**Evolution & Genetics Notes Part 1**

**What did Darwin’s Travels reveal?**

* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of living species was far greater than anyone had previously known!!
* These observations led him to develop the theory of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_!!

**How did tortoises and birds differ among the islands of the Galapagos?**

* Each island had its own type of tortoises and birds that were clearly \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from other islands

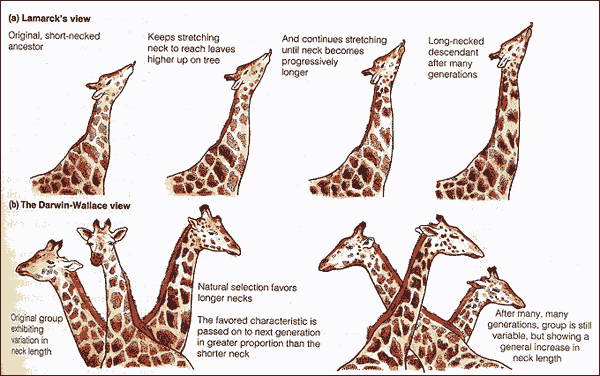
**Evolution is when organisms change over time. So, modern organisms \_\_\_\_\_\_\_\_\_\_\_\_ from ancient ones**

**Evolution is a Theory – Just like Gravity!**

* Evolution is a well-supported explanation of phenomena that have occurred in the natural world
* A theory in science is a well-tested \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, not just a guess

**Previous Theory by Lamark - Theory of acquired characteristics**

* Lamark said organisms \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ traits by using their bodies in new ways
* These new characteristics were passed to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Lamark was totally wrong!



**Darwin finally published his ideas in 1859**

* Other naturalists were \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the same theory that Darwin did.
* Even though he was afraid of the Church’s reaction to his book he wanted to get credit for his work.

**Artificial Selection**

* nature provides variation, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ select variations that are useful.
* Example - a farmer breeds only his best livestock

**Natural Selection**

* The traits that help an organism survive in a particular environment are \_\_\_\_\_\_\_\_\_\_\_\_\_\_ in natural selection

**Natural Selection and Species Fitness**

* Overtime, natural selection results in changes in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ characteristics of a population.
* These changes increase a species \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (survival rate)

**Survival of the Fittest**

* populations with the most \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ traits and ability to compete will live long enough to reproduce and pass on those beneficial traits.

**6 key points of Natural Selection and Survival of the Fittest**

* \_\_\_\_\_\_\_\_\_\_\_\_\_: living things produce more offspring than needed for the species to survive
  + Ex. Populations remain constant because only a small fraction live long enough to reproduce (food is a limiting factor)
* ­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: struggle between organisms for food, shelter, mates and living space
  + Ex. Resources for life are limited so an organisms must compete within its species and with other species to survive long enough to reproduce
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: differences (structural, molecular, and behavioral) within a species that makes individuals different
  + Ex. Individuals vary in their abilities to get food, escape enemies, or find and attract a mate
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: inherited traits that improve an organisms chances of survival and reproduction in a certain environment “Survival of the Fittest!”
  + Ex. Individuals that are better adapted to the environment will live long enough to reproduce
  + Camofluage or blending coloring
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: Individuals that have favorable traits and better adapted to survive will pass on these traits to future offspring
  + Ex. Good genes survive and bad ones are eliminated
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: A new species is formed over many generations of favorable adaptations gradually accumulate and non-favorable ones disappear.
  + Ex. So many gradual changes accumulate that a new species emerges

**Camouflage**

* Blends into the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Warning Coloration**

* Shows a predator (or prey) that they are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to eat.

**Mimicry**

* Resembles another species to gain an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ at survival

**Speciation**

* Favorable \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ accumulate
* Unfavorable disappear
  + - All changes may eventually result in a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ species

**Mutations**

* Source of genetic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* May be harmful or helpful
  + The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_could turn a harmful allele into a helpful trait

**Summary of Darwin’s Theory**

* Organisms differ; variation is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Organisms produce more offspring than survive
* Organisms \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for resources
* Organisms with advantages survive to pass those advantages to their children
* Species alive today are descended with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from common ancestors

**Evolution & Genetics Notes Part 2**

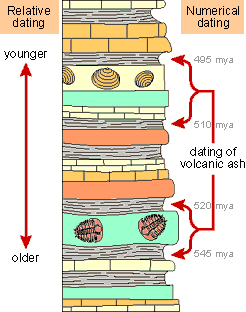
**Evidence of Evolution**

* Fossil Record
  + Law of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Theory of plate \_\_\_\_\_\_\_\_\_\_\_\_\_
* Geographic Distribution of Living Species
* Comparative Anatomy
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ structures
  + Analogous structures
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ structures
* Similarities in Embryology

**Evidence of Evolution – Fossil Record**

* Fossil Record provides evidence that living things have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Fossils show the history of life on earth and how different groups of organisms have changed over time

**Relative vs. Absolute Dating**



**Relative Dating**

* Can determine a fossil’s relative age
* Performed by estimating \_\_\_\_\_\_\_\_\_\_\_\_\_\_ compared with that of other fossils – law of superposition
* Drawbacks – provides \_\_\_\_\_\_\_\_\_\_ info about age in years

**Absolute dating**

* Can determine the absolute age in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Is performed by radioactive dating – based on the amount of remaining radioactive isotopes
* Drawbacks - part of the fossil is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ during the test

**Theory of Plate tectonics**

* A theory that states that the earth’s crust is made up of a number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_ which move over a liquid crust that get created and destroyed over time.

**Pangea**

* Two hundred million years ago (Ma), research suggests that all the continents were one large mass which was named \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Terrestrial organisms were able to migrate across all the continents and were only \_\_\_\_\_\_\_\_\_\_\_\_\_\_ by their biotic potential.

**Biodiversity**

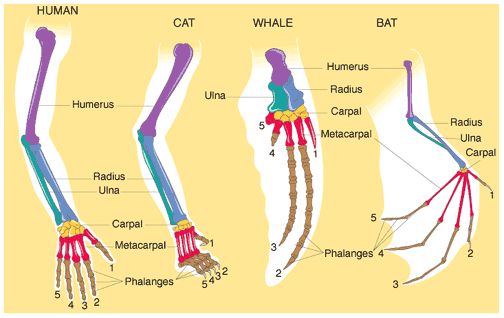
* As Pangea began to separate into separate continents 130 Ma, creating physical barriers such as seas, restricting \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to within the continents.
* Gene pools of species are separated and as they are exposed to different physical (i.e. climate) and biotic (i.e. change in predators) conditions, each portion of the species \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ differently and eventually forms new species on the separated continents.
* This process is known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Changes in physical and biotic conditions will also lead to the creation of new species increasing the diversity of habitats and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* This also provides the space for new species to evolve into these habitats.
* The end result of the separation of Pangea into today’s continental configuration is that plate tectonics has been one of the main driving forces promoting \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of organisms.

**Evidence of Evolution - Geographic Distribution of Living Species**

* Similar animals in different locations were the product of different lines of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Evidence for Evolution – Comparative Anatomy**

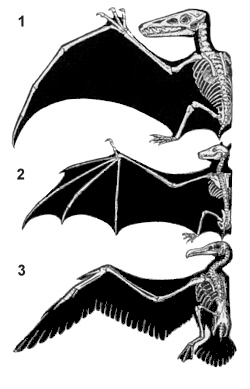
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Body Structures
  + Structures that have different mature forms but develop from the same \_\_\_\_\_\_\_\_\_\_\_\_ tissues
  + *e.g. Wing of bat, human arm, leg of turtle*



**Evidence for Evolution – Comparative Anatomy**

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ structures
  + - Similar functions, but different internal structures
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: birds and insects wings both are used for flying
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: internal structures and embryo development are very different

**Analogous Structures**



**Evidence for Evolution – Comparative Anatomy**

* + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ structures
    - remnants of structures that were once functional in an ancestor (now-reduced in size and serve little or no function
    - Examples: Tail bone: (coccyx) remnant of a reptilian tail, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, Muscles that move nose and ears
    - Whales and snakes have hind leg bones imbedded in their bodies from four legged ancestors
    - Molecular similarities-genetic DNA code and proteins

**Evidence of Evolution - Similarities in Embryology**

* In their early stages of development, chickens, turtles and rats look similar, providing evidence that they shared a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Embryological development**

