Ontogenesis of the Information Society and Phylogenesis of the Informational Personality in the Light of Cybernetics*

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According to the author's cybernetic model of evolution of the hierarchical-network system of the Humankind, the ontogenesis of the information society has been traced from the moment of emergence of the first basic information technology of signal poses/sounds/movements. Further, information technologies would continue to develop: mimics/gestures, speech/language, writing/reading, replication texts, computers, telecommunications, perspective information nanotechnology, etc. At the same time and in parallel with this process, the phylogenesis of the corresponding informational personality also occurs. It is indicated that these two processes are 'projections' of a holistic process of the systemogenesis of the Humankind. It is noted that the fact of the possibility of calculation in accordance with the formal mathematical-cybernetic models of critical moments of the Humankind's systemogenesis, including the ontogenesis of the information society, the phylogenesis of the informational personality, etc., demonstrates the direct dependence of these evolutionary processes on the fundamental laws of the Universe.

Keywords: *ontogenesis, information society, phylogenesis, informational personality, cybernetic hierarchical-network model of Humankind, basic information technology.*

Introduction

The information society is commonly understood as a 'modern type' of social system based on the avalanche-like spread of 'information technologies (primarily computer and telecommunication)' (Melik-Gaygazyan 2008). In turn, it is difficult to disagree with the fact that '... in the conditions of active development of the information society, the development of an individual ready for constant changes in technologies and knowledge in the modern information space – an informational personality' (Gagarin and Raitskaya 2013).

But is the definition 'modern' necessary in these formulations? After all, people used to communicate with each other in ancient times and now use not only the above-mentioned *basic information technologies* (BIT), but also others, namely, speech, writing, *etc*. At the same time, it is obvious that simultaneously with the ontogenesis of the information society (the course of its development as a holistic system), the phylogenesis of its elements – informational personalities also occurs. There is every reason to believe that

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the stages of the latter – in contracted form – each of us repeats today in the ontogenesis of our own personality, starting from childhood and beyond (by analogy with the biogenetic law of the development of living[1]).

The question arises: are the 'ancient' and 'modern' BITs that are the basis of the ontogenesis of the information society and the phylogenesis of informational personalities related in one way or another to each other, and if so, on what basis?

Cybernetic Model of the Hierarchical-Network System of Humankind

This question can be answered by referring to the concept of the Humankind as a *holistic cybernetic* system – as part of several subsystems of different historical age, evolving on the Earth, starting from a distant background ~28.2 million years ago, and representing hierarchical-network structures (Gagarin, and Raitskaya 2013; Grinchenko 2004, 2006, 2007, 2009, 2011, 2012a) (Fig. 1).

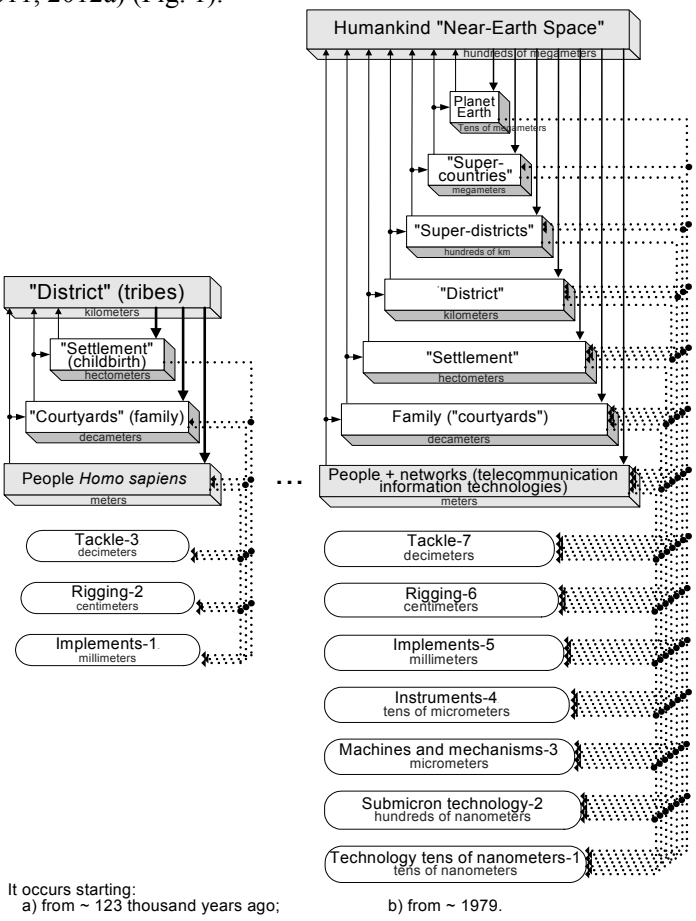

Fig. 1. Fragments of the Humankind's system scheme

[1] 'The ontogenesis of every organism represents a brief and concise repetition (recapitulation) of the phylogenesis of its ancestors ... phylogenesis is the cause of the formation of ontogenesis' (Iordansky 2005).

We should make some comments to Figure 1. The ascending arrows having a 'many-to-one' structure (on the left side of the subsystems) reflect *the search activity* of the representatives of the corresponding tiers in the hierarchy. The descending solid arrows, having a 'one-to-many' structure (in the central part of the subsystems), reflect *the target criteria of search optimization of the energy* of the Humankind's system. The downward dashed arrows, having a 'one-to-many' structure (on the right side of the subsystems), reflect the optimizational *system memory* of the personal-production-social: the result of adaptive influences of representatives of the overlying hierarchical tiers on the structure and behavior of the underlying ones.

The goal-setting elements of these subsystems permanently inform the components hierarchically embedded in them, whether their actions lead to a state that is energetically favorable for the subsystem, or not, which initiates a change in such actions. Such cybernetic behavior is adequately described by random search optimization algorithms (Rastrigin 1979).

According to the cybernetic model of evolution of the hierarchical-network personality-production-social system (of the Humankind), the intervals between the starts of the considered evolutionary stages, as well as the allocated spatial dimensions of the communities, their infrastructures and the manipulative accuracies used, obey the simplest mathematical law. They represent a geometric progression with a denominator of e^e=15.15426…[2].

The hierarchical-network structures of natural systems represent hierarchical tiers interacting with each other to form the network structures. In other words, these are hierarchical structures formed via enclosure (*i.e.*, of the 'nested doll' type, but with a significantly more than one inclosure at each hierarchical level). Their interaction with each other forms corresponding network structures (*i.e.*, hierarchical structures formed via enclosure significantly differ from the hierarchical structures formed via submission, the ltter are characteristic of social structures such as the army, bureaucracy, church, *etc.*).

Thus, an organically intimate combination of hierarchical and network structures takes place, and the network interaction of elements occurs not only within the representative of the hierarchically higher tier that encompasses them, but also between the elements belonging to other, adjacent, representatives of the latter (Fig. 2).

At the same time, the emergence of BIT telecommunications made possible the inter-tiered network interactions within the framework of the hierarchical-network of the Humankind's system. As a result, this has radically changed the whole structure of interpersonal and public network connections that are natural for such a system until the present. This is observed in practice and noted by experts, for example, 'The network principle becomes the main one in the information society' (Kostina 2018: 147). After all, this BIT has provided the opportunity for *direct and unlimited* influence on a separate isolated individual of groups and communities external in relation to it – in accordance with their own interests and goals. The resulting conflict of interests and targets of the individual and such communities in potency can be very dangerous for society as a whole.

[2] The value of this quantity was previously revealed by Zhirmunsky and Kuzmin in their study of critical levels in the development of the wildlife system (Zhirmunsky, and Kuzmin 1982).

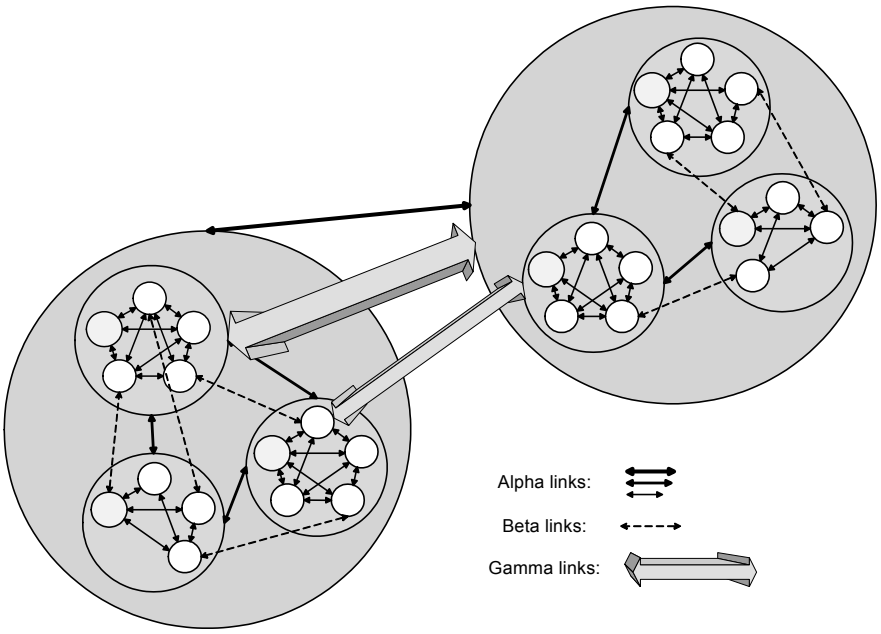

Fig. 2. Typical three-tier hierarchical-network structures: fragments with 'nesting' coefficients 3 and 5 (4)

Stages of Ontogenesis of the Information Society and of Phylogenesis of the Information Individuals

Within the cybernetic model of the Humankind's system, the stages of ontogenesis of the information society and phylogenesis of the informational personalities can be traced by several parameters: the growth of the hierarchical complexity of the system,[3] the growth of spatial (infrastructure and accuracy) characteristics adequate to its stages, the complexity of its corresponding BIT stages, *etc*. The combination of all such processes is logical to call the *systemogenesis* of the Humankind (Fig. 3).

It is precisely the sequence of the emergent new BIT which is most clearly traced in the history of Humankind and which directly characterizes the corresponding stage of the development of the information personality using them – and, as a result, formed by these personalities of society.

Let us consider in more detail the main stages of ontogenesis of the information society and of phylogenesis of informational individuals in the Humankind's system. Noting that all dates and sizes in the model are estimated approximately but rather close to those empirically observed by historians, paleoanthropologists, and archaeologists (Grinchenko and Shchapova 2010, 2014, 2020; Shchapova, and Grinchenko 2017; Schapova, Grinchenko, and Kokorina 2019).

[3] The hierarchical complexity of system is the number of levels/tiers in the systemic hierarchy of Humankind, where it varies in the range of 3–17, according to the formula $N = 1 + 2n$, where: $n = 1 \div 8$ – stage number.

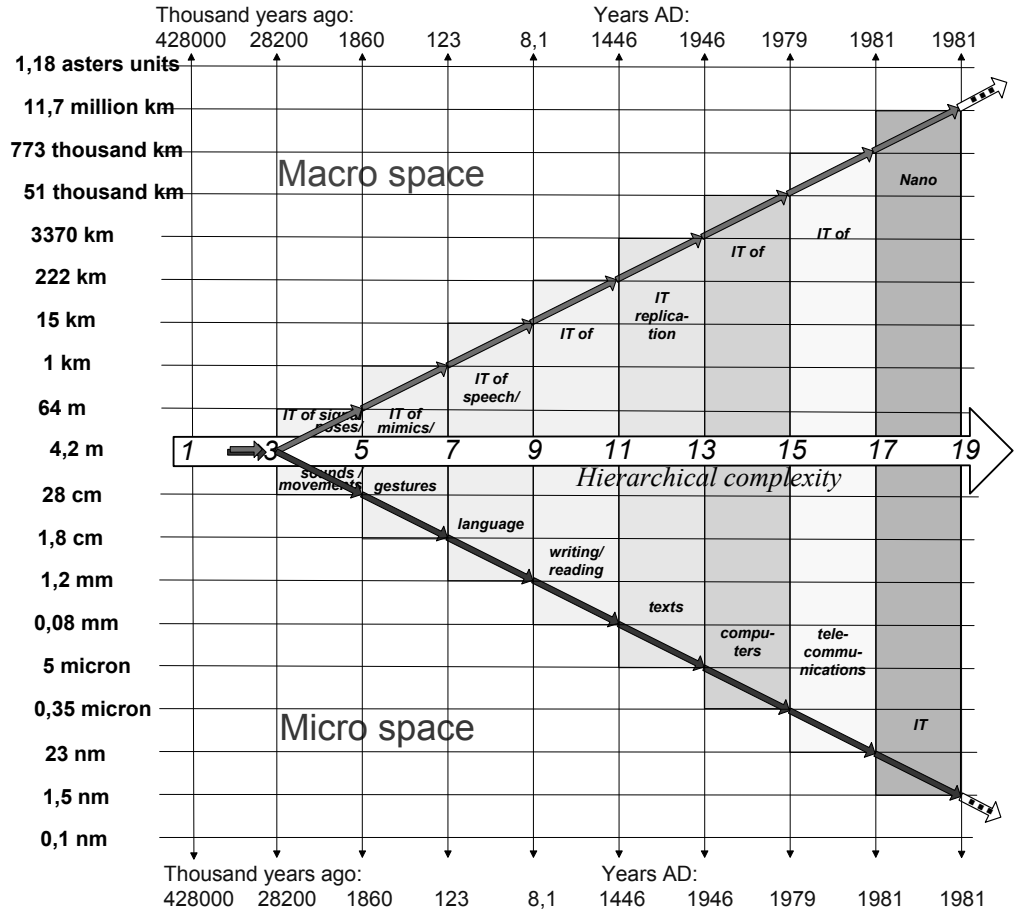

Fig. 3. Stages of the Humankind's systemogenesis (on a double logarithmic scale)

So, the *zero stage* can be dated to 428–28.2 million years ago and the hierarchical complexity of the system was equal to one. This is the way to interpret the time between the start of the cephalization of vertebrates and the emergence of the first *Hominoidea* (distant human ancestors) with a corresponding area about 4.2 m.

The first stage: 28.2–1.86 million years ago and beyond, the hierarchical complexity of the 'pre-pre-Humankind's' system at this stage is equal to three. The subject of *Hominoidea* and then his successor *Hominidae*, combining into flocks and families, form relatively stable/effective self-control and infrastructure elements of communities in territories with a linear size (radius of a circle of the corresponding area) of 4.2–64 m, and also increase the accuracy of their manipulative environmental impacts from 420 to 28 cm. At the same time, they develop and use BIT signaling poses/sounds/movements: starting from 28.2 million years ago to the culmination (emergence of *Hominidae*) – about 9.79 million years ago.

The second stage: 1860–123 thousand years ago and beyond, the hierarchical complexity of the 'pre-Humankind's' system at this stage is equal to five. The subject of *Homo ergaster/Homo erectus/Homo heidelbergensis*, when combined into genera, forms relative-

ly stable/effective self-control and infrastructure elements of these communities in the areas with a linear size of 64–1000 m, and also increases the accuracy of their manipulative effects on the environment from 28 to 1.8 cm. At the same time, in addition to BIT signaling poses/sounds/movements, it develops and uses BIT mimics/gestures: starting from about 1,860 thousand years ago to the culmination (the emergence of *Homo heidelbergensis*) about 612 thousand years ago.

The third stage: 123–8.1 thousand years ago and further, the hierarchical complexity of the system of the Humankind at this stage is equal to seven (see Fig. 1a). The *Homo sapiens* join together in tribes and form relatively stable/effective self-control and infrastructure elements of these communities in territories with a linear size of 1–15 km, and they also increase the accuracy of the manipulative environmental impacts from 18 to 1.2 mm. At the same time, he, in addition to BIT signal poses/sounds/movements and BIT mimics/gestures, develops and uses speech/language BIT: starting from about 123 thousand years ago to the culmination ('Upper Paleolithic revolution') about 40.3 thousand years backwards.

The fourth stage: 8.1 thousand years ago – 1446 AD and further, the hierarchical complexity of the Humankind system at this stage is equal to nine. The *Homo sapiens*[4] uniting into 'super-districts' (tribal unions and then into small states), form relatively stable/effective self-control and infrastructure elements of these communities in the territories with linear size of 15–222 km, and also increases the accuracy of the manipulative effects on the environment from 1.2 to 0.08 mm. At the same time, in addition to BIT signal poses/sounds/movements, BIT mimics/gestures, and BIT speech/language, they develop and use BIT writing: starting from about 8.1 thousand years ago to the culmination ('the Axial Age') about 2.7 thousand years ago.

The fifth stage: 1446–1946 and further, the hierarchical complexity of the system of Humankind at this stage is equal to eleven. The *Homo sapiens,* uniting into 'supercountries' (large states and unions), form relatively stable/effective self-control and infrastructure elements of these communities in territories with a linear size of 222–3370 km, and they also increase the accuracy of the manipulative effects on the environment from 80 to 5 microns. At the same time, in addition to BIT signal poses/sounds/movements, BIT mimics/gestures, BIT speech/language and BIT writing/reading, they develop and use BIT replication of texts (typography): starting from around 1446 to the culmination (industrial revolution) in around 1806.

The sixth stage: 1946–1979 and further, the hierarchical complexity of the Humankind system at this stage is equal to thirteen. The *Homo sapiens*, integrating into the Planetary (or 'global) community, form relatively stable/effective self-control and infrastructure elements of this community in a territory with a linear size 3.37–51 thousand km, and also increase the accuracy of the manipulative effects on the environment from 5 to 0.35 microns. At the same time, in addition to BIT signal poses/sounds/movements, BIT mimics/gestures, BIT speech/language, BIT writing/reading and BIT replication of texts, they develop and use BIT computers: starting from around 1946 to the culmination (creating of microprocessors) in around 1970.

The seventh stage: 1979–1981 and further, the hierarchical complexity of the system of Humankind at this stage is equal to fifteen (see Fig. 1b). The *Homo sapiens''''* subject,

[4] Subjects of *Homo sapiens', Homo sapiens'', Homo sapiens'''*, etc. anatomically and physiologically nearby and almost indistinguishable, and differ among themselves by the increasing capabilities of the psyche and intellect (Grinchenko 2012a).

uniting in the Community of the "Near" Cosmos, began the formation of its relatively stable/effective self-control and infrastructure elements in a space with a linear size (radius of the ball with the center in the Earth) 51–773 thousand km. It also improves the accuracy of its manipulative effects on the environment from 350 to 23 nm. At the same time, in addition to BIT signal poses/sounds/movements, BIT mimics/gestures, BIT speech/language, BIT writing/reading, BIT replicating texts and BIT computers, it develops and uses BIT telecommunications: with a start around 1979 and culminating (the appearance of social networks) around 2003.

The eighth stage: 1981–1981 and further, the hierarchical complexity of the Humankind's system at this stage is equal to seventeen. The subject of *Homo sapiens'''''*, uniting in the Community of the 'Intermediate' Cosmos, began the formation of its relatively stable/effective self-control and infrastructure elements in the space volume with a linear size of 0.773–11.7 million km, and also increases the accuracy of its manipulative effects on the environment from 23 to 1.5 nm. At the same time, in addition to BIT signal poses/sounds/movements, BIT mimics/gestures, BIT speech/language, BIT writing/reading, BIT replicating texts, BIT computers and BIT telecommunications, he began to develop and use promising nano-BIT: with a start around 1981 and the culmination in about 2341 (calculated forecast; it is possible that this will be BIT nano-hardware supported selective telepathy [Grinchenko 2012b]).

In some our works, we considered and interpreted the phenomenon of information-systemic singularity in the development of Humankind around 1981 from the standpoint of the systemic cumulation principle (Grinchenko 2007; Grinchenko, Shchapova 2020).

The fact of such a mathematical predetermination of changes in social processes in time and in space in itself indicates that – by and large, in major – these processes do not develop in an arbitrary manner, but depending on the fundamental laws of the Universe.

In turn, the ontogenesis of informational personality, whose pace of movement exceeds the rate of anticipatory phylogenesis by 6–7 orders of magnitude, repeats the course of the latter in general terms. The additional intellectual component of the development of the infant-child-teenager-young-mature personality is best seen when they follow the development of new and new BIT communication (Grinchenko 2009).

Conclusion

What conclusions can be drawn from the above? It seems that the ontogenesis processes of the information society and the phylogenesis of the information personality are '*projections*' *of a unified process of systemogenesis* of the personal-production-social system (Humankind) – along with the genesis of production technologies (infrastructure and accuracy), techno-genesis, *etc*.

Therefore, there is a recommendation: even before the start of any study in the field of social, historical and cultural etc. phenomena and processes *cognition*, the researcher must *understand* their fundamental consistency, complexity, multidisciplinarity – and, of course, take this into account in his future work, even if it is quite local.

Finally, the fact that the critical moments of *the historical development of Humankind, in particular – the ontogenesis of the information society and the phylogenesis of the information personality – can be calculated according to formal mathematical-cybernetic models,* indicates *the direct dependence of these processes on the fundamental laws of the Universe.*

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