



Mental Activity as an Attractor of Evolutionary Development of Homo Sapiens

Alexander G. Kruglov, PhD, ScD*

*Central Research Institute of Radiation Diagnosis
Moscow, the Russian Federation*

Abstract

We view the psyche of HS as an active distributed system, in which the emergence of new subsystem, creativity, about 50,000 years ago created conditions for a sharp jump-over to a new quality level of the system as a whole, into a new class of systems. As a result of the separation of the image of the goal (IG) from the “reactive behavior,” the creation and projection of the creative product (CC) into the external environment, and the subsequent perception of CC as an objectively existing fragment of the world (with control functions relative to the subject), a new hominid need arose: to achieve parametric equilibrium with a virtual construction—a symbol. Satisfaction of this need created a primary frustration—the desire to achieve a symbolic goal that is beyond reach. We believe that the main factor in the evolutionary development (ED) of HS is the mechanism for satisfying this need by resolving frustration, accompanied by the development of technological support for the purposeful forms of HS behavior. The period of formation of the HS psyche, as a system at a new level, coincides in time and meaningful content with the 11th phase transition of the planetary evolution (Panov-Snooks), being the initial segment of the ascending part of the hyperbolic trajectory of ED. We believe that the psyche of this new representative of HS, which creates frustration constructs (virtual motivators), has become an attractor for ED. By an attractor, we mean the finite region of the inevitable convergence of phase trajectories of a complex system, the attraction of which draws into itself the set of possible trajectories of systems determined by different initial conditions. The actions of the attractor create conditions under which the future state of the system, represented by the final state of the system, has a determinative influence on the present system. (**International Journal of Biomedicine. 2017;7(4):330-334.**)

Key Words: creativity • symbol • frustration • evolutionary development • mental activity

Abbreviations

CC, creative construct; ED, evolutionary development; HS, Homo sapiens; IG, image of the goal.

Basic Part

The purpose of this research was to determine the role and mechanisms of mental activity of HS in ED.

Creativity, as a specific species feature of the HS psyche, is the ability to produce prognostic hypotheses that cannot be derived directly from the initial conditions. This ability appeared in HS as a result of a genetic mutation,⁽¹⁾ or other (exogenous or interfering) causes,⁽²⁾ about 50,000 years ago, and led to the possibility of separating the IG from targeted

forms of behavior. The creative product (CC), originally the IG, was transformed into a fragment of the environment⁽²⁻⁴⁾ with the functions of the control object. The emergence and complication of projective ways of depicting the CC triggered the emergence of pictorial techniques and primary cultural skills. The combination of the “image and meaning” in the CC has formed the more complex forms of abstract, symbolic thinking, inevitably accompanied by interpretations at the initial stages of the development of evaluation criteria and decisions, before the formation of the final CC, which becomes a symbol that is not subjected to significant additions and changes. Being an upper, finite segment of the pyramid consisting of primary representations, mythologems, myths, logical systems, etc., in its complete form the symbol has a finite number of characters

*Corresponding author: Alexander G. Kruglov, PhD, ScD.
Central Research Institute of Radiation Diagnosis. Moscow, the Russian Federation. E-mail: krag48@mail.ru

(possibly coinciding with the Mueller number), correlated with a volume of random attention, with the possibility of being perceived as an integral (indivisible) object, an appeal to which actualizes the entire pyramid of evidentiary reasoning.

Empowering the symbol with controlling properties initiated the creation of attributes of the control object (symbol) consisting of an arsenal of capabilities that were inaccessible to HS (the mechanism for the appearance of mythologies, myths, cults, etc.).

We view the psyche of HS as an active distributed system consisting of functional subsystems, in which the emergence of a new subsystem, creativity, created conditions for a sharp jump-over to a new quality level of the system as a whole, with a change in functional properties and a transition into a new class of systems.

The result of the projection of CC into the external environment, the subsequent perception of it as an objectively existing fragment of the surrounding world, with managerial (in relation to the subject) functions, was the emergence of a new need for hominids: equilibrium in the parametric relationships with the virtual construct (CC) that created frustration, at the resolution of which, the isometric coincidence of the parameters with the ultimate goal (symbol) is unattainable. At the same time, homomorphic degrees of similarity, approximation to the symbol, have no quantitative restrictions. The intensity of frustration, which is maximal at the starting position, periodically decreases with the achievement of the step-like homomorphic similarities of the desired result (inverse positive connection), the achievement of temporal parametric equilibrium with the step-by-step goal determining the vector leading to a decrease in the intensity of frustration.

The complication of the information landscape as a result of including a mental product (CC) as a significant fragment of the environment has formed and developed new operational systems of the psyche: creativity, imagination, symbolic thinking, etc.

Integration into social groups (regardless of scale), formation of hierarchies, creation of boundaries around what is possible and permissible (ethics), complication of mythologems, and creation of mythological systems that determine ethics. Negentropic processes of socialization have several main goals, of which we note the following:

a) optimization of cooperative behavior to ensure vital needs (permissible and acceptable, the alimentary, defensive, sexual and other behaviors);

b) reduction of the frustration tension as a result of adaptive purposeful behavior, with vectors determined by IGs (symbols) formed by common mythologies (motives) of various degrees of complexity common to a social group.

The principal difference between these forms of behavior is that, in the behavioral algorithm of type “a”, positive feedback emerges only when the final goal (meeting the need) is achieved, eliminating the integral units of behavior (i.e., neuronal structures for ensuring purposeful behavior); in behavior “b”, positive feedback, temporarily reducing frustration tension, emerges at the stage of awareness (“insight”) and decision-making, (i.e., at the completion of

the first purposeful behavior and in the following sequence leading to the final result).

With the behavior “a”, the need (and the providing systems: neural, metabolic and other) is eliminated by positive feedback as a result of vital behavior—achieving the ultimate goal; with behavior “b”, there is a temporary decrease in the frustration tension, which does not lead to the elimination of the need, to demotivation, due to the impossibility of achieving the ultimate goal—the symbol. In other words, to eliminate integral units of purposeful behavior of type “a” (the first signaling system), it is necessary to lack an afferent information flow from the receptor fields of the organism (an elimination of negative feedback); for behavior of type “b” (the second signaling system), it is sufficient to achieve a virtual intermediate (graded) goal (a reverse feedback, which does not have afferent receptor equivalents before the insight stage), temporarily reducing the frustration tension. We agree with L. White ⁽⁵⁾ that since symbolic behavior is the most important sign of culture, one of HS’s main abilities is to give symbols a major role in any culture. It is asserted ⁽⁵⁻⁷⁾ that in the interconnected elements of culture, the dominant driving factors are “techno-economics,” technological systems that are the basis of sociocultural transformations with a main tendency to increase information for impact on technologies that, according to the dominant point of view, are the main factors of evolution.

We believe that the main factor of evolution is the new need for hominids: the achievement of the current parametric equilibrium with CC, the symbol, and the resolution of frustration, where the technologies, despite rapid, exponential growth, have an auxiliary meaning, namely, the provision of technical means to aid targeted behavior. Unlike the ultimate goal (symbol) that is beyond the achievable, homomorphic (in relation to the symbol) forms of behavior have a set of specific, step-by-step goals that stimulate the development of applied technologies in accordance with realistic goals. These technologies provide both vital needs and mechanisms for reducing the frustration voltage (i.e., technologies, often having a double purpose, or more, are not significant in themselves but as a means of achieving the goal).

The theory of the evolution of the biosphere and society is formulated as a synergetic model of history,⁽⁸⁻¹⁰⁾ where the crises (resource, techno-humanitarian, ecological) and environmental degradation can be productive (productive phase transitions). One of the decisive factors in the periods of phase crises is the excessive internal diversity of the system. In other words, at the onset of the evolutionary crisis, certain species forms that did not previously have evolutionary advantages find a deterministic equivalent response, an adaptive response to the crisis, which makes them a new factor in the formation of systems.⁽⁹⁾ We believe that the emergence of creativity, symbolic thinking, the production of various forms of adaptive behavior that initiated technological development, and increasing socialization have modified one of the subspecies of hominids (HS), transforming it into a significant and then leading evolutionary factor with the potential for technological transformation of the environment and aggressive species (also intraspecific) behavior, as an

effective way of achieving the goal. The mechanism described above for the emergence of new functions of the psyche created the conditions for the transition of the HS psyche to a new systemic level, one of the manifestations of which was the phenomenon of frustration, as a derivative of a new need for hominids, initiating adaptive forms of purposeful behavior with a vector of achieving a goal that is beyond reach. The period of the supposed formation of the psyche, as a system at a new level, dates from the final stage of the Upper Paleolithic (about 50,000 years ago) and coincides with the 11th position of the planetary revolutions.^(9,11) It was at the end of the Upper Paleolithic that the development of hunting technologies, accompanied by improvement in the conditions and life span of HS, led to the destruction of populations (and species) of animals, to the reduction in the resource base, and to the intensification of intraspecific competition. The way out of the crisis was the transition from the appropriating (hunting, gathering) to the producing economy (farming, cattle breeding).

In the phase transition diagrams (Fig.1 and Fig.2) separating the qualitatively different phases of the evolution of the planetary system, there is a transformation of the rising plateau from the 7th phase transition (Olduvai, Paleolithic revolution) to the 11th phase transition—the exponentially rising segment of the evolutionary chart: the period of the Upper Paleolithic Period ending (more than 2 million years).

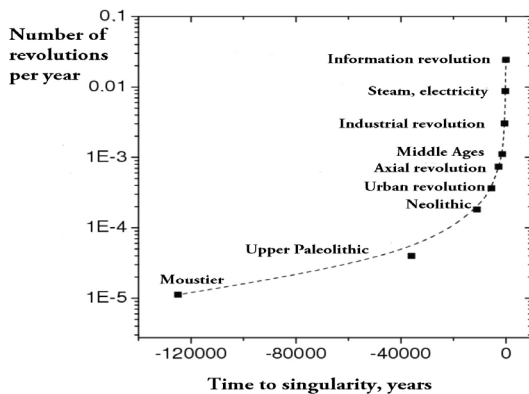


Fig. 1. Singularity of evolution and exacerbation regimes. The points corresponding to a few last phase transitions (cited by A. Panov, 2005).

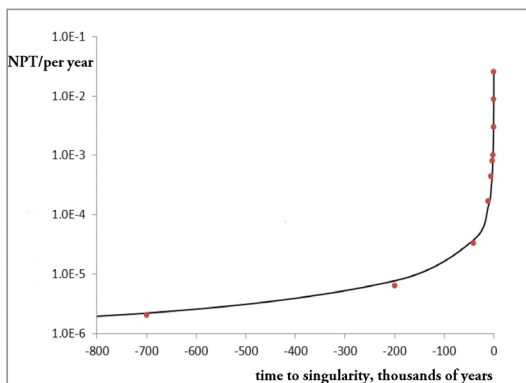


Fig. 2. The Snooks-Panov curve. The points of phase transitions 9-18. NPT- number of phase transitions (cited by La Rose R & Bates B, 1990).

The reasons for the phase transitions, according to A. Panov⁽¹¹⁾ are “oxygen crisis” - phase 1, “Cambrian explosion” - phase 2, etc. We believe that it is possible to state that the causes of the 11th phase transition (the Paleolithic cultural revolution) are those described above and earlier⁽²⁻⁴⁾ qualitative changes in the HS psyche, which formed the psyche of a new class: a creative psyche producing frustration constructs—motivating, purposeful forms of behavior that require cooperation—and developing forms of communication, where the symbol becomes the dominant factor in ED of HS. In other words, the psyche of a new class that creates motivating frustration constructs (virtual motivators) becomes an attractor of the evolutionary development of HS. In our understanding, the attractor is the final region of the inevitable convergence of phase trajectories of a complex system, the attraction of which draws into itself a multitude of possible trajectories of systems determined by different initial conditions. The actions of the attractor realize the determinative function of the future state of the system.⁽¹²⁾ In other words, the final state has not yet been reached, but as a goal chosen by the system it already affects that system.

Beginning in the Upper Paleolithic, HS is becoming an increasingly important participant in ED with the accelerating and increasing role of the HS community in the scale of the planetary biosphere. The advantages of the psyche at a new level allowed HS to accelerate the development of technologies in all types of activities, both appropriating and subsequently extractive (from cultural, agrarian transformations to information globalization). We do not list the achievements of technological growth, elaborated in detail by many authors and partly by Panov.^(9,11) While the pace of technological development advances, it should be noted that the development of the ethical coordinates of society (cultural regulators), which could compensate for the destructive aspects of technology, lag behind.⁽⁸⁾ The disparity between the advanced dynamics of technological development and the lagging development of “cultural regulators” creates the risks of applying technological advances to realize the species aggressive potential as an effective way of implementing purposeful behavior,⁽⁴⁾ which can influence the vectors of ED. That is, the dynamics of technological development can have vectors that do not coincide with the vectors of sociocultural evolution.

A quantitative study of the sequence of points of phase evolutionary transitions showed that each subsequent phase of the evolution of the planetary system is, on average, 2.67 ± 0.15 times shorter than the previous one.⁽¹¹⁾ We consider that the following events are related: 1) the initial phase of the ascending segment of the evolutionary exponent; and 2) the emergence and sharp growth of a new component of planetary (not only biological) evolution—the technological results of the mental activity of HS. In the absence of known factors of the all-planet (geological, climatic, etc.) scale, with the potential to influence the vector of ED, we believe it is possible to assert that the results of the mental activity of HS, the attractor of ED from the end of the Upper Paleolithic, were the accelerator for the development of this vector, which sets the parameters and the speed of development. A number of authors affirm^(11,13) that genetic changes (as well as technological ones) are processes in

which the exit of one paradigm is the entrance of the other, which gives the “acceleration effect.” The dynamics of accelerating and contracting phase transitions of the evolution of HS is defined^(11,14-16) as a sequence having a limit (“singularity” of evolution). Since the “singularity point” is a mathematical abstraction, meaning an inevitable change in the parameters of global evolution, it is proposed to consider it not a “point” but a “singularity period,” similar in meaning to a demographic transition.⁽¹⁷⁾

We consider it advisable to consider the computational (and other) capabilities of computer technology as a functional complement to the HS psyche, at this stage of development, connected with the operating systems of the HS brain by the main communication channel through the eyes (sensory organ taken out of the brain, but related anatomically and functionally). We consider the analogy of constructive interrelations in systems to be admissible: 1) “psyche of HS - computer” with 2) “psyche of HS - creative product,” with the mechanism of projection into the external environment and perception of projection as an independent object (symbol). The principal difference between this system and other types of systems is the absence of an intermediary, the absence of liability and other restrictions of an ethical nature, the possibility of direct dialogue with an immediate unambiguous response (i.e. a constant cycle of positive encouragement, known as a way of regulating behavior).⁽¹⁸⁾ In other words, communications are a two-way channel between the “recipient” (person) and the information “donor” (computer), where the “donor” influences the psyche by means of imposing and changing adaptive behavioral responses and ethical attitudes, rendering the recipient’s responses and communications archaic, changing the influence of cultural regulators, and modifying the human behavior. The addition of written messages with graphic symbols greatly expands the information capacity due to the emotional component sewn in the iconography. The use of graphic symbols and acronyms (symbolic abbreviations of whole phrases, for example, IMHO and many others) brings together the IRC-writing with the primitive writing of the initial cultures. The behavior of HS in a nonlinear information environment reveals, in addition to the archetypal information environment, also fundamentally new phenomena for the psyche, namely, virtual “reality,” “drift of goals,” virtual associations of individuals with unusual properties of the psyche, elimination of the age threshold, and many others. Thus, the interaction and mutual influence in the system HS-computer, combining the archetypal and constructively new qualities of both the recipient and the donor (with a periodic change of roles), has a vector of accelerating convergence, expansion, and interference of the spheres of interaction (i.e., mutual adaptation). The emergence of a new (external, technological) object communicating with the psyche has already led to the emergence of new operational capabilities. With the accumulation of quantitative changes (unknown to us), conditions can be created for adaptive transformation, modification of the psyche HS with the vector of maximum communication contact with the “donor” (computer) and transition to a new qualitative level of the system with a change in configuration, functional properties and access to

a new systemic class (possibly with the migrating topography of the “decision center” and the expansion of the boundaries of personalization).

It is not the task of the present paper to consider the prognostic vectors of evolutionary development when the singularity is achieved. We believe that the projected problems and tasks of the post-singular evolutionary phase transition are a subject to resolution with a possible change in the development vector by the already active evolutionary attractor, the modifying psyche of HS, which is in the stage of developing a new configuration, the transformation of which (amplification, change of properties, qualities, etc.) occurs at present, with the accelerating development (exceeding the limits established by Moore’s law) of the external, technological element of the attractor of ED.

Conclusion

We believe that the basic initiating factor of the exponential growth of ED was the spasmodic qualitative change in the psyche of HS, which appeared at the end of the Upper Paleolithic, with a change in functional properties and a transition to a new class of systems. The result of this phenomenon was a new need for hominids, namely, the achievement of the current parametric equilibrium with the symbol, projected into the external environment by the creative construct of the psyche, endowed with control functions. Satisfaction of this need has activated the development of the phenomenon of frustration, which has initiated adaptive forms of purposeful behavior with the vector of achieving a symbolic goal that is beyond reach. Beginning with the era of the Upper Paleolithic, the initial segment of the exponential growth of the evolutionary chart, which sets the parameters for the growth of ED, we presume the accelerator of ED has been the mental activity of HS with the qualities and properties of the attractor of planetary evolution.

References

1. Klein RG. *The human career: Human biological and cultural origins*. The University of Chicago Press; 1989: 524 pp.
2. Kruglov AG. Creativity as a Determinant of the Development of Homo Sapiens. *International Journal of biomedicine*. 2016;6(4):298-302.
3. Kruglov AG. Mythologem as a Determinant of Goal-Directed Behavior. *International Journal of biomedicine*. 2015;5(4):231-234.
4. Kruglov AG. Creativity as a Determinant of Intraspecific Aggressive Properties of the Psyche of Homo Sapiens. *International Journal of biomedicine*. 2017;7(2):150-154.
5. White L. *Favorites: the evolution of culture*. M. ROSSPEN; 2004: 1064 pp.
6. Nolan P, Lenski G. *Human societies: An introduction to Macrosociology*. 11th edition. Oxford University Press; 2010:430 pp.
7. Sztompka P. *The Sociology of Social Change*. Wiley; 1993;368 pp.
8. Nazaretyan AP. *Civilization crises in the context of Universal History (synergetics-psychology-forecasting)*. M. Mir; 2004: 368 pp. [in Russian].

9. Panov AD. *Universal evolution and the problem of the search for extraterrestrial intelligence (SETI)*. M.LKI; 2008:208 pp.[in Russian].
 10. Snooks GD. *The dynamic society. Exploring the source of global change*. London, NY, Routledge; 1996: 491 pp.
 11. Panov AD. *Singular point of history. Social sciences and modernity*. M. MSU; 2005:122-137. [in Russian].
 12. Knyazeva EN, Turobov A. [The unified science of a unified nature]. *Novii Mir*. 2000;(3):161-179.[Article in Russian].
 13. Snooks GB. Uncovering the laws in Global history. *Social Evolution & History*. 2002;1(1):.25-53.
 14. Von Foerster H, Mora PM, Amiot LW. Doomsday: Friday, 13 November, A.D. 2026. At this date human population will approach infinity if it grows as it has grown in the last two millenia. *Science*. 1960;132(3436):1291-5.
 15. Dyakonov NM. *Ways of history. From ancient man to our days*. Eastern Literature. M.;1994: 384 pp.[in Russian].
 16. Kapitza SP. [The phenomenological theory of world population growth]. *Uspekhi Fizicheskikh Nauk*. 1996;166(1): 63-80.[Article in Russian].
 17. Konstantinov AI. *Singularity of planetary evolution: further refinement of the model. Evolution (Megahistory and global evolution)*. Volgograd; 2015:58-64. [in Russian].
 18. La Rose R., Bates B. Virtual social distance and adoption of interactive telecommunication technologies. *Southwestern Mass Communication Journal*. 1990;6(1):34-43.
-