Lithics: Stone tools

Brief overview over lithic tool types and how these are used to categorize different stone age periods. Given that Neanderthals and Denisovans and Homo heidelbergesis and Homo erectus all made stone tools…..we cannot know for sure which species made which stone tool….

Time slots

Holocene: 12k onward
Pleistocene: 2 mya tp 12kya
Pleiocene: 5.2 to ~2 mya
Miocene: 23 to 5.3 mya

Eon	Era	Period		Epoch Start Date (mya)	
Phanerozoic	Cenozoic	Quaternary		Holocene	0.01
				Pleistocene	1.64
		Tertiary	Neogene	Pliocene	5.2
				Miocene	23.3
			Paleogene	Oligocene	35.4
				Eocene	56.5
				Paleocene	65

Paleontologists classify time slots into : Eons, Eras, Periods and Epochs!

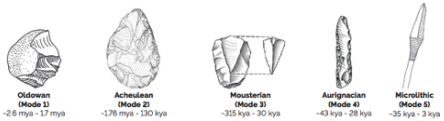
Technological periods:

Paleolithic: 3.2 (Lomekwi) or 2.4 (Gona) to 300 kya (includes non-himo sapiens other than neanderthals, possibly Australopithecus!)
Mesolithic: 300 kya to 12kya (mostly Homo sapiens)
Neolithic: 12 to 7 kya (only Homo sapiens)

Levallois Mousterian: 300 kya to 60 kya
Mousterian: 160 kya to 60 kya
  Chatelperronian: 44 to 36 kya
Aurignacian: 43 to 33 kya
Gravettian: 33 to 26
Solutrean: 22 to 17
Magdalenian: 17 to 12 kya

very strong focus on Europe! many newer finds outside Europe in Africa and Asia will require careful new categorization.

Lithics: Stone tools



Oldowan (Mode 1) Tools: A stone tool characterized by simple "choppers" for pounding, breaking, and bashing. ~2.6 mya - 1.7 mya possibly made by *Australopithecus*, rather than *Homo*.

Acheulean (Mode 2) Tools: A stone tool type characterized by oval or pear-shaped bi-faced "hand-axes" and are typically associated with *Homo erectus*. ~1.76 mya -130 kya.

Mousterian (Mode 3) Tools: A stone tool type characterized by a method of stone-knapping known as the **Levallois** Technique (prepared core technology) to form handaxes, scrapers, triangle points. It lasted roughly from 160 to 40 kya.

Aurignacian (Mode 4) Tools: A type of stone tools characterized by worked bone and antler points with grooves cut in the bottom, as well as fine stone blades and bladelets struck from prepared cores rather than using crude flakes. 43 -28 kya.

Microlithic (Mode 5) Tools: A stone tool type consisting of small blades or points, called microliths, that were typically used in composite tools, such as an arrow point fastened to a haft. ~35 kya - 3 kya

Practice question: How many principle modes of stone tools have been identified across human evolution?
Answer: Five.

Oldest hominid tools, way to get at marrow and brain?

(Oldowan) stone tools from Lake Turkana, Kenya, 3.3 My

Such stone tools would allow easy access to bone marrow and brain, two fat rich resources that remain uncontaminated by bacteria for extended time in an animal carcass.

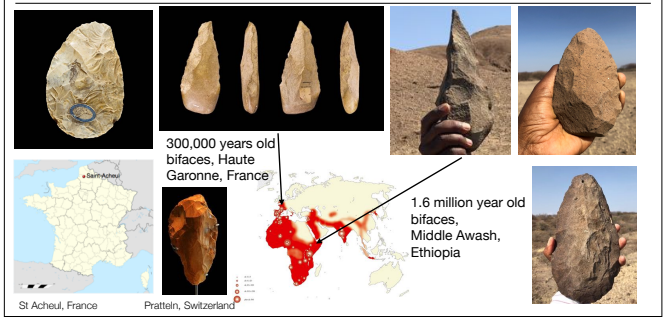
Practice question:
the oldest stone tools found correspond with the age of the genus *Homo*.
True/False?
False, stone tools that are 3 million years old prove that such tools were already made and used by the genus *Australopithecus.*

Lithics: Oldowan Tools

Oldowan, named after Oldupai Gorge

Named after Olduvai Gorge, which really should be called Oldupai Gorge, after the Maasai word for a local plant species: *Sansevieria ehrenbergii*, or Maasai Sisal.
Looking at a 2 million year-old hippopotamus jaw with archeologist Dr. Berhane Asfaw in Addis Ababa, Ethiopia. The jaw has a clear cut mark on it from an early *Homo erectus* defleshing the hippo jaw!

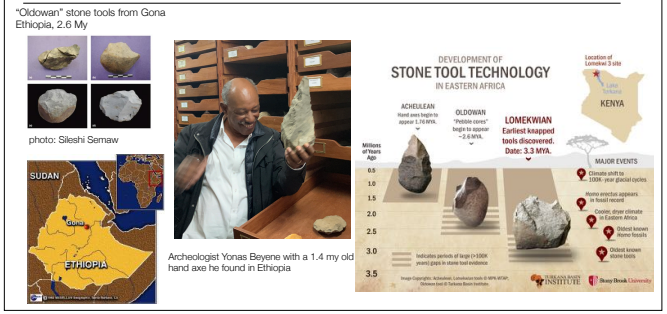
Lithics Acheulean hand axes



Named after a town in Northern France, but even more abundant across Africa, also found in Asia, where *Homo erectus* first arrived expanding from Africa.

Practice question:
Why is the name Acheulean hand axe somewhat unfortunate?
Because the oldest examples of these versatile tools appeared over a million years earlier in Africa.

Oldest hominin artifacts: stone tools



Named after Olduvai Gorge, an important fossil site in Tanzania.
A more recent discovery puts the oldest stone tools at over 3 million years ago, in Lomekwi, on the shores of Lake Turkana, Kenya.
Acheulean stone tools are named after a town in France, but these symmetrical hand axes are found all over Africa and Eurasia and date back to *Homo erectus* 1.7 million years ago.

Lithics: Mousterian Tools, Levallois-Mousterian (315-30 kya)

Making many blades from a carefully prepared core: requires complex planning and very careful execution: a technology that must have helped shape the mind of our ancestors.

Carefully prepared cores produce shard blades upon a single hammer stone blow:
think of it as a "Gillette box of blades".

Levallois Mesolithic is considered to start around 300 k years ago (corresponding to the age of *Homo sapiens*.

Lithics: Aurignacian tools

Aurignac shelter, France

Aurignacian: 43 to 33 kya

Tools made out of bones and teeth, including ivory, became rather common. These do not preserve as well over longer periods of time though and might already have existed much earlier, but without persisting into the archeological record.
This period is thought to reflect modern *Homo sapiens* technology.

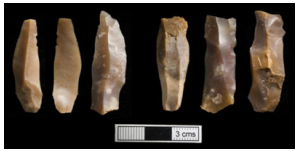
Lithics: Chatelperronien, 35–30 Kya??

Gravettian, La Gravette, Southwestern France, 33 kya - 22 ky last unified european culture..
blunt backed knives

(after Aurignacian)
Solutrean, Solutré in east central France, 22 to 17 kya

Around 40,000 years ago, modern humans made their way into Europe, sweeping through the continent and, eventually, driving to extinction our close relatives, the Neanderthals. Exactly how that process took place is still up for debate. Tangled up in that conversation are questions about the sophistication of Neanderthals, including whether they were capable of artistic expression, or made jewelry or complex stone tools.
Archaeologists agree that hand axes and scrapers were definitely part of the Neanderthal toolkit, and modern humans are credited with developing points made of bone and antler, as well as flint blades. But in between these two types of technology, chronologically, are the so-called **Châtelperronian** tools, characterized by sawtooth edges and knives with convex backs. Researchers are still unsure which hominin was responsible for them.

Lithics: Microlithics



microliths from Grotte des pigeons, Morocco 15 kya

Berhane Asfaw showing us micro blades

A group of UC San Diego graduate students looking at small stone blades (microlithic) at the National Museum of Ethiopia in 2016. Mostly made from obsidian and chert, but sometimes also from quartz.

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Oldowan (Mode 1) Tools: An archaeological industry of stone tools characterized as simple flakes struck off an unmodified core, most commonly as "choppers" for pounding, breaking, and bashing. Oldowan tools are the earliest widespread stone tool industry in prehistory and were used during the Lower Paleolithic, from 2.6 - 1.7 million years ago, by ancient hominids across much of Africa, South Asia, the Middle East and Europe. It is most associated with *Australopithecus garhi*, *H. habilis*, *H. ergaster*, and early *Homo erectus*.

Acheulean (Mode 2) Tools: An archaeological industry of stone tools characterized by distinctive oval and pear-shaped bifaced "hand-axes." Acheulean tools were produced during the Lower Palaeolithic era across Africa and much of West Asia, South Asia, and Europe.

Mousterian (Mode 3): An archaeological industry of stone tools characterized by a method of stone-knapping known as the Levallois Technique (prepared core technology) to form handaxes, scrapers, triangle points, and denticulates, and is most associated with Neanderthals. It lasted roughly from 160,000 BP to 40,000 BP.

Aurignacian (Mode 4): An archaeological industry of stone tools characterized by worked bone and antler points with grooves cut in the bottom, as well as fine stone blades and bladelets struck from prepared cores rather than using crude flakes. It is associated with the earliest modern humans in Europe and their migration from the Near East. 43 to 33 kya

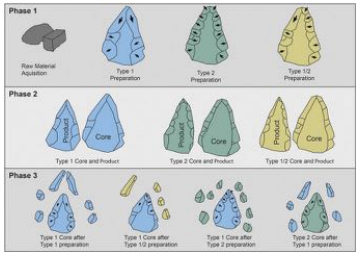
Microlithic (Mode 5): A stone tool type consisting of small blades or points, called microliths, that were typically used in composite tools, such as an arrow point fastened to a haft. ~35 kya - 3 kya

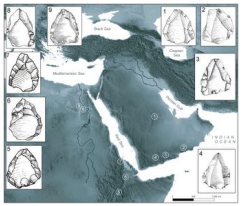
Mousterian tool made by the Levallois flaking technique, from Syria.

Practice question: briefly describe the five types of stone tools made by human ancestors:

1. rock with few ridges for smashing and cracking things.
2. bifaces, hand axes, symmetrical
3. cores giving rise to multiple blades
4. smaller flakes combined with wood and bone tools
5. tiny blades hafted into projectile weapons

Lithics: portable "gillette blade boxes"?



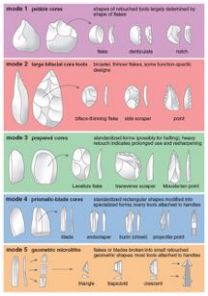


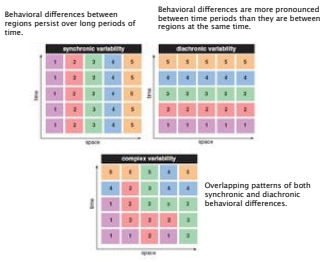
Nubian Complex

Crassard, R. & Hieronymus Hilbert, Y. The Nubian Complex of Dhofar, Oman: an African middle stone age industry in Southern Arabia.***PLoS One.*** 2011

Practice question: What is the great advantage of Levallois type stone tools"
"Levallois" Cores, allow to generate new sharp blades with a single strike.

Lithics





Shea, John. 2011 ***American Scientist***

Above are Grahame Clark's five technological modes (left) and patterns of behavioral variability (right). Clark classified stone-tool industries in terms of the different ways flakes were detached from cores and modified into retouched tools. This framework can help archaeologists capture variability in ecological adaptations among people. Synchronic variability is when behavioral differences between regions persist over long periods of time. Diachronic variability is when behavioral differences are more pronounced between time periods than they are between regions at the same time. And complex variability involves overlapping patterns of both synchronic and diachronic behavioral differences.

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archaeological sites	date (years ago)	core technology				
		mode 1	mode 2	mode 3	mode 4	mode 5
Lowasera, Kenya	~7000	●	●	●		●
Lothagam, Kenya	8,000–7000	●	●	●	○	●
Lukenya Hill 2 (GvJm 22, GvJm 16), Kenya	13,000–17,000	●	●	●	●	●
Porc Epic Cave, Ethiopia	61,000–78,000	●		●	○	●
Middle Awash Valley, Aduma and Bouri MSA 1-3, Ethiopia	80,000–160,000	●	●	●	○	
Abdur Reef Limestone Complex, Eritrea	125,000	○	●	●		
Middle Awash Valley, Herto Member, Bouri Formation, Ethiopia	160,000	●	●	●	○	
Lower Omo Valley, Kibish Formation Members 1-3, Ethiopia	>104,000–195,000	●	●	●	○	
Gademotta/Kulkuletti, Ethiopia	175,000–276,000	●	●	●	●	
West Baringo, Kapthurin Formation, Kenya	234,000–284,000	●	●	●	●	

Shea, John. 2011 ***American Scientist***

It is enlightening to use Grahame Clark's lithic technology modes to describe archaeological sites in eastern Africa that date back as far as 250,000 years. Solid circles represent sites with evidence based on large numbers of well-dated artifacts. Hollow circles indicate evidence based on a small number of artifacts or on artifacts that were not recovered by systematic excavation. It is important to note that four of five modes were present from the earliest sites onwards. Only geometric microlithic technology appears solely in recent contexts.

Lithics: stone age

Stone Age: The prehistoric period during which stone was used to make tools and weapons and is synonymous with the paleolithic. ~3.4 mya - 10 kya. In African archaeology, stone age chronology is divided into Early Stone Age (ESA): ~2.6 mya to ~300 kya; Middle Stone Age (MSA): ~300 kya to ~50 kya; and Later Stone Age (LSA): ~ 50 kya to ~39 kya.

Early Stone Age ~2.6 mya to ~300 kya
ESA is characterized by the development of the first African stone tools, such as Oldowan technology used by Australopithecines, and the more advanced Acheulean technology, utilized by Homo erectus.

Middle Stone Age ~300 kya to ~50 kya
MSA is characterized by a transition from Acheulean to Levallois technology and the earliest known modern human behavior.

Later Stone Age ~50 kya to ~39 kya.
LSA is characterized by microlithic industries and punchstruck blades and fully modern human behavior.

Neolithic Age -12k to 7kya when metallurgy started with copper age

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Practice question: What are the three major periods of stone age called?
Early, Middle, Later Stone age.