

## Discoveries in Biology can be generalized by researching through Model systems (Animal Model/Plant Model organisms) and Fossils

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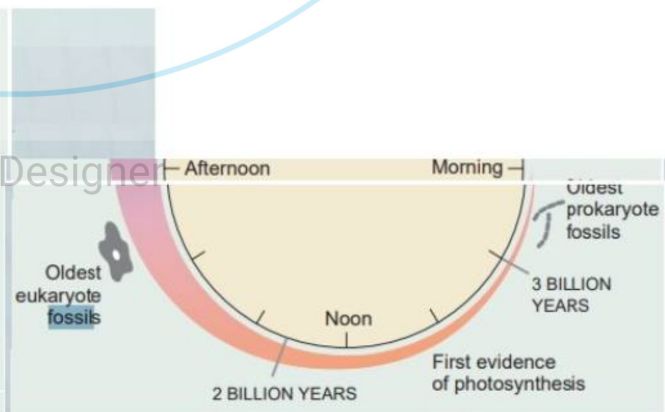
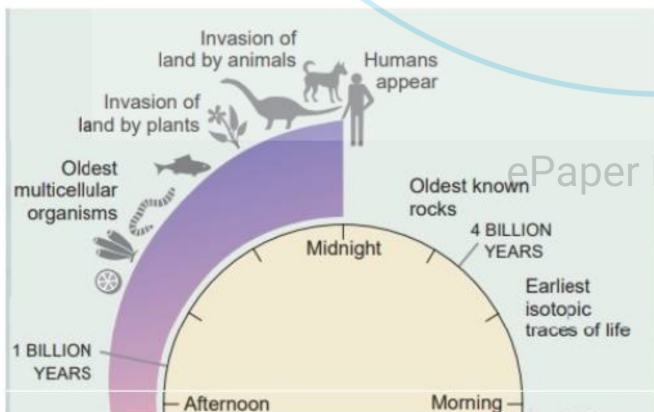
All life forms/organisms present on earth are genetically related and descent from common ancestors i.e., shares genetic code and consists of similar building blocks called cells. The knowledge gained from investigations of one type of organism can be generalized to other organisms as well. If two species are similar then they probably have a common ancestor in recent past. The common ancestor of two species that are more different then probably lived in the more distant past and if two organisms are very different, then we must go back to the very distant past to find their common ancestor. How can we tell how far back in time the common ancestor of any two organisms lived? In other words, how do we discover the evolutionary relationships among organisms? The answer to this question lies in "Palaeontology (Study of fossils or fossil records)". The preserved remains of organisms that lived in the distant past is termed as Fossils. Those who study fossils are called Palaeontologist. Geologists discovered fossils and provided knowledge about fossils and the nature of the environments in which they lived. Biologists then found the evolutionary relationships among living and fossil organisms by comparing anatomical similarities and differences between them. Frequently big gaps existed in the fossil record that was filled in by the existence of "Missing links" between two groups of organisms. Missing link had the characteristics of two groups had are now extinct. For example Archeopteryx (fossil 150 million years old) is a missing link between Reptile and Birds/Aves. It had both reptilian as well as avian characteristics. Archeopteryx is the earliest known relative of bird (Hence called Glorified reptiles because they had feathers like birds). Birds evolved

from Archeopteryx and it is a missing link between Reptiles and Aves (Birds). Molecular methods for comparing genomes enabled biologists to more accurately establish evolutionary relationship between living organisms by forensic analysis of genetic material (bone DNA) of fossil record. Recently deciphered genetic material from fossil bones of Neanderthals that led to the conclusion that even though Neanderthals and modern humans coexisted, they did not interbreed. In general, the greater the differences between the genomes of two species, the more distant their common ancestor. Using molecular techniques, biologists are exploring fundamental questions about life. like what were the earliest forms of life? How did simple organisms give rise to the great diversity of organisms that we see today? Can we reconstruct a Phylogenetic tree/family tree of life? Biologists use model systems for research, knowing that they can extend their findings to other organisms including humans. For example, our basic understanding of the chemical reactions in cells came from research on bacteria but is applicable to all cells, including those of humans. The biochemistry of photosynthesis is the process by which plants use sunlight to produce biological molecules was largely worked out from experiments on Chlorella, a unicellular green alga. Much of what we know about the genes that control plant development is the result of work on Arabidopsis thaliana (a relative of the mustard plant). Knowledge about how animals develop has come from work on sea urchins, frogs, chickens, roundworms, and fruit flies (*Drosophila melanogaster*). Recently, the discovery of a major gene controlling human skin color came from work on zebra-fish.

### Archeopteryx (Missing link): Earliest reptilian relative of bird (Key piece of evidence in the study of evolution)



Archeopteryx is genus of bird like Dinosaur that live in late Jurassic period about 150 million years ago.



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**Father of Green revolution in India: Dr. M.S. Swaminathan**

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