SNS COLLEGE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)

Approved by AICTE & Affiliated to Anna University
Accredited by NBA & Accrediated by NAAC with 'A+' Grade,
Recognized by UGC saravanampatti (post), Coimbatore-641035.

Department of Biomedical Engineering

Course Name: 19GET277 – Biology for Engineers

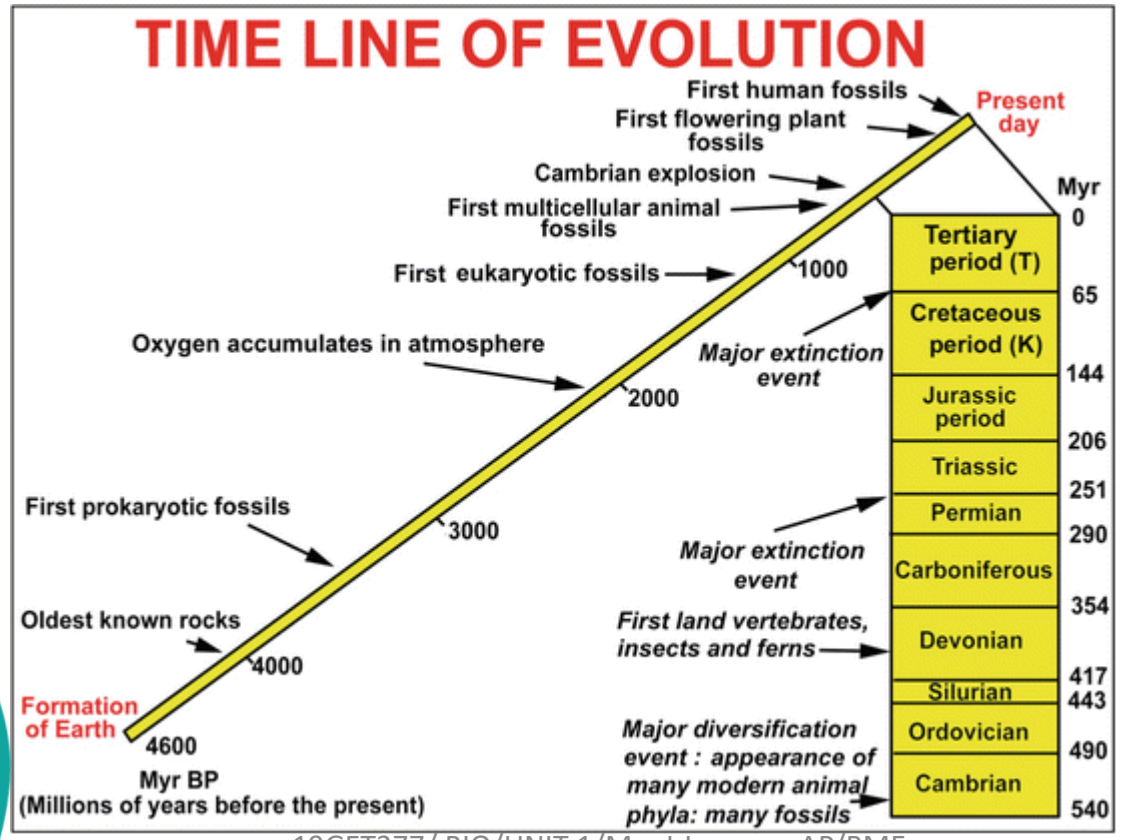
IV Year : VII Semester

UNIT III – GENETICS AND IMMUNE SYSTEM

Topic : Evolution: theories of evolution

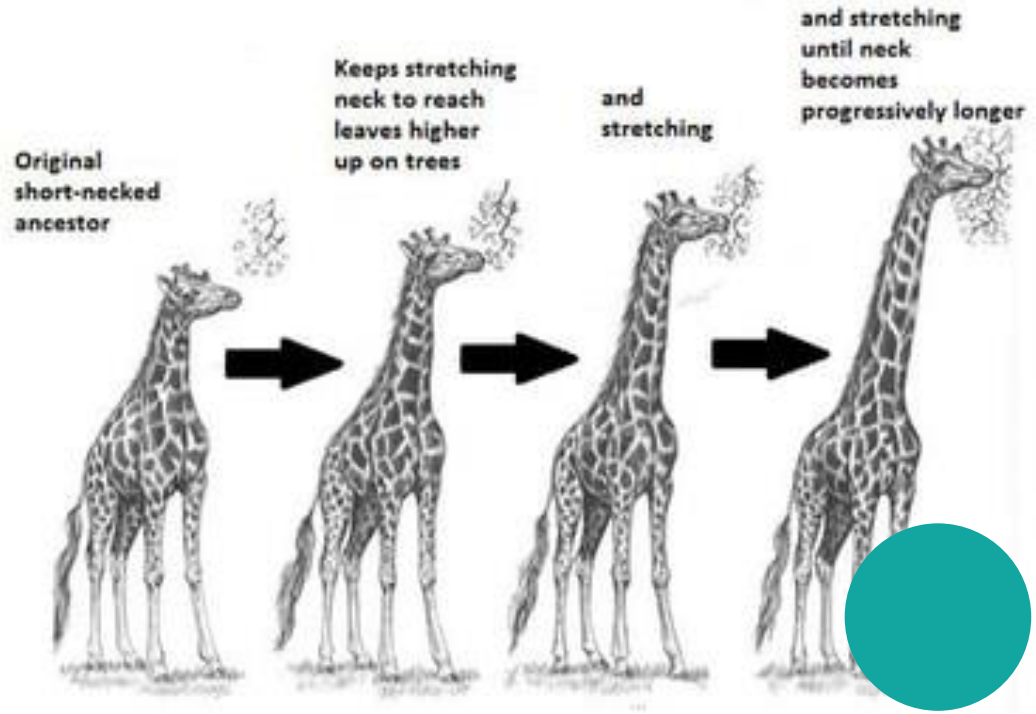
Introduction to Evolution

- Evolution is the process through which species of organisms undergo changes over time through variations in their genetic material.
- Key Question: How did life evolve on Earth?



Early Theories of Evolution

- Jean-Baptiste Lamarck (1744–1829): Proposed the theory of inheritance of acquired characteristics.
- Example: Giraffes stretching their necks leads to longer-necked offspring.Charles Darwin (1809–1882):
- Proposed natural selection as the mechanism for evolution in his book On the Origin of Species (1859).



Darwin's Theory of Natural Selection

- Key principles:**Variation**: Individuals within a population have variations.
- **Inheritance**: Some of these variations are heritable.
- **Competition**: Individuals compete for limited resources.
- **Differential Survival and Reproduction**: Individuals with advantageous traits are more likely to survive and reproduce.

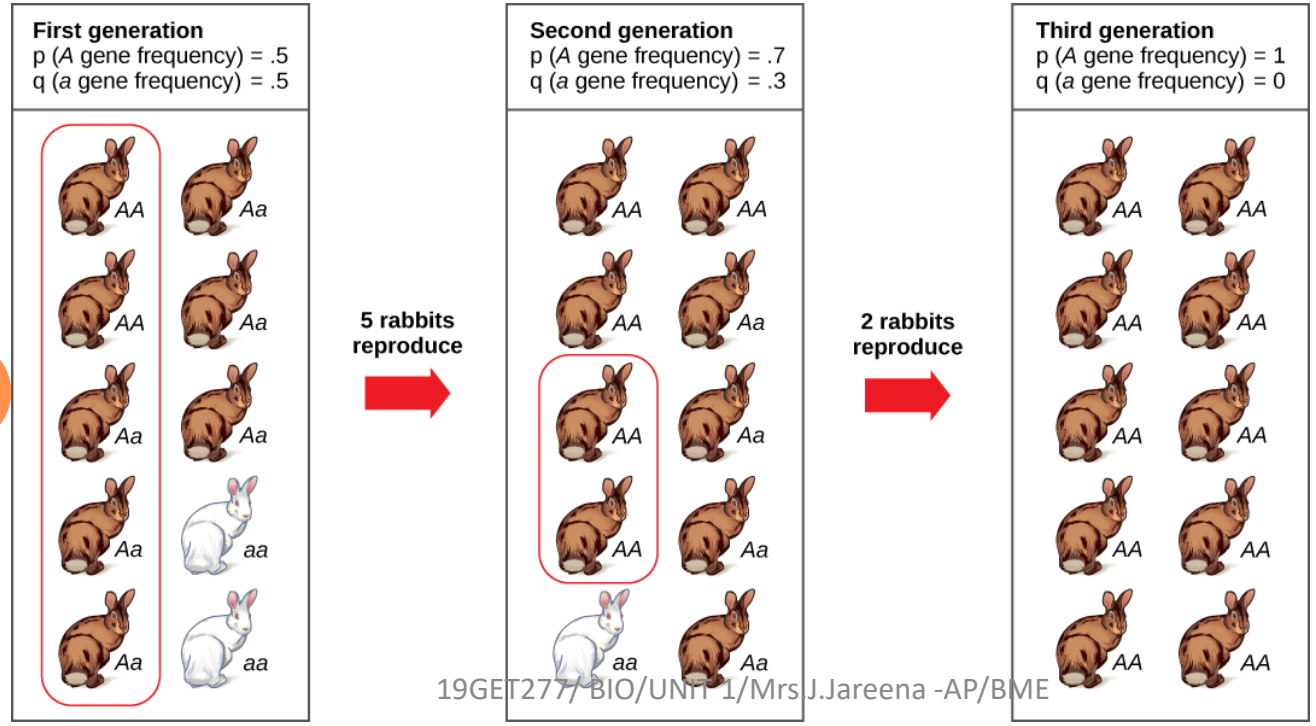
5.2 Natural selection

The image shows the changes of beak shape in the Galapagos finch to suit the different food sources available on different islands in the archipelago. Natural selection has caused one species to evolve into different, distinct species.

adapted from: http://online.itp.ucsb.edu/plecture/nurse/oh/27.jpg

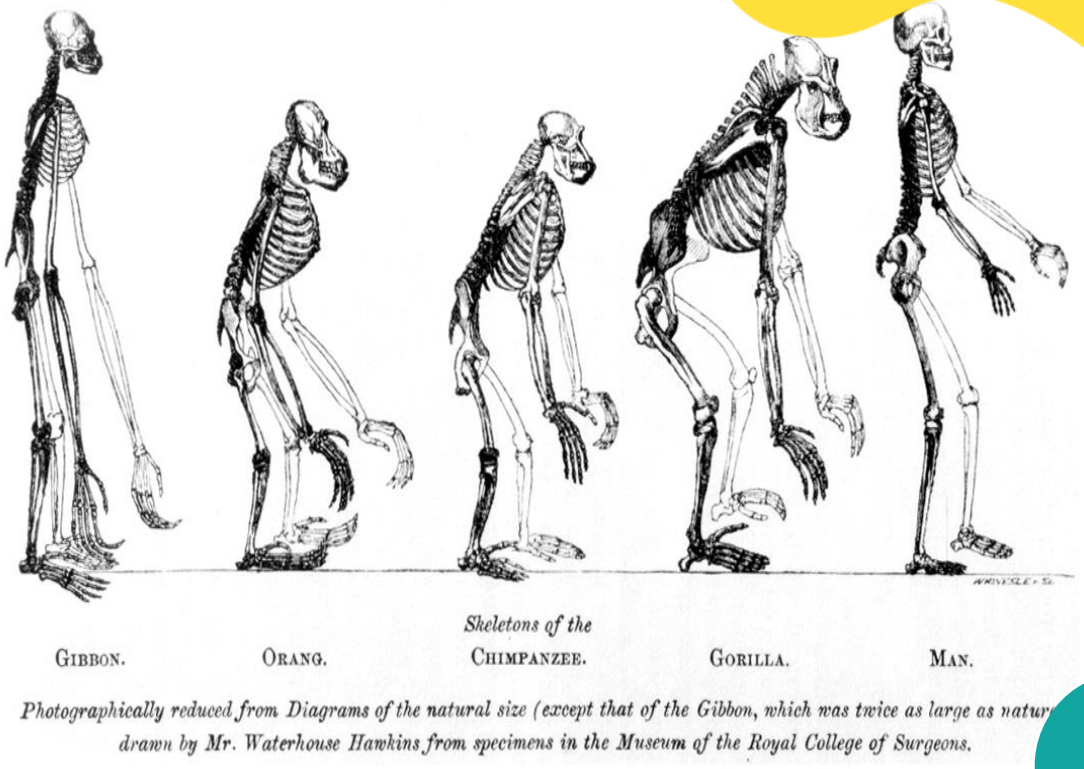
Modern Synthesis (Neo-Darwinism)

- Modern Synthesis (1940s): Combines Darwin's theory of natural selection with Mendelian genetics.
- Key idea: Evolution is a change in the frequency of alleles (genetic variants) in a population over time.



Evidence for Evolution

- **Fossil Record**: Shows changes in species over time.
- **Comparative Anatomy**: Homologous structures like human arms and bat wings.
- **Molecular Biology**: Similar DNA sequences among different species.
- **Biogeography**: Distribution of species across different continents.



Skeletons of the

Photographically reduced from Diagrams of the natural size (except that of the Gibbon, which was twice as large as natur
drawn by Mr. Waterhouse Hawkins from specimens in the Museum of the Royal College of Surgeons.

Genetic Drift and Mutation

- Genetic Drift: Random changes in allele frequency in a population, especially in small populations.
- Mutation: Changes in DNA that introduce new genetic variation into a population.

Punctuated Equilibrium vs. Gradualism

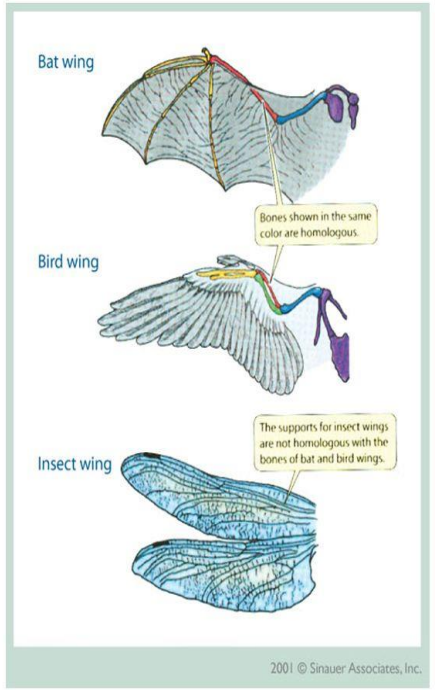
- Punctuated Equilibrium: Proposed by Niles Eldredge and Stephen Jay Gould. Evolution occurs in bursts of rapid change, followed by long periods of stability.
- Gradualism: Evolution occurs slowly and steadily over time.

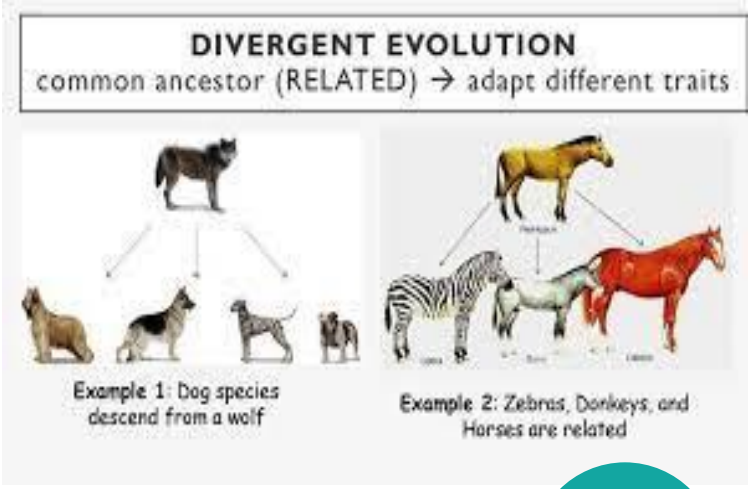
Coevolution, Convergent Evolution, a Divergent Evolution

- **Coevolution**: Species evolve in response to each other (e.g., predator-prey relationships).
- **Convergent Evolution**: Unrelated species evolve similar traits due to similar environmental pressures.
- **Divergent Evolution**: A single species evolves into multiple different species due to differing environment

Convergent Evolution

Examples...





Human Evolution

- Hominid Evolution: Evolutionary history of humans, tracing back from Australopithecus to Homo sapiens.
- Major milestones: Bipedalism, tool use, larger brain sizes.