

NONLINEAR THINKING: THE ROLE OF BIFURCATION AND CHAOS IN THE PROCESS OF COGNITION

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Abstract:

This article examines nonlinear thinking as one of the components of the cognition process. Particular attention is paid to the multivariate direction of thinking and the impossibility of adequately reflecting the nature of the system in knowledge by a single strict system of axioms and laws. The role of bifurcation and chaos in the implementation of nonlinearity and their impact on the stability of the system is also discussed. The importance of random influences on the system and their influence on probabilistic thinking of nonlinear thinking is also emphasized.

Keywords: nonlinear thinking, cognition, multivariate, bifurcation, chaos, stability, probabilistic thinking, self-organization.

Nonlinear thinking is considered one of the components of the process of cognition and is characterized by a multivariate direction of thinking, expressed in the impossibility of adequately reflecting the nature of the system in cognition by a single strict system of axioms and laws. Nonlinear thinking also ignores weak influences on the system. The reason is that the system is also affected by fluctuations. The effects of small fluctuations can even radically change the structure of the entire system. Consequently, the constancy of the stability, linear state of the system cannot be guaranteed.

With a nonlinear way of thinking, system instability and chaotic states arise from thinking, that is, they also cannot be ignored. The role of random influences on the system will be critical. This, in turn, indicates that probabilistic thinking depends on nonlinear thinking" [1].

Bifurcation acts as a fundamental mechanism for implementing the nonlinearity process. Because during the period of bifurcation, several paths and options for the development of the system arise. These paths and options can be radically different from each other. And the path that the system will take largely depends on the degree of chaos in the system. "In nonlinear systems, chaos at the micro level will be a new force and motivation for self-organization, and not a factor causing a crisis" [2]. That is, it is argued that micro-chaos in the system leads to self-organization and the acquisition of more and more new qualities, and not to destruction of the system. Here it should be noted that in synergetics, chaos is recognized as a phenomenon that has two natures. On the one hand, it can be creative, and on the other, it can have a destructive nature. "By nonlinearity we mean mathematical equations that describe the uneven growth of functions with qualitatively different decisions "[3], writes A.S. Ryabov.

A non-linear world is some world rich in freedoms, with ample opportunities for self-improvement and not subject to the linear orders to which we are accustomed, and which has its own difficulties. It can also self-organize due to its many branched connections. Coincidences in this world have their own strict laws. Therefore, in synergetics, coincidences do not obey the laws of determining relativity, as in the linear world.

Nonlinearity is an integral aspect inherent in thinking, human morality, the spiritual existence of man as a whole, the process of his formation and existence. The nonlinear world is a self-organizing, self-correcting, self-regulating, self-regulating world.

Speaking about the manifestation of nonlinearity in the process of human cognition, we believe that we should dwell separately on the issue of nonlinear thinking. The achievements of science and technology achieved at the beginning of the 20th century, as well as increasingly complex socio-political relations, showed that the being around us and the complex processes in it cannot be explained only within the framework of the laws of classical mechanics. Humanity, in the course of its practical activities, encountered such phenomena that it became difficult to explain them within the framework of theories existing at that time, based on the Ditermen system. There is a need for a way of thinking that can interpret complex processes and complex structures, complex systems. The formation and development of the concept of a nonlinear style of thinking is directly related to synergetics. This concept was introduced into science by the physicist L. I. Introduced by Mandelstam. In Synergetics I. Prigogine, G. Haken, with the behaviour of such scientists as S. Kurdyumov, nonlinear thinking became the paradigm of modern post-noclassical science” [4]. Although non-linear thinking style is a new thinking style, today it has risen to the level of a general thinking style. A nonlinear way of thinking recognizes instability, imbalance, ambiguity of physical, biological and social processes, the possibility of choice, the process of self-creation of new structures. In the book “Order Out of Chaos” by Prigogine and Stengers, “our perception of existence undergoes radical changes. It is changing towards diversity, complexity, mastering intense movements” [5]. Synergetics “as a new method of philosophical thinking advocates the principle of nonlinearity along with unilinearity. This principle shows that progress does not follow a predetermined inevitable path, but each time follows a new and unique path based on the internal properties and external interconnection of everything” [6].

One of the features of a nonlinear way of thinking is that with it a person’s ability to predict the future is extremely limited. In addition, a non-linear way of thinking is also characterized by a constant readiness for innovation. While linearity is characterized by constancy, equilibrium, strict algorithmic consistency, and the negation of alternatives, it is characterized by nonlinearity, variability, diversity, instability, deviation from equilibrium, randomness, and bifurcation states. “According to the synergetic approach, nonlinear thinking becomes the ideological, theoretical and methodological basis of postclassical science, which includes the

image of chaos, order, imbalance, self-organization, bifurcation, coherent and cooperative processes as a conceptual element” [7].

It should be taken into account that before the advent of the scientific direction, synergetics was not divided into nonlinear, unbalanced, and positively reacting to chaotic states. It was thanks to the doctrine of synergetics that it was proven that the state of disorder (chaos) is also crucial for progress, for the formation of a new system. Synergetics also explores the relationship between the categories of instability and chaos. According to researchers in this scientific direction, when any old structure is replaced with a new one, instability, chaos initially sets in, and the stability of the elements in the system is undermined.

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