

# MEDICAL SCIENCES

## BIOCYBERNETICS OF MYKOLA AMOSOV

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**Abstract:** The article is devoted to the study of Mykola Amosov work by means of information technologies. The term biocybernetics and its development on the territory of Ukraine are considered. The scientific literature on the developments of the outstanding scientist doctor Amosov in the field of biocybernetics was analyzed. The scientist's achievements are described and promising directions for the improvement of biocybernetics are shown.

**Key words:** cybernetics, biocybernetics, information technologies, medicine.

Cybernetics as a holistic science studies complex systems and the interactions that take place in them. Cybernetics studies the general laws of preservation, transfer and processing of information in complex management systems of various nature: technical, biological, administrative, social, etc. Cybernetics defines the general laws of obtaining, storing, transmitting and distributing information in complex control systems. At the same time, management systems are not only technical, but also biological and social systems. To highlight the relation to biological systems, the term biocybernetics is used. In the Encyclopedia of Modern Ukraine [1], biocybernetics is understood as a direction in biological sciences based on the

application of cybernetics methods, research and modeling of biological processes using mathematics and computer technologies. Biocybernetics studies the laws of storage, processing and transmission of information in biological systems.

The development of biocybernetics is directly related to the improvement of computer technology. The role of biocybernetics is to accelerate, improve the quality and efficiency of research in biology and medicine. This is reflected in the automation of research, the use of information technologies in medicine, the development of intelligent research information technologies, diagnosis, forecasting and management in biology and medicine, the creation of biotechnical systems [1]. Thanks to the development of biocybernetics, we are now actively using biological prostheses in medicine, devices for assessing a person's condition during physical exertion, developing cybernetic models for studying breathing processes, thermoregulation, and other vital processes.

In Ukraine, the development of biocybernetics is associated with the name of Mykola Amosov. Cybernetics for Amosov began with work on improving the artificial blood circulation apparatus. Together with doctors and engineers, he improved the design of an artificial ball-shaped heart valve. The results of the research were positive and were used in future decades.

The focus of the Amosov school works on complex modeling of mental functions largely determined the "robotic" trend of further research in Ukraine. Amosov, together with his colleagues, created models of autonomous mobile robots and worked on the development of neural network control systems. The results of experimental studies demonstrated the fundamental possibility of creating an autonomous robot controlled by a hardware-implemented neural network [3]. At the same time, it showed all the complexity of organizing the robot's interaction with the natural environment and the need to use neural networks that learn by themselves thanks to feedback from the environment. The basis of the experimental studies are the theoretical propositions of M. Amosov about the mechanisms of information transformation by the brain and the principles of the emergence of complex mental functions. These provisions were used when working with a special class of neural

network, called the M-network. The M-network, as a tool for modeling mechanisms of information transformation, was proposed by O. Kasatkin and L. Kasatkina in 1966 [4].

Under the leadership of M. Amosov, fundamental studies of heart self-regulation systems and the development of machine diagnostics of heart diseases, development and construction of a physiological model of the "internal environment of the body", modeling of basic mental functions and some socio-psychological mechanisms of human behavior on electronic computing machines were carried out.

In the process of developing biocybernetics, Amosov created heuristic models of the individual and models of society. He developed his own system of loads and restrictions, which is reflected in his works. For innovative discoveries in biocybernetics, Amosov received recognition not only in Ukraine, but also abroad.

## REFERENCES

1. Encyclopedia Of Modern Ukraine. Біокібернетика: веб-сайт. URL: [https://esu.com.ua/search\\_articles.php?id=35293](https://esu.com.ua/search_articles.php?id=35293) (дата звернення: 10.10.2022).
2. Від серця до серця: біокібернетика Миколи Амосова. Куншт: веб-сайт. URL: <https://kunsht.com.ua/vid-sercyu-sercyu-biokibernetika-mikoli-amosova/> (дата звернення: 13.10.2022).
3. Микола Амосов - основоположник біокібернетичних інформаційних технологій. Історія розвитку інформаційних технологій в Україні: веб-сайт. URL: [http://www.icfcst.kiev.ua/MUSEUM/Amoscience\\_printed\\_u.html](http://www.icfcst.kiev.ua/MUSEUM/Amoscience_printed_u.html) (дата звернення: 18.10.2022).
4. Вовк Н. Філософія науки: розвиток інформаційних технологій в Україні у ХХ ст. Магістерський науковий вісник. 2015. № 23. С. 16 – 18.