Evolution

Evolution, in a general sense, means a slow change over time. In biology, evolution means the change in characteristics of organisms over time, which may lead to the creation of a new species. It is a slow process and takes many generations to occur.

A **species** is a group of organisms with similar traits that will naturally reproduce with each other. Individuals in a species do not have to look exactly like each other – all breeds of dogs are a single species! Differences between individuals start with **mutations** in their genes. Mutations randomly occur naturally or may have environmental causes such as exposure to strong radiation or certain chemicals.

Evolution can occur in several ways:

- **Artificial selection** is the method used by animal breeders and farmers to ensure that their stock has the qualities they desire. Most plants and animals raised today are the result of artificial selection.

Horse breeders want fast, strong horses with long legs. Because of artificial selection, modern breeds of horses are taller than horses from even 100 years ago.

- **Natural selection** is driven by nature rather than humans. In a group of organisms, some will have characteristics that allow them to survive better in their environment. These individuals will have a better chance to reproduce since they will be healthier and live longer. Individuals without these characteristics, or with characteristics that make it more difficult to survive, will be less healthy or even die sooner. They will reproduce less, and future generations will have more of the 'good' characteristics than the 'bad' ones.

Most Arctic animals have a layer of fat under their skin. Animals without this layer would die from the cold before they were old enough to reproduce and pass on the fat-less characteristic.

- **Genetic drift**, sometimes called 'accidental evolution', is the evolution of a trait in a group of organisms that gives them no advantage to their survival. One way in could occur is when a large portion of the population is wiped out at random by a disaster. The characteristics in the organisms left alive will be seen more in the next generations, whether or not they have a survival advantage.

An organism's **niche** is the place it occupies in the ecosystem. Where it nests, what it eats, and what time of day it is active are all components of the niche. Usually, only one species will fit into a specific niche. If more than one species tries to fit into a single niche, there is competition for food and space, and the organism better suited to that particular environment would squeeze out the less-suited ones.

When a single species evolves to produce several new species with different characteristics, it is termed **adaptive radiation** or **divergent evolution**. Structures that are similar in the new species (because of their shared ancestry) are called **homologous**. Often, organisms with similar characteristics will develop separately from each other. For example, hedgehogs and porcupines both have spines, but are not directly related to each other. These characteristics are called **analogous**.

There is some debate over whether evolution occurs gradually, with old species fading into new ones (**gradualism**), or whether species remain mostly the same for long periods of time, with a few short bursts of rapid change (**punctuated equilibrium**).

Keep in mind that only characteristics that are **heritable** (part of the organism's genetics) may be passed on to future generations. For example, a plant that naturally has blue flowers will pass this on to its offspring, but a plant that has blue flowers because of a dye in the soil will not pass the blue color to its offspring.

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