**Chapter 22**

**Must Knows:**

* How Lamarck’s view of the mechanism of evolution differed from Darwin’s
* Several example of evidence for evolution and how they each support how organisms have changed overtime
* The difference between structures that are homologous and those that are analogous, and how this relates to evolution
* The role of adaptations, variations, time, reproductive success, and heritability in evolution.

**22.1**:The Darwinian revolutions challenged traditional views of a young Earth inhabited by unchanging species

**Before Darwin:**

Carolus Linnaeus: Grouped similar species into increasingly general categories

\_\_\_\_\_\_\_\_\_\_\_\_\_\_: branch of biology dedicated for naming and classification

Binomial Nomenclature: two-part naming system that includes the organisms \_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_

Georges Cuvier: Opposed the idea of evolution

Paleontology: the study of \_\_\_\_\_\_\_\_\_\_

Strata: superimposed layers of rock compressed from new layers covering old ones

The \_\_\_\_\_\_\_ the strata, the more dissimilar its fossils were to current life-forms.

Catastrophism: the principle that events in the past occurred suddenly and were caused by mechanisms different from those operating in the present

Charles Lydell and James Hutton:

Geologic features could be explained by gradual mechanisms still operating today

Uniformitarianism: mechanisms of change are \_\_\_\_\_\_\_\_\_ overtime.

Important: The Earth must be very \_\_\_\_\_\_\_\_\_\_

Jean-Baptiste de Lamarck: Based idea of evolution on two principles

1. Use and disuse: parts of the body that are \_\_\_\_\_\_\_\_\_ extensively become larger and stronger, while those that are \_\_\_\_\_\_\_\_\_\_\_\_ deteriorate
2. Inheritance of acquired characteristics: characteristics acquired during an organism's lifetime could be passed on to the next generation

**22.2**: Descent with modification by natural selection explains the adaptations of organisms and the unity and diversity of life

*Descent with modification by natural selection explains the adaptations of organisms and the unity and diversity of life*

**Charles Darwin’s** voyage on the HMS Beagle from 1831-1836 was the impetus for the development of his theory of evolution by \_\_\_\_\_\_\_\_\_\_\_

-His mechanism for evolution was natural selection. Recall Lamarck’s mechanism was the i\_\_\_\_\_\_\_\_\_\_ of acquired characteristics

**N\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is a process in which individuals that have certain inherited traits tend to survive and reproduce at higher rates than other individuals because of those traits. This explains how adaptations arise:

-**Adaptations** are\_\_\_\_\_\_\_\_\_\_\_characteristics that enhance organism's’ ability to survive and reproduce in specific environments

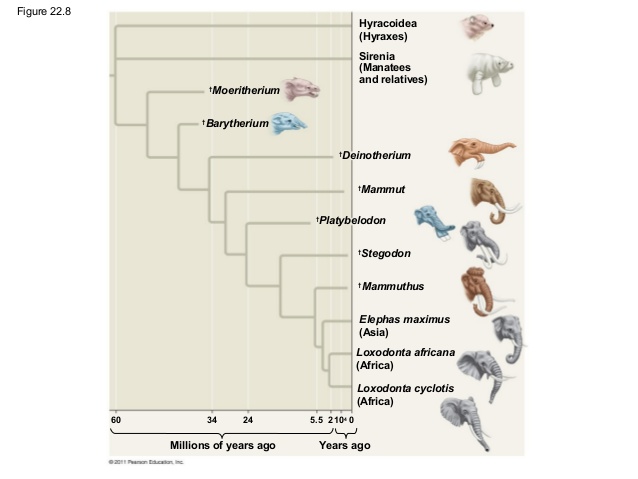
Example: Desert foxes = large ears to radiate heat

    Arctic foxes = small ears to conserve body heat



Important points of Natural Selection:

1. Individuals in a population \_\_\_\_\_\_ in their traits, many of which are heritable
2. A population can produce far more offspring that can survive. With more individuals than the environment can support, \_\_\_\_\_\_\_\_\_\_ is inevitable
3. Individuals with inherited traits that are better suited to the local environment are more likely to survive and reproduce than individuals less well-suited. Sometimes called “d\_\_\_\_\_\_\_\_\_\_ reproductive success”
4. Evolution occurs as the unequal reproductive success of individuals ultimately leading to adaptations to their \_\_\_\_\_\_\_\_\_\_. Over time, natural selection can increase the match between organisms and their environment.



If an environment changes, or if individuals move to a new environment, natural selection may result in adaptation to these new conditions, sometimes giving rise to new species in the process.

**Artificial selection** is the process by which species are modified by \_\_\_\_\_\_\_\_\_\_.

Example: Selective breeding of milk or meat production and the development of dog breeds

Individuals do not evolve. P\_\_\_\_\_\_\_\_\_evolve.

**22.3**: Evolution is supported by an overwhelming of scientific evidence

1. **Direct observation of Evolutionary change**

* Insect populations can \_\_\_\_\_\_\_\_\_\_\_ become resistant to pesticides such as DDT
* Evolution of drug-resistant viruses and antibiotic- resistant bacteria

1. **Homology and Convergent Evolution**

* **Homology:** Characteristics in related species can have an underlying similarity even though they have very different functions. Similarity resulting from \_\_\_\_\_\_\_\_\_\_\_ is known as homology.
* **Homologous Structures** are anatomical signs of evolution.

Examples: Forelimbs of mammals that are now used for a variety of purposes, such as flying in bats or swimming in whales, but were present and used in a common ancestor for walking

* **Embryonic homologies:** Comparison of early stages of animal development reveals many anatomical homologies in embryos that are not visible in \_\_\_\_\_\_\_\_organisms. Example: All vertebrate embryos have a post-anal tail and pharyngeal pouches.
* **Vestigial Organs** are structures of marginal, if any, importance to the organism. They are \_\_\_\_\_\_\_\_\_\_\_ of structures that served important functions in the organism's ancestors. Example: Remnants of the pelvis and leg bones are found in some snakes.
* **Molecular homologies** are shared characteristics on the molecular level. Examples: All life forms use the same genetic language of DNA and RNA. \_\_\_\_\_\_\_  \_\_\_\_\_\_\_sequences coding for hemoglobin in primate species show great similarity, thus indicating a common ancestor.
* **Convergent Evolution** explains why distantly species can resemble one another. Convergent evolution has taken place when two organisms developed similarities as they \_\_\_\_\_\_\_\_ to similar environmental challenges not because they evolved from a common ancestor. The likenesses that result from convergent evolution are considered analogous rather than homologous. Think of it like this: Similar problems have similar solutions. Examples:
* The torpedo shapes of a penguin, dolphin, and shark are the solution to movement through an aqueous environment.
* Sugar gliders and flying squirrels occupy similar niches in their respective habitats.

1. **The Fossil Record:** *Fossils provide evidence for the theory of evolution*

* Fossils are remains or traces of organisms from the past. They are found in sedimentary rock. \_\_\_\_\_\_\_\_\_\_ is the study of fossils.
* Fossils show that evolutionary changes have occurred over time and the origin of major new groups of organisms
* \_\_\_\_\_\_\_\_\_ theory of evolution through natural selection explains the succession of forms in the fossil record. Transitional fossils have been found that link ancient organisms to modern species, just as Darwin’s theory predicts

1. **Biogeography:** The geographic distribution of species

* Species in a discrete geographic area tend to be more closely related to each other than to a species in distant geographic areas.

*Examples:* In South America, desert animals are more closely related to local animals in other habitats that they are to the desert animals of Asia. This reflects evolution, not creation.

* **Continental Drift** and the break-up of *Pangaea* can be explain the similarity of species on \_\_\_\_\_\_\_\_\_that are distant today
* **Endemic Species** are found at a certain geographic location and nowhere else.

*Example:* Marine iguanas are endemic to the Galápagos.

**Extra Vocabulary:**

1. **Evolutionary Tree -** A branching diagram that reflects a hypothesis about evolutionary relationships among groups of organisms
2. **Analogous -** Having characteristics that are similar because of convergent evolution, not homology
3. **Pangaea -** The supercontinent that formed near the end of the Paleozoic era, when plate movements brought all the landmasses of Earth together