EDITORIAL

Investigation of symmetries of natural systems is one of the most effective methods of cognitions of the nature. Due to the efforts of many generations of scientists, modern science knows that deep knowledge about phenomenological relations of symmetry among separate parts of a complex natural system can tell much important things about an evolution and mechanisms of this system. Modern physics and other natural sciences have a great number of successful applications of a symmetry method. The latter is considered, in addition, one of the most ancient methods of theoretical investigation. Since ancient times theoretical doctrines about structures of the world worked for a symmetric classification of natural systems and for presentation of their knowledge in symmetrical schemes of square tables, symmetrically divided circular patterns, etc. Investigations of symmetries are most relevant in that case when science does not know how to create a theory of a concrete natural system.

Principles of symmetry got a new essential quality in modern science additionally. They became simultaneously as one of the bases of modern mathematical natural science. In our days, many physical theories, from the theory of relativity and from quantum mechanics, are created as theories of invariants of mathematical groups of transformations, in other words as theories of special kinds of symmetry.

Biological organisms belong to a category of very complex natural systems. Multiformity of organisms is very numerous. Their sorts differ from each other vastly by many aspects: by their sizes, appearances, kinds of motions, etc. But to the surprise of humanity, molecular genetics have discovered that from a molecular-genetic viewpoint all organisms are equivalent to each other by their basic genetic structures. Due to this revolutionary discovery, a great unification of all biological organisms took place in science, and the information-genetic line of investigations became one of the most perspective lines not only in biology but also in science on the whole. It is essential that a basic system of genetic coding has happened strikingly simple. Its simplicities and its orderliness throw down a challenge to specialists from many scientific fields, including specialists in a theory of symmetry and of anti-symmetry.

It should be noted that fantastic successes of molecular genetics were defined in particular by a disclosure of phenomenological facts of symmetry in molecular constructions of genetic code and by skilful using of these facts in theoretical modeling. A bright example is a disclosure of a symmetrological fact, reflected in the famous rule by E. Chargaff, of an equality of quantities of nitrogenous bases in their appropriate pairs (adenine-thymine and cytosine-guanine) in molecules of DNA in different organisms. This phenomenological rule was used skilfully in a theoretic modeling of a double spiral of DNA by F. Crick and J. Watson with using of additional symmetrological principles.

Many excellent specialists from many countries around the world work in the very attractive field of investigation of symmetries in genetic informatics. This thematic issue on symmetries in genetic information represents a few original ones of such articles. All authors of our issue are modern scientists who prolong investigations in this field intensively and who, in our opinion, are capable of disclosing many key secrets of genetic informatics for mankind. The International Symmetry Association (http://us.geocities.com/symmetrion/) and ISA's International Society of Symmetry in Bioinformatics (http://polaris.nova.edu/MST/ISSB) support and consolidate such scientists actively.

This thematic issue contains ten articles from many countries in the following order. The article by I. Hargittai is devoted to historical aspects of investigation of symmetry in molecular genetics. Then a few articles present modern applications of methods of symmetry for analyzing problems of genetic coding. They describe new theoretic approaches and formal models in this field. Their authors are M. He, C. M. Yang, J. Hornos, M. Magini, T. Négadi and S. Petoukhov. The articles by S. Marcus, K. Bakhtiarov and P. Marijuán are devoted to analyses of applications of symmetrological data in genetic informatics and they discuss complexity and poly-aspects meaning of genetic system. The final part of the issue contains additional information on this theme, including information on "The International Conference on Bioinformatics and its Applications - 2004" (December 16-19, 2004, Florida, USA).

Sergei Petoukhov
Guest Editor