

# THE EVOLUTION OF CONSCIOUSNESS FROM THE POINT OF VIEW OF MODERN THEORY OF INFORMATION AND TELECOMMUNICATIONS

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## ABSTRACT

The question of the nature of the evolution of consciousness is considered. It is shown that the answer to this question can be given by considering the evolution of intelligence as one of the components of the complex structure of personality. It is proved that the evolution of intelligence is an objective process that continues and even accelerates at the present time. The basis for the proof is the theory of the formation of the transpersonal level of information processing, according to which interpersonal communication is interpreted as the exchange of signals between neurons located in different brains. As a result, a common neural network arises, and different transpersonal information objects are formed in it. The existence of a transpersonal level of information processing leads to the fact that the intellect of a person has a dual nature. It simultaneously has both an individual and a collective component. The fact, in particular, makes it possible to establish the nature of the collective unconscious. The collective component of intelligence is being transformed due to changes in the communication environment, including due to the rapid development of telecommunication and information technologies.

**Key words:** Consciousness, Transhumanism, Evolution of Intelligence, Transpersonal Level of Information Processing, Neural Networks, Telecommunication Technologies.

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## Қазіргі ақпарат және телекоммуникация теориясы тұрғысынан сананың эволюциясы

**Аңдатпа.** Сана эволюциясының табиғаты туралы мәселе қарастырылды. Бұл сұраққа интеллект эволюциясын тұлғаның күрделі құрылымының құрамдас бөліктерінің бірі ретінде қарастыру арқылы жауап беруге болатындығы көрсетілген. Интеллект эволюциясы қазіргі уақытта жалғасатын және тіпті жеделдететін объективті процесс екендігі дәлелденді. Дәлелдің негізінде ақпаратты өңдеудің трансперсоналды деңгейін қалыптастыру теориясы жатыр, оған сәйкес тұлғааралық байланыс әртүрлі мида орналасқан нейрондар арасындағы сигнал алмасу ретінде түсіндіріледі. Нәтижесінде әртүрлі трансперсоналды ақпараттық объектілер пайда болатын жалпы нейрондық желі пайда болады. Ақпаратты өңдеудің трансперсоналды деңгейінің болуы адамның интеллектінің Қос табиғатқа ие болуына әкеледі. Ол бір уақытта жеке және ұжымдық құрамдас бөлікке ие. Бұл, атап айтқанда, ұжымдық бейсаналықтың табиғатын анықтауға мүмкіндік береді. Барлаудың ұжымдық құрамдас бөлігі коммуникациялық ортадағы өзгерістерге байланысты, оның ішінде телекоммуникациялық және ақпараттық технологиялардың қарқынды дамуына байланысты өзгереді.

**Түйін сөздер:** сана, трансгуманизм, интеллект эволюциясы, ақпаратты өңдеудің трансперсоналды деңгейі, нейрондық желілер, телекоммуникациялық технологиялар.

## Эволюция сознания с точки зрения современной теории информации и телекоммуникаций

**Аннотация.** Рассмотрен вопрос о природе эволюции сознания. Показано, что ответ на этот вопрос можно дать, рассматривая эволюцию интеллекта как одну из составляющих

сложной структуры личности. Доказано, что эволюция интеллекта — объективный процесс, продолжающийся и даже ускоряющийся в настоящее время. В основе доказательства лежит теория формирования трансперсонального уровня обработки информации, согласно которой межличностное общение трактуется как обмен сигналами между нейронами, расположенными в разных мозгах. В результате возникает общая нейронная сеть, в которой формируются разные трансперсональные информационные объекты. Существование трансперсонального уровня обработки информации приводит к тому, что интеллект человека имеет двойственную природу. Оно одновременно имеет как индивидуальную, так и коллективную составляющую. Это, в частности, позволяет установить природу коллективного бессознательного. Коллективная составляющая разведки трансформируется в связи с изменениями в коммуникационной среде, в том числе благодаря бурному развитию телекоммуникационных и информационных технологий.

**Ключевые слова:** сознание, трансгуманизм, эволюция интеллекта, трансперсональный уровень обработки информации, нейронные сети, телекоммуникационные технологии.

### **Introduction**

The question of whether a person and human consciousness is evolving is becoming increasingly relevant in connection with discussions regarding the concept of transhumanism and posthumanism, which is currently being actively discussed both in journalistic and scientific literature [1-3]. As a rule, the attention of the authors focuses on the transformation of a human with the help of means, most of which were listed in [4]. These are, firstly, technologies for manipulating the human brain, which ensure the transformation of his behavior; secondly, neuropharmacological effects; thirdly, a variety of technologies aimed at significantly extending human life; fourthly, genetic engineering technologies, which in the future are capable of providing a radical "remake" of a person. The expected results, in general terms, remain close to those indicated by Huxley [5], who first used the term "transhumanism". This:

- the gradual endowment of a person with more and more new abilities, including intellectual ones;
- overcoming the limitations that are set by the biological nature of man, in particular, a significant increase in life expectancy;
- achieving complete control over one's personality and individuality;
- gaining the ability to leave your planet, etc.

In the long term, in accordance with the ideas of [5], it is assumed that a person will control evolutionary processes not only on a planetary, but also on a cosmic scale, and will also achieve individual immortality.

This concept faces very sharp criticism, mainly affecting the humanitarian, in particular, ethical aspects of the concept of transhumanism. Thus, in [6] Christian an-

thropology is opposed to transhumanist anthropology, and the very concept of transhumanism is interpreted as "A New Kind of Promethean Hubris". Questions of this kind, obviously, are actualized due to the fact that various kinds of organizations arise on the basis of the ideas of transhumanism, which can be called quasi-religious [7].

The humanitarian and ethical aspect of the issue under consideration is obviously more than important [8-10], especially if we take into account that many supporters of the concept of transhumanism [11] believe that new technologies are capable of changing the world over the next centuries so much that our descendants will in many ways will no longer be human in usual understanding of this word.

Also important is the value aspect of the implementation and promising technologies that meet the ideas of transhumanism. Moreover, technologies have already become widespread, which in one way or another modify, if not a person as such, then his biological behavior. So, the Russian futurologist S.B. Pereslegin [12] noted that improving the quality of infant formula already largely allows considering breastfeeding as a "biological prejudice". From a similar position, he considers the technology of in vitro fertilization – as a definite step to overcome such a "biological prejudice" as placental pregnancy.

At the same time, it should be noted that many aspects of the concept of transhumanism are obviously attractive, in particular, this refers to the multiple increase in the intellectual abilities of a person.

More precisely, the concept of transhumanism is characterized by a very definite duality inherent in its basic ideas, which can be traced back to the fundamental works

of J. Huxley [5, 13]. In terms of value, it can be interpreted both as a continuation and development of the traditions of humanism (based on the assumption that a person remains a person), and as a kind of "overcoming" of the traditional form of humanism (based on the assumption that the implementation of appropriate technologies will lead to a deep modernization of a person).

The work [14] emphasizes that the philosophical aspect of transhumanism is inseparable from the question of what is a "posthuman". However, one cannot fail to notice that the answer to it cannot be obtained without having an answer to the question of what constitutes a person as such. Similarly, the question of what can and cannot be considered artificial intelligence cannot be answered until it is clear what exactly is intelligence [15].

The fundamental questions raised in the literature cited above show that the question of human biological transformations realized through the achievements of science and technology is, in essence, secondary.

The primary question is whether his fundamental essence, which is connected with his humanity itself, is unchangeable. Let's consider this question from the point of view of information theory, which, in our opinion, will answer the question about the mechanisms of the evolution of consciousness.

The reasons for this are as follows. All components of the personality (mind, intellect, consciousness, etc.) are objects of informational nature, which is important, among other things, from the point of view of the philosophical aspect of the issue under consideration [16]. Therefore, the key issue of the concept of transhumanism is the question of the evolution of just such objects.

In an extremely simplified formulation, it sounds like this: How can human consciousness evolve in the foreseeable future? And, if so, in what direction?

Obviously, there can be no doubt that it evolved in previous historical periods.

We emphasize that this is indeed a simplification, and a rather serious one, since in the ultimate ontological sense we are talking about the exact essence of human. Attempts to reveal the essence of human have been made by philosophers and theologians for many centuries. It is unlike-

ly that a generally accepted interpretation will appear in the foreseeable future.

But, if we concentrate on a narrower formulation of the question, i.e. on the evolution of the intellect and / or consciousness of a person, then verifiable results can be obtained.

Accordingly, the purpose of this work is to describe the possible mechanisms of the evolution of human intelligence.

### **Methodology**

The basis of the methodology of this report is the theory of the formation of transpersonal information structures, reflected, in particular, in [17, 18]. This theory is based on the obvious fact that interpersonal communication is actually an exchange of signals between neurons placed within the brain of communicating individuals. It is customary to say that in the process of communication individuals exchange information with each other, but this is nothing more than an approximation. The exchange of information occurs only through the exchange of signals between neurons, although they belong to different brains. Information cannot be transmitted without a carrier, which is optical (vision) and acoustic (hearing) waves. Signals transmitted through acoustic and optical channels unite neurons located in different heads into a common network.

Further, as the current practice of creating artificial neural networks (ANN) shows, their ability to process information non-linearly depends on the number of network elements. Otherwise, there would be no need to synthesize neural networks with an increasing number of elements (as the tasks being solved become more complex [19, 20]). This conclusion is also confirmed by the results obtained in the theory of neural networks [21] using an analogy with the methods of error-correcting coding [22].

Therefore, we can conclude that during the formation of a common neural network that occurs when several individuals communicate, a new quality may appear. Such a neural network obviously has greater information processing capabilities than the totality of neural networks that correspond to individual human brains, taken separately.

This new quality is closely connected with the formation of transpersonal infor-

mation structures and objects. The nature of these objects is similar to the nature of human consciousness and intellect. These information objects are generated by the exchange of signals between neurons concentrated within the brain of an individual. Similarly, transpersonal information objects are formed by the exchange of signals between neurons of the common neural network collectively formed by a particular ethnic or social group. In the limiting case, a global neural network is formed, which can be identified with the noosphere understanding in accordance with V.I. Vernadsky's ideas [23]. The noosphere is complexly structured, it is a system of interpenetrating neural networks, each of which, generally speaking, can correspond to its own specific transpersonal information objects (for example, generated by professional activity).

We emphasize that this conclusion is also confirmed by quite obvious considerations. Thus, as it was shown in [24] any voting body (for example, a dissertation defense council) is converted into a direct analogue of the Hopfield neuroprocessor if system of horizontal connections is sufficiently branched. This, in particular, means that the decision on the issue put to the vote is actually made not by the members of the council, but by the analogue of the neural network formed by them. A similar conclusion is also valid when considering the university as a system integrity [25].

The methodology used is also based on the fact that personality has a very complex structure. This is recognized by almost all psychological scientific schools, although personality structure schemes proposed by various researchers are highly variable [26-28].

Note that the conclusion about the complex structure of personality correlates with the conclusion that the intellect, mind and consciousness of a person are not identical concepts, which follows from philosophical judgments.

For the purposes of this work, this fact is also of considerable interest. Indeed, essence of a person (with all the ambiguity of existing interpretations) is able to transform if only one of the components that make up the personality (for example, intelligence) evolves.

Provided that the human intellect

evolves for objective reasons, the vast majority of issues related to the humanitarian (including ethical) aspects of the problems of transhumanism should be transferred to a different plane – the plane of objective scientific research.

We will show that the human intellect has evolved and continues to evolve regardless of the change in the biological nature of man.

### **Results and discussion**

*The dual nature of human nature as a rational being.*

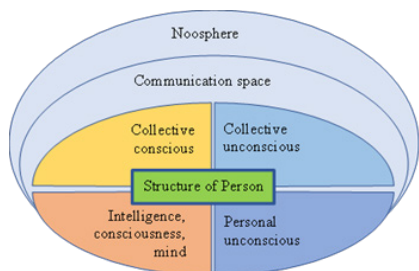
The theory of the formation of transpersonal information structures allows, among other things, to give a consistent interpretation of the concept of the collective unconscious, as well as related concepts widely used in analytical psychology [29, 30]. Recall that K. Jung and his followers come to the conclusion about the existence of the collective unconscious on a purely empirical basis. The mechanism of its formation in analytical psychology remains undiscovered.

The neural network approach to the consideration of society (and the noosphere) as a system integrity allows us to overcome this difficulty. Indeed, only a local fragment of the global neural network is formed in the human brain, which can be identified with the noosphere. This, among other things, means that the nature of human consciousness and intellect is dual. They have both collective and individual components.

This conclusion, among other things, forces us to reconsider the personality structure scheme proposed by K. Jung and used by his followers at the present time [26]. Indeed, the collective unconscious obviously cannot be included in the structure of an individual. This is, by definition, a collective effect. At the same time, the very existence of the collective unconscious (which has been empirically proven) serves as an additional argument in favor of the conclusion about the dual nature of the intellect and consciousness of a person (more precisely, about the dual nature of a person as a rational being).

We assume that, along with the collective unconscious, there is also a collective conscious, which also belongs to the transpersonal level of information processing

(Fig. 1). As an example of an object belonging to the collective conscious, any highly developed scientific theory can be considered [17]. Indeed, such a theory is actually fixed not in the memory of individuals, but in the communication space as a system integrity. Individual carriers of the theory are passing away from time to time, but others take their place. In addition, it should be taken into account that not a single person possesses the fullness of knowledge even in a relatively narrow area, therefore, theory as an information object can really exist only in communication and due to communication. Similar conclusions are valid for any of the natural languages considered as a system integrity.



**Figure 1** - To the dual nature of human nature as a rational being

There is no clear boundary between the collective conscious and the collective unconscious. This follows, in particular, from the existence of a professional collective unconscious (Fig. 1).

Each type of communication generates a certain subnet, more precisely, as noted above, the noosphere (global neural network) is a complex system of interpenetrating subnets. Different social relations correspond to different subnets of the global neural network. In each of these subnets, specific transpersonal information objects can arise, which, among other things, determines the structuring of the collective unconscious [31].

Since professional activity generates one of the main types of communication in society, there is also a segment of the collective unconscious associated specifically with professional activity - the professional collective unconscious [31].

There is every reason to believe that namely professional collective unconscious is responsible for the highest levels

of professionalism - for the presence of professional intuition, for bursts of creative activity, the so-called «insights», etc. At the very least, the conclusion about the connection between intuition and the collective unconscious can now be considered quite reasonable [32, 33].

Moreover, there is every reason to believe that the persons calling geniuses have not quite clearly secured for themselves some kind of contact with transpersonal information objects. They showed not just intuition, but intuition that provides forecasting (in their areas of professional activity) for decades to come.

Consideration of the professional collective unconscious reveals important differences between the concept of "intelligence" and the concept of "consciousness", which are by no means identical.

*Intelligence as a product of the collective conscious.*

The intellect, in accordance with what has been said above, obviously represents that part of the structure of personality that most closely adjoins the collective conscious. Moreover, there is every reason to believe that the intellect as an information object of a dual nature is in many respects a kind of projection of the collective conscious onto the individual.

This thesis can be conveniently illustrated by considering education from the point of view of the conclusion about the dual nature of the intellect and human consciousness. From this point of view, the collective conscious is the link between transpersonal information objects and the intellect of individuals. More precisely, information objects are formed at the level of the collective conscious, which, on the one hand, belong to the transpersonal level of information processing, and, on the other hand, to the personal level. An example of such an object is any developed scientific theory. In such a formulation of the question, education should be interpreted as the projection of a certain set of transpersonal information objects onto the personal level of information processing. Let's show it.

Theoretical pedagogy has long and reasonably argued that education cannot be reduced to the assimilation of a certain set of information. It has long been recognized that the task of higher educa-

tion is to form a certain style and culture of thinking, i.e. to teach a person to think like a professional thinks. These theses implicitly assume the transformation of the student's intellect. Moreover, it is easy to show that such a transformation proceeds in leaps and bounds.

There is such a thing as functional illiteracy. A functionally illiterate person knows the letters of the alphabet, can put words out of them, but this requires him to exert all his mental and sometimes physical strength. In the opposite case, there is a certain qualitative leap, as a result of which the ability to read – and to enjoy reading – becomes an integral part of this particular person.

The situation is similar with the subsequent stages in education. Thus, the ability to use the integral or variational calculus is also easily classified according to the criterion of functional "literacy" – functional "illiteracy". In one case, the individual automatically uses the basic provisions of the variational calculus, for example, to understand the principles of "maximum and minimum" used by various disciplines, in the other, he can, referring to reference books and other manuals, recreate the course of reasoning of the author of the text being read, but this will require him to more than serious work, again connected with the tension of both mental and physical strength. It can be argued that mastering the apparatus of integral or variational calculus is impossible without its "embedding" in the structure of personality. In any case, a person who has mastered the specified mathematical apparatus at a truly professional level will apply it almost unconsciously.

A person who has really mastered a certain system of concepts begins to think differently, in other categories, qualitatively differently. De facto there is a change in his intellect. Professionalization as such is inevitably associated with certain structural changes in what is called intelligence.

Such changes will manifest themselves in everything, and first of all – when reading texts written on professional topics. In any case, it is impossible to argue with the fact that any professional easily and quickly learns a text written in his own specialty.

Thus, any education is a certain sequence of transitions from quantity to quality.

Problem solving, the assimilation of specific material and all other components

of university programs are nothing more than a set of empirically worked out informational influences, which – by a currently unknown mechanism – ensures the transition to the next level of "literacy".

The next – in relation to the "simply professional" – the level of competence also requires a well-defined (and much deeper) restructuring of the intellect. It is at this level that persons operate, for whom inventive and other creative activities are everyday professional work.

The above considerations can be interpreted from the point of view of the formation of transpersonal information structures in the global infocommunication space (noosphere), which were discussed above.

Namely, the qualitative transitions that make up the true content of what is called "education" can be considered from the point of view of "connecting" an individual to ever higher information structures that develop at the transpersonal level of information processing.

The human intellect, moving from one level to another, is able to perceive huge amounts of information in the most compact form. (These mechanisms are practically not studied.) In ordinary language, this is interpreted as professional intuition, the ability to make decisions quickly, find the right path with a minimum amount of initial data, and, finally, genius. Geniuses have felt this from time immemorial: "Inspiration is the disposition of the soul towards the liveliest acceptance of impressions and consideration of concepts, and, consequently, their explanation. Inspiration is needed in geometry, as in poetry» [34].

We can formulate the following preliminary conclusion. If transpersonal information structures evolve (even if only due to the development of science and technology), and a person's intellect is determined by their projection onto the personal level of information processing, then intellect as such must also evolve. Accordingly, the question arises as to whether this evolution can be made controllable, especially if we take into account that the considered mechanisms are in no way connected with the biological evolution of man.

Let us consider the question of the non-biological mechanism of the evolution of intellect and consciousness from the most general positions.

*The nature of the evolution of intelligence and consciousness.*

The dominant point of view on the question of the mechanisms of evolution of systems of various nature goes back to the theory of the origin of species by Charles Darwin. In accordance with it, the driving force of evolution is random fluctuations / mutations, the result of which is fixed if it corresponds to the appearance of a favorable trait. This point of view does not answer many questions, in any case, the problem of the origin of life still remains unresolved.

As emphasized, in particular, in [35], the Darwinian point of view satisfactorily describes those stages of evolution at which already emerged species master new ecological niches and adapt to them. However, real evolution also knows other stages (great leaps or aromorphoses [35]), when new species arose with fundamentally different functions. One of these leaps is associated with the emergence of photosynthetic organisms that can decompose water and absorb sunlight.

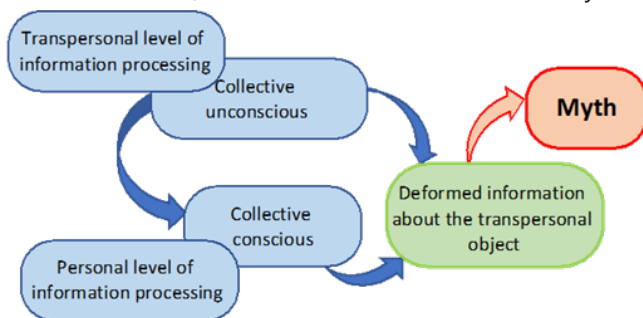
The appearance of such organisms, however, cannot be interpreted from the standpoint of the mutational mechanisms of evolution. The absorption of light and the subsequent utilization of its energy requires a very complex sequence of operations, each of which is carried out by specific proteins. The emergence of each of these proteins separately does not provide any evolutionary advantages [35]. Benefits arise only when the system evolves as a whole.

Considering the noosphere as a global neural network makes it possible to remove contradictions of this kind (at least

in relation to the question of the origin of mind and consciousness). On this basis, it is possible to propose a mechanism of evolution that is fundamentally different from the mutational mechanism considered in [36] using the example of macromolecular systems. This mechanism is implemented under conditions when the system under consideration is a neural network or its analogue. When implementing such a mechanism, at the first stage, the properties of the elements of the system remain unchanged. Only the neural network itself evolves, which is physically expressed in the transformation of the architecture of connections between its elements and/or the nature of signal exchange. At the second stage, those elements that correspond to the new state of the system receive benefits. As a result, they crowd out the rest, gradually occupying a dominant position.

The difference from the Darwinian mechanism of evolution is obvious. In one case, selection is controlled by purely random factors, in the other case, it is determined by the nature of the evolution of the system as a whole.

The application of this mechanism to the description of the evolution of consciousness leads to the conclusion that at the first stages of its formation, the collective component should have dominated. The manifestations of the collective principle can be quite easily traced in practice in societies where traditions are expressed, coming from the tribal system. Indirect evidence of this is the structure of the mythology of the cultural peoples of the Ancient World (Fig.2). From the point of view of the theory of transpersonal



**Figure 2** - To the generation of mythology

informational structures, the ancient gods are a deformed reflection of transpersonal

informational objects responsible for the appearance of Nous.

In the early stages of the development of civilization, when the individual component of the mind was not expressed, collective actions were determined not by conscious obedience to certain norms, but by signals generated by a common neural network. These signals were personified in the images of ancient deities, the spirits of ancestors, etc. Such a view of the mythology of antiquity suggests that the individual component of consciousness began to dominate only at the later stages of the evolution of consciousness. Indeed, if ancient deities are the result of interaction with transpersonal information structures, then during the formation of mythology, interaction with such structures should have been quite effective. Consequently, the historical period in which mythology was formed must meet the conditions when there was a certain balance between the collective and individual components of consciousness.

Note that the study of the collective component of the mind, due to the formation of a global neural network, at modern historical stage deserves the closest attention. There is every reason to believe that the rapid development of telecommunication technologies significantly enhances the collective component of the human mind – only due to more intense inter-

personal communication, taking place, for example, in social online networks. This factor significantly transforms the very structure of the communication space, for example, due to the possibility of close communication between residents of different countries. Already at this historical stage, the noosphere has actually been converted into a human-machine system.

Further, there is no doubt that the human intellect is formed by speech (more precisely, by the second signaling system understanding from I.P. Pavlov's point of view [37]). It is also obvious that speech is associated with a well-defined channel for transmitting information – acoustic. Writing is a derivative of the speech apparatus.

In modern conditions, when it becomes possible to easily synthesize various computer graphics, the nature of interpersonal communication is also changing in many respects. Gradually, easily perceived visual information begins to dominate, which cannot but affect the nature of the formation of intelligence.

Consequently, the evolution of intellect is an objectively established process that took place earlier and is already taking place almost in real time (Fig. 3). We emphasize that the evolution of intelligence is already taking place, regardless of the judgments made on this matter.

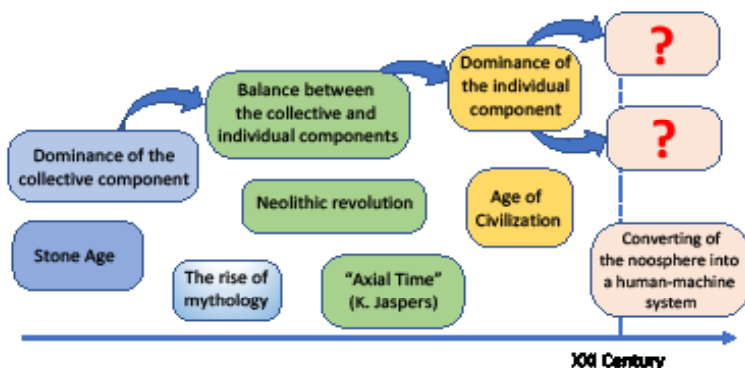


Figure 3 - Stages of evolution of human intelligence

We also emphasize that we are focusing our attention on the evolution of intelligence, since it is the easiest to follow. However, since the intellect is a very significant component of the personality, then its changes – if they become sufficiently pronounced – will also lead to a change in human nature. An obvious question arises about the controllability of evolutionary

processes leading to transformations of the intellect.

*Further evolution of intelligence as an objectively emerging need.*

The further development of civilization is not just a need, but an objective factor in the survival of mankind. This applies to almost all aspects of life, including the



economy. Stagnation, which follows from the most general considerations, will inevitably lead to degradation, which, in turn, leads to more than serious risks, and the corresponding trends are already visible.

At the same time, it already seems obvious that the further development of civilization requires, among other things, a significant modernization of the forms of scientific and technical activity and the forms of training highly qualified personnel.

Even more than half a century ago, one of the founders of quantum physics, E. Wigner, spoke on this subject in the following way.

"If science ... grows so much that the human mind will not be able to grasp it and human life will not be enough to get to the frontier of the known, could not several people unite in a group and joint effort to achieve what cannot be achieved alone? Couldn't, instead of following Shaw back to Methuselah, find a new way to increase the capacity of the human mind - by superimposing several individual minds, rather than «stretching» one individual mind? This possibility has been studied so little that any statements about it are purely speculative ... At the same time, the possibilities of joint research should be studied much more widely than has been done so far, because in them we see the only hope of extending the life of science after how the scope of science becomes too large for an individual» [38].

It follows from the theory of the formation of transpersonal information structures that the problem posed by E. Wigner actually boils down to the creation of tools aimed at using the resources of the professional collective unconscious. Note that attempts to use it (albeit based on heuristic considerations) are well known. These are brainstorming technologies [39] and various modifications.

The need to create tools of this type is indeed becoming more acute. The amount of information that a person must learn in order to successfully engage in scientific activities is growing year by year. This leads to the fact that he receives a real qualification at an increasingly mature age. This, among other things, leads to an outflow of personnel from science: the path to a position that provides an appropriate standard of living and independence becomes too long and difficult. There are many other factors of

this kind that raise the question of using the hidden resources of the intellect, in particular, this applies to brainstorming technologies using electronic resources [40, 41].

In addition, similar problems arise in the training of managerial personnel, as well as in daily organizational activities, the successful implementation of which requires an increasing level of competencies and versatile knowledge.

This returns to the question discussed above about the "connection" of the individual to various kinds of transpersonal information structures. Considerable hopes in this regard are placed on artificial intelligence (AI), aimed at use in education [42, 43]. From our point of view, AI can become not only an assistant to a person, but also a kind of "intermediary" between the personal and transpersonal levels of information processing. This fully corresponds to the emerging trends, in particular, the observed convergence of telecommunications and information technologies (a modern smartphone is equally a computing device and a means of communication). Being immersed in the telecommunications environment, AI systems may well provide contact with transpersonal information structures, especially if we take into account the conclusions made in [44]. Some individual components of intellectual activity can be transferred to a non-biological carrier already at this stage. For example, a neural network can be trained to conduct classes using a concrete teacher as a prototype, and there is every opportunity to significantly improve such technologies.

However, there are simpler examples of technologies that can modernize the educational process. Thus, it is known that the emotional state of the student can significantly increase the effectiveness of learning [45,46], the relevant technologies are already being developed in practice. From our point of view, it is appropriate to draw an analogy here with the mysteries used in the Ancient World to introduce adherents to such religious cults as the cult of Mithra [47]. In fact, the mysteries were a theatrical educational performance, the high efficiency of which was determined by the fact that the impact was on all the senses at the same time, creating, among other things, an appropriate emotional mood. It is acceptable

to assume that this form of education was born in the historical period there was a balance between the collective and individual components of consciousness.

Thus, the objective needs to maintain the required level of progress in the foreseeable future will force the higher school to use various kinds of non-trivial teaching methods, which, to one degree or another, will involve the use of the resources of the professional collective unconscious (i.e., provide a "connection" of the student to transpersonal information structures). This cannot but lead to the evolution of intelligence as such, and it will not affect the biological characteristics of a person, at least at the first stage.

It seems to us that namely educational organizations, for objective reasons, will be the driver of transformations under consideration in the foreseeable future. We emphasize once again that there are objective needs for this, and of a complex nature. In particular, in [48] it is clearly demonstrated that the condition for the stable existence of the economy in its modern form is continuous expansion to more and more new markets. Nanotechnology from this point of view can be viewed as an expansion to the lower levels of the structure of matter. Another direction of expansion is the transpersonal level of information processing.

The fact that it is the higher school (more broadly, the education system) that, for objective reasons, becomes the driver of the transformations of the intellect is extremely important from the point of view of ensuring the value and ethical components of these transformations. Appropriate views can and should be incorporated into the developed methods.

### Conclusion

Thus, the dual nature of human intelligence (both collective and individual components are present in it at the same time) determines the possibility of implementing non-trivial mechanisms of its evolution. Moreover, the human intellect is a kind of projection of transpersonal information objects on the personal level of information processing. Transpersonal information objects have a different nature, including some of them are directly related to the collective conscious. These objects are cur-

rently evolving very rapidly due to the rapid development of telecommunications and information technologies, artificial intelligence, etc.

Further, intelligence is a significant part of the personality structure. Consequently, its evolution cannot but lead to the evolution of consciousness, which makes, in particular, to look at the concepts of transhumanism from a slightly different angle. The evolution of human consciousness is an objective process that does not depend on existing points of view on this matter.

It is essential that the establishment of the laws of the evolution of intelligence in the future will make this process manageable, and the driver in this respect should necessarily be higher education. Namely, there has already been an objective need to use the hidden resources of the intellect, including those determined by the potential contact of the individual with the transpersonal level of information processing.

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