Evolution

Evolution is a general term for the gradual development of a system. It can be living or non-living systems. The process of the emergence of living systems from non-living systems is described by protobiology.

Biological evolution

The term biological evolution is used for living systems. Biological evolution has three stages: abiogenetic, autoreproductive and cellular.

- **Abiogenesis**: this stage describes the formation of more complex compounds (biopolymers) from simple compounds (CO_2, N, H, CH_4, NH_4) and water vapor - all this with the help of electrical discharges and ionizing radiation in anoxic conditions.
- **Self-replicating**: describes the evolution of systems that were capable of self-replication and basal metabolic activity.
- **Cellular**: systems were capable of reproduction and more complex metabolism such as phototrophy, chemolithotrophy and heterotrophy. Cells already had more complex cellular structures and genetic apparatus.

Autotrophy appears to be a simpler metabolism, but probably arose secondary to organisms exhausting all organic compounds.

Characteristics of the products of biological evolution

Biological evolution is a process to which only living systems, sufficiently complex, capable of competition, variability and heredity, can undergo. Some of the basic terms that are good to know are:

- **Complexity** – degree of organization of the resulting system (the longer the formula for describing the given system, the more complex the system is).
- **Diversity** - refers to the number of species in a certain area.
- **Disparity** – refers to the diversity of body structures and life forms.

Mechanisms of biological evolution

Evolution has many mechanisms by which it works:

- **Selection** - the so-called natural selection, is the process of uneven transfer of alleles to the gene pool of other populations.
- **Genetic drift** – a random mechanism that changes the frequency of alleles in the population and fixes alleles (reduces polymorphism).
- **Genetic draft** – there is a drift and fixation, or elimination of neutral mutations together with positive or negative mutations (reduces polymorphism).
- **Gene flow** – a mechanism where genes are transferred between populations using migrants (increases polymorphism).
- **Evolutionary moves** – mechanisms of genetic information change. There is a mutational, reparative, molecular and meiotic drive.

Evolution of genes and genome

New genes arise from existing genes = existence of genetic families and superfamilies in genomes.

Gene family = group of homologous genes with mostly similar function (MHC, opsins, ...)

1. First, the gene must be duplicated by uneven crossing-over, or fusion and splitting of genes, rearrangement of exons, retrotransposition may occur.
2. The fate of the duplicate - it can become a pseudogene (neutral mutation, loses function) or it can have the same, partial or completely new function.

Evolutionary concepts

- Cladogenesis – splitting of developmental lines.
- Anagenesis – changes in characters at level 1 of the developmental line.
- Microevolution - evolution at the species level.
- Macroevolution – evolution above the species level (e.g., entire strains of organisms).

Cultural evolution

Cultural evolution has a number of common features with biological evolution. Genu is an analogous meme (e.g., a well-known song). A meme is passed on by imitation (analogy to copying). However, the difference compared to biological evolution is the possibility of transmitting memes by horizontal transmission (biological evolution uses vertical transmission - from parent to offspring) and the transfer of memes between species. However, the main difference compared to biological evolution is the preferential creation of purposeful memes, whereas mutations arise randomly in direction (beneficial ones do not arise preferentially).

Various evolutionary theories

One of the first theories of evolution was presented by Jean-Baptiste Lamarck (Lamarckism). Lamarck assumed that changes are caused by changes in the environment and are transmitted directly to offspring (this is not possible due to the Weismann barrier). A well-known example is with the giraffe, where Lamarck tried to demonstrate that its long neck arose as a result of reaching for food. Each stretch was passed on to the offspring and it follows that their necks have lengthened so much.

Charles Robert Darwin came up with the theory of natural selection, which assumes that the one with the most favorable genetic makeup is most likely to reproduce and thus pass on its good genes to future generations.

Clinton Richard Dawkins, a professor who worked at Oxford until 2008, came up with the idea that individuals do not compete with each other, but genes that try to spread as much as possible through their carriers (organisms). He thus created the theory of the selfish gene.

It is also worth mentioning the Czech scientist, professor from the Faculty of Natural Sciences of the Charles University, Jaroslav Flegr, who recently came out with the book "Frozen Evolution, or it's Different, Mr. Darwin". In it, he presents the hypothesis that the entire evolution takes place only 2% of the time of a species' existence (e.g., after part of the population has split off), the rest of the time the organisms are frozen and do not evolve. However, his theory is also met with questioning criticism.

Links

External links

- Evoluce (česká wikipedie)
- Evolution (anglická wikipedie)

Reference

1. Jiří Heřt: Flegr versus Darwin. Book review on the website of the Czech Sisifos Skeptic Club

References

- FLEGR, Jaroslav. *Introduction to Evolutionary Biology.* 1. edition. Prague : Academia, 2007. ISBN 978-80-200-1539-6.

- FLEGR, Jaroslav. *Frozen Evolution, or, It's Different, Mr. Darwin.* 1. edition. Prague : Academia, 2006. ISBN 978-80-200-1526-6.

- ROSYPAL, Stanislav. *New overview of biology Stanislav Rosypal.* 1. edition. Prague : Scientia, 2003. ISBN 978-80-86960-23-4.