

THE ORIGIN AND EVOLUTION OF LIFE



INDEX (PROVISIONAL)

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THE BEGINNING OF LIFE

The beginning and evolution of life

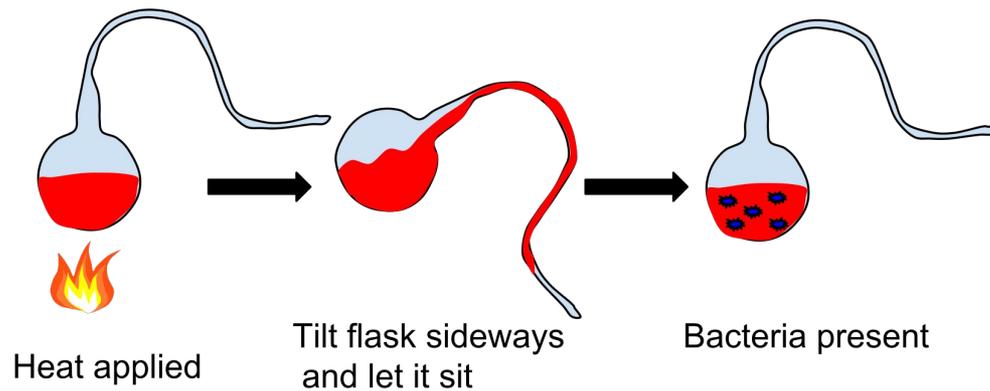
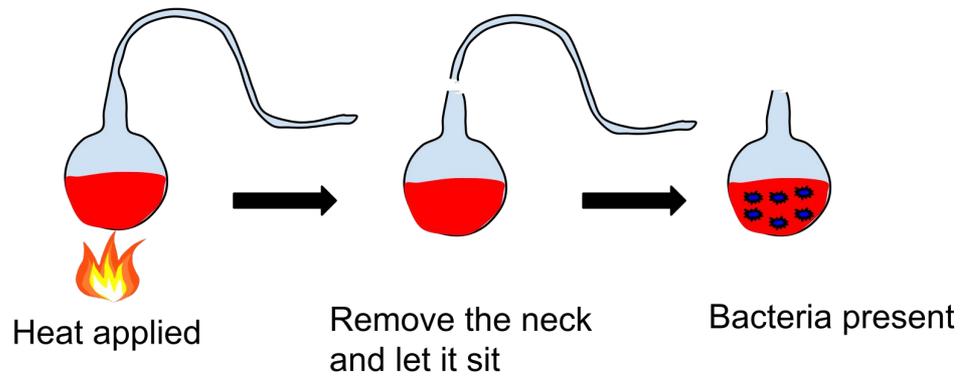
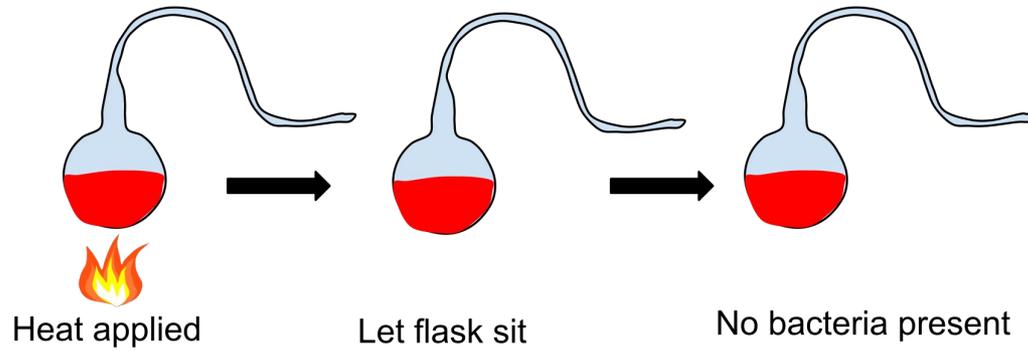
Actually we maintain that our life began from [molecules](#) which existed in an early stage of the Earth's [past](#), but through the history there were many [other theories](#), like the theory of [spontaneous generation](#):

- In Ancient Egypt people believed that the Sun produced snakes and cocrodiles in the Nile.
- In the Middle ages there were recipes to create living things from differents materials.

These theories were abolished by:

- [Francesco Redi](#), an italian doctor that demonstrated that larvae found in rotting meat came from flies.
- [Louis Pasteur](#) demonstrated that microorganisms did not come from spontaneous generation with his [experiment](#). The theory was finally rejected.

Pausteur's experiment



Oparin's theory

The basis of the hypothesis accepted by most scientist today were made by the Russian biochemist Alexander Ivanovich Oparin.

According to Oparin life arose from physical and chemical processes which occurred in the atmosphere of the primitive Earth.

Stages of Oparin's theory:

1- Spontaneous chemical reactions occurred between the atmosphere's components (methane, ammonia, hydrogen and water vapour)

2- The reactions start thanks to electric charges from storms, intense UV radiation and continuous volcanic eruptions. The synthesis of simple organic molecules began.

3- The temperature fell so the water vapour condensed, the primitive seas were formed. The molecules formed accumulated in the seas, they were so much warmer and less deep than now. Oparin called them “primordial soup”.

4- The simple molecules join together to form bigger molecules, some of them were the future components of living beings.

5- The new molecules were insulated from the water inside structures called coacervates. This insulation was not complete, so the more stable coacervates survive and the less stable one disappeared.

6- Some of the stable coacervates divided and multiplied. To do this they synthesised molecules (nucleo acids) that were capable of replication. The result of this process will be described as an organism. This was the origin of all cells.

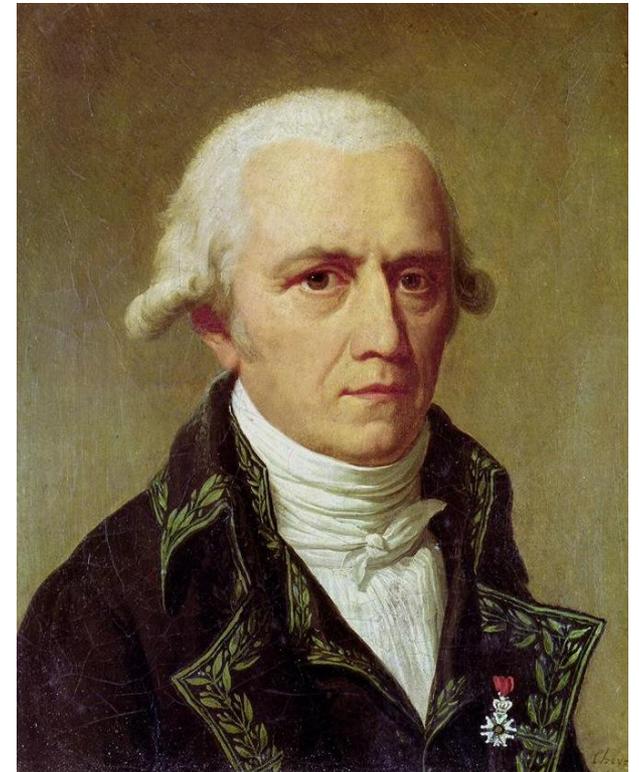


EVOLUTIONARY THEORIES BEFORE THE 20TH CENTURY

There are lots of theories during this time, but the most important ones are the following ones:

Lamarckism

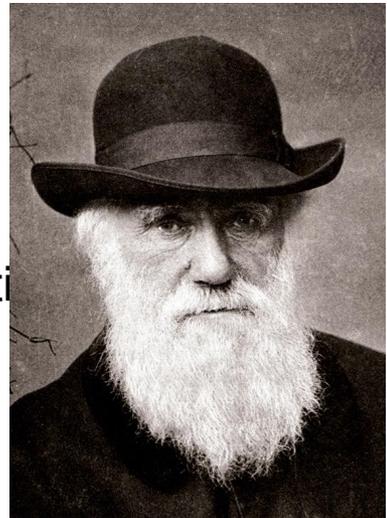
- Theory of inheritance of acquired characteristics.
- Adaptive force: animal developed structures and organs that they need to adapt to their environment.
- The new characteristics were transmitted to their descendants and so changes were produced that modified species.

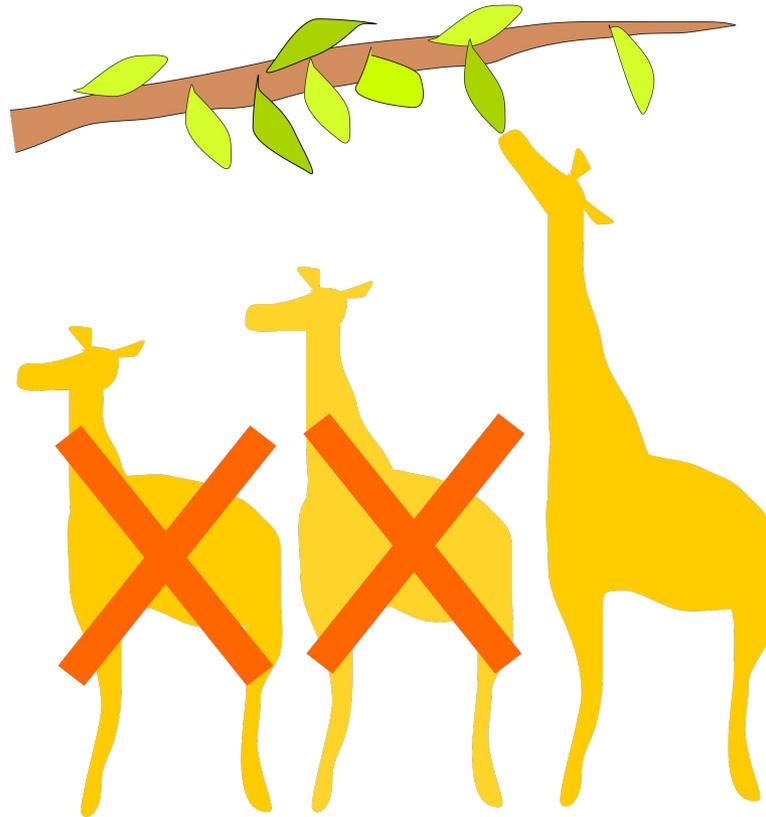
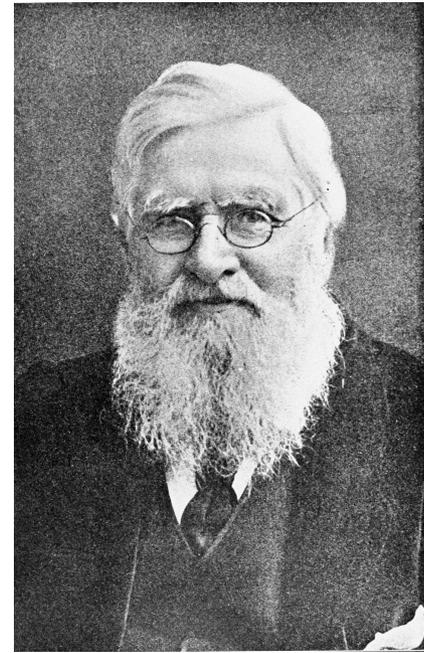
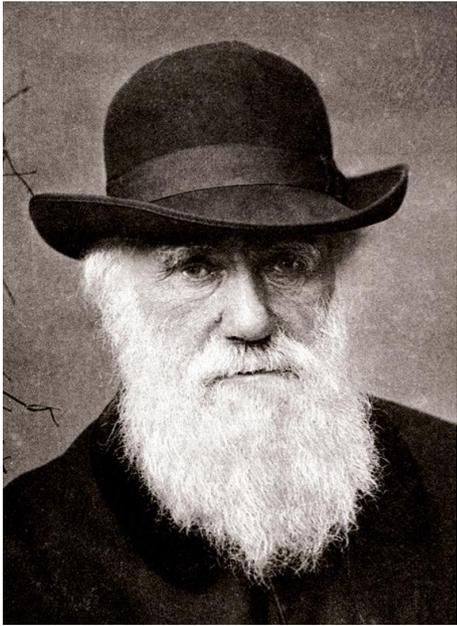


Darwinism

This theory was developed by the British naturalists Charles Darwin and Alfred Russell Wallace in the mid-19th century. Present-day theories are based on this theory.

- Based on the natural selection.
- The individuals of any population have anatomical, physiological and behavioural differences.
- Each organism produces more offspring than actually survive to reproduce.
- Struggle for existence, competition for food and space.
- Survival of the fittest and well adapted.
- The surviving individuals (which are the fittest) produce next generation, so the most favourable variations are transmitted.
- The less favoured individuals disappear.





EVIDENCE OF EVOLUTION

Evidence of evolution

There is so much evidence for evolution.

1-Anatomical and morphological evidence: there are three type of organs that provide these evidence to support the theory of evolution.

- Homologous organs: the samen structural pattern but different functions. For example, the development of different limbs in mammals, such as those of kangaroos or bats.
- Analogous organs: same functions and different evolutionary origin. For example, the wings of insects and birds.
- Vestigial organs: evolutionary remains of organs which disappear. For example, the appendix.

2-Fossil evidence: fossils reveal that the ancient organisms were different from today, this show that species change over time. When fossils are compared to present-day species, generally an increase in diversity and biological complexity can be seen.

3-Embryonic evidence: some embryos from different species are similar, which shows that there is a clear evolutionary relationship between them.

4-Biogeographical evidence: the geographical distribution of animal and plant species can be explained according to theories of evolution.

- The species of the continents are different to the species in islands, species are more similar on islands that are close to each other.
- Some organisms, separated by oceans, have evolved differently although they have certain similarities.

5-Molecular evidence: the study of molecules reveals that the greater the molecular similarity between two groups of organism.

- In all living things are proteins and DNA.
- These are made of smaller molecules (amino acids and nucleotides).
- They follow specific sequence and characteristics for each organism.
- By comparing these sequences in different species and groups of organisms, the evolutionary relationship between them can be established.

6-Other evidence:

- Parasites: organisms that live off other species, they adapt to their host's way of life. For example, tapeworms and leeches belong to different taxonomic phyla and don't share a common ancestor, but they have similar organs.
- Behaviour: some of the instinctive behaviour of animals is based on genetic inheritance. Species that have evolved in a similar way have types of behavior that are more alike than species distantly. This indicates that they inherited their behaviour from a common ancestor.

PRESENT-DAY THEORIES OF EVOLUTION

Neo-Darwinism

Include:

- Mendel's laws, which explain hereditary traits and their transmission mechanism.
- Sexual reproduction: gene combinations.
- Genetic recombination during meiosis,
- Mutations, which cause rapid changes in genes.

Theory:

- Natural selection doesn't act on individual in isolation but in the population it belongs to.
- A population is modified as the frequency of the different varieties of individual change.
- After many changes accumulated, the individuals evolve; so this can result in a new specie.

The theory of the selfish gene

- The unit of evolution is the gene, not the population.
- The role of individuals is that of receptors and transmitters of genes.
- The final aim (intention or purpose) of the evolutionary process is to increase the frequency of some genes over others in a population.

Endosymbiotic theory

- Eukaryotic cells originated from the fusion of two types of bacteria.
- This cells acquired the capacity to phagocytose (consume or incorporate microorganisms) other cells which became cellular organelles, such as mitochondria and chloroplasts.
- The interdependence between these cells caused them to behave as a single organism.
- This symbiotic relationship between organisms is a key mechanism for the evolution of living things.

Theory of punctuated equilibrium

- According to this hypothesis, the process of evolution has not always been slow and gradual but that in many cases, the appearance of new species has happened quickly.
- The theory is based on findings of the sudden appearance of fossil groups without any links to earlier forms or transitions from previous groups.
- They explained that this appearance was due to the development of macromutation (complex mutations) which affected the genes that regulate other genes.

Neutral theory of molecular evolution

- This theory maintains that the majority of mutations originate from genes that are neither advantageous nor disadvantageous for the individuals who have them, so natural selection doesn't apply.
- A new species can appear if these individuals have offsprings and they are isolated from the other members of the population.



EL ORIGEN DE LA VIDA

Primeras teorías

donde encontramos

Teorías modernas

aún vigente

CREACIONISMO

prevalció por más de 2000 años

GENERACIÓN ESPONTÁNEA

la más aceptada

PANSPERMIA

EVOLUCIÓN QUÍMICA DE LA VIDA

contrasta a Oparin

Los polímeros que llegaban a la sopa primitiva quedaban enganchados a la **arcilla** (biocatalizador) formando el "collar"

apoyada por

MUNDO DEL ARN

GÉNESIS MINERAL

FUENTES HIDROTERMALES

origen en dorsales submarinas

Los gases de las dorsales serían la base de la formación de los pol. orgánicos

Para abrir los CMaps y recursos debz pinchar en el ícono que aparece bajo cada concepto.

THE ORIGIN OF NEW SPECIES

The origin of new species

The changes produced in living things over the course of many years produce the formation of new species.

There are 4 stages in the formation of a new species:

1-Production of evolutionary changes in populations: The result of natural selection, that favours some individuals and prejudices others. The new populations are different from the original ones.

2-Genetic isolation of new population: The new population shouldn't reproduce with the original population . This genetic isolation can occur because of different barriers:

-Geographical barriers: prevent the physical contact between populations.

-Sexual barriers: has anatomical differences that prevent mating or they have different synchronisation between fertile periods.

-Physiological barriers: the gametes are incompatibilities which prevent the fertilisation.

-Chromosomal barriers: changes in the structure or number of chromosomes.

-Ethological barriers: the appearance of new types of behaviour that result in the rejection of some living beings by others.

3-Graduel differentiation: After isolation, the population accumulates changes due to new mutations, and it becomes different with the original population.

4-Speciation: Over time, if this population mating with the original population, the result will be that they won't obtain fertile offspring. From this moment, the populations are considered to be two distinct species.

MICROEVOLUTION AND MACROEVOLUTION

Microevolution: is the process of evolution that causes the appearance of new species. species belonging to the same genus were caused by microevolution:

ex: (-Canadian lynx -Iberian lynx -Eurasian lynx -Red lynx).

Macroevolution: Then type of evolution that resulted in large groups of different species because of drastic changes, (microevolution accumulated over a long period of time). Darwin stated that the evolutionary mechanism is the same in both types of evolution, although in the case of macroevolution, the process lasted longer and was more intense.

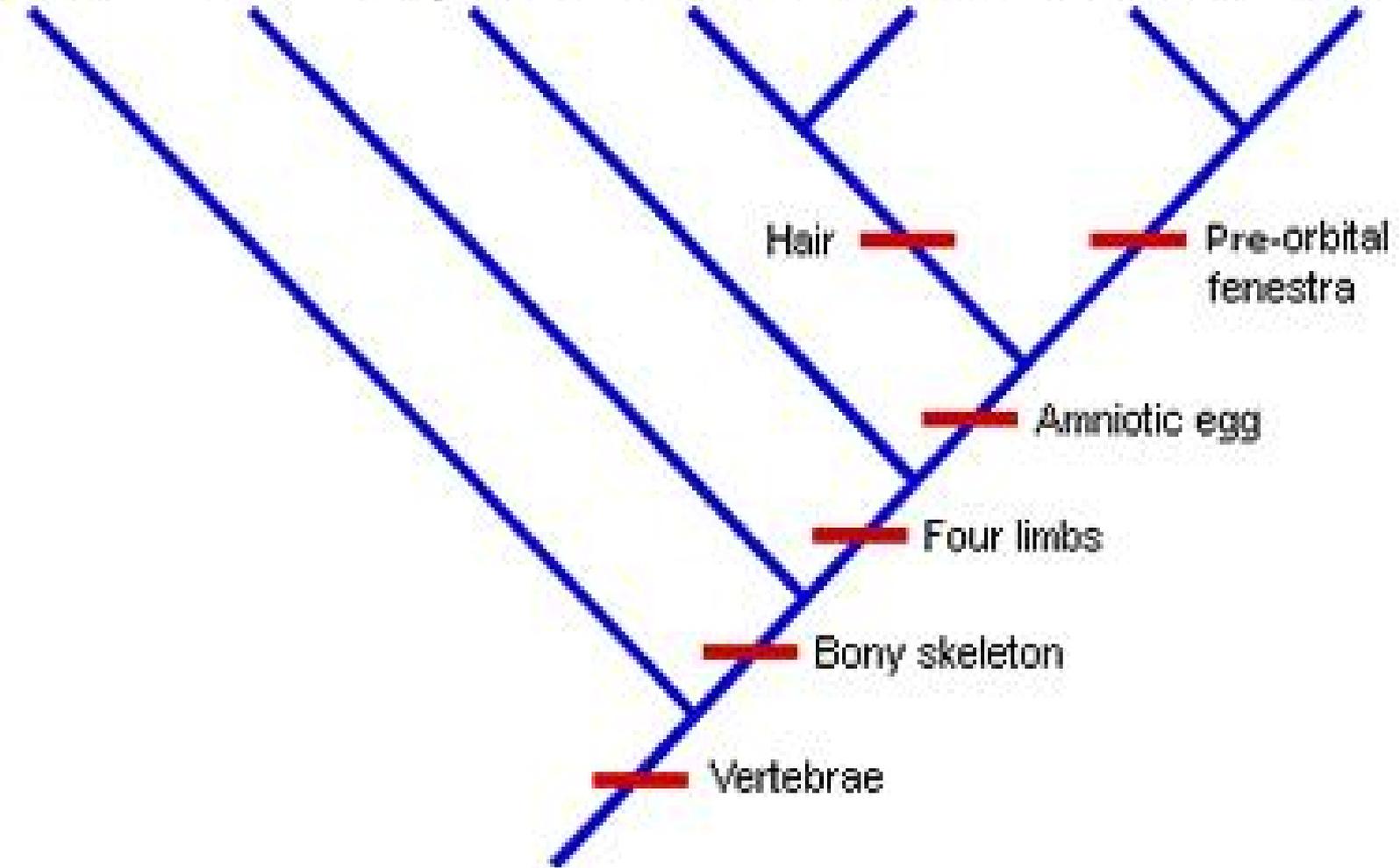
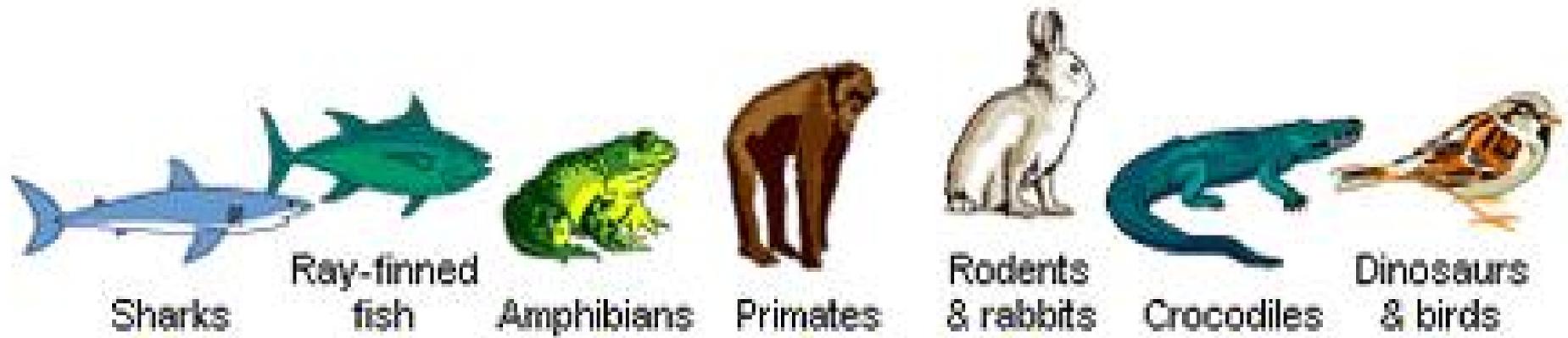
American mastodon
(*Mammuthus americanum*)

woolly mammoth
(*Mammuthus primigenius*)

African savanna elephant
(*Loxodonta africana*)

1 m
3 feet





The Appearance of Human Beings

They are bipedal- this fact makes changes to the cranium, pelvis, spine and limbs.

They have an upright position- to see their prey and predators-

The main characteristic that defines the Homo genus is the capacity to use tools and instruments. To be able to do this, they had to evolve hands with an opposable thumb that let them make precise movements.

They also needed a sufficiently developed brain that was capable of sending orders to the muscles involved in this type of movement.

The chronological appearance of species in the Homo genus was:

- Homo habilis
- Homo erectus
- Homo sapiens

