

**1 – Chapter 23**

adaptation

**2 - Chapter 23**

allele

**3 - Chapter 23**

analogous structure

**4 - Chapter 23**

biogeography

**5 - Chapter 23**

biological evolution

**6 - Chapter 23**

convergent evolution

**7 - Chapter 23**

descent with modification

**8 - Chapter 23**

empirical thought

<p>A variant form of a gene.</p>	<p>The processes and structures by which organisms adjust to short-term or long-term changes in their environment.</p>
<p>The study of the geographic distribution of extinct and modern species.</p>	<p>A trait that is the result of convergent evolution; structures have arisen independently, two or more times, because species have occupied similar types of environments on the Earth.</p>
<p>The process whereby two different species from different lineages show similar characteristics because they occupy similar environments.</p> <ul style="list-style-type: none"> <li>• analogous or convergent traits: similar structures that are not genetically related. Structures develop due to similar environments</li> </ul>	<p>The phenomenon that populations of organisms change over the course of many generations. As a result, some organisms become more successful at survival and reproduction.</p> <ul style="list-style-type: none"> <li>• Small scale: relating to changes in a single gene in a population over time</li> <li>• Larger scale: relating to formation of new species or groups of species</li> </ul>
<p>Thought that relies on observation to form an idea or hypothesis, rather than trying to understand life from a nonphysical or spiritual point of view.</p>	<p>Darwin's theory that existing life-forms on our planet are the product of the modification of pre-existing life-forms.</p> <ul style="list-style-type: none"> <li>• <b>Evolution based on:</b> Variation within a given species. Natural selection.</li> <li>• <b>Natural selection:</b> Culls out those less likely to survive and reproduce; leaves those with traits better suited to survive and reproduce</li> <li>• <b>Leads to adaptation:</b> Population's characteristics change to make its members better suited to an environment</li> <li>• Darwin's theory preceded Mendel's genetics work <ul style="list-style-type: none"> <li>• Modern synthesis of evolution</li> <li>• Natural variation caused by random changes in the genetic material</li> <li>• May be positive, negative or neutral</li> </ul> </li> </ul>

<b>9 - Chapter 23</b> endemic	<b>10 - Chapter 23</b> exon shuffling
<b>11 - Chapter 23</b> gene family	<b>12 - Chapter 23</b> homology
<b>13 - Chapter 23</b> homologous genes	<b>14 - Chapter 23</b> homologous structures
<b>15 - Chapter 23</b> horizontal gene transfer	<b>16 - Chapter 23</b> inheritance of acquired characteristics

<p>A form of mutation in which exons are inserted into genes and thereby create proteins with additional functional domains.</p>	<p>The term to describe organisms that are naturally found only in a particular location.</p>
<p>A fundamental similarity that occurs due to descent from a common ancestor.</p> <ul style="list-style-type: none"><li>• Anatomical</li><li>• Development</li><li>• Molecular</li></ul>	<p>A group of homologous genes within a single species.</p> <ul style="list-style-type: none"><li>• Gene duplication can lead to a gene family<ul style="list-style-type: none"><li>• 2 or more paralogs within the genome of a single organism</li></ul></li></ul>
<p>Structures that are similar to each other because they are derived from the same ancestral structure.</p>	<p>Genes derived from the same ancestral gene that have accumulated random mutations that make their sequences slightly different.</p>
<p>Jean-Baptiste Lamarck's hypothesis that species change over the course of many generations by adapting to new environments. He thought behavioral changes modified traits, and he hypothesized that such modified traits were inherited by offspring.</p>	<p>The transfer of genes between different species. It's a common phenomenon. It can occur between prokaryotes and eukaryotes, and is widespread among bacteria.</p>

<b>17 - Chapter 23</b> modern synthesis of evolution	<b>18 - Chapter 23</b> molecular evolution
<b>19 - Chapter 23</b> molecular homologies	<b>20 - Chapter 23</b> natural selection
<b>21 - Chapter 23</b> orthologs	<b>22 - Chapter 23</b> paralogs
<b>23 - Chapter 23</b> Population	<b>24 - Chapter 23</b> selective breeding

<p>The molecular changes in genetic material that underlie the phenotypic changes associated with evolution.</p>	<p>Within a given population of interbreeding organisms, natural variation exists that is caused by random changes in the genetic material. Such genetic changes may affect the phenotype of an individual in a positive, negative, or neutral way. If a genetic change promotes an individual's reproductive success, natural selection may increase the prevalence of that trait in future generations.</p>
<p>The process that culls out those individuals that are less likely to survive and reproduce in a particular environment, while allowing other individuals with traits that confer greater reproductive success to increase in numbers.</p>	<p>Similarities in cells at the molecular level that indicate that living species evolved from a common ancestor or interrelated group of common ancestors.</p> <ul style="list-style-type: none"> <li>• All living species use DNA to store information</li> <li>• Certain biochemical pathways are found in all or nearly all species</li> </ul>
<p>Homologous genes within a single species.</p>	<p>A homologous gene in different species.</p>
<p>Programs and procedures designed to modify traits in domesticated species.</p>	<p>A group of individuals of the same species that can interbreed with one another.</p>

<b>25 - Chapter 23</b>  species	<b>26 - Chapter 23</b>  transitional form
<b>27 - Chapter 23</b>  vertical evolution	<b>28 - Chapter 23</b>  vestigial structure
<b>29 - Chapter 23</b>  exon	<b>30 - Chapter 23</b>  <b>Study of the natural world</b> -- John Ray, Carolus Lannaeus George Buffon, Jean-Baptiste Lamarck
<b>31 - Chapter 23</b>  Charles Darwin	<b>32 - Chapter 23</b>  Uniformitarianism hypothesis from geology

<p>An organism that provides a link between earlier and later forms in evolution.</p> <p><i>T. roseae</i> is called a transitional form because it provides a link between earlier species and many later species. In this case, the fishapod is a transitional form between fish, which are aquatic animals, and tetrapods, which are usually terrestrial animals.</p>	<p>A group of related organisms that share a distinctive form in nature. Members of the same species are capable of interbreeding to produce viable and fertile offspring.</p>
<p>An anatomical feature that has no apparent function but resembles a structure of a presumed ancestor.</p>	<p>A process that involves genetic changes in a series of ancestors, which form a lineage.</p>
<ul style="list-style-type: none"> <li>• Mid- to late-1600s, John Ray was the first to carry out a thorough study of the natural world <ul style="list-style-type: none"> <li>• Developed an early classification system</li> <li>• Modern species concept</li> </ul> </li> <li>• Extended by Carolus Linnaeus</li> <li>• Neither proposed that evolutionary change promotes the formation of new species</li> <li>• Late 1700s, small number of European scientists suggest life forms are not fixed</li> <li>• George Buffon says life forms change over time</li> <li>• Jean-Baptiste Lamarck realized that some animals remain the same while others change</li> <li>• Believed living things evolved upward toward human "perfection"</li> <li>• Inheritance of acquired characteristics</li> <li>• Giraffe neck example</li> </ul>	<p>A portion of RNA that is found in the mature RNA molecule after splicing is finished.</p>
<ul style="list-style-type: none"> <li>• Slow geological processes lead to substantial change</li> <li>• Earth was much older than 6,000 years</li> </ul>	<ul style="list-style-type: none"> <li>• British naturalist born in 1809</li> <li>• Theory shaped by several different fields of study <ul style="list-style-type: none"> <li>• Geology</li> <li>• Economics</li> <li>• Voyage of the Beagle</li> </ul> </li> <li>• Formulated theory of evolution by mid-1840s</li> <li>• 1856, began writing his book</li> <li>• 1858, Alfred Wallace sends Darwin an unpublished manuscript proposing many of the same ideas</li> <li>• Darwin's and Wallace's papers published together</li> <li>• Darwin's <i>The Origin of the Species</i> is published detailing his ideas with observational support</li> <li>• Biological species change over the course of many generations</li> <li>• Hypothesized that existing life forms are the product of the modification of pre-existing life forms</li> </ul>

<p><b>33 - Chapter 23</b></p> <p>Thomas Malthus</p>	<p><b>34 - Chapter 23</b></p> <p>Observations of evolutionary change</p>
<p><b>35 - Chapter 23</b></p> <p>globin</p>	<p><b>35 - Chapter 23</b></p> <p>vertical gene transfer</p>
<p><b>36 - Chapter 23</b></p> <p>Observations of Biological Evolution: Fossil record</p>	<p><b>37 - Chapter 23</b></p> <p>Observations of Biological Evolution: Biogeography</p>
<p><b>38 - Chapter 23</b></p> <p>Observations of Biological Evolution: Convergent evolution</p>	<p><b>39 - Chapter 23</b></p> <p>Observations of Biological Evolution: Selective breeding</p>

<ul style="list-style-type: none"><li>• Fossil record</li><li>• Biogeography</li><li>• Convergent evolution</li><li>• Selective breeding</li><li>• Homologies<ul style="list-style-type: none"><li>• Anatomical</li><li>• Developmental</li><li>• Molecular</li></ul></li></ul>	<p>Thomas Malthus, an economist, says that only a fraction of any population will survive and reproduce</p>
<p>Vertical gene transfer involves evolution from pre-existing species by accumulation of mutations, gene duplications and exon shuffling</p>	<p>Globin genes coding for oxygen binding proteins</p>
<p>Unique species found on islands and other remote areas have arisen because the species in these locations have evolved in isolation from the rest of the world.</p>	<p>When fossils are compared according to their age, from oldest to youngest, successive evolutionary change becomes apparent.</p>
<p>The traits in domesticated species have been profoundly modified by artificial selection practices.</p>	<p>Two different species from different lineages sometimes become anatomically similar because they occupy similar environments. This indicates that natural selection promotes adaptation to a given environment.</p>

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Observations of Biological Evolution: Homologies--  
Anatomical

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Observations of Biological Evolution: Homologies--  
Developmental

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Observations of Biological Evolution: Homologies--  
Molecular

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<p>An analysis of embryonic development often reveals similar anatomical features that point to past evolutionary relationships.</p>	<p>Evolutionarily related species may possess homologous structures that have been modified in ways that allowed them to be used differently by each species. In some cases, such structures are no longer needed and degenerate to nonfunctional vestigial structures.</p>
	<p>At the molecular level, certain characteristics are found in all living cells, suggesting that all living species are derived from a common ancestor. In addition, species that are closely related evolutionarily tend to have DNA sequences that are more similar to each other than they are to those in distantly related organisms.</p>