ARCHIVES, LIBRARIES AND MUSEUMS IN A GLOBAL INFORMATION ENVIRONMENT

Cherny Yu.

PhD in Philosophy, Chief, Informatics Problems Center of the Institute of Scientific Information for Social Sciences, Russian Academy of Sciences
Assistant Professor, Media Education Department of the Institute of Journalism, Communications and Media Education, Moscow State University of Education
yuri.chiorny@mail.ru

**English translation:
Malyavskaya E.**

Abstract:

This article is an attempt to retrace the logic of the evolution of social memory institutions (archives, libraries and museums) from their inception to nowadays. The author indicates that archives, libraries and museums made an organic whole in the handwriting age and hypothesises that their convergence in the digital age is a form of reversion at a new technological level. He forecasts the development of a global information environment until almost 2040 in the direction of the global brain – the collective intelligence of humankind. He focuses on the NeuroWeb project (Web 4.0) and describes it as a promising undertaking within the framework of the National Technological Initiative of the Russian Federation.
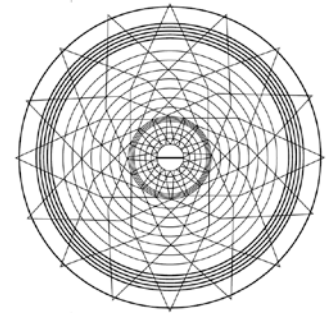
[Scientific Articles]

Cherny Yu.
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Introduction

Alvin Toffler, an American philosopher, sociologist and futurist predicted a social struggle on the verge of the 21st century, which would break out not among political systems but among the forces, which represent the Second (Industrial) and Third (Post-industrial) Waves in the development of the civilisation; this struggle would culminate in 2025 with the victory of the Third Wave; large-scale social and cultural changes would affect all aspects of life including the social memory system; computers would play a decisive role in the transformation of this system and enhance the intellectual abilities of men, just as the machines of the industrial era enhanced their physical abilities.
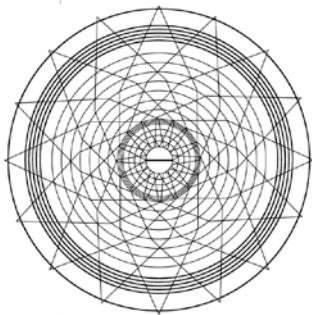
Toffler dedicated Chapter 14 of his book The Third Wave (1980) to the transformation of the intellectual environment [Toffler, 1980]. He argued that memory may be of two kinds: individual (private), inaccessible to others, and social (common), open to everybody. Individual memory dies together with its 'medium', but social memory keeps living. The ability to preserve and find information in social memory is a key to the successful evolutionary progress of us as species. Our destinies are determined by the means we apply to create, accumulate and use social memory.

The means of social memory accumulation have undergone two drastic changes throughout the history of mankind. Initially, common memory was accumulated in the heads of the chiefs of tribes and sages. The most essential knowledge of how to make fire, sharpen a cane, entrap a bird, make a float or rear oxen was memorised in the format of stories, myths, indigenous practical knowledge and legends and passed by word of mouth or examples. The experience accumulated by each group was preserved in the neurons, nervous tissue and conjugations of human chromosomes which, in turn, constrained the volume of social memory.

The Second-wave civilisation 'extracted' social memory out of the brainpan and discovered new means of storing it: card indexes were invented, mass literacy was disseminated, and thousands of libraries and museums were opened. By doing this, the Second Wave lifted the former restrictions, increased the amount of cumulative knowledge, and gave impetus to innovations and social transformations.

The creation of the Third-wave infosphere puts us on the verge of further transformations in social memory. Modern electronic devices are capable of recording the activity of the society in minor detail, and soon we will find ourselves in the photographic-memory civilisation. The Third-wave civilisation will benefit from a much better organisation of the information about itself.

However, the difference in quantity is not the only thing that matters. The Third Wave will breathe life again into social memory. Initially, when social memory was accumulated in the human brain, it was subject to gradual destruction, addition, mixture and combination, which means it remained active, dynamic and, therefore, alive. The industrial civilisation took most of the social memory beyond the limits of the individual brain and objectified it, i.e., embodied it in documentary artefacts such as books, payroll records, newspapers, photos and films, but, at the same time, made it

immobile and passive. The above-named symbols come to life only when brought back into the human brain. That is why, though having radically extended social memory, the Second-wave civilisation froze it.

The revitalisation of a new extended memory in the Third-wave era will let out new cultural forces. Unlike traditional libraries or catalogues, computers will not only organise or synthesise 'information grains' into coordinated models of reality. They will expand horizons; turn into reality a flow of earlier unimaginable theories, ideas, ideologies, artistic insights, technological breakthroughs, as well as economic and political innovations; accelerate historical changes; and ensure a sharp shift towards the social diversity of the Third Wave.

Earlier, the word 'infosphere' denoted various facilities for human communication. The Third Wave will not only multiply these facilities but also, for the first time in our history, provide powerful means of inter-machine communication and communication between people and their intellectual environment. The revolution in the infosphere will be as great and stunning as was its counterpart in the technosphere – the embodiment of the energy and technology of the society.

Toffler's inspirational and prophetic gift has been confirmed by further developments and cannot leave us indifferent. However, there is one inconsistency in his reasoning. Social memory was 'extracted' from the brainpan not by the Second (Industrial) but by the First (Agrarian) Wave, which replaced the hunter-gatherer (Pre-agrarian) society. That is why, the entire period of handwritten communication, which lasted for several thousand years from the invention of writing until the Reformation (16th-17th centuries), fell out of Toffler's field of vision. Social memory institutions emerged at that particular time but they differed from those of the Post-industrial era.
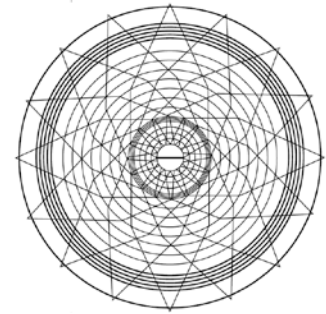
Archives, libraries and museums in the handwriting age

It was writing that called archives, libraries and museums into being, and they must be indebted to it. Writing is believed to emerge on the basis of the proto-script systems in 4000-3000 BC though more and more voices are being raised now in favour of extending this period by two or three thousand years [Grinchenko, 2007. PP. 132–133]. The ability to record oral speech by signs and transfer them through time and space goes back to the first ancient civilisations: Mesopotamian, Ancient Egyptian, Cretan, Hindu, Ancient Chinese and Mesoamerican. The information revolution of the Neolithic age, which was preceded by a long period of oral society [Semenovker, 2007; Stolyarov, 2009], was caused by the needs of the civilizational development: emergence of towns, trade and crafts; formation of powerful unitary states; and class divide of the population [Sokolov, 2014. P. 96]. The role of script for society is so great that it divided the history of humankind into pre-historical (primitive) and historical eras. Information collecting, processing, storing and disseminating have always been considered the major functions of archives, libraries and museums. Boris Semenovker noted that originally the organisational triad of information activity had functioned as
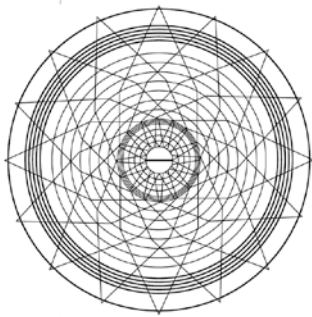
an organic whole and split naturally into three components much later due to the differences in their composition and methods of work. Archives accumulated documents on the activity of the people, society and state (documents of actions and decisions); libraries accumulated documents on literary, scientific and artistic creative activity (documents of thought), and museums accumulated various tangible natural objects and objects of human activity [Semenovker, 2011. P. 5]. At that, in the handwriting period, each institution included some elements of the other two institutions: archival collections held books and tangible objects; libraries held archival and museum components (along with a permanent exposition in many cases); and museums held documents and books together with archives and subsidiary libraries. In ancient and medieval times, archives and libraries represented one institution, especially so in monasteries, because prior to book-printing both institutions had been dealing with manuscripts exclusively. In early European museums, libraries were constituent parts of their collections.

The difference between archives, libraries and museums can be explained by the differences in their emergence and further development. Archives appear and grow naturally as a result of documenting some activities; libraries and museums increase their collections consciously in the course of acquisition. According to Semenovker, the first libraries appeared within archives and were their constituent parts because of the need to keep at hand the texts that were meant for long-term and permanent use. Unlike archives, libraries and museums are to a greater extent focused on information dissemination including that for educational purposes [ibid. P. 6].

The emergence of archives indicated a shift from oral to written memory and culture. They were called to being by governmental and economic activity and, also, by gradually consolidating interstate relations. The first archives appeared in Mesopotamia in the 1st half of the 30th century BC and proliferated to Egypt, Mycenaean Greece, Asia Minor and Persian Empire until the Hellenistic period and Celeucids. In China, archives appeared close to the end of the Zhou Dynasty. The first written documents recorded the peasants' labour, and the first archives collected those documents. At first, script as a new technical means of communication was under the governing group's control but gradually it got widely used. Unlike the archives in the Ancient East, which yielded to the private purposes of the governors, the archives of Ancient Greece were not of an economic but of a legal nature. They appeared as public institutions bound by democratic values and the desire of the citizens to control the leaders of the state. Further on, private archives started to appear as a result of commodity-money relations and the need in managing large tangible assets [ibid. PP. 14–18].

The history of libraries reflects the history of social demand [Volodin, 2002. PP. 9–10]. Libraries appeared whenever there was a need for the frequent usage of written texts. They were conceived in archives and, for a long time, including during the medieval centuries, constituted an organic whole with them. The true difference between archives and libraries became obvious only closer to the end of the Roman period. Libraries became a storehouse of memory and written communication, a cross-point of

old and new experiences on the basis of reading – a new information communication system. For many centuries, libraries remained the only social institutions, which were well-structured and had a stable information system for everyone. This system had to provide users with the timely information they needed and meet their demands in making copies of the texts for the purpose of the preservation and dissemination of knowledge.

Mesopotamia was one the first library civilisations. The most prominent library in the region was that of Ashurbanipal, King of the Assyrian Empire (7th century BC), which amassed a magnificent collection of cuneiform clay tablets. Ashurbanipal was enamoured with written word and intended to collect all the knowledge that had been accumulated to that time. There was a belief that his library perished together with Ninevia in 612 BC, but, in 1849, part of it (over 25,000 tablets) was found during excavations. Today, these tablets are stored in the British Museum in London.

Ancient libraries were a symbol and centre of power. In China, there was a tradition of keeping books and documents together because books on historical, religious and ethical issues were regarded as guidebooks for the government. For this reason, books were normally located close to governmental institutions. No less close connectivity can be traced between libraries and religious institutions. Right up to the 18th century, libraries were mainly established for religious purposes. The Musaeum of Alexandria (see below for more detail) was the Institution of the Muses, so the attitude to the Library of Alexandria was that of a storehouse of divine wisdom and law, the more so as its core included the archive of the deified Alexander the Great. The glory of that Library as the most famous library of the Ancient World has reached our days. On the initiative of the professors of Alexandria University, the Library of Alexandria was rekindled and opened in 2002 on the grounds of the ancient library under the name Bibliotheca Alexandrina [Cherny, 2006]. Thanks to several valuable lessons that the former Library has taught us, its image has survived into our times: (1) due to the composition of its collections and methods of work it became a model for national libraries; (2) it demonstrated that a scientific library may be an essential integral part of research; (3) it developed its own bibliographical system, which prefigured national bibliographies [Semenovker, 2011. PP. 98–99].
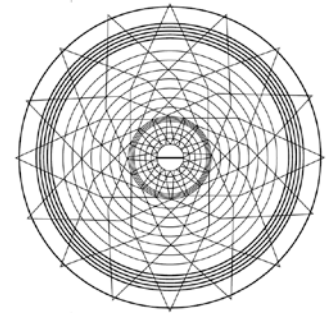
The ties of libraries with places of worship extended to medieval Europe. The library's ideological function was subordinated to Christianity and the state. In Christian countries, such as Ethiopia and Russia, libraries appeared due to the need in books, worship and clerical education. In the Arab and Moslem world with its cult of knowledge, the first libraries appeared on the premises of religious and education centres, meeting rooms and centres for reading poetry. As a rule, the largest mosque held the largest and most comprehensive library. A similar situation was in Southeast Asia after the adoption of Buddhism as an official religion. In Asia, the centres for future libraries were in the Buddhist pagodas and monasteries.

The first libraries of the governors and temples of the ancient world were sheltered institutions. Open access to documents appeared together with public (generally

accessible) libraries in Ancient Rome. The idea of establishing such library in Rome was expressed by Julius Caesar, who was lucky to visit the Library of Alexandria prior to the destruction of its main part during war. The specific feature of Ancient Greece and, later on, Rome was that their libraries were established not by groups of people but by individuals: scientists, philosophers, poets, orators and public officers. Public libraries gradually turned into significant places for communication.
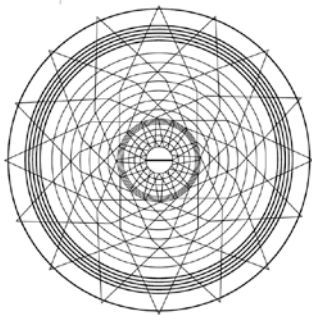
The history of libraries is inseparable from the history of education. Both were generated by the Hellenic school of thought, especially by that of Aristotle. Later, the peripatetics took part in setting up the Library of Alexandria [Semenovker, 2011. PP. 86–92].

Museums appeared later than archives and libraries. They stand closer to archives than libraries by their goals, but, as libraries, they have to accomplish standard educational tasks [Mayakovsky, 1998]. Noteworthy is that all three social institutions strive to preserve their artefacts for further study and use.

According to the operational policy, museums have to extract the items of museum value from the environment and preserve them. Chaotic piling-up for collection-making was prevailing in the primitive society. A great deal of statues of gods, heroes, singers, musicians and animals, as well as stelas with dedicatory inscriptions that were often visited by pilgrims were piled up for 12 centuries in Ancient Greece, in the sanctuary of the Valley of the Muses in Boeotia. Ancient people used the word musaeum to describe an open-air sanctuary and, also, the entire land plot this sanctuary was located on. As a result, the antique musaeum was turned into a consecrated place of worship of nine Muses who were Olympic goddesses, the daughters of Zeus and Mnemosyne.

Each school of thought had its own musaeum, e.g., Pythagorean School and Platonic Academy. However, it was in Aristotle's Lyceum that the notion of the musaeum gained momentum. His musaeum had a botanical garden, a zoo and, most probably, a collection of minerals. Aristotle devoted much of his time to the study of the inner composition of animals and was a skilled anatomist. The dissected bodies of rare animals were stuffed, stored in the musaeum and used at lectures as illustrative material.

The peripatetics transferred the museum tradition to Alexandria where the Musaeum of Alexandria was established in the 3rd century BC by the Kings of Egypt Ptolemy I Soter и Ptolemy II Philadelphus on the initiative of Demetrius of Phalerum. The project of the Musaeum was closely connected with Aristotle's research and political program and was described as an ideal town in his Politics. It was a temple of the Muses and was headed by the high priest. It included the Library of Alexandria (similar to what we see today in research centres) and, as some experts suppose, an observatory, mineral collections and a collection of medical drugs. Hundreds of the most sophisticated mechanical tools were produced in the workshop of the Hero of Alexandria. As the musaeum in Aristotle's Lyceum, the Musaeum of Alexandria had collections of stuffed animals and herbaria and used its gardens and zoo as a basis of its collections. For 800 years, the Musaeum of Alexandria remained the major religious, research,

educational and cultural centre of Hellinism. It was there that the Neoplatonic theory saw light under the effect of the cult of the Muses; research was done in natural philosophy, mathematics, astronomy, geography, medicine, musical theory, linguistics and other sciences; great scientists were working: Archimedes, Aristarchus of Samos, Erasistratus, Eratosthenes, Euclid, Herophilos, Hipparchus, Pappus of Alexandria, Hero of Alexandria; philosophers Philo of Alexandria and Plotinus; poets Zenodotus of Ephesus, Callimachus of Cyrene and Theokritus [Porshnev, 2006; Porshnev, 2011]. Being part of the King's quarters, the Musaeum was of a king's profile. The governors of Egypt used it for both their own pleasure and the benefit of the country.

The Musaeum of Alexandria served as a model for other museums and temple complexes, which were dedicated to other gods or deified emperors and emerged later in Antioch, Pergamum and Rome. They were bound to include porches, gardens, libraries, and collections of sculptures and paintings open to the public. Hero II, the tyrant of Syracuse, had his own museum on the vessel. More museums were opened in Roman villas, e.g., in Cicero's villas near Tusculum and Puteoli.

It became a tradition to paint on the sides of the buildings and put statues on the squares (see Tommaso Campanella's The City of the Sun: 'It is Wisdom who causes the exterior and interior, the higher and lower walls of the city to be adorned with the finest pictures, and to have all the sciences painted upon them in an admirable manner. ... There are magistrates who announce the meaning of the pictures, and boys are accustomed to learn all the sciences, without toil and as if for pleasure; but in the way of history only until they are ten years old' [Campanella T.].) It was in the late Roman Republic times when people started adorning library buildings and interiors with the statues and busts of the most celebrated writers – the tradition that has survived to nowadays. This was done in the first public library of Rome set up by Gaius Asinius Pollio, and in the libraries of Pergamon, Halicarnassus in Asia Minor, Timgad in North Africa and others.
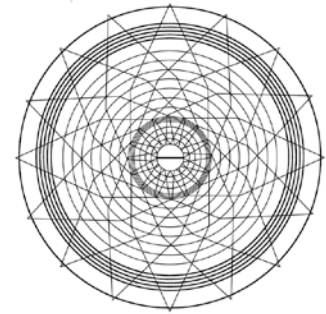
However, other words were used in Europe to denote what we know today as a museum. It was called a studiolo or studio in Italy, and kunstkamera, wunderkamera or theatre in the countries of Central and Northern Europe. The former Latin term museum, unlike the Greek museion, was getting popular in Europe starting with the Renaissance. It made an allusion to the Musaeum of Alexandria as an authority scientific institution of the antiquity. This word was first used by the Italian scientist, humanist and bishop of Nocera Paolo Giovio. In 1536–1543, on Lake Como, he built a villa which he used for his collection. One hall was dedicated to the Muses and Apollo and was referred to as *Museo*. In 1591, in the treatise Della forma delle muse, Giovanni Paolo Lomazzo finalised the idea of the museum as a venue for exhibiting works of art and pieces of vertu.

Collecting is museums' traditional task, but the main difference between the museum and the collection lies in the consistent nature of the former: a private collection may get disseminated after its owner's death or for some other reasons, but a museum will outlast its founders. Another difference is in the public nature of the museum: its

collection is intended for public observation under certain terms and conditions [Semenovker, 2011. PP. 274–282].
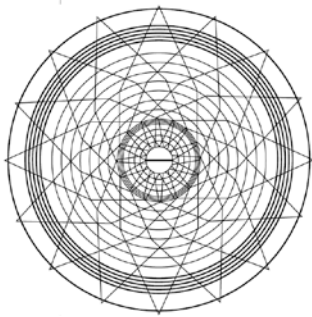
Nowadays, under the impact of information and communication technologies (ICT), we are observing an increasingly apparent trend of the convergence of social memory institutions and even their integration within the framework of a joint organisation [Pryanishnikov, 2009]. Therefore, it is especially important to understand the syncretic nature of the activity of archives, libraries and museums in the handwritten communication age. We believe that the current convergence of social memory institutions is not an accidental process but a reversion at a new technological level.

Global Brain: From Metaphor to Reality

Herbert Marshall McLuhan, a prophet of the information age, used the term implosion to describe a transfer to electronic communication media. In 1964, he wrote: 'After three thousand years of explosion, by means of fragmentary and mechanical technologies, the Western world is imploding. During the mechanical ages we had extended our bodies in space. Today, after more than a century of electric technology, we have extended our central nervous system itself in a global embrace, abolishing both space and time as far as our planet is concerned. Rapidly, we approach the final phase of the extensions of man – *the technological simulation of consciousness* (*italics supplied – Yu. Ch.*), when the creative process of knowing will be collectively and corporately extended to the whole of human society, much as we have already extended our senses and our nerves by the various media' [McLuhan, 1967. P. 11].

McLuhan argued that mechanical technology cuts the world into fragments, while electrical technology reassembles it. That is why he gave much attention to the emergence of the telegraph. Telegraph message transmission allows for an instant dissemination of information and results in total connectivity. Connectivity will develop thanks to new communication media: telephone, radio, television and computer. At birth, every person is somehow linked to the global information network, which is based on electromagnetic energy. 'We live today in the Age of Information and of Communication because electric media instantly and constantly create a total field of interacting events in which all men participate. Now, the world of public interaction has the same inclusive scope of integral interplay that has hitherto characterized only our private nervous systems. That is because electricity is organic in character and confirms the organic social bond by its technological use in telegraph and telephone, radio, and other forms. The simultaneity of electric communication, also characteristic of our nervous system, makes each of us present and accessible to every other person in the world' [Ibid. P. 264].

This approach to electricity as a universal substance is not novel. In this context, it is therefore necessary to refer to Jules Verne, who considered electricity the *principium* of the Universe, and Father Pavel Florensky, who bracketed it with the *od* (the juice of life) and *astral* [Geller, 2006]. Nikola Tesla, a magician of electricity, believed that

electromagnetic phenomena are connected with the global ether [Tesla, 1891]. McLuhan also regarded electricity as a framework for connecting men.

As is known, McLuhan perceived global history from the standpoint of the evolution of communication media and divided it into four eras: oral tribe culture, millennium of manuscript culture, Guttenberg galaxy (five hundred years of printing machines) and Marconi galaxy, the contemporary electronic civilisation. In a more general sense, this conceptual scheme may be represented as movement from initial harmony ('Audio man') to distorted communicative balance ('Visual man') and restoration of harmony at a higher level (the synthesis of both the 'Audio man' and 'Visual man'). According to Arkady Sokolov, the latter stage may be described in the following way: the social reality reappears in its living specificity, and people obtain an illusion of being connected to the ongoing life; they restore their ''sensory balance'' typical of the pre-writing communication; electronic communication technologies contribute to merging mythological (direct) perceptions of the world with rational (indirect) ones and create prerequisites for a holistic development of one's personality; the ''electronic galaxy'' causes the ''retribalisation'' of emerging societies and reproduces ''a primitive unity of collective consciousness'' on a new technological basis, thus transforming our planet into a uniform ''global village'', which is void of individualism and nationalism, alienation, aggression and military conflicts [Sokolov, 2014. PP. 245-246].
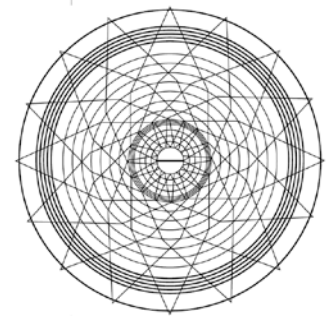
Though an information society cannot boast of harmony, the basic scheme will not seem meaningless if we approach it as *a unity – separation – restoration of unity chain*. This approach to the study of the Internet phenomenon within the context of the macro-evolutionary dynamics of culture has been applied by the Russian philosopher and culturologist Andrey Pelipenko. He believes that, in ancient times, our ancestors had a *universal sympathetic connectivity* with each other and the environment and that contemporary users of information technologies are striving to restore this connectivity, partly consciously but generally unconsciously. Pelipenko considered abstract the statement that the existence in the virtual reality is the most effective and technologically the most acceptable form of transcendence. However, the evidence of psychiatrists who record the growing number of mental disorders caused by ''computer intoxication'' confirms this statement; one does not have to be a skilled anthropologist to realise that a personal Web account is nothing but a specific magic clone (soul or alter ego) of a modern spontaneous neo-pagan in the ultramundane/virtual world the boundaries of which are as permeated as were those of archaic people that separated them from the world of ghosts. [Pelipenko, 2014. PP. 88–89].

The logic of the development of human mentality and culture can be represented as incremental dynamics: a retreat from nature to a certain limit and then a reversion to it at a new level. Starting from the emergence of consciousness and disruption of the general connectivity with the world, humankind has been in need of restoring this connectivity. However, every attempt to establish a unity resulted in a new alienation,
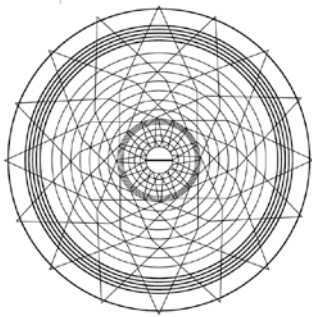
thus triggering the perpetual motion machine of the parallel evolution of human culture and mentality.

Prior to starting the reconstruction of the general connectivity we had to realise the limits of the opposites – those of the fractional nature of the living things and forms of thinking. Such was the goal, which was set by the *logocentric paradigm of culture*, which was adopted by *Axial peoples* and embraced most of humankind. During the life cycle in that global period of history, myths were separated from rituals; writing emerged; logocentrism settled in the monotheistic religions of salvation; book printing was invented and, finally, the modern information revolution broke out. The attempts to get closer to the All by way of simplifying and archaising mental forms failed because the syncretic connectivity cannot be restored in its original form, and the spiritual energy of "going to the roots" was used by the then developing logocentrism for its own purposes: to make an intellectual design of the absolute spirit image. The New Time with its rationalism, scientism, mechanicalism and other thinking attributes of the intelligent European was the apotheosis of logocentrism in the European culture. All these attributes reflected an inherent and unconscious analytical attitude to the reality, which forced people to continuously divide all and any integrities in an attempt to grasp the is –, the last indivisible particle of the thing in existence.

The various civilizational crises of the 19-20th centuries made it clear that the logocentric stage in history must be terminated and a global turn must be made to *neocyncretism*, which was introduced not only in religion, philosophy and art but, also, in the form of a new type of cultural consciousness – New Naturalism. It is represented as a subject of screen revolution; its clip thinking is of a mosaic type, fluid and focused on short-term processes and procedures. Contrary to the Man of Word, the mentality of the Man of Figures is remarkable in its overwhelming relativism (including moral one), contextualism, pragmatism, atomism of meanings and conventionality of values. Their environment is the Internet which, for the first time in the Western culture, outlined the discourse of *is* (things in existence) by contrast to that of *ought*. In the World Wide Web, is with its spontaneous nature, "incorrectness" and disregard of the norms has overstepped the bounds of cultural regulations and qualified for the vote [ibid. PP. 88–94].

The Internet has turned into an *artificial analogue of universal connectivity*. It was invented at the time of critical atomisation and discretion of the image of the reality, when it was already virtually impossible to live without it. Pelipenko thinks that people set only those tasks, which they can solve in response to some deep and often unconscious demands. The abilities of the up-to-date Internet match only an early stage of the new neosynchretic age, which rhymes with the pre-axis time over the head of the logocentric age. The World Wide Web is only a web and not an all-over uniform field environment ensuring overwhelming connectivity. However, the vector of development is clearly set in this direction, and, in the near future, the Web may start transforming into a global universal (not only informational) connectivity field [ibid. P. 94]. We can suppose that this global universal connectivity field is what the mathematician and philosopher Vassily Nalimov called a *continual stream of*

consciousness [Nalimov, 1976; Nalimov, 1989], and one of the founders of the Russian informatics Fyodor Temnikov referred to it as a *synchronous communication field* [Temnikov, 1983; Volkova, 2013].
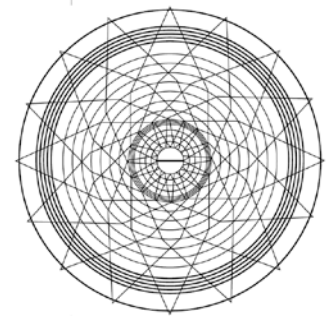
The research of the design and understanding of the Internet led to the results which testify to its *non-random nature*. This research shows that the life and development of the World Wide Web are similar to the reproduction and evolution of living organisms. The growth dynamics and topology of the Web meet power-law dependences, which are typical of the complex physical and biological systems of the Universe. According to Igor Gordienko, the behaviour of the Web is very similar to the behaviour of the electromagnetic fields, galaxies, and the processes of plant growing and maturing. Researchers believe that this behaviour can be explained by the fact that the number of references on many web pages is dozens of times as big as the average net number of seven references to other pages and resources. It is this 'genetic' feature of the content that excludes the Internet from the objects, which may be described by simple models with a reasonable degree of accuracy [Gordienko, 2000].

A trend, which considers the World Wide Web as a prototype of the future *collective intelligence*, has been actively developing in Europe and the United States within the framework of evolutionary epistemology and evolutionary cybernetics. This idea was jointly predicted philosophically and scientifically as a concept of the noosphere by Edouard Le Roy, Pierre Teilhard de Chardin and Vladimir Ivanovich Vernadsky. Three of the most significant papers on this subject were published in the mid-1990s: the article by G. Mayer-Kress and C. Barczys *The Global Brain as an Emergent Structure from the Worldwide Computing Network, and Its Implications for Modeling*; the article by F. Heylighen and J. Bollen *The World Wide Web as a Super-Brain: From Metaphor to Model*; and the book by P. Russell The Global Brain Awakens: *Our Next Evolutionary Leap* [Mayer-Kress, Barczys, 1995; Heylighen, Bollen, 1996; Russell, 1995]. Francis Paul Heylighen, a research professor at the Free University of Brussels, and Johan Bollen, his PhD student, were the first to propose the algorithms capable of transforming the Internet into a self-organising and self-learning network, which represents collective intelligence, i.e., the global brain of humankind. In his 2007 article *The Global Superorganism: an Evolutionary-Cybernetic Model of the Emerging Network Society* [Heylighen, 2007], Heylighen presented a view on society as a superorganism [Superorganism] and suggested that approaches to the study of the underlying evolutionary mechanisms should consider their application to the ongoing and future developments in a globalising world. Presently, he is developing a mathematical and simulation model of collective intelligence, together with his collaborators in The Global Brain Institute, which was founded in 2012 at the Free University of Brussels [The Global Brain Institute]. Among other world-known centres working on the collective intelligence problems are the FuturICT Project, Massachusetts Institute of Technology (MIT) Center for Collective Intelligence (Boston, Massachusetts, USA), the Millennium Project, International Institute of Cognitive Informatics and Cognitive Computing at the University of Calgary (Calgary, Canada),

Singularity University, and Human-Computer Interaction Institute at the Carnegie Mellon University (Pittsburg, Pennsylvania, USA).

The work in this direction has started gradually in many countries, including Russia. The task of launching the National Technological Initiative (NTI) [National Technological Initiative] was formulated in President Putin's Address to the Federal Assembly on December 04, 2014. NTI is a state program aimed to support the national economy in those areas, which may become basic for the global economy in the next 20 years. A most promising project being developed within the NTI is the *NeuroWeb*. Its aim is to create distributed artificial components of consciousness and psychics. The project managers overseeing this are Andrey Ivashchenko, Chairman of the Board of Directors of *KhimRar* Group of Companies, and Lyudmila Ogorodova, Deputy Minister of Education and Science of Russia.

The abstract to the Action Plan (the Roadmap) of the *NeuroWeb* market within NTI reads that the forthcoming technological revolution will be bonded with neuro-technologies and drastic enhancement of intellectual labour through the integration of human brain and computers. The onrush of this technology is going to start after the completion of the mapping on the brain function, similar to the biotechnological revolution, which started after the mapping on the human genome.
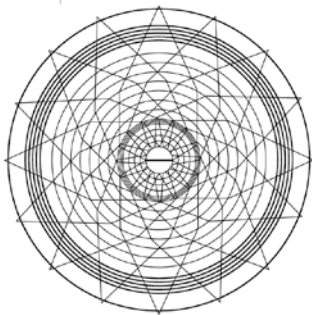
The *NeuroNet* (written this way in the original — Yu. Ch.) is destined to become the next stage of the Internet (Web 4.0) development in what concerns human-human and human-machine interactions, which will proceed by means of new neuro-computer interfaces in addition to traditional means, while computers themselves will become neuro-morphic (like the human brain) due to hybrid digital/analogue architectures. The emergence of social neuro-nets and full-fledged hybrid human-machine intelligence is forecasted.

In education, neuro-technologies will contribute to a significant increase in the volume and speed of learning; to the development of neuro-fitness and memory modulation technologies, which will result in a drastic improvement in cognitive abilities.

As for medicine, new technologies will allow people to use artificial limbs and additional sensory organs, which will develop into a generally available neuro-management of the home environment by 2035. In the coming ten years, we may expect the invention of efficient targeted biomarkers and medications capable of curing various age-related mental disabilities, such as Alzheimer dementia and Parkinson's disease. In the twenty-year period, we may expect the discovery of gene and cell engineering for brain correction [See Abstract to the Action Plan (the Roadmap) for NIT NeuroWeb Market Development].

According to forecasts, the size of the new segments of the NeuroWeb market will reach 100 billion US dollars by 2020. Its exponential growth is expected to reach 1.8 trillion US dollars in 2035 [ibid.].

The overall coordination of the NeuroWeb and of other promising projects is laid upon the Agency of Strategic Initiatives (ASI), an independent non-profit organisation established by the government of Russia; Vladimir Putin, Chairman of the Supervisory Board, took part in the Moscow Forum of Strategic Initiatives (June 21, 2016) [almost

200 advanced projects were supported by the ASI by 2016], which had to devise a concept of Russia's long-term social and economic development by 2035 [Forum of Strategic Initiatives, 2016].

The Nano-Gorod (Nano-City) Festival of Science and High Technologies took place in Moscow on June 23–24, 2016, on the premises of the *Artplay* Design Center. The Festival was organised by the communication agency *You Know* under the aegis of the Moscow Department of Culture, the charity fund *Za slovom delo* and the House of Culture *Gaidarovets*. The promotion leaflet promised that the rich program would meet the requirements and interests of everybody, irrespective of the age and field of activity: eight sections would be open for the guests who may go to the Robo-café to taste nano-latte and space food of astronauts; or go to the Robo-cinema to watch the most entertaining movies about robots and technologies; or go to the Robo-squared circle where the most sophisticated robots matched the strength of their steel muscles! Meanwhile, your children could have fun in the specialised Robo-zone or try their hand as researchers in the Nano-institute.

In addition, the city of the future will have a Robo-library where researchers, futuristic writers, historians, astronauts and test pilots will share their experience and knowledge; a Nano-market with virtual-reality attractions and various high-tech gadgets, 3D-machines and the latest software; a Robo-club where musicians will play instruments produced by 3D-printers on interactive platforms made from fruit, and many other amusing platforms with scientific shows and installations for children and adults [Nano-Gorod Festival, 2016]. This is how new technologies pierce our society and become its asset.

The project under the title 'NeuroWeb Development Roadmap' [Mitin, 2014] was presented by Pavel Luksha, Professor of the Skolkovo Business School and Director of Global Education Futures, in October 2014 at the meeting of the Expert Council of the Russian Venture Company. He divided the development process into three stages:

Stage I. Biometrinet (Pre-NeuroWeb) – from 2014 to 2024,

Stage II. Early NeuroWeb – from 2025 to 2035,

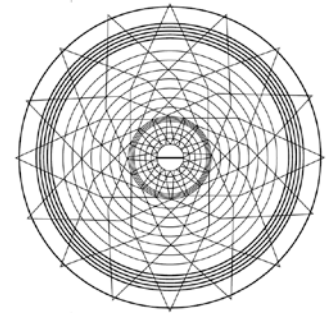Stage III. Full-fledged NeuroWeb – after 2035.

He also defined four lines of activity leading to the NeuroWeb:

1.   Naturalisation of technologies (seamless interfaces between natural functions of the body and consciousness and technological decisions).

2.   Development of the abilities of the body and consciousness (production of artificial limbs, cyberbodies, artificial sensory organs, improved intelligence, and exocortex on the basis of artificial intelligence).

3.   Invigoration of the technosphere (emergence of the Internet of things and smart environments, artificial intelligence in management and education, and artificial agents which copy and replace mental functions), and

4.   Stronger impact of the network culture (collective, horizontal, complexity-oriented, and based on emergent effects) [Luksha, 2014].
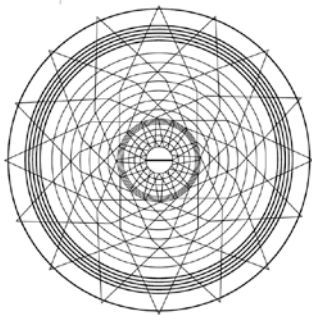
By 2020, the Biometrinet as the NeuroWeb's immediate future may be described as an environment with widely used portable biometric devices; with the data produced by these devices which will be actively used in health care and behavioural games; with the neuro-marketing via BigLiveData, which will devise a digital model of individual behaviour; with biometrics, which will be applied in education in order to correct learning processes according to the biometric data and to do consciousness management training; with artificial limbs, which will appear and operate under the direct control of the human nervous system; with the first tests on neuro-interface-interconnected groups; with the semantic Internet and brain-computer interfaces based on natural verbal and nonverbal communication [ibid.].

The biometric future is much closer to us than we can imagine. According to Sberbank CEO Herman Gref, his bank will be ready to introduce a client identification biometric system within the next two or three years. Sberbank is now considering security measures, such as voice and image recognition systems. These solutions are capable of ensuring 99.9-percent correct recognition and are almost finalised. They ensure both fraud protection and convenience: one does not have to go anywhere or produce any documents in order to be identified by voice for any banking transaction. Sberbank's latest platform '18+' is equipped with a palm identification functionality. More and more biometric ATMs are being bought. As a result, cards whose main task is client identification are gradually becoming a thing of the past. With the introduction of '18+' planned for 2018, the frequency of card usage as the main payment tool will start falling drastically, and banking will change dramatically [Kaledina, 2016]. According to Sberbank's press service, the voice identification of the clients will be introduced bank-wide and provided in all regions and to all clients upon request. Most of the appropriate tests have already been done. It turned out that there are no legal barriers hindering the introduction of new identification tools. Anastasia Ragulina, Director of the *Yakovlev and Partners* Legal Group, said the new technology fully complies with the Russian applicable law. She noted that, when making an agreement, a bank, upon its client's consent, can add the clause on personal data usage because image and voice make part of the personal data. In particular, this is stipulated by Clause 11 of the Private Data Law [ibid.].

The NeuroWeb development periodisation, as defined by Pavel Luksha, differs from that described in the 2015 analytical report entitled 'Approaches to Shaping and Launching New Industries within the Context of the National Technological Initiative, by Example of Digital-Reality Technologies and Perspective Human-Computer Interfaces (as Related to Neuroelectronics)'. In that report, Stage I (the sprouts of the future net) falls on 2015–2020; Stage II (the NeuroWeb preface) - on– 2020–2030; Stage III (the full-fledged NeuroWeb) - on 2030–2040; Stage IV (the NeuroWeb embraces the entire communication area) will start after 2040 [ibid.]. As it may be observed, the difference between these two periodisations is insignificant and does not exceed five years.

The forthcoming entry into the neuro-environment and mastering of neuro-communication processes are accompanied by many risks: neuro-hacking (the NeuroWeb hacking with subsequent damage to the human body and consciousness and spread of specific viruses; threat of the external management of people, including that by artificial intelligence); violation of privacy; transformation of a human's true self by turning people into biorobots; stratification of societies (transformation of the elite into a new biological species of supermen) [NeuroWeb].
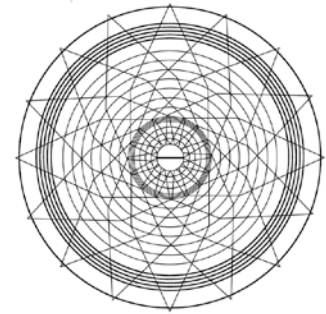
This explains why the NeuroWeb has both protagonists and antagonists. Galina Tsareva, a public activist and author of critical movies about the effect of high technologies on societies, calls the NeuroWeb project a roadmap to the extermination of humankind. She believes that the idea behind the NeuroWeb supposes the emergence of an interface between the human brain and computers; that this interface will operate as a transmission system of electric pulses from the human nervous system to the electronic device and back; that this is a global system of joint networks (the Internet of documents, people, things and living beings), where communication and joint activity proceed by means of neuro-communication tools. She argues that the main goal of the NeuroWeb is the creation of a global, collective brain; a connection of human minds; direct sharing of sensor and emotional experience when a person perceives other people's thoughts, feelings and emotions. In the near future, the popularity of neuro-games will rise, and it will be possible to dip a person into virtual worlds to the extent of merging with them; design telepresence, neuro-prosthetic and brain simulation systems; study consciousness and ways of transmitting the human ego to a non-biological substrate – an artificial body; reach distorted consciousness by simulating visual, sound and contact sensations, which will result in the dissolution of boundaries between physical and digital realities [Tsareva].

By 2020, we expect interfaces, which will manage the Internet of Things, including robots. Smart things will occupy not only the external environment but also human bodies. The number of Internet-connected physical objects will reach 50 billion. The Internet of Things will allow people to record in the real time and post on the web the data on moving a chair in the kitchen or on the nutritional habits of a house cat. A possibility of using a communication channel so as to connect two brains and send messages between them has already been proved. Interfaces that will appear in the near future will enable communication of higher animals (cetaceans, dogs, horses, apes, etc.) which, will subsequently allow them to develop their psychic functions and verbal communication with people. The human brain may be connected to any animal's brain and adopt not only its sensations but also their inherent body capabilities.

According to Galina Tsareva, the NeuroWeb is a weapon in the hands of globalisers. It helps them achieve total power over humankind. She wrote about an imposed idea to view bodies and humans as a raw material capable of being transformed: they can be manipulated in order to restore some lost functions or acquire new and yet unknown ones, which may only be speculated. However, it is not machines that are going to
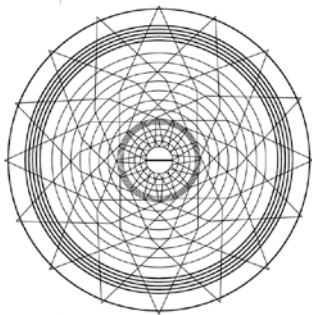
shape human consciousness. This will be done by those who control them. Unfortunately, humankind has not realised yet that when electronic devices interconnect with the human nervous system, and when humans realise their unity with these devices, this will mean putting into practice one of the prerequisites for transforming them into 'a new evolutionary creature', i.e., a cyborg. This is not a phantasy or futurology. This is a harsh reality of our days. The main purpose of this process is to transform men into certain artificial bio-objects deprived of free will, turned into stooges for the ruling elite, and being so easy to exterminate at any moment by simply sending a certain signal to the chip [ibid.].

The real danger of the evolutionary 'collapse' of the history of humankind has been discussed in Russia at the highest level. On September 30, 2015, when addressing the members of the Federal Council of the Federal Assembly of the Russian Federation within the Expert Time Project, Mikhail Kovalchuk, President of the Kurchatov Institute National Research Center, stated that the current world policy keynote was the fight for dwindling resources. Military colonisation is replaced by technological enslavement, and leadership is backed up by technological superiority [Speech by M. Kovalchuk in the Federal Council, September 30, 2015]. Just as Galina Tsareva, Mikhail Kovalchuk is worried by a possible intervention into human evolution for the purpose of subordinating masses to the elite. He said that their purpose was to create a basically new *Homo sapiens* subspecies, i.e., *Homo servus*. The basic features of this population are rather simple: first, they have a limited self-consciousness, which may be easily regulated cognitively (we have already witnessed this process); secondly, their reproduction may be controlled; thirdly, they may abide by cheap feed, i.e., genetically modified products. All these prerequisites are ready, which means that nowadays there is a technological possibility for breeding Homo servus. Nobody will be able to interfere because this is a natural process of scientific development, and what we have to do is to realise our place in this civilisation [ibid].

The creation of the Global Brain on the basis of neuro-communication (planetary Solaris) [Dzyaloshinsky, 2012] is a task humankind is destined to solve in the near future. By all appearances, this task is not occasional. It was predetermined by the fundamental laws of the meta-evolution of the systems of inanimate, animate and socio-technological nature [Grinchenko, 2007; Shchapova, 2011; Grinchenko, Shchapova, 2013; Grinchenko, 2014]. The neuro-environment will be mastered by means of human enhancement technologies [Human Enhancement] within the framework of the transhumanism concept, which was finalised in the late 1990s [Transhumanism]. The countries participating in a new technological race, which repeats itself on the next loop of the ICT process of the 1980-1990s [Cherny, 2014(a); Cherny, 2014(b); Cherny, 2016], are the United States, Japan, China, EU countries and Russia (the latter through the NeuroWeb project; the activity of the Scientific Council of the Russian Academy of Sciences on the methods of artificial intelligence; Russia 2045 project and others). Several Russian institutions conduct research in neuro-communication: Institute of Higher Nervous Activity and Neuro-physiology, Institute of Biomedical Problems, Bekhtereva Institute of Human Brain, Sechenov Institute of

Evolutionary Physiology and Biochemistry (all of the Russian Academy of Sciences); Centre of Nano-, Bio-, Information and Cognitive Technologies of the 'Kurchatov Institute' Research Center; Laboratory of Neuro-physiology and Neuro-computer Interfaces, Biological Department of Moscow State University; Kogan Research Institute of Neuro-cybernetics, Southern Federal University [NeuroWeb].

This was a general survey of the developmental context of a global information environment in the next 25 years, almost until 2040. We believe that traditional social memory institutions (archives, libraries and museums), which emerged and shaped in the writing age, will keep developing in this context.

Conclusion

Alvin Toffler demonstrated that the secret of the industrial civilisation success is in its systemic nature. Six interconnected principles: standardisation, specialisation, synchronisation, concentration, maximisation and centralisation, shaped a unique background that affected all aspects of human life. Nowadays, the secret code of industrialism is disintegrating and changing for a new one. The Second-Wave people intuitively use and defend the old principles, whereas the Third-Wave people challenge them.

A new post-industrial world will gain shape within the next two or three generations. The world history has never witnessed a rate of changes like this. 'The first wave of change – the agricultural revolution… took thousands of years to play itself out. The Second Wave – the rise of the industrial civilization – took a mere three hundred years. Today history is even more accelerative, and it is likely that the Third Wave will sweep across history and complete itself in a few decades. We, who happen to share the planet at this explosive moment, will therefore feel the full impact of the Third Wave in our own lifetimes' [Toffler, 1980, 10].
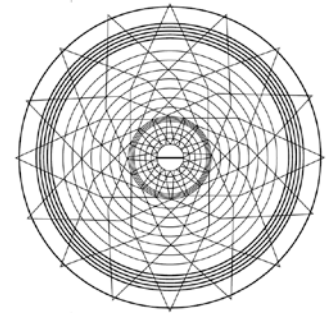
The idea of a *uniform planetary consciousness* has been filled by real content in the interconnected and interdependent world. Its media are employees of multinationals, environmentalists, financial experts, revolutionaries, intellectuals, poets and artists. Just as nationalism spoke on behalf of the nation, globalism is speaking now on behalf of the world, and its emergence is regarded as an evolutionary need, a step to space consciousness, which straddles both the Earth and the Universe [ibid.].

The noosphere originated in the course of the evolution some 100,000 years ago during the transfer from *Homo erectus* to *Homo sapiens*. However, nowadays, we are witnessing the most active development of the generation, systematisation, storage, reproduction and dissemination of knowledge. According to Igor Kondrashin, even if the human brain mechanism has undergone some, but not drastic, changes for the last thousands of years, gradually perfecting but remaining unchanged in principle, the fixation of knowledge in the noosphere has undergone significant changes for the same time span, rising from the cave drawings and stone figurines of primitive people (15–20 thousand years ago), inscriptions on the walls of cathedrals and clay tablets of

ancient civilisations (5 thousand years ago) to modern libraries with encyclopaedias, explanatory dictionaries, textbooks and works of the best thinkers of all times and peoples. The up-to-date knowledge fixations are electronic information media. With the emergence of the Internet, the noosphere entered a new stage of development when the reproduction and dissemination of knowledge will proceed on an ever larger scale and on a higher and more qualitative technological level [Kondrashin, 2003].

In the post-industrial age, the staff of archives, libraries and museums will have to go back at times to find a reasonable balance between their respective professional routines, technological and social innovations, and achievements of sciences (including historical science). What should we all do to be up-to-date but save our identity, to change constantly but remain ourselves? We believe a mature answer to this question can be found in the developmental patterns of a global information environment.

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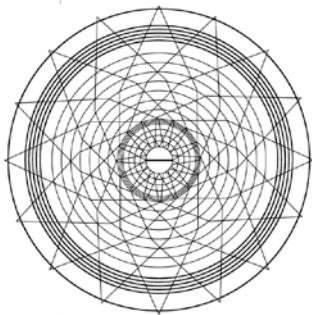
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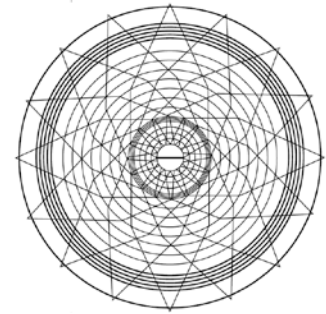
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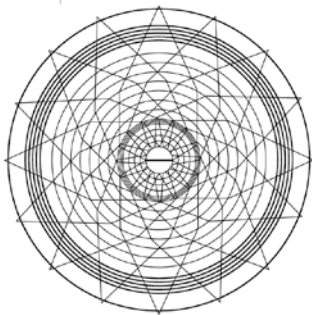
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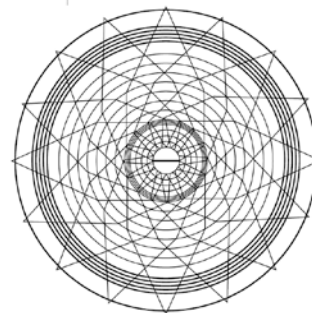
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АРХИВЫ, БИБЛИОТЕКИ, МУЗЕИ
В ГЛОБАЛЬНОЙ ИНФОРМАЦИОННОЙ СРЕДЕ

Чёрный Ю. Ю.

Руководитель Центра по изучению проблем информатики Института научной информации по общественным наукам РАН, кандидат философских наук. Доцент кафедры медиаобразования Института журналистики, коммуникаций и медиаобразования Московского педагогического государственного университета.
yuri.chiorny@mail.ru
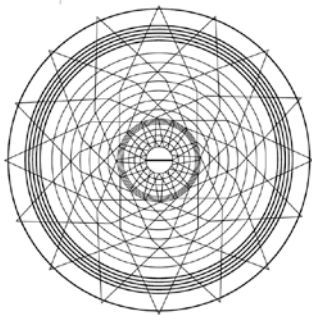
Перевод на английский: Малявская Е. В.

Аннотация:

В статье представлена логика эволюции институтов социальной памяти (архивов, библиотек и музеев) со времени их возникновения до наших дней. Показано, что в рукописную эпоху архивы, библиотеки и музеи представляли собой единое целое. Делается предположение, что конвергенция институтов социальной памяти в электронную эпоху является возвращением к истокам на новом технологическом уровне. Описывается направление развития глобальной информационной среды примерно до 2040 г. в сторону формирования глобального мозга — коллективного интеллекта человечества. Специальное внимание уделяется проекту «Нейронет» (Web 4.0) – одной из перспективных разработок в рамках Национальной технологической инициативы Российской Федерации.

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Ключевые слова: архивы, библиотеки, музеи, социальная память, рукописная коммуникация, электронная коммуникация, Интернет, глобальный мозг, коллективный интеллект, ноосфера, Нейронет, трансгуманизм, конвергенция, индустриализм, постиндустриализм, глобализм, глобальная информационная среда.

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Аналитический доклад «Подходы к формированию и запуску новых отраслей промышленности в контексте Национальной технологической инициативы, на примере сферы "Технологии и системы цифровой реальности и перспективные "человеко-компьютерные" интерфейсы (в части нейроэлектроники)"». М., 2015. 78 с. Режим доступа: http://asi.ru/nti/docs/Doklad.pdf.

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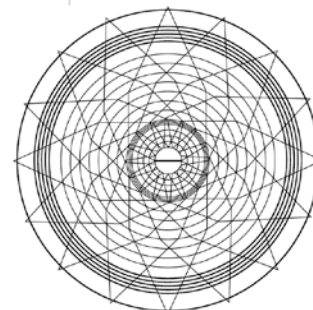
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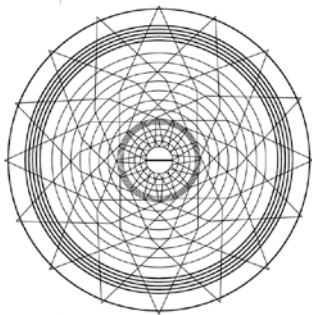
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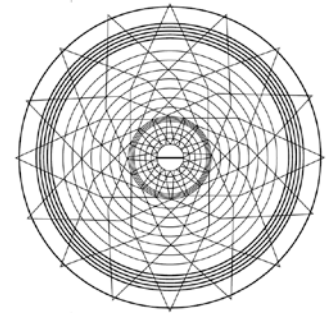
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