Chapter 22

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- Influences on Darwin's Theories
    1. Thomas Malthus − Mentions competition and a struggle for survival, as population surpasses food supply
    2. Lyell − Land masses change over immeasurable time
    3. Lamarck − Discusses acquired characteristics (giraffe example)
- Darwin proposed the theory of natural selection and inheritance
- Darwin examined the various types of finches on the Galapagos islands to support his theory
- Differences in Finch beaks allowed for:
    1. successful competition
    2. successful feeding
    3. successful reproduction
- Successful traits (such as a certain sized beak) were passed down to next generation
- Adaptive Radiation − Rapid speciation, with new species filling niches due to the inheritance of successful traits
- Darwin's idea of Natural Selection was based on:
    1. Heritable variation exists in populations
    2. Populations over-produce offspring (more individuals produced than the environment can support)
    3. Competition for food, mates, nesting sites, and escaping from predators occurs
    4. Differential survival − successful traits become adaptations
    5. Differences reproduction − adaptations become more common in population

- Genetic Variation comes from mutations (random changes to the DNA), which causes errors in mitosis and meiosis. This can also be caused by UV damage.
- Sexual reproduction introduces mixing of alleles through genetic recombination, which form new combinations of alleles in every offspring. New combinations create new phenotypes.
- Evidence Darwin used:

    1. Fossil Records
        (a) Archaeopteryx, which lived roughly 150 million years ago, links reptiles to birds
        (b) Tiktaalik linked sea to land animals, as it went from swimming (no legs) to walking (4 legs)
    2. Artificial Selection
        (a) Choosing which traits are to be passed down (selective breeding)
    3. Anatomical Evidence
        (a) Looking at the limbs of humans, cats, bats, and whales, it is evident that the structures are similar.
        (b) Known as homologous structures, these kinds of structures can hint at common ancestors.
        (c) Analogous structures are structures that have similar uses, but not a common ancestor (solve a similar problem with similar solutions). Sometimes referred to as convergent evolution.
        (d) Vestigial organs are used too. Vestigial organs are structures that are left over, but are not used, from evolution (ex. human tailbone, appendix, wisdom teeth).
    4. Comparative Structures
        (a) DNA sequences are compared to determine differences between species. For example, humans and macaques have only 8 differences.
        (b) Comparative structures allow people to construct family trees.