EBERHARD KARLS
UNIVERSITÄT
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Faculty of Philosophy
General Linguistics

Language Evolution WiSe 2023/2024

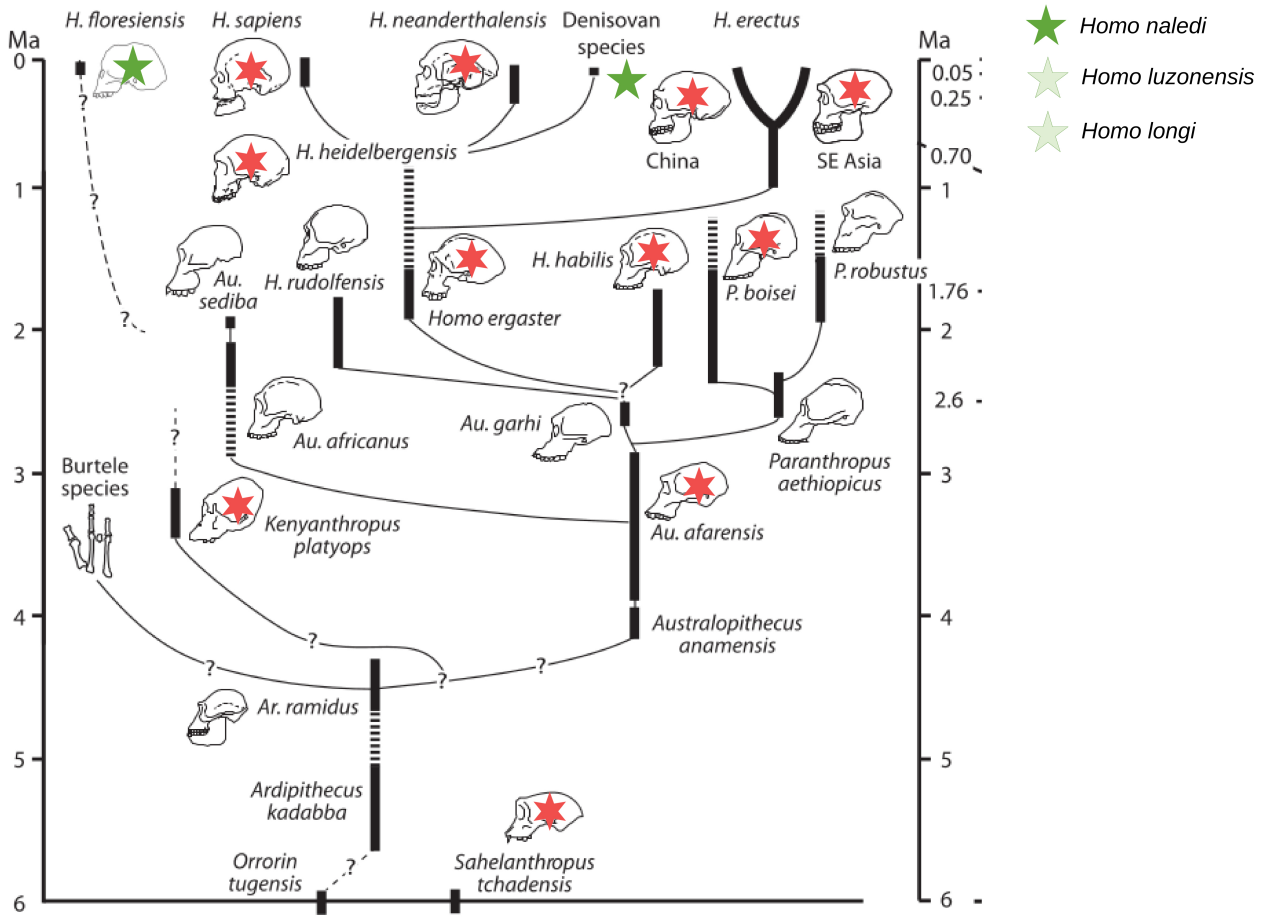
Lecture 4: Human Evolution III
Archaeology

02/11/2023, Christian Bentz

Overview

Section 1: Recap

Summary: Hominin Fossils in Time



Kenyanthropus platyops (Holotype: KNM-WT 40000)

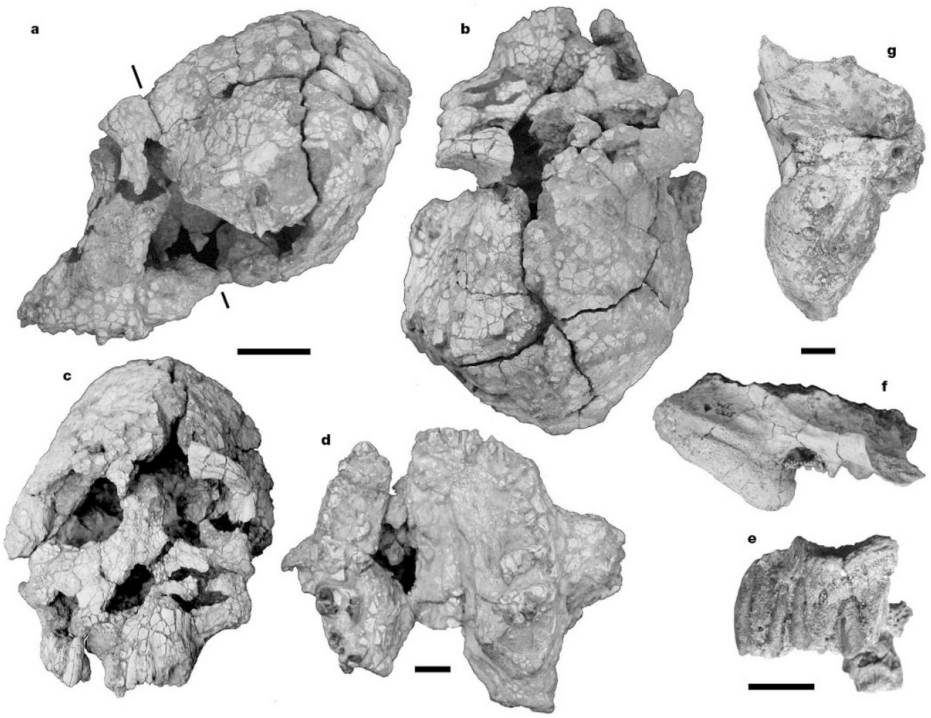
Profile

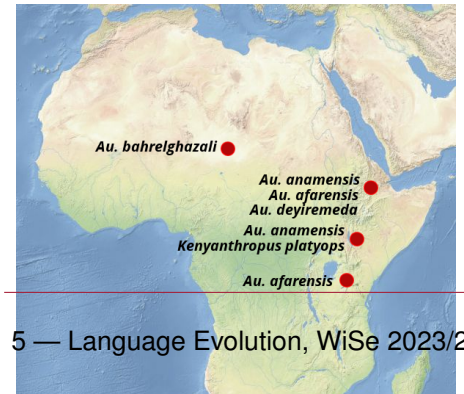
Genus:
Kenyanthropus

Species:
Kenyanthropus platyops

Age:
c. 3.5 Mya

Location:
Lomekwi 3, Lake Turkana, Kenya





Leakey et al. (2001) New hominin genus from eastern Africa shows diverse middle Pliocene lineages.

Australopithecus afarensis (Holotype: LH-4)

Profile

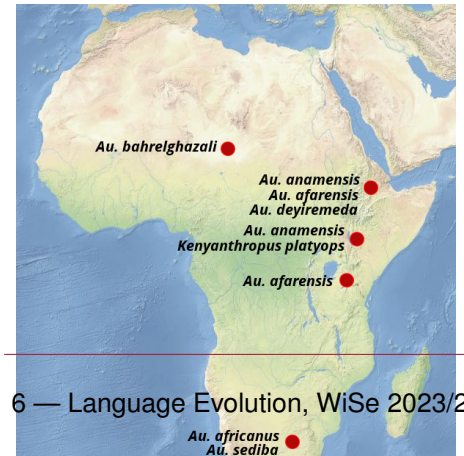
Genus:
Australopithecus

Species:
Australopithecus afarensis

Age:
c. 2.9-3.9 Mya

Location:
Laetoli, Tanzania

Australopithecus afarensis, “Lucy”, reconstructed skeleton (Chip Clark, Smithsonian Institution)



Johanson, White & Coppens (1978). A new species of the genus australopithecus (Primates: Hominidae) from the Pliocene of Eastern Africa.

Johanson & Edey (1981) Lucy, the beginnings of humankind.

Homo habilis (Holotype: KNM ER 1813)

Profile

Genus:
Homo

Species:
Homo habilis

Age:
c. 2.3-1.6 Mya

Location:
Koobi Fora, Kenya

Leakey et al. (1964). A new species of genus Homo from Olduvai Gorge.

Leakey (1974). Further evidence of Lower Pleistocene hominids from East Rudolf, North Kenya, 1973.

Homo ergaster (erectus in Africa) (Holotype: KNM ER 992)

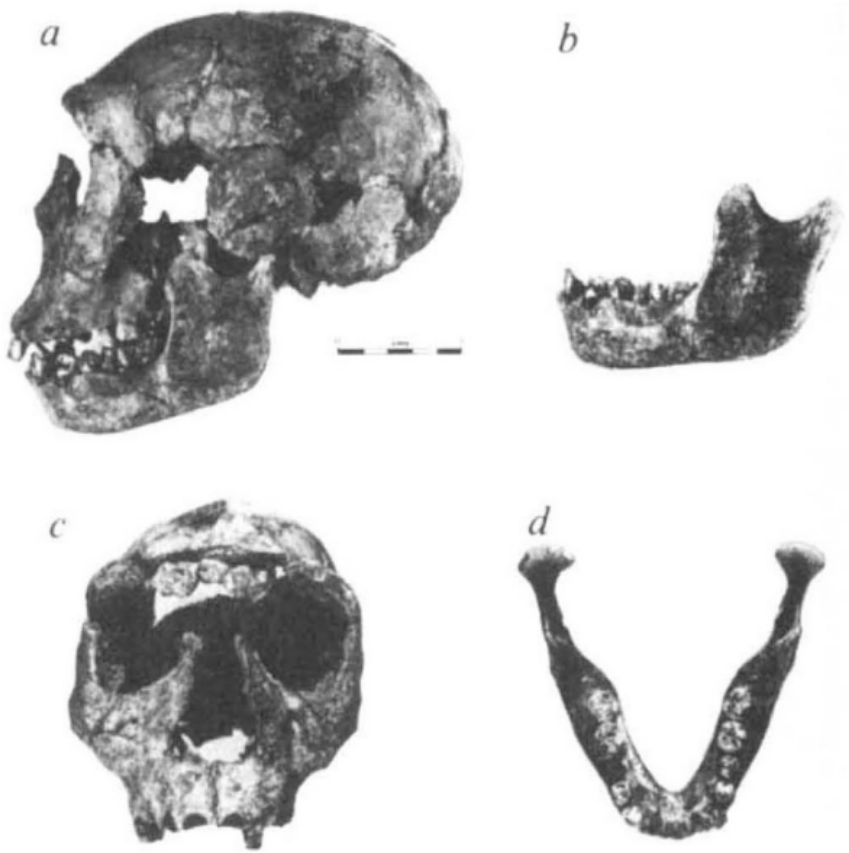
Profile

Genus:
Homo

Species:
Homo ergaster

Age:
c. 1.7-1.4 Mya

Location: Lake Turkana, Kenya



Not the holotype but fossil KNM-WT 15000, called “Turkana boy”.

Brown et al. (1985). Early Homo erectus skeleton from west Lake Turkana, Kenya.

Homo neanderthalensis (Holotype: Neanderthal 1)

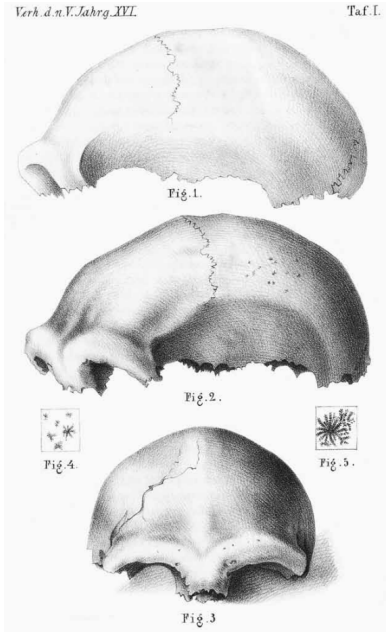
Profile

Genus:
Homo

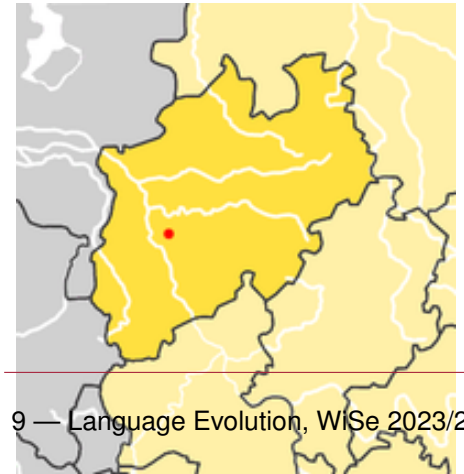
Species:
Homo neanderthalensis

Age:
c. 800 - 40 Ka

Location: Mauer, Heidelberg, Germany



Left: drawing according to Fuhlrott (1859). Right: https://www.efossils.org.



Fuhlrott (1859). Menschliche Ueberreste aus einer Felsengrotte des Düsselthals.

Homo sapiens (further fossils)

Homo sapiens (idaltu)
Herto, Middle, Awash
(c. 160-154 Ka)

White et al. (2003). Pleistocene Homo sapiens from Middle Awash, Ethiopia.

Skhul 5
Mount Carmel, Israel
(c. 120-80 Ka)

https://humanorigins.si.edu/

Cro-Magnon 1
Cro-Magnon, France
(c. 30 Ka)

https://humanorigins.si.edu/

Section 2: Introduction

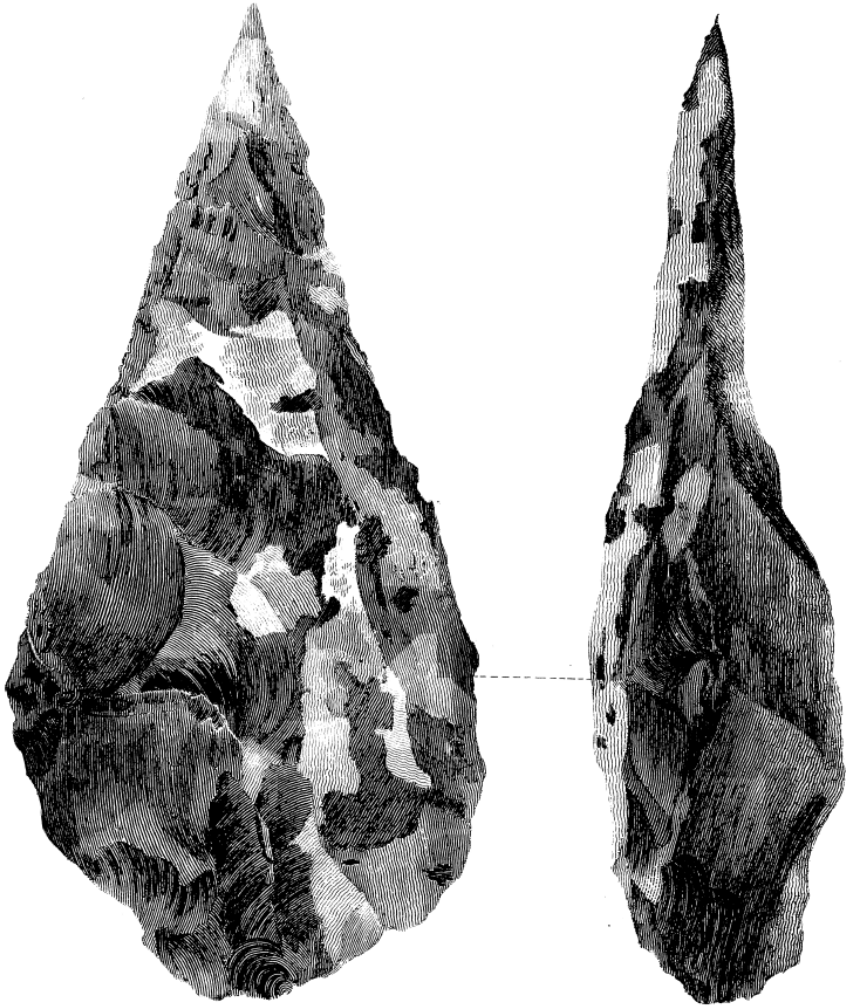
XVIII. *Account of Flint Weapons discovered at* Hoxne *in* Suffolk. *By* John Frere, *Esq.* F.R.S. *and* F.A.S. *In a Letter to the Rev.* John Brand, *Secretary.*

Read June 22, 1797.

SIR,

I TAKE the liberty to request you to lay before the Society some flints found in the parish of Hoxne, in the county of Suffolk, which, if not particularly objects of curiosity in themselves, must, I think, be considered in that light, from the situation in which they were found. See Pl. XIV, XV.

They are, I think, evidently weapons of war, fabricated and used by a people who had not the use of metals. They lay in great numbers at the depth of about twelve feet, in a stratified soil, which was dug into for the purpose of raising clay for bricks.



Flint Weapon found at Hoxne in Suffolk.

Basic Terminology of Stone Working

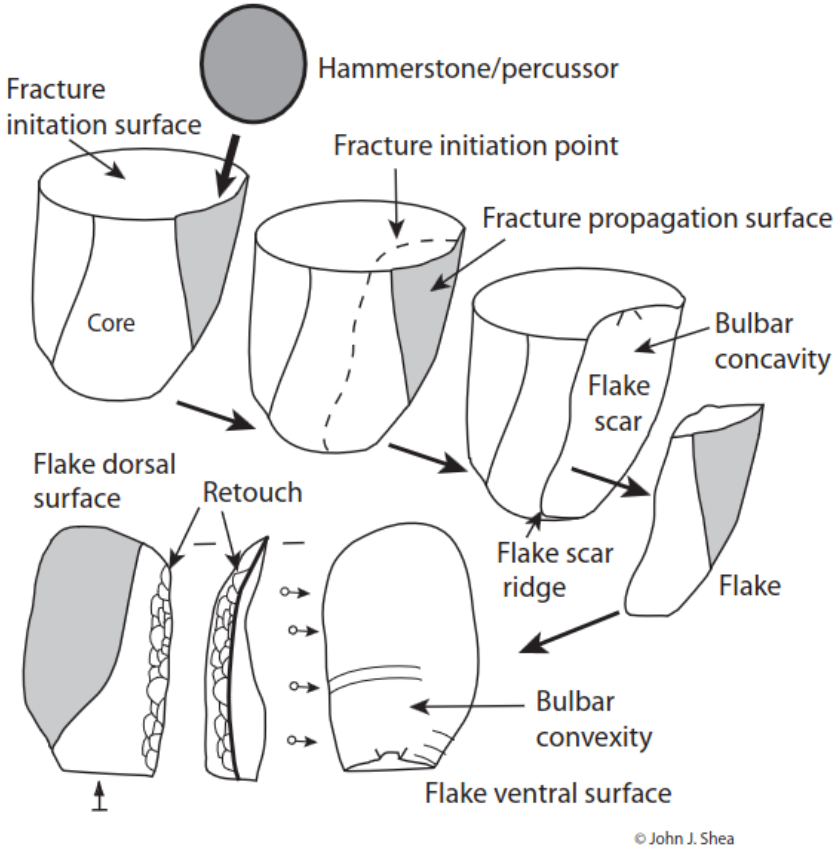


Figure 2.1 Stoneworking basics

Shea (2020). Stone tools: Essential terms and concepts.

Stone Working Techniques

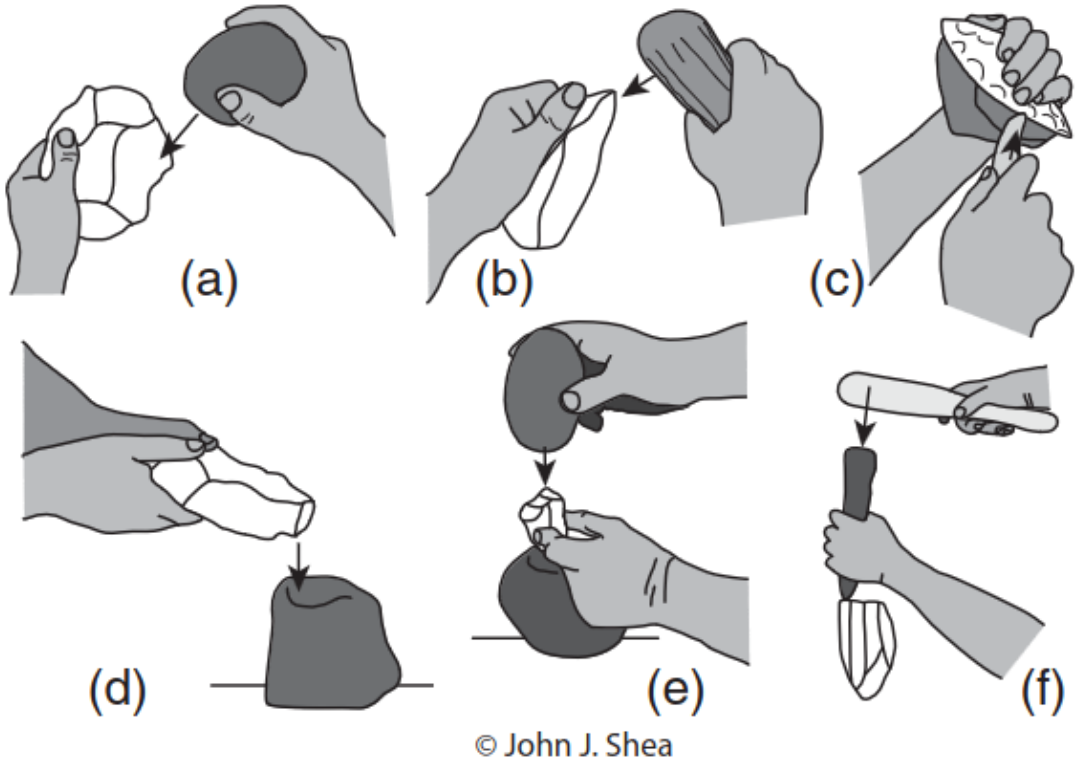


Figure 2.2 Stoneworking techniques. (a) Hard hammer percussion. (b) Soft hammer percussion. (c) Pressure flaking. (d) Anvil technique. (e) Bipolar percussion. (f) Indirect percussion.

Shea (2020). Stone tools: Essential terms and concepts.

Terminology

- **Stone tool industry**: "An *industry* combines assemblages from the same region and time period that preserve similar inventories of lithic artifact-types."
- **Technocomplex**: "*Technological complexes* group together industries sharing similar distinctive ways of making tools or technologies. [...] Technological complexes differ from industries in their geographic extent. While industries occur at local or subcontinental scales, a technological complex encompasses assemblage groups at continental or intercontinental scales."
- **Archaeological culture**: "When archaeologists define an assemblage-group in terms of both lithic and nonlithic evidence (e.g., ceramics, bone or metal tools, architecture), they may refer to that grouping as an *archaeological culture* [...]"

Shea (2020), p. 22.

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Section 3: Tool Behavior in Primates

"Lithic technologies" in other Primates

The usage of stone tools has long been considered a crucial difference between **hominins and other primates**. However, these have more recently been observed using stone tools, for example, to crack nuts.

Proffitt et al. (2022). Identifying functional and regional differences in chimpanzee stone tool technology.

Carvalho et al. (2008). Chaînes opératoire and resource exploitation strategies in chimpanzee (Pan troglodytes) nut cracking.

Figure 1. Examples of chimpanzee nut-cracking in the Taï forest and a nut-cracking site at Djouroutou. (*a*) Female chimpanzee cracking *Panda oleosa* nuts using a granodiorite hammerstone on a wooden (panda tree root) anvil (Credit: Liran Samuni, Taï Chimpanzee Project), and (*b*,*c*) examples of an active *Panda oleosa* nut-cracking site at Djouroutou. Note the combination of hammerstone, anvil and fresh nut debris.

"Lithic technologies" in other Primates

Note: while chimpanzees use cobble stones as *hammers* – which might yield flakes as a byproduct – early hominins have **produced** stone tools to then **use** them further.

Proffitt et al. (2022). Identifying functional and regional differences in chimpanzee stone tool technology.

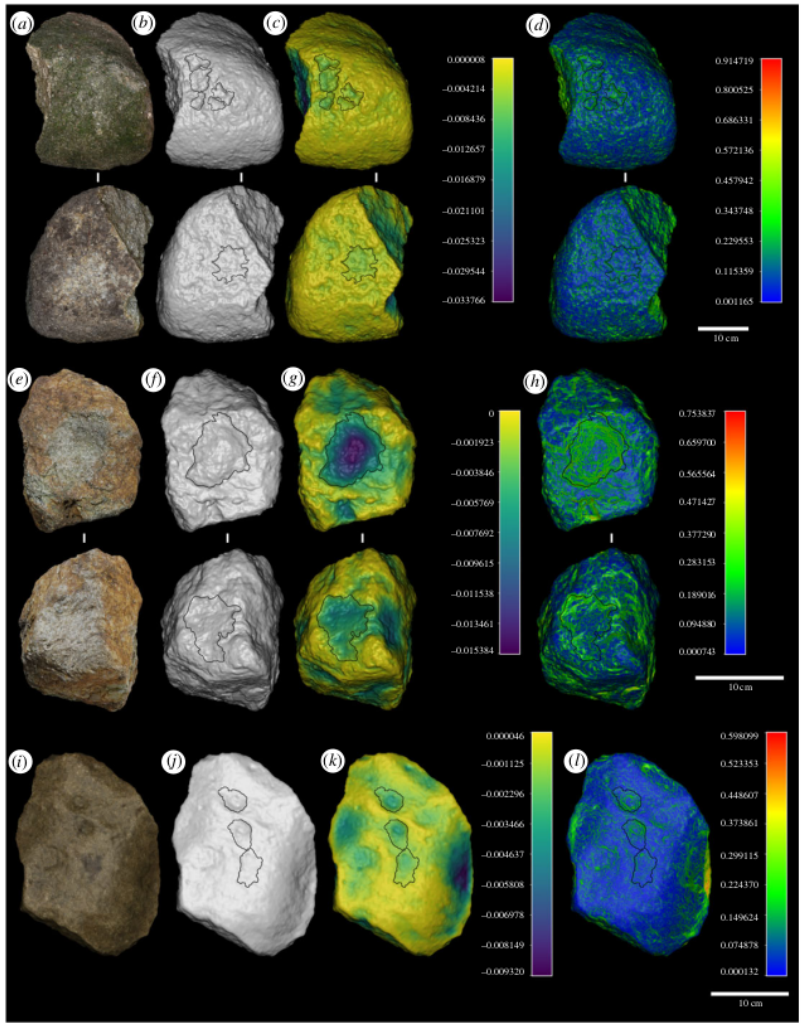

Figure 3. Examples of chimpanzee hammerstones (M Granite Hammer (*a–d*); PPQ1003 (*e–h*); CGG23 (*i–l*)) from Djouroutou included in this study illustrating their textured surface (*a,e,i*); three-dimensional surface (*b,f,j*); surface depth (mm) (*c,g,k*) and surface gradient (*d,h,l*) with location of all pits overlain.

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Section 4: Lower Paleolithic Technocomplex

Starting Point

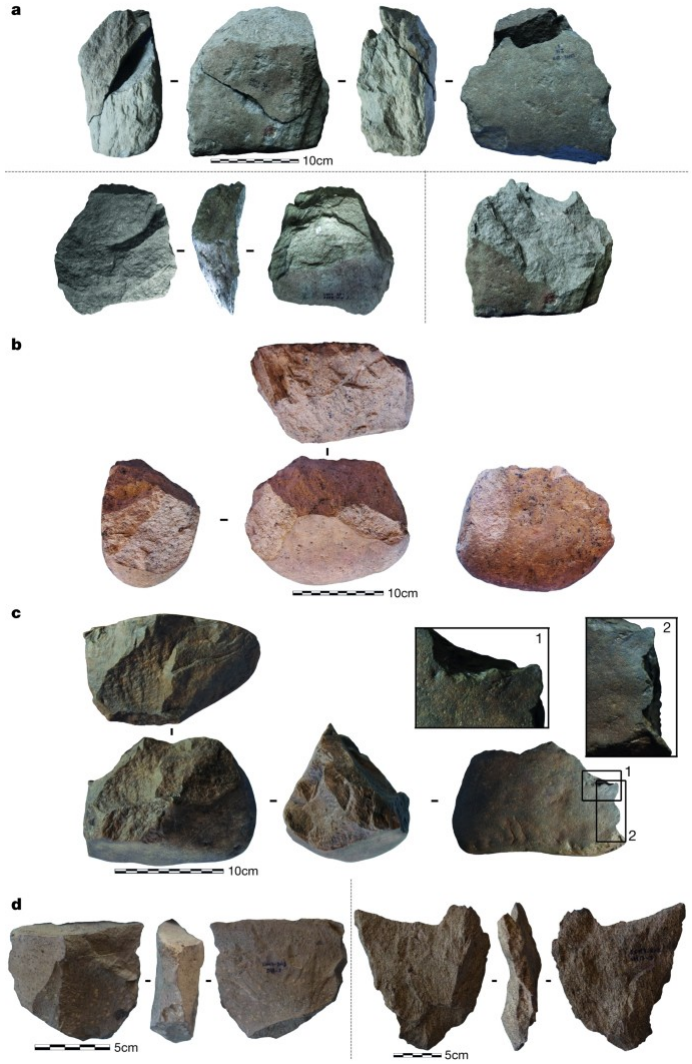
https://www.youtube.com/watch?v=NhM-2P93hoI

Lomekwian industry (c. 3.3 Mya)

Recently discovered, **simple choppers** of *large size*. Probably used for food processing (plants or animals).

Harmand et al. (2015). 3.3-million-year-old stone tools from Lomekwi 3, West Turkana, Kenya.

Lewis & Harmand (2016). An earlier origin for stone tool making: implications for cognitive evolution and the transition to *Homo*.



Production

The Lomekwian industry was (likely) produced by either the **anvil technique** (aka passive hammer), i.e. a core is hit onto an anvil, or by a **bipolar percussion technique**, i.e. a hammerstone is hit onto a core supported by the anvil.

Lewis & Harmand (2016). An earlier origin for stone tool making: implications for cognitive evolution and the transition to *Homo*.

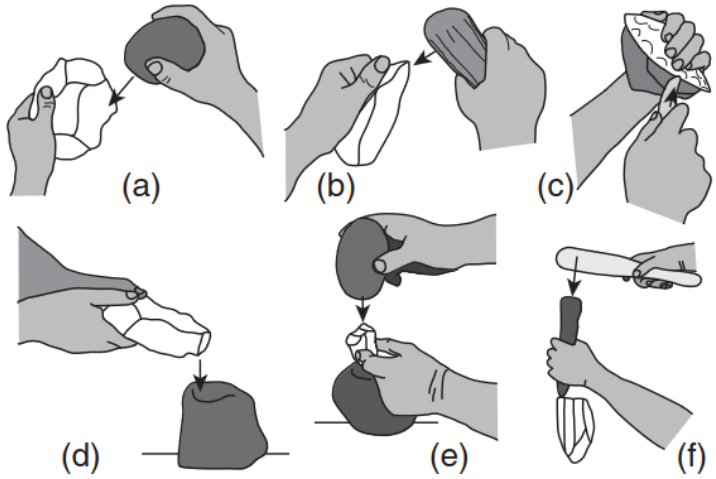
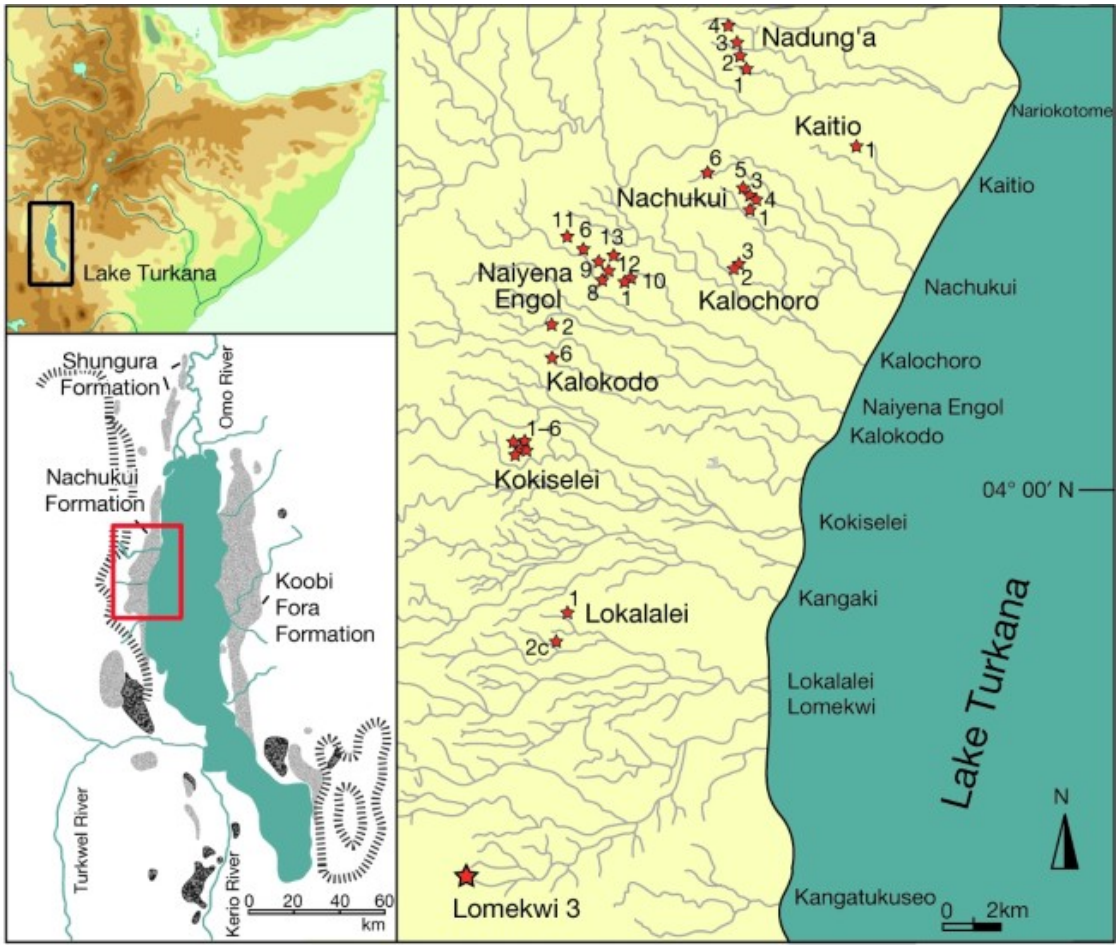


Figure 2.2 Stoneworking techniques. (a) Hard hammer percussion. (b) Soft hammer percussion. (c) Pressure flaking. (d) Anvil technique. (e) Bipolar percussion. (f) Indirect percussion.

Location



Harmand et al. (2015).

Oldowan industry (c. 2.9 - 1.7 Mya)

Simple **chopper, scrapper, and pounder** tools produced by coarsely modifying a core (e.g. cobble stone) to yield a cutting edge. Can be used for cracking bones, cutting skin, pounding plants/meat. The first examples were discovered in Olduvai Gorge, Tanzania.

Semaw et al. (1997). 2.5-million-year-old stone tools from Gona, Ethiopia.

Plummer et al. (2023). Expanded geographic distribution and dietary strategies of the earliest Oldowan hominins and Paranthropus.

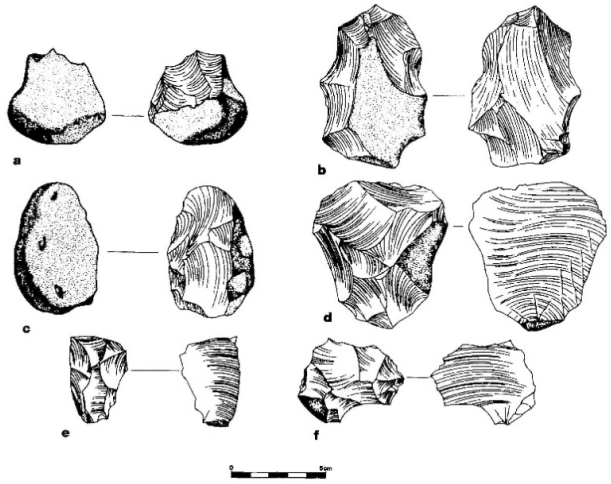


Figure 3 Sketches of a sample of the excavated Gona artefacts. Flaked pieces: **a**, unifacial side chopper, EG12; **b**, discoid, EG10; **c**, unifacial side chopper, EG10. Detached pieces: **d–f**, whole flakes, EG10. Note that the maximum dimension of **d** is as large as some of the flaked pieces.

Left: Oldowan stone chopper from Olduvai Gorge, Tanzania; Middle: Stone core and flake from Lokalalei, Kenya, about 2.3 million years old; Right: IVPP P5470 stone core, Majuangou Xiaochangliang.
https://humanorigins.si.edu/evidence/behavior/stone-tools

Production

The Oldowan industry was (likely) produced by either a **bipolar technique** (hammer, core, and anvil), or a **hard hammer technique** (stone-on-stone) where the core is held with one hand, and potentially supported by the knee.

Napier (1962). Fossil hand bones from Olduvai Gorge.

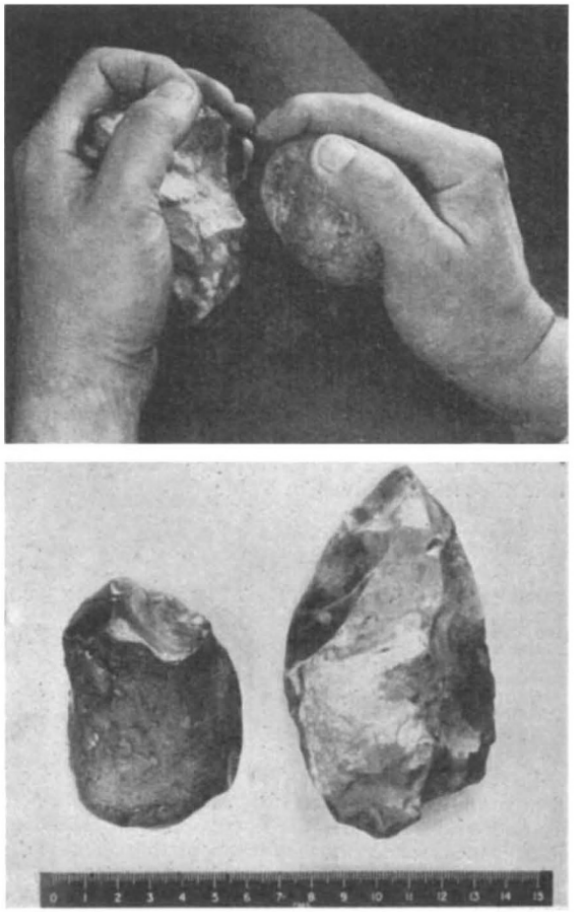


Fig. 2. Top, stone-on-stone technique of hand-axe construction using a power grip only. The flint core is being supported on the knee; bottom left, 'Oldowan' pebble-tool; right, 'Chellean' hand-axe made by me using the above technique

Location

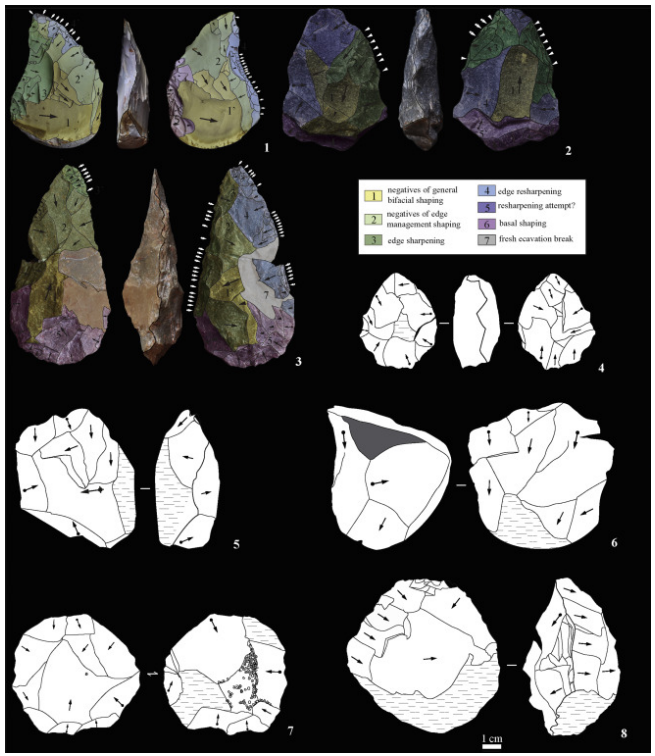
Note: While some of the earliest finds come from Eastern Africa between 2.6-2.9 Mya, this technology has subsequently spread to other parts of the world, e.g. Europe and Asia.

Tobias (2003). Encore Olduvai.

Acheulean industry
(c. 1.7 Mya - 130 Kya)

Assemblages are dominated by **bifacial handaxes** of different sizes. These were produced by systematically flaking off parts of the core and retouching, until an often symmetrical "tear-drop" shaped tool is achieved. Versatile tools of different shapes and sizes with many purposes (including hunting).

Daura et al. (2013). A 400,000-year-old Acheulean assemblage associated with the Aroeira-3 human cranium.



Left: Handaxe from Europe; Middle: Handaxe from Bose, China; Right: Handaxe from India.
https://humanorigins.si.edu/evidence/behavior/stone-tools

Production

The Acheulean industry was (likely) produced by combining **hard hammer** and **soft hammer** techniques, first producing a rough shape with a hard hammer, and then retouching to create finer contours with a soft hammer.

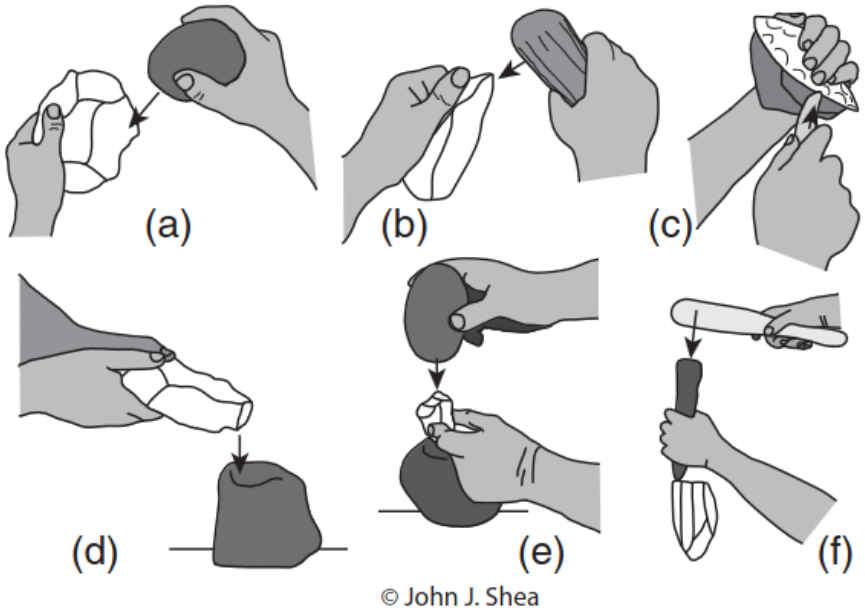
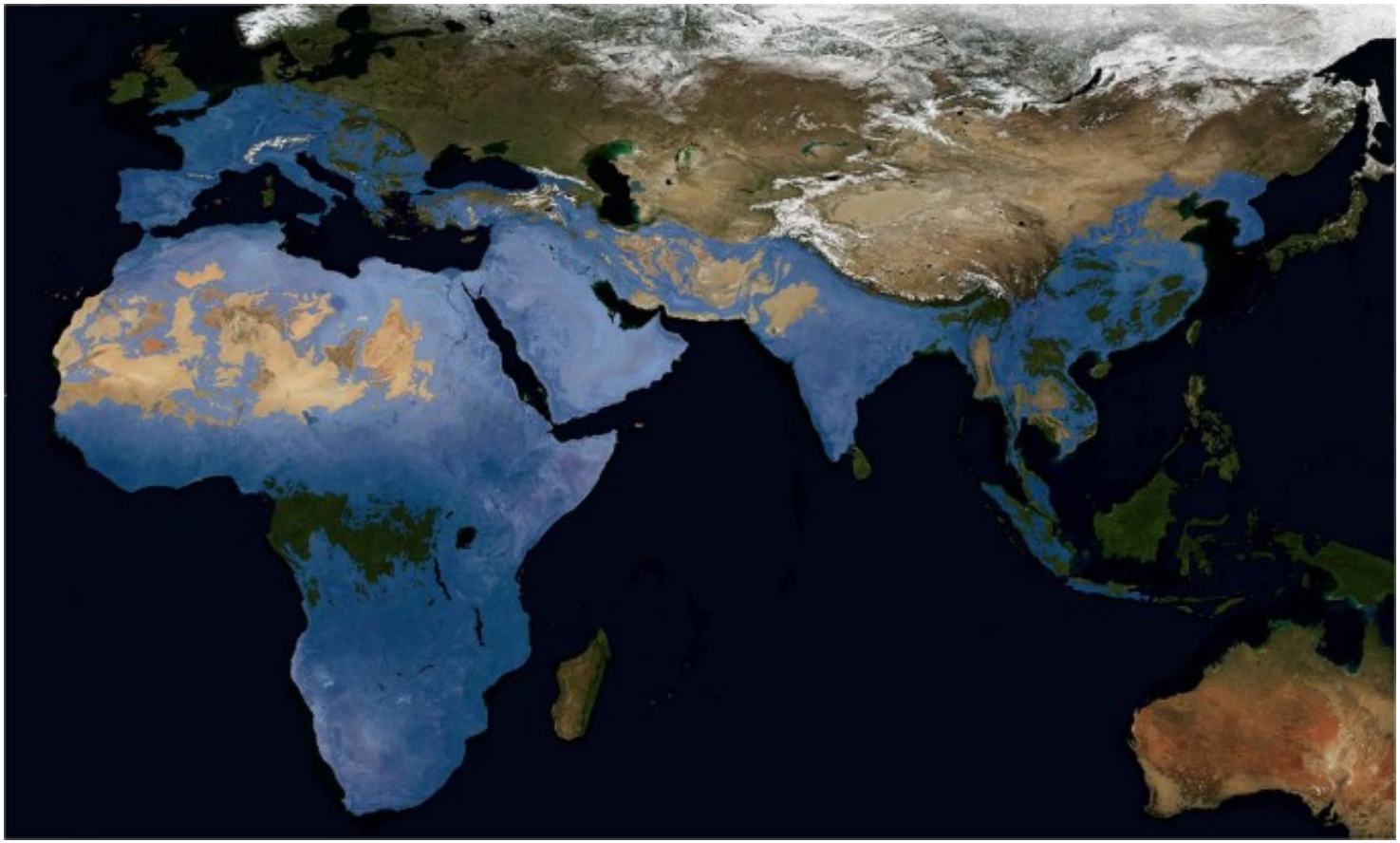


Figure 2.2 Stoneworking techniques. (a) Hard hammer percussion. (b) Soft hammer percussion. (c) Pressure flaking. (d) Anvil technique. (e) Bipolar percussion. (f) Indirect percussion.

Distribution



Key et al. (2023). Modelling the end of the Acheulean at global and continental levels suggests widespread persistence into the Middle Palaeolithic.

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Section 5: Middle Paleolithic Technocomplex

Levallois
(since c. 350 Kya)

Levallois tools are multifaceted and versatile tools of different shapes and sizes. They can be used as *blades*, *scrappers*, *spear tips*, etc.

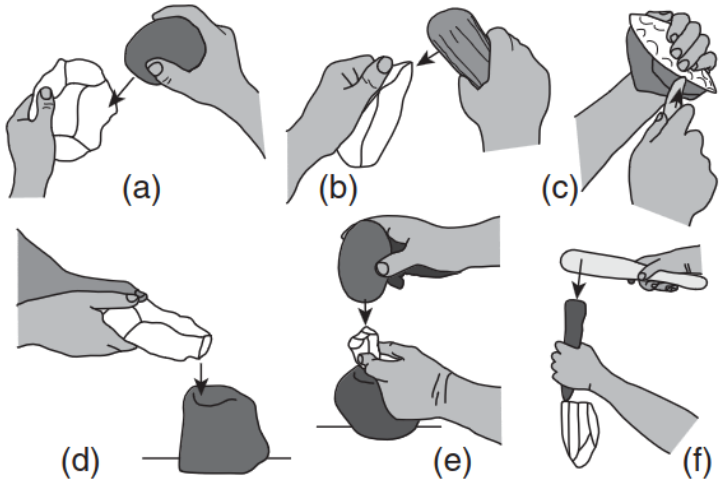
Hallinan et al. (2022). No direct evidence for the presence of Nubian Levallois technology and its association with Neanderthals at Shukbah Cave.

Figure 2. Middle Palaeolithic lithic artefacts from Shukbah Layer D: (**a**) preferential centripetally prepared Levallois core, (**b**) recurrent centripetal Levallois core; (**c**) bidirectional Levallois core; (**d**) exhausted preferential centripetally prepared Levallois core; (**e–g**) Levallois points; (**h–i**) Hummal points; (**j–k**) convergent scrapers on blades.

Production

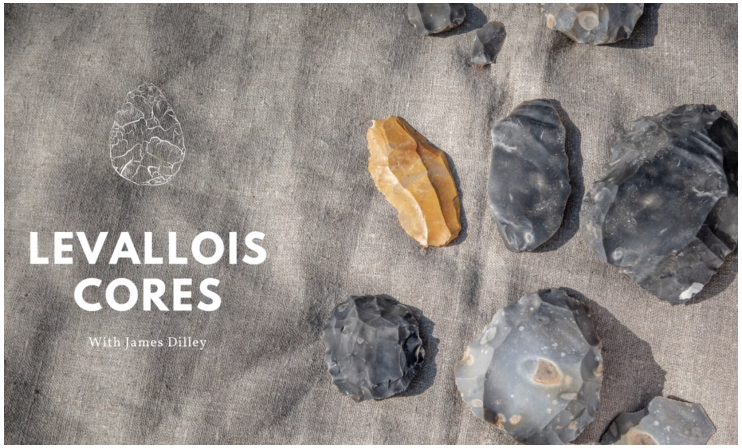
Levallois tools are produced by using **hard hammer** and **soft hammer techniques**, similar to the Acheulean. However, a crucial difference is the so-called **prepared core technology**. Rather than reducing a core to yield the final tool, this method prepares a core and then produces a tool of a particular shape by a final strike.

https://www.youtube.com/watch?v=tA91YHaNTpc

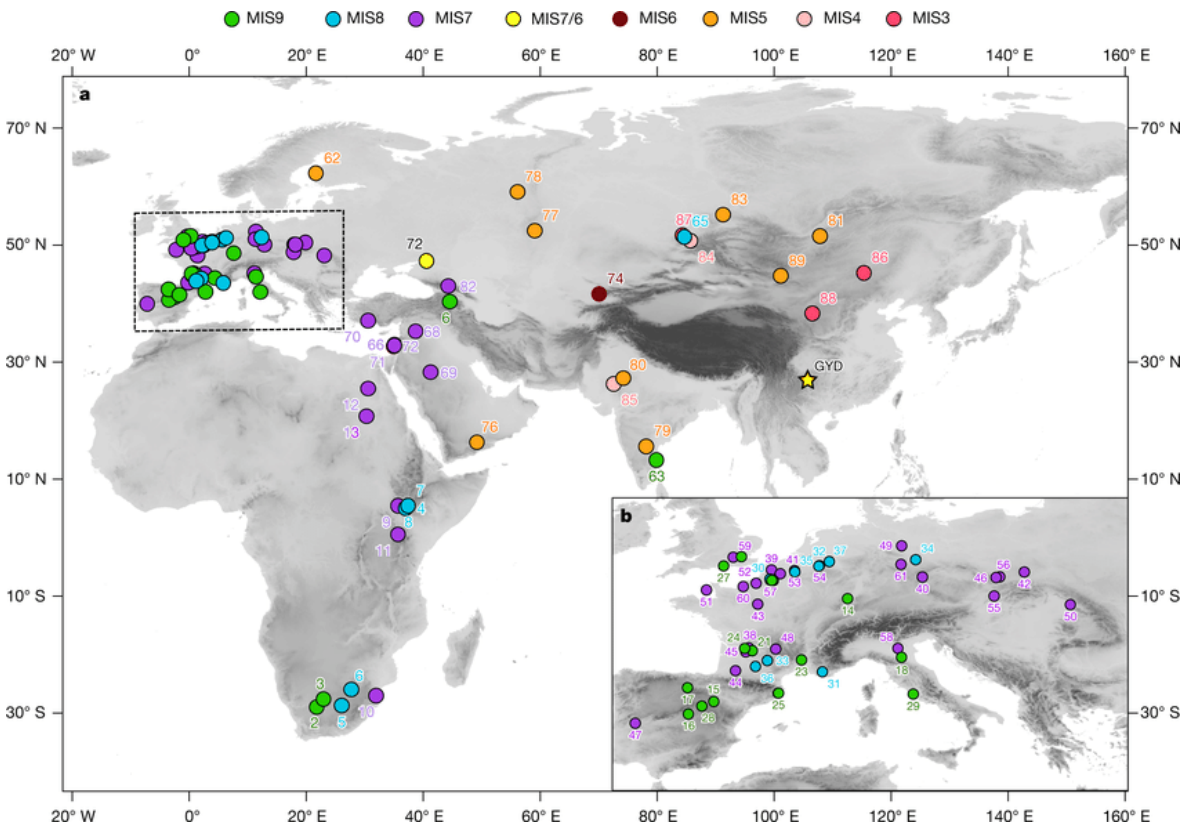


© John J. Shea

Figure 2.2 Stoneworking techniques. (a) Hard hammer percussion. (b) Soft hammer percussion. (c) Pressure flaking. (d) Anvil technique. (e) Bipolar percussion. (f) Indirect percussion.



Distribution



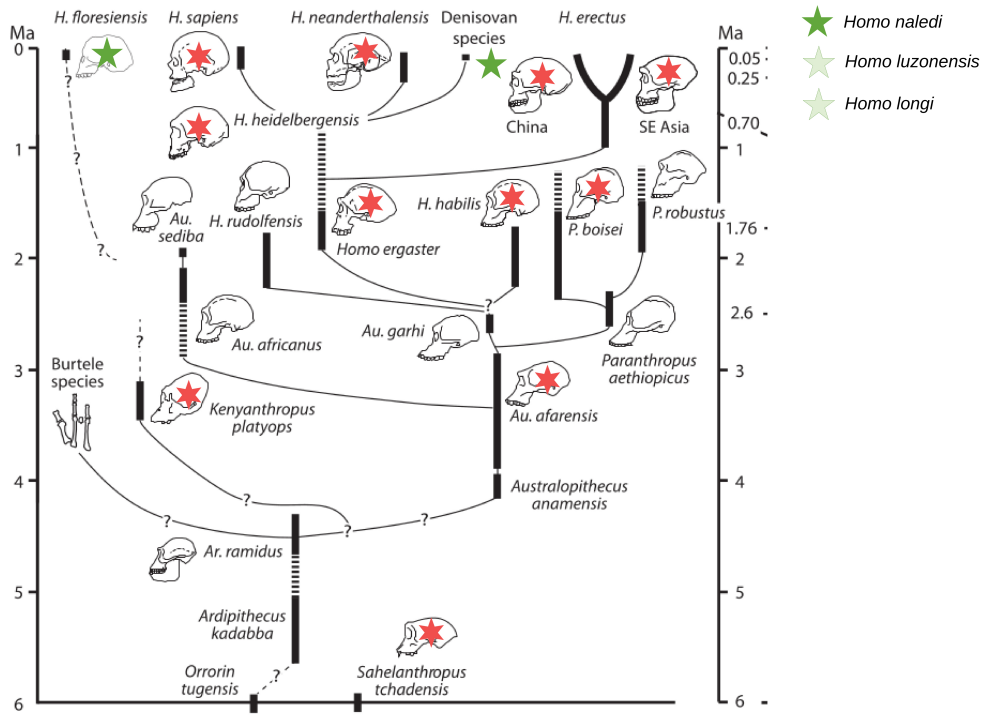
MIS
(Marine isotope stages):

MIS 3: 57 Kya
MIS 9: 337 Kya

Hu et al. (2019). Late Middle Pleistocene Levallois stone-tool technology in southwest China.

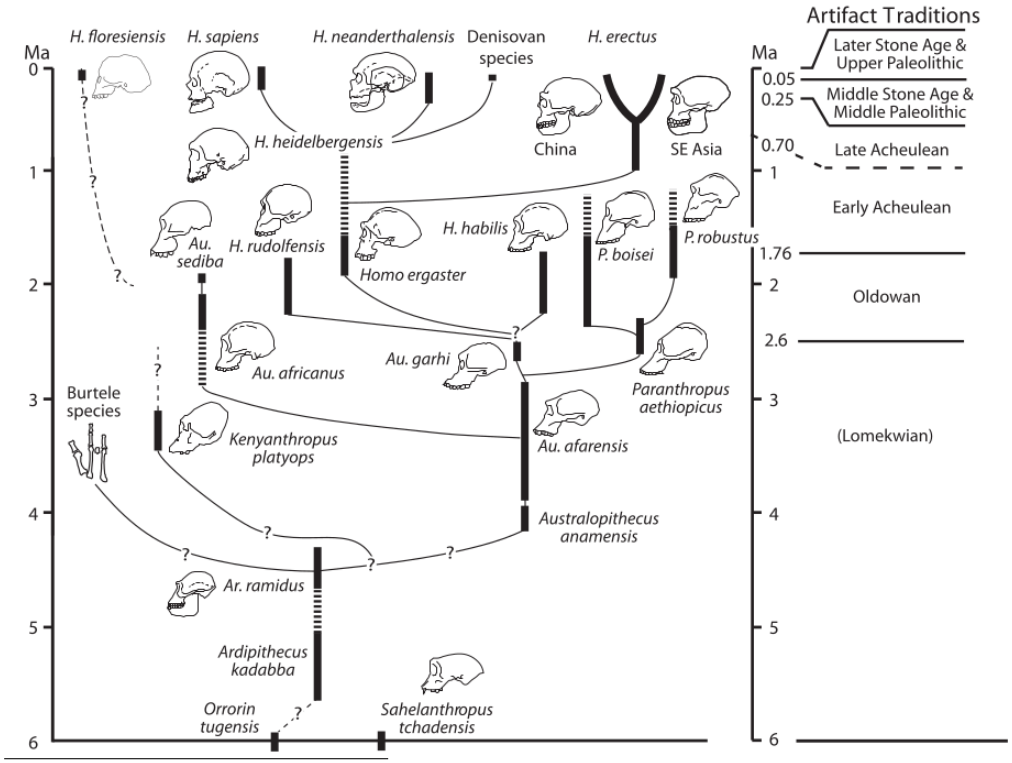
Exercise

Assume you find a stone tool assemblage clearly dominated by one of the following industries: *Oldowan*, *Acheulean*, *Levallois*. Based on the timeline of hominin species below, which species (singular or plural) could have produced this assemblage?



Solution

Oldowan: Homo habilis, Paranthropus, etc.
Acheulean: Homo habilis, Homo ergaster (erectus), etc.
Levallois: Homo neanderthalensis, Denisovans, etc.[1]



[1] I name here just the species which are typically associated with these industries.

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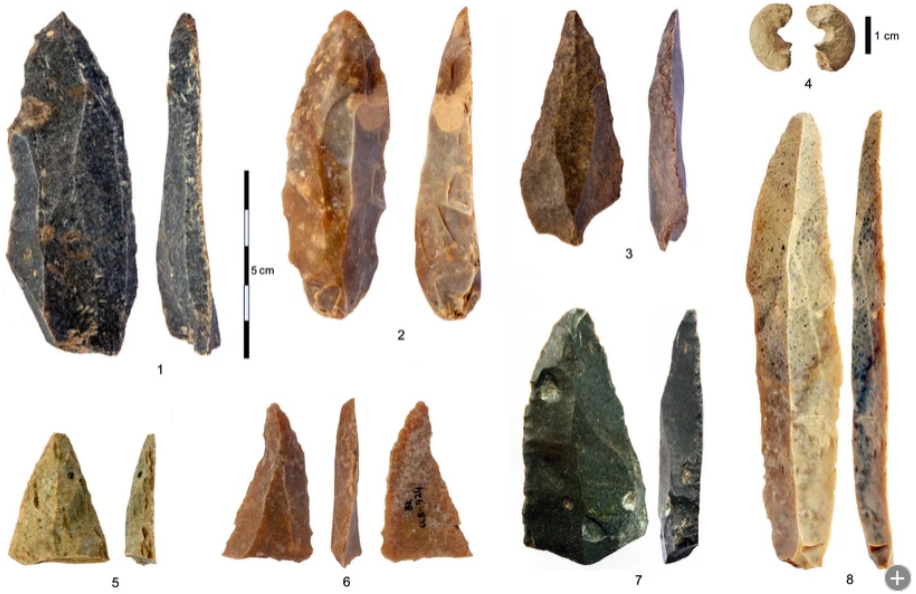
Section 6: Upper Paleolithic Technocomplex

Upper Paleolithic
(c. 45 - 15 Kya)

Upper Paleolithic assemblages of stone tools are dominated by **highly specialized** tools for various different purposes: prismatic blades of different sizes, spear tips, arrow tips, borers, etc.



Stone artifacts from the Initial Upper Paleolithic at Bacho Kiro Cave: **1-3, 5-7** Pointed blades and fragments from Layer I; **4** Sandstone bead with morphology similar to bone beads; **8** The longest complete blade.
© Tsenka Tsanova, License: CC-BY-SA 2.0

Hublin et al. (2020). Initial Upper Palaeolithic Homo sapiens from Bacho Kiro Cave, Bulgaria.

Upper Paleolithic
(c. 45 - 15 Kya)

In addition to diverse assemblages of stone tools, the same layers frequently contain tools made of **bone and wood**, as well as **symbolic artifacts** such as jewellery (beads, pendants) and figurines.

Hublin et al. (2020). Initial Upper Palaeolithic Homo sapiens from Bacho Kiro Cave, Bulgaria.

Fig. 3 | Bone tools and personal ornaments from Bacho Kiro Cave layers I and J (Niche 1 and Main sectors). a–j, Pendants made from perforated and grooved teeth (**a**, ungulate; **b–j**, cave bear). **k**, **l**, **o**, Awls. **m**, Anthropogenically modified piece. **n**, **p**, *Lissoirs*. **q**, Ivory bead. Further details are provided in Supplementary Table 15. Scale bars, 1 cm (**a–o**, **q**), 3 cm (**p**).

Distribution (Initial Upper Paleolithic)

Extended Data Fig. 2 | Geographical distributions. Geographical distribution of the main IUP sites of western and central Eurasia (black dots), directly dated early *H. sapiens* predating 37,000 cal. BP (empty black dots) and directly dated late Neanderthals associated with Châtelperronian assemblages (orange squares). Bacho Kiro Cave is represented by a red circle.

Hublin et al. (2020). Initial Upper Palaeolithic Homo sapiens from Bacho Kiro Cave, Bulgaria.

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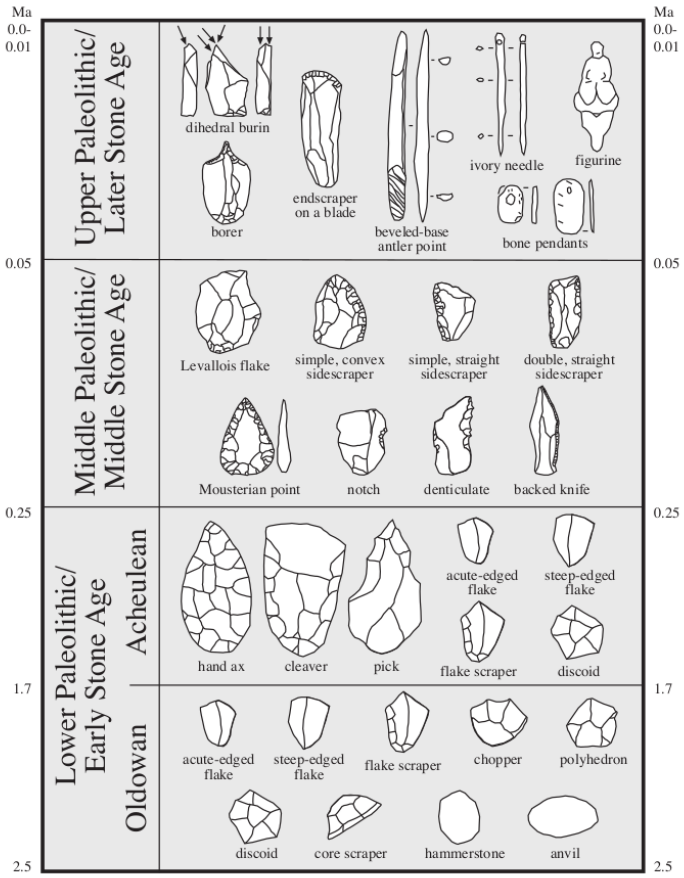
Section 7: Overview Technocomplexes

Overview



Klein (2009), p. 727

Notes:
– The terms *Lower, Middle and Upper Paleolithic* in Eurasia correspond (roughly) to *Early, Middle, and Late Stone Age* in Africa (often abreviated ESA, MSA, LSA).

– The Lomekwian industry is not included here. This would extend the Lower Paleolithic further back to c. 3.3 Mya.

Alternative Classification of Stone Tools

TABLE 2.1 *Clark Modes 1–6*

Mode	Defining features	Eurasian prehistoric period
1	Pebble-tools	Lower Paleolithic
2	Handaxes	Lower Paleolithic
3	Levallois prepared cores	Middle Paleolithic
4	Prismatic blades	Upper Paleolithic
5	Geometric microliths	Mesolithic/Epipaleolithic
6	Groundstone artifacts	Neolithic

References: Clark (1969a, 1970)

Shea (2020), p. 23.


photo by Abdullah Mohiuddin
CC BY-NC-SA Hajime Yamauchi
GGCCTGACACCTTCGCACC

Summary

Summary

- While other primates use stone tools (cracking nuts, sea shells, fishing for termites), hominins have started to **produce and use** stone tools for a specific purpose.
- **Lower Paleolithic** stone tool assemblages are dominated by choppers, handaxes and other large and medium sized tools which were produced by hammer and anvil and hard hammer techniques.
- **Middle Paleolithic** tool assemblages are dominated by blades and smaller tools produced often with a prepared core technology.
- **Upper Paleolithic** assemblages are extremely diverse, with highly specified tools, produced by a wide variety of techniques.


photo by Abdullah Mohiuddin
CC BY-NC-SA Hajime Yamauchi
GGCCTGACACCTTCGCACC

References

References

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Thank You.

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