeological layers. Two other objectives for this season included widening the area towards the cave wall, and digging a deep sounding to verify the depth of sediment and associated archaeological layers.

Two new sets of squares were open in Area I in order to widen the exposure of the combustion features and archaeological layers exposed in the previous season. An area of 2x3 $m^2$ was opened and excavated along the cave wall (see Fig. 22 Squares F96-98 and G96-98) as well as another area of 2x2 $m^2$ ( see Fig. 22 – Squares K93-95, L94). Three stratigraphic units were defined. Three archaeological levels were identified, each including remains of a combustion feature and a patchy crust which varies in hardness and thickness but never exceeding a thickness of 10 cm. Artifacts are found sporadically throughout the excavation.

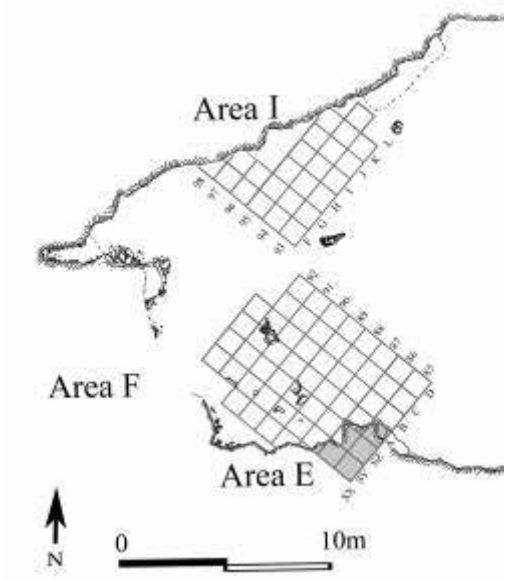



*Fig. 22: Map of excavated squares in Area I*

Squares F96-98 and G96-98 were excavated to a maximum depth of 70cm, to just above the elevation of L. 900 and archaeological Layer 1. We stopped the excavation in these squares as sediments were hard and compact, there were very few finds, thus, this season excavations concentrated on the deep sounding excavated in squares K93-94 and the combustion features of L. 900 and L. 904/905.

## *Stratigraphy*

Following the 2016 season, the sedimentological units and archaeological layers remain unchanged (Fig. 23). On the other hand, the combustion features of L. 900 and L. 904 seem to be more complex than thought at the end of last year. Full description of the units and layers appears in the 2015 report. The combustion loci and deep sounding of squares K93-94, excavated this season, will be described.

***Unit II*** – A sedimentological unit composed of reddish brown sediment mostly silty in texture (Layers 1-3). Lithics and bones were found sporadically throughout the unit. The sediments lack the big rocks seen in Unit I and seem to reflect less weathering indicated by the lack of gray and white spots. The sediment is rich in roots and yellow nodules ~1 cm in diameter.

***Layer 1*** – This layer is less than 10 cm thick, with a combustion feature (L. 900) in square F94, at elevation 220.66-220.60 m. (Fig. 22-23). The crusts around the feature, which did not seem to continue into square F95, were almost devoid of artifacts and bones. A sedimentary block was taken from the combustion feature (MM 27).

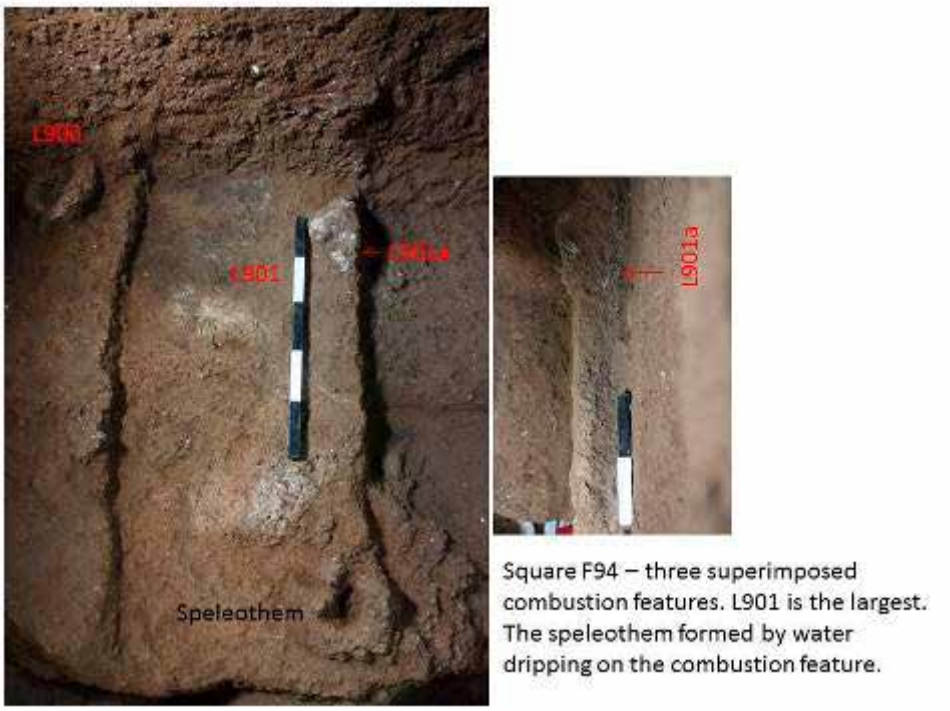
***Loci 900 and 901*** – These were defined in season 2015 and are thought to be two separate combustion features. As they were uncovered this season, it seemed that these two features can be split into three, representing three distict levels.


*Fig. 23: Units, layers, and loci of Area I*

***L. 900*** - Was exposed in the 2015 season (Fig. 24) and was removed. Elevations of L. 900, as expsoed this season, are 220.68-220.61 m. and consisted of a hard dark grey concretion. Once L. 900 was removed, the sediment was softer and a grey patch appeared, this was later defined as the upper most part of L. 901.

***L. 901*** – This combustion feature is about 70 cm in diameter. There is a clear differentiation of the sediment to a hard white semi-circular concretion with a dark ash patch within (Fig. 25). Flint artifacts and burnt flint artifacts were removed from the feature in three coordiantes and charcoal samples were collected. A cemented orange patch appears in association with the white concretion. In the section between F94 and F95, there seems to be another thin grey layer below L. 901. As for the moment, it is not clear if this is the bottom of L. 901 or a separate level of combustion feature and was therefore numbered as L. 901a. The top elevation of L.901 is 220.56m and the bottom is at 220.48m. The speleothem seems to have formed while L .901 was expsoed due to dripping from the sealing. The cementation process occurs from the exposed surface into the sediment, thus, the bottom of the speleothem is at a lower elevation than the bottom of L. 901. The elevations of the speleothem are 220.61-220.53m. Anthropogenic Layer 3 was not excavated this year.

Layer 2 was only excavated in F95 a and c, excavation was conducted in G95 in order to reach the top of Layer 3, to allow for a larger spatial exposure of the layer. The loci 902 and 903 were not excavated this season (Fig. 23).




Square F94 – three superimposed combustion features. L901 is the largest. The speleothem formed by water dripping on the combustion feature.

*Fig 24: Three combustion features in square F94*

Square F94 –L901 once the speleothem and L900 were removed.

*Fig. 25: L. 901 once L.900 and the speleothem were removed*

***Unit III*** – This sedimentological unit is composed of mostly reddish brown silty clay. At times, it is compact. A large concretion associated with rocks was exposed in squares I95b, I95d along the section; the sediment in these sub-squares was hard and compact with few flint items when close to the cave wall. Farther away from the wall towards I94 and I95a and c, the sediment was softer with flint artifacts. Layer 4 was not excavated this season, while the bottom of Layer 5 was excavated in Squares I94 and I95, as was the top of a new layer exposed this season, i.e., Layer 6 (Fig. 22).


*Figure 26: Combustion feature L.904.*

***L. 904*** is a large combustion feature composed of soft ashy sediments. In section H/I the bowl shape of the feature is seen, with a grey center, darker grey with large charcoal pieces towards the bottom, and a thin orange layer just below (Fig.26a and c and Fig. 27). L.903 (H94, ~219.80-219.60m) as identified last year seems to actually be the top of L.904, but this will be only be verifiable only once Square H95 will be excavated. This combustion feature is large, only partially exposed over an area of 30x40 cm in sq. I94c and I95a, and has a thickness of at least 40 cm at its center, with a series of charcoals sampled from the center at an elevation of 219.47-44 m. The bottom of this feature is at 219.33 m.

***Layer 5*** is associated with L. 904. This anthropogenic layer was composed of soft reddish/brown sediment and while flint artifacts were few, they included typically Aurignacian artifacts; a small core, an end scraper on blade, and another on a flake, bladelets and CTE of a bladelet core (Basket 9234 - Squares I95d, 219.43-219.37 m.).

***L. 905*** – This feature was exposed in sq. I94b and I95a at an elevation of 219.31-219.28 m. It is defined by a semi-circular line of yellow nodules, while the sediment within is greyish and soft, and the sediment outside (in I95a and b) was reddish, brown, and hard (Fig. 28).

***Layer 6*** is the defined anthropogenic layer associated with L. 905, a soft greyish concretion did seem to appear sporadically across I94 and I95, although not within L.905. The sediment just below the soft concretions is reddish brown, more compact in I95c than I94a with several flint artifacts found including an Aurignacian scraper and bladelets (elevations ~219.31-23 m).


*Fig. 27: Outline of L. 904 in section H/I*


*Fig. 28: L. 905 as defined by the semi-circular line of yellow nodules*

*Deep Sounding in Square K93-94* – These squares are located at the bottom of the slope of Area I (Fig. 29). The squares were excavated in 20 cm. spits and one of four buckets was wet sieved, the other three were dry sieved. The aim of the excavation in these squares was to see how deep the sediments are in this part of the cave and find evidence for *in situ* anthropogenic layer within these sediments. The two squares were excavated down to a depth of 2 m., down to an elevation of 217.48 m. On the surface of these squares, and extending into L94, there is a large concentration of bone (Fig. 29). This area had previously been marked as a find spot and seems to represent an accumulation of bones brought to the cave by scavengers.


*Fig. 29: Sections of square K94*

At the top of the section (section J/K 93-94) the sediment is reddish/brown rich in clay with variable amounts of white and yellow nodules (Fig. 29). Bellow the large rock in the northern section, the sediment changes, the levels have a steeper decline, and there is an interchange between soft sediment and hard concreted levels. Variable amounts of flint appear throughout the deep sounding, and bones, while still very few, seem to appear mostly below the large rock. In the lowest 40 cm, there seems to be a change in the flint tradition, with higher percentages of blades and blade cores. This change in technology was also noted at the same elevations in the deep sounding of Area E. In section K93/92 there is a dark level of 4-5 cm thick with charcoal and could indicate the presence of a hearth (218.20m).

## *Finds*

Bones were few, and in most instances, poorly preserved. The lithic assemblage associated with Layers 1 and 2 seem to be dominated by bladelets and twisted bladelets. Layers 5 and 6 include artifacts of the Aurignacian industry including; end scrapers, carinated end-scrapers, bladelets, and bladelet cores. A change in the lithic technology is noted in the lower 40 cm of Squares K93-94, i.e., increase in blades and blade cores.

## *Summary*

Generally, the top 50 cm of the excavations, assigned to Unit I, reveals high levels of rock weathering, with alternating areas of compact clay and softer sediments richer in rocks. This unit was excavated in Squares F96-98 and G96-98. As the excavation lowered into Unit II, the sediment became softer and looser. This unit was excavated in Square F94-95 where combustion features (L.900 and L.901) and anthropogenic Layers 1 and 2 were defined. The lithic finds from these layers were few and included mainly bladelets and flakes. Those retrieved from L. 901 were burnt, only a few bone flakes were seen within L. 901; other than that, no bone was found. Unit III was excavated in Squares I95-94. Sediment was soft except along the cave wall, where it was compact. Within this unit two combustion features were excavated, L. 904 and L.905. The first is a large feature, maybe a fire pit, with clear borders, ashy grey sediments, and large pieces of charcoal. Excavating bellow L.904, a soft grey concretion was exposed below which was L.905. The feature of L. 905 is marked by a ring of yellow nodules crossing from I95a to I95b and possibly marking an outline to a feature. The sediment within this semi-circular line is soft and grey, while the outer area is reddish/brown sediment and is slightly more compact. The lithics from both feature and layers are of the Aurignacian tradition, including, bladelets, bladelet cores, and Aurignacian scrapers. Bones were almost absent from all the excavated areas. The yellow nodules are thought to be what remains of bone. In the deep sounding there seem to be indications for a change in the lithic technological tradition. This is noted in the lower most 40 cm.

## *Area F*

Area F is located outside the current cave boundaries, south to its artificial entrance, and southwest of Area E (Fig. 30). The original entrance to the cave, the one used by its prehistoric human inhabitants, is hypothesized to have been sealed ca. 30,000 years ago by either the collapse of the cave roof, by a gradual fill of sediments which drifted from outside inwards, or by both. The excavation of this area was meant, for the most part, to trace evidences for the original location of this entrance and for the processes which lead to its sealing.


*Fig. 30: Area F: General plan in relation to Area E; 2016 season's excavation units marked as blue polygons; western edge of the excavation in Area E marked in a blue line; suggested excavation units for future seasons marked as red rectangles*

Area F was first excavated in the 2012 season, in which a 2x2 meter square was dug ca. one meter deep, until the top of a boulder was reached. In the current season, the excavation in the area was renewed on a larger scale (Fig. 30). After clearing the top soil by a bulldozer, the excavation focused on five excavation units: two ca. 4x4 meter squares (F3 and F4) and three loci (1603, 1604 and 1605; Figs. 31-32). None of these units precisely overlaps the grid squares, since the excavation was initially meant to follow specific features in the terrain. The southeastern part of the area (adjacent to the cave wall) was characterized by a large depression stretching on a northeast-southwest axis (its top being its southern edge), filled with small to medium sized boulders reaching up to ca. two meters in length. The northwestern part (distant from the cave) contained also large boulders reaching up to ca. four meters in length (Figs. 31-32).

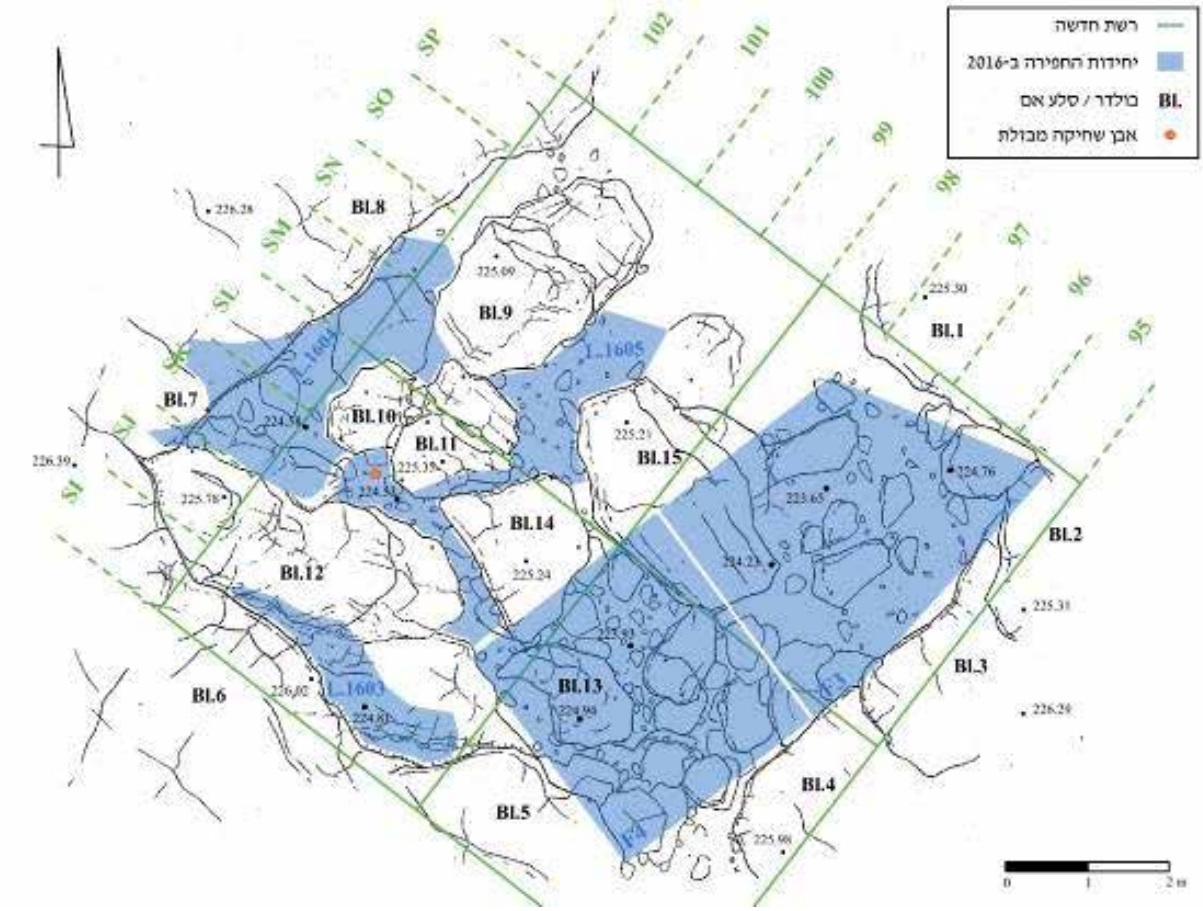



*Fig. 31: Area F plan; 2016 season's excavation units marked as blue polygons*

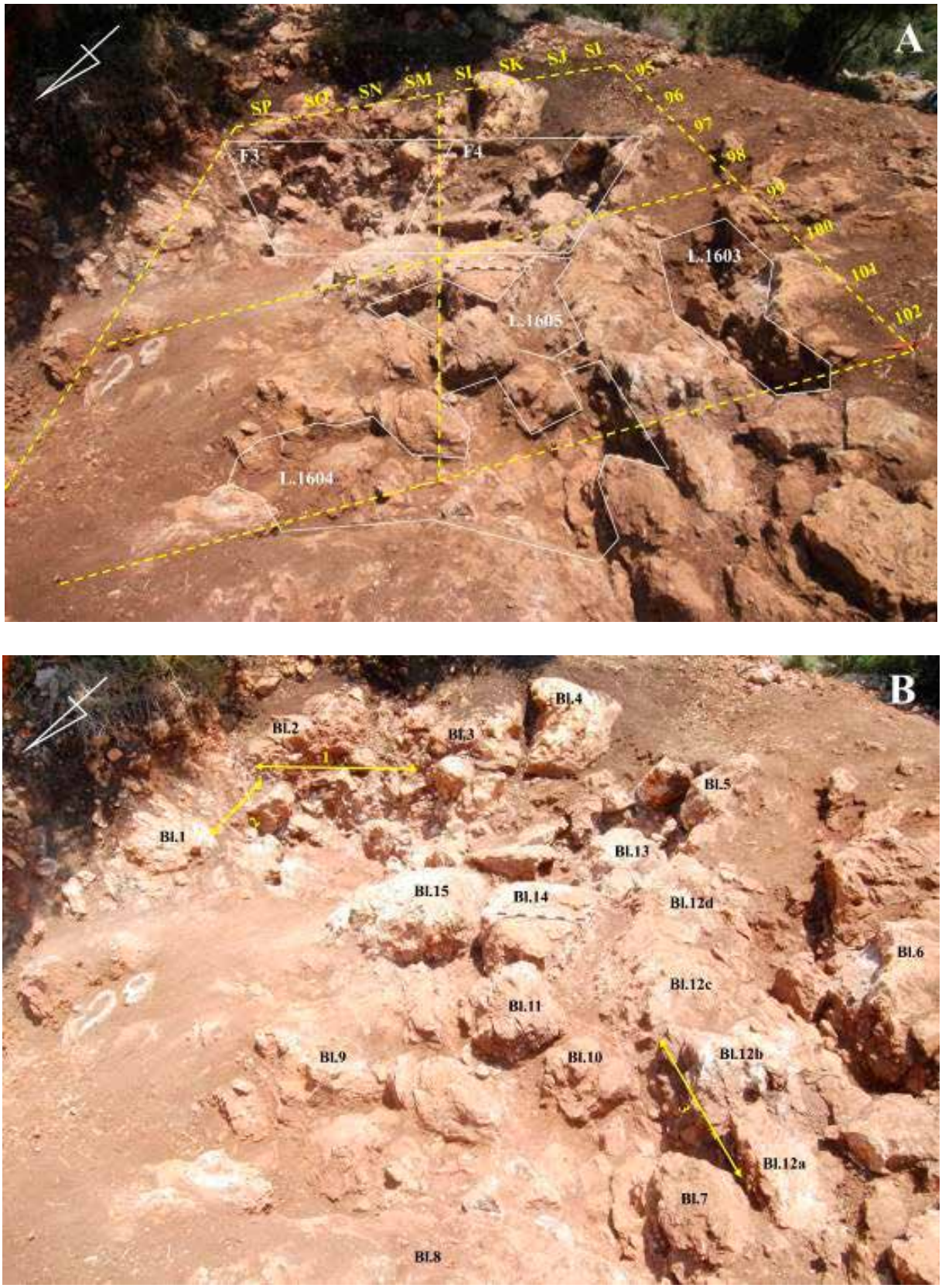



*Fig. 32a-b: General views of Area F to the southwest*

## Methodology

The top soil was excavated as a single unit for the entire area (L.1600), after which the area was divided into two units: one covering its northwestern half (L.1601) and the other covering its southeastern half (L.1602), which was in turn divided into four ca. 4x4 meter squares (F1-F4), only two of them were excavated (F3, F4). After a brief excavation on L. 1601 (few centimeters deep), it was divided into three loci, defined by the contours of the boulders: L.1603, L.1604, and L.1605 (Figs. 31-23).

The baskets in Area F represent volumetric units of sediments excavated in a single square or locus, mostly switched arbitrarily after digging 5-10 cm deep. On certain occasions, baskets were switched based on differences in density or color of sediment, when such were observed. Most of the sediments were selectively dry-sieved by a sieving ratio ranging from 1/1 to 1/10, based on potential estimations made according to the amounts of archaeological findings recovered from the sieving of the first two buckets of sediment excavated in each basket.

## Stratigraphy

During the excavation two major sedimentological units were discerned, stratified one on top of the other: Unit 1- the top soil layer, 0.5-1 meter deep; and Unit 2- a sediment layer stratified underneath it. Unit 1 is composed of dark brown vertisol, rich in fresh organic materials and pebbles. Unit 2 is composed of light brown sediment, which becomes more compact as the layer deepens. This layer bears much less organic material, and is rich in cobbles and boulders (up to one meter in length). A recurrent geological phenomenon observed in Unit 2 is the conglomeration (binding) of pebbles and cobbles by calcification, forming vertical rock surfaces and boulders (see Figs. 33-34, the whitish stains within Unit 2).

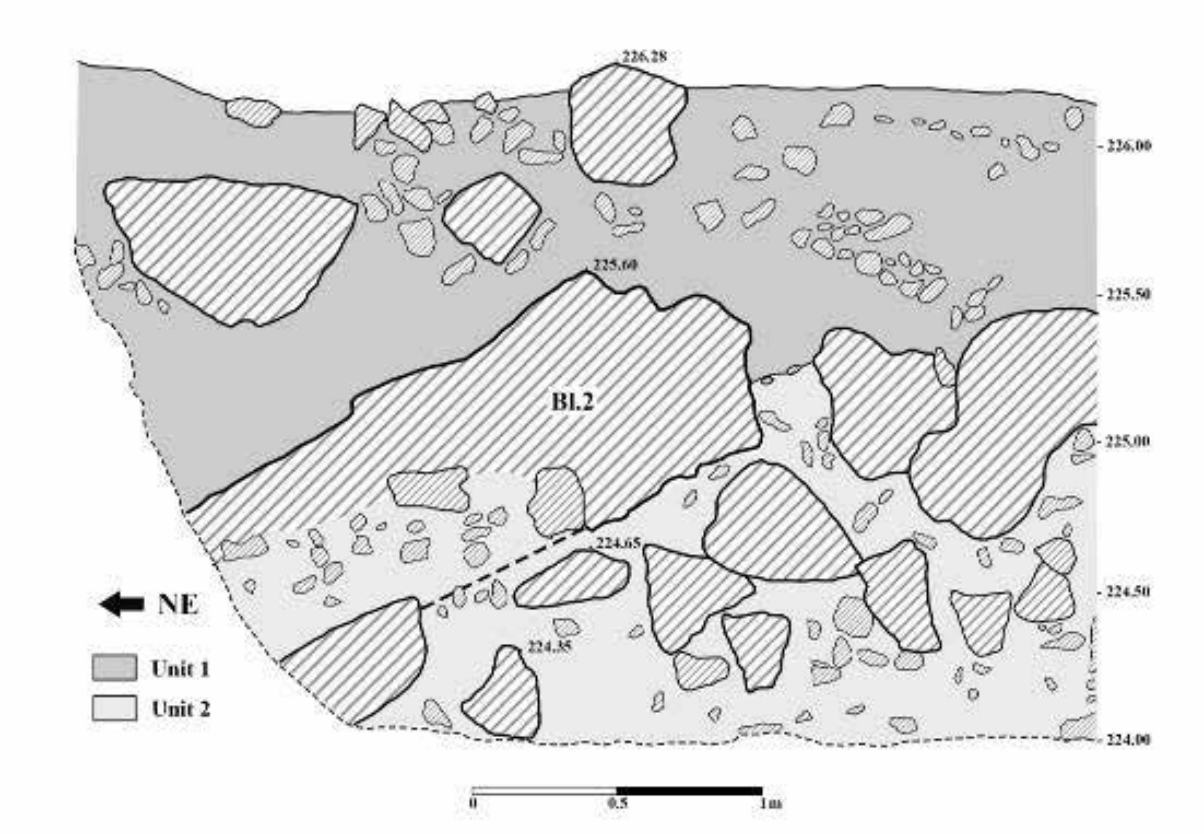



*Fig. 33: Square F3, southwestern section (designated "1" on fig. 3B)*

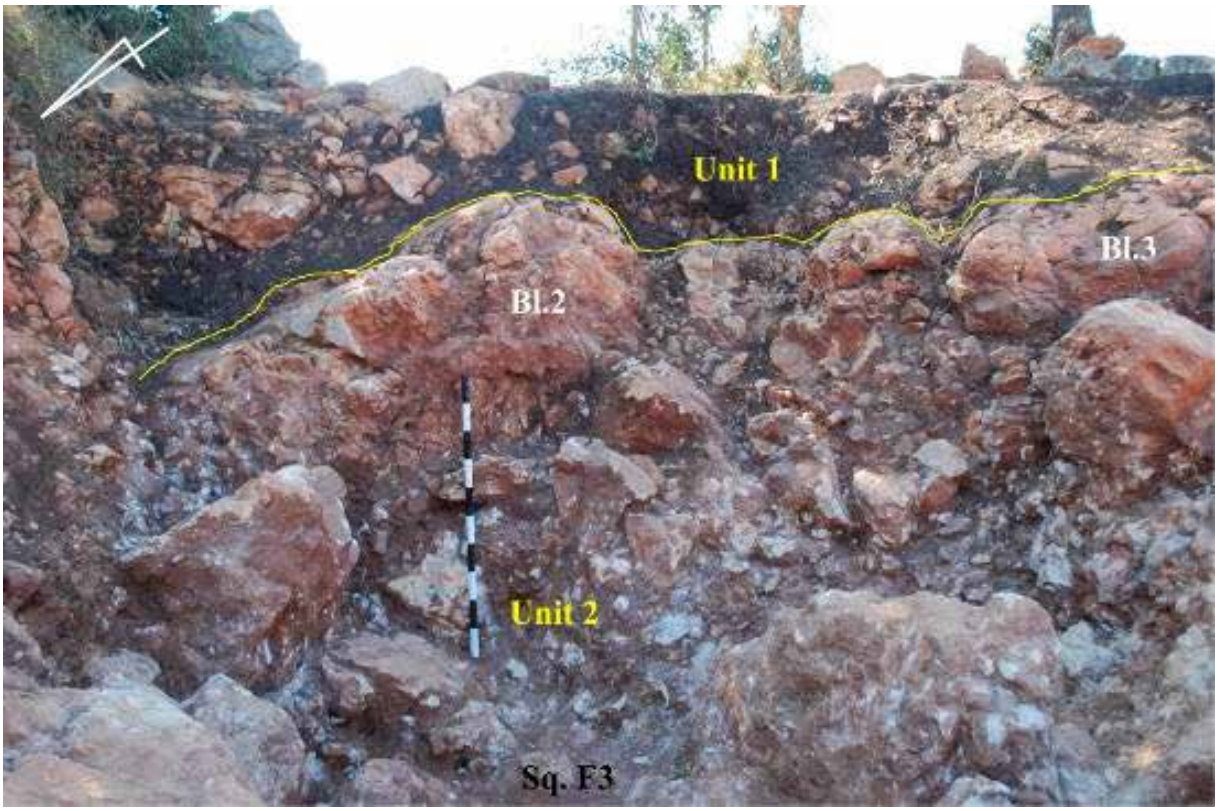



*Fig. 34: Square F3: view of southwestern section (designated "1" on Fig. 3B)*

This stratigraphic observation is most prominent in the eastern part of the area (Squares F3-F4), where the contact between the two units appears between the tops of the boulders adjacent to the northeastern edge of the depression (Figs. 33-34). None of these units can be attributed to a specific archaeological period, since the few finds recovered from them appeared in a mixture of diagnostic items of several different cultural entities; none of them were found *in situ* (see below).

## The Excavation of the Southeastern Part of the Area (Squares F3 and F4)

In this part of the area, the excavation focused on exposing what appeared to be a large depression. To reveal its dimensions, depth and arrangement of boulders within it in order to better understand its possible connection to the original cave entrance. Beginning with a slope of medium and large boulders, slanting from south to north (Fig. 35), the excavation uncovered the continuance of the depression underneath it.

The excavation of Square F3 past the top soil layer (Unit 1) revealed Unit 2, which deepens for at least one meter (from 224.58 to 223.65 masl), mostly underneath the large boulders revealed in the southeastern section (Bl.2, Bl.3; figs. 4, 5). A large yellow chunk of Goethite (7 cm in length) was excavated in the southeastern part of the square (223.72 masl). This mineral was found in its natural form.

In Square F4 similar characteristics were observed as in Square F3. After the removal of the medium and large boulders from the slope, the excavation deepened into Unit 2 to a maximum depth of ca. 1.30 meter (from 225.19 to 223.93 masl). In contrast with Square F3, Square F4 was abundant with larger boulders, such as Bl.13, reaching up to two meters in length. The excavation of Unit 2 revealed a small dolomite boulder (ca. 20X30 cm.) covered by flowstone which formed a concentric pattern, sloping from the top of the boulder to its bottom (Fig. 36). Smaller pebbles with similar characteristic were also recovered from both squares (F3 and F4).


*Fig. 35: View of the southwestern part of Area F after the removal of the top soil to the height of the tops of the boulders*

*Fig. 36: Square F4: a small boulder covered by flowstone retrieved from Unit 2*

To conclude, the excavation of the southeastern part of Area F exposed an elongated depression, stretching from Bl.5 to the northeast, towards the cave (Fig. 37 a-b). The orientation of this depression suggests a connection with a sealed underground cavity found 15 meters to the north, which was revealed during the cutting of the modern entrance to the cave (now the paved slope leading to the modern entrance separates the two). This evidence suggests that the cave's internal space originally extended further west.

By the end of the current season, the northeastern corner of Square F3 was located three meters to the west of the southwestern corner of the excavated part of Area E, with the bottom of the excavated portion of Area F's Unit 2 being 60 cm higher than the top of Area E's Unit 1 (Figs. 30-31). As the excavation in Area E drew closer to Area F, the parallel sections between both areas (the southeastern and southwestern sections of Square F3 in Area F compared and the northeastern section of Squares SU-SV92 in Area E) grew similar. The thing that was similar was the presence of a sediment layer compacted with medium to small boulders, cobbles, and pebbles, with only rare archaeological findings (in contrast with the inner parts of Area E's Unit 1, where boulders become rare as it continues inwards within the cave).

Boulders 2, 3, and 4 form a punctuated rock platform slanting from Bl.4 in the south towards the cave, which raises the possibility that they represent the continuum of the cave roof, whether still intact or formed as a result of its collapse (Fig. 38). Because Unit 2 was deposited underneath Bl.2, and it shows a great similarity to Area E's Unit 1, it seems possible that both units represent two parts of the same sedimentological layer, which originated outside the cave and gradually drifted inwards. The slanted angle in which Bl.15 was found (Fig. 37a), along with the other boulders filling the depression, might point out to a possible past event of roof collapse, making the depression a former integral part of the cave's inner space.

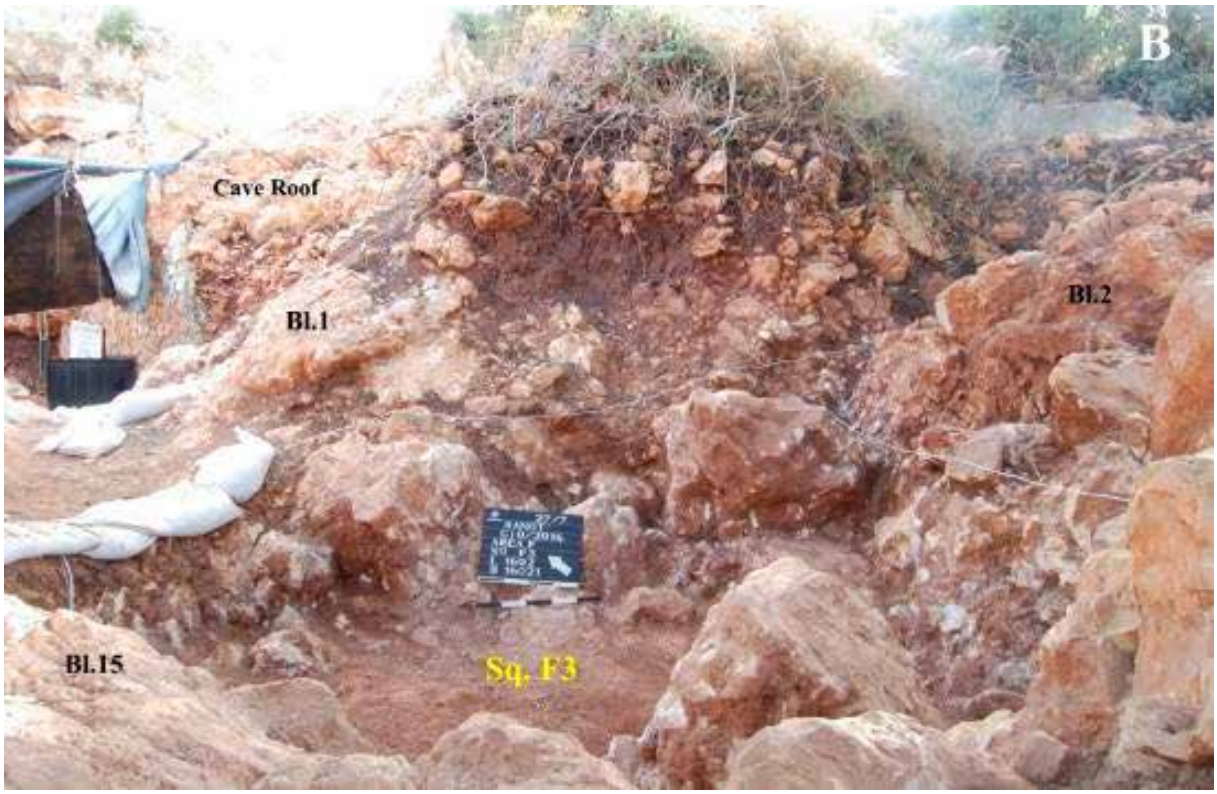



*Fig. 37 a-b: Views of the southwestern part of Area F from within the depression at the end of 2016 season; a: view to the southwest; b: view to the northeast*

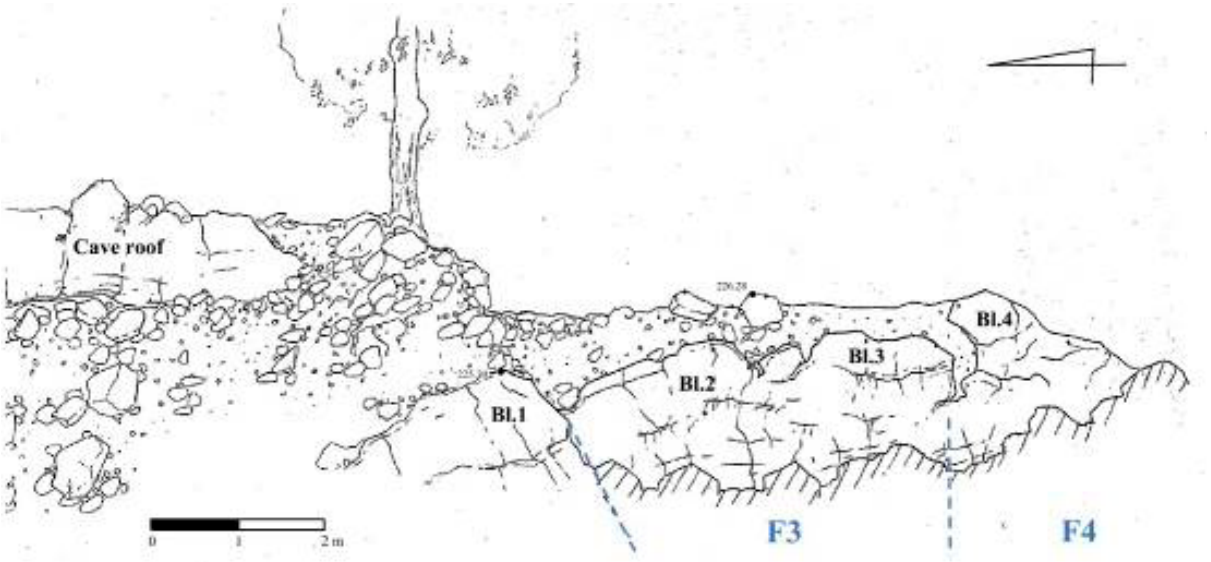



*Fig. 38: View of the cave front to the east; on the left: a part of the cave roof exposed during the cutting of the modern entrance; on the right: Area F*

## The excavation of the northwestern part of the area (Loci 1603, 1604, and 1605)

The heights of the boulders' tops in the northwestern part of the area (Bl.9-Bl.15) gradually increase as they appear further away from the depression westwards (the eastern edge of Bl.15 is 224.23 masl while the western edge of Bl.12 is 225.78 masl; Fig. 31). Loci 1603-1605 were located in the gaps between these boulders and in the gaps between them and the higher boulders forming the northwestern and southwestern parameters of the area (Bl.6-Bl.8), and were excavated in accordance with the contours of the boulders (Figs. 30-32). The excavation in these loci, which seemed at first only as small sediment traps catching findings from the top soil, revealed that at least some of the boulders in this area (Bl.12a and Bl.12b, parts of the fragmented Bl.12) are not part of the bedrock, and underneath them lays a sediment layer similar to Unit 2 in the southwestern part of the area (Fig. 39). The connection between this layer and Unit 2 is yet to be determined.

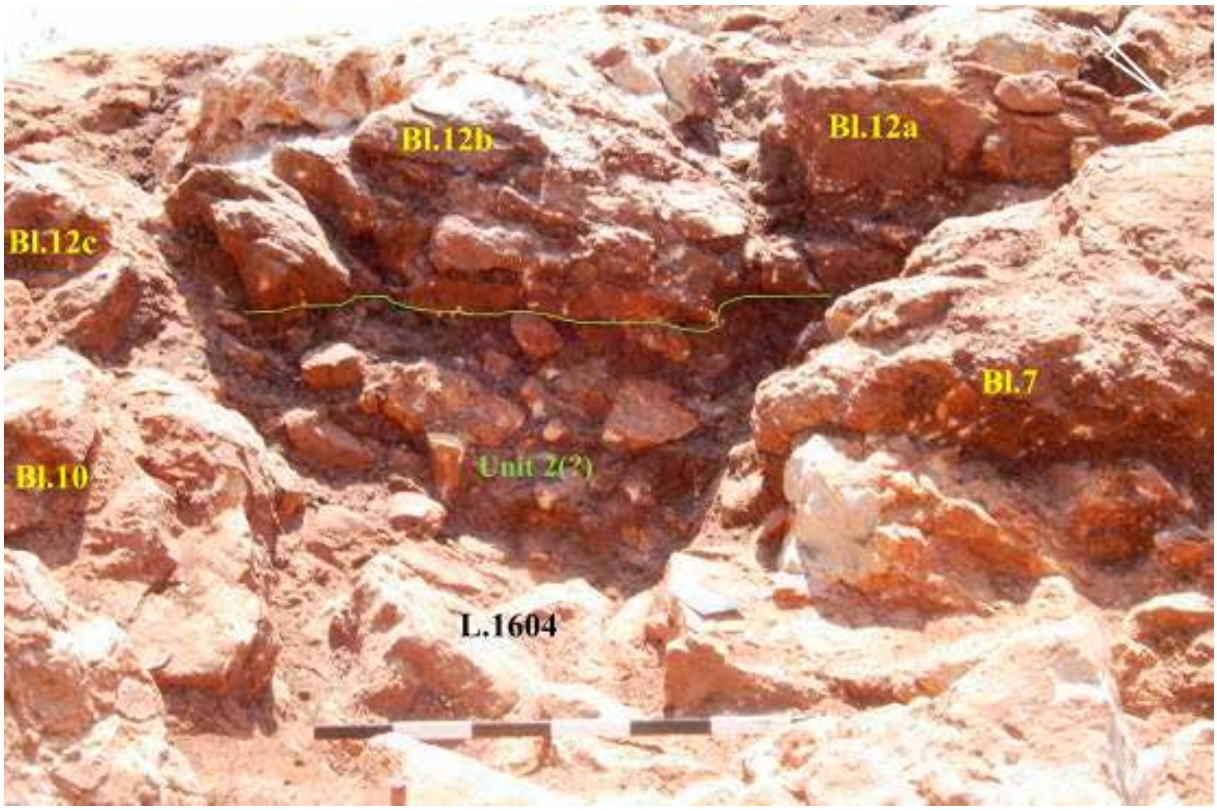



*Fig. 39: L.1604: View of southwestern section (designated "3" on Fig. 32b)*

Locus 1603, excavated adjacent to the boulders in the western corner of the area (Bl.5-Bl.6; Figs. 31-32), has yet to reveal any sign of sediment stratification underneath the boulders. Locus 1604 was excavated between the boulders in the northwestern edge of the area (Bl.7-Bl.10, Bl.12; Figs. 31-32). Besides uncovering the sediment layer underneath the boulders, Bl.12b was found to be covered by flowstone, like the small boulder in Square F4. Only in this case does the flowstone cover the top of a large boulder close to the surface (Fig. 40).

*Fig. 40: Locus 1604, flowstone covering Bl.12b; view to the southwest*

Locus 1605 was excavated between the inner boulders of the northeastern part of the area (Bl.9-Bl.12, Bl.14-Bl.15; Figs. 31-32). Within the area of this locus, during the time it was still being excavated as part of the general Locus 1601, a basalt grinding stone was retrieved (224.72 masl), almost identical to a grinding

stone retrieved from the area in a week of excavation lead by the Israel Antiquity Authority prior to the 2016 season (Fig. 47). Additionally, one sediment bucket from L.1605 went through wet sieving, during which a Kebaran point was recovered (Figs. 44-45).

To conclude, the excavation of the northwestern part of Area F raises the possibility that all the boulders within it (Bl.9-Bl.15) are not part of the bedrock, and might demonstrate a collapse of the cave roof. In contrast to them, the boulders on the southwest parameter of the area seem to be part of the bedrock, hence, the entire area might have originally been a part of the cave's inner space, and the boulders in its parameters (Bl.5-Bl.8) represent the upper parts of the cave walls.

## The Archaeological Finds

When compared with the archaeological layers excavated inside the cave, archaeological findings in Area F are rare. Nevertheless, the same archaeological periods and cultural affinities found *in situ* inside the cave are represented within the findings of Area F in a mixture.

Among the flint artifacts retrieved from Area F, there are a few diagnostic artifacts. Middle Paleolithic period artifacts include Levallois cores and a retouched Levallois flake (fig. 12). Artifacts of the Upper Paleolithic period include blade and bladelet cores (fig. 13), bladelets, and blades, some of which are core-trimming elements (fig. 14). Artifacts of the Kebaran culture of the Epi-Paleolithic period include a Kebaran point and bladelets (figs. 15, 16). Unlike the *in situ* assemblages from inside the cave, the Upper Paleolithic artifacts from the small and mixed sample retrieved from Area F could not be further assigned to the Aurignacian or Ahmarian cultures.


*Fig. 41: Middle Paleolithic flint artifacts; 1, 3, 4: Levallois cores; 2: retouched Levallois flake*

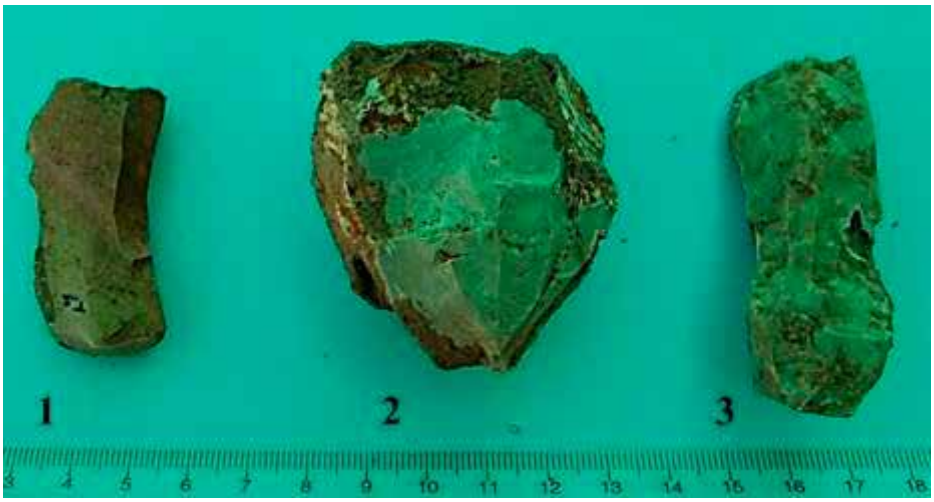



*Fig. 42: Upper Paleolithic blade and bladelet cores; 1, 3: opposed striking platform cores; 2: single striking platform core*


*Fig. 43: Upper Paleolithic blades and bladelets; 1: bladelet; 2: blade; 3: ridge blade; 4: overpassed blade*


*Fig. 44: Epi-Paleolithic bladelets;*
*1: Kebaran point; 2: bladelet; 3: backed bladelet*

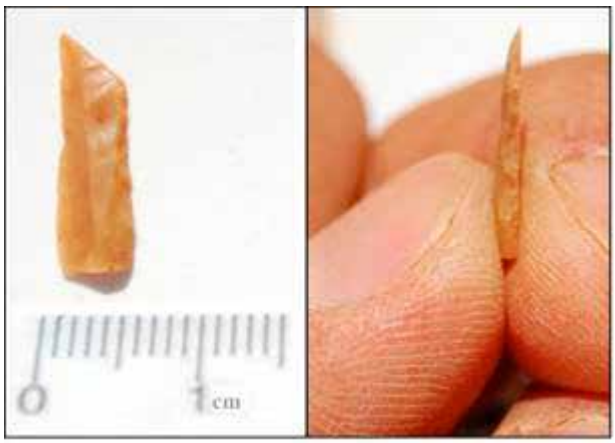



*Fig. 45: A Kebaran point*

## Bone and Special Finds

The bone assemblage retrieved from Area F is relatively poor, composed mostly of small fragments (Figs 46). Yet, some of these bone fragments were found covered in breccia due to the ongoing karstic processes within the cave. In addition, two basalt grinding stones were retrieved, attesting to the manuport of tools made of raw materials which are not found in the vicinity of the cave (Fig. 47).


*Fig. 46: Animal bones from Area F*


*Fig. 47: A basalt grinding stone*

## *Summary and Conclusions*

The current excavation season in Area F ended prior to tracing undisputable evidence for the location of the original entrance of the cave or for the processes that led to its sealing. Nevertheless, some evidence, which could focus the general hypotheses regarding the original entrance and boundaries of the cave, were gathered.

Some of this evidence, regarding the general arrangement of the boulders in the area, indicates that major portions of Area F might have been included within the original boundaries of the cave until its ceiling collapsed. This evidence includes the depression adjacent to the cave and the parallel underground cavity to its north, the inclinations of the boulders closest to the cave (Bl.2-Bl.4) and of Boulder 15 in the center of the area, the smaller boulders filling the depression, and the higher boulders surrounding the area from the south and from the west, which seem to be part of the bedrock. Other sedimentological evidence may point to the same conclusion, namely the similarity between Area F's Unit 2, stratified underneath the boulders adjacent to the cave, and Area E's Unit 1 in its western section, the sediment layer stratified underneath some boulders in the western part of the area. To that we may add the bones which were found covered in breccia, which might indicate they were buried in an active karstic environment such as the cave's inner space.

As for the location of the entrance, the current excavation in Area F did not yield any evidence regarding that. Nevertheless, the excavation of the southwestern parts of Area E revealed that the inner cave ceiling tends to lower and possibly transforms to a wall in the south, while to the northwest it becomes higher. Combining the evidence from Areas F and E together, it seems possible that the entrance will be found north or northwest of the current excavated part of Area F rather than within its parameters or to its south. Another possibility still worthy of consideration is the existence of multiple entrances in the general area of Area F.

With all that in mind, we recommend the following actions be implemented on future excavations (illustrated on fig. 1):

1. Extending the excavation of Square F3 to a 4x4 meters square based on the general grid (squares SM95-SP98) after removing the tree preventing this extension, exposing and removing (if possible) Bl.15 and deepening within Unit 2. Exposing the bottom of Bl.15 may help understand its original function, for if

it was a part of the cave roof, one may expect to observe some karstic patterns on it which resemble the ones observed on the ceiling inside the cave. Further excavation of Unit 2 might expose an *in situ* layer, which may have been originally located inside the cave.

2. Excavating a 2x2 meters square within Locus 1604 (squares SK102-SL103), the furthermost location from the cave, which seems to have both loose boulders with sediments underneath and boulders which seem to be a part of the bedrock. This could clarify the boundaries of the area which was originally inside the cave, if indeed there was such an area.

3. Excavating a 2x1 meters test pit next to the paved slope leading to the modern entrance, assuming that the living floors excavated in Area E extend westwards, either as a part of the original inner space of the cave or within the boundaries of its original entrance. This area has already been massively exposed to a lower level than the excavated bottom of Area F, hence, would constitute an easier starting point for excavation aiming to uncover *in situ* layers.

## *General Discussion*

After the 2016 season, there is for the first time evidence indicating that major portions of Area F might have been included within the original boundaries of the cave, until its ceiling collapsed. Moreover, it can be suggested that the cave entrance will be found north or northwest of the current excavated part of Area F rather than within its parameters or to its south. Another possibility still worth considering is the existence of multiple entrances in the general area of Area F.

The most important point revealed in the 2016 season is that the Aurignacian entity exposed at Manot Cave is probably one of the most intensive and dense Upper Paleolithic occupation in the Near East. This is apparent from the size of the occupied area (ca. 150 sq.m), the thickness of the Aurignacian deposits (at least 2.5 m) and the richness and high density of archaeological remains (animal bones, lithic artifacts, bone tools, and shells). Furthermore, the exposure of large Upper Palaeolithic occupation at Manot enable to reconstruct the technology production (*chaîn opératoire*) of bone tools on antler, and the preparation of special types of tools (carinated end-scrapers). Both technologies display high similarity to the European Early Aurignacian antler as well as lithic industries (ca. 39-36 ky cal. BP), which prove again the existence of back migration from Europe to the Near East a short time after the full colonization of Europe by modern *Homo sapiens*. It is important to stress that in our opinion, the Aurignacian entity, as manifested at Manot Cave, supports the idea that its migration to the Near East was restricted to the Mediterranean vegetation zone and cave sites and lasted for a very short period of time.

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# EXCAVATION REPORTS
## TINSHEMET CAVE

# 2016 Season Excavation Report on Tinshemet Cave

**In collaboration with Yossi Zaidner[1,2], Oz Varoner[3], Marion Prevost[1], Gadi Herzlinger[1], Reuven Yershurun[2], Kathryn Pocklington[2], and Naomi Porat[4]**

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[4]Geological Survey of Israel

Tinshemet Cave, also known as Mugharet al-Watwat (Stekelis, 1942), is located in central Israel, near the modern city of Shoham. The cave is located on a moderate slope on the east bank of Nahal Bet-Arif stream, approximately 20 meters above the riverbed (Figure 1).

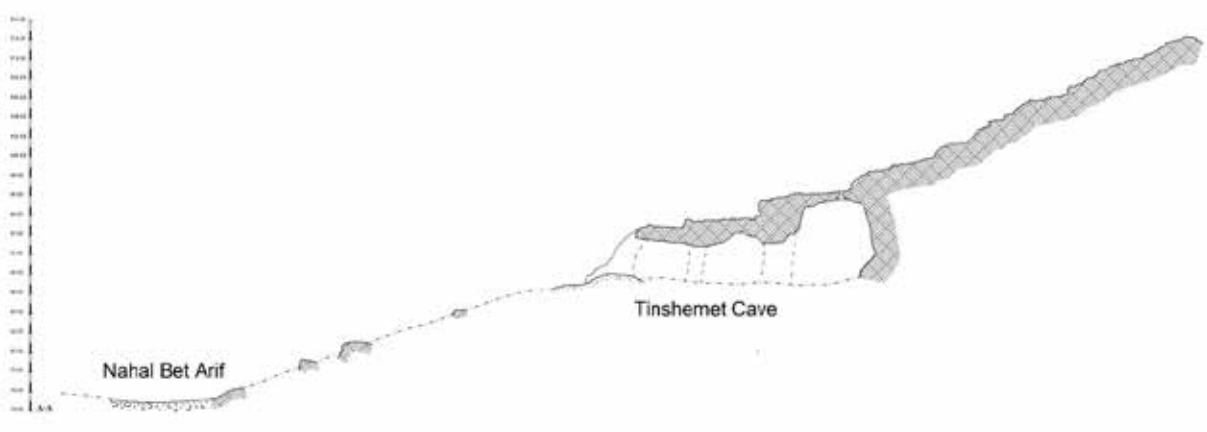


*Figure 1: The section of the slope where Tinshemet Cave is located*

Tinshemet Cave contains three chambers, the innermost having an open chimney (Figure 2). A preliminary survey of the cave conducted by Stekelis (1942) revealed Mousterian artifacts. In 2016, we conducted pilot excavations aimed at assessing the spatial and vertical extent of the archaeological layers and evaluating the potential of the cave for future large-scale excavations. The pilot excavations at Tinshemet Cave revealed excellent potential for further excavation of the site. The habitation layers were discovered on the terrace of the cave and inside the first chamber. The archaeological material is exposed on area of about 80 square meters (Figure 2). On the terrace, the Middle Paleolithic breccia extends over an area of around 40 square meters (Figure 3). In the deepest square, we reached a depth of 120 cm beneath the surface.

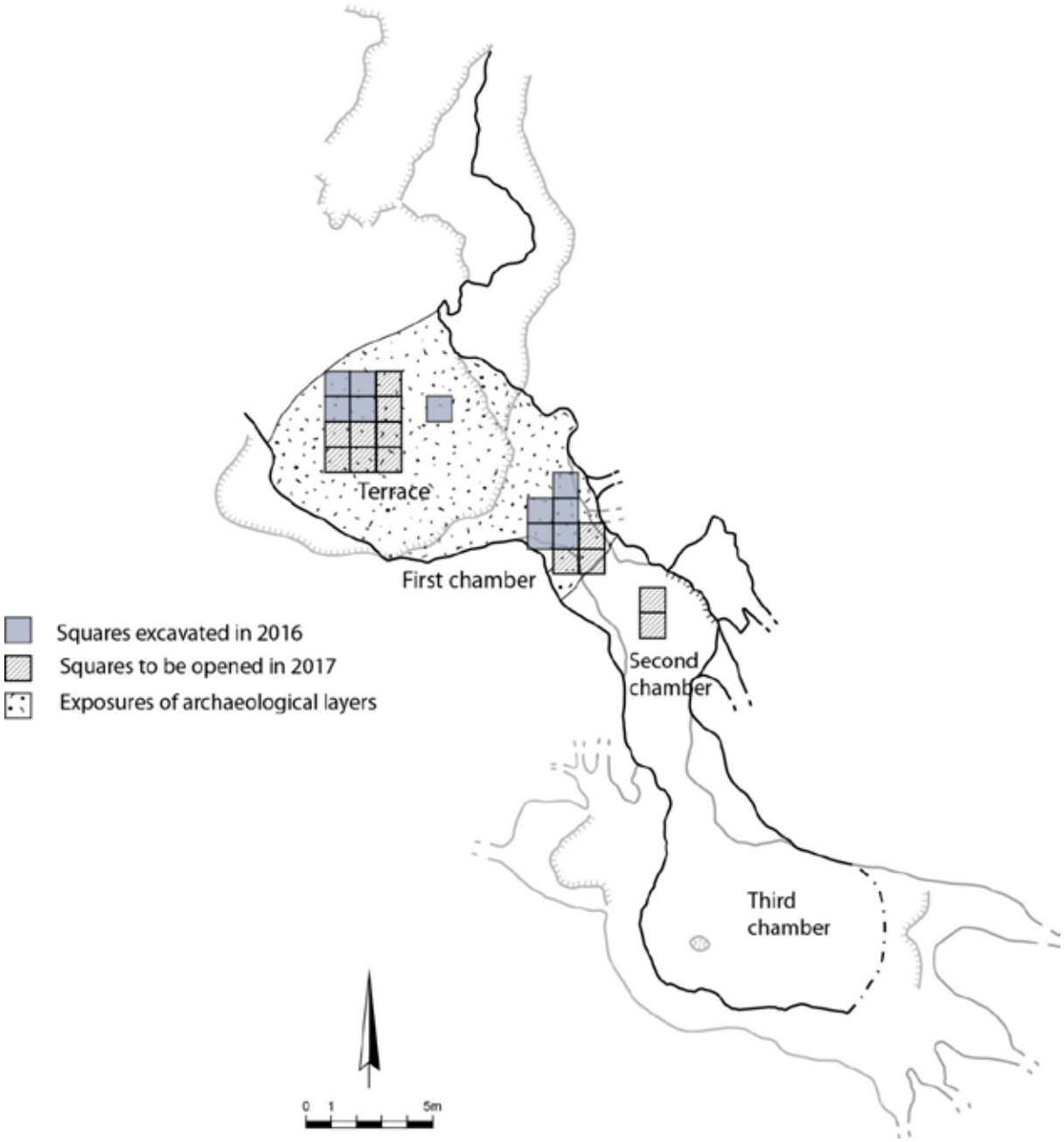


*Figure 2: Tinshemet Cave map*

The stratigraphic section of the terrace contains:

1. Topsoil (50 cm thick) with abundant Middle Paleolithic artifacts and a few ceramic sherds from late historic periods.

2. Middle Paleolithic breccia layers (70 cm thick) that are moderately hard and contain both well-preserved lithics and bones amenable to retrieval. The bedrock was not reached, and the thickness of habitation layers on the terrace is still unknown.

Samples for OSL dating were taken from the Middle Paleolithic breccia layers on the terrace (Figure 4).

*Figure 3: The excavation area on the terrace of Tinshemet Cave*

*Figure 4: Location of OSL samples (red circles) in the section of the terrace*

In the first chamber of the cave, soft MP sediments were discovered and excavated to the depth of about 70 cm beneath the surface in an area measuring six square meters (Figure 5). The soft sediments contain fresh and unrolled artifacts and bones. A lens of gray sediments with microscopic remains of charcoals was discovered, possibly indicating remains of a hearth (Figure 6).

*Figure 5: Excavated squares in the first chamber of Tinshemet Cave*


*Figure 6: The section of soft Middle Paleolithic sediments excavated in the first chamber; the arrow marks the location of a lens of gray sediments*

The stratigraphic section in the first chamber contains:

1. Topsoil (20 cm thick).

2. Soft Middle Paleolithic sediments (40-50 cm thick, bedrock was not reached).

## *Finds*

The finds at the site include lithics, faunal remains, and chunks of ochre brought to the site by the Middle Paleolithic hominins (Figure 7, 8).

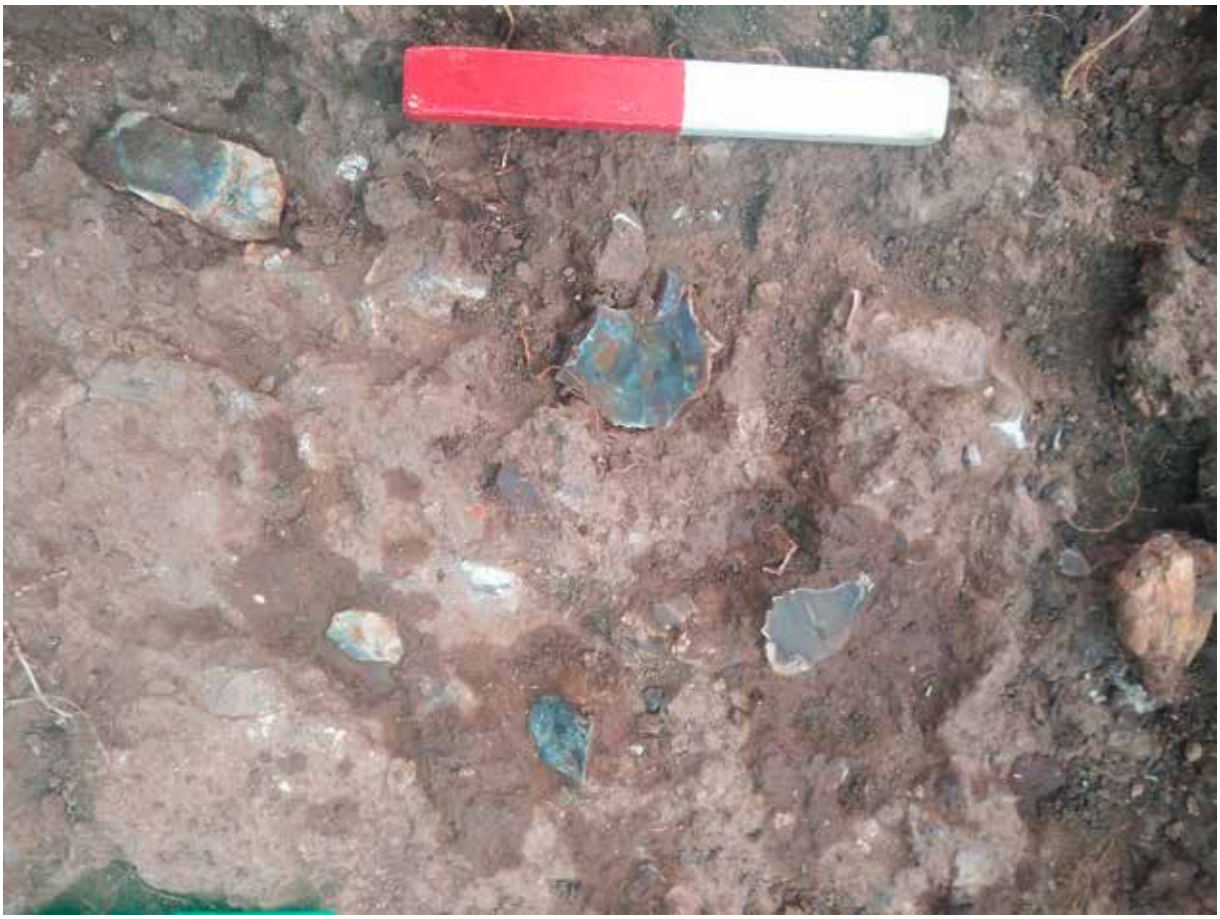

*Figure 7: A surface with Middle Paleolithic artifacts and horse tooth during the excavations*

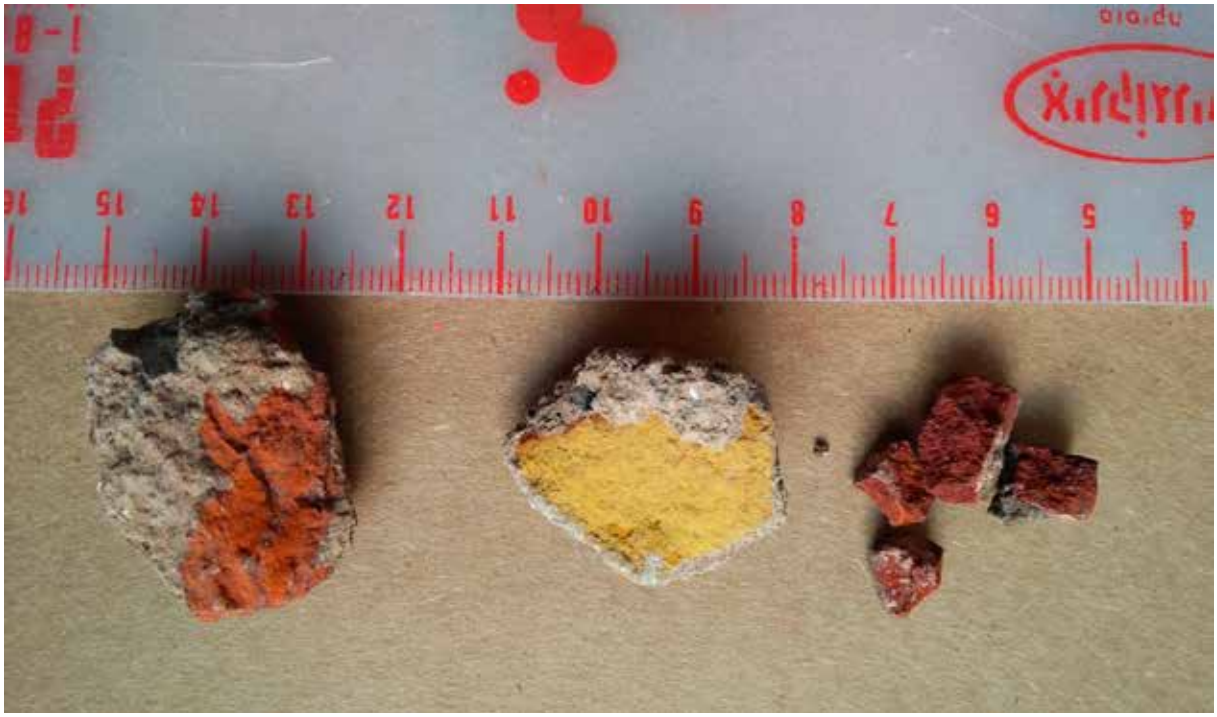

*Figure 8: Chunks of ochre brought to the site by the Middle Paleolithic hominins*

## Lithics

The lithic assemblage unearthed so far contains 1,820 artifacts from the Middle Paleolithic layers and ca 2000 artifacts from the topsoil. The assemblage shows strong evidence for use of fire with 41% of burnt artifacts from Middle Paleolithic layers on the terrace and the in the first chamber. The dominant type of raw materials used at the site is local Mishash Formation flint (Figure 9). The only prepared core reduction method identified so far is the Levallois. Yet, the frequencies of Levallois items are quite low (6-8%). Retouched tools are also rare (Table 1). The main artifact categories are flakes (57%), cortical elements (12%) and chunks (12%). The tool assemblage is composed of 39 artifacts, among them 38% are lightly retouched flakes and 31% are side-scrapers (Table 2). The Levallois assemblage is clearly dominated by flakes with centripetal scar pattern (64%) followed by unipolar convergent scar patterns (28%). Absent are laminar or elongated Levallois items, like those found in the early Middle Paleolithic sites in the Levant (e.g. Misliya and Hayonim Caves, Hummal; Meignen, 1998, 2011; Wojtczak, 2011; Zaidner and Weinstein-Evron, 2014).

Our preliminary study suggests that of the characteristics of the Levallois products and absence of laminar items, the Tinshemet Cave lithic assemblage exhibit some similarity with Mousterian of Tabun C type. If this is the case, then Tinshemet Cave is the southernmost occurrence of this industry in the Levant.

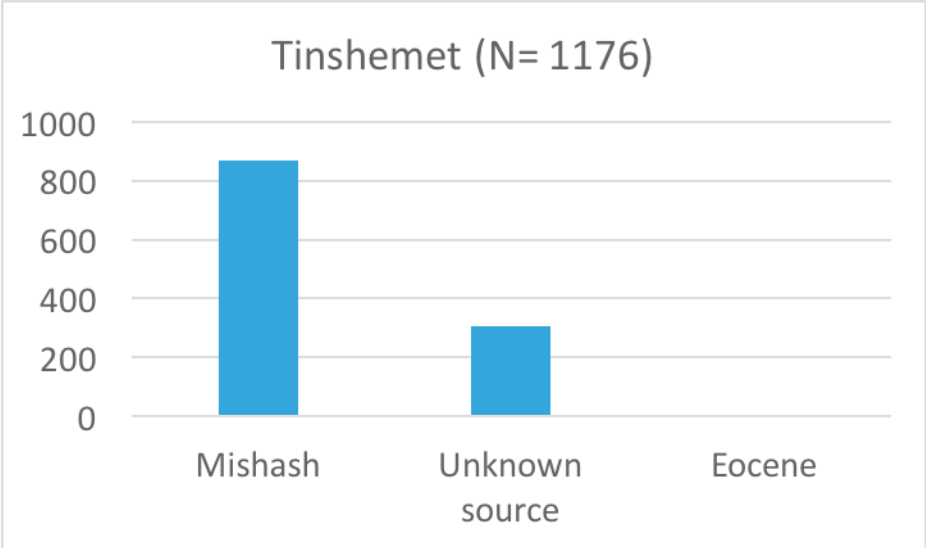


*Figure 9: Distribution of raw material types in the lithic assemblage of Tinshemet Cave*

***Table 1: The breakdown of the lithic assemblage from the Middle Paleolithic layers on the terrace and the first chamber of Tinshemet Cave***

| | Number | % |
|---|---|---|
| **CORE** | | |
| Levallois core | 7 | 0.4% |
| Nahr Ibrahim | 1 | 0.1% |
| Core-on-flake | 4 | 0.2% |
| Hierarchical surfaces core | 5 | 0.3% |
| Core | 7 | 0.4% |
| Broken core | 24 | 1.4% |
| Tested nodule | 2 | 0.1% |
| **DEBITAGE** | | |
| Levallois flake | 98 | 5.7% |
| Levallois point | 4 | 0.2% |
| Levallois blade | 3 | 0.2% |
| Flake | 981 | 57.5% |
| Kombewa flake | 13 | 0.8% |
| Blade | 42 | 2.5% |
| CTE general | 19 | 1.1% |
| Debordant flake | 28 | 1.6% |
| Debordant-outrepassé flake | 8 | 0.5% |
| Pseudo-Levallois point | 2 | 0.1% |
| Surface rectification flake | 5 | 0.3% |
| Primary element 25-75% | 89 | 5.2% |
| Primary element 75-100% | 108 | 6.3% |
| Naturally backed flake | 11 | 0.6% |
| Naturally backed blade | 1 | 0.1% |
| **TOOLS** | 39 | 2.3% |
| Chunk | 206 | 12.1% |
| **SUB-TOTAL** | 1707 | 100% |
| Chips | 2022 | |
| **TOTAL** | 3729 | |

***Table 2: Retouched tools typology of the lithic assemblage from the Middle Paleolithic layers on the terrace and the first chamber of Tinshemet Cave***

| **TYPOLOGY** | n | % |
|---|---|---|
| Single convex side scraper | 7 | 13.7% |
| Single concave side scraper | 1 | 2.0% |
| Double concave-convex side scraper | 2 | 3.9% |
| Double convex side-scraper | 1 | 2.0% |
| Side scraper on ventral face | 1 | 2.0% |
| Typical end scraper | 2 | 3.9% |
| Atypical end scraper | 1 | 2.0% |
| Notch | 3 | 5.9% |
| Retouched flake | 14 | 27.5% |
| Retouched blade | 1 | 2.0% |
| Use-wear | 12 | 23.5% |
| Broken tool | 4 | 7.8% |
| Burin + retouch on ventral face | 1 | 2.0% |
| Awl | 1 | 2.0% |
| **TOTAL** | **51** | 100% |

## Fauna

The 2016 excavation in Tinshemet Cave yielded a medium-sized faunal assemblage (2 archive boxes). The assemblage is primarily composed of fragmented ungulate remains. They appear to be well preserved macroscopically and are mostly covered in heavy carbonate concretions, obscuring their surfaces. The assemblage contains numerous long bone shaft fragments, the majority of which are broken longitudinally and exhibit <50% of their circumference. Some complete elements including calcanei and phalanges, and rarely epiphyses, exist but for the most part the assemblage fragmentation is high. For example, all teeth (n = 24) were found isolated and not within jaws. Some of these characteristics may change when the excavation reaches deeper deposits.

The taxonomic composition (Table 3) is rich and includes aurochs (*Bos primigenius*), mountain gazelle (*Gazella gazella*), equids (*Equus* sp.; large-bodied), Mesopotamian fallow deer (*Dama mesopotamica*), wild goat (*Capra* sp.), red deer (*Cervus elaphus*) and wild boar (*Sus scrofa*). The two most abundant species are gazelle and aurochs, followed by equids, cervids and the caprine. Two skeletal elements possibly belong to canids but could not be identified more precisely. Notably, small mammals are very rare and no tortoise remains were found. Nearly all elements belong to adult animals, attested by fully fused epiphyses or worn permanent teeth. The sole exception is an aurochs $dP_4$ with heavy wear, probably belonging to an old juvenile individual.

### *Table 3: Taxonomic composition in the 2016 Tinshemet Cave faunal assemblage*

| | NISP | %NISP |
|---|---|---|
| *Gazella gazella* | 9 | 28.1% |
| *Capra* sp. | 3 | 9.4% |
| *Dama mesopotamica* | 3 | 9.4% |
| *Cervus elaphus* | 2 | 6.3% |
| *Sus scrofa* | 1 | 3.1% |
| *Equus* sp. | 5 | 15.6% |
| *Bos primigenius* | 9 | 28.1% |
| Total | 32 | 100.0% |

A few coprolites were observed. The contribution of humans and carnivores to ungulate deposition in the cave should be studied in the future, after cleaning bone fragments and recording of the elements identified to size-class. Currently, no modifications relating to carnivore consumption that are conspicuous even on uncleaned bones, such as gnawing on the epiphyses and digestion of compact elements, were observed. Thus, it can be tentatively suggested that this is mostly an anthropogenic assemblage, but a detailed taphonomic study will be needed to verify this.

To sum up, the Tinshemet faunal assemblage appears to be well preserved and taxonomically rich. The taxonomic composition, indicating a typical mosaic of open and wooded Mediterranean settings, is reminiscent of other Middle Paleolithic faunas in the southern Levant in general and in central Israel in particular, though aurochs and, particularly, equids are more abundant here than in most other cave-sites. The lack of small game is interesting and merit further investigation to assess the role of Tinshemet Cave in the Middle Paleolithic settlement system.

## *Summary and Future Plans*

The 2016 pilot excavations at Tinshemet Cave revealed Middle Paleolithic occupation layers on the terrace in front of the cave and in the first chamber. The archaeological material is exposed on area of about 80 square meters. The lithic artifacts are abundant (1820 artifacts were unearthed so far from MP layers and ca. 2000 artifacts were collected from the topsoil) and bones are well-preserved, suggesting good potential for further excavations.

During the next season, we plan to excavate an area of 10-12 square meters on the terrace of the cave, eight square meters in the first chamber, and a 2x1 meter area of test trench in the second chamber (see Figure 2). The goals of the excavations are: 1) to assess the depth of archeological layers in first and second chambers, and, 2) to unearth large lithic and faunal assemblages from the terrace of the cave and the first chamber.

The excavations at Tinshemet Cave will contribute to our knowledge on human culture, behavior, and subsistence in the part of the Levant where Middle Paleolithic sites are rare. The good preservation state of faunal material points to the possibility of discovering human remains there, which is especially important in the Levant given the presence of both Neanderthals and Anatomically Modern Humans in the region during the Middle Paleolithic.

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# EXCAVATION REPORTS
## HAR SAFSUF CAVE

# 1st Season Report on Har Safsuf Cave, February 2017

**In collaboration with Uri Davidovich[1] and Ofer Marder[2]**

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Har Safsuf Cave is a newly discovered karstic cave, located on the eastern slope of Mt. Safsuf in the upper Galilee. The cave was surveyed by Uri Davidovich, Ido Wechtel, and Micka Ullman, with the help of the Caves Research Center. The cave is a large underground set of chambers located at various levels and connected by narrow passages and shafts. Passage through the different cave parts requires the use of rappelling and climbing gear (see the cave plan and sections in Figs. 1, 2).

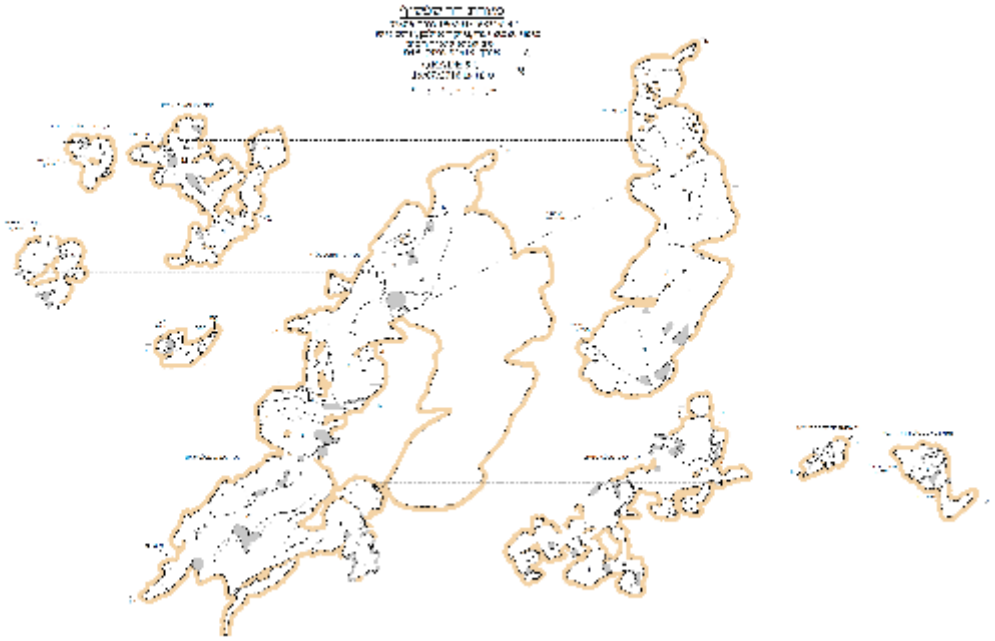

*Figure 1: Cave plan (side drawings indicate separate levels located above or beneath the main level)*

During cave mapping and the initial archeological survey, abundant archaeological finds were discovered, including built walls, numerous pottery shards, chipped flint items, charcoal, faunal remains, human bones, and a unique metal bowl.

The human remains consisted of two skeletons, which seemed to be in primary contexts. Other singular human bones were retrieved from many other areas of the cave. One of the skeletons (Safsuf 1) was collected during the initial survey, a second skeleton (Safsuf 2) was left in-situ, and a third skeleton (Safsuf 3), which was partially visible, was also left in place.

The main goal of the first season of excavations was to retrieve the human skeletons that were spotted during the initial survey in order to avoid damage to these finds by visitors to the cave. A short season of four days took place during February 20-23, 2017, under the supervision of Micka Ullman and Ron Lavi, assisted by Dr. Uri Davidovich, Prof. Ofer Marder, Prof. Israel Hershkovitz, and Dr. Hila May. The participants were students of Ben-Gurion University, volunteers, an anthropological team of scholars and students from Tel Aviv University, and a team from the Weitzman Institute (Excavation permit G-14/2017).

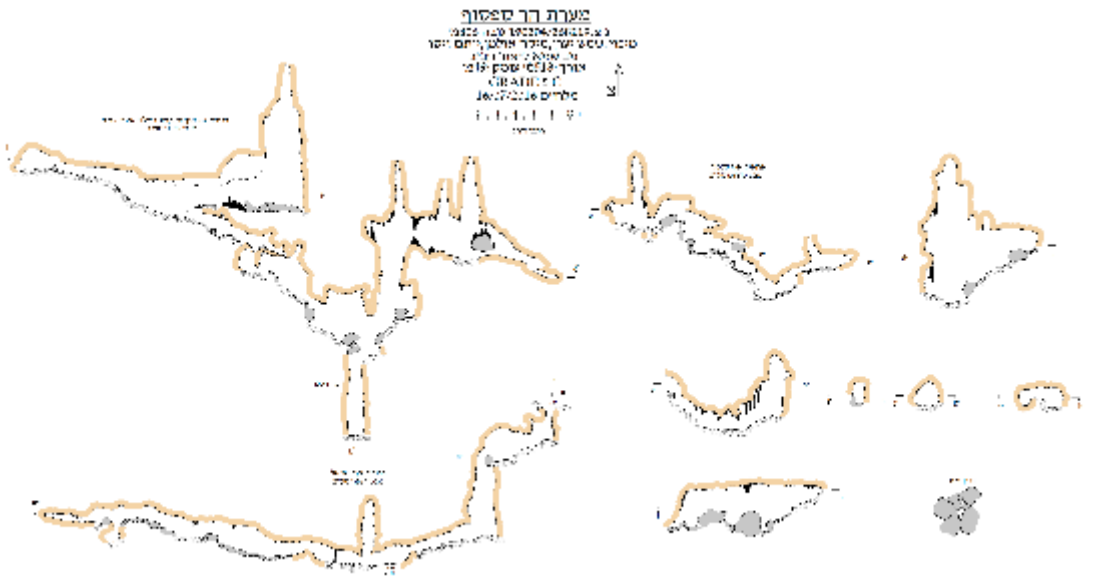

*Figure 2: Sections of the cave*

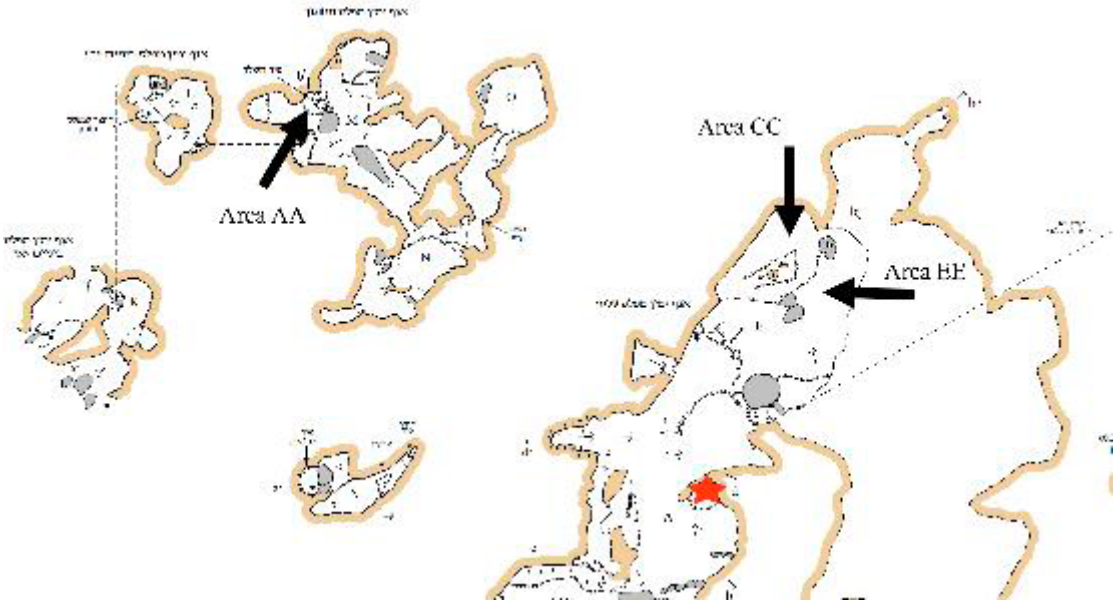


*Figure 3: The locations of excavation areas in the right wing of the cave; red star marks the entrance to the cave*

Four areas were excavated during the first season. Areas AA and BB were located by the visible skeletal remains Safsuf 1 and Safsuf 2. Area CC was a test pit of 1X1 meter, placed where numerous chipped flint items were visible on the surface. Area EE is a small trench in which charcoal and burnt seeds were collected for radio carbon dating. In addition, some finds were collected from the surface without excavation, and their exact location was marked on the cave's planar map.

### *Area AA*

This area is located in the deepest point of the cave at the bottom of a vertical shaft; this point has an accumulated depth of 49 meters below the surface. The access to this location is very hard because it requires crawling and squeezing through some narrow passages and rappelling down a 10-meter vertical shaft, termed "the skeleton shaft" (Fig. 3, 4).

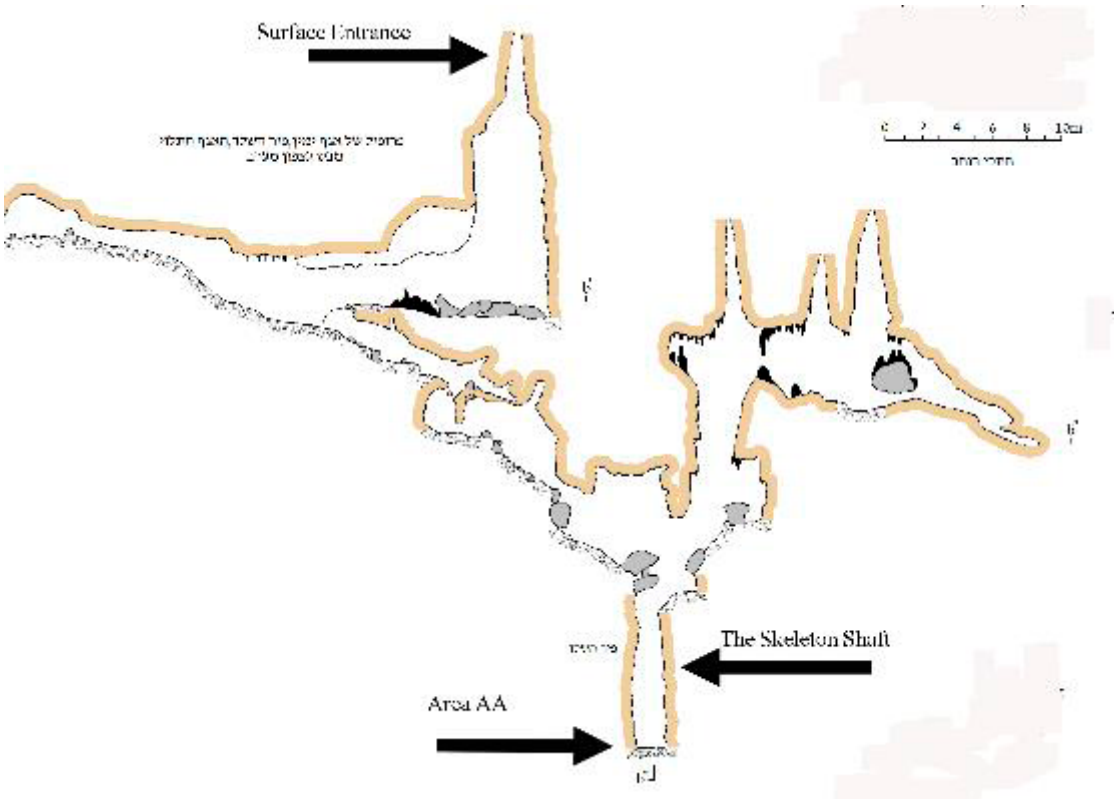


*Figure 4: Section of the right wing of the cave, with the location of area AA at the bottom*

The shaft diameter is about 2 meters. At its bottom, there is a niche on one side that is about 1.6 meters long, 1 meter wide, and 2 meters high (Fig. 5). Inside the niche, a human skeleton stretching into the niche was visible, with the head close to the shaft and the legs away from it. Most of the skeleton was visible, partly covered by muddy sediments (Fig. 6, 8).

Once the excavation started, it became obvious that it would be impossible to expose the skeleton completely before its removal. That is due to the narrow configuration of the niche and the sticky nature of the muddy sediments covering many of the bones. The soil covering the skeleton was made of very fine dark clay, wet from constant water dripping. It was impossible to remove it without damaging the bones; therefore, the bones were roughly cleaned on the spot and then removed with the clay sediments still attached to them for further cleaning at the lab. It was also quite impossible to maintain a clean working environment and straight sections. All sediment excavated at area AA was carefully collected and carried out to be wet-sieved (2x2 mm mesh).

The skeleton was not retrieved fully. Bones that could be reached during the excavation days where retrieved (skull, ribs, pelvis, legs), while other parts (mainly both arms) were not located and are most likely still in situ, covered by about 1 meter of sediments that accumulated on the left and right edges of the niche, on both sides of the skeleton (Figure 5, bottom left). The preservation seems to be very good,

with many bones still in articulation or just slightly moved. In addition to the complete skeleton (dubbed "Safsuf 2"), a piece of another skull bone was found, indicating the possible existence of more burials under the soil in the niche (although that single bone fragment could have fallen through the shaft). Several small bones, dispersed on top of the accumulated sediments on the right-hand side of the niche seem to belong to a small mammal, possibly a bat.

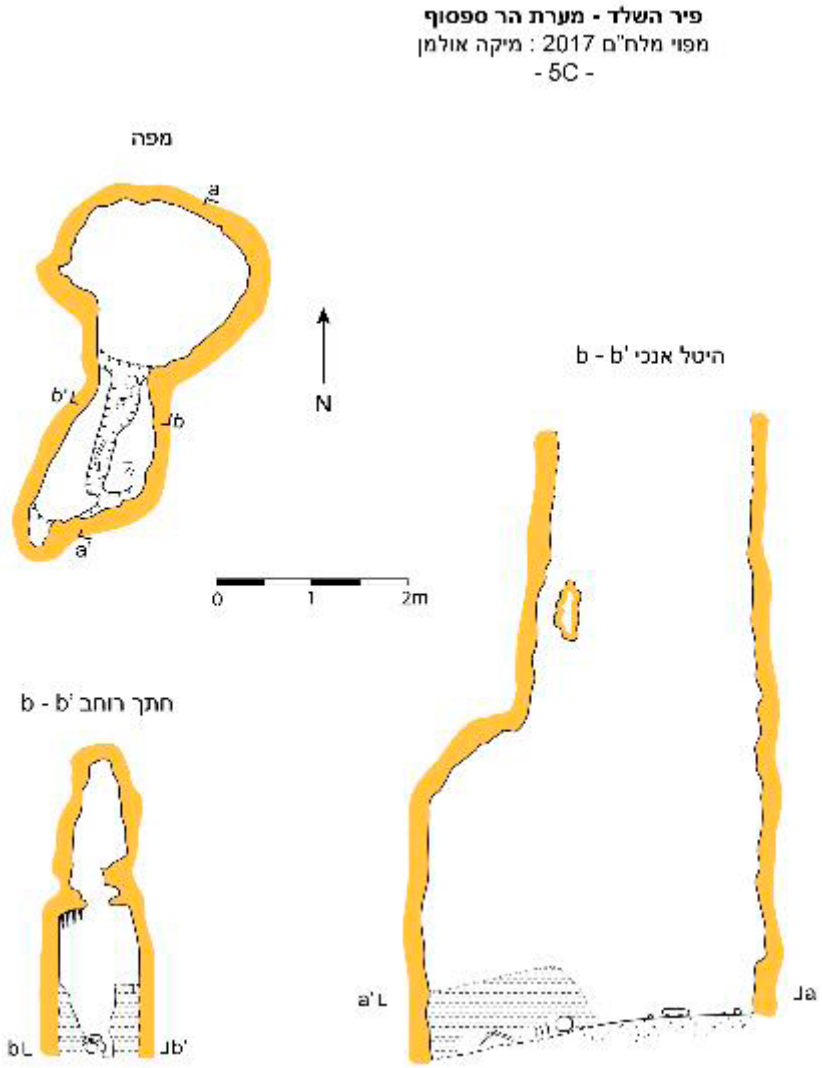


*Figure 5: A plan and section of the shaft and niche, area AA*

*Figure 6: The skeleton in area AA before excavation, the shaft is on the left*

Under the skeleton, and under the dark clay covering it, there was a layer of yellowish clay with charcoal fragments inside it (Fig. 7). This clay seems to represent the original sediment of the chamber on which the skeleton was laid. The dark clay on top was either deliberately dumped on top of the skeleton, or was swept down into the niche with the dripping water. Samples of the charcoal embedded in the yellowish clay were taken, for radiocarbon dating (B1002).

*Figure 7: Yellowish clay under the skeleton bones with charcoal fragments embedded in it (left of the pen)*

No archaeological finds were found next to the skeleton. A few chipped flint items were observed on the shaft's bottom but with no direct association with the burial.

The skeleton 'Safsuf 2' represents a deliberate burial. The way it was laid nicely along the niche, to the side of the shaft, precludes the possibility of an accidental fall down the shaft. It must be stressed that this burial required a lot of effort, carrying the body through the narrow passages of the cave and down the shaft.

Since the sediments filling the niche were not excavated (except what was attached to the skeleton), there is the possibility of more burials hiding inside the niche. The niche might have been more spacious at the time of the burial, bigger than it appears in its present configuration; therefore, it is recommended to go back and excavate it further, in order to reveal its full volume and expose the bedrock walls.

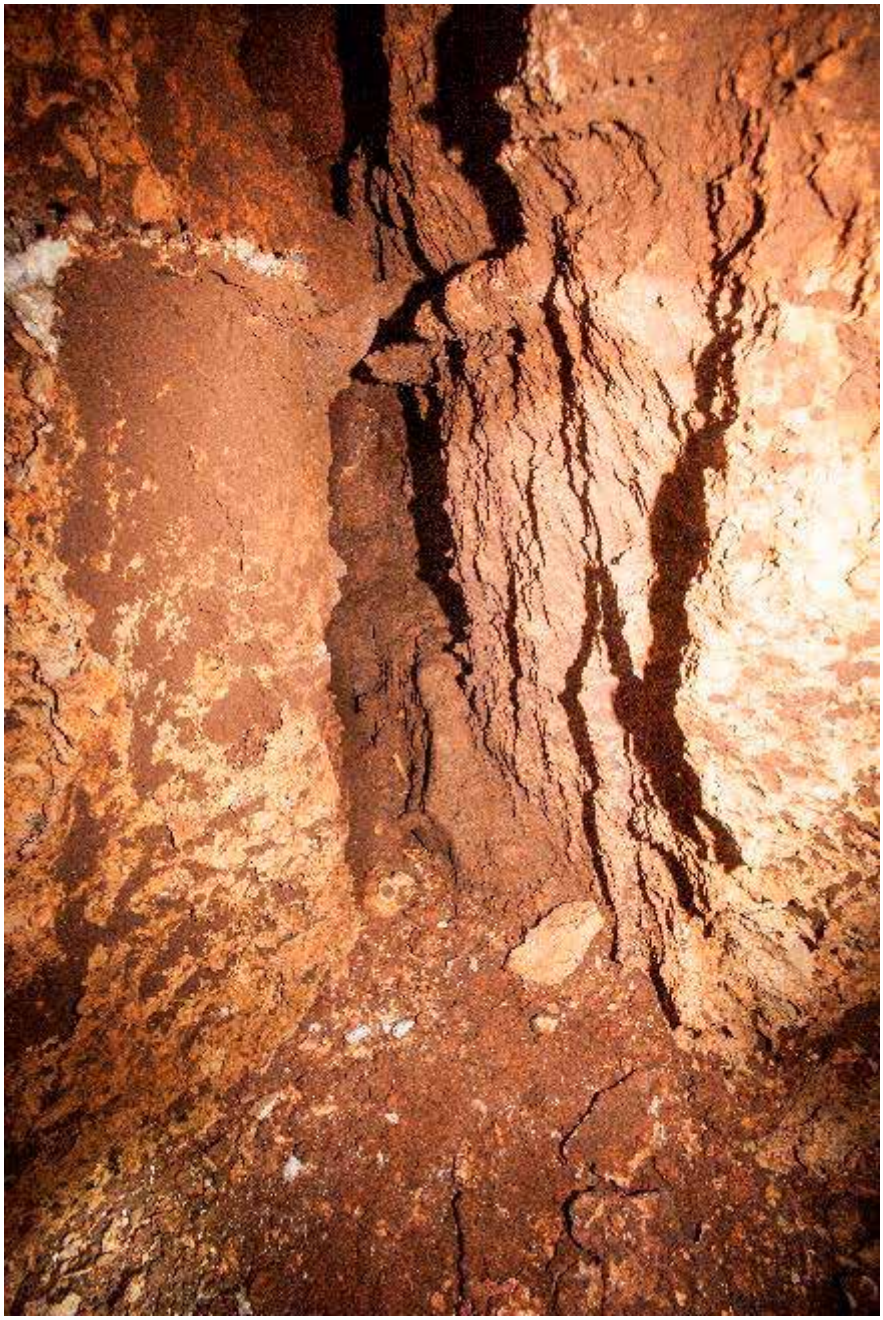

*Figure 8: General view of the niche with the skeleton before the excavation*

### *Area BB*

This area is located at the far end of the left wing of the cave, at the end of a narrow low corridor full of fallen boulders (Fig. 9). Working conditions in this area were very hard, as the excavators were forced to crouch all day long.

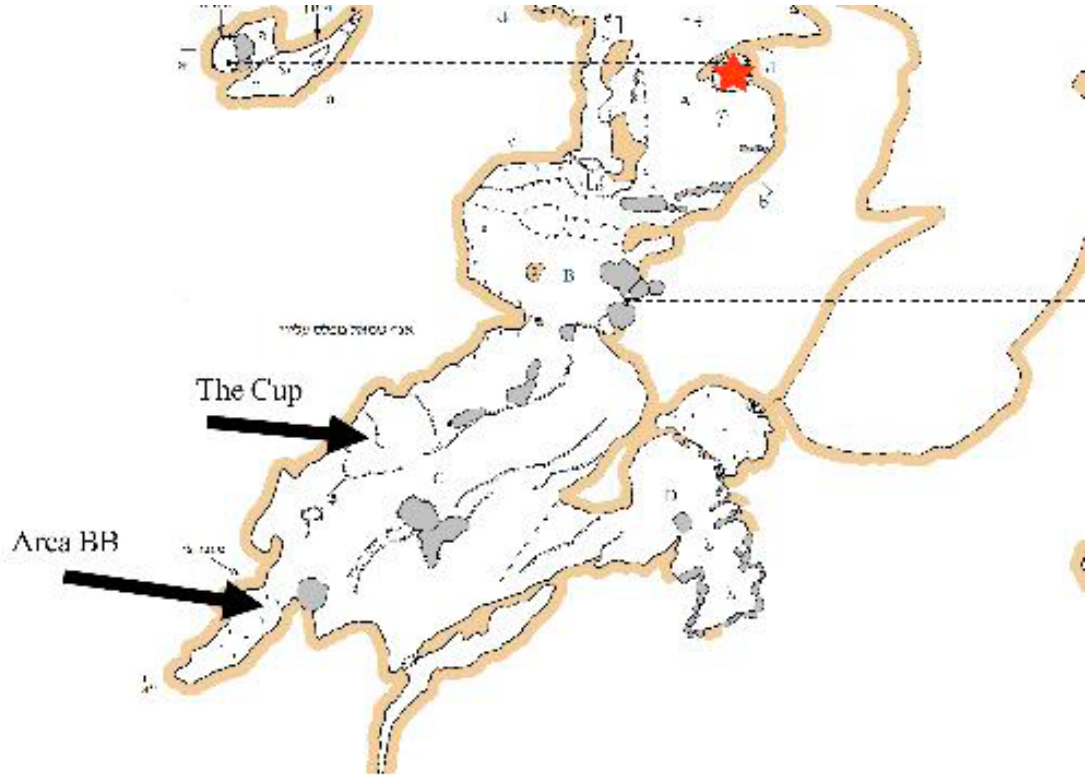


*Figure 9: Excavation areas in the left wing of the cave; red star marks the entrance to the cave*

This area was selected for excavation since human bones were detected protruding from the soft sediment at the end of this narrow passage (Fig. 10). An area of about 1X1 meter was excavated to a depth of 0.5 meter. The matrix was a mixture of soft sediment, small stones eroding from the cave walls and ceiling, and broken speleothems covering the surface. The sediment has a mixture of various colors and textures. Human bones, likely representing a single skeleton, were collected from on top and inside the sediment; sometime they were embedded in speleothems (figs. 11, 12). The bones were damaged, broken, and not articulated. All excavated sediments were carefully collected and then wet-sieved outside the cave. The human remains were dubbed 'Safsuf 3'. At the end of the season, there were no visible human remains on the surface, though additional human remains may still be covered by soil nearby. No archaeological artifacts were found in direct association with the burial.

It seems that 'Safsuf 3' is a disturbed primary burial. The disturbance may be the result of sediment movements – it seems to drift from behind the skeletal remains, pushing them into the passage. Due to the short working time, we did not decipher the exact context of the burial, or the sedimentological stratigraphy. It is recommended to go back and excavate this area further.

*Figure 10: Area BB before excavation*

*Figure 11: Human bones embedded in speleothems, Area BB*

*Figure 12: Area BB during the excavation; note the human bones inside the spelethems*

## *Area CC*

This area is a test pit of 1X1 meter located at the end of the right wing of the cave, on the main level (Fig. 3). It was placed where a concentration of chipped flint items was observed during the initial survey (Fig. 13) on top of an artificial platform, created by a built wall south of it (Fig. 14).

It was excavated to a depth of merely 0.15 meter and revealed muddy dark-brown sediment with many small stones and many chipped flint items, mostly very small. Some charcoal pieces were observed and collected. The overall impression was that this spot is located within a drainage route of water coming down from a 'chimney' east of the area, and going down in the direction of area AA. Thus, the conclusion was that the flint items are not in-situ and do not represent a 'living surface'.

Although the shallow excavation did not reveal any living surface, the location of area CC on top of an artificial platform warrants investigating this location further.

*Figure 13: Area CC before the excavation*

*Figure 14: A built wall supporting the platform of area CC (the dark area at the top right)*

## *Area EE*

This area is located close to Area CC, in the right wing of the cave (Fig. 3), on top of a raised platform, which may be artificial. During the survey, remains of possible built walls were detected, as well as a large patch of ash and charcoal, possibly a hearth. On the first day of this season, a closer look revealed that this ash spot contains many burnt seeds and grains (Fig. 15).

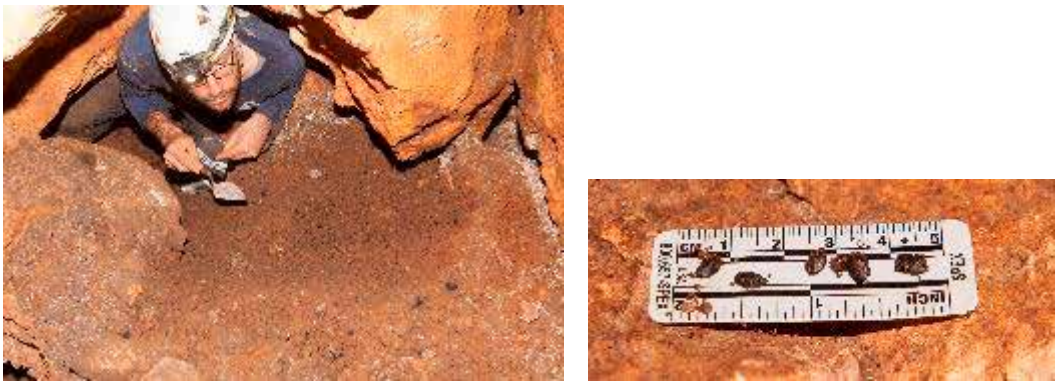

*Figure 15: Area EE during the discovery of the burnt seeds and some of the seeds (right)*

The area was not excavated archaeologically, but its surface was sampled by a team of the Weitzman Institute, headed by Dr. Boaretto. A small section was cut into the ash concentration, and samples of sediments, charcoal and charred grains were collected for radio carbon dating, sediment identification by FTIR tests and botanical identification. The section shows the concentration of burnt seeds inside red clay, about 0.1 meter thick, on top of red clay with no seeds in it (fig. 16). Under the seeds, a few pottery shards were collected, lying in a horizontal position (B5001). The rest of the section showed sediments in various colors and textures. An animal bone (unidentified) was retrieved from the section, and was taken to test for collagen.

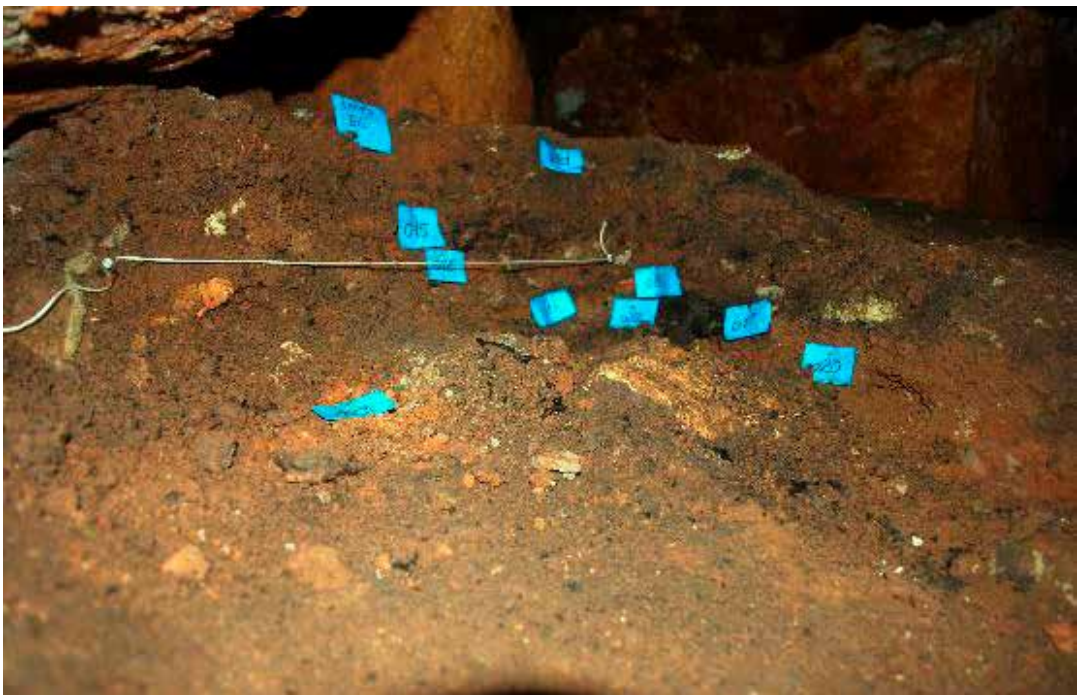

*Figure 16: The section in area EE, note the burnt seeds and charcoal in the upper part of the section*

This area most likely represents an activity area of the people who inhabited the cave; it needs to be explored thoroughly in the future.

### *'The Cup' Area*

In the passage leading to area BB, on a rock shelf at the northern cave wall, a unique find was spotted – a ceramic cup – of a design not known so far. The cup was lying on its side, partly covered by a thin layer of speleothems (Figs. 17, 18).

*Figure 17: The cup on the rock shelf (left) and after its extraction (right); note the knob on the inside rim*

The cup is long and narrow, with parallel sides, and with two knobs on the inside upper rim of the cup (Fig. 17). The design of such knobs is known from the Chalcolithic age, but a cup like this is, as far as we now know, is unique.

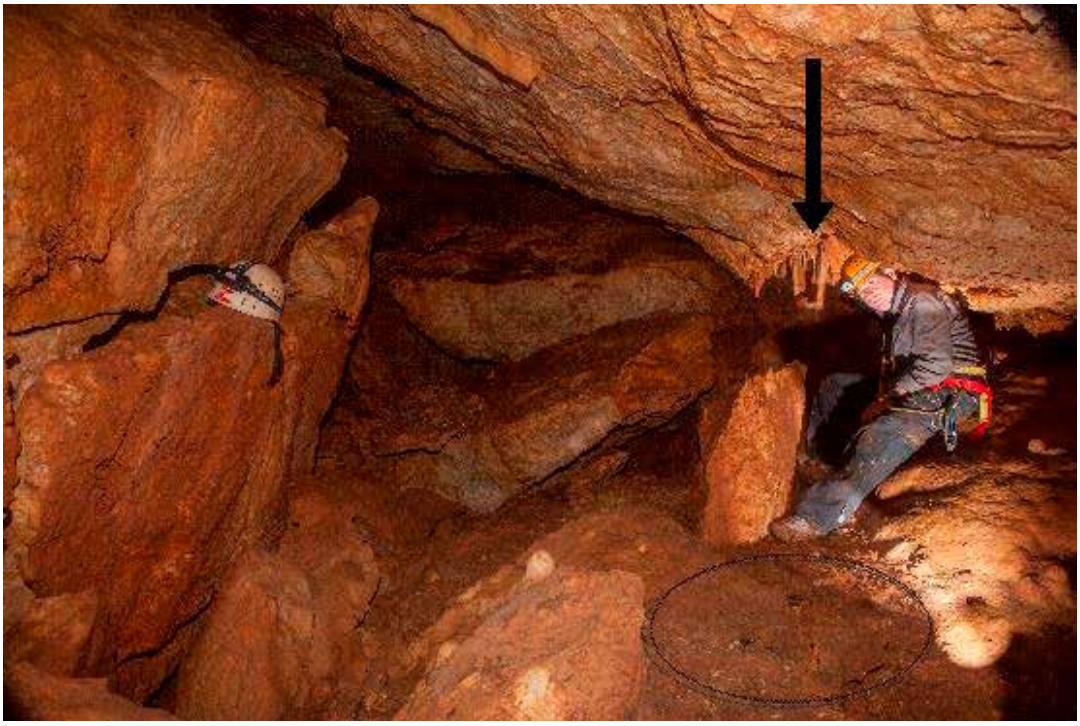

*Figure 18: The cup area - the arrow marks the rock shelf upon which the cup was found; at the bottom right is a cluster of charcoals sampled for dating*

At the foot of the cup's rock shelf, a cluster of charcoals was observed. These charcoals were sampled by Dr. Boaretto of the Weitzman Institute for radio carbon dating and identification.

## *Other Finds*

'Safsuf 4' – A human mandible was located on a level lower than Area BB, under huge rock boulders. Next to the mandible, there was a pottery base (Fig. 19). It seems that the mandible drifted to its present location, and that this location does not represent an in-situ burial.

On a lower level, in the left wing of the cave there are many built walls, which seem to designate activity areas. In some of them, there is plenty of ash and charcoal. Pottery, flint and bone tools were retrieved from those localities.

*Figure 19: A human mandible, 'Safsuf 4', and pottery*

## *Summary*

Safsuf Cave is a very important archaeological site, displaying a phenomenon that is thus far not known in this geographical region. The cave was used both for habitation and for burial in the early Chalcolithic period. The nature of the habitat, the identity of the inhabitants, and the nature of the burials are all topics that warrant further exploration.

The vertical and complex structure of the cave poses some technical and logistical challenges that complicate the archaeological work. Some of the excavation areas are extremely narrow which cause limited movement inside and a slow work rate. The logistics involved in digging and transporting the excavated material for sifting outside the cave are demanding. There is also a need for a considerable amount of safety precautions and equipment, which make the working days expensive but are necessary for preventing accidents and injuries.

There is a great potential for exploration in the cave and for gaining innovative knowledge from its excavation and research. . The first season, described in this paper, was a limited operation intended mainly to prevent immediate possible damage to the most sensitive finds in the cave (e.g. human remains visible on the cave floor surface). Such effort was needed, as there is no way to prevent the site from being entered by random visitors that might unintendedly damage the in-situ finds scattered in the cave. Further archeological and anthropological work is much needed, as there are additional human remains to be found and retrieved from the cave. This short season proved the great potential for research of this rare site. There are many archaeological questions to be addressed, and the first four days that took place in the first season demonstrated that.  Considering the results of the first excavation season, we highly recommend a return to Har Safsuf Cave for a second season, longer than the first, which will enable us to delve deeper into this research site.

# EXCAVATION REPORTS
## GEULA CAVE

# Excavation Report on Geula Caves A-7723/2016 for the Dan David Foundation, August 2016

**In collaboration with Omry Barzilai**[1]

[1] Excavations, Survey & Research Department, Israel Antiquities Authority, PO Box 586, Jerusalem 91004, Israel

During June-July 2016 (26/06/2016 – 14/07/2016) a salvage excavation was conducted in Geula Caves, on behalf of the Israel Antiquities Authority. The excavation, financed by Shikun Ovdim, of the Shikun & Binui Group, and the Dan David Foundation, was directed by O. Barzilai with the assistance of T. Abulafia, M. Shemer and L. Davis (area supervision), I. Hershkovitz and H. May (anthropology), M. Orbach and R. Yeshurun (archaeozoology), A. Frumkin and M. Ulman (speleology), N. Shtober-Zisu (geology), R. Mishayev, R. Liran and M. Kahan (surveying), A. Dagot (GPS mapping), P. Gendelman (scientific consultation), K. Sa'id and L. Talmi (organizational planning and support), Y. Amrani and E. Bachar (administration), students from Tel Aviv and Ben-Gurion universities and laborers from Wadi Ara.

The Geula Caves are located at the foothills of the Vardiya district in Haifa (Fig 1), approximately 15 m above Nahal Tan, which is a tributary of Nahal Giborim (Wadi Rushmiya). The Geula Caves are, in fact, the remains of a larger cave system, which was partially destroyed by quarrying activities during the British Mandate (Fig 2).

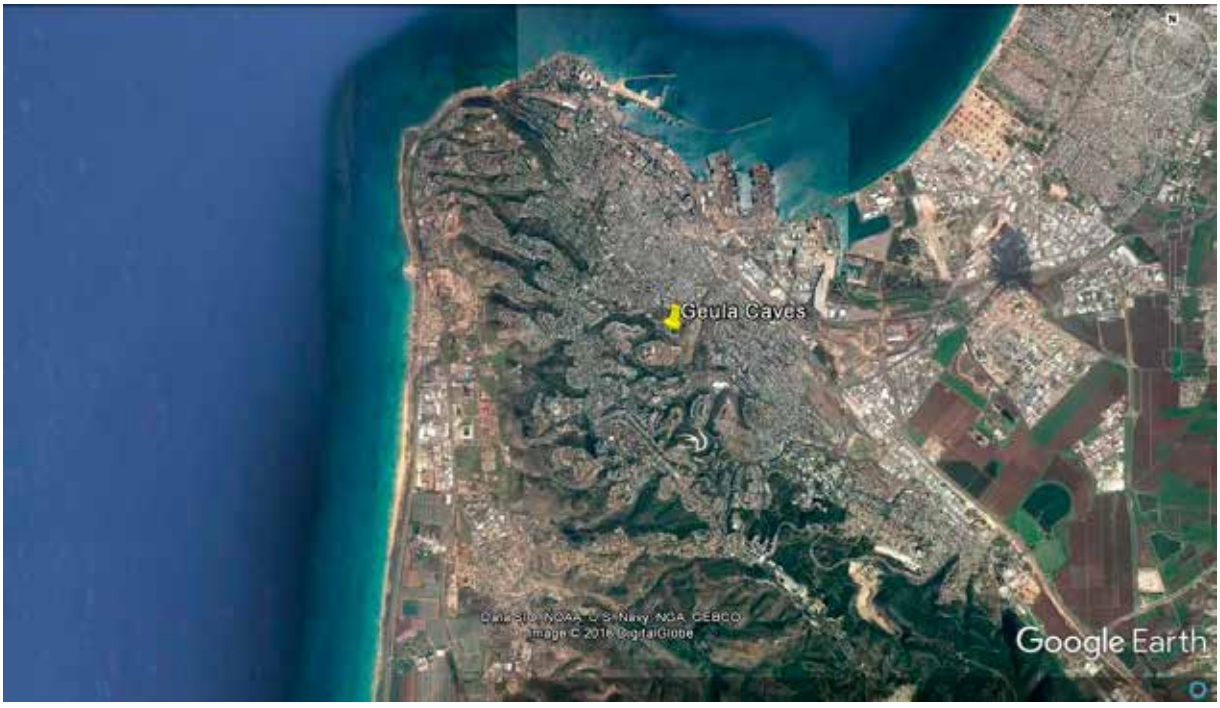


*Figure 1: The site location*


*Figure 2: A photograph of Geula Caves from the 1960's after Wreschener, 1967*

The caves were excavated by E. Wrechener during 1958-1964 (Wrechener 1967). Prehistoric finds were recovered only from Cave B. The excavation at the cave revealed three archaeological layers in a limited area of ca. 50 $m^2$. All layers were rich in finds and included large amounts of faunal remains, flint artifacts in fresh condition, and three human bones. All layers were ascribed to the Mousterian culture of the Middle Paleolithic period (250-50,000 years ago).

During November-December 2015, the site was re-examined by D. Kirzner on behalf of the Israel Antiquities Authority, in preparation for the construction of a new residential quarter just above the caves cliff. The caves and their surroundings were surveyed and the front of the caves was subjected to mechanical trench testing. This examination revealed faunal remains of animal bones and Mousterian flint artifacts, near Cave B. Two additional cave openings (Cave C, Cave D) as well as a thick soil profile named "the Chimney" were revealed west of Cave B. Another new observation was the presence of brecciated sediments, located between Cave A and the Chimney (Figs 3-4). Following that, a salvage excavation was initiated focusing on the newly discovered elements of Geula Caves: Caves C-D, the Chimney, and the brecciated sediments.


*Figure 3: Geula Caves during the 2016 excavation, looking northwest; the yellow labels mark the caves excavated by E. Wreschener; the green labels mark areas excavated in the 2016 excavation; photograph taken by Assaf Peretz*

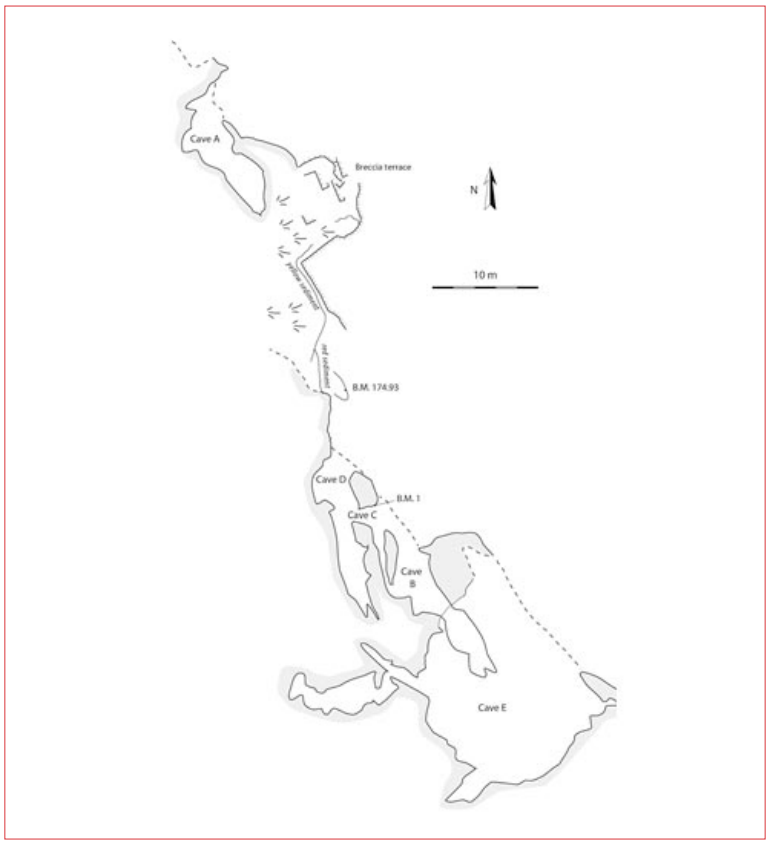


*Figure 4: A schematic plan of Geula Caves, courtesy of A. Frumkin*

## *Caves C and D*

During the mechanical clearing of the area, two cave openings were revealed to the west of Cave B:

- Cave C is located ca. 5 m northwest of the Cave B entrance. It has a small opening, which leads into a narrow and long inner chamber measuring ca. 4 m from the cave opening to the west (Figs 4-5). Cave C was identified by Wreschener (1967: Fig 2), but was never excavated.

*Figure 5: Cave C entrance, looking northwest*

- Cave D is located ca. 5 m northwest of Cave C (Figs 4, 6). It also has a small opening and a narrow and long inner chamber leading eastward and connecting to the inner chamber of Cave C (Fig. 7). Thus, these two caves are in fact the remains of one cave system.

*Figure 6: Cave D entrance, looking northwest*

*Figure 7: The corridor connecting Caves C and D; picture taken from Cave D looking east to Cave C*

The stratigraphic sequence in Caves C and D is composed of three sedimentary units, and it resembles Wreschener's stratigraphic description of Cave B (Fig 8). The upper layer (Layer 1) was composed of loose light grey sediment. It contained large amounts of animal bones; some of them are modern remains. The underlying Layer 2 was composed of loose brown sediment, which contained animal bones and a few Mousterian flint artifacts. The deepest layer (3) was composed of compact dark brown sediment, and yielded a large number of animal bones, a few flint artifacts and two human teeth. Some of the animal bones and flint artifacts from this layer seemed to be burnt. The section was sampled for OSL dating.

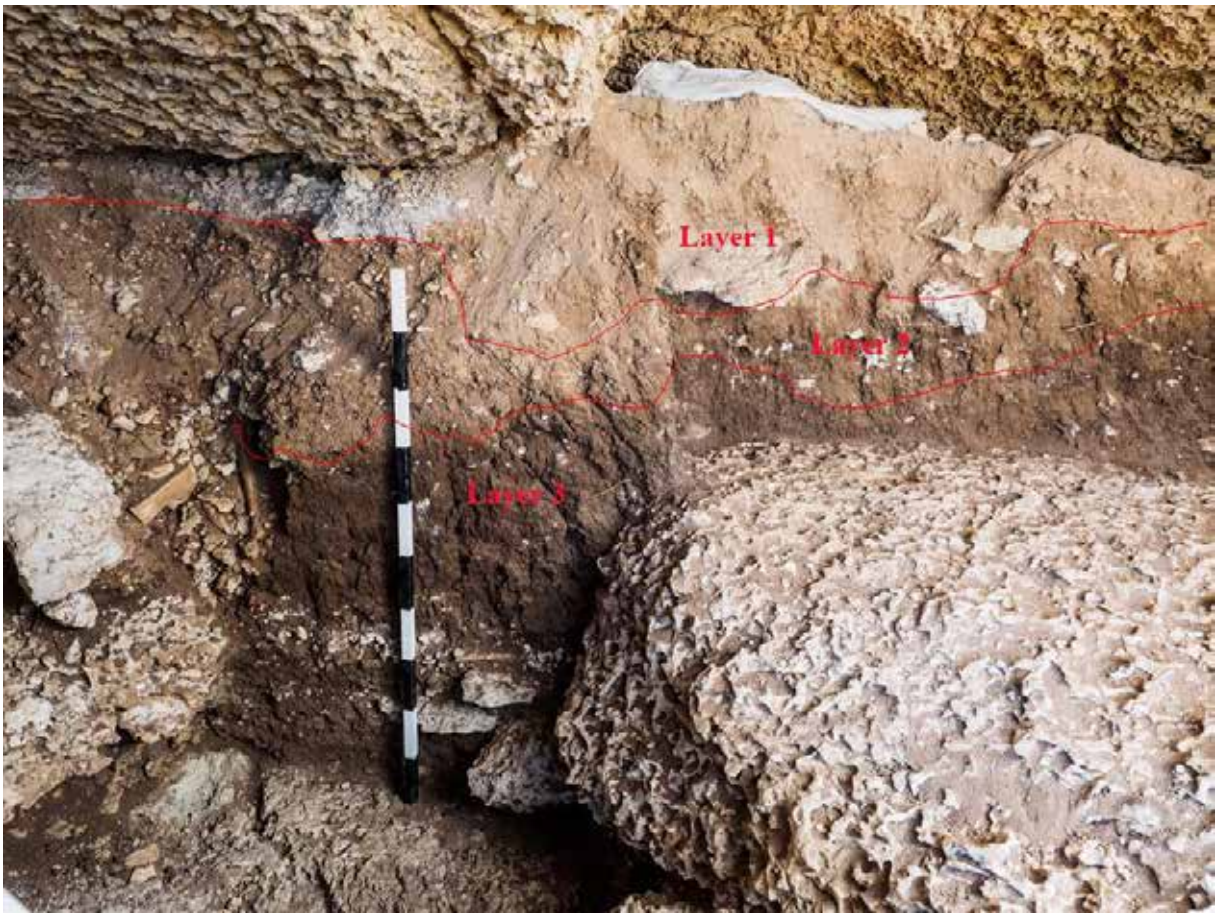


*Figure 8: The stratigraphic section of Cave D, looking northwest*

## The Chimney

The chimney is evident on the cliff section north of Caves B-D. It is all filled with compacted reddish brown sediments containing small pebbles (Fig 9). Stratigraphically, this sediment is overlaying and sealing the entrance to Cave D. Therefore, all archaeological finds in Cave D are older than the accumulation of the sediments in the chimney.

Approximately 3 m of the exposed chimney sediments were excavated from top to bottom (Fig 9) to examine its stratigraphy and to attempt to locate archaeological horizons. The section was sampled for OSL dating. The Chimney's sediments contained small amounts of animal bones and Mousterian flint artifacts. We assume that these do not represent an archaeological level but rather represent drifted materials from the surface above the cave into its inner chamber. It is quite possible that the chimney's depression was a 'natural trap' for animals.

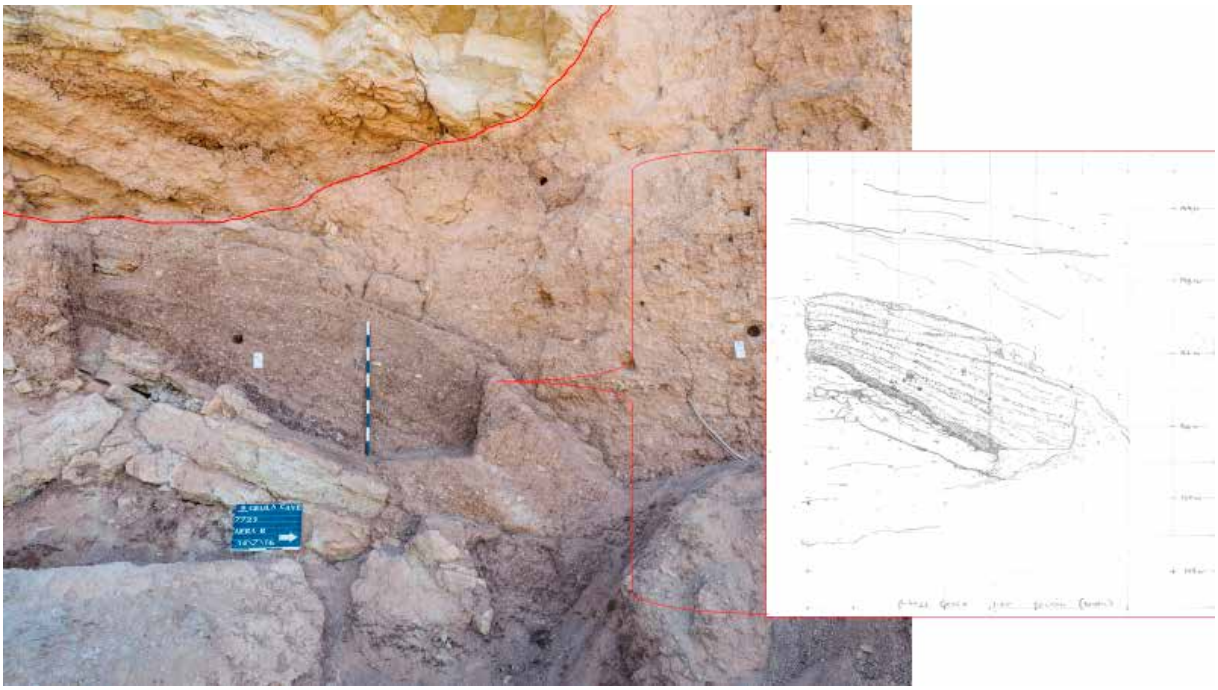

*Figure 9 : The chimney section, looking west*

## The Breccia

Northeast of Cave A and in close proximity to its entrance, a thick (1-2 m) brecciated layer was identified. The brecciated layer contained large amounts of Mousterian flint artifacts, some animal bones and ash lenses. This layer was exposed over an area of approximately 20 $m^2$ (Fig 10), and it seems to continue further to the east and to the south, covering a major part of the area between Caves A and D. The northeastern part of breccia was destroyed during quarrying activities. It could be safely assumed that the brecciated layer represents the floor of a cave, which was not preserved. Large boulders, which were found on top of the breccia in several locations, are probably the remains of a collapsed ceiling. It is not clear whether this cave was originally a part of the B-D Caves complex, or if it represents a different system.

*Figure 10, left photo: The breccia, looking northwest; right photo: a closeup of flint artifacts embedded within the breccia*

## The Fauna Assemblages

The fauna assemblages vary in quantities and composition between the excavated areas, probably representing different activities. All the layers of Caves C-D yielded large quantities of animal bones in good preservation, presenting a wide variety of species. Among the Ungulate species, the remains of wild cattle (*Bos primigenius*), red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*), Persian fellow deer (*Dama mesopotamica*), gazelle (*Gazella gazella*), horse (*Equus* sp.) and wild boar (*Sus scrofa*) were identified (Fig. 11).

*Figure 11: An antler of a red deer from cave D*

Reptiles and small animals were also represented in small numbers. Among identified species were the following: a turtle (*Testudo*), a sheltopusik (*Ophisaurus apodus*), a hedgehog (*Erinaceus* sp.), and a porcupine (*Hystrix refossa*). Unidentified snake vertebrae and several bird bones were also a part of the assemblage. In addition, several carnivore species were identified in the assemblage, including the following: spotted hyena (*Crocuta Crocuta*), a lion (*Panthera leo*), a fox (*Vulpes*) and possibly a leopard (*Panthera pardus*) (Fig. 12).

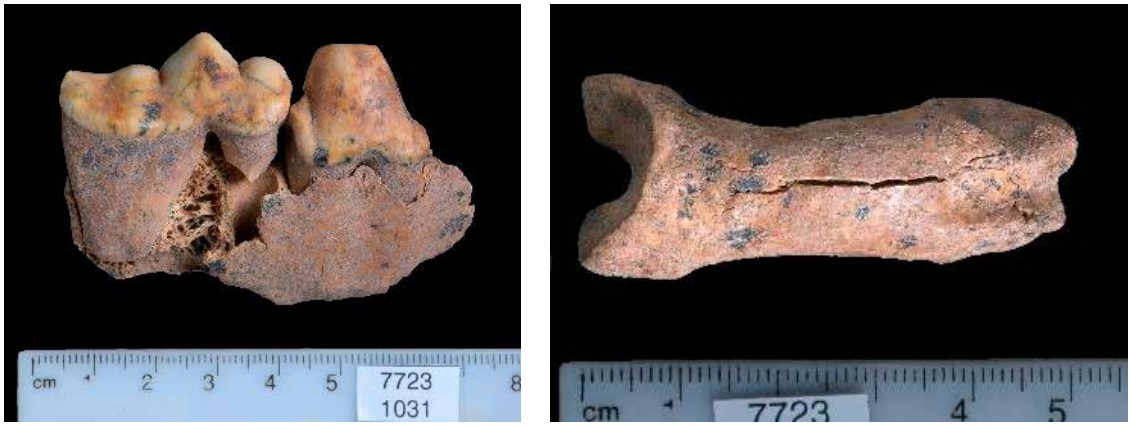


*Figure 12: A mandible of a hyena (left) and a toe of a lion (right) from caves C-D*

The good state of preservation of the bones permits identification of carnivore's treatment such as bite marks, gnawing marks, porosity and digestion marks on the bones, fitting the relatively large amount

and variety of predators in the fauna assemblage. Many of the gnawing marks are characteristic to the porcupine species found on site. The large amount of carnivore marks on the bones indicates that this assemblage was formed by carnivores' activity.

The bones from the brecciated layer showed intentional-breaking patterns, which are characteristic of human activity (for the purpose of marrow extraction). Medium sized mammals seem to dominate this assemblage.

## *The flint assemblage*

All flint artifacts collected during the excavation were ascribed to a Mousterian industry. Caves C and D yielded a small number of artifacts, most of them complete tools such as scrapers and Levallois and Mousterian points (Fig. 13). The brecciated layer, however, yielded large amounts of flint artifacts, including cores and debitage in addition to finished tools. The composition of this assemblage in this area indicates that some knapping activity took place inside the cave.


*Figure 13: Levallois (left) and Mousterian (right) points from Caves C-D*

## *Summary and Conclusions*

The current excavation in Geula Caves was concentrated in three main areas. The first is the cave's C-D complex, which seems to be a part of a larger complex that also includes Wreschener's Cave B. It seems that the human activity within this complex should be ascribed to the oldest stratigraphic layer (Layer 3), due to the presence of burnt animal bones and flint artifacts. The following stratigraphic stage (Layer 2) showed a great representation of carnivore activity on the bones, most of them associated with the spotted hyena, a species that is now considered extinct in this region. The youngest layer (1) indicated mostly porcupine activity, through the gnawing marks identified on the bones from this layer.

The second area of focus was the chimney complex, which seems to represent the last stage of accumulation in the cave. The excavation in this area indicated the infiltration of sediments from outside the cave through the chimney and into the inner chamber, which sealed the entrance to Cave D. The finds yielded from the chimney included a few animal bones and Mousterian flint artifacts. Those, alongside the compact nature of the sediments, imply that the chimney was sealed in ancient time, maybe not long after the end of the Middle Palaeolithic period.

The third area of focus is the brecciated layer, which is considered to represent a floor of an additional cave, which was not preserved, probably because of natural processes rather than quarrying activity. The thickness of this layer, ca 2 m, indicates a long period of human presence in this cave during the Middle Palaeolithic. The large boulders, found on top of the brecciated layer, and the fact that this layer reaches stone walls at its western part, further indicate the past existence of an additional cave in the Geula Caves complex.

The Geula Caves complex is the only complex of its kind known today on the northern slopes of Mt. Carmel. Most of the known cave sites dated to this period in the region (i.e Tabun, Misliya, Kebara, Sefunim) are at lower elevations, on the western slopes of Mt. Carmel. Future research will include a cultural and chronological analysis of the Mousterian culture in Geula Caves, its correlation with other contemporary cave sites in the region, and a paleo environment reconstruction based on the fauna assemblage. All should contribute a lot to the current research of the Mousterian culture and of human activity in this region during the Middle Palaeolithic period.

## *References*

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# EXCAVATION REPORTS
## TABUN CAVE


# New Excavation at Tabun Cave
# Report for 2016-early 2017

**In collaboration with Mina Weinstein-Evron[1] and Ron Shimelmitz[1]**

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## *Introduction*

Tabun Cave is located at the western edge of Mount Carmel, at the opening of Nahal Me'arot. It was first excavated between 1929 and 1934 by D.A.E. Garrod (Garrod and Bate, 1937). The total depth of sediments in the cave is 25 meters. Garrod divided the stratigraphical sequence into seven layers, ranging from the Lower Paleolithic to the late Middle Paleolithic. Three of these layers are attributed to the Middle Paleolithic, including Layer D of the early Middle Paleolithic, Layer C of the middle Middle Paleolithic, and Layer B of the late Middle Paleolithic. Each of these layers represents a different phase in the Levantine Middle Paleolithic (Shea, 2003; Hovers, 2009).

During the 1930s, excavation revealed several human remains in layers B and C. The most famous of this is C1; the Neanderthal woman that was found in the interface between Layers C and B (McCown and Keith, 1939). While its attribution to a specific layer was left in question by Garrod (Garrod and Bate, 1937), it is most often assigned today to Layer B (Bar-Yosef and Callander, 1999). Many more human remains were found within Layer B (McCown and Keith, 1939), including dental remains (Coppa et al., 2005). The finding of Neanderthal remains in Layer B correlates with other sites dated to the late Middle Paleolithic (Bar-Yosef et al., 1992; Hovers et al., 1995; Akazawa et al., 1999). Nevertheless, while numerous Middle Paleolithic sites are scattered throughout the Levant, in most of these no human remains were found. Tabun Cave is one of the rare exceptions with rich human remains, including burials (Shea, 2001, 2003).

Since the 1930s, two other excavation expeditions at Tabun Cave were made. One by A. Jelinek between 1967 and 1971 (Jelinek et al., 1973; Jelinek, 1982), and the second by A. Ronen between 1975 and 2003 (Ronen et al., 2011). Ronen excavated the Lower Paleolithic layers at the cave, while Jelinek excavated a 10-meter step section at the middle of the former section made by Garrod. Jelinek's section covered Garrod's Layers E-C, ranging from the Lower Paleolithic to the middle of the Middle Paleolithic. Layer B was not included in Jelinek's trench, and, thus, this part of the cave was not excavated since 1934 despite is enormous potential. The potential of a new excavation is further echoed in that studies of aNDA from the last decade which hypothesize the Levantine late Middle Paleolithic as the time and place of gene-flow between Neanderthals and *Homo sapiens* (Sankararaman et al., 2012; Kuhlwilm et al., 2016).

In 2017, a new excavation was initiated in Tabun Layer B by Mina Weinstein-Evron, Ron Shimelmitz and Israel Hershkovitz from the University of Haifa and Tel Aviv University (Fig. 1). Through the excavation, we aim to meet these goals:

- Gain a better understand of the stratigraphy of this part of the sequence, including its environment of deposition and post depositional processes
- Provide for the first time a comprehensive chronological frame for this layer using a variety of methods
- Reconstruct the paleo-environment and human exploitation of it using a set of studies of biotic remains
- Track anthropogenic signatures within the sediments such as the extent of fire use using micromorphology
- Identify patterns in material culture referring to cognition, landscape exploitation, site use and the transformation of socially learned knowledge
- Search new human remains that will help understand the contact between Neanderthals and *Homo sapiens* at the late Middle Paleolithic

In all, this cluster of studies is expected to fill-in important gaps in our knowledge that are significant to develop new models for reconstructing Neanderthal migration into the Levant and their extinction at the late Middle Paleolithic, as well as Neanderthals-*Homo sapiens* relationship.

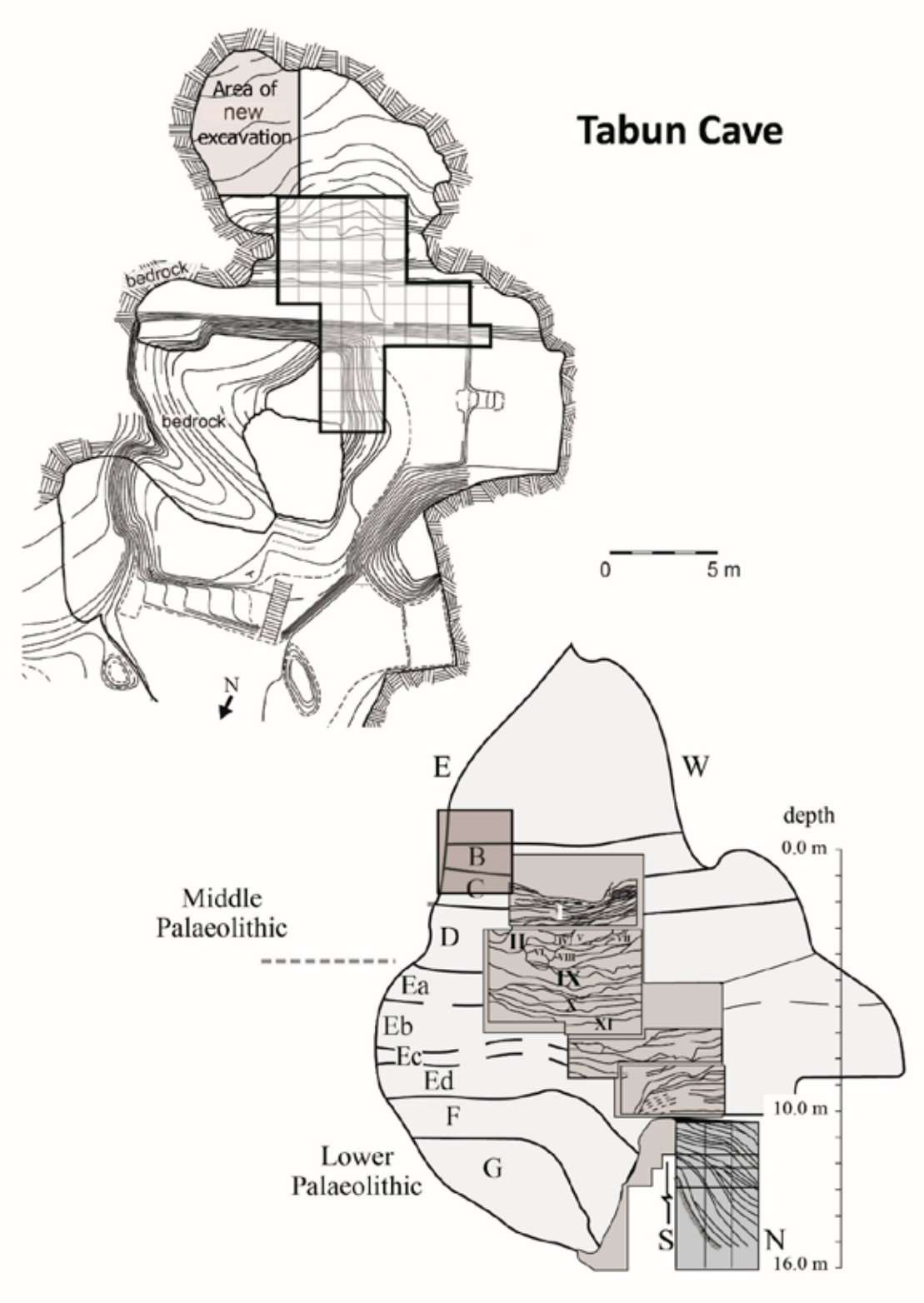


*Fig. 1: Tabun Cave and the location of the new excavation of the late Middle Paleolithic, Layer B*

## Setting the Ground for the New Excavation: The construction of a ladder and fence

In order to enable easy and safe access to the very upper layer (B), which is the target of the current excavation project, a ladder was built running through the cave's chimney (Fig. 2). This was also performed

in order to keep the step section below, which runs from the Lower to the Middle Paleolithic, intact and unharmed. The construction of the ladder and its specific location was coordinated with the Israel Nature and Parks Authority. It was designed and built by a company that specializes in working at high altitudes –'Vertical Solutions.' The construction procedures were accompanied by 'Aagam Safety' – a safety engineer – that constructed the working scheme at the cave as well. The ladder is 13 m long with its head at the upper opening of the chimney. A set of two doors, locked by keys, was constructed at the roofed ceiling that covers the cave's chimney. A resting zone was made at the center of the ladder as requested by the safety regulation.

In order to maintain the safety of the students excavating, a fence was constructed along the edge of the section left by Garrod and Jelinek, a steep step section, which reaches a depth of 16 m (Fig. 3). A cable line for downloading the excavated sediments for wet sieving outside of the cave and an additional safety cable in case of emergency were constructed as well (Fig. 4). The construction of the ladder, fence, and cables was finished at the end of October 2016.

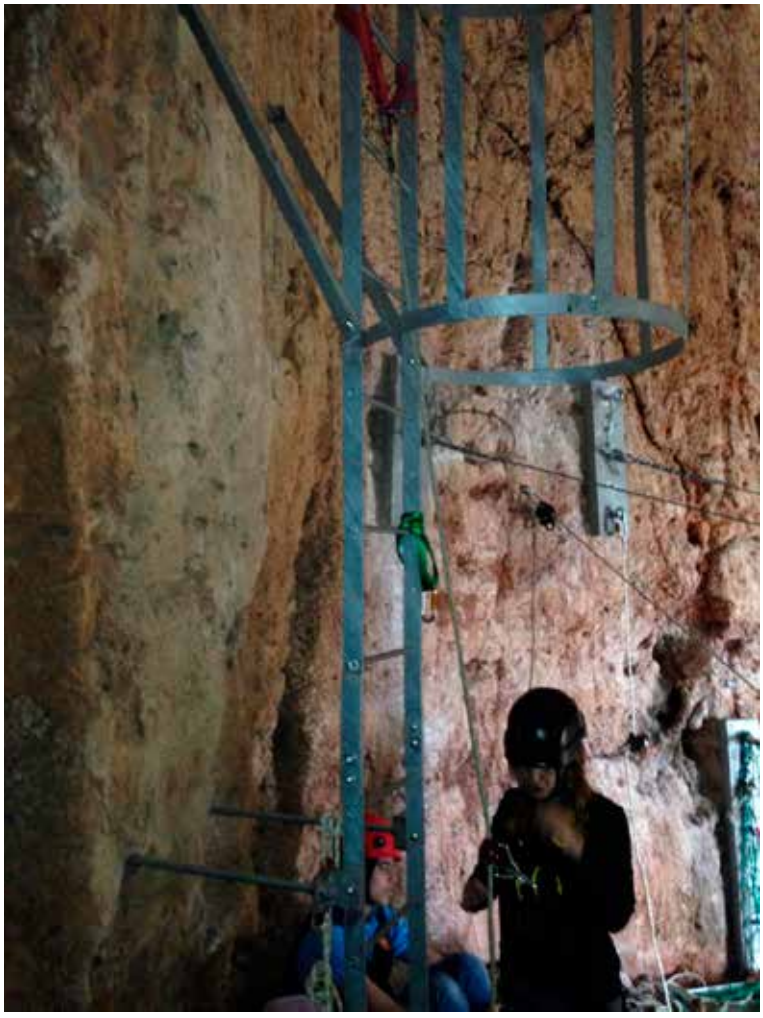

*Fig. 2: The lower part of the 13 meter long ladder*

*Fig. 3: The fence constructed in order to protect excavators from the steep 16-meter deep section left by Garrod's and Jelinek's excavations*

*Fig. 4: The set of two cables: one for shifting sediments and equipment and one for emergency evacuation*

## The 2017 Excavation

While the main 2017 season is planned for June-July 2017, a week of excavation was already conducted at the end of February to early March (28.2-5.3.2017). The first 2017 excavation started with a high altitude work course for all team members as well as an emergency evacuation course for several of the team members; this follows the safety protocol.

The surface at the inner chamber of Tabun, the focus of our excavation, is inclining from the back of the cave in the south to its opening in the north. While Garrod left after her excavation a set of three clear steps in this area (Garrod and Bate, 1937), these were heavily deformed due to erosion resulting from rain. This process of erosion stopped in the late 1960's when Jelinek built the roof that covers the chimney opening. In all, this area is raised ca. 3.5 meters above the very top of Jelinek's excavation. The surface of this area was found to be packed with limestones of various sizes. Numerous animal bones were found scattered all over the surface as well, mostly in a good state of preservation (Fig. 6).

*Fig. 5: The inner chamber prior to our excavation (as remained after Garrod's excavation 1929-1934); photographed from the ladder, facing east*

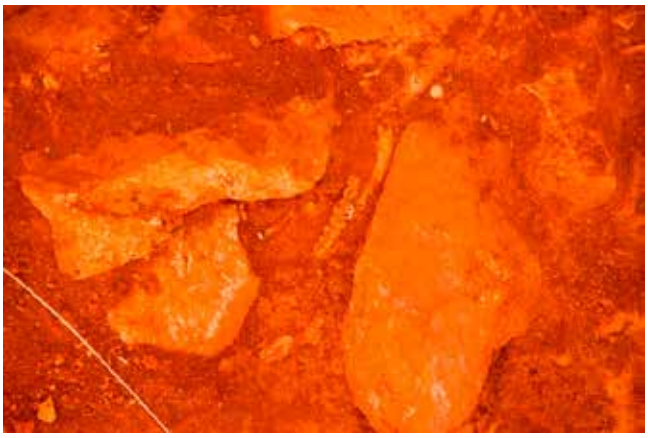

*Fig. 6: A fallow deer mandible found within the surface of the site as left after Garrod's excavation in 1934*

The new excavation was set according to the datum and grid used by earlier excavations at the cave. Currently, a set of six squares of 1x1 meter was marked, running along columns K and L, rows 3-5. This area will later be expanded into a trench running from the southern wall to the section left by Garrod at the north (Fig. 7).

*Fig. 7: The grid of the early 2017 season of cleaning and excavating the surface*

The excavation thus far concentrated on cleaning the surface and removing the very upper layer that was slightly eroded prior for the construction of the roof. During the excavation of the surface, a massive concentration of bones, which seems to be *in-situ,* was uncovered at the four southern squares of K-L/3-4. In the northern squares of K-L/5, the upper sediments seem to be not *in situ*. The *in-situ* sediments include a high content of *terra rossa* soil, and limestone fragments of various sizes. Bones are also highly frequent within these sediments, found in high concentrations in several localities (Figs. 8-9). Stone tools

and waste appear in small frequency; however, it is worth noting that the finding of a scraper and a broad Levallois point are typical finds for this stage of the Middle Paleolithic, taking into consideration the very limited volume excavated in the preliminary season.

A preliminary observation of the bone finds (R. Yeshurun) indicates a high representation of fallow deer. Other observations of the faunal record include the presence of articulated specimens and a high frequency of young specimens. Excavation at this area will resume in 18.6.2017, at which time we intend to extend our area of excavation and go further down through Layer B.


*Fig. 8: Sediments encountered at the very upper part of Layer B, the layer includes a high terra rossa component and it is packed with limestone fragments of various sizes as well as numerous bones*


*Fig. 9: Side scraper found in a horizon packed with bone fragments*

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