Evolution: Changes Over Time

Look around you... there are so many different species of organisms out there. The variety of organisms that inhabit our planet is called its diversity. Have you ever wondered how organisms can look the same but still be completely different? What causes an organism to change over time? Evolution is the gradual change in a species over time. It is the ability of an organism to use its characteristics to help it to survive and reproduce. When an organism does this, it allows it to be able to pass its traits on to the next generation.

The man who figured out how evolution works is Charles Darwin. He was a British Naturalist that ventured out to the Galapagos Islands and while there, observed finches that were similar to one another yet very different. He came up with the theory of evolution, which we still use today, to describe how we get variation among organisms. A variation is just the differences we see between organisms of the same species.

Plants, animals and other organisms have special features called adaptations. An adaptation is a behavior or physical characteristic that allows an organism to survive and reproduce in its environment. Adaptations arise from mutation. Mutations are a result of a change in the DNA of an organism. It would be similar to writing your name one hundred times - chances are you would make mistake or two. When the DNA of a cell makes a copy of itself, sometimes mistakes are made, and voila, Mutation! So, let’s say a moth is born with a mutation that changes its color from white to brown. If this moth lands on a tree trunk, it will blend in with its surroundings. This is an adaptation that allows it to survive. If that same moth were to land on green leaves, do you think that this adaptation of being brown would allow it to survive there?

Natural selection is what drives evolution. It is the process by which individuals that are better adapted to their environment are more likely to survive and reproduce than others that are not. So our brown moth, because it is adapted to survive in its environment, will have a better chance of mating and passing on its genes to its children. That’s natural selection, or “survival of the fittest.” The “fittest” organisms survive to live a long life and reproduce. To be “fit” you must FIT your environment, i.e. you are well adapted!

When the entire population of a species dies off, we call that extinction. Dinosaurs went extinct millions of years ago. In fact, 99% of all organisms that have ever lived on earth are now extinct. Everything we know about them we get from their fossils, the preserved remains or traces of an organism that lived in the past. Sometimes we can piece together the history of organisms by looking at their fossils. Often times, there will be a gap in the fossil record. We call these “missing links.” When there is a missing link, we can still figure out how organisms are related by looking at their homologous structures. A homologous structure is a physical characteristic that demonstrates that certain species are related and have a common ancestor. Bird wings, dolphin fins, the human arm and a dog’s leg have a very similar bone structure because they are all composed of a humerus, radius and an ulna.

We can estimate the age of fossils by using a process called radioactive dating. This process allows scientists to look at the half-life of chemicals contained in the rocks surrounding a fossil or contained within the fossil itself to determine the estimated age of the fossil or rock. Earth is 4.6 billion years old, and in that time, a variety of organisms have lived and died on the planet. Fossils allow us to create a picture of the diversity of life that has existed on Earth!
Changes Over Time Vocabulary
Use the reading to match the vocabulary term with the appropriate definition

1. __________________________ - behavior or physical characteristic that allows an organism to survive and reproduce in its environment
2. __________________________ - the gradual change in species over time
3. __________________________ - a process by which individuals that are better adapted to their environment are more likely to survive and reproduce than others that are not
4. __________________________ - the variety of organisms that inhabit the Earth
5. __________________________ - British naturalist who formulated the theory of evolution by natural selection
6. __________________________ - any difference between organisms of the same species
7. __________________________ - the disappearance of all members of a species from Earth
8. __________________________ - gaps in the fossil record
9. __________________________ - similar structures that related species have inherited from a common ancestor (example – bones in a bird’s wing, dolphin fin, and dog leg are very similar)
10. __________________________ - the preserved remains or traces of an organism that lived in the past
11. __________________________ - process where scientists look at the half-life of chemicals contained in rocks around a fossil to determine the age of that fossil
12. __________________________ - any change in the DNA of an organism

Free Response

1. What does the term “survival of the fittest” mean?
2. Explain how we know that organisms that lived millions of years ago are related to the organisms of today.
3. Explain how a mutation might lead to adaptation.
4. Green beetles are a favorite treat of the blackbird. They live on the green foliage in the local temperate forest. Unfortunately, drought has caused most of the trees to die out and the leaves to turn brown. How can this environmental change impact the population of the green beetle?
5. A mutation of a brown exoskeleton has been introduced into the green beetle population able. Explain what might happen to the population with the introduction of this new trait.