Atop Nazaretyan
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Akop Nazaretyan's contributions to the big history research

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The two main starting points of Nazaretyan's theory of evolution

1. How is evolution from simple to complex possible at all, while the universal Second law of thermodynamics prescribes movement from complex structures to chaos?
   How does the Second Law fit in with progressive evolution, and what is the role of the Second Law in evolution?

2. Darwin's theory describes how natural selection leads to the adaptation of life to its environment.
   But high adaptation is not the same as high complexity.
   Why does evolution create more and more complex objects?
   In other words: why the evolution is progressive?

- Nazareth's theory of evolution addresses primarily the largest evolutionary shifts in the history of the World-system. Such evolutionary shifts or revolutions are called ***phase transitions*** of the World-system.

- Some parts of Nazaretyan's theory of evolution can be adapted also to more local evolutionary events, like speciation.

- In the present presentation, evolutionary steps or jumps mean mainly the largest events - phase transitions of the World-system.

There are a number of notions that taking together represent a main frame of the Nazaretyan's theory of evolution

Endo-exogenous crisis of Nazaretyan

- In the course of maintaining its homeostasis (“sustainable disequilibrium” in terms of Akop Nazaretyan), the evolving system dumps entropy into the environment, leading to its degradation.

- At some point, the habitat deteriorates so much that it threatens the existence of the evolving system itself.

- This is an endo-exogenous evolutionary crisis: they have external manifestations in the form of damage of the environment (exo-) but have an internal origin (endo-).

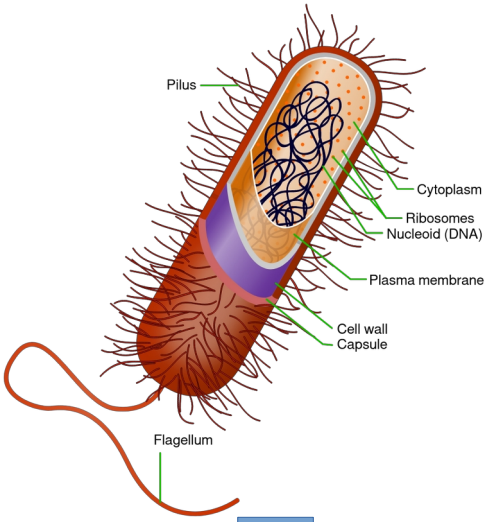
- To get out of the crisis, a subsystem must be found that can maintain "sustainable disequilibrium" at a higher level, and therefore it must be more complexly organized than the systems of the previous level of evolution.

- If a more highly organized subsystem is found, the crisis is overcome and a progressive step of evolution takes place

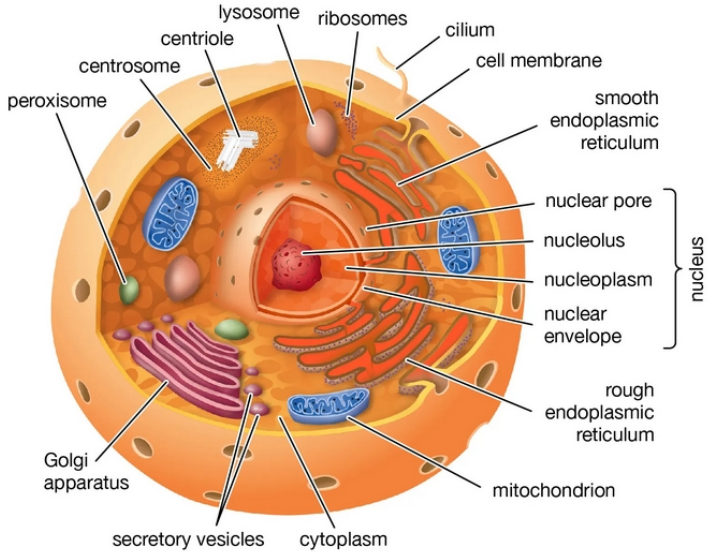
- If such a subsystem is not found, the system will die or degrade.

Example 1: Neoproterozoic Revolution, 1.5 billion years ago

prokaryotes



eukaryotes



- Life appeared on Earth in the form of a biosphere of very simple unicellular creatures - prokaryotes about 4 billion years ago.
- Prokaryotes were anaerobic creatures and gave off oxygen as their poisonous waste product.
- The atmosphere of the Earth was enriched with oxygen by prokaryotes and prokaryotes began to die out about 1.5 billion years ago. This was the first ecological catastrophe in the Earth history and it was caused by the vital activity of prokaryotes.
- 2.5-2 billion years ago, more complex unicellular creatures appeared - eukaryotes, for which oxygen was a necessary component of the environment. But there were very few of them, they lived in marginal ecological niches (probably – near oxygen bubbles in bacterial mats).
- When 1.5 billion years ago prokaryotes began to die out or go into anaerobic ecological niches, and the atmosphere was enriched with oxygen, eukaryotes became the leaders of evolution, and the revolution of eukaryotes has happened

Example 2: Neolithic revolution, 12 thousand years ago

The Upper Paleolithic

The Neolithic

- By the end of the Upper Paleolithic (40 - 12 thousand years ago), hunting technologies were so developed that the entire megalithic fauna, which served as the basis for the life of primitive people, was completely destroyed.
- Hunger has come. Man undermined the basis of his own existence, there was a severe demographic crisis. The human population has decreased several times. It was a crisis of the appropriating form of economy.
- Already during the Upper Paleolithic, the first animals (dogs, for example) were domesticated and the beginnings of agriculture appeared, initially mainly for ritual purposes.
- In the context of the crisis of the appropriating form of economy, it turned out that agriculture and animal husbandry, which were already known, could become a new basis for people's existence. Producing forms of economy began to dominate, and there was an agrarian revolution.
  The population began to grow rapidly again.

Important:

- The Neoproterozoic revolution took place in the phase of biological evolution;
- The Neolithic Revolution took place in the phase of social evolution;
- In both cases, mechanism of the crisis and the subsequent revolution were very similar.
- In both cases the activity of some system of the upper level of evolution leads to the degradation of the habitat, but there is a new subsystem (a new form of life, a new form of activity) that is able to maintain homeostasis of the life in new conditions, at higher level.
- In both cases, there is an endo-exogenous crisis, overcoming which takes the evolving system to a new level — it is a progressive jump in evolution.
- According to Nazaretyan, a progressive jump in evolution is exactly a transition to maintaining a “sustainable disequilibrium” at a new and higher level, which also brings more complex systems to the leaders of evolution.

Techno-humanitarian mechanism of Nazaretyan's endo-exogenous crisis (crisis of techno-humanitarian balance)

- The crisis of the techno-humanitarian balance is a special case of the general endo-exogenous crisis, characteristic for the social stage of evolution.
- The growth of technology leads to increase in the destructive power of weapons and an increase in the ability of people to destroy the environment.
- The lethal force of weapons and the ability to destroy habitats are growing faster than the growth of cultural restrictions of these negative factors.
- When cultural restrictions of the destructive use of technology lag too far behind the growth of technology, a techno-humanitarian crisis occurs, which is a special case of the general endo-exogenous evolutionary crisis.
- The crisis is resolved through the emergence of new cultural restrictions (“domestication of technology”, in terms of the Nazaretyan), which brings the social system to a new level of development with a more complicated level of social regulation (Neolithic Revolution is an example).

Law of Techno-Humanitarian Balance of Nazaretyan

The level of cultural restrictions of the destructive power of technology grows along the level of technology itself and evolves in parallel with it.

- This leads to a synchronous evolution of technology and human morality.
- Morality is not an a priori constant given from above or immanent in the human race, but is a product of evolution, dependent on time, like all evolving entities.
- This is represented, in particular, in the long-term decline in the specific level of bloodshed in military clashes (per capita), despite the growth of the destructive power of weapons.
- Local social systems that strongly violate the techno-humanitarian balance have repeatedly dropped out of evolution (as, for example, Hitler's Germany). There are many other examples.
- Until now, the law of techno-humanitarian balance has been fulfilled globally on Earth.
- Excessive violation of this law in modern conditions can lead to the death of the Earth civilization in the process of self-destruction, either in a military conflict or in an ecological catastrophe.

Nazaretyan's redundant diversity rule

- This rule describes exactly how the endo-exogenous crisis is overcome.
- The subsystem that provides the possibility of transition to a higher evolutionary level when overcoming the endo-exogenous evolutionary crisis does not arise at the moment of this transition, but is selected from the pool of redundant diversity in the evolving system of the previous level.
- **Redundant diversity systems** are those that did not play a significant role in homeostasis in the previous phase of evolution, providing, however, a large variety of actually useless or slightly harmful features and functions.
- It follows from the rule of redundant diversity that the more diverse the evolving system is, the more chances it has to successfully overcome the next evolutionary crisis.
- In the act of choosing a progressive system from an redundant diversity, there is no any teleology, it is only a variant of the work of natural selection but in the situation of evolutionary crisis. It may be called as ”crisis macroselection”.
- ***Therefore***, progressive evolution is not the result of the realization of some “aim of evolution”, but is simply a consequence of the immanent desire of life for self-preservation.

Nazaretyan's Law of Delayed Dysfunction

- **Any progressive step in evolution sooner or later leads to problems for the system in the form of a new evolutionary crisis. There are no absolutely good and eternal solutions in the evolution.**
- Explanation: Since the system that provided the progressive step of evolution maintains a higher level of disequilibrium, doing more and more intense anti-entropy work, then, simply in accordance with the second law of thermodynamics, this leads to an accelerated increase of entropy in the environment of the system.
- This causes new endo-exogenous crisis.
- An accelerated increase of entropy in the environment means an earlier arrival of the next endo-exogenous crisis. Therefore, evolution must go with acceleration (up to certain limits - see the presentation by Andrey Korotaev). This conclusion was made by Nazaretian before anybody received quantitative confirmation of this acceleration.
- A delayed crisis will not necessarily be strictly next in line of the evolution.
- Example: The emergence of agriculture in the Neolithic revolution, on the one hand, saved the hunters and gatherers of the Upper Paleolithic from extinction, on the other hand, it led to a severe agrarian crisis in the late Middle Ages. But between these events, there were other global endo-exogenous crises of a predominantly techno-humanitarian nature, for example, the crisis of excessive bloodshed in wars associated with the emergence of iron processing technology, etc.

Sedov-Nazaretyan's Law of Hierarchical Compensations

- The problems associated with this law were considered in the works of E.A. Sedov in the late 1980s. The final formulation of the law was given by Nazaretyan in the preface to the posthumous article by E.A. Sedov in 1993.
- Meaning of the law: A high price has to be paid for all the progressive steps of evolution.
- Precise formulation: **The growth of diversity at the top level of the hierarchical organization of an evolving system is ensured by the restriction of diversity at the previous levels, and vice versa - the growth of diversity at the lower level destroys the upper level of organization.**
- Evolutionary progress necessarily comes at a price in the form of less diversity at the hierarchically lower levels of the organization.

Examples:

- The dominance of eukaryotes after the Neoproterozoic revolution drastically reduced the diversity of the prokaryotic fauna.
- The development of modern civilization reduces the diversity of the animal world on the Earth.

The concepts connected to Nazaretyan name

- Endo-exogenous crisis of Nazaretyan
- Techno-humanitarian mechanism of Nazaretyan's endo-exogenous crisis
- Law of Techno-Humanitarian Balance of Nazaretyan
- Nazaretyan's redundant diversity rule
- Nazaretyan's Law of Delayed Dysfunction
- Sedov-Nazaretyan's Law of Hierarchical Compensations

These concepts represent the main frame of Nazareth's theory of evolution, but, of course, do not exhaust his contribution to the Big History. There are his enormous pedagogical and organizational work, his brilliant and witty critical reviews of literature, etc.

Final notes

- Nazarethian's theory of evolution gives a rather approximate qualitative picture, requires a development of details and some critical analysis, but it represents a reliable foundation for further development in understanding the causes and paths of evolution.

- It is important that the theory was constructed in an inductive way on the basis of a generalization of the available facts about life on Earth since its appearance 4 billion years ago to the present day.

- It is not known now whether the theory allows extrapolation to the distant "post-sigular future" of human civilization, since the pace of evolution should change significantly in the near future (see the report by Andrey Korotaev), and the laws of evolution themselves may change.

- However, even if the laws of evolution change, Nazaretyan's theory will help to better understand the cause and meaning of these changes.

Thank you!