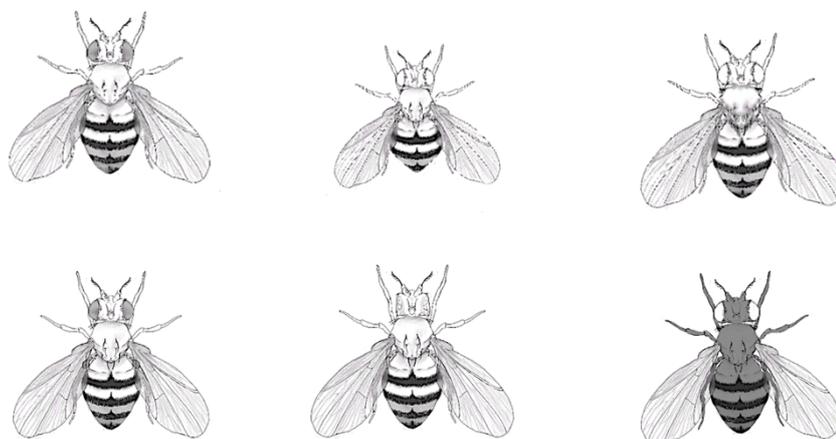


What evolution is.

By Lars Eicholt

Named after the book „What evolution is“ (2002) by evolutionary biologist Ernst Mayr (1904-2005), this column aims to inform on concepts, theories and philosophical currents in the field of evolution.

The Modern Evolutionary Synthesis



Drawing by Angelica Coculla

When you think about the theory of evolution, one name pops up in your mind: Charles Darwin. Charles Darwin (1809-1882), also known as the founder of evolutionary theory, since he was the first one to propose the idea that species evolve over time through a process called natural selection. Natural selection is the process by which organisms better adapted to the environment are more likely to survive and reproduce, leading to the gradual evolution of species over time. Darwin formulated his theory after his famous voyage on the HMS Beagle, where he collected evidence of various species and observed how they changed over time. In 1859, he published the "On the Origin of Species", which detailed his theory of natural selection and how it could explain the diversity of life on Earth. Darwin's work was groundbreaking and it influenced the scientific community's understanding of evolution and the natural world. What was yet lacking in Darwin's theory was an explanation of how traits are inherited.

This is one of the key insights of the modern evolutionary synthesis. It recognizes the role of genetics in evolution as the mechanism of inheritance. This was largely due to the rediscovery of Gregor Mendel's (1822-1884) work on genetics and the development of population genetics, which showed that evolution could be understood in terms of changes in the frequencies of genes in populations. Modern evolutionary synthesis, also known as the Neo-Darwinian synthesis, refers to the integration of Darwin's theory of evolution by natural selection with genetics. This integration took place in the early 20th century and is considered the prevailing theory of evolution today.

The modern evolutionary synthesis is a comprehensive theoretical framework that explains how evolution occurs through the interaction of genetic variation and natural selection. Genetic variation is the result of mutations and genetic recombination and lead to phenotypic variation. Those variations are as well the raw materials for natural selection to act upon, leading to the survival and reproduction of those individuals with advantageous traits. Over time, this process leads to the evolution of species. Another important aspect of the modern evolutionary synthesis is the idea of evolutionary mechanisms, such as mutation, genetic drift, and gene flow. These mechanisms can have different effects on evolution, with mutation providing the raw material for evolution, genetic drift leading to random changes in gene frequencies, and gene flow exchanging genes between populations.

The modern evolutionary synthesis has also been expanded to include new findings in molecular biology, ecology, and behavior. For example, the study of molecular evolution has revealed the evolution of genes and proteins at the molecular level, while research on evolution and ecology has shown the interactions between species and their environment. It has been constantly refined and expanded to incorporate new findings from various fields of biology, and continues to provide a framework for understanding the evolution of life on Earth and maybe beyond.