

Scientists and their discoveries

Objective: Investigation of the three different scientists in evolution: Charles Darwin, Carl Linnaeus, and Jean-Baptiste Lamarck, and the theories they believed in.

Introduction

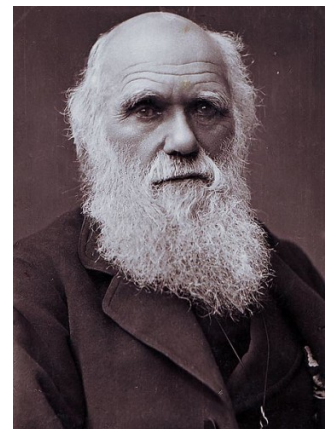
Our most recent topic was Evolution, where we looked at several revolutionary scientists who contributed to the many concepts of Evolution, such as Charles Darwin, and Jean Baptist Lamark, therefore it was the perfect opportunity to research impactful scientists that built the foundation of modern evolutionary theory.

1 Charles Darwin

1.1 Background Charles Darwin

Charles Darwin, born February 12th 1809, is an English naturalist who is famous particularly for the theory of natural selection, in which he became the foundation of modern evolutionary studies. During Victorian times, when little was known about evolution, Darwin suggested that animals and humans shared a common ancestry, in which it shocked the religious Victorian society. By the time of his death on April 19th 1882, many of Darwin's theories impacted many aspects of society, such as science, literature, economics as well as politics.

(Photo of Charles Darwin by Herbert Rose Barraud, 1881)



1.2 Charles Darwin' theory of Evolution

From Charles Darwin's theory of evolution by natural selection, many modern evolutionary theories emerged and developed. The theory of evolution by natural selection was first formulated through Charles Darwin's explanation of how organisms evolve through inheritance over generations, described in his book "*On the Origin of Species*" published in 1859. Charles Darwin's theory of evolution was based on ideas suggested by Jean Baptiste-Lamarck as well as recent fossil discoveries. Furthermore, Charles Darwin developed his theories after his many travels around many regions. Many of Darwin's ideas were used to support theories such as social Darwinism and eugenics which were widespread. His theory explained that species today had been changed over time and derived from ancestral organisms through variation and natural selection. He drew up various main components and conditions of his theory, which included:

- That variation happens randomly among the species, meaning traits differ for individuals within populations.
- Individual traits can be inherited

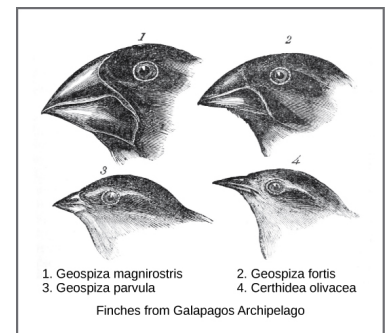
- That there would be a “Survival of the fittest”, meaning organisms which possess advantageous traits that are better adapted to conditions are more successful in reproducing and surviving.
- These advantageous traits would therefore grow in numbers, becoming more common within the population, resulting in the gradual change of the species.
- There are limiting natural factors which will restrict the growth of some populations, such as the availability of food and water.

1.3 Natural Selection and “Survival of the fittest”

The theory of natural selection focused on the concept of the “Survival of the fittest”, a phrase Darwin used to describe individuals with advantageous traits that increase their chance of survival and reproduction, resulting in these traits becoming more common within a population. Charles Darwin drew three main principles for the mechanism of natural selection. He argued that natural selection was inevitable considering the nature of evolution. The first principle was that individual traits of organisms are inherited. Secondly, he stated that more offspring are produced than the number of resources, hence meaning that there is a limit to the survival and reproduction of organisms. As there is limited availability of resources, there is competition between organisms in each generation. The final third principle was that there is a variety among offspring due to the different characteristics and variations that were inherited.

1.4 Galapagos Finches

During 1831 to 1836, Darwin travelled around the world to various places like South America, Australia and the southern part of Africa. One of his stops included the Galápagos Islands west of Ecuador, where he observed different species of organisms residing on different islands; he saw that these different species were similar yet had distinct differences. For example, the ground finches in the Galápagos Islands consisted of several species of finches with unique beak shapes. These different adaptations of beaks



allowed the birds to acquire specific food to the source. Charles Darwin observed that these seed-eating finches on the Galápagos Islands closely resembled other finch species on mainland South America. He thought that the Galápagos finches could have been derived from one of the original mainland finches.

2 Carl Linnaeus

2.1 Background of Carl Linnaeus

Carl Linnaeus is a Swedish naturalist and explorer who was born on May 23 1707. He was the first scientist who invented the system for naming organisms, which is known as binomial nomenclature. Linnaeus was born in the poor region of southern Sweden called Smaland.

Linnaeus was born in the poor region of southern Sweden called Smaland. The introduction of the French botanist, Joseph Pitton de Tournefort and Sebastian Vaillantand, and their research essay on “*plant sexuality*” by his gymnasium teacher was the root of his interest in the study of biology related to plants was initiated. Thanks to his intellectual superiority, he got accepted into Lund University School of Medicine, however, he transferred college from Lund University, studying medicine, to Uppsala University due to his financial instability. Tragically, in his new school, he was only able to attend a few lectures as he could not afford school tuition. The university professor Olof Celsius, thankfully, provided Linnaeus access to his library. From 1730 to 1732 he was able to subsidize himself by teaching botany in the university garden of Uppsala.

2.2 Linnaean taxonomy

The *Systema Naturae* (“The System of Nature”) is one of Linnaean’s published works that presents a hierarchical classification, or taxonomy, of the three kingdoms of nature including stones, plants, and animals. According to the *Systema Naturae*, he proposed that there were three groups, **kingdoms** that include animals, plants, and minerals, into which the whole of nature could fit. He divided each of these kingdoms into **classes**, **order**, **genera**, and then **species**. This was shown in Image 2, which is a biological diagram that shows Linnaeus’s classification methods.

Image 2. Linnaeus's classification table (1735).

With the application of his prior investigation, today, we only use this system to classify living things though Linnaeus included nonliving things in his mineral kingdom. The broadest level of life is now a domain. All living things can be classified in three domains: Archaea, Eukarya, and Bacteria. Within each of these domains, there are kingdoms. For example, Eukarya includes the kingdoms Animalia, Fungi, Plantae, and more. Each kingdom contains phyla, followed by class, order, family, genus, and species. This hierarchy of taxonomic ranks has survived in biology, through additional ranks, such as families, and still, people from nowadays

utilize Linnaeus's classification system to classify organisms more efficiently. Here is an example of Taxonomy classification using Linnaean taxonomy.

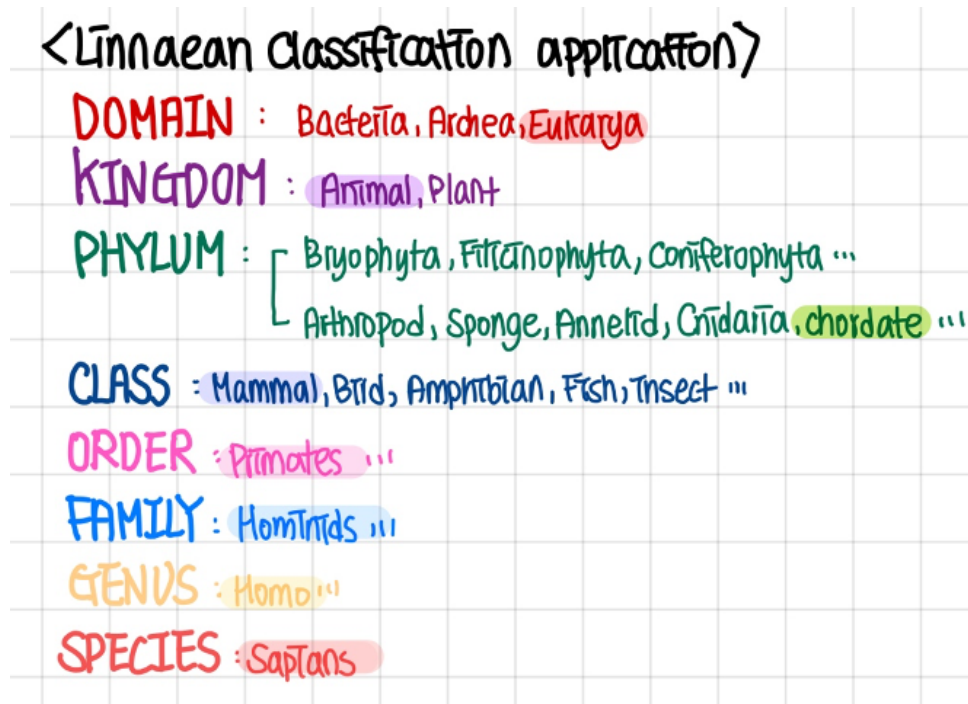


Image 3. The image that shows the application of the Linnaean Classification System

3 Jean-Baptiste Lamarck

3.1 Background of Jean-Baptiste Lamarck

3.1.1 Early Life

Jean Baptiste Lamarck was an evolutionary scientist born on the 1st of August 1744. He was born into a family of 11 children with parents who have strong military backgrounds. Lamarck was expected to take a role in the local church however, he didn't feel as if it was what he wanted to achieve in his life. Once his father died, he left his bible studies and joined the French army in Germany. After displays of courage and loyalty in the army, Lamarck was promoted to officer. After he left military life, he became a lieutenant in the command of a garrison in Monaco. At this location, some of the soldiers were indulging in physical games as a form of relaxation; however, it resulted in an accident as Lamarck fell from the life of his fellow friends. This caused inflammation in his head and the lymphatic glands in the neck and he had to be taken to the hospital for surgery. This made the situation worse, causing Lamarck to be withdrawn from the position. He was then forced to live off of a military pension thus leading to his interest being directed toward the natural sciences.

3.1.2 Natural Science

Eventually, he started reading botanical works and studying medicine with his brother. However, he slowly became more and more interested in the natural sciences and eventually, he completely abandoned medicine. At the age of 34, he studied botany for 10 years and released his paper with his fellow botanist Buffon. After this was released, he received a lot of positive feedback hence it remained his standard work for years. After retirement in 1793, he was appointed to be one of the professors at the French Museum of Natural History. After being put charged of invertebrates and categorizing the museum's collection. His system of dividing the organisms according to their species, set the standard for the modern systems of taxonomy. After a period of time in his work, he soon realized that each species vary by minute degrees. He then began to idealize the relationship with animals and transmutations of new ones.

3.2 Lamarck's theory

3.2.1 What is Lamarck's theory

Lamarck's theory of transmutation was introduced in 1809 in his most famous book *Philosophie Zoologique*. His main proposal in his theory was that there was a whole "tendency to progression". These simple terms state that creation is in a constant state or advancement. He believed that the organisms constantly improved by successive generations albeit, it was too slow to be perceived by the fossil record. According to his theory, humans were at the top of the chain of progression after passing through all stages in prehistory. However, his theory was flawed as it needed the principle of spontaneous generation thus meaning that when simple celled organisms evolved, new protozoans must've been created to replace them. Overall, the principal component of Lamarckian evolutionism was the fact that inheritance was of acquired characters. Like other theories of evolution, the structure of an organism adapts over generations. Variety in species occurred due to a parent passing down the physiological changes that it had gone through in its own lifetime which had occurred in the first place due to the animal's response to its survival needs. No part of Lamarck's theory has not been substantiated by modern knowledge of genetic inheritance, meaning that the process was just an incredible interpretation of details we could observe.

4 Bibliography

Encyclopædia Britannica, Charles Darwin. Encyclopædia Britannica. Available at:
<https://www.britannica.com/biography/Charles-Darwin>

Libretexts, B.L.T., 2020. 18.1b: Charles Darwin and natural selection. Biology LibreTexts. Available at:
[https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3AGeneral_Biology_\(Boundless\)/18%3AEvolution_and_the_Origin_of_Species/18.1%3A_Understanding_Evolution/18.1B%3A_Charles_Darwin_and_Natural_Selection](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3AGeneral_Biology_(Boundless)/18%3AEvolution_and_the_Origin_of_Species/18.1%3A_Understanding_Evolution/18.1B%3A_Charles_Darwin_and_Natural_Selection)

BioNinja, Brent Cornell. BioNinja. Available at: <http://www.ib.bioninja.com.au/standard-level/topic-5-evolution-and-biodi/52-natural-selection/natural-selection.html>

Libretexts, B.L.T., 2020. 18.1c: The Galapagos Finches and natural selection. Biology LibreTexts. Available at:
[https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3AGeneral_Biology_\(Boundless\)/18%3AEvolution_and_the_Origin_of_Species/18.1%3A_Understanding_Evolution/18.1C%3A_The_Galapagos_Finches_and_Natural_Selection](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3AGeneral_Biology_(Boundless)/18%3AEvolution_and_the_Origin_of_Species/18.1%3A_Understanding_Evolution/18.1C%3A_The_Galapagos_Finches_and_Natural_Selection)

Carolus Linnaeus: Classification, Taxonomy & Contributions to Biology. (2014, December 23). Retrieved from
<https://study.com/academy/lesson/carolus-linnaeus-classification-taxonomy-contributions-to-biology.html>.

1998. Jean Baptiste Lamarck. Jean-Baptiste Lamarck (1744-1829). Available at:
<https://ucmp.berkeley.edu/history/lamarck.html>

2020. Backyard Bird Bingo. ScienceWorks. Available at: <https://scienceworksmuseum.org/backyard-bird-bingo/#:~:text=Our%20modern%20classification%20system%20is,Fungi%2C%20Plantae%2C%20and%20more>

Mccarthy, E.M., Jean-Baptiste Lamarck. Biography - Famous Biologists. Available at:
<http://www.macroevolution.net/jean-baptiste-lamarck.html>

Famous Scientists, Jean Baptiste Lamarck. famous scientists. Available at:
<https://www.famousscientists.org/jean-baptiste-lamarck/>

PBS, Evolution: Library: Jean Baptiste Lamarck. PBS. Available at:
https://www.pbs.org/wgbh/evolution/library/02/3/1_023_01.html

Burkhardt, R. W. (2021, December 14). Jean-Baptiste Lamarck. Encyclopedia Britannica.
<https://www.britannica.com/biography/Jean-Baptiste-Lamarck>

Scoville, H., 2019. Who is Jean Baptiste Lamarck? *ThoughtCo*. Available at:
<https://www.thoughtco.com/about-jean-baptiste-lamarck-1224845>