

The Human Mind: Renovation through Chaos

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1 The Individual Self: A Self-organizing Complexity

Structures of self-organization are not hard blocks from which the observed well-ordered universe is built. They are rather metastable localized processes that are able to become permanently transformed, to enter into the cooperative interaction with other processes and to form thereby larger entities or, on the contrary, to come apart and sometimes to completely disappear in the general chaotic background of the universe. The observed well-ordered world is the world where structures-processes of self-organization live their own life. If we consider a human being, his cognitive abilities and practical intentions, the construction of his personality, the hierarchical layers of his consciousness-subconsciousness, the historical strata of his memory, all these formations can be understood as structure-processes of self-organization. Many notions from the modern theory of complexity called also synergetics (Knyazeva 1998a,

Abstract

Order in the world we live in is based on a primordial yawning abyss of potencies: on chaos. A structure emerges in chaos and out of chaos. Chaos is organized and it organizes. When destroying, it builds. Chaos has many facets. Chaos is a way of renovation of complex organizations. A periodical immersion of a human mind into chaos is a way of stimulation of its cognitive and creative activities.

Key words:

Creative thinking, complex systems, dynamical approach in cognitive science, embodied mind, nonlinear dynamics, self-organization, situated cognition, synergetics

1998b, Knyazeva & Kurdyumov 2002), such as self-organization and poising at the edge of chaos, operational closeness and self-production, autopoiesis, a multitude of possible discrete states and the existential choice in the moments of bifurcation, the slow, iterative going out to the automodel stage of development and the autocatalytic, avalanche-like growth of a new property, are in use for a better understanding of the internal complexity of individual self.

2 Poising at the Edge of Chaos

Nature is wise in constructing complex structure forma-

tions, but these structures are rather fragile. They are poised "at the edge of chaos" in such a way that even the best little step in the direction of improvement of their organization can initiate the process of their rapid spontaneous decay. Such properties of self-organizing systems are studied in the theory of self-organized criticality (Bak 1997).

Availability of chaotic elements, a relative irregularity is often a sign of human health, both corporal and spiritual, a sign of stability of personal structure. For example, only a strong aperiodicity in heartbeat means a sickly state - arrhythmia, whereas some small chaotic fluctuations in heartbeat are quite normal; they are a result

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of especially internal rather than external factors. A line of demarcation between the health and an illness, between life-giving and basilisk chaos is rather polysemantic and mobile. The question is: what portion of chaos must a human carry in himself in order to be healthy?

Chaos is a natural randomizer, i.e. a random-signal generator in nature. Chaos makes *our organs* more flexible and more suited for a changeable environment. A complex organization emerges and maintains itself at the edge of chaos. "The edge of chaos is a dynamic, fluid transition zone existing between two extremes: predictable order and unpredictable chaos... All of life evolves to the edge of chaos, where it remains flexibly poised in a critical state of readiness... Only between extremes, at the edge of chaos, can psychological balance be achieved. At the edge of chaos, we are best equipped psychologically to deal with erratic and unpredictable events in life" (Marks-Tarlow 1999, p. 322-323).

The more stereotype human behavior is, the more suspicions of a pathology there are. Whereas a psychologically healthy man conforms to the patterns of behaviour depending on social roles he plays at the present moment, a man with a mental disease pursues – to a considerable or lesser degree – only one object (*idée fixe*), his behaviour is – to a great extent – repeatable, iterative, liable to cyclic attractors. His behavior doesn't have due flexibility and isn't sensitive to an unsteady environment.

3. To Be Chaotic Means to Be Creative. Chaotic Cognition

The human creative activity is in need of special stages or permanently existing layers of subconscious random, chaotic movements of mind. To be productive, cognition should have periods when it plunges into chaos. Nowadays some specific methods of chaotic cognition are under development. Such methods allow thinkers to explore new possibilities and to make maximum use of moments of intensive inspired work when the increase of new knowledge occurs. Creative thinking is divergent thinking. The pathway of creativity consists in giving oneself over to chaos in order to take possession of it. That is to resign oneself to control of chaos when at the same time seizing the opportunity to create a refined structure.

Every human has a shady side which lies not only in his psychological weaknesses and shortcomings but also harbors a demonic dynamics. This monstrous, explosive, non-organized energy that cuts its way through layers of subconsciousness is similar to avalanche-like natural processes, the so-called blow-up regimes, studied in synergetics, in which new, so far unwitnessed structures of self-organization arise. A "wandering look" of mind - this is an image that might rather precisely express the basis of human creativity. The mind should be decentralized, defocused; it should move freely between vectors of directional activity. The "wander-

ing over the field of possible pathways of development", the chaotic movement of creative mind leads every now and then to coming out to one of structure-attractors. Thereby, a vector of creative activity, leading to a break-through into a new, is determined. The field of possibilities is put to the test and sounded out. As a result, one of latent structures is materialized; the crystallization of new knowledge occurs.

Thus, chaos is necessary in order to allow a cognitive system to go out to a structure-attractor, its own trend of development and to initiate the process of its self-organization. As a matter of fact, it was known long ago and was expressed in allegorical, poetical forms, such as, for example, in one of aphorisms of Nietzsche: "Man muß noch Chaos in sich haben, um einen tanzenden Stern gebären zu können" (Nietzsche 1955, S.284).

According to the **synergetic** model of Hermann Haken (order parameters, slaving principle, circular causality), as a result of creative activity or creative teaching, new order parameters of behavior of a human as a complex nonlinear system spring up (Haken 1996, Knyazeva & Haken 1999). The system "swings" over all accessible degrees of freedom, and after that new macroscopic structures of knowledge or of experience appear. Creativity is a factor of success, because it implicitly relies on chaos as a way of self-renewal. To under-

take something means to change oneself permanently and to find vectors of farther development.

4 Individual Landscapes of Personality

Every personality is autonomous and all-sufficient. If we apply a term from the theory of autopoiesis elaborated by Humberto Maturana and Francisco Varela (Maturana & Varela 1980), we may say that a personality is operationally closed, i.e. a man derives his strength and intentions of his activity from himself, makes his own plans, actualizes himself, devotes himself to the world. The Russian academician Petr L. Kapitza once noted that "the main sign of talent consists in the fact that a man knows what he wants". At the same time, the self is a polylayer and many-dimensional formation which is dissolved in situations, actualized in different social and family roles, distributed in a topological way. The self has his own space of life of which borders are fragile and mobile. An individual landscape of personality is built into a landscape of his family as well as of the corresponding social group, nation, noospheric reason.

These notions are strikingly close to the ideas of Kurt Lewin (1890-1947) who was a disciple of the Berlin school of gestalt-psychology but developed later on his original research trend called by different names: "dynamical theory", "topological psychology", "vectorial psychology", "Field theory". Lewin introduced a notion of "space of life" ("Lebensraum"). This is a personality together with his psy-

chological environment in such a form how it exists for the personality. As a rule, the space of life is taken into consideration, if personal needs, motivation, mood, purposes, doubts and fears, ideals are analyzed.

What is structure of the personal space of life? The concept of purpose as an ordering of forces in a dynamical field of personality plays here the central role. The space of life contains "the psychological past", "the psychological present" and "the psychological future", they are different dimensions of the available space of life (Lewin 1982, p. 68). Lewin introduced the principle of simultaneity (synchronism) and of simultaneous influence of the past and the future: any act of behavior and any possible change of the psychological field depend purely on the state of the field at the present moment. The psychological past, present and future are parts of the psychological field in a certain point of time. Both the past (accumulated experience) and the future (expectations, desires, apprehensions and hopes) exert influence on forces regulating the today's behavior of an individual.

The space of life of personality is a certain field on which different forces, determinative tendencies, aspirations come into collision with each other. Thereby, the purpose is understood as a force field of psychological activities structured in a certain way; it is a disposition of forces in space. As a matter of fact, this is a certain dispersed purpose. The notion of vector

finds a quite constructive use in the topological psychology. Firstly, forces that are available in the psychological field can differ in magnitude. Secondly, one can perceive various directions of forces (of aspirations) within the psychological field. The very notion of direction makes sense only if one can distinguish different directions, as we might say from the synergetic point of view, different structure-attractors of psychological activities.

The individual landscapes of personality are configurations of the inner (own) space and of environment of an acting and cognitive subject. These configurations are determined by a dispersed purpose, by a spectrum of structure-attractors of cognitive and creative activities.

The cognitive activities are partly pre-determined by latent and overt attitudes and plans. The cognitive subject is permanently in a multistable state and takes a random walk about the field of possibilities. There is a zigzag path that every time actualizes only one possibility from an available spectrum of theirs. The individual landscape contains a whole series of purposes and paths that lead to them. One can form a picture of a certain space where all possible forms of trains of thought are already available in a concealed, latent way. When a new knowledge arises, a fan of possibilities rolls up into one possibility from a set of discrete states.

Another specific feature of the individual landscape of personality is synchronism. The

landscape involves possible pathways of fixture development as well as some traces of the past activities. Applying a term of Kurt Lewin, one may say that the landscape has a certain temporal depth. The synchronism of configurations of the human soul was a subject of investigation in the works of Karl Jung as well: "The soul is all that a human has already done and that he still has to do in the future". The memory of the past is always at present, but it can exert influence on the course of life only before points of "bifurcation", i.e. at the moment of decisive choice of one of possible courses of life. If the point of "bifurcation" is already passed, the choice is made, the human activities are determined by the future rather than by the past. In such a case, the activities are built from the future, in accordance with one of structure-attractors of development.

5 Instabilities. Cascades of Crystallization of Personality

The structure of landscape of the individual self is not rigid. Change in the intrinsic characteristics of a personality leads to reconstructing the field of pathways of his movement into the future. The stages of child's education as well as the further self-education condition periodic qualitative transformations of a spectrum of purposes of life (plans, expectations and hopes) and a spectrum of possibilities. The personality passes through periods of instabilities and crises, as a result crystallizations of personality (his knowledge, his talent, etc.) can take place.

The long process of self-education and of permanent creative activity are connected with a whole series of "bifurcation", cascades of crystallization of personality, several events of qualitative reconstruction of structure-attractors, non-linear phase transitions. The individual landscape is repeatedly rebuilt in a qualitative way. A person becomes times and again another one. A creator is created. As Paul Valery once noted in his diaries, the attained exerts a backward influence on the creator. The work alters an author.

6 Fractal Geometry of Human Behavior

The fractal pictures of human behavior are determined, in the first place, by some stable, reiterative, reproducible structures (patterns) of behavior and, in the second place, by self-similarity of these structures on different levels and on different scales of human activities. The fractal dynamics signifies either the structure of a strange, chaotic attractor that underlie the human behavior or self-organization of a complex structure in the vicinity of a critical point, "at the edge of chaos".

The landscape of individual self has a certain fractal depth. In other words, configurations of situations of life demonstrate a property of scale invariance. A creative man is creative in all kinds of activities, both in the large and in the small. He is creative on all levels of the scientific and practical activities, down to the everyday life. For example, he can develop his origi-

nal methods of cooking – of the preparation of house-made veal cutlets. It is paradoxical that the creative, nonlinear writing is connected with the creative, non-linear cooking. On all levels and in all fragments of the chain of his actions, one can discover his "handwriting", his original style of creative activity.

7 The Human Mind: Embodiment and Enactivation

The synergetic approach to understanding the human mind and behavior coincides with the modern dynamical approach in cognitive science (F. Varela, R. Brooks, T. van Gelder, R. D. Beer, A. Clark and others) which is based on the applying the models of nonlinear mathematics and of the theory of complex adaptive systems. The dynamical approach is defined by three key words: embodied, situated and enactive cognition. What is sense of these new concepts?

Cognition is embodied: the perceptual and mental processes are bound up with the "architecture" of human body. F. Varela with his co-authors explains the term as follows: "By using the term embodied we mean to highlight two points: first, that cognition depends upon the kinds of experience that come from having a body with various sensorimotor capacities, and second, that these individual sensorimotor capacities are themselves embedded in a more encompassing biological, psychological, and cultural context" (Varela et al 1991, p. 172-173). The processes of perception and motor activity are indissolubly connected in the

real processes of cognition. The mental processes are bound up not only with the emotionality of an individual but also with peculiarities of his corporal organization. Therefore, it is in a certain sense true that a human thinks using his body not only his brain. It is said for a long time that there is a language of body that constitutes a basis of non-verbal communication. If there is the language of body, may be the thinking is not concentrated in the head but is poured over the whole body.

Cognition is situated: a cognitive act expands into a situation that possesses certain topological properties. The relations of a cognitive subject with his environment are essential. From the standpoint, memory isn't considered as something accumulated in a symbolic form in the head, it is rather spread over environment. The cognitive

psychology becomes an ecological psychology.

The third neologism is *enactive cognition*. It is introduced to lay emphasis on the active side of perception and thinking, of the human cognition in general. We learn, remember, get to know something when we act. Cognition is an epistemic action: cognition occurs in action and through action. A human conceives the world but at the same time the very process of cognition forms and changes him, imparts configurations to his cognitive activity. A going man paves the way, but at the same time the way makes the going man; when the path is traversed, he becomes another man. And what is more, the cognizing subject not only cognizes the world but also constructs it, because if the world of pigeon is colored in five colors, butterflies perceive the

splendor of the world of flowers in ultra-violet rays and the world of humans is polychromatic, it is senseless to question what is *real color of the world*. Thus, as Varela says, the world can be characterized not by attributes but only by potencies that can be enactivated in the cognitive activity. In such an enactive process of cognition, new emergent structures arise and develop, sometimes fall into decay or, on the contrary, become complicated and are completed. The human life (and therefore human cognition) is an autopoietic activity because it directed to the search of elements that are missed, it longs for completing integral structures.

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