

## BIOPHYSICS as LIVING SYSTEMS THEORY

**Kirvelis D.J.**

Vilnius University, Faculty Natural Sciences, dept. Neurobiology and Biophysics,  
Lithuania, LT-03101, Vilnius, M.K.Čiurlionio 21/27, Tel.: +370-5-2398225, fax.: +370-5-  
2398204, E-mail: [dobilas.kirvelis@gf.vu.lt](mailto:dobilas.kirvelis@gf.vu.lt)

Today biophysics is not only molecular or physico-chemical cell biology, but is transforming to fundamental life science, arise a new biophysics paradigm, as by information organized systems of bio-technologies. Aristotle's physics concept explained as living and non-living nature. Non-living nature has been interpreted in *dynamis/potente*, *energeya* values (traditional physics), and for living nature interpretation (biophysics) was a necessity additional *entelecheya* - purposeful, goal-oriented activities as life "organizing force" (information today). The last decades of research point to a conceptual turn in biology to technology. "*Conceptually at least, biology is becoming technology. And physically, technology is becoming biology*" [W.B. Arthur, 2009]. Another word for this is "*Wetware: a computer in every living cell*" [D. Bray, 2009]. The J.G. Miller's living systems theory allege that the space and time, the matter and energy, the information and entropy are conceptual techno-engineering factors in different levels of life organization. The essence of life and living systems is their organization on the base bioinformational technology of informational control. The opinion that biological evolution of species is evolution of the natural life technologies are developed by R. Kurzweil. Schrödinger studied the basic element of life, the cell, concluded that "*life feeds on negentropy*" and that "*the known laws of physics are not sufficient to explain life.*" The negentropic concept brought the idea that the living organism in a limited space can reduce its own entropy, *i.e.*, to increase the functional organization by the expense of environmental resources. It's shows that life is organized as technology system, is controlled by the special structure of the biological information-technologies (genetic, molecular signals, hormones, neuro-networks, pheromones, sound signals, *etc.*), by means of cyclics (recursives) the closed-loop coding-decoding (CL-CD) circuits of control systems (D. Kirvelis, 2002-2009). The CL-CD concept as genotype-phenotype approach joins information-signals and physical processes in the functionally organized - semantic procedures. The bio-infotechnologies that determine the essence of life on CL-CD functional principle is always made from the material-signal (*hard*) and intangible (*soft*) technologies. *Hard-Soft* concept eliminates the misunderstandings between physicists and cyberneticists on understanding of information, as well as between biologists and biochemists theorists - *Vis Vitalis*. The feature reducing of the entropy, which is organizational properties of this system is acquired by information technology, as the essence of organized system to fight against the second law of thermodynamics. This bio-engineering technological approach was already seen by the pioneers of bioinformatics G.Gamow, M. Yčas (1956), biotheoreticists H. Maturana, J. Varela (1980), and biosemiotists (A. Sharov, 1999-2010). Such an integrated life science that leads to the future of humanity for creation and implementation of Converging Nano-Bio-Info-Cogno-Eco (NBICE) technologies, must be basic science – BIOPHYSICS.