

17.1 Genes and Variation

Lesson Objectives

-  Define evolution in genetic terms.
-  Identify the main sources of genetic variation in a population.
-  State what determines the number of phenotypes for a trait.

Lesson Summary

Genetics Joins Evolutionary Theory Darwin's original ideas can now be understood in genetic terms.

- ▶ Researchers discovered that traits are controlled by genes and that many genes have at least two forms, or alleles. The combination of different alleles is an individual's genotype. Natural selection acts on phenotype, not genotype.
- ▶ Genetic variation and evolution are studied in populations. Members of a population share a common group of genes, called a **gene pool**.
- ▶ **Allele frequency** is the number of times an allele occurs in a gene pool compared with the number of times other alleles for the same gene occur. In genetic terms, evolution is any change in the allele frequency in a population.

Sources of Genetic Variation The three main sources of genetic variation are mutations, genetic recombination during sexual reproduction, and lateral gene transfer.

- ▶ A mutation is any change in a sequence of DNA.
- ▶ Most heritable differences are due to genetic recombination during sexual reproduction. This occurs during meiosis when each chromosome in a pair moves independently. Genetic recombination also occurs during crossing-over in meiosis.
- ▶ Lateral gene transfer is the passing of genes from one organism to another organism that is not its offspring.

Single-Gene and Polygenic Traits The number of different phenotypes for a given trait depends on how many genes control the trait.

- ▶ A **single-gene trait** is controlled by one gene. An example in snails is the presence or absence of dark bands on their shells.
- ▶ A **polygenic trait** is controlled by two or more genes, and each gene often has two or more alleles. An example of a human polygenic trait is height.

Genetics Joins Evolutionary Theory

For Questions 1–4, complete each statement by writing the correct word or words.

1. Natural selection works on an organism's **phenotype** rather than its **genotype**.
2. A(n) **gene pool** consists of all the genes, including the alleles for each gene, that are present in a population.

Genes And Variations Answer Key

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