Symmetries and tensors of genetic codes
A bioinformatic approach to the geometrisation of biology

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Abstract: Modern science knows well a process of geometrisation of physics. This term was originated initially after the creation of the special theory of relativity by A. Einstein, when it became obvious that this theory is a science about invariants of a certain group of transformation (Poincaré group). From a formal viewpoint, it means that this theory is a special geometry (according to the Erlangen program by F. Klein, any geometry is a science about invariants of an appropriate group of transformations). Ideas of geometrisation of physics, in other words a creation and description of its theories on a language of invariants of groups of transformations (a language of symmetries), developed further in the fields of quantum mechanics, a theory of laws of conservation, a theory of elementary particles, etc. Group-invariant approach became one of the most typical attributes of modern physics.

Can a similar process of geometrisation in biology, for example, in the field of bioinformatics be developed? The authors investigate and discuss this question in relation to new results in symmetrological and matrix analysis of genetic codes. According to these results, such analysis of structures of genetic codes became very effective. It reveals new phenomenological rules of structuring genetic code and its evolution; a hidden relation of matrices of genetic codes to the golden section; a connection between matrices of a hyperbolic turn and genetic codes; an important role of metric tensors in this genetic field, etc.

All these results demonstrate a possibility of a new geometric approach to systems of genetic encoding and information inheritance. They testify into a favor of a possibility of a new “geometrical” paradigm of bioinformatics in comparison with an existing paradigm of genetic sequences there. Such geometrical paradigm doesn’t reject a sequential paradigm but generalises it by a natural way. Since all physiological systems should be co-coordinated with a basic biological system of genetic encoding for their surviving in a chain of generations, geometrical (tensor) properties of genetic code system are related to many physiological systems and biological organism as a whole. A possibility of geometrisation of bioinformatics leads to a possibility of geometrisation of biology in many aspects. Revealed tensor properties of genetic code systems can be useful not only for biology, but for computer informatics, biotechnology, medicine, etc. as well.