

Mutations: changes in the DNA of an organism that may or may not affect the organisms phenotype; mutations are the way new traits show up in a population. Most of the time mutations are harmful, but every once in a while, a beneficial trait is created.

Chromosome mutations:

- **Deletion** – a section of a chromosome is missing
- **Duplication** – a section of a chromosome is repeated
- **Translocation** – a piece of one chromosome breaks off and attaches to a non-homologous chromosome
- **Inversion** – a piece of a chromosome is reinserted upside down
- **Nondisjunction** – when a pair of chromosome doesn't separate; results in an extra chromosome or too few chromosomes

Gene mutations:

- **Point mutation** – replacement of a single nucleotide for another
 - **Missense** – puts one wrong amino acid in a protein
 - **Nonsense** – shortens a protein
 - **Silent** – has no effect on the protein that is produced
- **Frameshift mutation** – affects all of the amino acids beyond the point of the mutation

Selective breeding (artificial selection) is when humans choose individuals to breed so that they get certain traits in their offspring.

Genetic engineering refers to manipulating the DNA of an organism.

population → **community** → **ecosystem** → **biome** → **biosphere**

- **biotic** = living (animals, plants, bacteria, etc.)
- **abiotic** = nonliving (rocks, water, temperature, soil, etc.)

Energy flow through an ecosystem:

plants (**producers**) → herbivores (**primary consumers**) → carnivores
(**secondary consumers**)

Biological interactions in a community:

- **Competition** – when organisms try to utilize the same resource
- **Predation** – when one organism eats another
- **Symbiosis** – a long-term relationship between organisms of different species
 - **Parasitism** – one organism benefits, the other is harmed
 - **Mutualism** – both organisms benefit
 - **Commensalism** – one organism benefits, the other is unaffected

Nonnative species – an organism that humans introduced into an area

Limiting factor – any factor that prevents a population from increasing indefinitely (food, predators, soil nutrients, etc.)

Evidence for evolution includes:

- Fossils
- Anatomical similarities (bone structure)
- Physiological similarities
- Universal genetic code (DNA)
- Embryological similarities
- Biochemical similarities

Natural selection = the process whereby organisms better adapted to their environment tend to survive and produce more offspring; results in changes in allele frequencies over time. (Remember the peppered moths!)

Hypothesis – a prediction that is tested through experimentation

Inference – a logical conclusion drawn from evidence

Law – description of observed phenomena

Theory – a group of propositions formulated to explain a group of facts or phenomena in the natural world and **repeatedly confirmed through experiment or observation**

Observation – anything that can be measured or observed with your senses.