

Lamarck's Model

Read the translated excerpt from Jean Baptiste de Lamarck's book, *Zoological Philosophy*. Based on the reading, answer these questions and be prepared to discuss them in class.

- How does Lamarck explain the diversity of organisms?

Individuals change due to environmental influences. These acquired changes are then passed on to offspring. Thus, the diversity of organisms is a result of organisms adapting to the environment because of individual needs.

- Explain Lamarck's theory of use and disuse of organs. Do you agree or disagree with his theory? Why?

If an individual uses a particular organ, the organ will become stronger, and if it is not used, the organ will weaken. The stronger or weaker organ will then be inherited by the offspring. Over time, the organs of these individuals will be modified due to their use or disuse. If an organ is disused, it may disappear in future generations.

We do not agree with the model of use and disuse as proposed by Lamarck because it suggests that the modifications an organism acquires in its lifetime can be passed along to its offspring. For example, he states that the long neck of the giraffe evolved as a cumulative product of many ancestral generations stretching higher and higher. However, we know that there is no evidence to support that acquired characteristics are heritable.

- Do you think Lamarck was a good scientist with good scientific explanations? Why or why not?

Lamarck was a good scientist in that he proposed scientific explanations based on keen observations and the information he had available at his time. Without an understanding of genetics and heredity, Lamarck proposed a theory to explain the diversity of life that was logical and coherent.

- Explain Lamarck's viewpoint when he states, "Nothing of all this can be considered as hypothesis or private opinion; on the contrary, they are truths which, in order to be made clear, only require attention and the observation of facts."

Lamarck believed that his theory was correct based on the observations he made. While biological evolution is a fact and the great diversity of organisms is a fact, how we explain it scientifically is a theory which is developed from observations and the knowledge we have.

Wallace's Model

Read the excerpt from Alfred Russel Wallace's paper, *On the Tendency of Varieties to Depart Indefinitely from the Original Type*. Based on the reading, answer these questions and be prepared to discuss them in class.

- Wallace claims, "Useful variations will tend to increase, unuseful or hurtful variations to diminish." How does this occur? What evidence does he cite?

Wallace is referring to individuals with variations that affect their ability to "prolong their existence." Those varieties of individuals with capacities to prolong their existence will outlive those varieties of individuals with capacities that hinder their ability to procure food, or avoid enemies, etc. One example he gives is that of passenger pigeons with weaker wings than other pigeons. As a result of the weaker wings, these pigeons may not be able to procure food as well as other pigeons with stronger wings, leading to a decrease in the number of weak-winged pigeons in the population.

- How does Wallace's explanation differ from Lamarck's?

Wallace argues that changes in species are not a result of specific individual needs of organisms to adapt to their environment. Rather, he states that some qualities of an individual may allow it to outlive another individual without those qualities. The first individual will therefore pass on these qualities to its offspring.

- Do you agree with Wallace's critique of Lamarck's hypothesis and his own hypothesis about "the struggle for existence?"

Wallace's critique of Lamarck's hypothesis is accurate. His own hypothesis about "the struggle for existence" is also accurate and refers to the theory of natural selection.

Darwin's Model

Read the excerpt from Charles Darwin's book, *On the Origin of Species*. Based on the reading, answer these questions and be prepared to discuss them in class.

- What led Darwin to formulate his idea about the origin of species? On what did he base his explanation for his ideas about the origin of species?

Darwin's experience as a naturalist aboard the H.M.S. Beagle exposed him to the many living organisms distributed throughout South America. Darwin observed that there appeared to be a relationship between the physical features of species and their physical environments including geological features. Darwin also observed coadaptation of species, which could not be explained from the standpoint of independent creation. From these observations, Darwin determined that species did not arise independently; rather species are descendents of other species.

- Describe the relationship of Lamarck's and Wallace's work to Darwin's work.

Darwin refuted Lamarck's hypothesis that individuals change to meet needs due to environmental stress and that these acquired characteristics are passed on to offspring. Wallace and Darwin independently developed their theories and Darwin presented his findings with Wallace.

- What data does Darwin rely upon for his argument?

Darwin draws upon his observations as well as his readings and understanding of embryological and physical similarities among animals, their geographical distribution, and the geologic history of the earth. He also refers to co-adaptation between two species and a study of artificial selection/selective breeding.