International Journal of Scientific Trends- (IJST)
ISSN: 2980-4299
Volume 4, Issue 1, January - 2025
Website: https://scientifictrends.org/index.php/ijst
Open Access, Peer Reviewed, Scientific Journal

Scientific Creativity and Synergetic Thinking

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Abstract

This article describes the continuous movement associated with scientific creativity. And at the same time, it was suggested that through synergetic thinking we can gain knowledge about the principle of self-organization in nature, which creates complex systems from simple ones when conducting scientific research.

Keywords: Synergetic thinking, scientific creativity, potential, entropy and pantropy, bifurcation, fluctuation, disorder, dissociation, attractor, open system, heuristic ideas.

Introduction

One of the modern methods of philosophy is the synergetic method. Synergetics studies the mechanisms and patterns of self-organization as a universal component of the development process. This universality is so important for the theory of self-organization that one of the researchers of synergetics, G. Haken, connects the fundamental question of this science with it. "Why," he writes, "should systems consisting by their nature of various components-electrons, atoms, molecules, photons, cells, animals or even humans, when organized by themselves, obey the same principle, forming structures in a liquid, electrical vibrations, animal populations or social groups?". [1]

Such a wide range of self-organization phenomena cannot be postulated in synergetics. It is the result of the discovery by specialists of the common determinants of natural and social processes in various fields of knowledge. Due to this, synergetics is not as a set of ideas of a separate science, but as a system of common views in which a physicist, chemist, biologist and mathematician see their material, and, conversely, each of them, supporting their own method of science, in one way or another contributes to the development of synergetics. "I called the new science "synergetics" because, - writes G.Haken, -it not only explores the joint behavior of many elements of systems, but also the need for cooperation of many different sciences to find common principles governing self-organization". [2]

Synergetics is a theory that studies the processes of self-organization, stability, disintegration and re-emergence of structures of various natures.

Synergetics confirms the following idea of dialectics -each object is inextricably linked with various processes that surround it, as a result of the general interconnectedness of phenomena in the universe, while various parts are part of systems. Each component of the object will exist in interaction with other components and the outside world. Consequently, each component will have

its own system of individual connections, which means that it will have its own movement and internal movement, and as a result, there will be a tendency for internal self-differentiation of the object. At this time, the object as a whole affects its parts throughout the entire period of maintaining its integrity, which leads to a tendency for internal self-integration of the object.

Synergetics allows us to express the concept of progress more deeply. I.Prigozhin notes: “in both classical and quantum mechanics, if at some point the state of the system was known with sufficient accuracy, then the future could be predicted in principle, if not very much. In addition, a theoretical scheme of this kind has shown that, in a sense, the “now” holds the past and the future. As you can see, they don't actually eat it. The future is not a part of the past. Even in physics (as in sociology), only different “scenarios” are possible[3].

Synergetics allows us to identify a number of fundamental features of development. The formation of fluctuations in the general environment of the system in the process of progress, i.e. the new content of the system environment generated by a new external influence, is decisive at a stage close in quality to the jump point. This process is called the fluctuation process. This creates a bifurcation point, i.e., the "choice" of a certain option for the further course of development from a variety of possible options. The process of progress includes many other phenomena that previously could not be covered by the concept of progress, such as coherence, turbulence, dynamic disorder, dynamics of dissipative and autowave structures, large-scale spontaneous fluctuations. In the process of development and progress, deterministic laws prevail among bifurcation points, and probabilistic laws prevail at bifurcation points. This complex process creates systems at the micro and macro levels that are in new relationships through elements of renewal.

Synergetic thinking differs from other styles of thinking in its non-linear nature. Synergetic thinking also acquires methodological significance due to the nonlinear analysis of scientific creativity, which shows that it has both a complex and open system and a self-organizing nature. Also, within the framework of synergetic thinking, the issues of random (fluctuation), unstable states in scientific creativity, the transition from chaos to order in the development of creative thought, entropic and non-entropic changes in creative potential, the multivariance of nonlinear scientific creative searches are studied in detail. The influence of this style of thinking on scientific creativity is invaluable, although insignificant. Because its basic concepts and principles differ from other traditional approaches even in their new methodological character.

Synergetic thinking refers to a continuous movement, far from scientific creativity. Thanks to synergetic thinking, we gain knowledge about the principle of self-organization in nature, which creates complex systems from simple ones when conducting scientific research. From this it can be seen that as a result of the development of synergetic thinking in physics, a new global evolutionary direction has also appeared, as a result of which the development of science from creativity to the concept of innovation turned out to be from a new angle.

Synergetic thinking laid the foundation for the formation in a wider range of scientific views based on the recognition in the process of scientific creative searches of the self-organization of the Universe, the eternal sequence of things and events in space and time, their interconnection, their existence on the basis of cause-and-effect relationships consisting of certain complex systems. Synergetic thinking has introduced new concepts into scientific creativity, such as bifurcation, fluctuation, disorder, dissipation, attraction, open system, nonlinearity. This played an important

role in revealing the multivariate image of scientific creativity, as well as in explaining its behavior as an open system.

According to I.Prigozhin, bifurcation processes indicate a complication of the system. This process also promotes scientific creativity, and its scientific research is carried out as a goal. Therefore, N.Moiseev said that "every element of the social system is a case of bifurcation".

Although fluctuations appear more intuitively in scientific creativity, they also represent an interaction in the creative process. Even in scientific creativity, two large categories of fluctuations can be studied separately from the point of view of the nature of manifestation. Based on this, they are determined, firstly, by the influence of fluctuations that the external environment creates on creative activity, and secondly, fluctuations that arise in the creative process itself are also highlighted. Before our eyes, sometimes fluctuations in scientific creativity become very intense, the creator can completely take over his worldview and, focusing on the essence, change the direction of his activities and the order of his research. In turn, this process can acquire both constructive and negative significance. While heuristic ideas in this regard represent the constructive side, the negative side causes chaos of a destructive nature in the creative process. That's why synergetic thinking manifests itself as a style of thinking that helps determine the direction of fluctuations in scientific creativity.

In scientific creativity, the system in which influence spreads is also a dissipative system. In scientific creativity, these fluctuations indicate the nature of the behavior of a fully encompassed system. Its main feature is that subjects conducting scientific and creative research are extremely susceptible to various influences and, as a result, exhibit excessive inappropriate behavior.

Attractors are also important in scientific creativity. Because in the process of scientific creative research, this contributes to further increasing the interest of subjects in various complex realities and objects. As we know, this is usually called an attractor - a structure that attracts sets, a structure that characterizes the centers to which the elements tend. In the theory of self-organization, this process is called "sliding to the point of accumulation." Attractors accumulate stochastic elements around themselves, thus dividing the environment into structures and becoming participants in the ordering process. It can be seen from them that synergetic thinking contributes to the formation of creative, independent and free-thinking skills related to scientific creativity of a non-linear nature, mastering methodological principles and research methods of cognition, the formation of theoretical knowledge, practical skills. This also makes the main goal of the scientific research process awareness of the nonlinear nature of the general laws of the development of cognition, awareness of its methodological principles and the ability to apply them in practice.

A comparative analysis of alternative scientific and philosophical views on scientific creativity based on synergetic thinking leads to the formation of a holistic, general picture of the objective reality of the subject, the formation of skills for a free assessment of reality. In this sense, synergetic thinking fulfills the tasks of critical "selection" of the experience of understanding scientific creativity, its concentration and transmission to subsequent generations. At the same time, he offers the scientist various options for understanding scientific creativity. These options embody all forms of scientific creative human experience.

Synergetic thinking - in scientific creativity, according to this point of view, the creative "order" is opposed not by one, but by two "chaos". One of them is the classical linear, and the other is the nonlinear dynamic order. In such events, both cases are distorted by the same term "disorder", and

this raises many questions and discussions related to science. In turn, the logic of creativity and the transceiver deal with relationships and these conflicts, helping to understand the essence of the situation using the method used in individual confrontations. If the first type of disorder is opposed to order as a non-contextual element of opposition, then the second type is opposed as a complex contextual, specific compound. It is known that in synergetics, terminological differentiation of two types of scientific creativity is required. During this process, the epistemology of scientific creativity and the space in its ontological basis allowed halal to form an adequate new definition of synergetics. The people mentioned above hope that it is possible to develop a new concept for such new scientific creativity. But this, in our opinion, is not a "completely new creative concept of synergetics", but a pre-universal basis of creativity. That is why it is precisely synergetics that seeks only to develop rational ways to define its nonlinear components.

From the point of view of synergetic thinking, skills and an approach to solving a certain problem based on non-traditional scientific creativity are a matter of preparing for creativity and the possibility of solving problems in a new, as yet unknown, non-standard way. In particular, educational and educational work in the educational system "Objects" is carried out on the basis of rethinking certain stages and achievements in the history of scientific creativity. Using this method. Intellectual skills are formed in the scientific creations of young people. In this sense, real scientific creativity is inherent only to those who discover new connections, new solutions, new laws, new methods and methodologies, and not to those who rediscover. But it follows from this that any preparation for creativity does not necessarily lead to a creative act to solve problems and approach cases. Chunonchi, not every intellectual activity is creative. That is, scientific creativity is characterized by high intellectual activity, which generates historically new things (solutions, methods, approaches). Everything that is new to an individual is not new to science, society, innovation, that is, historically it may also not be new.

Conclusion

Well, for a scientific creative solution, an individual needs intellectual skills. In the process of creative activity, some subjects become subjects of scientific creativity, possessing highly developed intelligence. In this place, other intellectual activity may be useless, methodologically this is also one of the most important issues. Consequently, creative inefficiency is seen as a less solvable problem compared to creative productivity.

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