

## BSCS Biology An Ecological Approach

### Chapter 9: Evolution: Patterns and Diversity

*I felt like a blind man given sight.*

Charles Darwin speaking about his discoveries

#### Introduction

Living things have many similarities including development patterns, genetic codes, and patterns of body shapes and physical makeup. While there are **similarities**, there is a great deal of **diversity** of life on planet earth. There are millions of organisms and each species has a unique set of behaviors, structure, and ways of living and reproducing. This diversity is a result of an ongoing process known as **evolution**.

#### The Species Concept

While each living organism is unique, some resemble each other in form and function more closely than others. Organisms which can mate and produce fertile offspring are said to be a **species**. Within a species (such as dogs) there can be a great deal of **variation**. Physical factors such as mountain ranges and oceans can keep animal populations from mating and breeding (**reproductive isolation**).

#### Charles Darwin and Evolutionary Concepts

Charles Darwin was a naturalist who spent many years studying the diversity of species in far away places of the world including the **Galapagos Islands** of the Pacific. He believed that populations of organisms were kept in check by their ability to reproduce. Darwin also made note of how humans could breed specific species of animals to produce desired characteristics (**artificial selection**) and he observed that a similar process occurred naturally in nature (**natural selection**). The characteristic traits that increase an organism's chance of survival are known as **adaptations**. Darwin's theory, *On the Origin of Species*, published in 1859, brought forth revolutionary ideas on the nature of plant and animal species. His theory was not widely received at the time. Over time, Darwin's theory has been supported by thousands of scientists and has been tested over and over again through countless experiments.

#### Genetics and Evolution

Darwin's ideas have been widely held and supported by thousands of scientists over the years. Many of his original ideas have been expanded through research and advances in technology and research. Like Mendel, Darwin's original conclusions have been reached by other scientists as well. The modern study of genetics supports the concepts first described by Darwin. **Variability** in a population that can be inherited is the driving force behind the theory of **evolution**. The two sources of genetic variability are **mutations** and **genetic recombination**. Mutations are changes in the DNA molecule while recombination is a sort of swapping of various genes resulting in new combinations of genetic material. Genetic composition (genotype of a particular population) can change over time as a result of any or all of these factors: **mutation, migration, genetic drift, artificial or natural selection, and sexual selection**.

#### Evolutionary Patterns

When a population of organisms is relatively isolated, it will remain relatively distinct. At times a population may be separated due to environmental factors, into two separate breeding populations. Over time these two populations will develop their own unique characteristics and each will form as a distinct species. This is known as **adaptive radiation**. Several evolutionary patterns have been studied and named. They are **divergent evolution, parallel evolution, convergent evolution, and coevolution**.