Origin and development of species

Most modern **theories of the origin of life** on Earth assume that living systems arose **autochthonously**, by gradually increasing the organization of "inanimate matter".

There are also several older theories for the origin of life on Earth:

- **A creationist theory** that describes the origin of life through the intervention of a higher power.
- **The theory of panspermia** , which describes the bringing of life from another region of the universe.

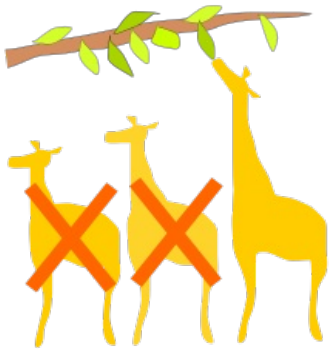
All hypotheses existing today are variants based on simple postulates:

1. Non-biological formation of organic compounds and simple biopolymers (especially peptides and peptidonucleotides).
2. The association of molecules of organic substances based on physical or physico-chemical processes into a limited system with a relatively stable structure.
3. The emergence of primitive metabolism and the self-reproduction capacity of these systems based on the fixation of free energy and biochemical memory.

The development of living systems includes **the prebiotic stage** , which represents chemical development and the emergence of a certain degree of organization, and **the biotic stage** , which includes the emergence of the most primitive living systems (eobionts) and their development into evolutionarily primitive cells.

Kind

Species is one of the basic categories of the organization of living systems. This is a set of individuals who are capable of reproducing fertile offspring and agree in certain molecular-biological characteristics of the genotype. Observing the development of species in recent and fossil records is a concrete picture of how living nature has developed and is developing. If we assume that life is monophyletic, i.e. that all species arose from a single base, then the number of existing species arose through gradual differentiation (divergence).



Natural selection according to Lamarck, but in reality it does not work 100% this way.

One of the important criteria for defining a species is **reproductive isolation** —that is, the fact that individuals of the same species produce fertile offspring when crossed, but not with individuals of another species (interspecific hybridization is possible, but hybrids are not fertile). The species are therefore separated from each other by a reproductive barrier. This barrier is created mainly by the action of selection factors that change gene of the population. For example, if a population is divided into subpopulations that are under the pressure of other selection factors, and as a result of isolation, their gene pool will begin to develop in different directions and may even lead to the emergence of a new species.

Reproductive isolation mechanisms (RIM)

Preventing effective reproduction is ensured in several ways. **We distinguish external** (geographical, temporal) and **internal** (prezygotic – pre-copulatory, post-copulatory and post-zygotic) mechanisms .

Prezygotic barriers

Pre-copulatory reproductive barriers – include mutual sexual disinterest of different species (unattractiveness), separation of time suitable for mating or incompatibility of copulatory organs.

Post-copulatory reproductive barriers – gametes meet, but are incompatible, fertilization of the egg will not occur.

Postzygotic barriers

These barriers include zygote mortality, non-viability of F1 hybrids (due to, for example, the lethality of certain gene combinations, polyploidy, etc.) or sterility.

Origin of species - speciation

We distinguish several types of speciation:

Other important types of speciation are:

- **Stasipatric speciation**, which arises from a sudden major change, causing a reproductive barrier. From that moment on, the species cannot interbreed and continue to evolve separately. An example can be the

formation of a reproductive barrier by Robertsonian translocation.
- **Extinction speciation**, which results from the extinction of part of a large population and the subsequent separation of a marginal population and the interruption of gene flow to it.

Another division of speciation

We can further divide speciation into:

- **cladogenesis** – splitting of individual species gradually from one ancestor,
- **anagenesis** ((phylogenetic speciation) – the emergence of changes in one non-dividing species,
- **syngenesis** – the emergence of one species from two originally different ones. We further divide it into:
  - *symbiogenesis*– two species living originally in the form of symbiosis, which gives rise to a multicellular organism (for example, the formation of eukaryotes by incorporating originally prokaryotic mitochondria),
  - *interspecies hybridization* – an individual is created by crossing two closely related species (for example, different species of jumpers). This individual (**klepton**) can further reproduce only with members of the parental generation.

Development of a living system - evolution

🔎 *For more information see Evolution.*

As a result of selection, gene drift and other mechanisms, the development of living systems occurs. The goal of evolution is great genetic variability - in the event of a natural disaster or a change in conditions, selection acts only against part of the population. Carriers of advantageous mutations survive and pass on this change in genetic information. We call this principle **natural selection**.

Links

Related Articles

- Evolution
- Human evolution
- Migration, Selection, Genetic drift

External links

- Masarykova univerzita v Brně. *Speciace* [online]. [cit. 2016-02-12]. <https://is.muni.cz/el/1431/jaro2008/Bi8150/um/Evol11.txt>.
- Masarykova univerzita v Brně. *Sympatrická a parapatrická speciace* [online]. [cit. 2016-10-21]. <https://is.muni.cz/el/1431/jaro2010/Z0005/18118868/index_book_2-6-2.html>.
- FVHE a FVL VFU Brno. *Evoluční biologie* [online]. [cit. 2016-10-21]. <http://www.zoologie.frasma.cz/Evolucni%20biologie/Evolucni%20biologie_C.html>.
- ŠTEFÁNEK, Jiří. *Medicína, nemoci, studium na 1. LF UK* [online]. [cit. 11.02.2010]. <https://www.stefajir.cz/>.