Dossier: The Palaeolithic

Secondary education

IPHES
Institut Català de Paleoecologia Humana i Evolució Social

Evoluciona
un projecte de l'IPHES

Index

Evoluciona
un projecte de l'IPHES

Introduction to the Paleolithic

What is prehistory?

Prehistory is the study of time **before** the invention of **written language.**

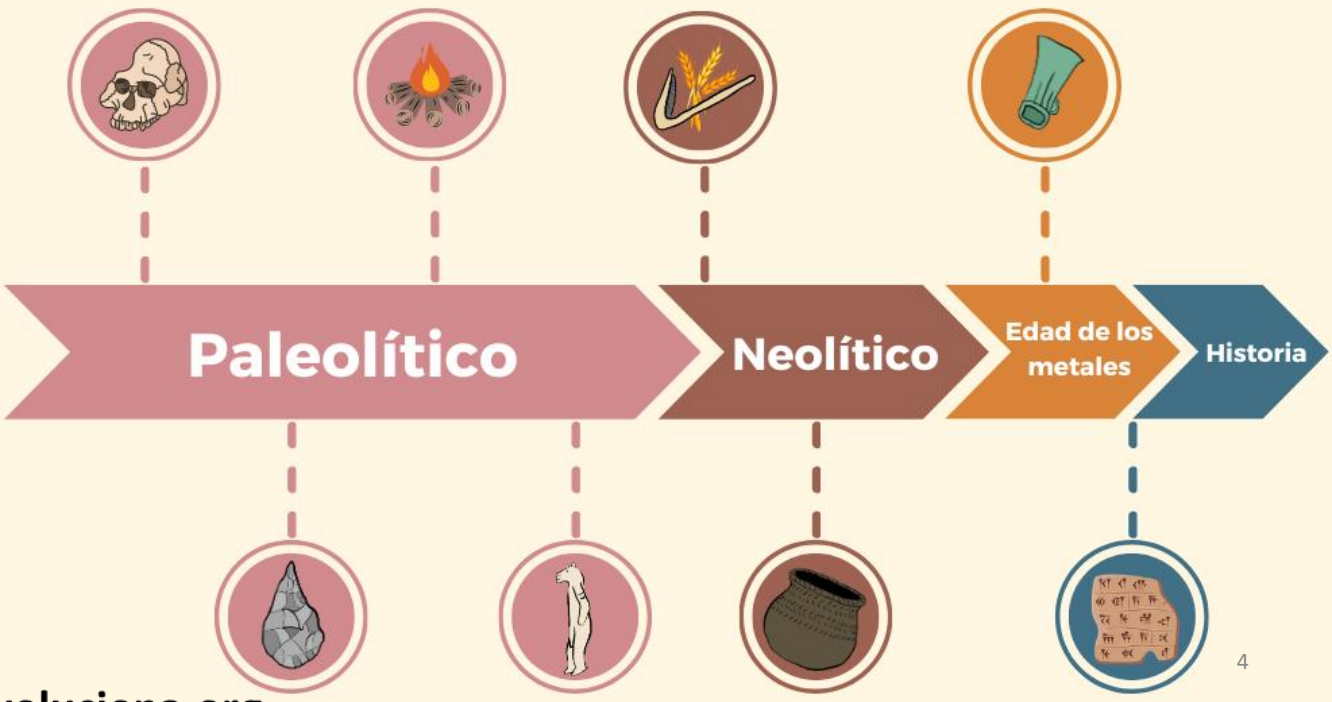
Written language does not appear at the same time in all regions of the world. For this reason, the end of prehistory **varies according to the different areas** of the planet.

In the same way, the beginning of prehistory depends on whether it is looked at from the perspective of paleontology or archaeology.

Prehistory from the field of **paleontology** covers a much broader time; starting from the **origin of life evolution** to the present.

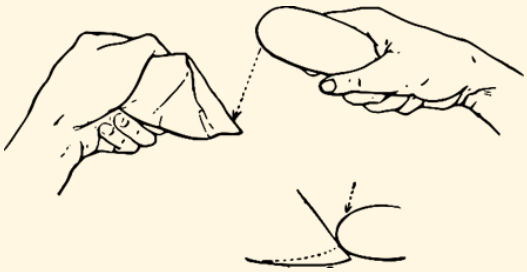
Prehistory from the field of **archaeology**, on the other hand, began **3.3 million years ago**, when the most ancient tools were made by the ancestors of humanity.

Prehistory, from the point of view of archaeology, is divided into **three stages**: **the Paleolithic, the Neolithic and the Metal Age.**



The Paleolithic

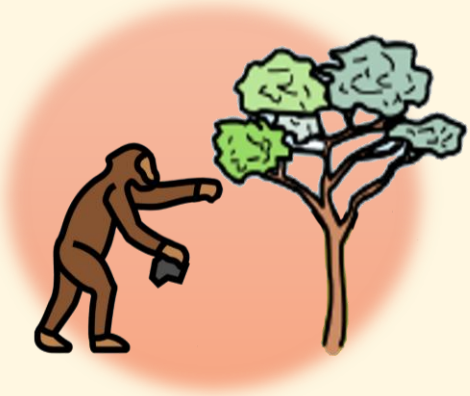
The **Paleolithic** dates back to the **origins of humanity**. The Paleolithic name refers to "ancient (lithic) stone" since most of the tools we find are made with the **carving** technique. Carving consists of skilfully and predictably striking stone, to extract **sharp flakes*** and be able to use them as **tools**, or to shape the entire block to form a **large tool**. We also find tools made of **wood and bone**, but they are **underrepresented** in archaeological records, as they are not easily preserved.



During the Paleolithic, human groups were **nomadic,** they did not have a permanent place to live, but often changed campsites. Mainly because they exploited the resources from different places. During this period, humans got their food from **hunting or gathering wild vegetables and fruits.**

The Paleolithic is the **longest prehistorical period**, it spans from **3.3 million years ago** to the beginning of the Neolithic, **10,000 years ago**.

For this reason, the Paleolithic is divided into **three stages: the Lower Paleolithic, the Middle Paleolithic and the Upper Paleolithic.**



Lower Paleolithic

From 3.3 million years ago to 300,000 years old

Middle Paleolithic

From 300,000 years to 40,000 years

Upper Paleolithic

From 40,000 years to 10,000 years

The Lower Paleolithic

Archaic hominins. Image credit: Ninara / CC BY 2.0.

The environment: climate and fauna

About two million years ago the climate of the African continent became **drier and colder**, as a result of the transformation of the landscape, with the appearance of new plant species typical of **savannah** environments.

2.6 years ago, new species of animals appeared in Europe, such as a new elephant, **Mammuthus,** of African origin, a new **bovid,** of Asian origin (Leptobos etruscus) and the **horse,** which came from America, as well as a type of deer (Eucladoceros) and **fallow deer** (Dama) that arrived from Asia. The **wolf**, of an American origin, would also disperse throughout Europe from the **cold period of 2.1 mya.** From 1.2 mya onwards, Europe would have more diversity of animal species, especially from Asia and Africa.

The vegetation was similar to today's, with species of trees and plants of the Mediterranean type, **adapted to a hotter and more humid climate than today's.**

The first humans

It was in this context of climate change, around two million years ago, that the first representative of our genus appeared, evolving from an African population of Australopithecus.

To be considered as belonging to our gender, a human has to have these essential attributes: be **bipedal** and have a **brain capacity** that allows them to perform **complex tasks**, such as making tools. In addition, it must have smaller teeth and jaw than previous hominins*.

Homo habilis:

The **first recognised human** within our genus is the Homo habilis.

The Homo habilis lived in **Southern and Eastern Africa**, some remains appearing in places from Kenya (Turkana), Ethiopia and South Africa (Sterkfontein) over the course of a million years, between **2.4 and 1.4 mya**. His name refers to his ability to **make lithic tools.**

The size and general appearance of the Homo habilis was very **similar** to that of **Australopithecines*** although its brain size was slightly larger, **700 cubic centimeters.**

We have to take into account that the first representative of our genus was a human of still very **primitive** appearance with basically a **vegetable diet,** but complemented with meat that he obtained both from **scavenging** large animals**, and occasionally, hunting** small animals. To extract the meat, he sometimes used very simple lithic tools of **Mode 1 or Oldowan Way.**

Homo erectus:

1.8 mya ago, a new species of our genus appeared, called Homo erectus. The Homo erectus has a **larger brain size** (between 850cc and 1000cc) and **body proportions,** between arms and legs and the shape of the trunk, **more similar to ours** than to chimpanzees.

This hominid begins to make more complex tools in **mode 2 or Acheulean**. It is the first hominid to succeed in leaving Africa and **spread to other territories**, especially Asia. Also in Europe, although occupation in this continent is more sporadic. African fossils are generally attributed to the genus Homo ergaster while Asian fossils are considered Homo erectus, to simplify the classification.

There is evidence that this hominid was **hunter-gatherer** and competed for food with large predators such as lions and hyenas.

Linked to Homo erectus, we begin to see the first evidence of the **use of fire**. The oldest evidence is found in Africa 1.5 mya in Koobi Fora (Kenya), we also find evidence of the use of fire from 1 mya in South Africa, Israel, China and in the Iberian Peninsula (Cueva Negra, Murcia). But this evidence is **sporadic,** the use of fire would not become widespread until the Middle Paleolithic.

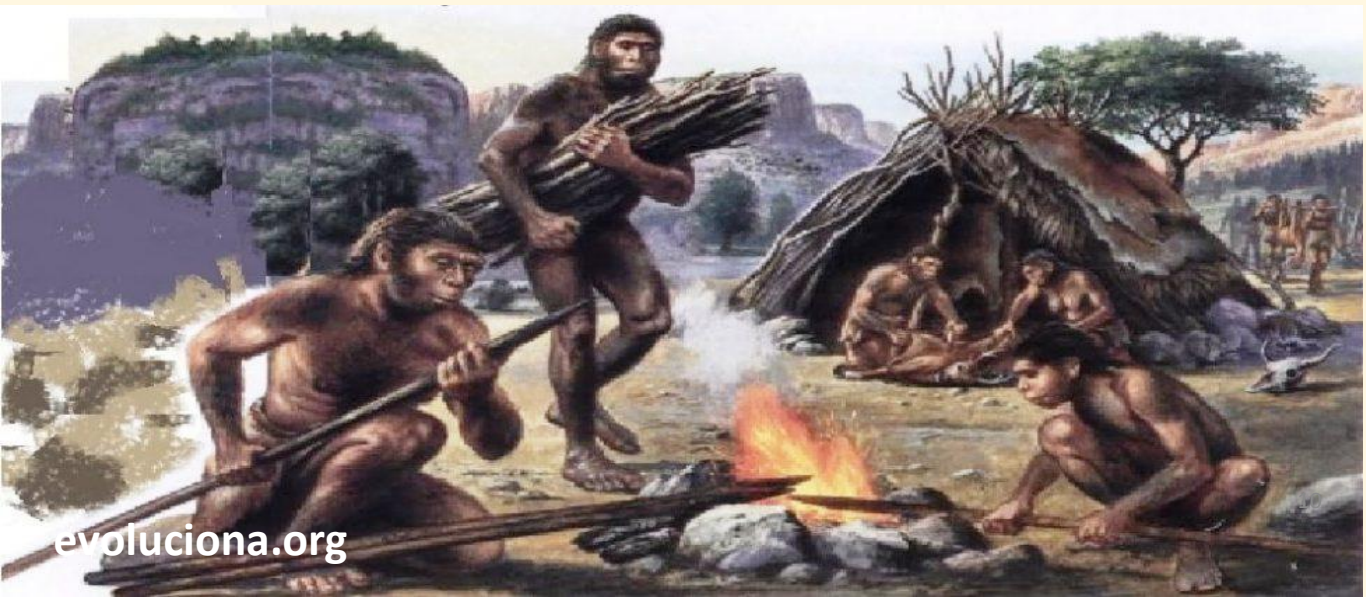


Ilustración de Christian Jegou. Science Photo Library.

The first humans in Europe

1.8 mya, we already found human presence in the **Caucasus,** evidenced by the remains recovered **at the site* of Dmanisi** (Republic of Georgia). It is believed that from this point on, hominids moved through both Asia and Europe. Throughout the European continent, there is evidence of very ancient settlements. The oldest human remains have been found in two sites in the **Iberian Peninsula**: ***Barranco León*** (Orce, Granada) **1.4 mya**, and ***Sima del Elefante*** (Sierra de Atapuerca, Burgos) **1.22 mya.**

Due to the fragmented and sparse nature of the oldest remains, it is difficult to know which specific species was the first to arrive in Europe. What there is no doubt about is that they were human groups. However, we do not have to think that the first settlement in Europe was stable and continuous, but rather that it was characterised by a series of **migratory waves of small groups** with more or less success and with different hominids as protagonists. In this context, the next evidence of a human settlement in Western Europe is found at the *Gran Dolina site* (Sierra de Atapuerca, Burgos) where fossils belonging to the species Homo antecessor, which lived between **800,000 and 500,000 years ago**, have been recovered.

Fotografías del Museo Nacional de Georgia

Homo antecessor

The first remains of the Homo antecessor were recovered at the *Gran Dolina site* (Sierra de Atapuerca, Burgos). The remains correspond to 8 individuals, the majority are children and adolescents.

The most defining characteristic of the Homo antecessor is the union of primitive and modern attributes. In particular, the shape of the teeth is very primitive, resembling the Homo erectus. However, his face is very similar to ours.

Their height would have been between 160 and 180 cm, with a highly developed musculature giving them a robust appearance. The individuals would be used to walking on uneven terrain, their diet would be varied since in the Sierra environment, they had access to hunting and scavenging different species of mammals and to the collection of different plant foods. Of course, we know that this diet would be very hard due to the wear and tear that their teeth show, despite being young individuals.

At the site of *La Gran Dolina*, evidence has been found that these humans practiced cannibalism. Archaeologists' general opinion is that it was territorial cannibalism, to protect the territory against other human groups.

Ilustración de Tom Bjorklund @tombjorklundart

Homo heidelbergensis:

The Homo heidelbergensis is believed to have **African origins** and provenance. They lived in the north of the African continent about **700,000 years ago**. They spread from Africa to Europe and perhaps also Asia. They lived until about **200,000 years ago.**

Physically, they have a larger skull than earlier hominids (between 1100cc and 1200cc), they have very marked arches over their eyes, and their face is flatter than more primitive species. They have a **robust build** with a broad and short trunk.

The Homo heidelbergensis would have been very **well adapted to the low temperatures** in Europe at that time, **controlling fire** and developing a set of tools, both lithic and wooden, that allowed them to **hunt large animals** on a regular basis.

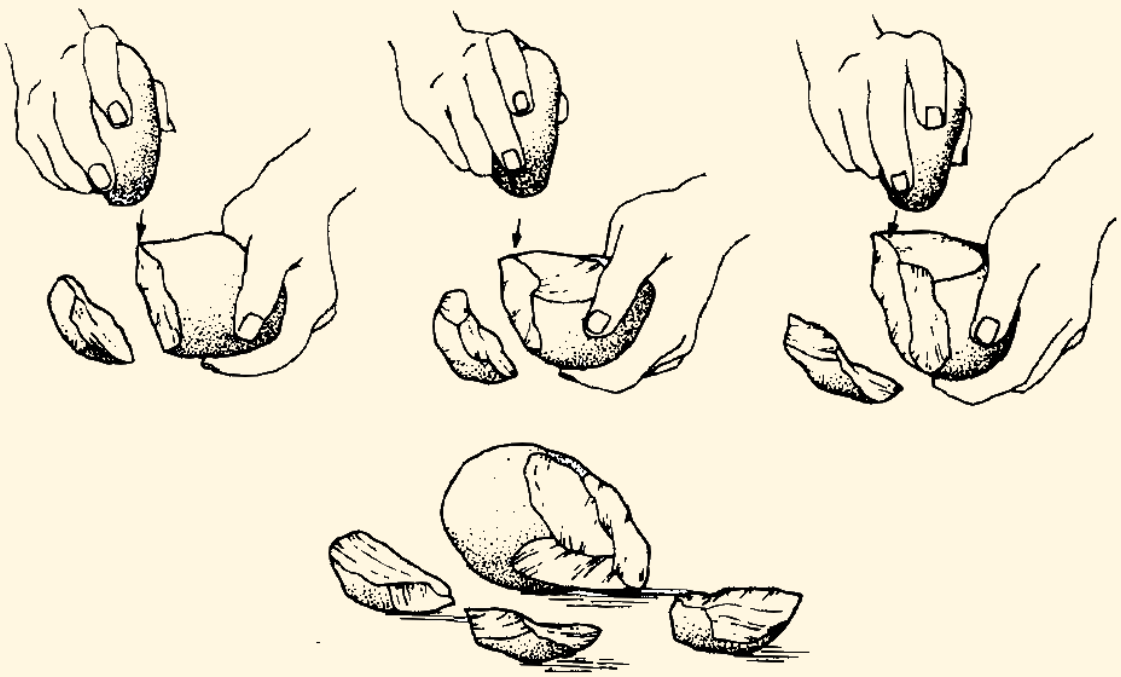
Ilustración de Gabriel Ugueto

Lithic Industry: Oldowan (Mode 1)

The most accepted scientific evidence is that the first stone tools are **2,600,000** years old, and have been located at two sites in Ethiopia (Bokol Dora I and Kada Gona), in Northeastern Africa. There is a site in Kenya (Lomekwi 3), where tools are proposed to be from 3,300,000 years ago, but not all the scientific community accepts this date.

Oldowan or mode 1 is a basic stone **carving technique,** which consists of striking stone or a boulder to **extract flakes*** (cutting parts of the stone), to use them as knives. In addition, some of these flakes were retouched (struck at the edge) to form a different, more resistant cut.

During this period, most tools were made where needed, with the stones that were on site, and then abandoned on the spot.



Lithic Industry: Acheulean (Mode 2)

The Acheulean is a new way of making stone tools that consists of **cutting a block of rock on both sides**, symmetrically. This technique produces tools of standardised shapes with a **larger cutting surface**. These tools are more sophisticated and complex than those of Mode 1, demonstrating an increase in the intelligence of their producers.

The typical tools of the Acheulean are **the hand axe or biface, the trihedral pickaxe and the splitter.** They are multi-purpose tools. They used them to cut meat, wood, plants, dig, etc. Some researchers believe they could also have been used as a core* to extract smaller flakes.

The first sites with tools of this type are found in Africa, and date back to about **1,700,000 years ago**, while in Europe they seem to arrive 900,000 years ago, as evidenced at the Catalan site of the *Barranco de la Boella,* although we would have to wait 500,000 years for them to become more abundant.

Imatges de @IPHES-CERCA

Evoluciona
un projecte de l'IPHES

The Middle Paleolithic

Ilustración José Emilio Toro Pareja. www.torografic.com

The environment: climate and fauna

At the beginning of the Middle Paleolithic, we find a period where **forests expanded** a lot: oak, holly, hazelnut and boxwood occupied humid Europe; holm oak, oak, aleppo and buckthorn grew in Mediterranean Europe.

The cold cycles would be increasingly extreme,. This **replaced the forests of meadows and tundra** with vegetation of grass and shrubs.

As for the fauna, **animals** thriving would be those increasingly **acclimatised to the cold:** aurochs, bison, deer, horses, woolly rhinoceroses and mammoths would prevail in this new cold Europe, and they would also be the Neanderthals' favourite prey.

We also find **large predators:** hyenas, lions and wolves, against whom the Neanderthals competed for prey.

Neanderthals

Physically, the Homo neanderthalensis was **slightly shorter** the than Homo heidelbergensis, although they had an equally **robust build.**

One of the most defining characteristics of Neanderthals is their **large, elongated skull**, with a sloping forehead, somewhat larger than ours (between 1600cc and 1500cc). His face featured **facial prognathism** (face tilted forward) with a **large, robust jaw,** no chin, and **large eyes and nose**.

Neanderthals populated Europe between **300,000 and 30,000 years ago.** Throughout their existence, they adapted to various climatic changes. They spread throughout Asia, reaching Iraq, Uzbekistan and Southern Siberia.

Neanderthals **controlled and used fire on** a regular basis, for cooking, protection from predators, lighting caves and warming themselves up in cold periods. They sometimes lit fire using flint and pyrite, an efficient method that was used up to the Bronze Age.

Ilustración Tom Bjorklund @tombjorklundart

Neanderthals had their **own culture**, similar to that of the Homo sapiens of the time. They used shells, prey bird feathers and animal bones to make **ornaments**, which occasionally dyed with pigments such as ochre. Recently, some **cave art** paintings have been discovered in the caves of *Maltravieso*, *Ardales* and *La Passiega,* which were produced more than 60,000 years ago, when only Neanderthals inhabited Europe.

Neanderthals **cared for the sick** and the elderly. In the Sidrón cave, the use of medicinal plants has been discovered, to cure gastrointestinal diseases, for example.

During the Middle Palaeolithic, we find the first **evidence of burials** with an intentional positioning which were undoubtedly made by Neanderthals, at least 50,000 years ago.

Because of Neanderthals' social, technological and cultural complexity, as well as because of the anatomy of their neck and brain organisation, we know that Neanderthals had the **ability to speak.**

The Denosives

This new species is only known from **genetic evidence**. Individuals of this species are known as "**Denisovans"** in reference to the Denisova site where the first remains were found.

Genetic data show that **Denisovans and Neanderthals** shared a **common ancestor** about **650,000 years ago** and with **modern humans** about **800,000 years ago.**

Regarding the physical appearance of these individuals, based on an **epigenetic analysis*,** it was determined that their appearance was similar to that of Neanderthals with their characteristic robustness, but with unique attributes; such as the **wider skull and jaw and larger teeth**. In addition, the fact that the archaeological sites, where remains associated with these individuals, are located in the Altai and areas of Tibet indicates that they had already **adapted to living at high altitudes** (more than 3,000 meters) about 100,000 years ago.

Denisovans spread throughout **Asia**, reaching as far as **New Guinea** where they are thought to have survived until about **30,000 years ago.** In fact, present-day humans in Papua New Guinea, Australia, and Melanesia have between 4% and 6% of Denisovan genetic material.

Ilustración Tom Bjorklund @tombjorklundart

Lithic Industry: Mousterian (Mode 3)

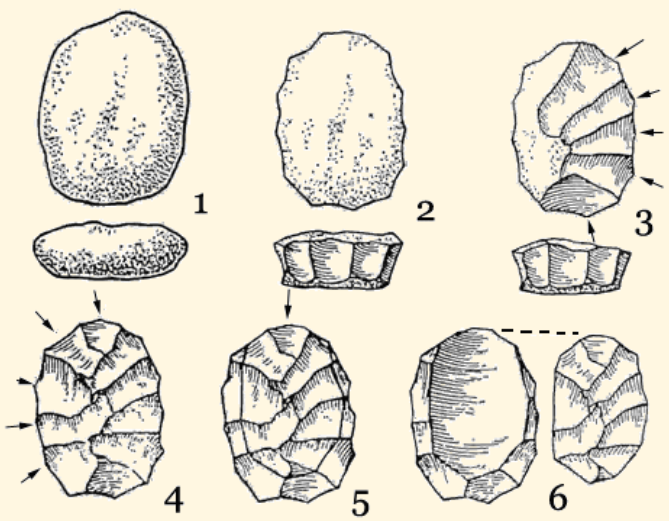
Around **300,000 years ago**, a new way of making tools appeared, **mode 3** (also called **Mousterian),** usually linked to Neanderthals.

The Mousterian is characterised by a very **controlled form of flake extraction,** where they tried to produce chips with a specific shape (predetermined), by means of a carving system that is used, called the "**Levallois method."**

They mainly made circular flakes to be used as knives, and also Levallois tips, an artifact that could be used either as a knife or as a tip for a spear.

They also continued to use **bifaces**, but we found them **smaller and more compact.** Neanderthals were well aware of the importance of saving raw materials. They used materials in the most efficient way, until the end of their useful life. Hand axes have been found to be reused down to the size of a thumb.

In sites such as the **Abric Romaní** (Capellades), evidence of the use of **wooden tools** has been found. They also used animal bones and other resources. Neanderthals were very resourceful.



Evoluciona
un projecte de l'IPHES

The Upper Paleolithic

Ilustración Tom Bjorklund @tombjorklundart

The environment: climate and fauna

The climatic dynamics of the late Paleolithic would lead **to gradual cooling**, in which warm periods would become shorter and shorter and the **glacial maximum** would be reached around **18,000 years ago.**

The Upper Paleolithic is, therefore, a **very cold period**, in which the vegetation would be reduced in **forest areas**, and with a considerable dominance of plants adapted to cold and dryness, mainly **meadows**. Consequently, **animals adapted to the cold** would live, such as the famous mammoths, woolly rhinoceroses, horses, aurochs and large predators such as cave lions, hyenas and wolves.

11,000 years ago, the **interglacial period,** in which we find ourselves now, began. A **warm period**, where most **species of the glacial age** could not adapt. Mammoths, woolly rhinoceroses, saber-toothed rhinoceroses, hyenas and lions **disappear** in Europe.

It is possible that this climate change was one of the reasons for the appearance of **the first agricultural and livestock societies** in the Near East. These societies arrived in Europe **8,000 years ago** and with them, the Neolithic began.

Ilustración Tom Bjorklund @tombjorklundart

Modern humans

The Upper Paleolithic begins about **40,000 years ago**. The change of period would start with the arrival in Europe of a new species of humans: the **Homo sapiens**, us. The origin of our species is found in **Africa** about **300,000 years ago,** at a time of climate change.

The most accepted theory of the origin of our species is the so-called "**Out of Africa**" model, which postulates that the **evolution** of the Homo sapiens occurred in Africa from **several populations**, which mixed and exchanged information. Later, these populations **migrated** to other parts of the world.

Anatomically, the Homo sapiens has a skull with a **high forehead and a globe shape,** which is marked by highly developed frontal and parietal lobes. With a **brain capacity of 1350cc**. The bones above the eyes are poorly marked, the jaw and teeth are smaller, and the **chin** appears. As for the rest of the body, their **longer and thinner limbs**, as compared with previous species, and their **more slender** body stand out.

Ilustración Tom Bjorklund @tombjorklundart

Lithic Industry: Mode 4

The Homo sapiens would bring to Europe a new way of making tools**: laminar technology**. It consists of extracting **elongated flakes with straight cuts**, which are very close to the concept of the current knife.

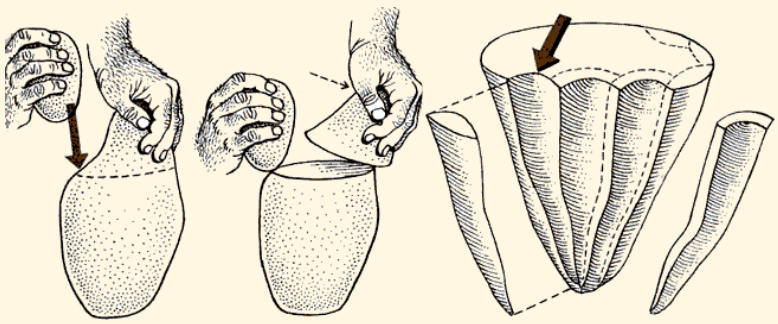
New item types and new tools also appear, adapting to a **new strategy for hunting** and gathering food. Due to **climate cooling**, many of **Europe's forests are disappearing,** as well as animal and plant species. Humans would have to adapt to these new conditions.

Some of the most important new tools are:

The "Atl-Atl" or propellant. To hunt the animals, which are now found in large meadows, the propeller is invented; an instrument that **propels their spears over long distances.**

The needle. With weather cooling, it is necessary to wear appropriate clothing to keep warm. The invention of the needle is crucial for the survival of human beings.

The harpoon. Neanderthals had already begun to hunt and eat sea animals such as dolphins, turtles, seals, etc. But with climate change and the extinction of many animals, **an alternative weapon for the sea** would be more important than ever. The harpoon is made from **bone**, and it has **spikes** that ensure that **the most slippery fish do not escape.**



Prehistoric art

During the Upper Paleolithic, we will find more and more paintings and engravings in caves (**cave art**), but also **portable art** (paintings, engravings, sculptures and ornaments made in transportable pieces). We also find **musical instruments**, such as flutes and buzzers.

To create their art, they would make use of all kinds of natural resources. **Natural pigments** such as ochre, charcoal, hematite, etc. They used **tools** such as flint, brushes made with animal hair, feathers, or their own fingers. And they would use **all kinds of support**: the cave walls, stone tiles, animal bones, wood, shells, etc.

In the Upper Paleolithic we find a greater abundance of **individual and collective burials** (more than one individual), which are almost always accompanied by a **trousseau*,** sometimes with a considerable accumulations of offerings. In some cases, they are truly spectacular, such as the well-known Sunghir burial (Russia), dated between 31,000 and 29,000 years ago, where we find two children with more than 10,000 ivory beads, 20 bracelets, 300 pierced fox teeth and 16 impressive ivory spears.

The Upper Paleolithic is divided into different periods: **Aurignacian, Gravettian, Solutrean and Magdalenian,** according to **changes** in the form and mode of **tools** and **art** manufacture. The gradual increase in the importance of artistic expressions culminated in the Solutrean and Magdalenian periods, with some spectacular examples of Paleolithic art, such as Lascaux or Altamira.

Ilustració de Libor Balák

Evoluciona
un projecte de l'IPHES

Scientific disciplines

Fotografia de @IPHES-CERCA

Some important scientific disciplines that study prehistory.

Experimental archaeology:

It is the part of archaeology in which experiments are carried out to **recreate prehistoric techniques and activitie**s, in order to better understand what we find in archaeological sites. Within this discipline, experiments of many types can be carried out: experimental technology, experimental traceology, geology, etc. Each experiment is designed to **delve into an initial problem**, and therefore are usually intended to shed light on a small aspect of a certain issue.

Traceology:

It is the study of **the cuts in the tools** on a **microscopic scale**, comparing them with experimental tools (manufactured today, with the same rocks and tools as in the site being studied). The goal is to **identify the type of material they cut**, as well as the time they were used.

Zooarchaeology:

It is a discipline that studies **the skeletal remains of animals** found in archaeological contexts. Therefore, they are normally animals that are related to the activities carried out by humans (usually for consumption), although the use of materials of animals (that could be recovered) made by these groups is also studied. Animal fossils can also be used to understand the landscape, as well as the competition for resources, where human groups lived.

Micropaleontology:

It is the discipline of paleontology that studies **the remains of small animals**, which are of great importance at an evolutionary and climatic level, since these small beings (mice, shrews, amphibians, reptiles, bats, etc.) **evolve very quickly**. From the field of archaeology, micropaleontology allows us to know the approximate **chronology**, the environment that surrounded the site and the existing **climate,** among other things.

Paleobotany:

It is a discipline that studies the **plants** that there existed, from their remains (seeds, pollens, microscopic remains or phytoliths, charcoals, etc.). For prehistoric archaeology, palaeobotanical studies depend on the **conservation** of these tiny plant remains, which does not occur often, especially in the oldest sites of the Lower Paleolithic. The information it provides is of great value, and complements micropaleontology studies in the **reconstruction of the environment.**

Paleoanthropology:

It is the discipline that studies **the species of humans** that have been discovered by archaeologists. Other disciplines are combined with this study; such as physical anthropology, the study of anatomical changes, ethnography, a discipline that compares populations for the study of cultural changes and even primatology (discipline that studies modern primates) used for comparison in the study of the most primitive hominid populations.

Taphonomy:

It is concerned with studying the **processes of formation of a deposit.** To do this, it uses other disciplines such as ecology, geochemistry or sedimentology. It is important to understand the **state of conservation,** the **dispersion** of fossils and the tools found in a site. It is observed whether water, animals or humans themselves have subsequently altered the dispersion of elements such as bones, tools, etc.

Genetics:

The study of fossil DNA allows us to study the **relationship** between human groups, we can observe lineages and kinship relationships between prehistoric populations. It also allows us to reconstruct some **physical characteristics** that are found in DNA such as skin color, eye color, sex of individuals, etc. Thanks to DNA, we know that white skin color did not appear in modern humans until the arrival of Neolithic groups from the Near East. Unfortunately, **DNA is not well preserved** and we have not yet been able to study fossil DNA from groups from the Lower Paleolithic.

Restoration:

It is a discipline that is used in archaeology to **restore objects and fossils** in order to **study and preserve them**. Most archaeological discoveries are found in very small pieces or in a very delicate state, restoration techniques allow the archaeological materials to be consolidated and, if possible, reconstructed.

Glossary

Some relevant words related to the syllabus:

Trousseau:

Among other meanings, in archaeology it is used to describe **what is deposited in a burial**, as an offering and/or accompaniment of the deceased.

Australopithecines:

They are the **direct ancestors of the first humans.** It is the genus Australopithecus. The Australopithecus belong to the tribe of hominins (Hominini). The first representatives of this tribe are: Sahelanthropus tchadensis, Ardipithecus ramidus, and even Orrorin tugenensis (all between 7 and 5 mi old). It is considered that it is very possible that Australopithecus derived from one of these species.

Dating:

This expression is used to refer to the **estimated age** of a **site or fossil** with **scientific methods.** There are "**absolute dating"** systems, from the count of atomic isotopes or with an analysis of some physical particularity. On the other hand, "**relative dating**" is based on appraisals or evaluations, such as when a tool appears of which we know exactly the period it was manufactured, but based on what we know so far; therefore, it is not so conclusive. **Absolute dating is more accurate** and more accepted.

Epigenetics:

Study of **changes in gene function** that are hereditary and cannot be attributed to alterations in the DNA sequence. The study of epigenetics is used in archaeology to detect **changes in human species** that would indicate a new species of hominids, since we find them in one species but not in another.

- **Scientific evidence:**

Scientific facts that research provides. The evidence can be disputed, but not the fact (e.g., an animal bone with a fragment of flint stuck in it. The manner in which it was nailed is debatable, but not the fact that it is nailed.) This expression has been misused, it is too often used in an interpretive way. Continuing with the same example of bone, some would say that they already had bows and arrows, but there are several ways to fire projectiles and we cannot know what was used in this case.

- **Scientific hypothesis:**

It is an acceptable proposal, which has been formulated after **data collection,** which serves to **address a problem** in a scientific way. Once the hypothesis (scientifically proven) is **refuted**, it ceases to be a hypothesis and a **verified statement** ensues.

Hominins:

They are all **bipedal primates**. The first to be considered as such are the australopithecines, our most direct ancestors. The genus Homo appears around 2.8 mya., according to what we know so far.

Laminae:

They are **elongated flakes**, usually thin and with **fairly straight side cuts**. Although they are present in Lower and Middle Paleolithic sites, it was in the Upper Paleolithic that these products were systematically sought.

Flake:

It occurs when a core is struck with the percussion (stone hammer used for carving). The intention is to generate **cutting fragments of rock** to use them as knives or to make another type of tool**.**

- **Nucleus:**

It is the **block of raw material** from which **flakes are extracted**. There are many types of rocks that can be used for flake extraction, although there are some materials that are more suitable for carving, especially flint and obsidian, but also quartzite, basalt and other types of rocks.

Pleistocene:

It is the geological period that comes **after the Pliocene**. For most researchers, it begins **2.6 million years ago** and ends in the Holocene, approximately **10,000 years ago**. It is characterized by the alternation of warmer periods with others of cold or very cold ones. The glacial maximum occurred about 18,000 years ago.

Scientific theory:

It is a set of scientific ideas and laws that try to explain a **phenomenon or a fact.** The strength of a theory is related to the number of phenomena it can explain and the ability to foresee these phenomena before they happen. Scientists use theories as a **foundation** for **scientific knowledge**.

Deposit:

It is the place where fossil remains or prehistoric tools are found. Humans have lived in all kinds of places, but we often find them in caves, since the archaeological levels are better preserved, and it is easier to locate a cave than an outdoor place. Even so, it is believed that, in the beginning, humans did not live in caves.