**BIOINFORMATICS FOR HUMANITARIANS.**

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According to the recently introduced Russian standard of the higher education in humanitarian sciences, this education includes obligatory discipline “Modern concepts in natural sciences”. We are now developing such course for the Siberian Trade University. This course includes lectures, seminars, practical work, self-preparation in a form of reviewing scientific and educational literature, and quizzes to certify the successful learning. This course is based on the synergetic viewpoint of the modern concepts in natural sciences, which is closest to the modern concepts in humanitarian sciences. The main peculiarity and novelty of our approach is in a wide involvement of informational-analytic methods, forming the basis of the up-to-date bioinformatics in both natural and humanitarian sciences, especially in economics, commerce, management, marketing, banks, law, etc. Such education provides the future humanitarian specialists not only with the basic knowledge in natural sciences, but also with skills in informational-analytic studies of complex self-organizing, self-reproducing, and self-regulating systems (for example, ecological systems in nature) necessary for their professional activities in economics, commerce, management, marketing, banks, law, etc.

Natural sciences study natural phenomena and laws, while humanitarian sciences study the specific phenomena and laws of human society and human mentality. That is why the natural and humanitarian scientific pictures of the world are essentially different and, interlacing with one another, form a united system of the scientific knowledge. Hence, the methodological novelties in one of these scientific areas usually have a considerable positive effect on its scientific counterpart. Recent introduction of the mandatory course “Modern concepts in natural sciences” in humanitarian faculties (economics, commerce, management, marketing, banks, law, etc.) of Russian Universities reflects this general scientific trend. Biological part of this discipline gives the humanitarian specialists the understanding that, for example, the genetic information is the molecular basis of self-organization, self-regulation, and self-reproduction of organisms, their populations, and ecological systems, while the diversity of the forms in living nature and mechanisms of heredity, variation, and evolution of their genetic information is the molecular basis of stability of the biosphere on the whole. One can see that the understanding of these basic principles of natural sciences aids considerably the education of humanitarian specialists in specific manifestations of similar principles in human society and human mentality.

The educational course “Bioinformatics for humanitarians”, which we are developing, is a part of the discipline “Modern concepts in natural sciences”. It comprises lectures, seminars, practical sessions, self-preparation in a form of reviewing scientific and educational literature, and quizzes to certify the successful learning. The lectures are mainly devoted to illustrative education of the humanitarian students in basic classical laws of population and molecular genetics, whose correct understanding are most difficult for humanitarians. The main attention is focused on considering the living nature as an open nonequilibrium dissipative system with a great number of inner nonlinear interrelationships between its elements (depending on the level of detailing: biological macromolecules, cells, tissues, organs, organisms, or populations). The function of the living systems is considered as a dynamic balancing between a number of quasi-stable states from a complete chaos to a stringent order. Such a simple dynamics of the living systems is demonstrated to be the basis of their self-organization, self-regulation, and self-reproduction; the threshold nature of origination and maintenance of these three basic properties in a living system is explained. The principles of equilibrium in the living systems, including the principle of equilibrium shift as an efficient regulation tool, are considered among such properties. The evolutionary patterns of living systems continuously subjected to such effects produced by constantly changing environmental conditions are also considered from this standpoint. The basic principles of the theories of catastrophes and errors and the strategic game theory, whose correct understanding is a necessary demand for such humanitarian specialties as economics, commerce, management, marketing, banks, and law, are illustrated with evolutionary examples. The listed basic properties of the living systems are illustrated with examples from population, ecological, and molecular genetics, simple and clear for humanitarian students.

Methodical directions, lists of the relevant recommended literature, quiz questions to estimate the correctness of learning, etc., are developed for each session. Each seminar session is directed to revealing the problems most difficult for humanitarian students and consequent explaining based on self-preparation, quizzing, reading reviews, and discussions during the sessions.

To consolidate the knowledge in bioinformatics obtained during the lectures and corrected at the seminars, practical sessions are designed. The practical sessions are represented by business games, such as HUMAN GENOME, EQUILIBRIUM, ACTIVITY, LIFE (according to J. Konway)», etc., involving computers and Internet. It is essential that these Internet-based business games allow the students to gain the experience in searching for the necessary information in real databanks, being developed within the biggest international project HUMAN GENOME and in applying informational-analytic methods to analysis of both the genetic information and dynamics of complex living systems. This experience is useful for the future specialists in the fields of economics, commerce, management, marketing, banks, and law.

Note in conclusion that the version of the educational course “Modern concepts in natural sciences” described here is implemented in the Siberian Trade University. This course on the whole and in particular, its constituent “Bioinformatics for humanitarians”, widens sufficiently the scope of education of the future specialists in economics, commerce, management, marketing, banks, and law. In addition, it is essential that the specialists undergone such training acquire the experience in understanding complex and entangled situations, constantly occurring in the specific areas of their professional activities, by analogy with more clear and illustrative examples of similar situations conventionally known in biology, genetics, and ecology.

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