The Theory of Evolution

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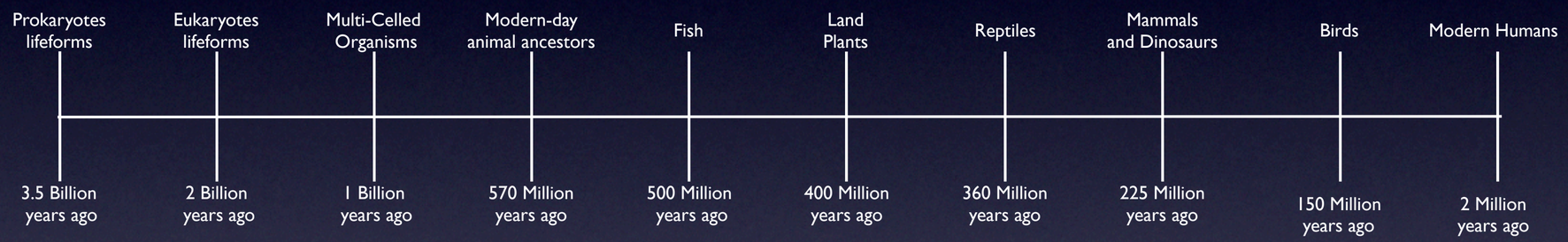
Evolution

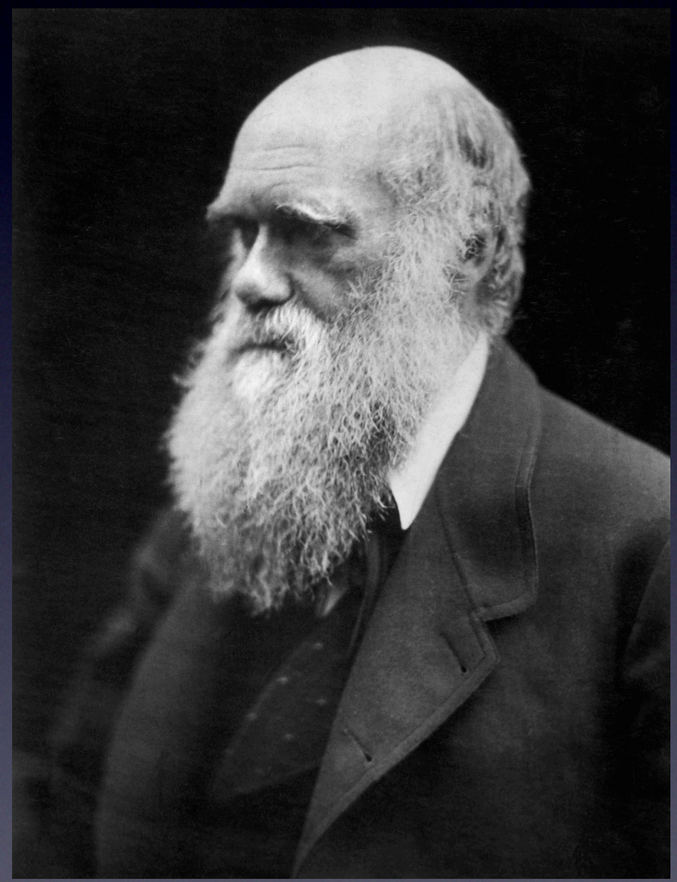
"The process by which different kinds of living organisms are thought to have developed and diversified from earlier forms during the history of the Earth."

Timeline


Prokaryotes lifeforms
3.5 Billion years ago
Eukaryotes lifeforms
2 Billion years ago
Multi-Celled Organisms
1 Billion years ago
Modern-day animal ancestors
570 Million years ago
Fish
500 Million years ago
Land Plants
400 Million years ago
Reptiles
360 Million years ago
Mammals and Dinosaurs
225 Million years ago
Birds
150 Million years ago
Modern Humans
2 Million years ago

Charles Darwin

The Theory of Evolution was created by Charles Darwin.



Evidence of Evolution

Fossils - Shows how the structure of organisms has changed and adapted over time.

DNA Sequences - How different DNA sequences match the classifications of organisms and of information in fossils.

Anatomical Similarities - Similarities in the anatomy of different species of organisms.

Physiological Similarities - How organisms relate to one another physiologically.

Mechanisms of Evolution

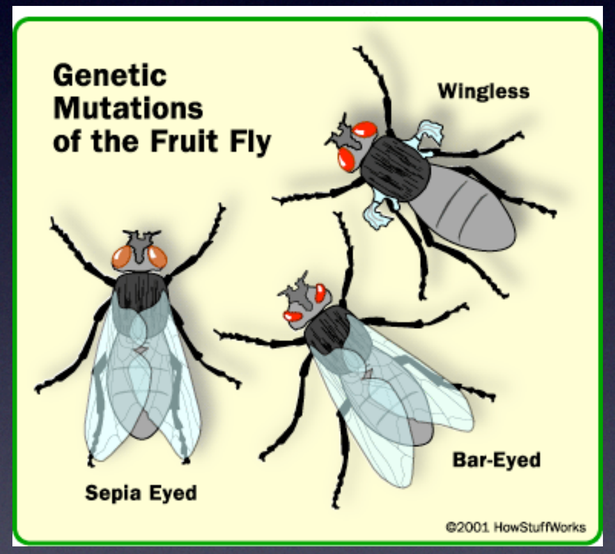
Mutation

Changes that occurs with an organism's genes, which can allow for the organism to be better adapted to its environment. If the mutation is beneficial, it will spread throughout the organism's population by natural selection.

Mutations

Fruit Flies

These fruit flies have genetic mutations that do not necessarily cause any guaranteed benefits, as these mutations may not be beneficial, such as the case of the wingless fruit fly. The wingless fruit fly will ultimately die, and the winged fruit fly will continue to produce, as part of natural selection.



Mechanisms of Evolution

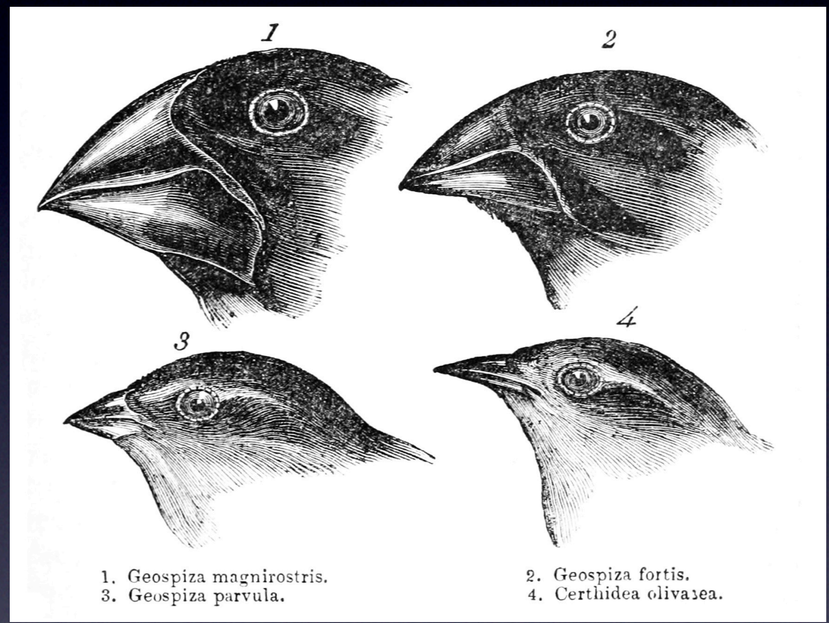
Natural Selection

Organisms who have genetics that allow them to be better adapted for an environment survive and reproduce at a higher rate than those who do not have these traits.

Natural Selection

Darwin's Finches

During Darwin's voyage on the Beagle, he began to notice that Finches that were from different environments had distinctive qualities to them, making their environment more accessible to them. The variations in beak sizes allows for these birds to better eat what is readily available to them. These variations are a result of the theory of natural selection.



1. Geospiza magnirostris.
2. Geospiza fortis.
3. Geospiza parvula.
4. Certhidea olivacea.

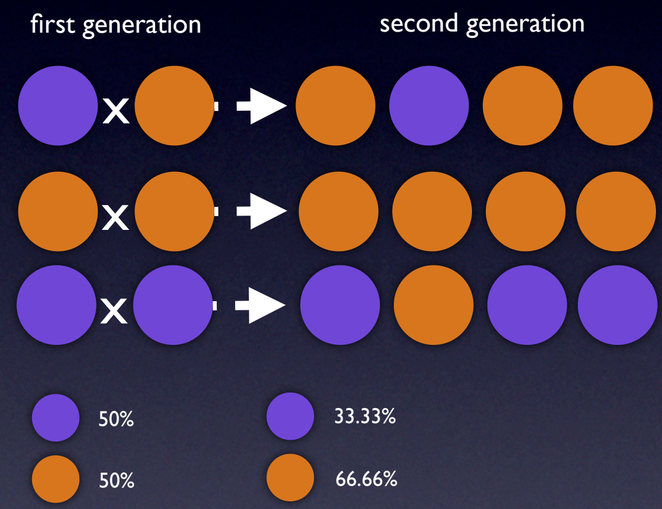
Mechanisms of Evolution

Genetic Drift

This is an uncontrollable aspect of evolution that is caused by variations in the gene pool of a population, and occurs through sexual reproduction.

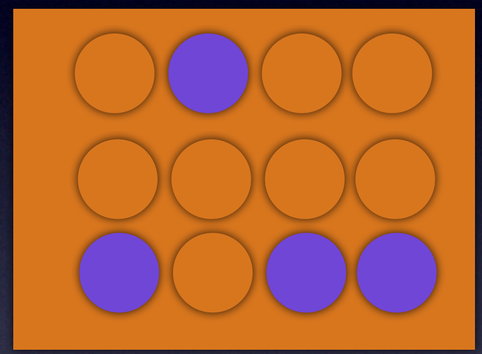
Genetic Drift

Randomly, more orange circles were reproduced than purple circles, even though there was the same percentage of each in the first gen. in the second generation 66.66% are orange.



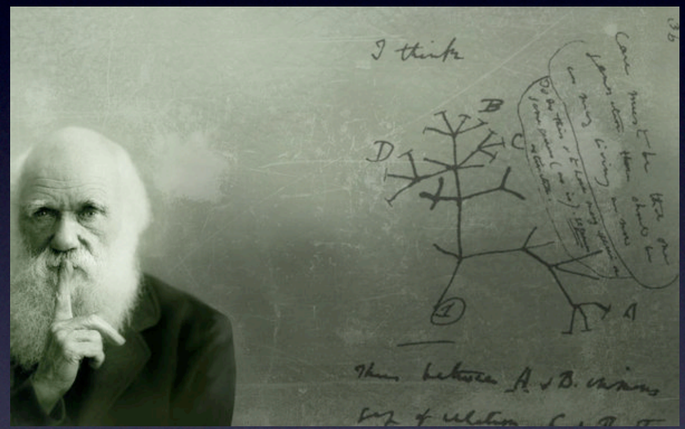
Genetic Drift

If placed on a board, the purple ones would be much easier to spot than the orange ones, making them more visible to predators. For this reason, the orange circles would survive more often, and the gene that makes orange circles would have an increased frequency.



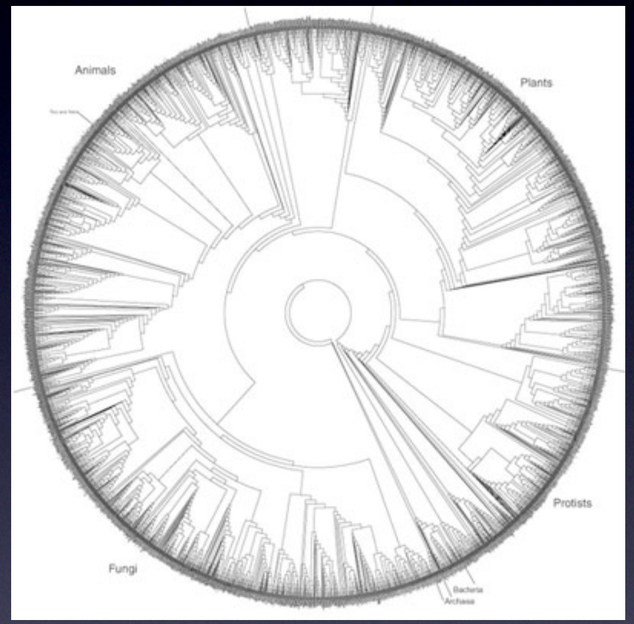
Phylogenetic Tree

Phylogenetic trees are diagrams that show evolutionary relationships between different species. These trees show the process of natural selection, showing variations among species that are from a shared ancestor. Phylogenetic trees display natural selection.



Main Idea

The ideas presented by Charles Darwin's theory of evolution changed the realm of science forever. By understanding evolution, many different branches of science were connected to one another, realizing that they all expand from evolution. Though a controversial theory, it is one that is very well accepted in the scientific world, with the belief that all organisms have expanded from a single organism, prokaryote lifeforms, that altered to adapt to their environment over billions of years. These adaptions are what causes the difference in species, such as those of Darwin's finches. Ultimately, all organisms are as they are now through genetic mutations, genetic adaptions, and natural selection, altering their genes to be better suited for the environment. Organisms are adaptable to their environment, capable of evolving in order to sustain life in a variety of environments.



PSSA Questions

Question One

Which of the following processes would be most effective in changing the frequency of certain traits in a population over time?

Spontaneous Mutations
Natural Selection
Chemically-induced Mutations
Genetic Recombination

PSSA Questions

Question One

Which of the following processes would be most effective in changing the frequency of certain traits in a population over time?

We know that spontaneous mutations aren't effect in creating a higher frequency of a certain trait, so we know that isn't the answer.

PSSA Questions

Question One

Which of the following processes would be most effective in changing the frequency of certain traits in a population over time?

We know that genetic recombination isn't going to increase the frequency of a trait, as the frequency of the trait would not go up through recombining genes.

PSSA Questions

Question One

Which of the following processes would be most effective in changing the frequency of certain traits in a population over time?

Chemically-induced mutations would not create a higher frequency of a trait, as the chemicals could alter the genes in a way that is not effective.

PSSA Questions

Question One

Which of the following processes would be most effective in changing the frequency of certain traits in a population over time?

The only answer to this problem is through natural selection. Through the interaction of the environment, a certain trait can increase in frequency.

PSSA Questions

Question Two

Scientists know that organisms that are more closely related will have DNA sequences more similar to each other than organisms that are distantly related. Which two organisms below would most likely have the **fewest** similar nucleotide sequences in a given gene?

Orangutan and Howler Monkey
Lion and Horse
Scorpion and Tarantula
Alligator and Earthworm

PSSA Questions

Question Two

Scientists know that organisms that are more closely related will have DNA sequences more similar to each other than organisms that are distantly related. Which two organisms below would most likely have the **fewest** similar nucleotide sequences in a given gene?

The answer can't be 'orangutan and howler monkey' as the two organisms are too close to one another in nucleotide sequence.

PSSA Questions

Question Two

Scientists know that organisms that are more closely related will have DNA sequences more similar to each other than organisms that are distantly related. Which two organisms below would most likely have the **fewest** similar nucleotide sequences in a given gene?

The answer can't be 'lion and horse' as they are both four-legged mammals.

PSSA Questions

Question Two

Scientists know that organisms that are more closely related will have DNA sequences more similar to each other than organisms that are distantly related. Which two organisms below would most likely have the **fewest** similar nucleotide sequences in a given gene?

The answer can't be 'scorpion and tarantula', as they are both arachnids.

PSSA Questions

Question Two

Scientists know that organisms that are more closely related will have DNA sequences more similar to each other than organisms that are distantly related. Which two organisms below would most likely have the **fewest** similar nucleotide sequences in a given gene?

The answer has to be 'alligator and earthworm' then. Alligators are water-based animals, while as earthworms are not. They are also both members of separate classes in the Animalia Kingdom.

PSSA Questions

Question Three

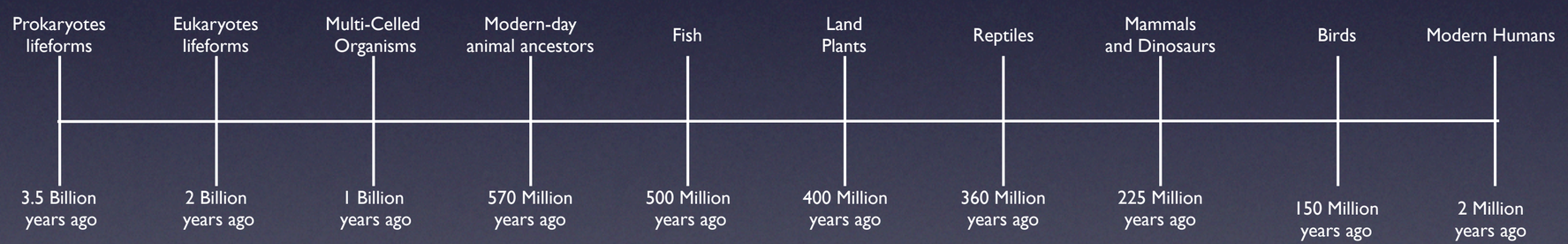
According to modern scientific theory, which of the following organisms appeared first?

microorganisms
land plants
humans
mammals

PSSA Questions

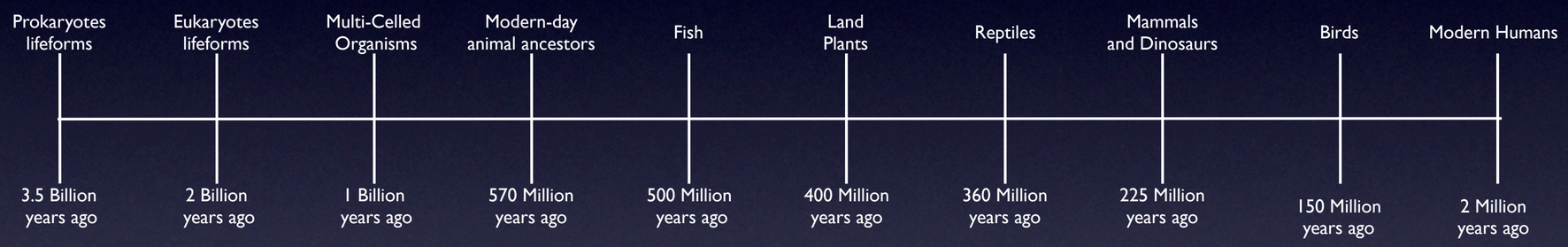
Question Three

For this question, we can analyze our timeline in order to find out which was the earliest forming.



PSSA Questions

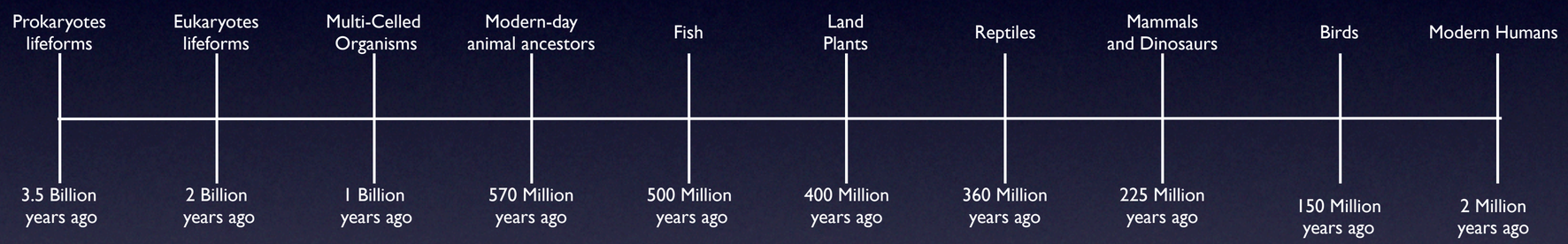
Question Three



The answer can't be humans, as they are the final thing to appear on our timeline, dating back only 2 million years.

PSSA Questions

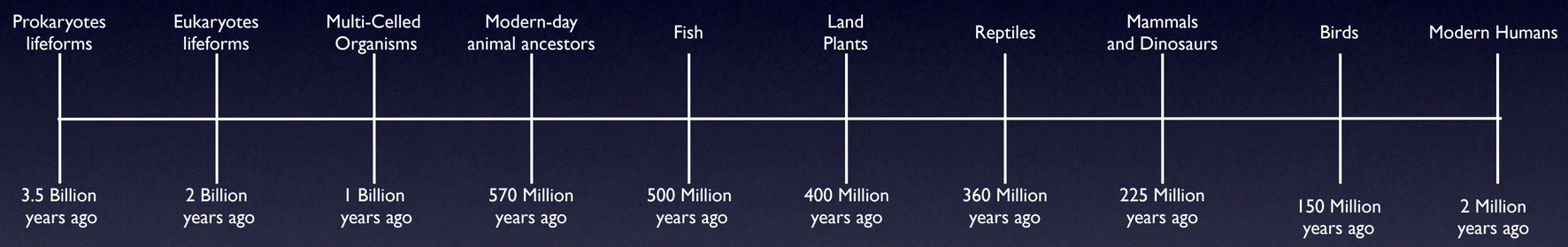
Question Three



While mammals were before humans, they aren't the earliest organism, as they came around 225 million years ago.

PSSA Questions

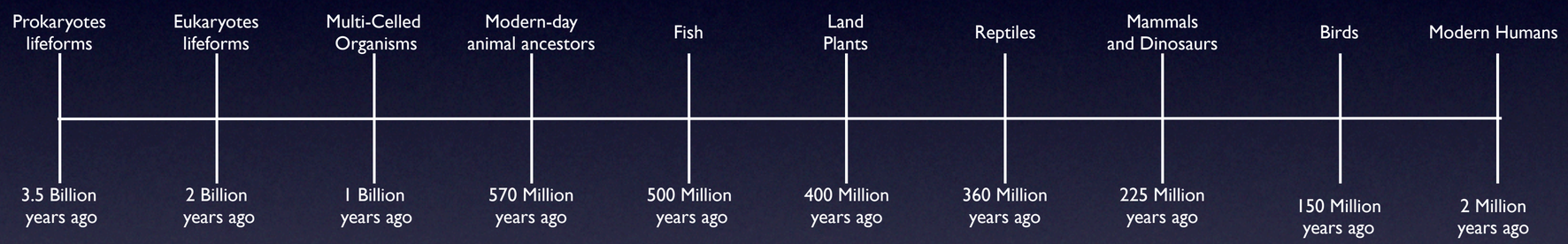
Question Three



Land plants are older than both of the other options, as it is 400 million years old, but it still isn't the oldest.

PSSA Questions

Question Three



The answer is microorganisms, as they are the oldest organism dating back to 3.5 billion years ago.

Now that you know all about the theory of evolution, you'll be able to rock those PSSAs! Good Luck.